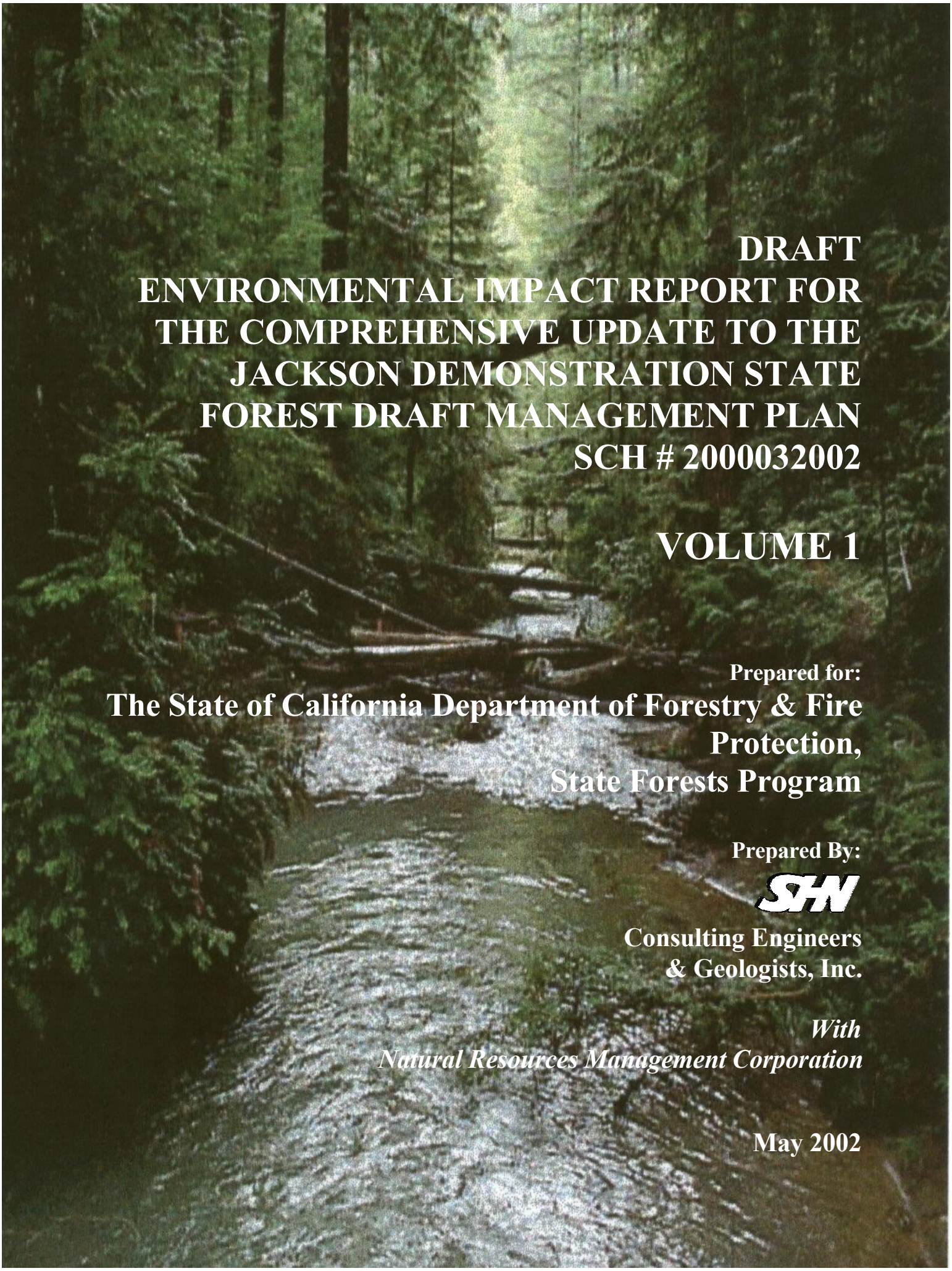

DRAFT ENVIRONMENTAL IMPACT REPORT FOR THE COMPREHENSIVE UPDATE TO THE JACKSON DEMONSTRATION STATE FOREST DRAFT MANAGEMENT PLAN SCH # 2000032002

VOLUME 1

Prepared for:

The State of California Department of Forestry & Fire Protection, State Forests Program

Prepared By:

SHN

Consulting Engineers & Geologists, Inc.

With

Natural Resources Management Corporation

May 2002

Reference: 002002

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FOR THE
COMPREHENSIVE UPDATE TO THE
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THE STATE OF CALIFORNIA DEPARTMENT OF FORESTRY
& FIRE PROTECTION,
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(Cover photo by CH2MHill photographer, from the JDSF Draft Management Plan)

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I. EXECUTIVE SUMMARY

1. INTRODUCTION

The California Department of Forestry and Fire Protection (CDF) is in the process of adopting a comprehensive update to the Jackson Demonstration State Forest (JDSF) Management Plan. The Plan is required pursuant to Public Resources Code (PRC) §4645 and Article 8 of California Board of Forestry and Fire Protection (Board) policy.

Adoption of the JDSF Management Plan is a project subject to the California Environmental Quality Act (CEQA)[1] as defined by statute and the CEQA Guidelines[2]. CDF, as lead agency, has prepared this Draft Program Environmental Impact Report (DEIR) pursuant to CEQA for consideration and certification prior to the Director's adoption of a final version of a new Management Plan for JDSF. CDF will then present the Management Plan to the Board for the Board's approval. CDF will also present the certified Final EIR for the Boards consideration as a responsible agency when the Board decides whether to approve the Management Plan.

This "Executive Summary" section is intended to briefly summarize the proposed actions and their consequences identified in the EIR and assist decision-makers and the public in readily determining EIR conclusions with respect to the proposed action and its consequences.[3]

2. JACKSON DEMONSTRATION STATE FOREST

JDSF is a 48,652-acre state-owned forest located in Mendocino County between Willits and Fort Bragg. Prior to its acquisition by the State in 1947, most of the area had been heavily harvested and is now primarily a healthy second-growth forest ecosystem with redwood, Douglas-fir, and hardwood tree species. Since 1947, JDSF has been managed to achieve a number of different goals, including research in various natural sciences of the forested landscape, demonstration of existing and new methods of sustainable timberland management for non-industrial and industrial forest landowners; educational efforts using formal seminars, publications, and demonstrations; maintenance and enhancement of wildlife and fisheries habitats; and public recreation.

3. PROJECT DESCRIPTION

The JDSF Draft Forest Management Plan (DFMP) provides direction for the management of all of the uses and resources of the forest based on the identified management emphasis areas of forest demonstration, research, habitat protection, watershed health, and recreation. The DFMP describes the application of a diverse set of silvicultural systems and the protection of existing old-growth redwood groves, resulting in a forest with a diversity of vegetation and habitats. The DFMP includes a plan for forest road management, addresses continued public recreation, provides for

[1] Public Resources Code §21000 et seq.
[2] Title 14, California Code of Regulations [CCR] §15000 et seq.
[3] Title 14 CCR §15123

protection of archaeological resources, and describes actions proposed to enhance anadromous salmonid habitat. It recognizes several categories of Special Concern Area and describes the management constraints needed to maintain the associated values.

The following table summarizes physical actions that may result from implementation of the DFMP:

Summary of Potential Actions Resulting from Implementation of the JDSF Management Plan
On-site Actions
• ***Research and Demonstration Programs Emphasizing Economic and Sustainable Forest Management, Timber Harvest, Environmental Resource Conservation, etc. (DFMP Chapter 4)***
• ***Forest Management with Increased Late-Seral Development and Sustained Yield Timber Harvest (10-Year Average 31 Million Board Feet Annually – well Below Growth of the Forest) (DFMP Chapter 3)***
• ***Continued Restoration and Protection of Habitat and Natural Resources (DFMP Chapter 3)***
• ***Continued Recreation Use (including Camping, Hiking, Picnicking, Biking, Horseback Riding, and Hunting) and Improvements to Recreational Facilities (DFMP Chapters 2 and 3)***
• ***Continued Harvest of Minor Forest Products Such as Salvage Logs, Greenery, Mushrooms, and Firewood (DFMP Chapter 2)***
• ***Fire Protection Measures Including Fuel Breaks, Fuel Thinning, Prescribed Burns, Water Storage, and Development of Helispots (DFMP Chapter 3)***
• ***Pest Control by Cultural, Mechanical, Chemical, or Biological Alternatives Pursuant to Integrated Pest Management Procedures (DFMP Chapter 3)***
• ***Vegetation Control for Noxious and Invasive Species by Physical Removal, Biological Controls, or Use of Herbicides (DFMP Chapter 3)***
• ***Reconstruction, Replacement or Decommissioning of existing roads pursuant to a Road Management Plan (DFMP Chapter 3)***
• ***Continued Use of Existing Quarries to obtain surface materials for on-site roads***
• ***Transport of Timber to Landings (Yarding) and Markets (DFMP Chapter 3)***
Off-site Activities
• ***Hauling of Timber for Off-site Processing***
• ***Continued Generation of Recreational Travel (DFMP Chapter 2)***
• ***Purchases of, or Trades for, Private Adjacent Lands and Inholdings with Possible Conversion to Uses Consistent with JDSF Management Plan (DFMP Chapter 3)***

For purposes of CEQA review, "actions" may also include decisions to protect specified areas from harmful activities. The "Project Information" section of this EIR further details potential actions. These are also discussed in the "Resources Specific Analysis" section of this EIR, particularly as they relate to environmental impacts.

4. PROJECT PURPOSE AND OBJECTIVES

The purpose of the JDSF Management Plan is guided by state legislation, Board policy, and forest management planning. These three tiers are interrelated and, in the aggregate, shape the project purpose.

Consistent with all the above, the JDSF Management Plan's stated purposes are as follows:

Project Purpose
• Guide the integrated use and protection of the Forest's resources • Meet requirements of legislation and Board policy • Address local, regional, and statewide concerns

Goals and objectives are detailed in the Section 3 (Project Information) and in Appendix II of the DFMP. The projects goals are as follows:

JDSF Management Goals
• **RESEARCH & DEMONSTRATION: 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.** • **TIMBER MANAGEMENT: Manage the forest on the sustained yield principle, defined as management which will achieve continuous high yields of timber production that contribute to employment and tax revenue, consistent with environmental constraints related to recreation, watershed, wildlife, fisheries, and aesthetic enjoyment.** • **WATERSHED AND ECOLOGICAL PROCESSES: Promote and maintain the health, sustainability, ecological processes, and biological diversity of the forest and watersheds during the conduct of all land management activities.** • **FOREST RESTORATION: Work towards achieving a balanced mix of forest structures and attributes in order to enhance forest health and productivity.** • **RECREATION and AESTHETIC ENJOYMENT: 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.** • **INFORMATION & PLANNING: Develop, maintain, and update management plans and other planning documents and processes. Manage and support the information needs of all State Forest programs.** • **PROTECTION: Protect the forest from damage and preserve the peace within.** • **MINOR FOREST PRODUCTS: Maintain a program that provides an opportunity for the public and small businesses to purchase minor forest products.** • **PROPERTY CONFIGURATION: Improve the boundary layout of the State Forest to facilitate management logistics and increase demonstration and research opportunities.**

5. ISSUES TO BE RESOLVED

The JDSF Management Plan proposes a balanced program to address multiple needs while still meeting the primary legislative goals and objectives of economical forest management, demonstration and research.

The EIR compares management alternatives weighing each against the project goals and objectives. Each alternative incorporates varying levels of forest management demonstration, wildlife habitat protection and management, commodity management, research, and recreational use. The Board will consider each alternative and, based on the analysis provided in this EIR, may select a management strategy that differs from the one presented in the DFMP. The final Management Plan may incorporate elements from several alternatives.

This document identifies and addresses significant impacts which may result from adoption of the JDSF Management Plan, and proposes mitigation to reduce them to "less than significant" levels through changes recommended for incorporation into the Management Plan, or through other mitigations required as part of Plan approval and/or subsequent implementing actions.

On the most fundamental level, the key question that must be answered is as follows:

Fundamental Question to Be Addressed by This EIR:
• Will adoption of the JDSF Management Plan result in any significant adverse environmental impacts?

6. IMPACTS AND MITIGATION

Public scoping and written comments have indicated several subjects of particular concern that are analyzed in the EIR. The following is a list of some of those concerns:

a. The harvest of old-growth forest may have significant effects on wildlife habitat.

The DFMP identifies existing groves of old-growth and discusses protection of individual old-growth trees. Identified groves will be protected and young growth stands that are adjacent to specific groves will be managed to enhance the wildlife habitat values of the protected stands. In addition, approximately 23% of the forest will be managed to produce late-seral habitat elements often associated with old-growth forest. Most individual old-growth trees with characteristics valuable to wildlife will be retained.

b. Continued timber harvesting may adversely affect water quality.

Timber harvesting on JDSF will be planned and implemented utilizing state of the art harvesting methods and protection measures. All operations will meet or exceed the state forest practice regulations. One goal of all operations is to protect watersheds and maintain watershed processes. In addition, the DFMP identifies near-stream tree retention standards, which are higher than those specified by the Rules. Higher tree retention contributes to protection from water temperature increases due to solar radiation; trees also increase the potential for large woody debris recruitment. These are both important elements of anadromous salmonid habitat. Equipment limitation zones and no-cut buffer zones adjacent to watercourses will enhance protection from sediment delivery to watercourses.

c. Timber harvesting may affect wildlife species that are listed as threatened or endangered.

The protection measures described in the DFMP present a programmatic approach to species protection. Potential impacts and mitigation are identified in Table 38 of the EIR. Site-specific analysis and mitigation will be developed at the project level, typically through the Timber harvest plan preparation and review process.

d. Management activities on JDSF may result in soil erosion.

In addition to erosion control techniques required by state regulations, the DFMP proposes a Road Management Plan. Forest Roads have high potential for sediment delivery to watercourses. The Road Management Plan proposes an inventory and plan for control of potentially significant road-related erosion sites, which will provide a beneficial long-term result.

Tables provided at the conclusion of each resource section within this report (See Section VII) summarize levels of impact among the five selected alternatives. Mitigation measures have been identified that will reduce potentially significant impacts to less than significant levels.

7. ALTERNATIVES CONSIDERED

The EIR examines the following alternatives:

Alternative A.	No Project-No Direct Management Activity
Alternative B.	No Project-Management Consistent with 1983 Management Plan
Alternative C.	Management Consistent with Draft Forest Management Plan
Alternative D.	All-Age Emphasis
Alternative E.	Late Seral Emphasis

8. AREAS OF CONTROVERSY

The management of JDSF has given rise to many controversies. The most important ones related to this EIR are as follows:

a. Should there be any timber harvesting?

Some commenters have opposed all timber harvesting on JDSF urging that the forest be allowed to "recover" and become an old-growth forest. They have urged that the area be allowed to develop into habitat for endangered species or that the purpose for the Forest be changed to focus solely on recreation.

CDF prepared the DFMP in consideration of a mandate to demonstrate sustainable timber management as called for in the enabling legislation.[4] The Forest was acquired by the State to restore the land to timber production and to demonstrate economical and sustainable forest management while giving consideration to other resource values. CDF believes that existing law requires timber production to remain an important activity on the forest. Further, the demonstrations on JDSF are beneficial to large and small timberland owners in providing an opportunity to learn how to enhance the productivity of their lands.

[4] Public Resources Code § 4651

State Park units located nearby or adjacent to JDSF are managed almost exclusively for recreation purposes and timber harvesting generally does not occur. These areas provide substantial benefits in terms of preservation and potential old-growth forest development. In addition to the recreational services provided by the State Parks in the area, providing recreational opportunities, including activities such as camping, horseback riding, and hiking, is an important part of JDSF management.

b. Should there be any clear cutting?

Some commenters have proposed that there be no clear cutting on JDSF. They have recommended that only selection cutting be allowed in order to reduce environmental impacts and to allow wildlife habitat conditions to continue to develop to favor wildlife species associated with old-growth forests.

The DFMP provides for both even-aged and uneven-aged management systems. Even-aged management is widely used and is a viable method of timber harvesting when utilized properly, therefore, the DFMP proposes continued research and demonstrations of this method, including reserve-form stands (popularly called "variable retention"). Demonstration of even-aged management offers an opportunity for resource professionals and private landowners to observe proper implementation and to determine the environmental effects associated with this management tool. Using both even- and uneven-aged management throughout JDSF will result in a diversity of wildlife habitat. The management plan restricts both the extent and location of even-age harvesting.

c. Should herbicide use be allowed?

Some people have urged that CDF discontinue all use of herbicides on the forest claiming that herbicides present a threat to the environment and human health. Responding to these concerns, CDF significantly reduced the use of herbicides on the forest until a new management plan could be prepared.

CDF believes that there are important benefits to be found in limited herbicide use as part of an integrated pest management program, and that when properly applied, herbicides do not present a threat to the environment or to human health. Limited use of herbicides on the forest can demonstrate for private owners the proper and appropriate use of chemical treatments in combination with non-herbicide methods for controlling invasive exotic plants, an important regional problem in natural resource management. Herbicide use remains significantly less expensive than many other means for accomplishing these objectives and is expected to remain an important vegetation management tool on private lands. Demonstration projects have potential to contribute to a reduction in herbicide use through application of improved silvicultural techniques and integrated pest management.

9. CONCLUSION

This EIR provides analysis of the potentially significant effects of reasonably foreseeable activities that are associated with alternative management strategies applied to JDSF, including the preferred Alternative C, as developed in the JDSF Draft Management Plan. The range of alternatives considered is, in large part, derived from comments received during public scoping meetings, letters from concerned citizens, and from a Citizen's Advisory Committee appointed by the Director of CDF.

Although there are potentially significant environmental effects associated with implementation of the preferred alternative, mitigation measures are proposed to avoid or substantially lessen those potential impacts. Following review of comments received during the comment period on this DEIR, the final selected management strategy may be the preferred alternative, one of the other Alternatives, or a combination of elements of some or all of the Alternatives examined here.

II. INTRODUCTION

The JDSF[5] is a 48,652-acre forest that is managed by the CDF. It consists primarily of redwood, Douglas-fir, and hardwood tree species.

California's State Forest System has been in existence since 1946 when the first large forest properties were acquired. PRC §4631-4658, provides the authority for acquisition, administration, and operation of the State forests by CDF. The Board has adopted policies for management of these lands.

1904, Railroad Track Reached Camp One

Demonstration forests play an important role in testing the efficacy of forest management techniques. Information gained through demonstration programs can then be applied to all forestlands, both public and private. Chapter 0350 of Board policy provides the following regarding the need and value of demonstration forests:

Camp One Area, Summer 2000 With The Egg Taking Station To The Right

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 benefit of state forests.

JDSF, at 48,652 acres, is the largest in the State system. JDSF was first acquired in 1947 from industrial owners in a mostly cutover condition. The initial acquisition actually occurred from 1947 through 1951 as part of an agreement with the seller. Additional lands were added to the Forest in 1968 (Board Policy, 2/21/01). JDSF was the third state forest to be acquired, and was preceded by Latour and Mountain Home State Forest in 1946. The authority to acquire private lands for the state forest system was enacted in by the legislature in 1945 (PRC Sections 4631-4658) following recommendations of the "Forest Study Committee" that was established by the legislature in 1943 (Board Policy Chapter 0351.1).

Prior to the first harvests beginning in the 1860's, most of the Forest can be assumed to have been virgin old growth. A history of JDSF is included in Chapter 1 of the DFMP and in Section V of this document.

[5] For a list of acronyms, see Appendix 2.

1. LEGISLATIVE MANDATE FOR THE STATE FOREST SYSTEM

In establishing the state forest system, the legislature stated,

> "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." (PRC 4631.)

The legislation went on to identify that one area, not to exceed approximately 40,000 acres, would be acquired to each of the Forest practice districts for the "purpose of demonstrating economical forest management." (PRC 4531) To guide the Forest management of these forests, the legislation included the statement "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: retain the existing land base of state forests and timber production for research and demonstration purposes." (PRC 4631.5)

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." JDSF is the largest publicly owned forest in California with a research and demonstration mandate.

The legislature further gave the authority for the management of the Forest to the CDF with oversight from the Board. The enabling legislation states, "the Department in accordance with plans approved by the Board, may engage in the management, protection, and reforestation of state forests" (PRC 4645), and goes on to state "the Director, acting in accordance with the policies adopted by the Board, shall administer this chapter. He can exercise all powers necessary to accomplish its purposes and intent." (PRC 4646) The legislature clarified the interaction between CDF and the Board as follows "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 conformance 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." (PRC 4651) The Board's authority is further defined by the legislature under PRC 4656.1 where it states,

> …the Board may establish rules and regulations in accordance with Chapter 3.5 (commencing at 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 the state forests. (PRC 4640)

To provide further guidance to CDF and the Board, the legislature provided definitions within the chapter. "'Protection' means protection of forest trees against damage by fire, insects, and trespass (PRC 4640). "'Continuous production' means such management as will approach a balance between depletion and growth." (PRC 4636)

As authorized by the legislature in the Public Resources Codes, the Board has developed policies that guide the management of the state forest system. Within the Board policies at Chapter 0351.1, it states "the significance of the state forest program in demonstrating improved practices will increase as the demand for forest products increases and as public interests in forest management practices intensifies. Demonstrations of the compatibility and conflicts involved in multiple use of forestland are essential as population and development pressures increase on California's forest lands." Based on the authority granted to it under the Public Resources Code, the Board has adopted the following policies to guide the CDF in administering the state forest program and managing the state forests.

2. 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.

3. JDSF DEMONSTRATION AND RESEARCH

Under State management, the JDSF has grown to include mature young-growth timber stands. The JDSF is currently 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.

3.1 Demonstration Aspects of JDSF

Legislature envisioned that the state forest system would serve as a demonstration for private landowners by purchasing cut over properties and demonstrating sound reforestation and management practices. The enabling legislation stated that state forests would be established in

each forest district "for the purpose of demonstration of economical forest management." (PRC 4631) The Board interpreted the demonstration aspect of the Forest when it developed Board Policy at Chapter 0351.3, as presented below.

3.2 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.

Several research and demonstration programs have been conducted, planned or are currently underway at JDSF. These include studies addressing the effects of silviculture on timber stand development, timber harvest effects, watershed analysis, wildlife surveys, and wildlife habitat analysis. Appendix IV of the DFMP provides a listing and description of each project. The goals for JDSF research and demonstration programs are generally as follows:

Summary of JDSF Research Goals
• Direct programs to the needs of the public, small forest land owners, resource professionals, timber operators and the timber industry • Conduct monitoring of resource management activities to gauge effectiveness • Develop methods to minimize conflicts inherent in the multiple use of forestland • Effectively disseminate research and demonstration information to interested stakeholders • Establish a Forest Learning Center at JDSF • Accelerate research and demonstration programs • Develop research, demonstration, and educational partnerships with other public and private interests

4. LOCATION

JDSF is located entirely within Mendocino County along Highway 20, roughly between U.S. Highway 1 (near the towns of Fort Bragg and Mendocino) and Highway 101 (near the town of Willits; see Figure 1). JDSF is located approximately 140 highway miles north of San Francisco and 130 highway miles south of Eureka, California. The area comprises approximately 48,652 acres (76 square miles). The western boundary of the State Forest comes within about 1½ miles of the coast. The Forest extends inland (eastward) about 16½ miles. The north/south site dimension varies from over seven miles at the western end of the Forest to as little as 2½ miles at the center.

5. FOREST MANAGEMENT PLANNING

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 Board policies also direct the timber management program on the state forests. These policies direct CDF to conduct regular periodic timber sales on Jackson, Latour, Boggs Mountain, and Mountain Home state forests. The Board policies further direct each forest to establish a "rotation age, cutting cycle, and allowable annual cut," and the establishment of timber harvesting schedules that "should be projected at least five years into the future." This also requires that the allowable cut levels "must be derived from pertinent inventory and growth data." The state forests are to be managed on a sustained yield principal, which the Board policy defined as "management, which will achieve and maintain continuous timber production consistent with environmental constraints." Although the state forest must be harvested on the basis of maximizing mean annual increment of high quality forest products, this does not preclude intermediate cuts designed to increase total yield and reduce losses from mortality. The Board policy requires that timber production harvesting

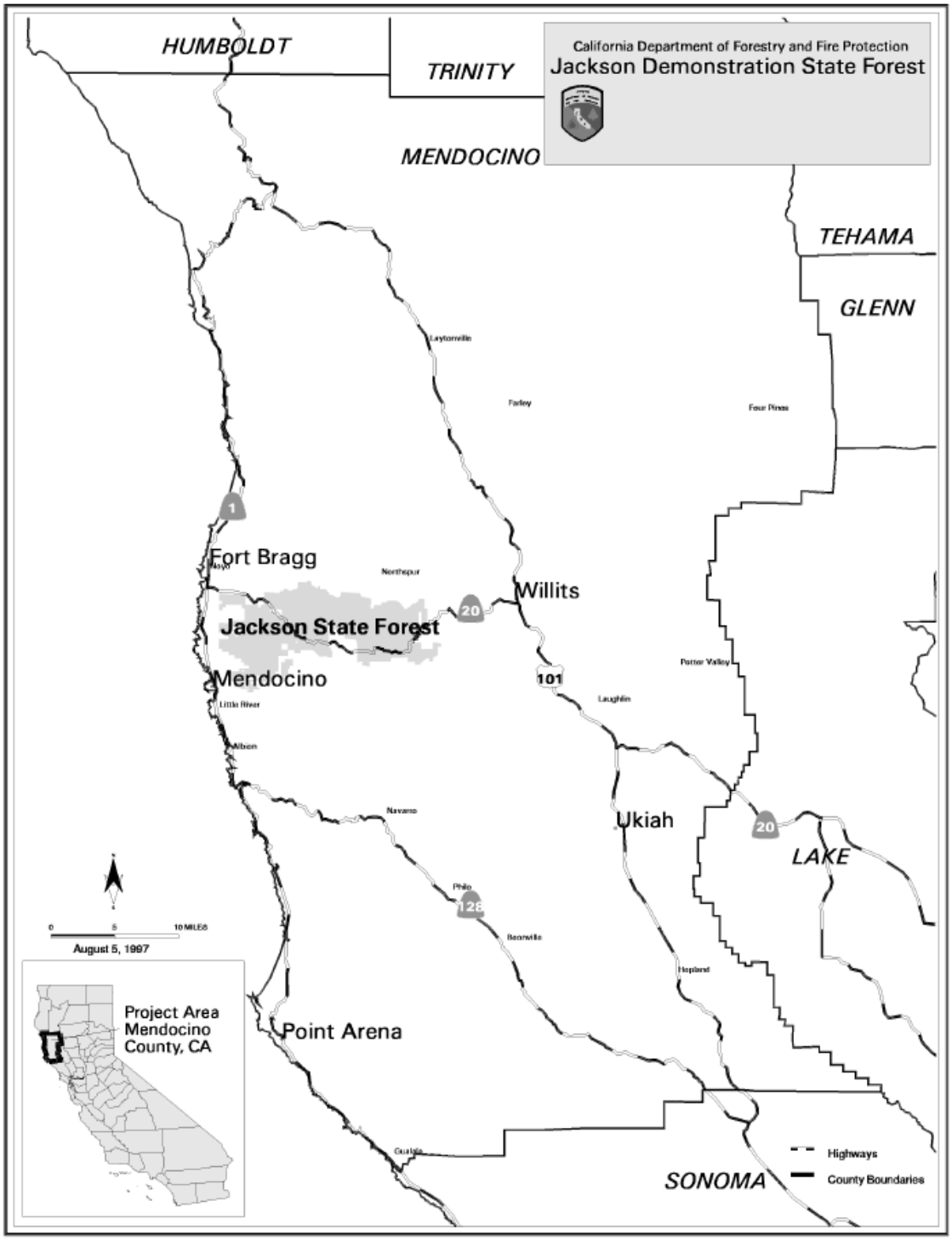

Figure 1. Jackson Demonstration State Forest Location Map

“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." The Board policies direct that,

> Economically and ecologically justifiable intensified forest management practices to increase total fiber production and timber quality will be pursed 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. (Board Policy Chapter 0351.4)

The Board policy also requires that "timber sales should have demonstrational value, and include experimental and educational aspects whenever possible." (Board Policy Chapter 0351.4)

5.1 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 that will achieve and maintain continuous timber production consistent with environmental constraints.

E) State forest timber stands should be harvested based on 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, 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. The Department should actively seek financing to conduct such intensive silvicultural practices.

H) Timber sales should have demonstrational value and include experimental and educational aspects whenever possible.

CDF operates eight Demonstration State Forests totaling approximately 71,000 acres. The Forests represent the most common forest types in the State. The State Forests grow approximately 68 million board feet yearly and harvest about half of the growth each year, enough to build over 3,000 single-family homes. The Forests provide research and demonstration projects on forest management, while providing public recreation opportunities, fish and wildlife habitat, and watershed protection. In addition, revenue from these harvests funds a variety of CDF's Resource Management Programs.

The Board sets policy for management of the State Forests. This policy builds upon legislation, directing CDF to prepare detailed management plans and to conduct programs in timber management, recreation, demonstration, and investigation.

Generally, Board policy specifies timber production as the highest priority on JDSF (§0351.2). Recreation is recognized as secondary but compatible. Special uses primarily benefiting non-forestry and/or private interests will have low priority. Uses that conflict with State forest objectives, such as mining and commercial concessions, are discouraged.

The need to prepare Forest Management Plans is specified in Public Resources Code Section 4645 and Board Policy. The content of the Forest Management Plan must conform to State Board of Forestry and Fire Protection policy pursuant to "Article 8: Management Plans."

Board Policy Chapter 0351.10, directs that "Management Plans for Boggs Mountain, Jackson, Latour, Mountain Home and Soquel Demonstration State Forests shall be prepared by the Department, with appropriate public review, for approval by the Board. The Department shall present to the Board a thorough review of each existing plan at least every five years. After each review, the Board may direct the Department either to continue management under the existing plan, to prepare amendments to the DFMP, or to prepare a new plan for public review and Board approval. The Department shall submit the requested amendments or plan to the Board within one year after each request. The Department shall continue management under existing plans with appropriate consideration for changes in law or regulation, until amendments or new plans are approved by the Board."

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 DFMP sets standards for monitoring and evaluation to ensure that the management direction is implemented and the objectives are met.

The CDF has drafted an update to the current JDSF Management Plan prepared in 1983. 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 (April 2001, DFMP).

The desired future condition of the Forest, discussed in detail in Chapter 3 of the DFMP, describes both the management practices planned for JDSF and the development of habitat and biological diversity.

The terms JDSF Management Plan, Management Plan, or Plan, as used in this document, refers to the latest draft of the JDSF Management Plan until the final plan is adopted. The final approved plan will incorporate information from this EIR. (For further explanations and a complete"List of Acronyms" and "Glossary of Terms," refer to Appendices 1 and 2, respectively).

5.2 EIR Required

The JDSF Management Plan is a project subject to CEQA (PRC) §21000 et al.) (Title 14, CCR §15000 et al.).

CDF, as lead agency, has prepared this EIR pursuant to CEQA for consideration prior to adoption of the JDSF Management Plan. For a list of preparers, see Appendix 3.) The purpose of this EIR is as follows:

Purpose of JDSF Environmental Impact Report
Inform agency decision-makers and the public of significant environmental effects resulting from adoption of the JDSF Management Plan. Identify possible ways to minimize the significant effects, including consideration of mitigation and alternatives.

Information in this EIR does not control the agency's ultimate decision on the project; however, the agency must respond to each significant impact identified in the EIR and make findings regarding the significance of each impact. Statements of overriding consideration, if applicable, must be adopted for those impacts that are not avoided or substantially lessened (CCR §15093). For a summary of the CEQA process, see Figure 2.

For evaluation of impacts, this EIR considers subsequent actions that may result from adoption of the JDSF Management Plan. A "Program" EIR is appropriate for this project since the issues addressed tend to be policy or program related (CCR §15168). The Program EIR approach has the benefit of allowing a more comprehensive environmental analysis at the policy-making stage rather than for each subsequent action over time which implements the JDSF Management Plan. In Program EIRs, the degree of specificity required corresponds to the degree of specificity in the DFMP (CCR §15146).

The term EIR, as used in this document, refers to the Draft EIR until such time as public review and adoption at which time this EIR will be considered a Final Program EIR. The final EIR will consist of any revisions to the Draft EIR, together with public and agency comments, and responses by CDF. Approval of the EIR will include findings regarding the project, its effects, alternatives, and any other information determined appropriate by CDF and the Board as lead agency.

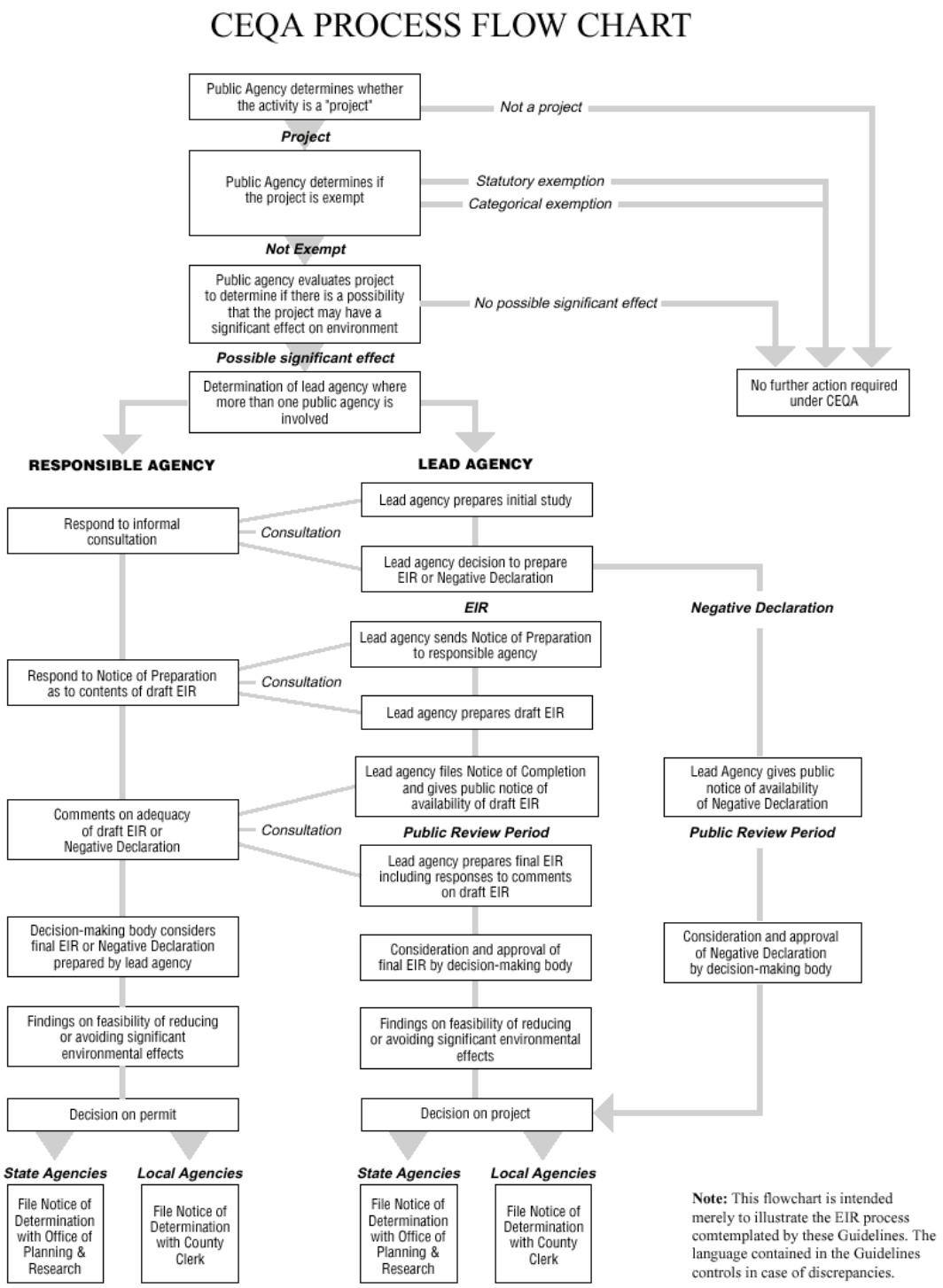

Figure 2. EIR Process Flow Chart From Guidelines

6. RELATIONSHIP BETWEEN EIR AND DRAFT JDSF MANAGEMENT PLAN

This EIR is intended as a public disclosure and decision-making tool for adoption of the JDSF Management Plan. When complete, the Final EIR will be reviewed and considered by the Director of CDF, and if found to be in compliance with CEQA, the Director of CDF will certify the Final EIR. Following certification of the Final EIR, the Board of Forestry will review and approve a JDSF Management Plan. The Management Plan approved by the Board will be consistent with the Final EIR. All mitigation measures developed in the Final EIR will be incorporated into the approved JDSF Management Plan.

The DFMP will be available for review during the Draft EIR review period. The JDSF Management Plan, and all support information, is incorporated into this EIR by reference.

This EIR is generally intended to "stand alone" and include all information necessary for the reader to understand the project and its effects. It is intended to allow review of the project for compliance with CEQA without necessarily reviewing the JDSF Management Plan itself. Therefore, this EIR summarizes–and sometimes reiterates–information contained in the JDSF Management Plan and other support information. It is highly recommended that readers interested in a more detailed review of the project obtain a copy of the DFMP. The JDSF Management Plan will be available for review at the same locations specified for this Draft EIR.

7. CALIFORNIA FOREST PRACTICE ACT AND FOREST PRACTICE RULES

The state forest system has unique management objectives established by the legislature and Board policies. (A complete set of the Board policies governing state forests is located in Appendix 5.) In addition to the requirement for a management plan to direct the harvesting from these lands, all harvesting activities also fall under the requirements of the FPA as administered through the FPRs. The FPA requires that "no person shall conduct timber operations unless a timber harvest plan (THP) prepared by a registered professional forester has been submitted for such operations to the department pursuant to this article." (PRC 4581) Timber operations are defined as "the cutting or removal or both of timber or other solid wood forest products, including Christmas trees, from timberlands for commercial purposes together with the work incidental thereto…" (PRC 4527).

The FPA defines "timberland" as,

> …land, other than land owned by the federal government and land designated by the Board as experimental forest land, which is available for, and capable of growing a crop of trees of any commercial species used to produce lumber and other forest products, including Christmas trees. (PRC 4526)

Because JDSF is not federally owned land, it therefore meets the definition of "timberland" under the FPA, and therefore all timber operations conducted require a THP with the exception of lands designated by the Board as "experimental forest land." [6]

8. RELATIONSHIP WITH PRIOR EIRS AND MANAGEMENT PLANS

Management plans were prepared for the Jackson Demonstration State Forest in 1958, 1964, 1970, and 1983. Each Management Plan built upon its predecessor, and each became increasingly complex as awareness and interest in forest management issues grew.

The DFMP and this corresponding EIR are comprehensive and intended to supercede all prior Forest Management Plans. (This EIR does not, however, supercede the negative declaration used to establish the 1,225-acre experimental forest designation for a portion of the North Fork Caspar Creek.) This approach avoids conflicts between prior documents. It also simplifies public and agency review, use, and implementation of the new Management Plan and EIR.

A comparison between the 1983 Management Plan and the proposed Management Plan can be found in the "Alternatives" section of this EIR. Alternative B represents continued management under the existing plan. Alternative C represents the proposed Plan. Accordingly, a comparison of impacts between the 1983 Management Plan and the proposed Management Plan can be readily ascertained by reviewing policies, actions, and impacts for Alternatives B and C. The comparative matrix in Section VI (Alternatives) provides a detailed summary of the differences between these and other alternatives.

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[6] In 1991 the Board designated 1,225 acres of JDSF as "experimental forest land" as allowed under PRC 4526 (see above). This action was taken under a negative declaration prepared jointly by the Board and CDF to "investigate the effects of logging on the watershed." The "Notice of Determination" was submitted to the Office of Planning and Research on July 11, 1991. The area is located within the North Fork of Casper Creek and is designated as a research area in the DFMP (See Figure H in attached Figures section).

Under the current regulatory requirements, CDF personnel from JDSF prepare THPs and submit them to the regional CDF office in Santa Rosa. CDF forest practice personnel that are not associated with the management of JDSF conduct the THP review and approval process, acting as the lead agency as provided under CEQA (See Figure 3). The THP review and approval process is a "functionally equivalent" program to an EIR as certified and authorized by the Secretary of Resources. The review of the THP by CDF is conducted in conjunction with an interdisciplinary review team that includes representatives of the California Regional Water Quality Control Board, North Coast Region (RWQCB), the California Department of Fish & Game (CDFG), and the Department of Conservation, California Geological Survey (aka, Division of Mines and Geology [CDMG]). These "responsible agencies" provide expertise in their respective fields to CDF serving as the lead agency for the review and approval of the THP. This review team may also include a representative of the county government, the California Coastal Commission (for plans within the coastal zone), and the Department of Parks and Recreation in the case of plans that may affect the values of publicly owned parklands. The director may also request any other federal, state, or county agencies or the Native American Heritage Commission or local tribes, when appropriate, to assist as advisors to the review process. (FPR at CCR1037.5).

9. AREAS OF POTENTIAL CONCERN

Specific areas of environmental concern raised during the public scoping processes for this EIR include the following:

Environmental Issues Raised
Aesthetics Visual impacts of timber harvests and even-aged management strategies, particularly near recreational facilities, homes, and main travel corridors **Recreation** Increasing the number of rustic campsites Expanding the Forest trail system for hikers, equestrians and bicyclists Maintaining non-motorized access upon decommissioning of roads Maintaining year-round motorized access for hunting and ORV use (comments for and against) Target shooting (comments for and against) **Geology and Soils** Remediation of erosion and stream sedimentation resulting from old roads and poorly maintained roads **Biological** Protection of native fish and aquatic habitat within riparian corridors Improved road maintenance and improved controls on logging activity Management for wildlife habitat diversity by maintaining multi-aged stands, existing old growth stands, downed trees, hardwoods, fire ecology, and other naturally occurring conditions Protection and recovery of endangered species through avoidance and habitat enhancement **Pest Management** Use of Forest herbicides/pesticides (comments for and against) **Land Use** Avoiding conflicts between timber harvest and the adjacent Mendocino Woodlands recreation camps

Areas of public concern are detailed in the DFMP, Chapter 2. Many other concerns not directly related to environmental issues are also discussed, such as JDSF funding and administration. The DFMP also discusses numerous management actions, strategies, and decisions proposed or already implemented in response to public concerns.

These and other issues raised during the public scoping process are further summarized in the Scoping Report attached as Appendix 6.

10. ISSUES TO BE RESOLVED

The primary issue to be resolved concerns appropriate management emphasis for the various Forest resources goals and objectives. The challenge of the JDSF Management Plan is to adopt appropriately balanced policies addressing multiple needs while still meeting the primary State

legislative goals and objectives for economical State Forest demonstration and research. This issue will be addressed by comparing a range of management alternatives to the preferred management strategy: the JDSF Management Plan.

The "Alternatives" section of this EIR weighs the relative trade-offs for each management strategy against the project goals and objectives. Alternatives assist the CDF Director in adopting a final management strategy.

Each alternative incorporates varying levels of commodity management, forest management demonstration, wildlife habitat protection and management, and recreational use. The Director of CDF will consider each alternative and, based on the analysis provided in this EIR, may select an alternative management strategy to the one presented in the DFMP. The selected alternative and mitigation measures adopted in the final EIR will be incorporated by CDF into the JDSF Management Plan for presentation to the Board for final approval.

Another important issue to be resolved concerns whether significant adverse impacts will result from adoption of the JDSF Management Plan, and whether those impacts can be mitigated to "less than significant" levels through changes incorporated into the DFMP, or other mitigations required as part of Plan approval and/or subsequent implementing actions.

On the most fundamental level, the key question that must be answered is as follows:

Fundamental Question to Be Addressed by This EIR:
Will adoption of the JDSF Management plan result in any significant adverse environmental impacts?

11. PUBLIC PARTICIPATION

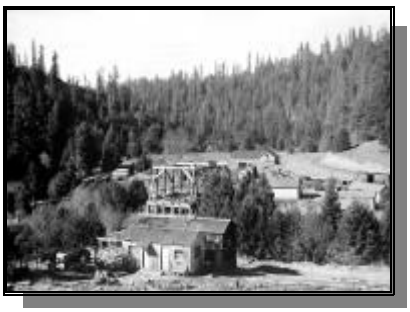
Preparation of the DFMP to date has included a substantial public input component. A number of forums have enabled the public to offer suggestions concerning the management direction of the Forest. In 1997, a Citizens' Advisory Committee was appointed by then-CDF Director Richard Wilson. The committee met periodically over an 18-month period and produced a number of recommendations for management of the Forest. A number of the recommendations of the committee have been incorporated into the Management Plan.

Prior to preparation of the DFMP, public scoping sessions were held in Ukiah, Fort Bragg and Sacramento. Both written and oral comments were received.

Certification of this EIR requires a minimum of two comment periods. The Notice of Preparation comment period, primarily intended for interested agencies, has concluded and comments received are included in Appendix 4.

Prospectively, a minimum 45-day public and agency comment period is required on this Draft EIR. Comments received must be responded to in writing by CDF and incorporated into the final EIR.

The public notice for review of the Draft EIR and Management Plan will specify a comment period and locations regarding where the Draft EIR and supporting material can be obtained for review.



Historic view of Camp 20.

Recent view of Camp 20 area.

12. CONTENTS AND ORGANIZATION OF EIR

The primary components of this EIR, as required by CEQA, are as follows:

Key Components of JDSF EIR (CEQA Guideline Reference)
Project summary (CCR §15123)
Project description (CCR §15124)
Project purpose, goals and objectives (CCR §15123)
Project setting (CCR §15125)
Project alternatives (CCR §15126.6)
Project impacts (CCR §15126)
Project mitigation measures (CCR §15126.4)
Comparison of effects among alternatives (CCR §15126.6)
Significant environmental effect (CCR §15126.2)

Project Summary: Project summary information is included in the "Executive Summary" section of this EIR. It allows the reader to readily determine EIR conclusions regarding the project and its consequences without necessarily reviewing the entire document.

Project Description & Project Purpose, Goals and Objectives: The project description and project purpose, goals and objectives are included in the "Project Information" section. All environmental impact analysis hinges on the project description information, particularly the discussion of foreseeable actions that may result from adoption of the DFMP. The project purpose, goals and objectives provide the basis for selection of management alternatives. Alternatives are used to determine whether basic changes to the project scope can lessen identified environmental impacts while still meeting the primary purpose, goals and objectives of the DFMP.

Project Setting: Basic project setting information is included in the "Environmental Setting" to give the reader a general sense or feel for the site. Detailed project setting information is discussed by environmental resource category (that is, biology, hydrology, and so on) in "Resource-Specific Analysis" section. This section also includes a discussion of impacts and mitigation since they are interrelated to the baseline setting information.

Discussion is divided into resource categories to better manage the complexity and range of issues required to be addressed pursuant to CEQA. It also allows the public and agencies to focus on their particular areas of concern. Project resource categories are arranged alphabetically consistent with CEQA Guidelines, "Appendix G: The Initial Study Checklist."

Setting information provided for each resource category focuses on information relating to identified project impacts. All project setting information is based on existing project conditions. This discussion also includes the existing regulatory setting as applied to the resource being evaluated. Regulatory standards discussed include permits, agreements, consultations, and consistency determinations. This section also includes applicable CDF standards, such as the current Forest Practice Rules, and proposed Management Plan policies applicable to protection of resources.

Project Alternatives: The "Project Alternatives" section of this EIR explains the differences between the preferred action (adoption of the DFMP) and a range of alternative management strategies. This section also includes the mandatory evaluation of a "no-project" alternative that is defined as continuation of policies under the existing JDSF Management Plan. (CCR §15126.6 (e)(3)(A)). The purpose of the "no-project" alternative is to provide a baseline from which to compare all other proposed actions. The "Project Alternatives" section also includes a brief listing and explanation of other alternatives considered by CDF, but not selected for evaluation in this EIR.

Since this is a program or policy-level project under CEQA, alternatives consist of other policies that may emphasize greater protection of a resource identified as adversely affected. Changes in management emphasis areas are considered in balance with other resource needs, and the project goals and objectives.

For each resource section, relative comparisons are made between impacts as identified for the proposed project (the JDSF Management Plan) and impacts that may result from selected alternatives. If an alternative will result in one or more significant effects, in addition to those caused by the proposed project, those significant effects will be discussed but in less detail than for the proposed project (CCR §15126.6 (d)).

The purpose of the alternatives evaluation is to determine whether fundamental changes to the proposed Management Plan would substantially lessen one or more environmental effects. Upon comparison of the relative merits among each alternative, the "environmental superior alternative" is identified. The final, approved JDSF Management Plan may borrow desired elements from several of these alternatives, as well as from other suggestions received during public and agency review.

Project Impacts: Each resource section includes an impact determination, including the type of impact (that is, direct, indirect, and so on) and the level of impact (that is, significant, less than significant, and so on).

Certain impacts may also be beneficial. This is often the case with adoption of a resource program such as the JDSF Management Plan. Each successive Management Plan continues to prioritize increased protection and enhancement to manage non-timber resources. This can result in improved conditions for a particular environmental resource over time when compared to the existing project setting.

Project Mitigation: Where impacts are determined to be adverse and significant despite applicable regulatory standards and protection measures proposed as part of the JDSF Management Plan, mitigation measures are proposed to reduce impacts to less than significant levels. Since one goal of the JDSF Management Plan is to avoid significant environmental impacts, additional mitigation measures are often not required. Where mitigation measures are necessary and feasible, they would be incorporated into the JDSF Management Plan prior to adoption.

For all discussion sections, added emphasis is placed on issues of concern. For example, detailed discussion is provided for impacts to biological resources while little discussion is provided for more urban-related issues such as housing or solid waste generation.

III. PROJECT INFORMATION

1. PROJECT LOCATION

JDSF is located entirely within Mendocino County along Highway 20, roughly between U.S. Highway 1 (near the towns of Fort Bragg and Mendocino) and Highway 101 (near the town of Willits; see Figure 1). JDSF is located approximately 140 highway miles north of San Francisco and 130 highway miles south of Eureka, California. The area comprises approximately 48,652 acres (76 square miles). The western boundary of the State Forest comes within about 1½ miles of the coast. The Forest extends inland (eastward) about 16½ miles. The north/south site dimension varies from over seven miles at the western end of the Forest to as little as 2½ miles at the center.

2. PROJECT PURPOSE, GOALS, AND OBJECTIVES

The overriding purpose, goals, and objectives for State demonstration forests in general are clearly set forth by the California legislature in the Board Policies. (Acomplete set of the Board policies governing state forests is located in Appendix 5.) This guidance sets the framework for specific purposes, goals and objectives as specified in the JDSF Management Plan. Each is discussed below.

2.1 Purpose

The purpose of the JDSF Management Plan is best understood from a tiered perspective built upon legislative intent, Board Policy and Department planning. Each must be considered with the other.

The California State Public Resources Code sets forth the legislative purpose of the JDSF as follows:

Project Purpose: Legislative (With Reference to Public Resources Code)

• Demonstration of economical forest management (PRC §4631(d))
  ○ "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 (PRC §4639)
  - "Forest products" includes sawlogs, pilings, poles, split products, pulpwood, bolts, bark and other products (PRC §4638)
• Retain the existing land base of state forests in timber production for research and demonstration purposes (PRC §4631.5(a))
• The management of state forests and the cutting and sale of timber 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 §4651)

Consistent with the legislative purpose, Board Policies 0351.3 and 0351.2 provide additional statements of purposes and priorities as follows:

Project Purpose: California Board of Forestry and Fire Protection (With Reference to Board Policy)
• The Board, consistent with PRC §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 (Policy 0351.3) • Timber production will be the primary land use on JDSF (Policy 0351.2(A)) • Recreation is a secondary but compatible land use (Policy 0351.2(B))

Consistent with all the above, the JDSF Management Plan's stated purposes are as follows:

Project Purpose: Per JDSF Management Plan
• Guide the integrated use and protection of the Forest's resources • Meet requirements of legislation and Board policy • Address local regional and statewide issues

Collectively, the purpose of the JDSF Management Plan is therefore identified as each of these tiered and interrelated purpose statements.

2.2 Goals and Objectives

As stated above, Board Policy 0351.3 (et al.) sets forth goals and objectives for demonstration forests consistent with legislative purposes. Appendix II of the JDSF Management Plan provides specific project goals and objectives consistent with Board policy. The goals and objectives for the DFMP are synonymous with the project goals and objectives for this EIR. They are repeated below.

Goal #1. Research & Demonstration: 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:

1-1. 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.

1-2. Conduct monitoring of resource management activities to gauge their effectiveness in meeting project objectives.

1-3. Demonstrate the compatibilities and conflicts involved in multiple use of forestland, and investigate methods to mitigate conflicts.

1-4. 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.

1-5. Establish a Forest Education Center at Jackson Demonstration State Forest to support and facilitate forest management research and learning activities.

1-6. Accelerate the expansion of knowledge about redwood forests by seeking increased funding to support research and demonstration projects.

1-7. 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.

Goal #2. Timber Management: Manage the Forest to maintain a wide range of age classes and diverse stand structures for research. 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:

2-1. 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.

2-2. 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 5 years into the future, and the long-term schedule at least 100 years.

2-3. 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.

2-4. Contribute to the vitality and stability of the economy of the North Coast of California by conducting regular periodic timber sales.

Goal #3. Watershed and Ecological Processes: Promote and maintain the health, sustainability, ecological processes, and biological diversity of the Forest and watersheds during the conduct of all land management activities.

Objectives:

3-1. 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.

3-2. Maintain and recruit structural elements necessary for properly functioning habitats. In riparian areas, manage for late seral habitats, while allowing flexibility to conduct research on riparian protection zones. Create or naturally develop recovery habitat for listed species.

3-3. Determine which native species, in addition to listed species, are most susceptible to adverse impacts from land management activities and which, therefore, warrant extra concern.

3-4. 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.

3-5. Utilize forestry practices that will maintain stability of hillslope areas and control sedimentation caused by accelerated mass wasting and surface erosion.

3-6. Monitor the development and condition of terrestrial and aquatic habitats over time, and apply adaptive management principles to ensure that goals are met.

3-7. Implement a comprehensive road management plan to reduce sediment production, including upgrading roads remaining in the permanent transportation network and properly abandoning high-risk riparian roads where possible.

Goal #4. Forest Restoration: Work toward achieving a balanced mix of forest structures and attributes in order to enhance forest health and productivity.

Objectives:

4-1. Restore and decommission roads to minimize WLPZ and unstable roads.

4-2. Minimize sediment production from roads.

4-3. Increase the amount of late seral forest.

4-4. Add large woody debris to streams and enhance overall habitat conditions for salmonids.

4-5. Add forest structural elements to stands (snags, large trees, large diameter limbs, cavities, flat tops).

4-6. Minimize the influence of exotic plants and animals.

4-7. Cultivate conifer stands capable of producing high quality sawtimber, on the east end of the Forest.

Goal #5. Recreation and Aesthetic Enjoyment: Plan for and provide low impact recreational opportunities that are compatible with forest management objectives andhealthy ecological processes, and that are consistent with historic recreational use characteristics.

Objectives:

5-1. Base the development of future recreation programs and facilities on a plan that assesses needs, opportunities and available resources.

5-2. Maintain campgrounds, picnic areas, trails and other recreational facilities in a safe, healthy and attractive condition.

5-3. 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.

5-4. 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.

5-5. 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.

5-6. 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.

Goal #6. Information & Planning: Develop, maintain, and update management plans and other planning documents and processes. Manage and support the information needs of all State Forest programs.

Objectives:

6-1. 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.

6-2. Prepare, monitor and update State Forest Management Plans and program area plans.

6-3. 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.

6-4. Provide opportunities for public and other agency input into planning processes.

Goal #7. Protection: Protect the Forest from damage and preserve the peace within.

Objectives:

7-1. 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.

7-2. 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.

7-3. 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.

7-4. 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:

8-1. Continue to make both personal-use and commercial firewood available following timber harvesting operations.

8-2. 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 wind-throw from riparian areas.

8-3. Increase opportunities for small-volume sales.

8-4. 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:

9-1. Consider making boundary line adjustments through cooperation with neighboring timberland owners to configure state forest boundaries to ridgelines and watershed boundaries.

9-2. Seek to reduce private in-holdings through purchase or exchange.

9-3. 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.

3. PROJECT DESCRIPTION

When defining the project description for a plan-level document, it is not sufficient to state that the project is simply adoption of the JDSF Management Plan. The project description, for purposes of CEQA review, must be more meaningful and descriptive focusing on physical actions likely to result from adoption of the DFMP. The determination of such actions is speculative to a degree; however, many potential actions are reasonably foreseeable and set forth in sufficient detail within the DFMP to determine environmental effects, at least on a program level. To assist in determining reasonably foreseeable actions, a precursory overview of the types of activities that are the focus of the DFMP is provided below.

3.1 Actions Associated with Forest Management

The JDSF is managed for a variety of benefits, including demonstration projects in forest management, watershed, fisheries, and wildlife. CDF cooperates in forest research and demonstration projects with other resource agencies, the University of California, Humboldt State University, California Polytechnic State University, the U.S. Forest Service Redwood Sciences Laboratory, and others.

JDSF has an estimated timber inventory of more than 2 billion board feet, with a total annual growth level estimated at approximately 65 million board feet (MMBF). Accounting for constrained areas and areas unavailable for timber production, current annual growth from the unconstrained areas is estimated at approximately 40 to 50 MMBF. Historic harvest levels on JDSF since 1980 has been approximately 25 MMBF of redwood, Douglas-fir, and whitewood logs. The target level established in the 1983 Management Plan was 29 MMBF.

Construction or reconstruction of roads is necessary to access certain harvest areas. Roads are occasionally decommissioned when timber harvests are complete. This timber is sold annually to bidders, harvested by local logging contractors, and is shipped to a number of sawmills throughout the redwood region and California. Substantial numbers of jobs are produced by this timber management activity, as well as tax revenues.

The Forest is home to a number of sensitive fish and wildlife species, including the northern spotted owl, coho salmon, and steelhead. The Forest provides habitat for a large number of species. Habitat protection and restoration is an important element of forest management activities.

The public also utilizes JDSF as an important recreational resource. There are over 60 individual campsites, many miles of riding and hiking trails, and over 200 miles of forestroad utilized by the public. Maintenance of these facilities is an important management component. Other common

recreational activities conducted on the Forest include picnicking, hunting, swimming, wildlife viewing, and target shooting. The Forest is also a local source of firewood and other minor forest products such as mushrooms and greenery for both personal and commercial use.

3.2 Potential Actions Resulting from Project

Two types of actions can result from adoption of the JDSF Management Plan. On-site actions are the most common. They are more readily identifiable and quantifiable. Off-site actions may also occur such as those due to the hauling of forest products for off-site processing. Important, but often overlooked, off-site actions also result from the application of forest demonstration practices to other areas. Increasingly, demonstration practices emphasize innovative research for protection of the environment.

Certain actions would occur under either the existing Management Plan or the proposed DFMP. The intent of this EIR is to show all actions resulting from the proposed Plan regardless of whether they are continuing or proposed actions. This allows the assessment of impacts from a baseline of existing conditions (CCR §15125). As stated earlier, a comparison of the current Management Plan with the proposed Plan is provided in the "Alternatives" section.

For purposes of CEQA review, "actions" may also include measures to protect specified areas from disturbance. Potential on-site and off-site actions are discussed below.

3.2.1 Potential On-site Actions

Research and Demonstration Programs: As stated earlier, the JDSF was acquired for the purpose of demonstrating economical forest management and timber production. One of the more challenging issues in forest management concerns the level of environmental protection and mitigation needed to avoid significant environment damage and to comply with the applicable regulatory standards of the various local, State, and Federal resource agencies. Accordingly and over time, many research and demonstration projects have shifted in focus from timber production to environmental impacts and the efficacy of environmental protection measures as they relate to timber production. (DFMP, Chapter 4).

If the benefits of research and demonstration programs are to be applied in as many areas as possible (primarily in California, but also out-of-state), it is important that the Forest promote a range of timber types (including species, age and age-mix), practice a variety logging activities, and maintain a diversity of habitat types for study.

Dissemination and presentation of information gained is also essential in the application of research to areas outside JDSF. To this end, the JDSF Management Plan recommends several measures including collaboration with universities and other resource agencies, developing a State data bank, and tours of demonstration areas. Within approximately 10 years, a Forest Learning Center and an Interpretive Center is envisioned. These facilities, if developed, would be subject to separate environmental reviews when more information is known regarding funding, timing, size, and location.

Demonstration and research programs will result in long-term improvements to environmental conditions on JDSF. More importantly, these programs will result in widespread environmental protection and conservation outside of JDSF as intended by the legislature (see "Potential Off-site Activities" section below and "Application of Demonstration Programs").
Chapter 4 and Appendix IV of the JDSF Management Plan provides a detailed discussion of active or planned research and demonstration programs. Also, refer to Section VII 6.3 (Timber Resources).

Silviculture and Timber Harvest: The JDSF Management Plan calls for an increase in uneven age silvicultural management. Approximately two-thirds of the area allocated for timber management will consist of mixed-age stands. The Silviculture Allocation Plan contained in the JDSF Management Plan will facilitate broader ranges of research activities.

The DFMP calls for the following structural mixes:

Structural Mixes		
Planned Structural Condition	***Acres***	***Percent***
Late Seral Development and Old Growth Preserves	9,680	20
Uneven Aged with Single Tree/Cluster Selection	12,101	25
Uneven Aged with Group Selection	9,513	20
Even Aged	14,256	29
Non-Timber	968	2
Research Areas	2,134	4
TOTAL	48,652	100

Timber sales and harvests would continue at a similar rate of three to five sales per year with an annual timber harvest rate of approximately 31 to 33 million board feet.

Harvesting in the Parlin Fork Management Area is expected to continue at current levels. This harvest 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 Forest management plan.

Harvest on JDSF generally involves longer rotations than on most private industrial timberlands within the region. Over any rolling five-year period, annual harvest averages about 1.5% of the inventory. For further discussion, refer to Section VII 6.3 (Timber Resources).

Habitat and Natural Resource Restoration and Protection: The JDSF includes twenty-three Special Concern Areas (SCAs), all of which will have either no harvests or harvest restrictions. SCAs comprise approximately 17,000 acres of the 48,652-acre Forest. A description of the SCAs is included in Appendix III of Management Plan. SCAs include unique habitat types, special status species habitat, unstable soils/slopes, watercourses, lakes, old growth groves, late-seral development stands, and research areas. (DFMP, Chapter 3)

There are several prescribed limited silviculture buffers to sensitive land uses such as campgrounds, roads, trails, adjacent homes, State Parks, and recreational areas. These non-resource oriented SCAs result in ancillary habitat protection areas.

Within all areas of the Forest (inside or outside of SCAs), the JDSF Management Plan calls for increased habitat diversity including goals for mixed forests (see "Silviculture" section below) and maintenance of a hardwood component. Increased timber harvest restrictions are also proposed along watercourses, potential habitat for special status species, and for retention of snags and large woody debris (LWD) in stream channels. (DFMP, Chapter 3) Prescribed burns, simulating natural conditions, may also occur for habitat management. (DFMP, Page 82)

For further discussion, refer to Section VII-6 (Biological Resources).

Recreation Use: The JDSF Management Plan calls for modest increases in recreational uses and facilities. These generally include improvements to existing campgrounds, trails and access roads, and development of small new accessory facilities, such as trails, adjacent to existing recreational areas. Consideration is also being given to the reopening certain historically used campsites. (DFMP, Pages 76 to 77)

Primary recreation activities at JDSF are camping, hiking, picnicking, biking, driving, horseback riding, swimming/wading, and hunting. Special events are also permitted at JDSF such as equestrian and bicycling events. (DFMP, Pages 32 to 34)

Recreation activities also include maintenance and use of existing, improved recreational facilities. These include the Camp 20 Highway Stop which is a rest area located off Highway 20 that is owned and operated by JDSF. These also include fourteen campgrounds and various trails. In 1999, there were over 12,200 days of use by campers. It is estimated that day-trippers account for 50,000 visitor-days annually. (DFMP, Page 25)

For further discussion, refer to Section VII-14 (Recreation).

Harvest of Other Forest Products: The DFMP (as with the current plan) permits the harvest of minor forest products such as salvage saw logs, poles, split products, greenery, mushrooms and firewood. These uses are subject to restrictions and are generally limited to low-intensity activities. Hunting in also allowed in designated areas subject to all California Department of Fish and Game regulations. (DFMP, Page 34)

Fire Protection: The JDSF Management Plan proposes a comprehensive Fire Protection Plan with consideration to shaded fuel breaks, fuel thinning, prescribed burns, and creation of improved water storage or collection areas, and helispots. (DFMP, Pages 80 to 83)

Pest Management: Forest pest control measures are proposed to control significant outbreaks. Actions are determined on a case-by-case basis. The JDSF Management Plan proposes an integrated pest management plan which emphasizes prevention and provides cultural, mechanical, chemical, and biological pest control alternatives. (DFMP, Page 83)

For further discussion, refer to Section VII-6.4 (Forest Protection).

Vegetation Control: Noxious and invasive species will be controlled through physical removal and, at times, through the use of herbicides. Similar vegetation control measures are also planned to manage roadside vegetation for safety and fire containment or prevention. (DFMP, Pages 58 to 59)

Roads: New roads will be constructed, or existing roads rehabilitated, to support harvest operations. Most road development will be necessary in the eastern third of the Forest. This area of approximately 15,000 acres was primarily tractor yarded between the 1940s and 1970s. The existing road system is concentrated along lower slopes and watercourses. Over the coming 30 years, it is anticipated that a new upper slope road system will replace the existing system in orderto facilitate cable skyline yarding and/or helicopter yarding of the steeper slopes. Certain older access roads were poorly constructed and contribute to erosion and sedimentation. Many of these will be upgraded or decommissioned.

A Road Management Plan is proposed to provide an inventory and prioritization schedule for road decommissioning or, where roads are still needed for access, improved road maintenance and stabilization practices. (DFMP, Pages 72 to 74)

For further discussion, refer to Section VII-7 (Geology and Soils), Section VII-10 (Hydrology and Water Quality) and Section VII-15 (Transportation and Traffic).

Quarries: Continued use of some existing quarries will occur to obtain surface materials for on-site roads. New quarries are not contemplated; however, this could be considered depending on future need. Any new quarry would be subject to separate environmental review when specific information is known regarding size and location.

Timber Transport (Yarding and Hauling): Timber will be moved from harvest areas to trucks by ground-based (tractor) yarding on mild to moderately steep slopes, cable yarding on steeper slopes, and limited helicopter yarding for sensitive-soil areas or inaccessible areas. Logging pads would be graded in specified areas for staging of loaders, haul trucks, and other equipment and materials, including fuels. (DFMP, Page 71)

For further discussion, refer to Section VII-6.3 (Timber Resources).

3.2.2 Potential Off-site Actions

Off-site Timber Transport and Recreational Travel: Logging trucks would utilize the surrounding public road network for hauling logs to processing facilities as determined by the contract operator or buyer. Private off-site roads could be used subject to needs and agreements from the access right holders.

Recreational travel is also significant. Nearly half of the 12,200 camping days annually are attributed to Mendocino County residents.

All roads generally feed Highway 20 (which runs east/west through the Forest), Highway 1, and Highway 101. Highway 20 also connects to Interstate 5 at Williams located approximately 95 road miles east of Willits. County Roads also receive traffic generated from JDSF. (DFMP, Pages 25 & 35)

Adjacent Land Purchases: The JDSF Management Plan considers purchases and trades to acquire private in-holdings and areas adjacent to JDSF. These are subject to limited funding and negotiations with landowners. Priority is given to areas that enhance Forest protection or research needs. Important considerations are watersheds, unique habitats, access, fire protection or buffer areas. (DFMP, Pages 85 to 86) Such purchases or trades could result in the following activities:

- Conversion from a non-resource use to a resources use such as timber production, timber buffers or habitat conservation.
- More effective research, demonstration and conservation through better control over area conditions
- Conversion to any other use consistent with JDSF Management Plan

Application of Demonstration Programs: The primary goal of the JDSF is to conduct research and demonstration programs for the benefit of all forests in the State, particularly those in coastal areas with similar forest structure and environmental characteristics. From either a biologicalor a regulatory point of view, economical forest management now, more than ever, requires conservation or protection of environmental resources; therefore, along with more conventional timber productivity assessments, environmental research is becoming increasingly important to economic timber production.

The Forest Service has a significant land base in all major forest ecosystem types except for coast redwoods. JDSF represents the most significant amount of acreage dedicated to long-term forest research. Results from research on JDSF are the best option to improve forest practices on private lands (85% of coast redwoods is in private ownership–this high percent is also unique when compared to other forest ecosystem types.

Many demonstration and research activities, to the degree they are effectively implemented and the information is disseminated, will undoubtedly result in actions to improve environmental resource conservation and protection on a level that transcends the JDSF itself. These beneficial off-site actions, although difficult to quantify, are also considered as part of this EIR.

Chapter 4 and Appendix IV of the JDSF Management Plan provides a detailed discussion of active and planned research/demonstration programs (also refer to "Research and Demonstration" in the "On-site" discussion above).

4. ACTIONS NOT EVALUATED AS PART OF THIS EIR

Two conservation camps housing inmates of the State correctional system (Parlin Fork and Chamberlain Creek) are located within JDSF. CDF has authority over these areas, which total 43 acres. JDSF has no management authority over these camps and they are not within the scope of the JDSF Management Plan, other than limited discussion regarding the impacts of forest management on camp operations.

The Pacific Gas and Electric Company maintains a power line right-of-way running through JDSF generally parallel to Highway 20. In addition, California Department of Transportation (Caltrans) maintains the Highway 20 right-of-way. These areas are not within the control of CDF. While the utilities and the Highway are part of the area setting, PG&E or Caltrans actions regarding these facilities are not within the scope of the JDSF Management Plan.

Several off-site, indirect actions related to the processing of JDSF forest products will also occur (i.e., use of new or existing mills, hauling and use of lumber, etc.) The location and types of action vary based on market conditions, desires of the timber sale buyers and operators, and the type of product being processed. These linked but distantly related actions are too speculative to warrant evaluation pursuant to CEQA (CCR §15064).

5. ECONOMIC, SOCIAL, AND COMMUNITY EFFECTS

CEQA Guidelines §15131 provides that "economic or social information may be presented in whatever form the agency desires." Economic or social effects are not significant effects on the environment for purposes of CEQA review if they cannot be reasonably linked to physical change in the environment (CCR §15358).

CEQA Guidelines §15124, however, states that a project description should include a project's economic characteristics. Social and economic factors are also discussed in the JDSF Management Plan since they are particularly important to area communities. Therefore, social and economic information is presented below.

6. JACKSON DEMONSTRATION STATE FOREST: SOCIAL AND ECONOMIC SETTING

6.1 Social Conditions

JDSF is located between the towns of Fort Bragg and Mendocino in Mendocino County. Its western edge is near the Pacific Coast Highway. The area has both substantial timber and recreational value.

In 2000, Mendocino County had a population of 87,600, of whom 60,600 lived in unincorporated areas. The county has a land area of 2.2 million acres. The county ranked 27th among California's counties in terms of per capita income. Fewer than 1 in 7 county residents lived in a multiple family dwelling. The median number of years of schooling was 13.[7]

Population in the area around JDSF grew during the last decade. As shown in Table 1, the population of Mendocino County grew from 79,700 in 1990 to 87,600 in 2000. The population of Fort Bragg, the town nearest JDSF, grew from 6,025 in 1990 to 6,425 in 2000.

[7] Income data is from California Department of Finance, County Profiles and is for 1998.

TABLE 1 FORT BRAGG AND MENDOCINO COUNTY POPULATION ESTIMATES: 1990-2000		
Year	**Fort Bragg**	**Mendocino County**
1990	6,025	79,700
1991	6,125	81,600
1992	6,200	82,400
1993	6,175	83,000
1994	6,175	83,600
1995	6,175	84,000
1996	6,200	84,500
1997	6,250	85,400
1998	6,300	86,100
1999	6,400	87,100
2000	6,425	87,600
Source: State of California, Department of Finance, Demographic Research Unit, 2001.		

JDSF is close enough to the Bay Area for weekend tourism, but is not within easy commuting distance. Given that JDSF is located in a large, rural county, the employment effects of different management plans are likely to be most strongly felt in the county itself. Accordingly, the social and economic effects of the JDSF's operations are limited mostly to Mendocino County.

The workforce of Mendocino County includes at least four major groups of citizens, categorized by employment: tourist related, agriculture or forestry related, other service related, and government. In addition, there are retired citizens. All Mendocino County citizens benefit from the quality of the natural environment, but those who work in forestry, agriculture, and related occupations also benefit from working with elements of that environment. Forestry, agriculture, and related occupations, on the one hand, and tourism on the other hand, account for a substantial part of employment in the region. Those residents making a living from tourism derive financial as well as aesthetic benefit from environmental "amenities," or natural features that attract visitors. Those residents working in forestry and agriculture derive financial benefit from working with their natural environment in order to derive "commodities" such as timber. These differing economic incentives suggest that citizens will have divergent views concerning actions that allocate to resources to conservation or productive uses.

6.2 Economic Conditions

The civilian labor force of Mendocino County as of 2000 was 42,390, with civilian employment of 39,510.[8] Table 2 shows the unemployment rate for the county and for the state.

[8] California Department of Finance, County Profiles. These numbers refer to county residents only.

TABLE 2 MENDOCINO COUNTY AND CALIFORNIA STATE UNEMPLOYMENT RATES: 1990-2001		
YEAR	UNEMPLOYMENT RATE (%)	
	COUNTY	STATE
1990	7.8	5.8
1991	10.8	7.7
1992	12.7	9.3
1993	11.3	9.4
1994	9.5	8.6
1995	9.6	7.8
1996	8.5	7.2
1997	7.8	6.3
1998	7.9	5.9
1999	6.7	5.2
2000	6.6	4.9
2001	6.6	5.3

Source: State of California Employment Development Department, Labor Market Information Division, 2002.

Mendocino County's average unemployment rate for 2001 was 6.6%, a rate that was higher than the statewide rate of 5.3%. The difference between state and county unemployment rate has decreased considerably since 1992. The county's unemployment rate, which stood at 12.7% in 1992, has been below 7% from 1999 to 2001, though it remains to be seen what the rate will be for all of 2002. of course, statewide unemployment rates also fell during the middle and late 1990s, and Mendocino County's improved employment picture reflected not only local trends, but also the nationwide economic expansion of that period.

Employment within the county by industry for the entire county for selected years is presented in Table 3. These are "employment by industry" data, which count jobs (full-time and part-time) of both residents and non-residents employed in the county. Because part-time jobs are counted, there are significantly more jobs than there are employed individuals.

There are five major groups of employees whose economic interests may be affected in different ways by forestry policies. As of 2001, 18% of the population worked in agriculture, forestry, fishing, lumber and wood products, and food and kindred products; 11% worked in the hotel or eating-place business, a disproportionately large number that suggests that many of these hotels and restaurants serve tourists (see below); 14% percent worked in retail trade; 20% in government; and 19% in other services.[9]

[9] See table 3

TABLE 3 EMPLOYMENT BY INDUSTRY, VARIOUS YEARS														
	1983		1988		1993		1998		1999		2000		2001	
SECTOR	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Agriculture, Forestry & Fishing	1,463	6	1,752	6	1,667	6	2,473	8	2,413	8	2,489	8	2,573	8
Construction & Mining	650	3	800	3	940	3	1,253	4	1,330	4	1,475	5	1,633	5
Lumber & Wood Products	N/A	N/A	N/A	N/A	2,303	8	2,313	7	2,378	7	2,506	8	2,025	6
Food & Kindred Products	N/A	N/A	N/A	N/A	996	4	1,131	4	1,167	4	1,246	4	1,399	4
Other Manufacturing	4,696	20	5,213	19	1,093	4	1,669	5	1,518	5	1,477	5	1,400	4
Transportation &Public Utilities	923	4	1,013	4	1,058	4	1,202	4	1,141	4	1,073	3	1,126	3
Wholesale Trade	719	3	1,165	4	872	3	860	3	851	3	837	3	819	2
Eating & Drinking Places	N/A	N/A	N/A	N/A	2,043	7	2,433	8	2,370	7	2,370	7	2,406	7
Other Retail Trade	4,435	19	5,569	21	4,078	15	4,418	14	4,516	14	4,563	14	4,721	14
Finance, Insurance, & Real Estate	815	4	854	3	966	4	953	3	947	3	943	3	1,002	3
Hotel & Other Lodging	N/A	N/A	N/A	N/A	1,129	4	1,366	4	1,300	4	1,319	4	1,327	4
Other Service	5,052	22	5,690	21	5,073	19	6,356	20	6,562	20	6,073	19	6,283	19
Federal Government	313	1	342	1	339	1	288	1	298	1	338	1	299	1
State Government	492	2	552	2	485	2	438	1	468	1	497	2	563	2
Local Government	3,702	16	4,092	15	4,243	16	4,664	15	4,791	15	5,538	17	5,826	17
Total	23,258	100	27,040	100	27,282	100	31,816	100	32,050	100	32,743	100	33,401	100

Source: State of California Employment Development Department, Labor Market Information Division, 2002.

The breakdown between groups of employees indicates that more residents work in forestry, agriculture and related occupations than in the hotel and restaurant business (18% versus 11%). However, if hotels, restaurants, retail, and other services are combined, a larger part of the workforce is employed in activities with some relationship to tourism than in forestry and agriculture (44% versus 18%). Either way, both employment based on commodities and employment based on amenities are of great importance to the local economy.

The largest grouping of employment types is the public sector. Government agencies (federal, state, and local) accounted for 20% of employment in Mendocino County in 2001. Some of these jobs bear a relationship to either the Forestry sector (for instance, California Department of Forestry employees) or tourism (for instance, state personnel staffing the state parks in the region).

In the area of public finance, Mendocino County collected $16.5 million in property tax and $3.3 million in sales tax in 1997-98.[10]

6.3 The Recreation and Tourist Industry

Areas of recreational value in Mendocino County include not only JDSF itself but also other forest areas, the Pacific coast, and towns that are popular tourist destinations, such as Mendocino. Among the Forest resources, old-growth redwoods are among the most highly valued amenities. There are twenty state parks in the county.[11] A new state park is funded and imminent for the area near lower Big River adjoining JDSF. The Mendocino coast area offers bicycling, birding, boating, fishing, art galleries, horseback riding, the Mendocino Music Festival, the Skunk train, museums, tours, gardens, and other activities.[12]

The county has more eating-place and hotel employment than would be expected based upon California averages. The ratio of hotel jobs to other jobs is three times as high in Mendocino as in California as a whole; the ratio of restaurant jobs to other jobs is about 14% higher.[13] This is evidence of an active tourist industry. However, as discussed above, many more employees work in forestry, agriculture, and related industries than in the hotel and restaurant industries, at least on a countywide basis. Employment might be more balanced toward tourism in the coastal area closest to JDSF. "[T]ourism is the primary industry on the Mendocino *Coast*," notes the 2001 County Snapshot published by the California Employment Development Department (EDD), Labor Market Information Division (emphasis added); the Snapshot goes on to note the diversity of coastal and other regions in the county.

Jackson Demonstration State Forest is a significant recreation area. Another section of this EIR details the usage and amenities in this forest. The major quantifiable economic benefit from the recreational use is the value of the visitor days. The number of days of camping use of the Forest was over 12,000 in 1999. Day use has been estimated at four times camping usage, with a significant number of county residents as day users. The US Forest Service suggests a value of

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[10] California Department of Finance, County Profiles.
[11] See http://www.parks.ca.gov/parkindex
[12] See http://www.mendocinocoast.com/Services/todo.htm for a list made by the Mendocino Chamber of Commerce.
[13] The ratio of jobs in hotels to total jobs in Mendocino County, divided by the ratio of jobs in hotels to total jobs in California, is 3.05. The same statistic for eating-places is 1.14. Source: IMPLAN system

about $20/day for forest recreation in their *Resource Pricing and Valuation Procedures for the Recommended 1990 RPA Program.* At these prices for recreation, JDSF would produce $1.2 million worth of recreation per year.[14]

6.4 The Timber Industry

Mendocino County produced 10.6% of the timber production of California in 1992. Manufacture of wood products produced added value of $127,500,000 in 1997.[15]

The timber harvest in Mendocino County (Table 4) decreased between 1996 and 2000. The county-wide harvest was 275,589 thousand board feet (MBF) in 1996, declining to 225,878 MBF in 1998, rising slightly to 227,515 in 1999 MBF, and falling sharply to 156,101 MBF in 2000.

TABLE 4
MENDOCINO COUNTY TIMBER HARVEST

Year	MBF	$	$/MBF[1]
2000	156,101	$114,636,073	$734
1999	227,515	$105,683,106	$465
1998	225,878	$96,490,920	$427
1987	243,866	$94,772,858	$389
1996	275,589	$118,830,711	$431
1995	211,583	$88,250,808	$417
1994	227,422	$124,594,482	$548
1993	254,895	$135,968,659	$533
1992	252,702	$90,941,878	$360
1991	277,686	$67,578,886	$243

1) MBF is thousand board feet.
Source: California Franchise Tax Board YT-36 Report

Timber harvest from JDSF also fell during most of those years, both in absolute terms and as a proportion of the countywide timber harvest. Timber harvest in JDSF was 42,500 MBF in 1996, rising to 48,500 MBF in 1997, dropping again to 27,600 MBF in 1998, declining to 21,900 MBF in 1999 and then to 13,500 MBF in 2000. Court action limited the harvest in 2001.

In 1996, timber harvest from JDSF represented 17.60% of the total timber harvest in Mendocino County. That proportion fell to 11.32% in 1997, 9.7% in 1998, 5.93% in 1999, and 1.54% in 2000. A longer-term perspective is shown by reviewing the data from 1991 through 2000; during that period, timber harvest from JDSF accounted for 11.1% of timber harvest in Mendocino County.

[14] Inflation alone would make these numbers substantially greater.
[15] California Department of Finance, County Profiles.

While timber harvest declined, revenue from timber fluctuated due to price fluctuations. County-wide revenue of $118,830,711 in 1996 fell in the next year to $94,772,858, then began a steady rise to $114,636,073 in 2000. Revenue per MBF was $431 in 1996, dropping to $389 in 1997, and then rising to $427 in 1998, $465 in 1999, and $734 in 2000.[16]

The employment effects of these changes in timber harvest are reflected directly, by the number of jobs in the lumber industry, and indirectly, by the number of jobs in other industries. The first step is to look at actual employment in the lumber and wood products industry; the next step is to project how changes in timber harvest will affect future employment in that industry; and the last step is to estimate how employment in the lumber industry has a multiplier effect on employment in other industries.

Employment in Mendocino County in lumber and wood products (consisting of logging, sawmills, and other lumber and wood products) was 2,400 in 1996, 2,500 in 1997, 2,310 in 1998, 2,380 in 1999, and 2,510 in 2000. Employment in 2001 dropped to 2,030 in that industry.

Each MMBF created 10.718 jobs during the period 1996-2000. This figure is derived by averaging the timber harvest from 1996 to 2000, averaging employment in the lumber industry during that period, and then dividing the averaged employment by the averaged harvest. The figure of 10.718 jobs per MMBF can be used to estimate the employment effect of a reduction of timber harvest.[17]

Each job in the lumber industry has a multiplier effect in other industries. A job that is created in the lumber industry creates jobs in other industries; a job that is lost in the lumber industry causes the loss of jobs in other industries. The multiplier effect can be estimated using a Social Accounting Matrix (SAM). A SAM is a snapshot of the all transactions in a particular area for a particular year and can be used to construct a linear model of the economy that can be used to find job multipliers. The job multipliers give the increase in total county jobs resultant from one additional job in the target sector. The model assumes that the product of the target sector is exported (and not further processed in the county.) The SAM for this study was constructed using the IMPLAN system, which is ultimately based upon the Census of Manufactures and the employment by industry data. SAM analyses include three types of effects:

a. Direct effects are the additional jobs in the affected industry.
b. Indirect effects are the effects of the purchases by the affected industry. For example, the lumber products industries purchases of business services.
c. Induced effects are the effects of the purchases of good and services by the newly employed individuals.

[16] Source: California Franchise Tax Board YT-36 Report.
[17] The use of average labor per output will lead to understatement of the effects of decreasing harvest because mills with the largest labor to output ratios will likely be eliminated first with decreased harvests.

The SAM multiplier for logging is 2.57. One additional job in logging leads to 2.57 jobs in the county, *including* the one logging job. The SAM multiplier for sawmills is 3.41; for wood products, it is 3.08. The jobs created include both jobs providing supplies for the work of logging, sawmill, or wood products, and jobs resulting from consumer spending by the workers employed in the logging, sawmill, or wood products employment.

For the five years 1996-2000, the jobs attributable to JDSF are computed as follows: The countywide jobs per million board feet are 10.718. A weighted average of the SAM multipliers is 3.1, so each million board feet in Mendocino County is associated with 33.2 jobs (direct, indirect, and induced.) Multiplying by the average number of million board feet in that time span gives an estimate of 1021 jobs.[18]

Multiplying the timber industry payroll and the non-timber industry payroll by their appropriate wage rates gives an estimate of the payroll attributable to JDSF. The direct payroll is $12 million while the indirect and induced payroll is $16 million. Together these are 4.4% of the payroll in Mendocino County.

6.5 Financial Contribution of JDSF

In addition to employment and payroll, JDSF has a significant financial contribution to both the State of California and the County of Mendocino. The value of the timber from JDSF, net of management costs, is described elsewhere in this report and is a benefit to the State. Various county entities receive 2.6% of the 2.9% yield tax, a tax of the gross sales from JDSF. Recent prices for the mix of timber that JDSF provides are approximately $500/MBF. At the 1991-2000 average yield, the yield tax revenue would be $340,000. The County receives part of the sales tax levied by the state. It receives 1% of taxable sales. Assuming that the generation of sales tax is in proportion to payroll, JDSF generates, directly and indirectly about 4.4% of the county's sales-tax take. Thus, JDSF's operations generate sales tax that is .044% of the total taxable sales in the county. In 1989, taxable retail sales were $644 million, so the part attributable to JDSF is $282,462. The Forest also pays property tax in the amount of $112,000.

6.6 Other Considerations

JDSF is a demonstration forest and is used to demonstrate techniques that are of possible use to other Northern California landowners. The Forest is managed to favor relatively rare vegetation and to favor wildlife to a degree greater than required of private forests. The protection of flora and fauna has economic values, though those values are difficult to quantify and are partially represented in the value for recreation. The Forest also produced mushrooms, forest greens, and firewood.

[18] Time series econometric work supports the notion of multipliers, but of smaller magnitude than the SAM multipliers.

6.7 The Economic Impact of Management Alternatives

The economic impacts of five alternatives were considered. These alternatives differed in the quantity of timber to be harvested on a yearly basis, those quantities being none, 10, 20, 29, and 31 million board foot per year. The economic impact of these alternatives is given in Table 5.

TABLE 5
ECONOMIC IMPACT OF MANAGEMENT ALTERNATIVES

Alternative	**A**	**B**	**C**	**D**	**E**
Harvest Volume Per Year (MMBF)	0	29	31	20	10
Employment					
Direct Employment (10.7 Jobs/ MMBF)	0	311	332	214	107
Indirect Employment (multiplier of 2.1)	0	651	696	449	224
Total Employment	0	961	1,028	663	332
Payroll					
Total Direct Payroll at $35,322/job	$0	$10,978,786	$11,735,944	$7,571,577	$3,785,788
Total Indirect Payroll at $22,915/job	$0	$14,909,857	$15,938,123	$10,282,660	$5,141,330
Total Payroll	$0	$25,888,643	$27,674,067	$17,854,237	$8,927,118
Taxes and Receipts					
Price/MBF (av. of years 1998- 2000)	$542	$542	$542	$542	$542
Gross Receipts	$0	$15,718,611	$16,802,653	$10,840,422	$5,420,211
Yield Tax (Local) at 2.6%	$0	$408,684	$436,869	$281,851	$140,925
Property Tax	$112,438	$112,438	$112,438	$112,438	$112,438
Sales Tax (1.03% of Payroll)	$0	$265,955	$284,296	$183,417	$91,708
Total Taxes	$112,438	$787,076	$833,603	$577,706	$345,072

The first section of Table 5 pertains to employment. The methodology for calculating the employment per MBF of harvest, both direct and indirect was explained in the previous section on the economic setting and depended upon the average employment per MBF for Mendocino County and a total employment multiplier of 3.1 (2.1 indirect jobs per job directly in the timber and milling sector.)

The second section of the table uses the employment data generated in the first section of the table and county average wages for the timber and milling sector and for the county as a whole. The payroll is the product of the sectoral wage and the employment.

The third section of the table presents the levels of taxation realized in alternatives A-E. The yield tax depends upon the price of timber. The evaluations are done at the average price reported to the State Board of Equalization for 1998-2000. This price is $542 per MBF. There is considerable variance in recent prices, with the recent low in 1987 being $389 per MBF and the high in 2000 of $734 per MBF. Gross receipts are the price per thousand times the projected yield in each of the scenarios. Since the local portion of the yield tax is 2.6% of price, the expected yield tax is subject to the same uncertainty as is the timber price. Long term projections for timber prices are for increasing timber prices, though at a rate slower than what was achieved in the last fifty years.

Specifically, a modest price increase of 0.5% a year is forecast for the next fifty years.[19] Thus, the level of the yield tax is expected to show a slight upward trend. Property tax payments are independent of management regime. Sales tax was taken as 1.03 percent of payroll, which was arrived at by multiplying the fraction of county payroll that was timber payroll (direct and indirect) by 1% of the taxable sales in the county. The total of taxes is shown as the last line of the table.

The analysis shows that tax revenue increases $233,000 per year for each additional 10-million board-feet of timber harvested. Total employment increases by 331 jobs per 10 million board feet and payroll increases by $8,927,118 per 10 million board feet.

The effect on recreation of the lower yield alternatives, particularly Alternative "A," are likely to be felt increasingly in the future as the condition of the Forest changes. An estimate of the value of an older forest, for the purposes of recreation is that each additional mile of trail in old growth is worth $2.61 per trip.[20] While the proposed alternatives will not be able to produce additional old growth in the near term, this number is instructive as a guide to the recreational value of forest condition. Assuming 50,000 visitor days per year, each mile of old growth on a trail would be worth $130,000. One must note that this number must be used with caution, as it is a number for incremental miles of trail so that it is not right to simply multiply it by anything more than a small increment in the number of miles of trail. This estimate comes from forests in the Cascade Mountains, where very large trees are much less common than they are on the California coast, and so may seriously overstate the value of older trees in the California environment. An older meta-study of recreational values gives a mean value for a recreational day of $33.95. Uniquely high value sites had recreational values nearly double the mean.[21] This would lead to a long run estimate of about $1.5 million for the increased quality, from a recreational point of view, of the Forest. These estimates take only recreationists into account and there may be further benefits from those who appreciate the condition of the Forest without actually viewing it.

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[19] "An Analysis of the Timber Situation in the United States: 1952-2050." Richard Haynes, Technical Coordinator. 2002.
http://www.fs.fed.us/pnw/sev/rpa/rpaweb_files/summary.pdf

[20] Jeffrey Englin and Robert Mendelsohn. "A Hedonic Travel Cost Analysis of Valuation of Multiple Components of Site Quality: The Recreational Value of Forest Management." *Journal of Environmental Economics and Management.* 21(1991)3:275-290

[21] Richard Walsh, Donn Johnson, and John McKean. "Issues in Non-Market Valuation and Policy. A Retrospective Glance." *Western Journal of Agricultural Economics.*14(1989)1: 178-188.

IV. AGENCY INVOLVEMENT

1. INTRODUCTION

Many agencies will use this EIR. CDF will use the EIR to evaluate the potential significant effects of the JDSF Management Plan as the Department develops and adopts the final version of the DFMP to submit to the Board of Forestry. The Board of Forestry will consider the EIR when deciding whether to approve the management plan. Other agencies such as the Department of Fish and Game and the State Water Resources Control Board will use the EIR to help analyze the environmental effects of management activities on JDSF and to submit comments about ways to lessen or avoid potential significant effects. They will also consider the EIR when they take action on any permits they may issue for activities on JDSF. CDF will also use the EIR to evaluate actions on JDSF that carry out the management plan.

2. CDF DECISION-MAKING

2.1 Approval of EIR and Forest Management Plan

Following Board policy, CDF prepared the current draft of the management plan. After considering the final EIR, CDF may make changes in the draft, adopt a final version of the management plan, and submit the management plan to the Board of Forestry for Board approval as provided in PRC sec. 4645. After the Board approves the DFMP, CDF will administer the Forest in keeping with the management plan.

While CDF was developing the management plan, some members of the public asserted that the Board rather than CDF should be the lead agency for the EIR. CDF and the Board will each make important, discretionary decisions about the management plan, and each could make a claim to be the appropriate lead agency. To resolve the issue, CDF and the Board entered into an agreement for CDF to serve as the lead agency with the Board acting as a responsible agency. As a result, CDF will certify the Final EIR and will consider that EIR in its final shaping of the management plan which it will then submit to the Board for approval. As a responsible agency, the Board will consider the EIR when the Board makes its decision on the management plan but will not certify the EIR.

2.2 Intended Uses of the EIR by the Lead Agency

CDF considered environmental issues while it developed the management plan. In developing this EIR, CDF re-examined many of those issues and considered refinements in the management plan. After completing the public EIR review process, CDF will determine whether yet additional refinements need to be made in the management plan before submitting the DFMP to the Board of Forestry.

This document is intended to be used as a program EIR (14 CCR § 15168). Program EIRs are permitted in connection with plans to govern the conduct of a continuing program such as the JDSF Management Plan. Subsequent actions in the Forest will be examined in the light of this EIR to determine whether:

- the action will be consistent with the DFMP and the program EIR,
- the action contains the mitigation measures in the EIR,
- new mitigation measure might be necessary,
- new significant environmental effects might be involved, and
- an additional environmental document must be prepared.

To the extent that a subsequent action qualifies as a "project" under CEQA (CCR §15378) and is not otherwise exempt, compliance with CEQA will be necessary. This can be accomplished with any one of the following documents and/or findings listed below in order of increasing procedural complexity:

- Determination of consistency with this EIR
- Addendum to this EIR
- Negative declaration
- Mitigated negative declaration
- Supplemental EIR
- Subsequent EIR
- New Program EIR

If a later activity would have effects that were not examined in this EIR, or not examined at a sufficient level of detail, additional environmental review pursuant to CEQA would be required. Alternatively, if the Director or Board (depending on who makes the final decision on a subsequent action) finds that no new effects could occur or no new mitigation measures would be required (CCR §15162), the agency may approve the activity as being within the scope of this EIR and further environmental review would not be necessary.

Where additional CEQA documents are prepared for subsequent actions, this Program EIR can be referenced or otherwise utilized to streamline the review process in the following ways:

- To provide the basis in an Initial Study for determining whether the later activity may have any significant effects
- Incorporate by reference regional influences, secondary effects, cumulative impacts, broad alternatives, and other factors that apply to the program as a whole
- Focus any later EIR on new effects that had not been considered before

When a law other than CEQA, such as the Forest Practice Rules, requires public notice for CDF to carry out or approve a subsequent activity that relies on this Program EIR for CEQA compliance, the notice for the activity shall include a statement that:

- The activity is within the scope of the program approved earlier; and
- The Program EIR adequately describes the activity for the purposes of CEQA.

A discussion of potential subsequent actions by the Director or Board to implement the JDSF Management Plan is provided in the following section.

2.3 Future Decisions to Implement the JDSF Management Plan

Upon approval of this Plan by the Director and Board, all land and resource management activities and all budget proposals will be based on the DFMP. 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 DFMP, subject to existing rights. It is expected that previous sale contracts for timber or other commodities not yet harvested may preclude bringing such activities into full conformance with this Plan.

Specific CDF project approvals resulting from the DFMP will likely include the following:

Anticipated Future CDF "Projects" Subject to CEQA
JDSF Management Plan Amendments (as needed)
JDSF Management Plan Revisions (at least every five years)
Timber Harvest Plans (3-5 annually and ongoing)
Construction of New Camp Sites, Trails and Related Recreational Facilities
Habitat Restoration
Construction of New Interpretive and Learning Center

The Director makes most of the above approvals; however, most may also be appealed to the Board.

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 DFMP cannot anticipate all of the possible developments in how the State Forest can best serve the needs of California's citizens. Therefore, 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. 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 (DFMP, Chapter 5).

Once again, to the extent that a subsequent action qualifies as a "project" under CEQA (CCR §15378) and is not otherwise exempt, compliance with CEQA will be necessary.

3. OTHER AGENCY INVOLVEMENT

3.1 Intended Use of EIR by Other Agencies

While not directly responsible for approval of the JDSF Management Plan or EIR, agencies other than CDF are "responsible" or "trustee" agencies to resources that may be affected by subsequent implementing actions of the DFMP.

Other agencies also have review and consultation responsibilities in development of this EIR. As a "responsible agency" under CEQA, they will utilize this EIR, and any subsequent CEQA documents tiered from this EIR, for their approval of permits or other entitlements (CCR §15096). In rare circumstances, responsible agencies may assume the lead agency role if their own conclusions differ from CDF's.

3.2 Decisions and Approvals Subsequent to Management Plan

As stated above, subsequent implementing actions by CDF may trigger one or more permits or other entitlements to carryout the project. The range of permits needed depends on the type of action. There are also numerous federal requirements that only apply where an action is "federalized" due to funding or the need for a federal permit. All potential permits or entitlements are listed below followed by a summary of each.

Applicable Permits and Entitlements	
Possible Permits or Other Entitlements for Subsequent JDSF Actions	***Responsible Agency***
FEDERAL	
• §404 Clean Water Act: Nationwide or Individual Permits for discharge of Dredge or Fill into "Waters of the U.S." (See discussion below regarding related federal requirements)	U.S. Army Corps of Engineers
• Federal Endangered Species Act: Consultation and Potential Incidental Take Permit	U.S. Fish and Wildlife Service or National Marine Fisheries Service
STATE	
• §1601 Streambed Alteration Agreement	California Dept. of Fish and Game
• California Endangered Species Act Consultation and Potential Incidental Take Permit	California Dept. of Fish and Game
• §401 Clean Water Act: Waste Discharge Requirements and National Pollutant Discharge Elimination System Permits (Except Timber Harvest Plans are typically exempt)	California Regional Water Quality Control Board
• Coastal Development Permit or Coastal Zone Consistency Determination (limited to areas in the California Coastal Zone)	California Coastal Commission
• Encroachment Permit (State Highways)	Caltrans
LOCAL	
• General Plan Consistency Determination	Mendocino County Planning Dept.
• Encroachment Permit (County Roads)	Mendocino County Public Works
• Local Review of Coastal Development Permit	Mendocino County Planning Dept.

A Section 1601 Streambed Alteration Agreement is required through the California Department of Fish and Game when it is determined an alteration to a bed, channel, or bank of a stream will occur such as a crossing installation.

Section 401 of the Clean Water Act requires that State water quality standards not be violated by the discharge of fill or dredged material into "Waters of the United States." The owner or operator of any facility or activity that discharges, or proposes to discharge, waste that may affect groundwater quality, or from which waste may be discharged in a diffused manner (for example, erosion from soil disturbance), must first obtain waste discharge requirements (WDRs) from the RWQCB

pursuant to Section 401 of the Clean Water Act. Activities as part of an approved THP are exempted from Waste Discharge Requirements based on the determination that the Forest Practice Rules adequately address water quality concerns. The RWQCB also issues National Pollutant Discharge Elimination System Permits for activities on sites greater than five acres.

Section 404 of the Clean Water Act authorizes the U.S. Army Corps of Engineers (ACOE) to issue permits for discharges of dredged or fill material into waters of the United States which include all streams and wetlands. Permits may be in the form of a Nationwide Permit where projects meet all thresholds set forth therein. Otherwise and Individual Permit is required and subject to a more detailed review.

The California Endangered Species Act (CESA) requires consultations with the California Department of Fish and Game to determine if an activity is likely to effect or result in the take of a plant or animal listed by the State as threatened or endangered.

Similar to CESA, The Federal Endangered Species Act (FESA) requires formal or informal consultation with the US Fish and Wildlife Service or the National Marine Fisheries Service where it is likely that the project could affect federally listed threatened or endangered species.

Other Federal Requirements. Consistency with the below rules and regulations may also be required where Federal approvals or funding is needed to proceed with an activity:

> **Migratory Bird Treaty Act:** The Migratory Bird Treaty Act and related international treaties and domestic laws provide protection for migratory birds. The Migratory Bird Treaty Act established that all migratory birds and their parts (including eggs, nests, and feathers) are fully protected. The Migratory Bird Treaty Act is the domestic law that affirms, or implements, the United States commitment to four international conventions (with Canada, Japan, Mexico, and Russia) for the protection of a shared migratory bird resource. Each of the conventions protects selected species of birds that are common to both countries (that is, they occur in both countries at some point during their annual life cycle). The US Fish and Wildlife Service is the federal agency primarily responsible for protection of migratory birds.
>
> **Fish and Wildlife Coordination Act:** The Fish and Wildlife Coordination Act (FWCA; P.L. 85-624) provides for the equal consideration and coordination of wildlife conservation with other project features of federally funded projects.
>
> **Magnuson-Stevens Fishery Conservation and Management Act:** The act requires Federal agencies to consult with the National Marine Fisheries Service to ensure actions do not adversely affect fish and shellfish resources including Essential Fish Habitat. This would typically be done as part of FESA compliance.
>
> **Section 106 of the National Historic Preservation Act:** Section 106 requires coordination with the State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (ACHP) regarding the effects a project may have on properties listed, or eligible for listing, on the National Register of Historic Places (NRHP).

Executive Order 13112 (Noxious and Invasive Plant Species): EO 13112 was signed by President Clinton on February 3, 1999. EO 13112 requires federal agencies to prevent and control the introduction and spread of invasive species.

Executive Order 11990 (Protection of Wetlands): EO 11990 requires federal agencies to follow avoidance, mitigation, and preservation procedures with public input before proposing new construction in wetlands. To comply with Executive Order 11990, the federal agency would coordinate with the ACOE, under section 404 of the Clean Water Act, and mitigate for impacts to wetland habitats.

Executive Order 11998 (Floodplain Management): EO 11998 requires all federal agencies to take actions to reduce the risk of flood loss, restore and preserve the natural and beneficial values in floodplains, and minimize the impacts of floods on human safety, health, and welfare.

V. SETTING

1. INTRODUCTION

The purpose of this section is to provide setting information for the region and for JDSF in general. Detailed project setting information, particularly as it relates to project impacts, is provided in the Resource Specific Analysis Sections (Section VII) by subject area.

2. AREA SETTING

2.1 Location

JDSF covers approximately 48,652 acres in central Mendocino County. It varies from 2½ to 8 miles wide in a north-south direction, and is about 16½ miles long on the east-west axis. Its western boundary is within 1.5 miles of the coast, and the eastern boundary generally lies on the crest of the Mendocino Ridge separating the coastal slopes from the inland valleys, approximately 7.0 miles west of Willits.

The JDSF boundary is irregular, especially at the western end where the property line zigzags following section and subsection lines. There are 11 privately owned parcels within the ownership, most in the southwest corner. A large private ownership extends into the middle of JDSF from the south.

The City of Fort Bragg, where JDSF headquarters facility is located, is 2 miles north of the western property boundary. The town of Mendocino is located 2 miles west of the southwest corner of JDSF; and Ukiah, the county seat, is 35 miles southeast of JDSF.

2.2 Climate

The Pacific Ocean is a moderating influence on the climate of region. The JDSF has a Mediterranean climate, characterized by a pattern of low-intensity rainfall in the winter and cool, dry summers. Fog is a dominant climatic feature, generally occurring daily in the summer and not infrequently during the rest of the year. Air temperature is 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 (15.6^{o} C) in July and August to 44° F (6.7^{o} C) in December (Zeimer, 1996). The monthly average maximum air temperature at the same location was 72° F (22.3^{o} C) in July, and the average minimum was 40° F (4.7^{o} C) in December.

About 90 percent of the precipitation in this area falls between October and April, with the highest average monthly precipitation in January. Winter storms from the Pacific Ocean bring intense rainfall over several hours or days, particularly warmer storms from lower latitudes. Snow is infrequent and usually does not last long even at higher elevations inland. Mean annual precipitation is 39 inches at Fort Bragg (California Department of Water Resources [CDWR], 1997), but measures higher in the Caspar Creek watershed, where annual means of 51 inches and 45

inches have been recorded at the North and South Fork gages, respectively (Zeimer, 1996). Mean annual precipitation at Willits, just a few miles to the east of the JDSF, is slightly higher at 55 inches (CDWR, 1997).

2.3 Surrounding Land Use

Lands to the north and south of JDSF are classified as Forest Lands (FL) in the Mendocino County General Plan. Lands to the east of JDSF are classified as FL and Range Land (RL). The Land Use Classifications for the west side of JDSF are Rural Residential (RR), Remote Residential (RMR), Public Service (PS) and Solid Waste Landfill (SW) (Mendocino County, 1981 rev. 1983). See Land Classification Map A in the attached Figures section. The greatest potential for conflict between JDSF and private landowners is in the Rural Residential areas where harvesting practices on JDSF could indirectly impact the private lands. Examples of these impacts are aesthetics, loss of wildlife on the private lands, and noise impacts.

The DFMP discusses the potential purchase of inholdings within JDSF (DFMP, pages 7, 85, and 86). The majority of inholdings are located within the western portion of JDSF, generally between County Roads 408 and 409. There is one inholding located near Mendocino Woodlands, within the southwest portion of the property, and one inholding located in the eastern portion of JDSF, within the James Creek watershed. These inholdings can be incorporated into the Forest through either land or timber trades.

There is one major outholding of approximately 800 acres, located on the east side of Mendocino Woodlands near the mouth of the Little North Fork Big River. JDSF's property configuration can also be adjusted through minor property boundary changes. 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. Private timber companies generally own these areas, which make the adjustments potentially feasible through either land or timber trade with adjacent owners.

3. PROJECT SETTING

3.1 Topography

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

In general, the landscape is characterized by moderate to high relief. Slopes are less steep in the western watersheds within the Forest, and are steeper to the east in the watersheds nearer the crest of the Mendocino Range. Elevations range from less than 100 feet within stream valleys along the western edge of JDSF, to a maximum of 2,092 feet in the southeast corner. The area is drained by coastal watersheds that drain to the Pacific Ocean. The stream pattern locally has a "trellis" pattern, where short tributary streams flow into larger streams at roughly right angles. Stream pattern appears to be, at least in part, controlled by structural patterns in the bedrock. As is true throughout the Coast Ranges, the predominant structural pattern trends northwesterly. Thus, many of the principal watercourses in the area flow northwesterly (South Fork Noyo River, Hare Creek, Caspar Creek, Parlin Creek, etc. Berry Gulch and Railroad Gulch flow southeastward).

3.2 Water Resources

There are 15 planning watersheds, delineated and defined by CALWATER version 2.2, that contain portions of JDSF ownership. In some cases, the planning watersheds were aggregated into four hydrologic units called Watershed and Wildlife Assessment Areas (WWAA) to facilitate evaluation of larger areas. The planning watersheds encapsulate over 99 percent of JDSF, less 250 acres located along the northern JDSF property line that fall to the other side of the dividing ridge lines.

3.3 Vegetation

The dominant vegetation type on JDSF is redwood/Douglas-fir, which covers over half (54 percent) of the Forest (see Section VII-6.2). Other common vegetation types are redwood and Douglas-fir/redwood, each comprising about 15 percent of the area. The remaining forested vegetation types, in descending order of abundance, are hardwood/redwood, mixed hardwood/conifer, pygmy forest, closed-cone (Bishop) pine/cypress, mixed conifer, and alder. Grassland/bare ground and brush vegetation types together make up less than 1 percent of JDSF.

3.4 Wildlife

The Forest is home to a number of sensitive fish and wildlife species, including the northern spotted owl, coho salmon, and steelhead. The Forest provides habitat for a large number of species. Habitat protection and restoration is an important element of forest management activities.

3.5 Forest Uses

The public also utilizes JDSF as an important recreational resource. There are over 60 individual campsites, many miles of riding and hiking trails, and over 200 miles of forest road utilized by the public. Maintenance of these facilities is an important management component. Other common recreational activities conducted on the Forest include picnicking, hunting, swimming, wildlife viewing, and target shooting. The Forest is also a local source of firewood and other minor forest products such as mushrooms and greenery for both personal and commercial use.

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

VI. ALTERNATIVES

1. INTRODUCTION

This section describes five alternatives that have been developed as the basis for impact analyses in this EIR. Table 6 provides a summary and comparison of the project characteristics among the alternatives. This section also identifies the environmentally superior and preferred alternatives.

The alternatives to the proposed JDSF Management Plan must, to some degree, meet the basic DFMP purposes, goals, and objectives (14 CCR. sec. 15126). The DFMP purpose, goals, and objectives are detailed in the Project Introduction section. In the interest of fostering meaningful public participation and informed decision making, this EIR includes alternatives recommended by several groups during the hearings on the draft management plan and during the scoping meetings even though these alternatives would not meet some of the basic purposes, goals and objectives and would require changes in legislation in order to be implemented. Because this project involves publicly owned land, and because government has an ability to change policies and laws, the EIR considers a range of alternatives offering a wider range of policy choices than are normally presented.

2. ALTERNATIVES CONSIDERED BUT DISMISSED FROM FURTHER CONSIDERATION

The selection of a reasonable range of alternatives began with an evaluation of a broader range of possible alternatives. This broader range of alternatives was developed by CDF in consultation with other agencies and based on public scoping comments. Certain alternatives are presented not because they were considered feasible or consistent with the project purpose, goals and objectives, rather, because they were recommended in frequent comments during the scooping meetings.

Sale of Jackson Demonstration State Forest: One idea frequently mentioned in the history of American public land management is that the way to make public lands productive is to transfer the lands into private ownership. This was the idea behind the original sales of public lands by the Federal Government in the 1700's and the 1800's. The idea returned to popularity during the Reagan Administration. Sale would also provide revenues to a strained State Treasury during a time of budget deficits.

Transfer into private ownership would probably lead to ownership by industrial timber interests, grape producers or real estate developers. In timber or vineyard production, the property might increase the flow of products into the economy, but the public benefits from demonstration, research, education, recreation, old growth development, and fish and wildlife habitat would be greatly reduced if not lost. With real estate development, new home sites would become available, but fragmentation of land holdings would greatly impair timber production as well as the other public benefits of the current forest. In any of these land uses, erosion and flow of pollutants into streams would probably increase.

Sale of the Forest is not presented here as a feasible alternative because it would foreclose the opportunities for demonstration, research, education, recreation, cultural resource protection, old growth development, and fish and wildlife habitat protection. This alternative conflicts with the purposes for which the State purchased the property in the late 1940's and for which CDF has managed the property since that time. Sale would require changes in legislation such as PRC §§ 4631(a) and 4651, and Board policies 0351.2 and 0351.3. . Because this approach would achieve few of the purposes of this project, this alternative was rejected from further consideration.

Endangered Species Protection and Recovery: Numerous public comments were received that encouraged the adoption of an alternative that afforded full protection to and ensured recovery of several species including coho salmon, steelhead, northern spotted owl, and marbled murrelet.

All alternatives would have to provide protection to state or federally listed species. However, an alternative that guaranteed recovery for all threatened and endangered species is not feasible at JDSF. In addition, regardless of the level of habitat protection provided, it is not scientifically possible for CDF, or any other landowner, to guarantee that a species will recover. JDSF is too small to provide the ability for species to recover, but by demonstrating proper management and monitoring can result in benefits on millions of private acres. This alternative was eliminated due to infeasibility and a failure to meet the basic purpose, goals and objectives of the DFMP of demonstrating how timber production can be managed to serve a variety of public purposes.

Components of this alternative have been incorporated into the alternatives analyzed in detail. Alternatives D and E would provide elevated levels of protection for these species, but they would not ensure full protection or recovery for the species considered.

Exclusive Late Seral Timber Management: Several scoping comments focused on JDSF considering longer-term timber management goals, such as long rotations and cutting cycles. Rotations/cutting cycles of 150 years up to 1,000 years were suggested that allowed for the production of large-diameter, old-growth quality logs. In addition, it was suggested that JDSF "not be mandated to manage exclusively for maximizing timber production" and that sustained yield should be projected for hundreds of years.

CDF is specifically prohibited from managing JDSF exclusively for maximizing timber production, but in fact must consider a variety of forest resource values (See PRC § 4651). The five alternatives analyzed in detail consider wildlife, water, recreation, aesthetics, cultural resources, and other resource values and the balance among these values among alternatives.

While a long-rotation/cutting cycle alternative would create larger-diameter logs, it would significantly limit JDSF's ability to function as a demonstration forest. Few private owners are growing large diameter trees for timber production anymore, and mills that can handle process large diameter logs are disappearing. There would be few people interested in learning from this type of demonstration. JDSF has a responsibility to demonstrate forest management over a variety of management regimes including short, medium, and long rotations/cutting cycles.

CDF's timber projections are based on a long-term analysis. The DFMP alternatives project a long-term sustained yield (LTSY) over a 120-year planning interval, whereas the FPRs require a planning interval of only 100 years. While it is recognized that longer-term projections may be

desirable from a wildlife habitat perspective, the state of the art in modeling tools limit analysis to shorter time frames. CDF's commitment to harvest at or below its 120-year LTSY ensures that the timber resource 120 years from now would be the same, or in better condition, than it is today. This alternative was eliminated from further consideration and analysis due to a failure to meet the basic purpose, goals, and objectives of the DFMP--demonstrating timber management in ways that would benefit the general public and a variety of timber owners and managers.

Components of this alternative have been incorporated into the five alternatives analyzed to the extent that the purpose, goals and objectives can be met. The alternatives include a wide spectrum of silvicultural treatments, even- and uneven-aged management, as well as various cutting cycles and rotations. Residual old-growth trees as well as old-growth groves would be set aside as no-harvest zones under each of the alternatives.

Recreational Use as Primary Management Emphasis: Some members of the public requested that JDSF be managed to enhance recreational benefits rather than traditional multiple uses and timber production. This alternative would promote more camping and hiking facilities as well as increased off-road vehicle use. No timber harvesting would occur as discussed in the "No Harvest" alternative above.

CDF lacks authority for managing JDSF exclusively for recreation; CDF is required to consider a variety of forest resource values including recreation. This alternative was eliminated from further consideration and analysis due to a failure to meet the basic purpose, goals and objectives of the DFMP as spelled out in PRC § 4651.

Components of this alternative have been incorporated into Alternatives A, D, and E to the extent that the project purpose, goals and objectives can be met. Continued forest recreation opportunities at JDSF would be ensured through the establishment of buffers around campgrounds and hiking trails as well as transportation corridors. No timber harvesting would be permitted under any of the alternatives in the pygmy forest and old-growth groves, which are popular visitor attractions. Only limited timber harvesting in the Mendocino Woodlands STA would be allowed under Alternatives A through D, while Alternative E includes a no-harvest prescription for the Mendocino Woodlands STA.

Small-Scale Operations for Local Needs and Increased Access to Minor Forest Products: Public scoping indicated that there was interest in having JDSF managed to better meet the needs of small, local timber operators and sawmills. In addition, the public is interested in increased access for minor forest products.

This alternative would emphasize managing JDSF primarily for timber sales to small operators and sawmills. Large commercial operations would be minimized. Thinning and other forest work would be targeted toward small businesses. In addition, other minor forest products (for example, firewood, mushrooms, burls, foliage) would continue to be harvested by the public and local businesses.

The difference between timber sales being made to small or large operators is unlikely to affect the Forest's wildlife, water, or timber resources. The harvesting of minor forest products by the public currently occurs on JDSF and would likely continue under all of the alternatives analyzed.

Small sales would produce potentially significant effects related to safety, closure of more roads to the public, and increased operating and planning costs.

This alternative would not affect the Forest's resources in a manner that is substantially different from the other alternatives analyzed. In as much as alternatives are designed to offer ways to reduce the DFMP's environmental effects, there is no beneficial environmental effect with respect to 20 or 30 minor sales versus 5 variable sized sales for the same areas. On the other hand, if the intent of this alternative is to restrict the amounts and types of timber harvest, these alternatives are included as part of Alternatives D and E. Based on the above considerations, this alternative was eliminated from further consideration and analysis.

Regional Watershed and Conservation Planning: Several commenters preferred to see an analysis that focused on a broader, regional approach rather than the management of JDSF within its own boundaries. This included developing a regionally based plan emphasizing watershed and resource conservation. This also included using JDSF as a mitigation bank for adjacent timberlands, managing JDSF as a wildlife connectivity corridor with other public lands in Mendocino County, and considering adjacent parklands as part of the analysis. Others wanted the entire Noyo River watershed considered in any analysis.

This alternative would require multiple landowners to participate and agree to management direction over the long term. The feasibility of such a mutually acceptable agreement is remote because adjoining public and private ownerships have differing management objectives. Demonstration on JDSF, however, will set an important precedent for other landowners in Mendocino County and elsewhere. In addition, the analysis of impacts on fish and wildlife species in this EIR is not limited to JDSF alone. The larger watershed areas are used to assess potential impacts to fish and wildlife species, and the cumulative effects analysis considers an even larger regional scope. The use of JDSF as a mitigation site would allow more intense timber management activities elsewhere likely resulting in a full range of significant indirect impacts that would not otherwise occur as a result of this project. This alternative was eliminated from further consideration and analysis due to technical infeasibility, expansion of the project scope and geographic area beyond the DFMP's basic purpose, and the likelihood of increased impacts associated with more intense off-site activities resulting from a mitigation bank on JDSF.

Components of this alternative have been incorporated into Alternatives D and E to the extent that they meet the project purpose, goals and objectives, and to the extent they reduce environmental impacts.

Alternative Locations: Certain types of projects require at least one alternative to evaluate an alternative project location if moving the project to the new location would avoid a significant effect and not cause the same kind of effect at the new location. An alternative location is not required for this Program EIR since the JDSF Management Plan is site-dependent in much the same way a City is site-dependent on its incorporated area in conducting a General Plan Program EIR. These considerations, however, do not preclude analysis of differing management activities in different locations within JDSF. Further, JDSF is unique in its maturing second growth timber conditions, its

ongoing research activities such as the Caspar Creek Study, its old growth groves, and its special facilities such as the conservation camps. No significant environmental effect has been identified that could be avoided by moving this State Forest to another location.

3. GENERAL DESCRIPTION OF ALTERNATIVES

Five alternatives have been selected for analysis including the preferred project, two no-project scenarios (no management and continued management under existing plan), and two other alternatives that have been determined consistent with the basic project purpose, goals and objectives and consistent with the intent of alternatives to minimize environmental effects. Each is discussed below.

3.1 Alternative "A" (No Project--No Direct Management Activity)

Alternative "A" describes the effects of only minimal maintenance and protection of JDSF lands. There would be no harvest of timber. Road maintenance would be limited to that necessary to maintain public access. Stand structure would change more slowly than in an active management strategy. The demonstration value of this alternative is limited to forest development that is not likely on most private lands in the state. The primary land uses on JDSF would be public recreation and monitoring or study of natural environmental processes.

This alternative is not required for analysis since it does not meet the project goals and objectives. Further, it would require changes in legislation and Board policy. It is not intended as an alternative that could feasibly be adopted; rather, it is intended as a baseline for purposes of comparing the project setting (and the absence of any management plan activities) to several different management strategies represented by Alternatives B through E.

3.2 Alternative B (No Project--Management Consistent with 1983 Management Plan)

Alternative B describes JDSF maintaining the current level of forest management demonstration, timber production, recreational development, and environmental protection consistent with the 1983 Management Plan. It includes an annual timber harvest of about 29 million board feet and conservative harvesting practices that meet or exceed the requirements of the FPRs. This alternative includes protection of listed species, and recruitment of recovery habitat for listed species as opportunities arise. A demonstration program is included that explores basic forest processes. It also includes the maintenance of existing recreational facilities. This alternative accommodates changes in laws and regulations that affect management activities, particularly changes in the FPRs and the Endangered Species Act. This alternative describes a moderate level of timber production, a moderate level of wildlife protection emphasis, with a low level of recreation facility development.

3.3 Alternative C (Management Consistent with the Draft Management Plan)

Alternative C describes an increased level of long-term sustained yield with enhanced demonstration capabilities. This alternative describes a timber management program based on determining and working towards a long-term desired future habitat, watershed, and growing stock condition. This alternative includes an average annual harvest level of 31 to 33 million board feet (based on a 10 year average) for the life of the management plan. This alternative has a conservation-oriented approach to management of wildlife and aquatic resources on a watershed basis. Use of watershed information and evaluation techniques is encouraged in the development and management of projects.

The desired future condition is developed in terms of maintaining a high level of timber production while actively maintaining and recruiting additional habitat needed for listed species and other species of concern. The alternative also includes a similar level or type of recreational use as Alternative B except that recreational corridors are envisioned adjacent to primary recreational sites. Management within the recreational corridors will emphasize demonstration values and aesthetics.

3.4 Alternative D (All-Age Emphasis)

This alternative is developed from recommendations of a seventeen-member committee of interested persons appointed by former Director Wilson. The primary goal for management of JDSF would be conversion of the entire forest into an all-aged forest. There would be no harvest of old-growth trees and even-age regeneration methods would not be used. No herbicides would be used. Riparian zones for all watercourse classes would be protected by using harvest limitations similar to the USFS methods described in the FEMAT (Federal Ecosystem Management Assessment Team) Report. Riparian zones would be managed to establish late successional habitat. Recreation would be emphasized, including increasing the number of hiking trails and campsites. Timber harvesting would be compatible with the recreation uses. Demonstrations and research would emphasize management alternatives for single tree selection and other all-aged silvicultural methods for small landowners. Hardwood management and use would be another demonstration emphasis.

This alternative represents a low to moderate level of timber production with specific management constraints, a high level of watershed protection, and a moderate to high level of recreational development.

3.5 Alternative E (Late Seral Emphasis)

This alternative includes many of the public's interests expressed during scoping, with an emphasis on development of late seral forests across the landscape. Restoration of the natural forest ecosystem and the protection of water quality, fish, and wildlife habitats at JDSF would be the primary management goals. There would be no even-aged management or harvest of old-growth trees. Timber harvesting, when it occurred, would be designed to advance timber stand development to late seral characteristics. Low impact recreational opportunities such as trails and hike-in campsites would be expanded where they did not pose significant risk to fish and wildlife

resources. Research would no longer address questions on active forest management, but would shift to studying the existing vegetation types and watercourse conditions and how they change over time. A research, demonstration, and monitoring program would be implemented to gain and distribute knowledge on the restoration of old-growth and late-seral forests, natural watersheds, and associated resources.

4. DETAILED COMPARISON OF ALTERNATIVES BY SUBJECT

Table 6 presents the five alternatives in a comparative format. In general, the comparison is geared toward key management measures.

TABLE 6 COMPARISON OF MANAGEMENT APPROACH AND ELEMENTS AMONG PROPOSED ALTERNATIVES				
A	**B**	**C**	**D**	**E**
FOREST MANAGEMENT				
Silviculture (Also refer to growth and yield below)				
No Harvest No Site Prep No thinning No Planting	Similar to C but with the possibility of more even-aged and less uneven-aged, no silvicultural allocation plan	Silvicultural allocation plan with approx. 2/3 uneven-age with 10–25 year re-entry and 1/3 under even-age w/ 3 types of cutting. Variable rotation age based on site and demonstration goals.	All uneven-aged prescriptions with an emphasis on watershed protection and habitat development.	Uneven-aged prescriptions to promote late seral development with very limited area available for timber harvest (approx. 25% of Forest).
Special Concern Areas				
No Inner gorge or landslide SCAs, all others similar to C related to roads for recreational access	No Inner gorge or landslide SCAs, no late seral habitat development, all others similar to C	23 SCAs as per draft management plan with either no harvest or harvest restrictions.	Similar to C with expanded riparian zones and habitat development	Inner gorge, landslide, WLPZ, Non-timberland neighbors, and Woodlands SCAs are all no harvest, all others similar to C with most of Forest off-limits to harvest
Conifer Species Diversity				
No active management for species diversity	Similar to C	Harvest and regeneration to favor RW/DF; Hemlock and GF managed for no increase over current levels; bishop pine controlled to remain minor species, hardwood dominated site returned to historic conifer occupancy.	Uneven-aged harvest and natural regeneration with minimal species control.	Similar to D with attempt to imitate old-growth forest species mix

TABLE 6 COMPARISON OF MANAGEMENT APPROACH AND ELEMENTS AMONG PROPOSED ALTERNATIVES				
A	**B**	**C**	**D**	**E**
Hardwood Management				
No active management	Similar to C with hardwood control by intensive practices	West end managed to maintain current hardwood levels of about 10% of stand basal area; east end managed to reduce hardwood occupancy to about 15% of stand and shift towards conifers.	Manage hardwoods as a significant stand component to demonstrate habitat and product values.	Manage hardwoods to maintain a species mix similar to old-growth forest.
Timber Sale Program				
No timber sales	Similar to C	Estimated 3- 5 timber sales per year with 2-15 MMBF per sale	Estimated 1 to 3 timber sales per year with 2-11 MMBF per sale, also some very small sales designed for local small mill owners	Estimated 1 to 3 sales per year with 2-10 MMBF per sale
Geologic Review of Timber Management Areas				
No review needed	Review as per FPRs	Review as per FPRs and CEG review of ground based activities on unstable areas.	No operations within inner gorge, review as per FPRs and CEG review of ground based activities on unstable areas.	Same as D

TABLE 6 COMPARISON OF MANAGEMENT APPROACH AND ELEMENTS AMONG PROPOSED ALTERNATIVES				
A	**B**	**C**	**D**	**E**
Yarding				
No Yarding	Same as C	Ground based yarding mostly limited to slopes <40%, cable on steeper slopes, and limited helicopter for inaccessible areas. Compliance with FPR limitations.	Same as C	Same as C
Transportation				
No significant road construction or reconstruction; minor maintenance and major repairs limited to imminent failures.	No road management plan, minimal abandonment on a project by project basis, no road inventory	Roads and landings constructed and reconstructed as needed to support harvest operations. Construction, reconstruction, upgrading and abandonment as per Road Management Plan.	Minimize new road construction. Construction, reconstruction, upgrading and abandonment as per Road Management Plan.	Similar to D with aggressive road abandonment in most of Forest to emphasize old-growth development
Fire Protection				
No active management to reduce fire risks	On going fire protection with no comprehensive Fire Protection Plan	Implementation of a comprehensive Fire Protection Plan that provides for shaded fuel breaks for fire defense and may include prescribed fire prescriptions.	On going fire protection with no comprehensive Fire Protection Plan	On going fire protection with no comprehensive Fire Protection Plan, potential to implement under-burning to simulate natural conditions

TABLE 6 COMPARISON OF MANAGEMENT APPROACH AND ELEMENTS AMONG PROPOSED ALTERNATIVES				
A	**B**	**C**	**D**	**E**
Growth and Yield				
No annual harvest volume	Compliance with FPR Maximum Sustained Productivity; No silvicultural allocation plan to control distribution of silviculture; Harvest about 29 MMBF per year.	Compliance with FPR Maximum Sustained Productivity; silvicultural allocation plan as per DFMP; Harvest about 31 MMBF per year.	Compliance with FPR Maximum Sustained Productivity; Silviculture restricted to single tree selection only; Harvest about 20 MMBF per year.	Compliance with FPR Maximum Sustained Productivity; Silviculture restricted to single tree selection only; Harvest about 10 MMBF per year.
Herbicide Application				
Limited use for road maintenance	Unconstrained use to treat road-side vegetation, control exotics, and control hardwoods in harvest units.	Use constrained in DMP for exotic plant control; hardwood control in the east end, competition control in regeneration areas, limited use for road maintenance.	None	None
SPECIES PROTECTION				
Aquatic Species				
NA	**Class I Watercourse:** FPR protection	**Class I Watercourses:** 150-foot minimum WLPZ, 25 foot inner band w/no cut or limited entry for habitat improvement; 25-150 foot outer band maintain at least 70% overstory canopy cover; retain at least 85% overstory canopy cover within 75 feet of the channel; retain a minimum	**Class I Watercourse:** FPR protection plus FEMAT standards of 340 foot no cut buffer; Managed to establish late successional habitat	Same as D in the managed area of Forest

TABLE 6 COMPARISON OF MANAGEMENT APPROACH AND ELEMENTS AMONG PROPOSED ALTERNATIVES				
A	**B**	**C**	**D**	**E**
		of 240 sq. ft. conifer basal area per acre in WLPZ; retain the 10 largest trees per 330 feet within 50 feet of channel; 0-50 feet ELZ with limited exceptions; 50 to 150 feet ELZ; No fire ignition in WLPZ; enter once per 20 years; no salvage in WLPZ except safety hazards; retain all native hardwoods, recruit late seral elements and characteristics		
NA	**Class II Watercourse:** FPR protection	**Class II Watercourse**: Includes class II seeps and springs; 50 to 100 foot WLPZ based on slope; 25 foot inner band w/no cut or limited entry for habitat improvement; maintain 85% canopy within 25 feet of channel; retain a minimum of 240 sq. ft. conifer basal area per acre in WLPZ; retain the 10 largest trees per 330 feet within 50 feet of channel; 0-50 feet ELZ with limited exceptions; remainder of WLPZ is ELZ; No fire ignition in WLPZ; no	**Class II Watercourse**: FPR Protections plus FEMAT Standard of 170 foot no harvest buffer, Managed to establish late successional habitat	Same as D in the managed area of the Forest

TABLE 6 COMPARISON OF MANAGEMENT APPROACH AND ELEMENTS AMONG PROPOSED ALTERNATIVES				
A	**B**	**C**	**D**	**E**
		salvage in WLPZ except safety hazards; retain all native hardwoods, recruit late seral elements and characteristics		
NA	**Class III watercourse:** FPR protection	**Class III watercourse**: 25 foot ELZ for slopes <30% and 50 feet for slopes >30%. May be expanded for site specific conditions; no fires ignited within 50 feet of channel; majority of LWD shall remain following burning in ELZ	**Class III Watercourse**: FPR Protections plus FEMAT Standard of 100 foot no harvest buffer, Managed to establish late successional habitat	Same as D in the managed area of the Forest
Wildlife				
Northern Spotted Owl (NSO)				
No management requiring FPR protection or USFWS Consultation	Same as C	FPR protection and consultation as needed with USFWS on a THP/project basis	Same as C	Same as C
Osprey				
No management requiring FPR protection or CDFG Consultation	Same as C	FPR protection and consult with CDFG as needed on a THP/project basis	Same as C	Same as C
Marbled Murrelet (MAMU)				
No project specific surveys, consult with CDFG/USFWS for occupied habitat, No specific MAMU habitat recruitment.	On going surveys; Consult with CDFG/USFWS for occupied habitat, No specific MAMU habitat	Protect all remnant OG forest at least 2 acres and 200 feet across; protect other areas based on consultation with CDFG and USFWS. 402	Same as C, with no harvest in Woodlands STA (Approx. 2,500 acres)	Same as C, plus additional late seral habitat development across the entire Forest

TABLE 6 COMPARISON OF MANAGEMENT APPROACH AND ELEMENTS AMONG PROPOSED ALTERNATIVES				
A	**B**	**C**	**D**	**E**
	recruitment, survey potential habitat in and near THPs	CDFG and USFWS; 492 acre buffer around Road 334 grove, 38 acre buffer around Upper James Creek Grove, 250 acre buffer around waterfall grove complex; additional silvicultural buffers adjacent to habitat buffer; Protocol surveys in potential habitat; seasonal buffers for occupied habitat; disturbance buffers for occupied habitat; USFWS and CDFG consultation for activities adjacent to potential habitat; 2,224 acres of Mendocino Woodland STA managed to recruit MAMU habitat, protocol surveys for THPs/projects only.		

TABLE 6 COMPARISON OF MANAGEMENT APPROACH AND ELEMENTS AMONG PROPOSED ALTERNATIVES				
A	**B**	**C**	**D**	**E**
Northern Goshawk (NOGO) and Cooper's Hawk				
No management activities that would require surveys or consultation.	FPR Protection	Surveys in potential habitat on a project basis; 100 acre nest site and 300 acre post fledging area protection zones for occupied NOGO nest sites if found; CDFG consultation for occupied cooper's nest site if found; seasonal and disturbance buffers as per FPRS and on a consultation basis with CDFG.	Same as C	Same as C
Vaux's Swift and Purple Martin				
No specific protection	No specific protection	Retain trees with suitable cavities; in even aged areas retain all snags; retain large firs in WLPZ as snag recruitment; no salvage in WLPZ, MAMU buffers; retain large fir trees in or near even-aged areas in suitable habitat locations.	Similar to C	Similar to C

TABLE 6 COMPARISON OF MANAGEMENT APPROACH AND ELEMENTS AMONG PROPOSED ALTERNATIVES				
A	**B**	**C**	**D**	**E**
Red Tree Vole (RTV)				
No specific protection	No specific protection	Manage to maintain significant potential habitat of Douglas fir trees in a connected state.	Similar to C, plus retain all identified RTV nests	Similar to C plus retain all identified RTV nests
Rare Plants				
No specific protection	Protect known populations and incidental discoveries of populations of R, T and E species, no project surveys required	Surveys in potential habitat on a THP or project basis; design projects to prevent significant negative effects to rare plant populations; provide survey results to CDFG.	Same as C	Same as C

TABLE 6 COMPARISON OF MANAGEMENT APPROACH AND ELEMENTS AMONG PROPOSED ALTERNATIVES				
A	**B**	**C**	**D**	**E**
OTHER MANAGEMENT				
Recreation				
Forest open to the public with no active development of recreation facilities, maintain existing facilities	Maintain existing facilities, continued recreation use at levels similar to current use.	Maintain existing facilities, develop recreation corridor at 2 main camping areas, 300 foot special treatment area around campsites, survey users for adaptive management purposes, 8 planned management activities in DFMP	Increased emphasis on recreation with development of new trails and campsites, mitigate timber harvest specifically to address recreation	Develop low impact recreation where they do not present a significant risk to fish or wildlife.
Research & Demonstration				
Limited research and demonstration of non-managed forest development	Continued ongoing research and demonstration	Continued ongoing research and demonstration with the silviculture allocation plan designed to increase research and demonstration capabilities.	Research and demonstration focused on single tree selection and all-aged management, Increased emphasis on hardwoods as habitat and a crop tree	Research and demonstration focused on the study of vegetation and watershed and how they change over time with management intended to develop old-growth structure
Minor Forest Products				
Same as C with limited access	Same as C	Permits for the following products available to the public: salvage saw logs, poles, split products, greenery, mushrooms and firewood; area and other restrictions included on permits	Same as C with additional restrictions	Same as C restricted to 25% of Forest area available for limited management, additional restrictions to limit effects on old-growth development

TABLE 6 COMPARISON OF MANAGEMENT APPROACH AND ELEMENTS AMONG PROPOSED ALTERNATIVES				
A	**B**	**C**	**D**	**E**
Rock Pits/Quarries				
Limited use of existing pits for road maintenance.	Same as C	Most road rock is brought in from off site rock pits with very limited use of existing pits for Forest road work; possible development of new pit(s).	Same as C	Decreased level of activity at existing pits and no new development.
Road Mgmt. Plan				
No plan outlining inventory, upgrades, construction, abandonment.	No specific road management plan, maintain roads as needed to support operations	Implement Road Management plan as outlined in DMP	Same as C	Same as C
Exotic Species Control				
None	Treat invasive exotics on a case by case basis	Integrated pest management approach to prevent or suppress invasive exotics with 8 planned actions in the DFMP	Similar to C with no herbicide use	Same as D
HABITAT MANAGEMENT				
Riparian Zone (Watercourse and Lake Protection Zone [WLPZ]) Refer to Aquatic Species Protection described above				
Not applicable	Forest Practices Rules	Forest Practices Rules with increased protections	FEMAT	FEMAT in areas managed
Wetlands				
Unchanged.	Forest Practices Rules	Forest Practices Rules with protection of wetland site integrity and hydrologic function	FEMAT	FEMAT

TABLE 6 COMPARISON OF MANAGEMENT APPROACH AND ELEMENTS AMONG PROPOSED ALTERNATIVES				
A	**B**	**C**	**D**	**E**
LWD				
No management	Forest Practices Rules	Retain at least 2 down logs per acre 20 ft. long by 16 inches large end diameter with at least 1 log per acre 20 ft. long by 24 inches large end diameter.	Similar to C	Similar to C with increased emphasis on late seral development
Snags				
No management	Forest Practices Rules	In wildlife special concern areas retain 3 snags per acre >20" dbh with at least 1 > 30" dbh, in general forest retain at least 1 per acre >30" dbh, uneven distribution to provide best snags in the best locations, indirect recruitment	Similar to C	Similar to C with increased emphasis on late seral development

TABLE 6 COMPARISON OF MANAGEMENT APPROACH AND ELEMENTS AMONG PROPOSED ALTERNATIVES				
A	**B**	**C**	**D**	**E**
Hardwoods (see hardwoods described above)				
Old Growth				
Retain existing old growth with no late seral development	Retain 115 acres of old growth groves; no specific plan for late seral development	Retain 459 acres of old growth groves, retention of old growth trees with selected structural characteristics, late seral development in SCAs and riparian protection zones	Retain existing old growth groves, retention of old growth trees with selected structural characteristics, late seral development in SCAs and large riparian protection zones	Retain all old growth groves and residual trees, main emphasis of management is to develop old growth forest characteristics across the Forest
Habitat Connectivity				
No change in existing conditions	No specific direction to develop habitat connectivity, standard riparian zone provide limited development	Management to provide late seral characteristics in managed stands, riparian zones and SCAs with late seral emphasis	Similar to C with larger riparian zones and additional no harvest SCAs	Specific emphasis on old growth development will tend to promote habitat connectivity across the Forest

5. RELATIVE COMPARISON OF IMPACTS BY RESOURCE

Tables are provided on the conclusion of each resource analysis section (refer to Section VII) summarizing the level of impact identified for each alternative and whether such impacts can be mitigation to less than significant levels.

6. ENVIRONMENTALLY SUPERIOR ALTERNATIVE AND PREFERRED ALTERNATIVE

Alternative E, with its habitat emphasis, is the environmentally superior alternative and would result in the least severe impacts, particularly to wildlife resources. The alternatives analysis further concludes that certain impacts, such as fire hazards and road erosion, would worsen under the no action alternatives (Alternatives A and B).

The preferred alternative is Alternative C, which represents the proposed JDSF Management Plan.

VII. RESOURCE SPECIFIC ANALYSIS

1. INTRODUCTION

This section discusses various environmental resources, by resource type (i.e., geology, hydrology, etc.). The categories selected are generally consistent with the initial study checklist (Appendix G of the CEQA Guidelines), although some discussion areas have been expanded where detailed discussion is warranted (i.e., biology) or combined where there are little to no project-related impacts (i.e., agricultural and mineral resources).

Each resource category begins with a detailed discussion of the setting, specifically as it relates to the resources being discussed. Setting information in each resource category is followed by a discussion of regulatory standards and policies or measures proposed as part of the DFMP that would achieve impact reductions. Potential actions resulting from the DFMP are then compared to the identified thresholds of significance to determine whether mitigation measures are warranted. Pertinent technical reports are included in the appendices.

1.1 Areas to Be Studied

Areas of study include the following:

EIR Resource Study Areas		
Aesthetics	**Land Use and Planning**	**Biological**
Air Quality	Noise	Aquatics
Geology and Soils	Recreation	Botanical
Hazards/Hazardous Mat.	Transportation and Traffic	Timber
Heritage Resources		Wetlands
Hydrology/Water Quality		Wildlife

1.2 Resources Not Present or Unaffected by Project

Resources not present of substantially unaffected by the project include agricultural lands, mineral resources, housing, services, and utilities. These resources are briefly discussed elsewhere in this section (Sections VII-3, - 4, and -13).

1.3 Applicable Regulations

Each environmental resource category discusses applicable regulatory standards. Many of these requirements serve to reduce the level of potential impact. It is important, however, that the description for each regulatory standard specify when such standards apply, and the general triggers for when an activity would be subject to these standards.

1.4 Thresholds of Significance

Each resource category provides criteria to guide in determining whether impacts resulting from the JDSF Management Plan are significant. Generally, this EIR adopts significance criteria consistent with the CEQA Guidelines and Initial Study Checklist (Guidelines Appendix G). These thresholds are based largely on adopted standards by CDF or other local, State, and Federal agencies. Project consistency with applicable standards is a good initial measure of significant effects; however, prior to making a conclusion regarding an impacts level of significance, this EIR further reviews each standard to determine applicability to the project.

1.5 Impacts

Based on the setting, regulatory standards, and thresholds of significance for a particular resource, a determination is made regarding whether potential actions resulting from the JDSF Management Plan would have significant adverse impacts. If not, the effect is identified as having "no impact," a "less than significant" impact, or a "beneficial" impact.

Where natural resources are concerned, it is important to recognize that the general goal of the JDSF Management Plan is to achieve net improvements of conditions for all natural resources over time in comparison to existing conditions. This goal has been ongoing since the property was acquired by the State in the 1940s and 1950s. The site was acquired in a degraded condition, but over time, has notably improved in most of the resource categories. There still exists room for improvement regarding some resource categories.

Impacts are considered for both the short- and long-term. Short- and long-term effects are typically related and evaluated in terms of net effect. For example, grading to remediate a road with severe erosion near a stream may result in a short-term increase in sedimentation despite the use of best management practices and compliance with all standards. The long-term effect, however, would be beneficial due to elimination of a chronic erosion source.

Impacts are also assessed for direct and indirect effects such as direct impacts related to grading and indirect impacts related to sedimentation in fish-spawning areas. As stated earlier, on-site as well as off-site activities and impacts are also considered.

CEQA also requires an examination of cumulative and growth-inducing effects. These have little or no applicability to the JDSF Management Plan project. Section VIII discusses these types of impacts in general. Cumulative impacts are also considered within each resources section.

1.6 Mitigation

Where impacts are determined significant despite measures proposed in the JDSF Management Plan, one or more mitigation measures are specified that would reduce the impact level below the significance threshold. Mitigation measures may include avoidance, minimization, rectification, or compensation. Avoidance is the preferred method and can typically be accomplished for resources

that are not widespread throughout the Forest. Where a resource is not avoided, impacts would first be minimized, then rectified and compensated within the same disturbance area or elsewhere on JDSF (CCR Section 15370).

Impact assessment and mitigation are stated in general terms where the specific details of a particular activity are not known, and cannot be known at this time. This is particularly true for a Program EIR such as this that must forecast the impacts of actions resulting from policy decisions. Most often, programmatic or policy-level mitigation is provided as part of this EIR. Detailed mitigation may be deferred to a subsequent impact assessment. In these cases, additional CEQA review is required once the activity is fully defined in terms of scope, location and other factors.

1.7 Cross-Referencing

Certain types of impact discussion may cross-over into two or more resource categories. For example, erosion/sedimentation issues could be discussed in terms of Geology (erosion), Water Quality (turbidity) and Biology (sedimentation effecting stream habitat). Table 7 provides a general references regarding closely related topics. This is intended to direct the reader to additional information.

1.8 Reference Availability

References are cited throughout this section and all references are listed in Appendix 7 of this EIR. The public notice for review of this EIR will specify contact information for the public and agencies to obtain all referenced information.

TABLE 7
GENERAL REFERENCES REGARDING CLOSELY RELATED TOPICS

	Aesthetics	Air Quality	Aquatic Resources	Botanical Resources	Timber Resources	Wetlands	Wildlife	Geology and Soils	Hazards/Hazardous Mat.	Heritage Resources	Hydrology/Water Quality	Land Use and Planning	Noise	Recreation	Transportation/Traffic
Aesthetics			X		X	X				X	X			X	
Air Quality					X										X
Aquatic Resources	X			X	X	X	X	X			X				
Botanical Resources			X		X	X	X				X				
Timber Resources	X	X	X	X			X	X	X		X	X	X	X	
Wetlands	X		X	X			X	X			X				
Wildlife			X	X	X	X					X		X		
Geology and Soils			X		X	X					X				
Hazards/Hazardous Mat.					X										X
Heritage Resources	X													X	
Hydrology/Water Quality	X		X	X	X	X	X	X							
Land Use and Planning					X								X	X	
Noise					X		X					X		X	X
Recreation	X				X					X		X	X		X
Transportation/Traffic		X							X				X	X	

2. AESTHETIC RESOURCES

Evaluation of aesthetic impacts intrinsically deals with the quality of the Forest visitor's experience. Aesthetics include the sights, sounds, and odors associated with management activities and how they will be perceived by the Forest visitor.

The general impacts of sounds on the Forest visitor and on sensitive land uses such as adjacent residences and State Parks are addressed in Section VII-12: Noise. Air quality impacts are addressed in Section VII-5: Air Quality.

Impacts of timber harvest operations as they affect the Mendocino Woodlands State Park and Outdoor Center, a National Historic Landmark, in terms of the of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features would be evaluated based on the Criteria of Adverse Effect of the Advisory Council on Historic Preservation (36 CFR Part 800). This evaluation is described in Section VII-9: Heritage Resources.

The analysis below addresses impacts of proposed management activities on the scenic resources of the JDSF.

2.1 Setting

2.1.1 Jurisdictional Setting

No plans or policies exist that are specific to scenic resource management of the JDSF.

There are no designated scenic highways on the JDSF and none are recommended in the Mendocino County General plan for State Scenic Highway designation.

There are no designated wild, scenic, or recreational rivers on the JDSF in either the Federal or State Wild and Scenic Rivers programs.

2.1.2 Existing Aesthetic Character of the JDSF

Landscape Character

The landscape character of the JDSF is one of a redwood and mixed conifer forest rich in flora and fauna. The Forest blankets portions of a coastal plateau and inland mountainous terrain and is deeply dissected by a series of creeks and rivers, the South Fork of the Noyo River being the most noticeable to the general public. While appearing natural in some areas, there are many areas of the JDSF where past timber harvests are readily apparent giving the overall impression of an actively managed resource.

Scenic Attractiveness

The majority of the JDSF landscape consists of forested lands and is typical of the north coast range in terms of overall scenic attractiveness.

Distinctive landscapes on JDSF with a high scenic attractiveness are:

- Low-lying river and stream corridors within the Forest where water and riparian vegetation are present.
- Old growth groves, the most popular and accessible of these being the Waterfall Grove.
- Pygmy forest areas, a unique and declining ecological community (Sholars 1984).
- Historic use areas and structures at Camp 20.

Scenic Integrity

Because of the expanse of the JDSF, general lack of developed facilities, and buffering of views from popular forest roads, scenic integrity on the JDSF is relatively high. 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 generally been maintained adjacent to most of these locations. 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.

Cultural modifications that disrupt the scenic integrity of the JDSF are:

- The PG&E transmission line corridor paralleling Highway 20 that has a right-of-way cleared of tall vegetation and with an edge that starkly contrasts with the surrounding forest.
- Forest areas harvested under an even-aged management prescription located near popularly-traveled forest roads and particularly Roads 408 and 500.
- Numerous illegal dumps located along the Forest road system.
- Abandoned quarry sites that have not been reclaimed and/or used for unauthorized target shooting.
- Two conservation camp facilities.

Landscape Visibility

Because of its size and topographic conditions, visitors do not view JDSF as a whole; rather, only portions of the Forest are visible at any one time. Middleground vistas are viewed from relatively few ridgeline vantage points and these views are filtered by standing trees. More typical are limited foreground views from roads, trails, campgrounds, day use recreation areas, and adjacent residences.

- **Roads:** Highway 20 traverses JDSF in an east-west direction. It generally follows a ridgeline along the western half of the Forest, but then follows the North Fork Big River and James Creek in the Eastern WWAA. County Roads 408 and 409 are both located in the Western WWAA and provide additional routes from the coast to the interior. As they climb from the coast, both roads generally follow ridgelines. Because Highway 20 and Road 409 pass through forested areas, views are generally limited to the perimeter of the road only. The same is generally true for Road 408 except where it passes through areas in the Caspar watershed where clearcutting has historically occurred.
- **Trails:** Notable hiking trails on JDSF follow the north fork of the South Fork Noyo River and Chamberlain Creek. Because these trails follow watercourses and are surrounded by forested areas, broad views of the Forest landscape are limited to the foreground. Trails are also located in the hills west of the Mendocino Woodlands.
- **Campgrounds and Day Use Recreation Areas:** Most of the campgrounds on JDSF are located along the South Fork Noyo River. As is the case with trails in this area, views of the Forest landscape are limited to the foreground because the campgrounds are in low, forested areas.
- **Residences:** Rural residential areas are located adjacent to the western boundary of JDSF. In general, these residences are at forest level and do not have broad views into the Forest landscape.

Constituent Analysis

Places on or adjacent to the JDSF assumed to be of a high level of aesthetic concern include: roads within the JDSF that are open throughout the year; designated campgrounds; developed day-use areas; designated trails; other recognized trails and non-motorized recreational routes of travel such as the Little Lake-Sherwood Inland Trail; staging areas on or adjacent to the JDSF; river and creek corridors; old-growth groves; the pygmy forest; the Mendocino Woodlands State Park and Outdoor Center; the Mendocino Woodlands Special Treatment Area; and residences immediately adjacent to the Forest boundary.

2.2 Regulatory Framework

Actions resulting from the DFMP may be subject to the following standards relating to protection of aesthetic resources.

- Z'berg-Nejedly Forest Practice Act of 1973; Sections 4512 and 4513, Public Resources Code
  Forest resources and timberlands of the state furnish high-quality timber, recreational opportunities, and aesthetic enjoyment while providing watershed protection and maintaining fisheries and wildlife. The goal of maximum sustained production of high-

quality timber products is achieved while giving consideration to values relating to recreation, watershed, wildlife, range and forage, fisheries, regional economic vitality, employment, and aesthetic enjoyment.

- Mendocino Woodlands Outdoor Center Act (PRC 5820)
  The lands within the Mendocino Woodlands Special Treatment Area and the Mendocino Woodlands State Park and Outdoor Center comprise a portion of a 5,425-acre property conveyed by deed from the United States Government to the Division of Forestry in 1947, and incorporated into JDSF. In establishing the Mendocino Woodlands Special Treatment Area and the Mendocino Woodlands State Park and Outdoor Center, the California legislature recognized that the original transfer of those lands was for "public park, recreational, and conservation purposes." Board policies and the DFMP objectives for the Mendocino Woodlands Special Treatment Area include using it to demonstrate forest management practices that are compatible with recreation for educational purposes.

  The legislature also directed that prior to authorizing the sale and cutting of timber from the Mendocino Woodlands Special Treatment Area or use of the road system within the State Park, 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 operations of the Outdoor Center (PRC 5829).

- CDF-Mendocino Woodlands State Park and Outdoor Center Memorandum of Understanding (MOU)
  CDF and State Parks entered into a MOU related to forest management practices surrounding the Mendocino Woodlands. The MOU is to be reviewed during the first quarter of each year and can be terminated by either party upon 30 days notice. This MOU includes provisions for:

  - protection of the Mendocino Woodlands water collection systems to insure the integrity and purpose of the systems;
  - consideration for managing a large portion of the Special Treatment Area in order to accelerate recruitment of late-seral habitat;
  - maintenance of Roads 700, 720, and 730;
  - use of Mendocino Woodlands roads by CDF; and
  - a 200-foot harvest exclusion buffer from camp areas, recreational cabins, or main roads located within the lands administered by State Parks. This buffer does not apply to the Railroad Gulch Silvicultural Study area.

2.3 Proposed JDSF Management Measures

2.3.1 Goals and Objectives

Future management of timber harvests within the DFMP places a priority upon aesthetics near homes, recreational facilities, and main travel corridors. Forest management is 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 and aesthetic enjoyment (Section 4639, Public Resources Code).

Goals and objectives of the DFMP combine aesthetic considerations with recreation on the JDSF. The following statements relate to aesthetic resources:

Goal #2. Timber Management: Manage the Forest on the sustained yield principle 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.

Goal #5. Recreation and Aesthetic Enjoyment: 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:

- 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.
- 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.

2.3.2 Specific Management Actions

Facility Style

In accordance with Board of Forestry and Fire Protection policy, recreational facilities will generally be maintained to provide a rustic and informal experience. No guidance is provided in the DFMP about other visitor-serving facilities, such as the Forest Learning Center or Interpretive Center facilities.

Recreation Corridor

The DFMP establishes the concept of defined Recreation Corridors. The size (width) of these corridors is to be determined by aesthetic considerations from the point(s) of concern. The DFMP generally defers the explicit definition of the Recreation Corridors until a user-survey is conducted as part of the JDSF recreation management program (see also Section VII-14: Recreation). However, the DFMP does propose a defined corridor width of 300 feet around major campgrounds and identifies that this zone will preclude even-aged silviculture, but does not specify any other particular management prescription for that zone.

A defined corridor width of 300 feet around campgrounds has been incorporated into current planning. Appropriate timber management options within this corridor, while not being specifically identified, could potentially include single tree selection, hazard tree removal, or no harvesting. Other management options for the Recreation Corridor identified in the DFMP include restricting the timing of timber operations to avoid conflicts with high visitor-use weekends or restricting operating hours to minimize noise pollution.

Special Concern Areas

A series of 23 Special Concern Areas are identified in DFMP with the intent of directing timber management practices to respect the sensitive resources within these areas. To varying degrees, these areas would have restricted timber management options that, even if not required for aesthetic purposes, would likely benefit the integrity of the visual setting.

Definitive management prescriptions within Special Concern Areas are:

- Areas not to be harvested: Cypress groups; Pygmy forest; Jughandle Reserve; Reserved old growth groves; and Conservation camps.
- Areas limited to no harvest or special uneven-aged regimes: Watercourse and lake protection zones.
- Areas excluded from even-aged management: Campground Buffers (note: assumed to be the same as the Recreation Buffer); Mendocino Woodlands Special Treatment Area; and late seral development areas.

Forest management practices within the remaining Special Concern Areas are not specifically prescribed but are often qualified by the statement "only a limited range of silviculture is allowed in these areas."

Four of the Special Concern Areas are to include qualitative aesthetic considerations in the Forest management prescriptions. These are:

- Road and trail corridors: buffer areas along trails and roads to maintain aesthetic qualities valued by the public.
- Buffers adjacent to non-timberland neighbors: areas along the boundary of JDSF adjacent to non-industrial timberland owners where a buffer zone is designated to minimize impacts on neighbors.

- State Park Special Treatment Areas: areas adjoining State Parks where the application of silvicultural systems must take the values of the State Park into consideration.
- Woodlands Special Treatment Area: where silvicultural activities are focused on promoting late-successional forest conditions, maintaining aesthetic qualities, and limiting impacts on the operation of Mendocino Woodlands.

California Forest Practice Rules (FPRs)

The JDSF DFMP incorporates the California Practice Rules as minimum standards. The FPRs contain measures intended, in part, to minimize the potential impacts of forest management activities on scenic resources, as follows:

- Individual clearcuts cannot exceed 40 acres.
- Individual clearcuts must be separated by an area at least as large as the clearcut or 20 acres; whichever is smaller, and separated by at least 300 feet in all directions.
- Units adjacent to a clearcut can undergo even-aged harvesting after a specified amount of time has passed, or the clearcut has regenerated to a defined age- or size-class composition.

2.4 Thresholds of Significance

Based on guidance provided by CEQA (PRC Section 21001 and the CEQA Guidelines), an impact of the proposed project would be considered significant if it:

Has a substantial adverse effect on a scenic vista.

Substantially degrades the existing visual character or quality of the site and its surroundings. Creates a new source of substantial light or glare that would adversely affect day or nighttime views in the area.

2.5 Impacts

The DFMP proposes a full range of timber harvest practices on the JDSF. To a large part, evidence of timber harvesting is common within the visual environment of JDSF and is consistent with its mission of demonstration. However, as required by the Forest Practices Act, forest management must balance the impacts of timber harvests to provide consideration to values relating to aesthetic enjoyment.

Within the context of a Demonstration Forest, potential long-term impacts to scenic resources on the JDSF would range from:

- No impact, in non-timber areas or Special Concern Areas that will not be harvested;
- Minimal impact in areas managed to develop high density, large tree, late seral characteristics (approximately 23% of the JDSF);
- Potential low impacts in un-even aged timber harvest areas (45 % of the JDSF); to
- Potential significant impacts in even-aged timber harvest areas (29% of the JDSF) where those areas would be openly visible from popular routes of travel, trails, recreation areas or adjacent parks and residences.

These impacts are further described below.

Impact 1: *Even-aged timber harvests would have a substantial adverse effect on a scenic vista.* (Less than Significant with Incorporation of Mitigation)

There are relatively few background vistas from major ridgeline roads of the JDSF landscape currently available. Where views do penetrate the Forest cover, they tend focus on the foreground and middleground landscape. In many cases, but not all, past timber harvests have avoided clearcutting immediately adjacent to major forest roads, thus screening out vistas over the JDSF. The DFMP proposes to establish Recreation Corridors that would include selected forest roads. These corridors would benefit the management of scenic vistas by both screening views to even-aged harvests and opening views where appropriate.

Within areas of the JDSF where uneven-aged silviculture prescriptions are to be applied, there would be less than significant long-term impacts on scenic vistas. When adjacent to locations with a high level of scenic concern, uneven-aged silviculture prescriptions could be directed to improve scenic vistas and could be a beneficial impact.

Even-aged management prescriptions are proposed in the central and eastern portions of the JDSF and would not be seen from outside the JDSF. Potential impacts on scenic vistas would be project-specific to each harvest. Potential impacts on scenic vistas created by even-aged management are most evident by the creation of a non-natural edge effect where clearcut areas meet the surrounding forest. This edge effect is generally noticeable in two circumstances: where the boundaries of the harvested unit strikingly contrast with the lines of the natural topography, and on ridgelines where trees are silhouetted against the sky. A visible example of this impact is the PG&E right-of-way, which is seen from Highway 20. The right-of-way clearing has created a walled canyon effect that draws attention to itself.

In order to minimize the impacts of even-aged forest management on scenic vistas, the following mitigation measures are recommended for adoption:

Mitigation: For even-aged timber harvest plans, conduct field evaluations by a RPF or his or her designee to determine the visibility of the THP area to the Forest visitor as seen from roads, trails, and recreation areas. Evaluations will be given to, but not limited to: the degree and duration of vistas, and general topography of the THP area in relation to the view aspect, and type and density

of forest canopy and understory cover of forest areas surrounding the THP area. Where appropriate to visually soften and mitigate impacts created by even-aged management on the integrity of scenic views visible to the general forest visitor, amend the THP to include one or a combination of the following: modify the configuration of the harvest area to better reflect topography; modify the configuration of the harvest area to avoid spanning ridgelines in whole or in part; or leave selected standing trees along the harvest edge boundaries.

Monitoring.
Timing: During the life of the JDSF Management Plan
Scope: Even-aged management THPs
Implementation: the Department
Monitoring Responsibility: the Department

Impact 2: *Timber harvests and related activities would substantially degrade the existing visual character or quality of the site and its surroundings.* (Less than Significant with Incorporation of Mitigation)

Aesthetic impacts related to the sights of equipment and activities that are evident during timber harvest operations are short-term impacts and are considered less than significant.

The long-term effects of forest management practices on the scenic character and quality of the JDSF would generally be related to site-specific changes in forest structure as seen from roads, non-motorized trail routes, recreation staging areas, campgrounds, day use recreation areas, adjacent residences, and the Mendocino Woodlands State Park where a high level of aesthetic concern can be assumed. Impacts to the visual quality of the Forest structure are chiefly related to clearcutting, the disruption to vegetation of the Forest floor caused by most timber harvest operations, clearings required for landings, and accumulated slash that can remain evident for years.

To mitigate impacts on the visual character and integrity of the JDSF, the DFMP prescribes no harvesting or some form of restricted timber harvesting within the 23 identified Special Concern Areas. The DFMP also provides for buffers around some Special Concern Areas and other forest resources that would mitigate the impacts of timber management on aesthetic resource. Buffers that are specifically defined in the DFMP are:

Campgrounds and day-use areas buffers--where timber harvesting within 300 feet of campgrounds and day-use areas will be planned and conducted with the designated site use in mind. Slash abatement zones--where main access routes to high-use recreation areas will have slash abatement within 50 feet of the road.

Non-catastrophic tree mortality and down wood retention zones-- within old-growth management areas, WLPZs, or within 100 feet of old-growth groves.

Watercourse and Lake Protection Zones--where a series of management prescriptions are defined to include, but not be limited to: a 25-foot no-harvest zone; an Equipment Exclusion Zone; leaving uncut the 10 largest trees per 330 feet of stream channel within 50 feet of the

watercourse transition line; retaining a minimum of 240 sq. ft. of conifer basal area within the WLPZ following harvest activity; reentry no more frequently than every 20 years in Class I WLPZs; and retention of native hardwoods except where species imbalance has occurred.

Additional buffers not described in the DFMP but employed by CDF include:

- A 200-foot harvest exclusion buffer from camp areas, recreational cabins, or main roads located within the lands administered by State Parks. This buffer does not apply to the Railroad Gulch Silvicultural Study area.
- 200-foot buffers have historically been considered around residential properties that are adjacent to the Forest boundary. The type of timber management that has occurred within these buffers has been based on discussions with individual property owners (personal communication: Marc Jamison, CDF, 2002).

With the exceptions listed above, buffer areas and the management practices within them are not specifically defined in the DFMP. Where they have been defined, comments made through the public Scoping process expressed the sentiment that the buffers were not necessarily sufficient to mitigate aesthetic impacts.

Buffers that involve no timber harvesting or restricted harvesting with no clearcutting would generally filter and / or direct views from areas or routes where there would be a high level of aesthetic concern. How buffers work in terms of blocking, screening, or directing views is very site-specific and typically addressed in the development of a timber harvest plan.

In addition to the mitigation for Impact "1" above, in order to minimize the impacts of forest management to the existing visual character or quality of the JDSF and its surroundings, the following mitigation measure is recommended:

Mitigation. For all timber harvest plans conducted within or adjacent to Special Treatment Areas or buffer areas that are identified but not specifically defined in the DFMP, conduct field evaluations by a qualified professional as determined by CDF, to determine the visibility of the THP area. Evaluations will be given to, but not limited to: the degree and duration of views from areas of concern; presence of distinctive visual attributes such as rock outcrops, streams, or distinctive flora; type and density of forest canopy and understory cover; and general topography in relation to the view aspect. Evaluations should take into account the configuration of the THP in relation to the areas around it. Where appropriate to visually screen views from Special Concern Areas and the Mendocino Woodlands State Park and Outdoor Center, or to direct views to provide desirable vistas, modify the width of the buffer appropriately (wider or narrower). Designate timber harvest practices within buffer areas to be one or a combination of single-tree selection, hazard tree removal, or no harvesting as appropriate.

Monitoring.
Timing: During the life of the JDSF Management Plan
Scope: THPs within or adjacent to Special Concern Areas
Implementation: the Department
Monitoring Responsibility: the Department

Impact 3: ***Facility development would create a new source of light or glare which would adversely affect day or nighttime views in the area.*** **(Less than Significant with Incorporation of Mitigation)**

Developments proposed within the DFMP that could involve lighting or glare are the Forest Learning Center and Forest Interpretive Center. As presented in the DFMP, these proposals are conceptual and would be subject to subsequent environmental review.

The DFMP identifies that the Interpretive Center may be built near the historic schoolhouse located in the Camp 20 area, adjacent to Highway 20. Because of the location, there would be no impact to campgrounds or other land uses that would be sensitive to light or glare created by the facility.

Siting criteria identified in the DFMP for the Forest Learning Center is not so site-specific and includes:

- Access from Highway 20
- Opportunity for expansion of facilities over time
- Adjacent space for a possible new State Forest headquarters

To avoid potential impacts of light or glare, the following mitigation measure is recommended.

Mitigation. Amend the DFMP to require the Forest Learning Center to be located and designed in accordance with the CEQA process to not significantly affect day of nighttime views from campgrounds or residential areas.

Monitoring.
Timing: During facility site selection
Scope: Highway 20 corridor
Implementation: the Department
Monitoring Responsibility: the Department

2.6 Aesthetics Alternatives

Comparisons of impacts among alternatives are presented in Table 8.

TABLE 8
COMPARISON OF IMPACTS AMONG AESTHETICS ALTERNATIVES

Alternatives						Discussion
Impact*	1	2	3	4	5	*Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant–Mitigation Feasible (5) Significant–Mitigation Not Feasible
Impact 1. Even-aged timber harvests would have a substantial adverse effect on a scenic vista.						
Alt. A			■			With no timber harvesting, the scenic vistas that currently exist, though relatively sparse through the JDSF, will be diminished over time in number and expanse.
Alt. B				■		The long-term quantity of scenic vistas would increase but the quality of scenic vistas will degrade where even-aged management is seen. Mitigation measures proposed in the DFMP, including buffers around Special Concern Areas, and the additional mitigation specified in this section, would reduce the impact to less than significant levels.
Alt. C (DFMP)				■		
Alt. D	■					With an emphasis on uneven-aged management and Recreation Corridors, scenic vistas could be enhanced over the long-term throughout the JDSF
Alt. E	■					
Impact 2. Timber harvests and related activities would substantially degrade the existing visual character or quality of the site and its surroundings.						
Alt. A	■					With no timber harvesting, the visual character of the Forest will improve steadily over time.
Alt. B				■		These alternatives would result in some beneficial long-term effects associated with increased late seral, mixed-age, and hardwood management to varying degrees (with Alternatives D and E superior to Alternative C). All alternatives would also result in short-term visual impacts since all involve timber harvest to varying degrees, and all would require mitigation with buffers and corridor preservation as specified in this section.
Alt. C (DFMP)				■		
Alt. D				■		
Alt. E				■		
Impact 3. Facility development would create a new source of substantial light or glare which would adversely affect day or nighttime views in the area.						
Alt. A		■				No development would be included that would cause light or glare which would adversely affect day or nighttime views in the area.
Alt. B		■				
Alt. C (DFMP)				■		Construction of the Forest Learning Center and Forest Interpretive Center could involve significant lighting and change the quality of the night skies if located near campgrounds or residences unless mitigated through the site-selection process as specified in this section.
Alt. D				■		
Alt. E				■		

3. AGRICULTURE RESOURCES

3.1 Environmental Setting

The Mendocino County General Plan land use designation for JDSF is Forest Lands and the zoning is Timber Production Zone (TPZ). The Forest Lands designation applies to land suited for and appropriately retained for the growing, harvesting, and production of timber and timber-related products. Uses consistent with the Forest Lands designation include forestry, timber processing, agricultural uses, cottage industries, residential uses, recreation, and uses determined to be related to and compatible with forestry. Land use in a TPZ district is restricted to growing and harvesting timber as well as certain compatible uses, and establishes a presumption that timber harvesting will occur on such lands.

Topography of JDSF ranges from moderately to steeply sloped, with some areas of low slope in the western portions of the Forest. JDSF is predominantly forested land. Although agricultural use is allowed within TPZ zoned and Forest Land designated land, no portion of JDSF land is specifically classified as agricultural land nor has it historically been used for agricultural purposes.

3.1.1 Significance Criteria

CEQA states that a project would be considered to have a significant effect on agricultural resources if it would result in one or more of the following:

- Convert prime farmland, unique farmland, or farmland of Statewide Importance.
- Conflict with existing zoning for agricultural use, or a Williamson Act contract.
- Involve other changes in the existing environment, which, due to their location or nature, could result in conversion of farmland, to non-agricultural use.

3.1.2 Impacts

Impact 1: *Convert prime farmland, unique farmland, or farmland of Statewide Importance*. (No impact)

JDSF is not located in an area designated as Prime Farmland, Unique Farmland, or a Farmland of Statewide Importance. Neither the project nor any of the alternatives willconvert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance.

Mitigation: None required.

Impact 2: *Conflict with existing zoning for agricultural use, or a Williamson Act contract*. (No Impact)

Neither the project nor any of the alternatives will conflict with existing zoning for agricultural use, or a Williamson Act contract. The Mendocino County General Plan land use designation for the parcel is Forest Lands and the zoning is TPZ.

Mitigation: None required

Impact 3: ***Involve other changes in the existing environment, which, due to their location or nature, could result in conversion of farmland, to non-agricultural use.*** **(No Impact)**

Neither the project nor any of the alternatives will involve other changes in the existing environment, which, due their location or nature, could result in conversion of Farmland, to non-agricultural use.

Mitigation: None required

4. MINERAL RESOURCES

4.1 Environmental Setting

No valuable mineral resources are known to exist within JDSF. There is no evidence that valuable mineral resources have been identified nor historically extracted from JDSF land. Neither CDF's past nor proposed management activities impact valuable mineral resources.

4.1.1 Significance Criteria

CEQA states that a project would be considered to have a significant effect on mineral resources if it would result in one or more of the following:

- Result in the loss of a known valuable mineral resource.
- Result in the loss of availability of a locally important mineral resourceidentified in an approved land use plan.

4.1.2 Impacts

Impact 1: ***Result In The Loss of A Known Valuable Mineral Resource*** **(No Impact)**

No known valuable mineral resources exist within JDSF. Neither the project nor any of the alternatives will result in the loss of a valuable mineral resource.

Mitigation: None required.

Impact 2: *Result In The Loss of Availability of A Locally Important Mineral Resource Identified In An Approved Land Use Plan.* (No Impact)

The Mendocino County General Plan identifies asbestos, carbon dioxide, chromite, coal, copper, feldspar, gold, jade, limestone, magnesite, manganese, methane gas, mineral springs, natural gas, nickel, petroleum, phosphate, platinum, quicksilver, sand and gravel, and sulfur as minerals which have been found within the county. Neither the project nor any of the alternatives will result in the loss of availability of a locally important mineral resource as identified in the General Plan.

Mitigation: None required.

5. AIR QUALITY

5.1 Setting

5.1.1 Climate

The Pacific Ocean is a moderating influence on the climate of region. The JDSF has a Mediterranean climate, characterized by a pattern of low-intensity rainfall in the winter and cool, dry summers. Fog is a dominant climatic feature, generally occurring daily in the summer and frequently during the rest of the year. Air temperature is 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 (15.6^{o} C) in July and August to 44° F (6.7^{o} C) in December (Zeimer, 1996). The monthly average maximum air temperature at the same location was 72° F (22.3^{o} C) in July, and the average minimum was 40° F (4.7^{o} C) in December.

About 90 percent of the precipitation in this area falls between October and April, with the highest average monthly precipitation in January. Winter storms from the Pacific Ocean bring intense rainfall over several hours or days, particularly warmer storms from lower latitudes. Snow is infrequent and usually does not last long even at higher elevations inland. Mean annual precipitation is 39 inches at Fort Bragg (CDWR, 1997), but measures higher in the Caspar Creek watershed, where annual means of 51 inches and 45 inches have been recorded at the North and South Fork gages, respectively (Zeimer, 1996). Mean annual precipitation at Willits, just a few miles *to the east of the JDSF, is slightly higher at 55 inches (CDWR, 1997).*

5.1.2 Air Quality

The JDSF is located in Mendocino County within the North Coast Air Basin. The Mendocino County Air Quality Management District (MCAQMD) is the regulatory agency that administers and regulates air quality in Mendocino County.

5.1.3 Prevailing Air Quality

The air quality of a region is determined by the quantities and types of pollutants emitted, the spatial distribution of the emission sources, and by the concentrations and accumulations of those pollutants under the influences of local meteorology and topography.

Consistent with the Federal Clean Air Act of 1970, the U.S. EPA established national ambient (outside) air quality standards. The standards were established for several air pollutants based on specific medical evidence and consist of an averaging time and the numeric concentration. The Federal standards are two tiered: primary standards—designed to protect public health; and secondary standards—designed to protect the environment, such as visibility, damage to property, soil, vegetation, etc. Table 9 lists the air pollutants and the federal ambient air quality standards. Recently, the EPA revised the list of air pollutants to include particulate matter with a diameter of 2.5 microns or less (PM2.5) to more closely regulate the particle size range responsible for health effects. While the EPA has promulgated standards for PM2.5, these standards have not been implemented at the state level. Monitoring and inventories are still maintained for particulate matter with a diameter of 10 microns or less (PM10).

The state of California also promulgates ambient air quality standards, several of which are more stringent than the federal standards, and include sulfates, hydrogen sulfide, and vinyl chloride. California air quality standards are included in Table 9. Air quality standards are expressed in terms of concentrations (e.g., parts per million [ppm], or micrograms per cubic meter [ug/m^3]).

TABLE 9
CALIFORNIA AND NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	California Standards	NATIONAL STANDARDS [a]	
			Primary [b,c]	Secondary [b,d]
Ozone	8-hour	—	0.08 ppm (176 ug/m^3)	—
	1-hour	0.09 ppm (180 ug/m^3)	0.12 ppm (235 ug/m^3)	Same as primary
Carbon monoxide	8-hour	9 ppm (10 ug/m^3)	9 ppm (10 ug/m^3)	—
	1-hour	20 ppm (23 ug/m^3)	35 ppm (40 ug/m^3)	—
Nitrogen dioxide	Annual	—	0.053 ppm (100 ug/m^3)	Same as primary
	1-hour	0.25 ppm (470 ug/m^3)	—	—
Sulfur dioxide	Annual	—	0.03 ppm (80 ug/m^3)	—
	24-hour	0.04 ppm (105 ug/m^3)	0.14 ppm (365 ug/m^3)	—
	3-hour	—	—	0.5 ppm (1,300 ug/m^3)
	1-hour	0.25 ppm (655 ug/m^3)	—	—

TABLE 9 CALIFORNIA AND NATIONAL AMBIENT AIR QUALITY STANDARDS				
Pollutant	**Averaging Time**	**California Standards**	**NATIONAL STANDARDS [a]**	
			Primary [b,c]	**Secondary [b,d]**
PM_{10}	Annual	30 ug/m^3 (geometric mean)	50 ug/m^3 (arithmetic mean)	Same as primary
	24-hour	50 ug/m^3	150 ug/m^3	Same as primary
PM2.5	Annual	—	15 ug/m^3	
	24-hour	—	65 ug/m^3	
Lead	Calendar quarter	—	1.5 ug/m^3	Same as primary
	30-day average	1.5 ug/m^3	—	—

a) Standards, other than for ozone and those based on annual averages, are not to be exceeded more than once a year. The ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than one.
b) Concentrations are expressed first in units in which they were promulgated. Equivalent units given in parenthesis.
c) Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health. Each state must attain the primary standards no later than 3 years after the EPA approves that states implementation plan.
d) Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

To determine whether the air quality of an area meets or exceeds the ambient standards, ambient air quality monitoring is conducted. The MCAQMD is required to monitor air quality in the County as part of a coordinated State and National monitoring network. The MCAQMD maintains monitoring sites in Fort Bragg, Willits, and Ukiah.

Ozone (O_3), Carbon monoxide (CO), and nitrogen oxides as nitrogen dioxide (NO_2) are monitored in Ukiah and Willits. Particulate matter, PM10, is monitored in Fort Bragg, Willits, and Ukiah. The air quality monitoring sites most representative of air quality conditions in the JDSF are those in Fort Bragg and Willits since they are closest to the JDSF. Table 10 summarizes the annual average and maximum measured short-term pollutant concentrations over the most recent 5-year period from 1997 through 2001.

TABLE 10 MAXIMUM MEASURED AIR POLLUTANT CONCENTRATIONS IN THE JDSF REGION						
Pollutant	Average Time	Measured Air Pollutant Levels				
		1997	1998	1999	2000	2001
Fort Bragg						
Particulate Matter (PM_{10})	24-Hour	**65** ug/m^3	50 ug/m^3	**66** ug/m^3	49 ug/m^3	**56** ug/m^3
	Annual	20.7 ug/m^3	19.6 ug/m^3	22.1 ug/m^3	19.8 ug/m^3	20.9 ug/m^3
Willits						
Ozone (O_3)	1-Hour	0.065 ppm	0.070 ppm	0.066 ppm	0.054 ppm	0.062 ppm
	8-Hour	0.058 ppm	0.059 ppm	0.059 ppm	0.046 ppm	0.045 ppm

TABLE 10 MAXIMUM MEASURED AIR POLLUTANT CONCENTRATIONS IN THE JDSF REGION						
Pollutant	Average Time	Measured Air Pollutant Levels				
		1997	1998	1999	2000	2001
Carbon Monoxide (CO)	8-Hour	3.04 ppm	2.06 ppm	1.82 ppm	1.22 ppm	0.96 ppm
Nitrogen Dioxide (NO_2)	1-Hour	0.061 ppm	0.052 ppm	0.056 ppm	0.035 ppm	0.044 ppm
	Annual	NA	0.010 ppm	0.008 ppm	0.007 ppm	0.007 ppm
Particulate Matter (PM_{10})	24-Hour	**66** ug/m^3	47 ug/m^3	**62** ug/m^3	48 ug/m^3	49 ug/m^3
	Annual	17.8 ug/m^3	15.1 ug/m^3	17.9 ug/m^3	15.3 ug/m^3	17.1 ug/m^3

ppm: parts per million
Values reported in **bold and underline** exceed ambient air quality standard
NA: data not available.

The air quality in the JDSF region is generally good. Mendocino County, including JDSF, is in attainment for all state and federal air quality standards, with the exception of the state standard for PM10. Levels of PM10 recorded at monitoring stations in Willits and Fort Bragg have occasionally exceeded the state daily limit; therefore, the surrounding area, including the JDSF, is considered to be in non-attainment for PM10. The daily standard was exceeded once in both Fort Bragg and Willits in 1997. No exceedences were measured in 1998. In 1999 the daily standard was exceeded in both Fort Bragg and Willits, however, these exceedences were coincident with severe smoke inundation of all of Northern California due to wildfires north and east of Mendocino County. In 2001, one exceedence of the State daily standard was measured in Fort Bragg.

As is consistent with other areas of the North Coast (NCUAQMD, 1995), PM10 levels in Mendocino exhibit a seasonal pattern. PM10 concentrations typically increase during the winter months and are at their lowest levels during the summer months. Results of a North Coast Air Quality Management District study (NCUAQMD, 1995) showed that woodstove emissions during the winter months, when added to the ever-present emissions of vehicles and sea salts, are the primary cause of high PM10 values in the North Coast. Analysis of makeup of PM10 collected in Eureka and Crescent City showed that, on an average basis, sea salt accounted for 25 percent to 35 percent of the total PM10, and woodstoves contributed 12 percent to 22 percent of the total PM10. In Weaverville, while the contribution from sea salts was insignificant, PM10 from woodstoves comprised 29 percent of the total PM10 measured. For the periods when the measured PM10 exceeded the State 24-hour standard of 50 ug/m3, the contribution to the total measured PM10 from wood stoves was 49 percent in Eureka, 27 percent in Crescent City, and 59 percent in Weaverville.

5.1.4 Existing Emission Sources

Air pollutant emission sources in Mendocino County include stationary sources; mobile sources, both highway and off road; area sources, such as from use of consumer products, residential fuel combustion, unpaved road dust, and wind blown dust; and natural sources. An emission inventory of air pollutant emissions for Mendocino County is compiled by the California Air Resources Board

(CARB) with input from the MCAQMD. The emission inventory tabulates annual average pollutant emissions (in tons per day) from each source category. Table 11 lists the most recent emission inventory information (2000).

TABLE 11
ESTIMATED 2000 ANNUAL AVERAGE EMISSIONS FOR MENDOCINO COUNTY

Source Category	ROG	CO	NOx	SO_2	PM10
Stationary	2.08	3.38	1.01	0.41	1.08
Area Sources	3.64	18.90	0.49	0.23	18.94
Mobile (On-road)	8.52	83.76	8.56	0.13	0.24
Mobile (Other)	11.53	102.34	14.18	0.80	0.72
Natural Sources	0.24	6.58	0.3	-	1.29
Total	17.49	131.20	15.98	1.44	22.02

1) ROG = Reactive Organic Gases (ozone precursor); CO = Carbon Monoxide; NOx = Nitrogen Oxides (ozone precursor); SO2 = Sulfur Dioxide; PM10 = Particulate Matter, less than 10 microns.
2) Source: California Air Resources Board 2001

The primary sources of PM10 in Mendocino County are area sources, such as dust from roads, agriculture, and residential fuel combustion. More than two-thirds of the PM10 emissions (12.9 tons per day) in the area source category are from unpaved roads and wind blown dust. The effects of dust emitted from unpaved roads tend to be localized to areas near the roads, particularly in areas where dispersion is limited by trees and vegetation. Road dust emissions are greatest during the dryer months of the year.

Unpaved road dust emissions include emissions from both farm and non-farm roads. In Mendocino County, non-farm road emissions account for more than 98 percent of the road emissions. Emissions from unpaved roads are estimated by the CARB separately for three major unpaved road categories: city and county roads, U.S. forest and park roads, and Bureau of Land Management (BLM) and Bureau of Indian Affairs (BIA) roads. In computing the dust emissions, the CARB (CARB, 1997) assumes that there are 10 vehicle miles traveled per mile of roadway per day, and that all roads emit PM10 at the same rate of 2.27 pounds of PM10 per vehicle mile traveled. In the emission inventory, about 60 percent of the unpaved roads (or about 670 miles) in Mendocino County are in forest or park lands, which would include the roads in the JDSF.

Other significant area source PM10 emissions include those for residential fuel combustion (2.4 tons), which includes wood burning in stoves and fireplaces; construction and demolition (1.3 tons), paved road dust (2.0 tons), and waste burning and disposal (0.3 tons), which included agricultural burning, and burning for range improvement and forest management. The natural source emissions category for Mendocino County only includes emissions from wildfires; other sources, such as sea salts, which are discussed above, are not included. Thus, for coastal areas such as Mendocino, the CARB emission inventory for PM10 does not include the contribution of sea salts that may be present. There are few stationary sources of emissions in Mendocino County. PM10 emissions from stationary sources (1.1 tons per day) represent about 5 percent of the total PM10 emissions in the County.

Emissions from the JDSF are predominantly PM10, resulting from timber harvesting activities and vehicle travel on roads within the JDSF. These activities result in particulate matter and gaseous pollutant emissions. Specifically, timber harvesting includes the following operations: logging and associated transportation, site preparation, slash control by broadcast burning, and road construction and maintenance. The air quality effects associated with the timber harvesting can be divided into several distinct categories of emissions:

- Fugitive dust from paved and unpaved roads
- Emissions from road construction
- Gaseous emissions from fuel combustion
- Emissions from slash burning

Fugitive dust is generated by vehicle travel on paved and unpaved roadways, grading and site preparation, road construction, and any other activity that disturbs surface soils. Fugitive dust is a source of fine particulate emissions or PM10. Emissions from slash burning result in both PM10 and gaseous emissions, although PM10 emissions are the most significant effect from burning. Fuel combustion emissions are associated with vehicle operation, heavy construction equipment operation, and operation of motorized hand-held equipment (chain saws). Fuel combustion results in emissions of gaseous air pollutants, such as CO, ROGs, SO_2, and NO_X. Prescribed broadcast burning, which is carried out under targeted conditions for factors such as fuel moisture, wind speed, temperature, and humidity, has been used periodically as a site-preparation technique on JDSF. Prescribed burning may also be conducted for fire suppression or to mimic natural fire conditions. Although burning permits are normally issued by the MCAQMD, CDF has the authority to self-issue burning permits for JDSF. CDF generally notifies or consults with the MCAQMD prior to any significant burning.

5.2 Regulatory Framework

CARB coordinates and oversees both State and Federal air pollution control programs in California. The CARB has divided the State into air basins. Authority for air quality management within them has been given to local Air Pollution Control Districts, which regulate stationary source emissions and develop local non-attainment plans within their jurisdiction. The MCAQMD is the local agency empowered to regulate air quality in Mendocino County, which together with Del Norte, Humboldt, Trinity, and northern Sonoma Counties make up the North Coast Air Basin.

The MCAQMD is mandated under the California Clean Air Act to ensure compliance with ambient air quality standards, and in cases where such standards are violated, to devise a plan for attaining the standards. Such a plan is referred to as the State Implementation Plan. The District regulates emissions from stationary sources while the state regulates emissions from mobile sources such as cars and trucks. The latter also includes emission standards for heavy construction equipment powered by diesel engines. The EPA adopted ambient standard for PM 2.5 has not been implemented at the state or MCAQMD level and all current regulatory requirements are presented in terms of PM10.

Emissions from mobile sources are regulated by State and Federal requirements that limit tailpipe emissions from mobile sources, including cars, trucks, construction equipment, etc. Fugitive dust emissions are regulated under District Regulation I, Chapter 4, Rule 430. Open burning is regulated under MCAQMD Regulation II, Rules 301-401.

Additionally, the California Forest Practice Rules, under Article 7, regulates the burning of piles and slash, specifying when permits are required, notification, methods of burning, and when burning is allowable.

5.3 JDSF Management Measures

There are approximately 350 miles of actively used roads within the Forest. Forest roads on JDSF are used for timber harvesting, forest management activities, forest protection, public access, and recreation (DFMP, Appendix VI: Road Management Plan). Numerous studies have shown that forest roads are a major source of management-related stream sediment (Furniss et al. 1991). The Management Plan for JDSF includes a program to inventory and improve its road system. Additionally, the DFMP provides guidelines for new road construction. The objective of the Road Management Plan is to ensure that the design, construction, use, maintenance, and surfacing of all JDSF roads will minimize sediment delivery to aquatic habitats. Implementation of this plan will also improve air quality by reducing PM10 emissions from vehicle travel on unpaved roads.

One of the primary sources of PM10 emissions in the JDSF is from vehicle travel on unpaved roads. The potential for generating airborne particulate matter from travel on unpaved roads can be minimized by several means, including: reducing vehicle traffic, reducing the availability of roads to travel on, reducing vehicle travel speeds, resurfacing roads with less erodible materials (gravel or asphalt), road maintenance, and dust abatement methods (watering or chemical stabilizers).

The JDSF Forest Management Plan has been compiled to address, among other things, the road management system. The following summarizes the principals stated in the DFMP (DFMP, Appendix VI: Road Management Plan) that will have an effect on the air quality of the JDSF:

- The total mileage of roads will be minimized through basin-wide planning.
- Existing roads will be used wherever appropriate, in preference to building new roads. Substandard roads with drainage and sediment production problems will be reconstructed, re-graded, re-aligned, resurfaced, or otherwise treated to prevent sediment delivery to watercourses, or they will be abandoned properly.
- Roads that are not in good condition will be properly abandoned.
- New roads will be designed to the minimum width necessary to safely accommodate required traffic, with turnouts spaced appropriately for the road class (as per the guidelines in the California Forest Practice Rules). All roads will be classified according to expected use (high, medium, or light) and maintained accordingly.

The Road Management Plan recognizes the need for dust abatement and calls for roads that are actively used for hauling during the dry period of the year to 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. Additionally, roads intended for year-round log hauling will be surfaced to reduce erosion potential. Surfacing agents include, but are not limited to: rock, chip seal, and asphalt paving.

5.4 Thresholds of Significance

Based on policy and guidance provided by CEQA (PRC Section 21001 and the CEQA Guidelines), an impact of the proposed project would be considered significant if it causes one or more of the following:

- Violate or substantially contribute to a violation of the ambient air quality standards;
- Conflict with or obstruct implementation of the applicable air quality plan;
- Results in a cumulatively considerable net increase in emissions of any criteria pollutant for which the project region is non-attainment.

A project is not considered significant if there is no significant increase in emissions over the baseline and there is no potential for violation of State or Federal air quality standards.

5.5 Project Impacts

Because Mendocino County is in non-attainment for the State PM_{10} standard, this analysis primarily focuses on how activities on JDSF lands could contribute to changes in ambient PM_{10} levels. As described above, PM_{10} emissions result from vehicle travel on paved and unpaved roads, slash burning, vehicle and equipment exhaust, and other types of fuel combustion. The largest source of PM10 emissions on JDSF is from vehicle and equipment travel on unpaved roads and other unpaved areas. Slash burning represents the second largest source of PM10 emissions but the magnitude of these emissions is substantially less than from unpaved road dust. The remaining emission sources contribute minor amounts to the total PM10 emitted.

From a seasonal standpoint, PM10 emissions in the JDSF are the greatest during the summer months when timber harvesting and other activities occurs and soil surface moisture is the lowest. During the winter wet season, PM10 emissions from road dust are negligible due to the mitigating effects of elevated soil moisture content. Thus, PM10 emissions from activities in the JDSF would be the lowest when traditionally the PM10 monitoring stations in the North Coast have measured the highest ambient PM10 concentrations.

In assessing potential impacts on air quality from PM10 emissions in the JDSF under the different alternatives being considered, both the magnitude of the emissions (increase or decrease from baseline conditions) as well as their effect on ambient PM10 concentrations need to be assessed. Factors to be considered when assessing potential PM10 impacts include:

- The types of emissions sources and the reason for emissions (e.g., due to timber harvest activities): Road dust from vehicle travel on unpaved roads and other areas represent the largest portion of PM10 emissions.

- The spatial distribution of emissions in the JDSF: PM10 emissions are dispersed geographically along roadways and in active timber harvest areas at various locations in the JDSF.
- The temporal nature of emissions in the JDSF: Emissions will vary with the degree of activity in the JDSF throughout the year, with the greatest degree of activity, and emissions, during the summer months.
- Other factors that would increase/decrease PM10 emissions under the alternatives being considered: This includes implementation of the Road Management Plan that contains measures that would generally reduce PM10 emissions from roadways.

Impact: ***Violate or substantially contribute to a violation of the ambient air quality standards.*** **(Less than Significant Impact)**

Management of the JDSF and timber harvest activities have the potential for localized, short-term effects associated with vehicular movement or slash burning.

Ambient air quality monitoring for the area has shown that State 24-hour average PM10 infrequently exceeds the State standards. There have been 4 periods in the past 5 years when the monitored concentrations exceeded the State 24-hour standard, two times in 1999, which were attributed to wildfires in the region, and once in 1997 and 2001. On an annual basis, there have been no measured exceedences of the State annual average PM10 standard in the region. Additionally, there have been no measured exceedences of the Federal 24-hour or annual average PM10 standards in the last five years.

As discussed earlier, higher PM10 concentrations tend to occur during the winter (wet) months. During these periods PM10 emissions from unpaved roads, and their contribution to ambient PM10 concentrations, would be insignificant due to decreased vehicle traffic in the winter and the mitigating effects of the increased roadway soil moisture.

Open burning, which may occur during the winter month, would be managed and conducted in accordance with the California Forest Practice Rules and in compliance with the MCAQMD open burning regulations. The CARB determines the days when open burning is allowed. The decision of whether it is a burn/no-burn day is based on meteorological data collected daily and the ability of the area to disperse smoke. Open burning is not allowed on days when it could adversely affect air quality.

Based on the temporary and geographically dispersed nature of emissions from activities associated with the management of the JDSF, it is reasonable to conclude that these activities would not violate or substantially contribute to a violation of an ambient air quality standard.

Mitigation: None Required.

Impact: ***Conflict with or obstruct implementation of the applicable air quality plan*** **(Less than Significant Impact)**

The MCAQMD is the regional agency responsible for overseeing and regulating air quality in Mendocino. The MCAQMD has developed and implemented rules and regulations that address PM10, as well as NOx, SO_2, VOCs, and ozone. The rules and regulations of the MCAQMD have been incorporated into the State's overall State Implementation Plan (SIP). Emissions from activities associated with the proposed management of the JDSF would be consistent with activities allowed under the MCAQMD rules and regulations and would be conducted in compliance with applicable regulations (e.g., fugitive dust and open burning). Thus, the JDSF management plan would not conflict with the State and local air quality planning requirements.

Mitigation: None Required.

Impact: ***Results in a cumulatively considerable net increase in emissions of any criteria pollutant for which the project region is non-attainment.*** **(Less than Significant Impact)**

The project area is non-attainment for PM10 with respect to the State PM10 standards. However, it is considered as being in attainment with the Federal PM10 standards. PM10 emissions would primarily result from vehicle travel on unpaved areas and from open burning (slash burning and other maintenance burning activities) under the proposed JDSF management plan. Roadway emissions would be minimized by implementation of the proposed Road Management Plan which would potentially reduce the number of traveled roads, increase maintenance of existing and new roads, surface existing and new roads intended for year-round log hauling, and implement a dust control program for roads. Emissions from burning activities are not expected to increase significantly. Thus, emissions from the proposed action, with implementation of the Road Management Plan, are not expected to result in a cumulatively considerable net increase in emissions of PM10.

From an area-wide air quality planning perspective the existing emissions inventory prepared by the CARB already includes emissions from these activities for purposes of cumulative analysis, and likely overestimates existing emissions of fugitive dust from unpaved roads in the JDSF. The CARB's calculation procedure for PM10 emissions from unpaved roads assumes that, on an annual average basis, 10 vehicles per day travel the entire length of every unpaved road. This is likely an overestimate in the overall degree of use of roads in the JDSF, resulting in an overestimate of actual emissions.

Mitigation: None Required.

5.6 Alternatives

A comparison of impacts among alternatives is presented in Table 12.

TABLE 12
COMPARISON OF AIR QUALITY IMPACTS BY ALTERNATIVES

Alternatives						Discussion
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant–Mitigation Feasible (5) Significant–Mitigation Not Feasible**
Violate or substantially contribute to a violation of the ambient air quality standards						
Alt. A						Alternative A would reduce air emissions overall by reducing harvest-related traffic and equipment use, and eliminating prescribed burning. Impacts would remain, however, due to continued recreational traffic on existing roads, lack of a road management plan, and an increased risk of severe wildfires in the absence of active fire suppression measures.
Alt. B						Alternative B would maintain emissions at current levels. These levels do not contribute significantly to violations in air quality standards.
Alt. C						There is no substantial difference among Alternative C, D, and E. All would result in reduced air quality impacts due to an active road management plan when compared to Alternatives A or B. Less than significant impacts, however, would still occur due to continued road use and timber harvest activities.
Alt. D						
Alt. E						
Conflicts or obstructs implementation of the applicable air quality plan						
Alt. A						No alternative directly conflicts with or obstructs implementation of any air quality plan.
Alt. B						
Alt. C						
Alt. D						
Alt. E						
Results in a cumulatively considerable net increase in PM10 emissions.						
Alt. A						Alternative A would reduce PM10 emissions overall by reducing harvest-related dust and burning. Impacts would remain, however, due to continued recreational traffic on existing roads, lack of a road management plan, and an increased risk of severe wildfires in the absence of active fire suppression measures.
Alt. B						Alternative B would maintain emissions at current levels as monitored by the Air District. For Alternative B there is no specific road management plan. Roads are constructed and maintained as needed to support operations. As discussed above, PM10 emissions also result from slash burning.
Alt. C						Compared to Alternative B, there would potentially be an increase in slash burning for Alternative C. However, assuming that the degree of slash burning is proportional to the volume of timber harvested, this increase would be minimal, only about 8 percent. The resulting increase in PM10 emissions from slash burning would be more than offset by the decrease in PM10 emissions due to implementation of the Road Management Plan. The Road Management Plan in Alternatives C, D and E would potentially reduce the number of traveled roads, increase maintenance of existing and new roads, surface existing and new roads intended for year-round log hauling, and implement a dust control program for roads.
Alt. D						
Alt. E						

6. BIOLOGICAL RESOURCES

6.1 Aquatic Resources

6.1.1 Environmental Setting

Within the 15 planning watersheds making up the JDSF assessment area, there are approximately 206 miles (331 km) of Class I (fish-bearing) streams, 362 miles (583 km) of Class II streams, and 339 miles (546 km) of Class III streams. On JDSF, the estimated stream miles for Class I, II, and III streams are 98 miles (157 km), 186 miles (299 km), and 174 miles (280 km), respectively (See Figure C in attached "Figures" section). The estimated mileage of Class III streams will likely increase, based on project- and site-specific field investigations.

Coho salmon and steelhead trout are of particular ecological and economic importance in coastal California, and both have undergone well-documented declines in overall abundance. The Central California Coast coho salmon, which includes populations within the assessment area, was listed as a threatened species by National Marine Fisheries Service (NMFS) in 1996 (NMFS, 1996a). Northern California steelhead, which includes populations within the assessment area, was listed as a threatened by NMFS in 2000 (Federal Register Vol. 65, No. 110, June 7, 2000). Steelhead were 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 in the assessment area). See Figure C in attached "Figures" section.

Fish population data for the pre-logging period are not known to exist for streams in or near the JDSF assessment area. However, salmonid populations in Mendocino County are widely believed to have declined during this century compared to historical conditions (Brown and Moyle, 1991; Nehlson et al., 1991). In the absence of evidence that conditions in assessment area streams differ greatly from other Mendocino County streams, it is reasonable to assume that salmonid populations have likely declined from pre-logging levels.

Overall, based on out-migrant trapping data it appears that salmonid habitat in the planning watersheds is near current carrying capacity (DFMP 2001). 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 (DFMP 2001). For example, well-intentioned stream cleaning projects reduced the amount of available instream large woody debris (LWD) resulting in reductions in pool depth and cover complexity throughout a large portion of JDSF and elsewhere. In addition, prior to the introduction of modern FPR, tractors were allowed to build roads and yard logs within stream channels, which physically filled and altered habitats. An increase in the amount of usable rearing habitat is expected to provide the greatest increase in salmonid production (DFMP 2001).

Current habitat conditions were evaluated for several factors. These included water temperatures, substrate composition, and LWD loading, and riparian vegetation. Changes in these factors affect spawning and rearing habitat quality, channel geomorphology, and fish populations.

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 16.8°C (62.2°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 (See Figure E in attached "Figures" section). In addition, 35 CDFG surveys conducted between 1995 and 1997 found 71.5% of the JDSF watercourses had overstream canopy densities greater than 90%; 17% ranged from 80-89% density; and 11.5% ranged from 60-79% density. Lewis et al (2000) reported water temperatures tend to cool as stream distance from the coast decreases. This was attributed to the influence of cooler marine air currents and coastal fog.

Values of the V-Star (V*) index, which is an expression of the average ratio of the volume of fine sediment to the residual pool volume (Lisle and Hilton, 1991, 1992) is a tool that can be used to gauge the relative sediment supply in a stream system. Work completed in 1993 showed that the percentage of pool space filled with fine sediment, or V*, 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. Lisle and Napolitano (1998) reported V* values in the North and South Forks Caspar Creek generally ranged from 0.2 to 0.3 over a seven year period between 1991 and 1997. Values of V* greater than 0.2 (20 percent pool filling) reflect high sediment supply, whereas V* values less than 0.1 (10 percent pool filling) indicate a relatively low sediment supply (Lisle and Hilton, 1992).

Burns (1970, 1971, 1972) conducted investigations into salmonids and their habitats in northern California before, during, and after logging in several watersheds in the late 1960's. Valentine and Jameson (1994) replicated portions of Burns' work on the Little North Fork Noyo River. Burns' studies found mean stream width increased from 1.5 to 2.3 m. and average depth decreased from 15 cm. to 9 cm. as a result of logging and road building. Valentine and Jameson found stream depth had recovered, if not increased, to 21 cm. and width was intermediate (2.1 m.) between Burns' pre- and post-logging period. Burns' studies found mean percentage of fine sediment (<0.85 mm) increased from 20 to 33% as a result of harvest activities. Valentine and Jameson's (1994) percentage of fine sediment was intermediate (25.4%) to Burns' pre- and post-logging period. Additional sampling was conducted by Valentine in 1991 and 1993 at other Little North Fork sites and had an average percent fines of 21.5 and 15.8, respectively.

Cafferata and Spitler (1998) conducted a comparative analysis of logging impacts in the North and South Forks of Caspar Creek from harvesting and road building operations that were conducted prior to and following introduction of the modern FPR. Roads (4.2 miles) were built throughout the entire South Fork Caspar Creek watershed in 1967 with many built low on the slope, adjacent to or in channels. The watershed was selectively logged with crawler tractors between 1971 and 1973. Approximately 48% of the North Fork was clearcut from 1985 to 1992 using 7.1 miles of existing road and 5.2 miles of new road located high on ridges. Approximately 80% of the North Fork was cable yarded. The South Fork showed a 212% increase in suspended sediment loads over background levels. The North Fork showed an 89% increase in suspended sediment load over background. The volume of sediment discharged by landslides (>100 yd^3) from the uncut and

clearcut units to date (1998) was approximately the same: 11 yd^3/ac. from the uncut units and 10 yd^3/ac. from the harvested areas (Cafferata and Spitler 1998). Cafferata and Spitler (1998) concluded the road, landing, and skid trail design, placement, and construction are the dominant controls on the number and locations of shallow landslides.

Significant impact to form and function of stream channels located within JDSF boundaries has resulted from the widespread removal of LWD from low gradient (0-4 percent) stream channels from the 1950's to the early 1990's, splash damming, and riparian timber harvest. These activities have reduced pool frequency and depths, and overall habitat complexity. This change 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 (DFMP, page 22). See Figure B in attached "Figures" section.

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). These diminished levels of LWD are reflected in the low pool shelter ratings observed during the CDFG surveys. Only one watercourse (Caspar Creek downstream of the South Fork) exceeded the desired level of 100. The majority (74%) of watercourses on JDSF have shelter ratings of less than 39 with 17% ratings between 40 and 60. Nearly all the CDFG surveys recommended direct placement of LWD into streams to improve aquatic habitat. Lisle and Napolitano (1998) reported LWD is responsible for much of the channel complexity in the North Fork Caspar Creek with 55% of the pools in a 340m reach upstream of the weir associated with wood. 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 LWD which help create pools and route sediment; 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; and provides important habitat for a variety of plants and animals. These zones are also among the first to exhibit the effects of improper management and a departure from the production of desired values.

JDSF contains approximately 7,753 acres of riparian zone within 150 feet and 100 feet of Class I and Class II watercourses respectively. of these approximately 1,682 acres are in CWHR size class 6 [multi-storied with a Quadratic Mean Diameter (QMD) >24 inches DBH]; 3,174 acres in CWHR size class 5 (QMD >24 inches DBH); 1,733 acres in CWHR 4 (QMD 11-24 inches DBH); 820 acres in CWHR 3 (QMD 6-11 inches DBH); 240 acres in CWHR size classes 2 (QMD 1-6 inches DBH); 14 acres in CWHR size classes 1 (QMD <1 inch DBH); and 90 acres in pygmy forest, grass, and brush. CWHR 5 and 6 stands, which compose 71% of Class I and 57% of Class II watercourse WLPZ vegetation types, are many times considered representative of late successional habitat (see Section VII-6.6: Wildlife).

It must be noted that the above CWHR size classes are based on the dominant trees within an entire typed polygon that in almost all cases extended well beyond the WLPZ boundaries. The mean diameters of trees within the WLPZs are very likely significantly larger than trees outside the

WLPZ for the same CWHR type. This is because trees outside the WLPZs have been exposed to higher levels of harvesting than those inside. Please see Appendix 8 for a detailed discussion of aquatic habitat, salmonid population, and riparian conditions.

6.1.2 Applicable Standards for Protection of Resources

State agencies, including CDF, are directed through a variety of programs and policies to protect and manage California's aquatic resources. These include:

- California Forest Practice Rules
- Basin Plan
- Fish and Game Code
- State and Federal Endangered Species Acts
- Clean Water Act
- Draft Jackson Demonstration State Forest Management Plan (DFMP)

The DFMP has been developed to achieve desired future conditions that will 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.

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 WLPZs to promote their ecological succession to late-successional forest conditions. JDSF will retain and enhance the vertical structural diversity of these stands, and protect riparian zone special habitat elements such as snags and LWD to improve habitat values.

Individual project stream and riparian protection and management measures will be determined on a site-specific basis and be designed to attain or maintain properly functioning condition as described above. A variety of conservation measures is 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 already be degraded and could be affected by planned operations. As these areas are identified, measures will be developed that are intended to improve conditions, especially in regard to LWD loading.

6.1.3 Habitat Protection

JDSF will manage forested stands in WLPZs to promote their ecological succession to late-successional forest conditions. Watercourse protection measures will include all applicable FPRs and at all times meet or exceed the following levels. The following rules under which the Management Plan will operate are partially based on the approved Board July 2000 Threatened and Impaired Watersheds rule package:

- Class I–150 foot WLPZ; class II–50 to 100 foot WLPZ. Zone widths are to be expanded where appropriate (e.g., unstable areas, etc.).
- Timber operations within channel migration zones will not occur (except as allowed in the Forest Practice Rules).
- Class I inner band–25 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.
- Class I outer band—remainder of WLPZ. 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) isto be retained in the outer band.
- Within Class I and Class II WLPZ, retain a minimum of 240 sq. ft. conifer basal area following completion of timber operations.
- Reentry–No more frequently than every 20 years for Class I WLPZs.
- Class I/II: Ten largest conifers per 330 feet of stream channel retained within 50 feet of the watercourse transition line.
- Class II inner band–25 feet 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.
- Class II outer band–remainder of WLPZ. 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.

- Class III–ELZs will be at least 25 feet on side slopes less than 30 percent, and 50 feet on slopes greater than 30 percent. These zones will be expanded where site-specific investigations reveal that additional protection is merited for preventing sediment movement into Class III channels.
- Class III–Burning will be conducted so that the majority of large woody debris is left within the ELZ. Fuels are not to be ignited within 50 feet of Class III channels.

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

Other habitat protection measures include:

- Natural springs and seeps that may provide habitat for non-fish aquatic species are provided the same protections as Class II streams
- LWD within the WLPZ will be retained and recruited to the stream system unless it presents an imminent risk to 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.

The DFMP includes a 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 have shown that forest roads are a major source of management-related stream sediment. The Road Management Plan 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 DFMP will also improve water quality by reducing suspended sediment concentrations and turbidity. Fish passage at Class I crossings will also be assessed. The Road Management Plan includes the following six major components:

1) **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 100 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.

2) **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 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.

3) **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 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.

4) **Inspection and Maintenance.** Proper maintenance is a key to reducing the long-term contribution of road related sediment. Permanent and seasonal roads will be inspected at least once annually to ensure that drainage facilities and structures are functioning properly. 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.

5) **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 on steep slopes or in close proximity to watercourses.

6) **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.

Additional protection measures relating to mass wasting, surface erosion, road management, and riparian vegetation can be found in the Geology, Hydrology, and Forestry Sections.

6.1.4 Monitoring and Adaptive Management.

A description of the Monitoring and Adaptive Management goals are presented as Chapter 5 of the DFMP. Monitoring is described as "the process used to evaluate progress toward the stated goals in the management plan for JDSF." Adaptive management describes the "management strategies that will be implemented if analysis of monitoring results indicate that resource conditions begin to deviate from the desired trajectory." Under the heading "Watershed Resources," five goals are presented that are aimed at hillslope management, reduction of sedimentation impacts, channel form and function, water temperatures, and aquatic species populations:

- **Goal: Hillslope Conditions.** Mitigate road and crossing problem sites (high priority).

  As described in the Road Management Plan, problem road sites will be inventoried, prioritized, and mitigated. The road network will be monitored on an informal basis by JDSF staff, and every two years as part of a formal monitoring program.

- **Goal: Hillslope Monitoring.** Minimize erosion impacts resulting from forest management operations (high priority).
  Completed THPs that have over-wintered for 1 to 4 years will be monitored. The scope of this THP monitoring will include:

  - inspection of all watercourse crossings, road segments and landings;
  - mapping the location of rilling/gullying on roads, landings, etc. that are contributing sediment to watercourses;

- mapping the location of mass wasting features (including cutbank/fillslope failures) associated with roads, crossings, and landings, or within harvest units;
- mapping the location of road drainage structures (including crossings) that are contributing significant amounts of sediment to watercourses;
- measurement of WLPZ canopy for Class I watercourses; and
- recording information on the causes of erosion features, proposed improvements, and a schedule for mitigation treatments.

Documented erosion problems will be analyzed to determine what management practice or site-specific condition was responsible. Adaptive management solutions will be site specific and based on professional judgment of JDSF staff.

- **Goal: Stream Channel Conditions.** Maintain or improve aquatic and riparian habitat conditions and minimize sediment delivery to watercourses (high priority).
  - Surveys of stream channel conditions will be implemented for a limited number of streams on JDSF.
  - Monitor long-term trends in channel morphology, habitat quality and woody debris, and to evaluate the effectiveness of prescriptions designed to maintain or improve aquatic and riparian habitat conditions and minimize sediment delivery to watercourses.
  - Parameters sampled will vary depending on the stream reach evaluated, but may include:
    - LWD frequency by size class, with information on condition and placement
    - Pool dimensions (including pool volume], residual pool depth, and useable rearing/holding/overwintering habitat)
    - Pool frequency
    - Gravel permeability, embeddedness and size distribution (including overall d50 of sampled reaches)
    - Channel dimensions (measured using transects)
    - Longitudinal profiles and cross sections
    - Bank conditions and entrenchment
    - Benthic macroinvertebrate

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: Stream Temperature.** Maintain or improve current stream temperature regimes (normal priority).
  - Annual summer stream temperature monitoring is scheduled to continue.

- Stream temperature data currently reported for each location include: (1) hourly water temperature, (2) maximum 4-week moving average temperature and date of occurrence, and (3) maximum 7-day moving average temperature and date of occurrence.

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

- **Goal: Fish and Amphibian Populations**. Maintain or improve current fish and amphibian populations on the Forest (high priority).
  - maintained a weir and coho salmon egg-taking station in JDSF
  - USFS yearly electrofishing surveys in the North and South Forks of Caspar Creek documenting density, biomass, and distribution of fish and amphibians by habitat type during the early summer.
  - CDFG trapping and counts of downstream juvenile migrant salmonids in mainstem Caspar Creek.
  - Analysis will consist of summarizing available data and projecting fish populations.
  - Utilize same management strategies as used for stream temperature.

6.1.5 Thresholds of Significance

Based on policy and guidance provided by CEQA (PRC Section 21001 and the CEQA Guidelines), an impact of the proposed project would be considered significant if it results in one or more of the following:

- Have substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive or special status species in local or regional plans, policies, or regulations, or by the CDFG or U.S. Fish and Wildlife Service.
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.
- Have a substantial adverse effect on any riparian habitat.
- Conflict with the provisions of an adopted Habitat Conservation Plan, or other approved local, regional, or State habitat conservation plan related aquatic resources.
- Have the potential to substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal.

The degree to which timber management would affect aquatic habitat and, hence, fish populations, was assessed based on appropriate scientific literature, current condition of existing habitat, general life-history habitat requirements of selected species (coho salmon and steelhead), and projected effect on specific habitat parameters resulting from the proposed project and the alternatives.

Because quantitative relationships between forest management activities and their effects on fish habitat on JDSF lands have not been developed, the assessment of fishery-related impacts for each alternative was generally and necessarily qualitative.

6.1.6 Project Impacts

The DFMP has been developed to minimize the potential for adverse impacts to aquatic habitat, fish migration, riparian habitat, aquatic species populations, and wetlands. Two of the aforementioned thresholds of significance referring to adverse effects on 1) species either directly or through habitat modification and 2) riparian vegetation, contain several individual components that could be affected by management activities. The various elements within each threshold of significance and associated impacts for the proposed action are considered below.

Project Impact: ***Potential to have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive or special status species in local or regional plans, policies, or regulations, or by the CDFG or U.S. Fish and Wildlife Service***

Although juvenile and adult salmonids can be adversely affected by forest management activities, direct impacts on fish populations under any of the alternatives would be uncommon. Management-related impacts would primarily result from indirect effects on aquatic habitat that result from changes to inputs of water, sediment, and LWD. Indirect effects may include, but are not limited to, changes in water temperature resulting from reductions in stream shading; increased sedimentation resulting from increased erosion; reduced recruitment of LWD; alteration of flow patterns resulting from changes in runoff characteristics; changes in stream channel geomorphology; and blockage of fish migration at stream crossings. Additional discussion regarding peak flows and sedimentation can be found in the Hydrology and Geology sections.

Impact: ***Water Temperature*** **(Less Than Significant)**

Most of JDSF's watercourses currently have water temperature regimes that meet NMFS (1997) target criteria. Those reaches not meeting target criteria are generally larger order streams such as the mid- to lower South Fork Noyo River or the North Fork Big River in the eastern portion of the Forest. Overstream canopy densities are generally considered to be high throughout JDSF (See Figure E in attached Figures Section). of the 35 stream surveys conducted by CDFG between 1995 and 1997, 25 streams had densities exceeding 90%, 6 streams exceeded 80%, and 4 streams were between 60 and 79%. These canopy densities developed under the CFPRs and 1983 management plan. The DFMP would require at least 85% overstory canopy within 75 and 25 feet of Class I and II watercourses respectively. Much of the previous timber harvesting on JDSF was conducted using FPRs with lower WLPZ retention standards than those stated above. Therefore, since most water temperatures meet target criteria, it can be assumed that the higher retention standards contained in the DFMP will not result in elevation of water temperatures. Therefore, this is considered a less than significant impact.

Mitigation: None required

Impact: *Sedimentation* (Less Than Significant)

The DFMP (Section 2, Watersheds) acknowledges that the present road network reflects a history of various transportation technologies and forest practices. Many existing roads utilize railroad grades beginning in the 1870s that are often located adjacent to streambeds, exacerbating erosional processes (e.g., mass wasting). The present road network was mostly constructed from the 1950s to the 1970s. JDSF contains an estimated 350 miles of actively used roads and 150 miles of potentially improperly abandoned roads. The sediment contribution per unit area from roads is often much greater than that from all other land management activities combined, including log skidding and yarding (Furniss et al. 1991). Sidle et al. (1985) in Furniss et al. (1991) summarized the results of 10 landslide inventories and found that mass wasting associated with roads produced 26-346 times the volume of sediment as undisturbed forest with clear-cuts producing 1.9-40.4 times the amount of undisturbed areas. 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 (DFMP). Erosion from road related shallow landslides and surface erosion is expected to continue dropping as the Road Management Plan on the State Forest is implemented and exclusion of tractors in WLPZs. Sediment delivery from mass wasting or unstable hillslope locations should be reduced over the current condition by implementing the hillslope management activities stated in the DFMP. Therefore, this is considered a less than significant impact.

Mitigation: None required

Impact: *LWD Recruitment* (Less Than Significant With Mitigation)

Timber harvesting along streams tends to reduce the quantity of woody debris in streams, which reduces the area and depth of pools (Beechie and Sibley 1997). Instream sediment storage, sorting, and transport are also partially dependent on LWD. Reductions in instream LWD has also been linked to decreases in salmonid habitat complexity, winter rearing habitat, stream carrying capacity, and species diversity (Spence et al. 1996). This is especially true in JDSF where timber harvesting and focused stream clearing projects have reduced LWD levels to less than one-third that found in undisturbed systems. Therefore, improvements in instream habitats in JDSF rely in large part on the ability of the riparian zone to provide LWD. Spence et al. (1996) stated a protected buffer of approximately one site tree height (30-45m) would provide 90-100% of a fully functioning riparian corridor. Reid and Hilton (1998) reported that about 90% of the instances of debris input occurred from falls within 115 feet of the channel in un-reentered forests and within 164 feet of the channel in buffer strips. Management decisions made relating to WLPZ retention measures will have an effect on the amount of LWD available for recruitment to streams.

Reductions in the amount of standing timber in the WLPZs could have a direct bearing on LWD recruitment potential. Although the DFMP proposes no-cut buffers of unspecified variable width, commercial thinning or single tree selection silviculture can be conducted within the remainder of the WLPZ. Although WLPZ prescriptions are designed to promote late successional stands, the removal of large dominant or codominant trees to release smaller diameter understory trees is permissible as long as canopy and basal area retention measures are achieved. This potential

scenario could slow down the recruitment of large-sized LWD, which may adversely affect stream habitat. Therefore, additional mitigations are recommended to: (a) maintain existing LWD recruitment rates (mitigation #1) and (b) provide for accelerated recovery (mitigation #2).

Mitigation 1: Either programmatic or THP-specific instream LWD surveys are recommended to help determine appropriate retention standards prior to designing WLPZ prescriptions. If instream wood loads do not meet target criteria as described in Bilby and Ward (1989), Class I WLPZ silviculture will either be no-cut (except for harvest of cable corridor trees where needed) within 100 to 150 feet of the Watercourse Transition Line, or limited to "thinning from below," to promote growth on the larger diameter trees and improve LWD recruitment potential. WLPZ prescriptions shall default to either no-cut within 100 to 150 feet of the Watercourse Transition Line or limited to "thinning from below" silviculture if the recommended LWD surveys are not conducted.

Mitigation 2: As part of a focused study project, assess for the potential of placing large wood into the Class I channel. Where assessments indicate that LWD levels are low and instream placement is feasible consider placement of unanchored log and/or rootwads in streams. LWD should exceed one bankfull width in length. When available, skyline or helicopter yarding systems used to yard the THP logs can be employed to place LWD in the channel where ground-based equipment access is not available. LWD installation projects should be coordinated with CDFG, NMFS, and other applicable state and federal agencies.

This mitigation is intended to accelerate recovery of the aquatic system, and should only be considered after thorough study of potential effects as part of operational demonstrations, formal studies, or research projects. This mitigation is not necessary to prevent potentially significant effects associated with timber management operations.

Monitoring:
Timing: As part of THP review
Scope: Forest-wide
Implementation: the Department
Monitoring Responsibility: the Department

Impact: *Alteration of Flow Patterns* (Less Than Significant)

Timber harvesting activities can alter flow patterns through construction of roads and interception of the drainage network. Roads, inboard ditches, skid trails, and landing surfaces can act as man-made drainages that carry water and sediment into natural streams (Weaver and Hagans 1994). Culverted stream crossings can plug and cause the fill to fail or gullies to form where the diverted water runs down the road surface and spills onto hillslopes. In some cases, tens of thousands of cubic yards of sediment can be eroded and deposited into stream channels from diversions. Inboard ditches can intercept one or more ephemeral channels and carry their flow to a receiving watercourse. Interception and delivery of water from these watercourses can result in excessive flow and downcutting of the receiving channel. Diversion potential will be inventoried and corrected as part of the Road Management Plan.

See the Section VII-10 (Hydrology) for additional discussion of peak flows.

Mitigation: None required

Impact: *Channel Geomorphology* (Less Than Significant With Mitigation)

Channel geomorphology is affected by a number of factors. These include geology, channel gradient and confinement, rainfall patterns and hydrology, LWD and sediment inputs, and anthropogenic activities. For the purposes of the aquatic habitat impacts, only LWD and sediment inputs to Class I watercourses are considered. The other factors affecting geomorphology are discussed in the Geology and Hydrology sections.

Channel form and function on JDSF have been affected by management activities. Pools have V* measurements that are twice as high as undisturbed channels in the same geologic type (Knopp 1993). Instream LWD loads, which could help scour and route sediment, are well below those for undisturbed systems. However, Valentine (1994) found stream depth had recovered, if not increased, between the late 1960's and 1993. In addition, the percentage of fine sediment in spawning gravel also decreased during that period. The DFMP includes hillslope management, WLPZ retention standards, and a road management plan that should reduce the potential for impacts to channel geomorphology. However, additional mitigation is required to bring impacts to a less than significant level. These mitigations include LWD surveys, silvicultural restrictions, and placement of instream LWD (Mitigations #1 and #2) as described above.

Mitigation: Incorporate mitigation and monitoring regarding LWD (Mitigation #1 and #2 above).

Project Impact: *Potential to interfere substantially with movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites* (Beneficial).

Migration barriers affect salmonids by restricting access by juveniles to higher quality habitats and inhibiting or halting adult entry to spawning grounds. In landscapes altered by anthropogenic activities, barriers to migration usually involve improper placement of stream crossings or development of thermal barriers during the summer. The CDFG stream surveys reported the presence of 55 definite, probable, or possible barriers to anadromous migration within JDSF. JDSF personnel identified several more. In addition, there are 66 Class I crossings on JDSF. Some of these crossings may inhibit upstream migration of adult or juvenile salmonids to some degree. The Road Management Plan includes inventories of crossings to determine risk to fish migration. The road upgrade component of the Road Management Plan will correct problem culverts and have a beneficial impact on fish migration and rearing habitat.

Mitigation: None required

Project Impact: *Potential to have a substantial effect on any riparian habitat.*

The presence of riparian vegetation adjacent to stream channels and within the flood prone area contributes to streambank stability, allochthonous inputs (leaf litter and terrestrial invertebrates), and instream habitat. Vegetative root structure reinforces streambanks to resist erosional forces. Leaf litter provides the trophic base for aquatic macro-invertebrates, which are an important food source for fish. LWD inputs from the riparian zone provide cover habitat for salmonids, promote

streambed scour and pool development, sort and store sediment, and slow water velocities. These riparian functions have a direct bearing on the quality of salmonid spawning and rearing habitat. See Appendix 8 for additional information.

Impact: *Streambank Stability* (Less Than Significant)

Timber harvesting activities have the potential to destabilize streambanks by removing trees whose roots provide erosional resistance to flows. As roots decay (non-redwoods), banks could fail and undercuts that are preferred fish habitat could be lost. As streambanks fail the channel widens and the cross-sectional area of increases. The increase in cross-sectional area reduces stream velocities during runoff events and the ability of the watercourse to transport sediment. Reduced sediment transport ability could result in channel aggradation and decreases in the quantity and quality of spawning and rearing habitat. The DFMP establishes a no-cut WLPZ on Class I and II watercourses (except for habitat enhancement) that reduces the potential for loss of streambank stability due to tree removal to a less than significant level.

Mitigation: None required

Impact: *Allochthonous Inputs* (Less Than Significant)

Riparian vegetation can provide nutrient inputs to the stream ecosystem in at least two ways: terrestrially derived invertebrates and as leaf litter. LWD can also function as a substrate and nutrient source for aquatic macro-invertebrates. The degree to which the riparian zone can provide invertebrates, leaf litter, and LWD has a direct relationship on the production of food resources for salmonids. Timber harvesting can reduce allochthonous inputs through direct removal of timber and vegetative cover thereby having some impact on salmonid food resources. The DFMP establishes a no-cut WLPZ on Class I and II watercourses (except for habitat enhancement), promotes the development of late successional habitat, and ensures at least an 85% overstory canopy closure within 75 feet and 25 feet of Class I and II watercourses respectively. These measures will reduce the potential for loss of allochthonous inputs to a less than significant level.

Mitigation: None required

Impact: *Instream Habitat* (Less Than Significant With Mitigation)

As previously discussed and analyzed, riparian vegetation contributes to instream habitat in a number of ways. Riparian canopy closure reduces the amount of solar radiation reaching the watercourse thereby moderating water temperatures. LWD provide roughness elements that cause flow turbulence resulting in pool scour and development. The turbulent flow also helps contributes to fine sediment mobilization and transport. Riparian root structure can be undercut and provide holding and rearing habitat for adult and juvenile fish while stabilizing streambanks. Riparian areas also provide fish with velocity refuge areas during overbank flood flows. Instream LWD provides critical winter cover for flows that don't overtop banks. Soil disturbance in WLPZs could result in delivery of sediment to watercourses that could affect spawning and rearing habitat quality and quantity.

Approximately 63% of the JDSF Class I and II WLPZs are composed of CWHR 5 and 6 stand types. Overstream canopy densities are generally considered to be high throughout JDSF (see water temperatures). of the 35 stream surveys conducted by CDFG between 1995 and 1997, 25 streams had densities exceeding 90%, 6 streams exceeded 80%, and 4 streams were between 60 and 79%. These stand types and densities developed under the FPRs and 1983 management plan. Although the riparian zone appears to be healthy, instream LWD loads are considerably below target levels. These diminished levels of LWD were reflected in the low pool shelter ratings observed during the CDFG surveys. Only one watercourse (Caspar Creek downstream of the South Fork) exceeded the desired level of 100. The majority (74%) of watercourses on JDSF had shelter ratings of less than 39 with 91% of the watercourses having of less than 60. Nearly all the CDFG surveys recommended direct placement of LWD into streams to improve aquatic habitat.

Although there have been improvements in fine sediment levels in JDSF streams, V* values indicated a continuing high sediment supply. In addition, Valentine's (1994) mean percentage of fine sediment was higher than the pre-logging amounts reported by Burns (1970). The implementation of the Road Management Plan and hillslope mitigations will likely reduce the amounts of erosion and sediment delivery to below that experienced under the 1983 Management Plan.

The DFMP currently proposes harvesting operations in the WLPZ that could adversely affect instream habitat without additional mitigation. Therefore, the incorporation of Mitigations #1 and #2 are necessary to reduce impacts to instream habitat to less than significant levels.

Mitigation: Incorporate mitigation and monitoring regarding LWD (Mitigation #1 and #2 above).

Project Impact: *Conflicts with provisions of an adopted HCP or other approved local, state, or federal HCP relating to aquatic resources* (No Impact).

There are no approved or adopted HCPs pertaining to JDSF.

Mitigation: None required

Project Impact: *Causes a fish population to drop below self-sustaining levels or threaten to eliminate an aquatic community* (Less Than Significant)

Fish populations can be extirpated from watercourses and watersheds if conditions degrade to a point the stocks are no longer self-sustainable. However, nearly two-thirds of the entire land base within the JDSF was clear-cut and burned prior to the introduction of the modern FPRs. Historic activities included massive broadcast burning, road construction and log skidding in watercourses, splash damming, stream clearing, and complete removal of riparian canopy. No effort was made to protect fish stocks at that time and populations did suffer. During the first season of operation the Noyo River egg taking station recorded a 1962-1963 coho run of 1,191 adults and 2,501 grilse. This indicates fish populations were able to maintain viability, albeit at low numbers, through that unregulated logging period. The potential effects to fish populations and aquatic communities from each alternative are significantly less than pre-modern FPR operations.

Project Impact: ***Reduce the number or restrict the range of a rare or endangered aquatic plant or animal*** **(Less Than Significant With Mitigation)**

There are no known rare or endangered aquatic plants on JDSF. Coho salmon and steelhead trout are listed as "Threatened" under the federal ESA and are currently considered for listing under the California ESA. Timber management activities have been identified as a contributing factor in the decline of salmonids throughout northwestern California. Changes in aquatic habitat conditions including elevation of water temperatures, increased sedimentation, reduced instream LWD loads, and altered flow patterns have been identified as factors in the decline of salmonid populations. The number and range of salmonids were reduced on the JDSF from the effects of timber operations prior to the introduction of the modern-FPR.

Instream sediment and LWD loads and pool shelter in JDSF currently fail to meet target criteria or desired levels in most cases. In addition, State personnel have identified a number of definite or potential migration barriers within the Forest. The Road Management Plan will inventory and correct the road-related sediment problems and migration barriers associated with the road system. The hillslope management strategy, establishment of ELZs, and use of a CEG on THPs will reduce the amount of sediment generated from upslope harvesting operations. These measures may lead to improvement of instream habitat and fish numbers. However, harvesting large trees in the WLPZ under the DFMP may result in lower LWD recruitment under certain circumstances. Therefore, incorporation of Mitigations #1 and #2 are needed to reduce impacts to a less than significant level.

Mitigation: Incorporate mitigation and monitoring regarding LWD (Mitigation #1 and #2 above).

6.1.7 Alternatives

A summary comparison regarding the level of aquatic resource impacts among the various alternatives is provided in Table 13. A more detailed narrative description of impacts by alternative is provided in Appendix 8.

TABLE 13 COMPARISON OF AQUATIC RESOURCE IMPACTS AMONG THE VARIOUS ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant - Mitigation Feasible (5) Significant -Mitigation Not Feasible**
Will the project have substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive or special status species?						
Water Temperature						
Alt. A						No harvesting would maintain existing canopy cover along watercourses and allow temperature regimes to return to background levels. This alternative would not allow restoration work in WLPZs where conifers need to be reestablished.
Alt. B						Most watercourses met temperature target criteria under old FPRs. New FPR retention standards increase canopy cover and would not result in higher water temperatures
Alt. C DFMP						Most watercourses met target criteria under old FPRs. New FPR and DFMP retention standards and late successional development emphasis in WLPZs should not result in higher water temperatures.
Alt. D						FEMAT-style stream buffer retention standards- sufficient to moderate water temperatures.
Alt. E						
Sedimentation						
Alt. A						Road maintenance would be limited to that necessary to maintain public access. No directed upgrade or abandonment program. Sediment delivery may increase from the unmaintained road system.
Alt. B						Three-year road maintenance requirement without directed upgrade and abandonment plan may not be sufficient to reduce sediment delivery to less than significant levels.
Alt. C DFMP						Alternatives C, D, and E have directed road maintenance, upgrade, and abandonment programs, ELZs, as well as CEG involvement in THP preparation should be sufficient to decrease sediment delivery potential.
Alt. D						
Alt. E						
LWD Supply						
Alt. A						No harvest would allow full development LWD recruitment potential, except where conifer restoration is needed.
Alt. B						New FPR retention standards are designed to protect LWD recruitment potential on a THP-by-THP basis.
Alt. C DFMP						New FPR and DFMP retention standards and late successional development emphasis in WLPZs should not result in a reduction of LWD loads in streams. However, additional mitigation is necessary requiring instream LWD surveys be conducted on a THP by THP basis to determine the amount of existing instream LWD prior to designing WLPZ prescriptions (Mitigations #1 and #2).
Alt. D						FEMAT-style WLPZ retention and late successional management standards should not result in decreased LWD inputs.
Alt. E						
Altered Flow Patterns						
Alt. A						No directed road maintenance, upgrade, or abandonment program could result in diverted flow as crossings plug.

TABLE 13
COMPARISON OF AQUATIC RESOURCE IMPACTS AMONG THE VARIOUS ALTERNATIVES

Alternatives						Discussion
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant - Mitigation Feasible (5) Significant -Mitigation Not Feasible**
Alt. B					■	No directed road maintenance beyond three years post-THP completion could result in diverted flow as crossings plug.
Alt. C DFMP			■			Alternatives C, D, and E have directed road maintenance, upgrade, and abandonment programs that should reduce and eventually eliminate diversion potential.
Alt. D			■			
Alt. E			■			
Channel Geomorphology						
Alt. A					■	Increased sediment delivery from non-maintained roads could fill pools and gravel interstices and reduce channel volume.
Alt. B					■	
Alt. C DFMP				■		Road Management Plan and use of CEG on THPs should reduce sediment delivery below current conditions and not result in further degradation of channel geomorphology. Additional mitigation identified in "LWD Supply" needed (Mitigations #1 and #2).
Alt. D			■			Road Management Plan and use of CEG on THPs should reduce sediment delivery below current conditions and not result in further degradation of channel geomorphology.
Alt. E			■			
Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?						
Alt. A					■	Increased sediment delivery from non-maintained roads could fill pools and gravel interstices and reduce egg incubation and rearing habitat quality. Road crossing failures on Class I streams could impede anadromous and resident migration.
Alt. B					■	
Alt. C DFMP	■					Alternatives C, D, and E include the Road Management Plan that will inventory and correct migration barriers along the road system. This will improve access to spawning and rearing areas.
Alt. D	■					
Alt. E	■					
Have a substantial adverse effect on any riparian habitat? (Alternatives impact on riparian vegetation's role in water temperature and LWD inputs identified above)						
Streambank Stability						
Alt. A		■				The no harvest component will maintain all trees along the streambank.
Alt. B				■		FPRs currently require consideration and protection of streambank stability at the THP level.
Alt. C DFMP			■			This alternative requires at least a 25-foot no-cut WLPZ for Class I watercourses and 10-foot no-cut on Class II's that would protect streambank stability. No-cut zone can be increased to the entire WLPZ width based on site conditions.
Alt. D			■			FEMAT-style WLPZ retention measures and late-successional management requirements will protect streambank stability.

TABLE 13 COMPARISON OF AQUATIC RESOURCE IMPACTS AMONG THE VARIOUS ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant - Mitigation Feasible (5) Significant -Mitigation Not Feasible**
Alt. E						
Allochthonous Inputs						
Alt. A						No harvesting will result in no reduction in allochthonous inputs.
Alt. B						Alternatives B, C, D, and E allow some form of harvesting within the WLPZ, even if it is only for developing late successional habitats. WLPZ canopy retention measures should result in maintenance of allochthonous inputs.
Alt. C DFMP						
Alt. D						
Alt. E						
Instream habitat						
Alt. A						No harvest WLPZ would allow development instream LWD recruitment and associated pool and habitat formation.
Alt. B						FPRs may not affect instream LWD and habitat in some reaches. However, riparian silviculture may reduce LWD recruitment potential in watercourses where instream wood loads are low thereby affecting instream habitat.
Alt. C DFMP						Alternative C has measures that include a road management plan, no-cut zones in WLPZs, promote the development of late successional riparian habitat, and may lead to improvements in instream habitat quality. However, additional mitigations regarding WLPZ harvesting needed (Mitigations #1 and #2).
Alt. D						Alternatives D and E have measures that include a road management plan, no-cut zones in WLPZs (2 site potential trees wide), promote the development of late successional riparian habitat, and will likely lead to improvements in instream habitat quality.
Alt. E						
Conflict with the provisions of an adopted Habitat Conservation Plan, or other approved local, regional, or State habitat conservation plan related aquatic resources?						
Alt. A						None of these alternative would be in conflict with the provisions of any HCP or other local, regional, or State HCP relating to aquatic resources.
Alt. B						
Alt. C DFMP						
Alt. D						
Alt. E						

TABLE 13 COMPARISON OF AQUATIC RESOURCE IMPACTS AMONG THE VARIOUS ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant - Mitigation Feasible (5) Significant -Mitigation Not Feasible**
Cause a fish population to drop below self-sustaining levels or threaten to eliminate an aquatic community?						
Alt. A						Nearly two-thirds of the entire land base within the JDSF was clear-cut and burned prior to the introduction of the FPRs. Historic activities included massive broadcast burning, road construction and log skidding in watercourses, splash damming, stream clearing, and complete removal of riparian canopy. No effort was made to protect fish populations at that time. Fish populations were able to maintain themselves through this period. The potential effects to fish populations and aquatic communities from each alternative are orders of magnitude less than pre-FPR operations.
Alt. B						
Alt. C DFMP						
Alt. D						
Alt. E						
Reduce the number or restrict the range of a rare or endangered aquatic plant or animal?						
Alt. A						Lack of Road Management Plan could result in degradation of spawning and rearing habitat and reduce the numbers of salmonids.
Alt. B						
Alt. C DFMP						Utilization of WLPZ retention measures and Road Management Plan may result in improved habitat conditions and access to spawning and rearing areas. However, WLPZ harvesting operations may degrade habitat and reduce fish numbers under specific conditions (Mitigations #1 and #2).
Alt. D						Utilization of FEMAT-style WLPZ retention measures and Road Management Plan may result in improved habitat conditions, access to spawning and rearing areas, and fish numbers.
Alt. E						

6.2 Botanical Resources

6.2.1 Setting

Vegetation Communities and Habitats

The JDSF is located in the coastal redwood belt and has vegetation communities and associations typical of other mature coastal redwood forests in Mendocino County. Redwood (*Sequoia sempervirens*) and Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*) trees dominate the Forest. Other conifers present in the Forest include grand fir (*Abies grandis*), western hemlock (*Tsuga heterophylla*), and Bishop pine. Hardwoods comprise substantial secondary components in the Forest and are represented by tan-oak (*Lithocarpus densiflorus* var. *densiflorus*), madrone (*Arbutus menziesii*), and others. Most of the redwood stands found on JDSF are young-growth, but approximately 459 acres of old-growth forests remain intact.

There are several unique vegetation communities that occur on JDSF. Rare or sensitive habitat types include the Mendocino pygmy forest, sphagnum bogs and other wetlands, and meadows and grassy openings.

Mendocino pygmy forest, a unique ecological system recognized by the CNDDB as a sensitive plant community type, occurs in JDSF and adjacent state park lands. This rare plant community occurs only in coastal Mendocino County. Pygmy forest in JDSF is concentrated in the Western WWAA, with small patches also occurring in the Southern WWAA.

Wetlands occur on and adjacent to the JDSF both as distinct contiguous bodies and as fragmented isolated wetlands. Examples of distinct wetlands include the Sphagnum bogs, creek sides, fresh and brackish marshes, and ponds (Lost Lake, McGuire's Pond) located on and adjacent to the property. Isolated wetlands occur along roadsides where ditch systems have developed perennial or seasonal wetland conditions, in seeps, and in areas where perched water tables influence the vegetation. Wetlands vary in size and quality and are of special interest as habitat for special plants.

The meadows of JDSF generally occur as disjunct grassy openings. There is, however, a single sizable meadow, the Bob Woods Meadow, located in the Northern WWAA. The disturbance regime on JDSF supports a number of small grassy openings.

In addition to the unique vegetation communities, several communities that occur more commonly develop characteristic vegetation associations. The primary vegetation communities are presented here based on series and associations, which are more useful for botanical analysis (Sawyer and Keeler-Wolf 1995, Holland 1986). These are listed below with the CWHR types in parentheses:

- Redwood Series (Redwood, Montane Hardwood conifer, Montane chaparral)
- Red alder series (Redwood)

- Pygmy cypress series (Closed-cone pine/cypress)
- Bishop pine series (Closed-cone pine/cypress)

In addition to these native communities, an introduced exotic eucalyptus plantation is located in the Western WWAA.

Redwood Series

Redwood (*Sequoia sempervirens*) comprises the sole, dominant, or important tree in the canopy of this series. Redwood commonly occurs with Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*), tan-oak (*Lithocarpus densiflorus* var. *densiflorus*), Pacific madrone (*Arbutus menziesii*), red alder (*Alnus rubra*), California bay (*Umbellularia californica*), and/or western hemlock (*Tsuga heterophylla*; Holland 1986; Sawyer and Keeler-Wolf 1995). Other important tree species in this series include bigleaf maple (*Acer macrophyllum*), and grand fir (*Abies grandis*) (Sawyer and Keeler-Wolf 1995). The understory vegetation consists of western sword fern (*Polystichum munitum*), black huckleberry (*Vaccinium ovatum*), bracken fern (*Pteridium aquilinum*), chain fern (*Woodwardia fimbriata*), deer fern (*Blechnum spicant*), Douglas iris (*Iris douglasiana*), little Oregon-grape (*Berberis nervosa*), man-root (*Marah* spp.) sedges (*Carex* spp.), trillium (*Trillium ovatum*), and redwood sorrel (*Oxalis oregana*) (Holland 1986, Sawyer and Keeler-Wolf 1995). Understory composition and density may vary considerably in response to microsite conditions and disturbance history.

Various associations occur within the Redwood series. The species composition of the redwood associations varies according to forest age and position in the landscape. The Redwood/Douglas-fir, Douglas-fir/redwood, and Hardwood/redwood timber types represent redwood associations that occur on the JDSF. These are discussed below.

Nearly all of the coast redwood forests in Mendocino County are young-growth forests.

Ecological Factors. The redwood forest is found along the Pacific coast from southwestern Oregon to San Luis Obispo County, California (Barbour and Major 1988, Holland 1986), generally below 600 meters in elevation (Sawyer and Keeler-Wolf). The coast redwood is generally restricted to areas of frequent summer fog typified by high summer humidity, meso-thermal temperatures, and shallow to deep, developed, well-drained soils (Holland 1986, Sawyer and Keeler-Wolf 1995).

The coast redwood tree can withstand periodic flooding, sediment deposition, and periodic low-intensity ground fires (Schoenherr 1992). Bare mineral soil conditions enhance seed germination, but reproduction from seed is infrequent. Redwoods vegetatively reproduce from the sprouting of stumps and fallen or damaged trees. Regeneration of coast redwood seedlings is most successful on disturbed sites.

JDSF Distribution. The Redwood Series is the main vegetation type found on the JDSF ownership. Stands of pure redwood are uncommon; however, stands in which redwood is the sole dominant include approximately 7,446 acres or 15% of JDSF ownership. These stands are found within each of the WWAAs and are most prevalent in the Northern WWAA.

Redwood/Douglas-fir Association

Douglas-fir is a common coniferous associate of coast redwood throughout its entire range (Sawyer and Keeler-Wolf 1995). The occurrence of each of these species in a particular stand is related primarily to the environmental requirements of the dominant species. Coast redwood is most commonly found in areas of consistent summer fog along the coast, with high summer humidity, cool temperatures, low evapotranspiration rates, and deep, developed soils. Douglas-fir occupies a wider range of sites, including more open, drier habitats, often on poorly developed soils, with comparatively warmer forest temperatures. Therefore, stands dominated by coast redwood often occur near the coast, within the summer fog belt, on mesic canyon bottoms, and north-facing slopes further inland. Douglas-fir is more common on drier inland sites and south-facing slopes.

Ecological Factors. Douglas-fir is a common coniferous associate of coast redwood throughout its entire range (Sawyer and Keeler-Wolf 1995). The proportion of each species in a particular stand is related primarily to the moisture gradient. Coast redwood is most commonly found in areas of consistent summer fog along the coast, with high summer humidity, cool temperatures, low evapotranspiration rates, and deep, developed soils. Douglas-fir occupies a wider range of sites, including more open, drier habitats, often on poorly developed soils, with comparatively warmer forest temperatures.

JDSF Distribution. The redwood/Douglas-fir vegetation type is the dominant forested vegetation type in JDSF, and is found throughout the ownership. Stands of this type are present in JDSF in a variety of seral stages and canopy closures.

Redwood/Douglas-fir/Hardwood Associations

Various associations between redwood, other conifer components, and hardwoods (especially tan-oak) occur on the JDSF. These stands consist of a mixture of hardwood species and a smaller component of coniferous species in which coast redwood (*Sequoia sempervirens*) is the most abundant. Other associated conifers include Douglas-fir and western hemlock. Hardwood species typically occurring in these associations include tan-oak (*Lithocarpus densiflorus* var. *densiflorus*), Pacific madrone (*Arbutus menziesii*), California bay-laurel (*Umbellularia californica*), and bigleaf maple (*Acer macrophyllum*) (Holland and Keil 1995).

Ecological Factors. The composition of this forest type is affected by slope aspect, harvest history, gradients of moisture, and soil type. Stands of mixed hardwoods and conifers are most developed on cool, mesic slopes at moderate elevations (460-1,070 m) since

comparatively mild winter conditions favor coniferous evergreens. The mild climate of the mid-elevation zone is characterized by high annual precipitation and large daily and seasonal temperatures ranges (Barbour et al. 1993). Pacific madrone and golden chinquapin (*Chrysolepis chrysophylla* var. *minor*) normally form secondary components in the lower-level canopy, with Pacific madrone preferring southern exposures and golden chinquapin typically found on northern slopes.

JDSF Distribution. Redwood/Douglas-fir/hardwood associations are common on the ownership and can be found in all WWAAs. Variations in this association depend on environmental factors and stand seral stage and gradate across the Forest. The dominant variations within this association are presented below.

One variation is principally composed of Redwood, Douglas-fir, and tan-oak. This variation occurs primarily on mesic sites such as north and east-facing slopes and canyons with well-drained soils. This association variation may include Pacific madrone, coast live oak (*Quercus agrifolia*), and grand fir (*Abies grandis*).

On coarse, well-drained, mesic soils along the upper elevation and inland margins of the redwood series, other hardwood species are important components. Hardwoods in this type include Pacific madrone, coast live oak, California bay (*Umbellularia californica*), and bigleaf maple (*Acer macrophyllum*). This variation may occur in the ecotonal area between the Redwood series associated with JDSF and the mixed evergreen series that occurs further inland. This type is also sometimes present as a seral stage in redwood stands and in the Redwood/Douglas-fir association.

Red Alder Series

The Red alder series is dominated or solely composed of Red alder (*Alnus rubra*) (Sawyer and Keeler-Wolf 1995). Other commonly associated species include arroyo willow (*Salix lasiolepis*), black cottonwood (*Populus balsamifera*), Hooker's willow (*Salix hookeriana*), and Sitka spruce (*Picea sitchensis*). Trees in this series are generally less than 40 meters tall. The tree canopy is continuous, and shrubs may be common or infrequent. Shrub species can include vine maple (*Acer circinatum*) and salal (*Gaultheria shallon*). The herbaceous layer is continuous and is often dominated by ferns such as chain fern (*Woodwardia fimbriata*).

Ecological Factors. Red alder series occurs on soils that are seasonally flooded, seasonally saturated, or permanently saturated (Sawyer and Keeler-Wolf 1995). Typically, this series is associated with stream and river backwaters, banks, bottoms, floodplains, mouths, and terraces and can be associated with any aspect. Soils are typically sandstone and derived from schist. Elevations can range from sea level to 750 meters.

JDSF Distribution. The Red alder series covers approximately 57 acres of the JDSF ownership in the Western WWAA (Appendix 8).

Pygmy Cypress Series

Pygmy cypress (*Cupressus goveniana* ssp. *pygmaea*) is the dominant or important tree in the canopy for Pygmy cypress series (Sawyer and Keeler-Wolf 1995). Other commonly associated species include Bishop pine (*Pinus muricata*) and Bolander pine (*Pinus contorta* ssp. *bolanderi*). Trees in this series are typically less than three meters tall (or up to 18 meters tall on more nutrient rich soils; Holland 1986, Sawyer and Keeler-Wolf 1995). The tree canopy is intermittent or open and can be taller or the same height as the shrubs. Dry sites tend to have a denser understory of shrubs, and mesic sites have more herbs. Shrub species are common and can include hairy manzanita (*Arctostaphylos columbiana*), pygmy manzanita (*Arctostaphylos mendocinensis*), Fort Bragg manzanita (*Arctostaphylos nummularia*), salal (*Gaultheria shallon*), Labrador-tea (*Ledum glandulosum*), California rose-bay (*Rhododendron macrophyllum*), and evergreen huckleberry (*Vaccinium ovatum*) (Holland 1986). The herbaceous layer can include bear-grass (*Xerophyllum tenax*).

Ecological Factors. The Pygmy cypress series is found on maritime terraces (Sawyer and Keeler-Wolf 1995). The soils are acidic, low in nutrients, poorly-drained (flooded during winter), derived from sandstone, and have an iron hardpan (Holland 1986, Sawyer and Keeler-Wolf 1995). Elevations can range from 100 to 300 meters (Sawyer and Keeler-Wolf 1995).

The role of fire in the ecology of this community is not well understood. Primary research into the fire ecology of the pygmy forest has not been done. While most references note that the cones of Bolander's shore pine are generally serotinous, Vogl et al. report that open cones can be found on the tree (Barbour and Major 1988). Furthermore, several pine species, including the closely related sister species beach pine (*P. contorta* ssp. *contorta*), exhibit both open- and closed-cones at maturity and utilize strategies to cope with fire and wind stress (Barbour and Major 1988, Green 1999). The degree of serotiny and cause for seed release could be related to both genetic and environmental factors; multiple strategies could be employed to cope with the stresses.

The pygmy cypress appears to have a fire ecology. Though the pygmy cypress cones open readily and release seeds when detached from the tree, recruitment from this type of dispersal is unknown but thought to be ineffective (Barbour & Major 1988). Other species that occur in the pygmy forest show evidence of at least tolerating fire stress. The manzanita species are known to stump sprout after fire. In addition, the even aged nature of the pygmy stands is often used to argue that stand replacing fires are essential to reproduction.

The fact that Bolander pine and pygmy cypress are found in the bishop pine stands on JDSF offers anecdotal evidence of fire ecology in the pygmy forest. The Bishop pine is a fire dependent species. Since the stands of bishop pine are replaced after large fires, and since the pygmy forest species are also found in these stands, it is likely that the pygmy species can cope with fire stress. It is unknown under which frequency, intensity, and scope of fire events the pygmy forest species could thrive. Further work on the life history of the pygmy forest species is also needed to understand the role of fire.

JDSF Distribution. The Pygmy cypress series covers approximately 613 acres of JDSF ownership in the Western and Southern WWAAs

Bishop Pine Series

Bishop pine (*Pinus muricata*) is the sole or dominant tree in the canopy for Bishop pine series (Sawyer and Keeler-Wolf 1995). Other commonly associated species include beach pine (*Pinus contorta* ssp. *contorta*), Bolander's pine (*Pinus contorta* ssp. *bolanderi*), Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*), madrone (*Arbutus menziesii*), Monterey pine (*Pinus radiata*), pygmy cypress (*Cupressus goveniana* ssp. *pygmaea*), and/or redwood (*Sequoia sempervirens*). Trees in this series are typically less than 25 meters tall, and the tree canopy is continuous. The shrub and herbaceous layers are variable. Shrub species can include Labrador-tea (*Ledum glandulosum*), California coffeeberry (*Rhamnus californica*), and evergreen huckleberry (*Vaccinium ovatum*; Holland 1986, Sawyer and Keeler-Wolf 1995). The herbaceous layer can include bear-grass (*Xerophyllum tenax*), bracken fern (*Pteridium aquilinum*), sword fern (*Polystichum munitum*), and poison-oak (*Toxicodendron diversilobum*).

Ecological Factors. This series is found near the coast from Fort Bragg in Mendocino County to northern Sonoma County (Holland 1986). There are scattered stands on Inverness Ridge and Mt. Tamalpais, Marin County, and in the Del Monte Forest on the Monterey Peninsula. Sawyer and Keeler-Wolf (1995) also cite Bishop pine series on the Channel Islands and Baja, California. The Bishop pine series is found on maritime terraces, headlands, and rocky ridges in shallow, acidic soils that may be inadequately drained (Sawyer and Keeler-Wolf 1995). The elevations of the Bishop pine series range from sea level to 400 meters. Bishop pine stands integrate most notably on JDSF with the Redwood and Pygmy series.

The role of fire in the Bishop series is well documented. Stands of this relatively short-lived pine species are generally even aged and originate after fires (Lindhart et al. 1967 as reported in Barbour and Major 1988). However, cones of this species will open on hot, low humidity days also. The recruitment based on this type of seed release is not known.

JDSF Distribution. The Bishop pine series covers approximately 622 acres of the JDSF ownership in the Western and Southern WWAAs.

Microsites

Although the previously-mentioned series and associations provide general descriptions of the Forest stands present on the JDSF, there are microsite habitats within each series, association, and type. Micro site features develop as the result of anthropogenic activities (road construction and maintenance, timber harvesting) and natural events (fire, wind, flooding). Microsites often provide niche habitat for plants. Since a landscape level investigation cannot encompass microsite features, the presence of such features merits attention.

Microsites provide habitat for native, rare, and invasive species alike. Wet roadside ditches provide habitat for rare sedges and swamp harebell. Seeps in the Forest may support running-pine (*Lycopodium clavatum*). Forest openings may provide habitat for early colonizing species such as the rare maple-leaved checkerbloom (*Sidalcea malachroides*) or the invasive Scotch broom (*Cytisus scoparius*).

Invasive Exotic Species

Invasive exotic species can cause negative impacts to native species assemblages and can greatly impact native diversity. There are five species of invasive exotics that occur with substantial frequency on JDSF, each of which is listed by the California Exotic Pest Plant Council (CalEPPC) as a List A-1, (most invasive wildland pest plants; widespread). These are pampas grass (*Cortaderia jubata*), Scotch broom (*Cytisus scoparius*), French broom (*Genista monspessulana*), yellow star-thistle (*Centaurea solstitialis*), and Tasmanian blue-gum (*Eucalyptus globosus*). An additional List 1A species that has the potential to become invasive on the JDSF is Himalayan berry (*Rubus discolor*). Gorse (*Ulex europaea)* is another List 1A invasive species known to occur on the Forest. The distribution of gorse is currently limited to the Western WWAA. Cape-ivy (*Senecio mikanoides*), also a List 1A species, is known to be in close proximity to JDSF.

All of the above-listed invasive species are widespread throughout much of California (except pampas grass and Cape-ivy are primarily only found in coastal regions), and all thrive in disturbed habitats. The various roads and skid trails, forest openings, and other disturbance related to timber harvesting activities provide habitat for further infestation by invasive species.

Invasive Exotic Species Descriptions

***Centaurea solstitialis* –yellow star-thistle.** Yellow star-thistle is a relatively large (up to 10 dm), deep-rooted annual plant in the sunflower family (*Asteraceae*). It has bristly, lobed leaves that are usually only present before the plant flowers. The flower heads, which are one to many per plant, are armed with stout, spine-tipped appendages (10-25 mm long) surrounding the many little (13-20 mm) yellow flowers. The small (2-4 mm), single-seeded fruits are wind-dispersed. This native to southern Europe is widespread throughout California in pastures, roadsides, disturbed grasslands, and woodlands at less than 1,300 meters in elevation. It is toxic to horses (Hickman 1993).

***Cortaderia jubata* –pampas grass.** Pampas grass is a large, densely clumped, erect perennial herb in the grass family (*Poaceae*). It has densely-hairy leaf sheaths and leaf blades 2 to 10 cm wide with the upper surface hairy at the base (Hickman 1993). Leaf margins are serrulate and razor-like (*cortadera* is the Argentine word for cutting; Hickman 1993, Munz and Keck 1959). Flowering stems are 2 to 7 meters tall with plume-like

inflorescences that are 3 to 10 dm long (Hickman 1993). Flowers are pistillate and produce fruit asexually (which is the primary form of reproduction). Pampas grass can inhabit a variety of disturbed habitats, especially coastal, and exists below 800 meters in elevation. It is reported to be native to montane western South America.

Pampas grass is one of the dominant invasive plants in the JDSF and is found throughout all watersheds.

Cytisus scoparius **–Scotch broom.** Scotch broom is an evergreen shrub in the legume family (*Fabaceae*). It grows to 2.5 meters tall and has five-angled, green, glabrous stems (hairy when young; Hickman 1993). Leaves are sessile on older branches and are composed of three leaflets (or one leaflet on younger branches). Flowers are axillary and generally golden yellow with glabrous calyx and fruits. Plants bloom April through June (Munz and Keck 1959). Scotch broom can inhabit a variety of disturbed habitats at less than 1,000 meters in elevation. Plants are native to southern Europe and Northern Africa (Hickman 1993).

Scotch broom is one of the dominant invasive plants in the JDSF.

Eucalyptus globosus **–Tasmanian blue gum.** Tasmanian blue gum is an evergreen tree, growing rapidly to 80 meters tall, in the myrtle family (Myrtaceae). As with all members of the genus, the trees have leaves of two kinds: opposite young leaves and alternate mature leaves (which are often narrower and longer than the young leaves; Hickman 1993). Mature leaves are generally narrow-lanceolate, often sickle-shaped, and are generally aromatic. Bark is generally shed in irregular strips and is sometimes persistent at the base. Flowers grow solitary in axils and are more or less sessile with cream-white stamens. Fruits are four-ribbed, warty, glaucous, and greater than 2 cm wide. Plants inhabit a variety of disturbed habitats at less than 300 meters in elevation (Hickman 1993). Native to southeast Australia, this species is the most commonly cultivated and naturalized of the *Eucalyptus* in California.

A Tasmanian blue gum infestation exists in the western WWAA on the JDSF. If disturbance occurs in close proximity to existing eucalyptus stands, then there is the potential for the spread of this species.

Genista monspessulana **–French broom.** French broom is an evergreen shrub in the legume family (Fabaceae). It grows to three meters and has angled silvery-silky-hairy twigs (Hickman 1993). Vegetative characteristics are very similar to Scotch broom except for the vestiture of mature stems, calyces, and fruits. Leaves are ternately once-compound and petioled with generally glabrous upper surfaces and appressed- or spreading-hairy lower surfaces. Four to 10 yellow flowers cluster on axillary short-shoots with silky-hairy calyces. Fruits are densely silky-hairy. Most plants reported as this species may be hybrids. Flowers, and perhaps all parts, are toxic. Plants can inhabit a variety of disturbed habitats at less than 500 meters in elevation. This species is native to the Mediterranean and the Azores (occurrence in Canary Islands questionable).

French broom is one of the dominant invasive plants in the JDSF.

***Rubus discolor* –Himalayan blackberry.** Himalayan blackberry is a robust, evergreen, arched bramble in the rose family (*Rosaceae*). Its brambles can grow to 3 meters tall (Munz and Keck 1959). Stems are 5-angled, 5 to 15 mm in diameter, and contain many prickles (Hickman 1993). Leaves are compound (often with five leaflets but sometimes three), sharply toothed, and white below. Inflorescences are many-flowered panicles of white to pink flowers. Fruits are shiny black drupelets clustered in an oblong shape (Hickman 1993, Munz and Keck 1959). Plants inhabit a variety of disturbed habitats at less than 1,600 meters in elevation and are native to Eurasia (Hickman 1993). Apparently, they are favored by rats for food and shelter.

It is not known whether Himalayan blackberry exists on the JDSF. This species has the potential to spread primarily to areas that are near existing concentrations and where openings are maintained for a sustained period of time. There is not much evidence of this species spreading on JDSF.

***Senecio mikanoides* –Cape-ivy.** Cape-ivy (also known as German-ivy) is a perennial, shiny-leaved vine in the sunflower family (Asteraceae). It is native to southern Africa and currently is widespread throughout California in more or less shady, disturbed habitats at less than 200 meters in elevation along the north and central coastal regions and in the San Francisco Bay Area (Hickman 1993). Cape-ivy leaf blades are 3-8 cm long and are about as long as the leaf stalk, which often has two lobes at its base. Leaves are more or less round in outline and sharply palmately 5-9-lobed (they are ivy-like in appearance). The inflorescence consists of 20-40 heads, each composed of many (up to 40) small yellow flowers. Fruits are single-seeded, glabrous, wind-dispersed achenes.

Cape ivy is not known to occur on JDSF, but it does occur in close proximity.

***Ulex europaea* –gorse.** Gorse is a heavily-armed, densely-branched shrub in the legume family (Fabaceae). It grows to 2 meters tall and has hairy twigs when young that become stiff, thorn-like, and intricately intertwined (Hickman 1993). Leaves become awl-like stiff spines as they mature. Inflorescences are axillary clusters with few yellow flowers. Each calyx is yellow, membranous, and persistent. Fruits are densely hairy. It is native to Western Europe and inhabits disturbed habitats to 400 meters in elevation. Old plants are apparently very flammable.

Gorse exists on the JDSF but is currently not one of the dominant invasive plants.

Threatened, Endangered, and Sensitive Species

Approximately 150 special-status plant species resulted from initial scoping of plants listed in the JDSF assessment area. The assessment area was defined as the 7.5' quadrangles that include the JDSF ownership and the adjacent quadrangles. The species were determined using the *Rare Find 2* (CDFG 2001), the *Electronic Inventory of Rare and Endangered Vascular Plants of California* (CNPS 2001), and lists of special-status species generated by the USFWS (USFWS 2002[letter]).

Species that are likely to occur within JDSF are presented in Table 14. A detailed summary of these species, including their identifying characteristics and habitat requirements, is presented in Appendix 8. Also included in Appendix 8 is a table describing the habitat for all listed species that have known occurrence on the project and adjacent USGS 7.5' Quadrangles. This table indicates the rationale for exclusion of those species that were not considered in this EIR.

TABLE 14
SPECIAL STATUS PLANT SPECIES WITH POTENTIAL OCCURRENCES WITHIN JDSF

Scientific/Common Name	CNPS	R-E-D	State	Federal
Arctostaphylos mendocinoensis "pygmy manzanita"	1B	3-2-3	None	None
Arenaria paludicola "marsh sandwort"	1B	3-3-2	CE	FE
Astragalus agnicidus "Humboldt milk-vetch"	1B	3-3-3	CE	None
Calamagrostis bolanderi "Bolander's reed grass"	1B	2-2-3	None	None
Campanula californica "swamp harebell"	1B	2-2-3	None	None
Carex arcta "northern clustered sedge"	2	?-?-3	None	None
Carex californica "California sedge"	2	3-1-1	None	None
Carex livida "livid sedge"	1A	*	None	None
Carex saliniformis "deceiving sedge"	1B	2-2-3	None	None
Carex viridula var. *viridula* "green sedge"	2	3-1-1	None	None
Castilleja mendocinensis "Mendocino coast Indian paintbrush"	1B	2-2-3	None	None
Cupressus goveniana ssp. *pygmaea* "pygmy cypress"	1B	2-2-3	None	None
Erythronium revolutum "coast fawn lily"	2	2-2-1	None	None
Fritillaria roderickii "Roderick's fritillary"	1B	3-3-3	CE	None
Horkelia marinensis "Point Reyes horkelia"	1B	3-2-3	None	None
Juncus supiniformis "hair-leaved rush"	2	2-2-2	None	None
Lasthenia macrantha ssp. *bakeri* "Baker's goldfields"	1B	2-2-3	None	None
Lilium maritimum "coast lily"	1B	2-3-3	None	None
Limnanthes bakeri "Baker's meadowfoam"	1B	3-3-3	CR	None
Lycopodium clavatum "running-pine"	2	2-1-1	None	None
Mitella caulescens "leafy-stemmed mitrewort"	2	2-1-1	None	None
Navarretia leucocephala ssp. *bakeri* "Baker's navarretia"	1B	2-3-3	None	None
Phacelia insularis var. *continentis* "North Coast phacelia"	1B	3-2-3	None	None
Pinus contorta ssp. *bolanderi* "Bolander's beach pine"	1B	2-2-3	None	None
Pleuropogon hooverianus "North Coast semaphore grass"	1B	3-3-3	CR	None
Rhynchospora alba "white beaked-rush"	2	2-2-1	None	None
Sanguisorba officinalis "great burnet"	2	2-2-1	None	None
Senecio bolanderi var. *bolanderi* "seacoast ragwort"	2	2-2-1	None	None
Sidalcea calycosa ssp. *rhizomata* "Point Reyes checkerbloom"	1B	2-2-3	None	None
Sidalcea malachroides "maple-leaved checkerbloom"	1B	2-2-2	None	None
Sidalcea malviflora ssp. *purpurea* "purple-stemmed	1B	2-2-3	None	None

TABLE 14 SPECIAL STATUS PLANT SPECIES WITH POTENTIAL OCCURRENCES WITHIN JDSF				
Scientific/Common Name	**CNPS**	**R-E-D**	**State**	**Federal**
checkerbloom"				
Triqueterlla californica "n/a"	1B	3-2-2	None	None
Viola palustris "marsh violet"	2	3-2-1	None	None
List derived from the California Native Plant Society's *Inventory of Rare and Endangered Plants of California*, 6th ed. v1.5.1.				

Federal, State and CNPS lists of rare, threatened and endangered species were used to determine the special status plant species list for this analysis. The lists from which these species were derived are updated annually. Any listing status additions or changes should be reflected in the DFMP. Furthermore, the aforementioned lists should be referenced as part of routine scoping for projects that have the potential to impact vegetation communities of the JDSF. In addition, species that are listed by CNPS as uncommon (List 4) should be considered during scoping. The uncommon species that are known to occur in Mendocino County are included in Table 15. Although CNPS is considered an authority on rare plants in California, and maintains an exhaustive database of rare, threatened, endangered and uncommon plants, they are a private organization operating independently of CDFG and USFWS. CNPS listed rare plants have not been through a formal public review process to qualify as listed or candidate species under the federal or State ESA.

TABLE 15 CNPS LIST 4 SPECIES THAT MAY POTENTIALLY OCCUR WITHIN JDSF		
Scientific Name	**Common Name**	**Family**
Angelica lucida	sea-watch	Apiaceae
Antirrhinum virga	tall snapdragon	Scrophulariaceae
Asclepias solanoana	serpentine milkweed	Asclepiadaceae
Astragalus breweri	Brewer's milk-vetch	Fabaceae
Astragalus rattanii var. *rattanii*	Rattan's milk-vetch	Fabaceae
Calamagrostis foliosa	leafy reed grass	Poaceae
Calandrinia breweri	Brewer's calandrinia	Portulacaceae
Calystegia collina ssp. *oxyphylla*	Mt. Saint Helena morning-glory	Convolvulaceae
Ceanothus gloriosus var. *exaltatus*	glory brush	Rhamnaceae
Ceanothus gloriosus var. *gloriosus*	Point Reyes ceanothus	Rhamnaceae
Clarkia gracilis ssp. *tracyi*	Tracy's clarkia	Onagraceae
Collomia diversifolia	serpentine collomia	Polemoniaceae
Cypripedium californicum	California lady's-slipper	Orchidaceae
Cypripedium montanum	mountain lady's-slipper	Orchidaceae
Epilobium septentrionale	Humboldt County fuchsia	Onagraceae
Erigeron decumbens var. *robustior*	robust daisy	Asteraceae
Eriogonum strictum var. *greenei*	Greene's buckwheat	Polygonaceae
Eriogonum umbellatum var. *bahiiforme*	bay buckwheat	Polygonaceae
Eschscholzia hypecoides	San Benito poppy	Papaveraceae
Fritillaria agrestis	stinkbells	Liliaceae
Fritillaria purdyi	Purdy's fritillary	Liliaceae
Gilia sinistra ssp. *pinnatisecta*	pinnate-leaved gilia	Polemoniaceae
Glehnia littoralis ssp. *leiocarpa*	American glehnia	Apiaceae
Hackelia amethystina	amethyst stickseed	Boraginaceae
Hemizonia congesta ssp. *calyculata*	Mendocino tarplant	Asteraceae

TABLE 15 CNPS LIST 4 SPECIES THAT MAY POTENTIALLY OCCUR WITHIN JDSF		
Scientific Name	**Common Name**	**Family**
Hemizonia congesta ssp. *tracyi*	Tracy's tarplant	Asteraceae
Lathyrus glandulosus	sticky pea	Fabaceae
Lilium rubescens	redwood lily	Liliaceae
Linanthus acicularis	bristly linanthus	Polemoniaceae
Linanthus latisectus	broad-lobed linanthus	Polemoniaceae
Linanthus rattanii	Rattan's linanthus	Polemoniaceae
Listera cordata	heart-leaved twayblade	Orchidaceae
Lomatium engelmannii	Engelmann's lomatium	Apiaceae
Melica spectabilis	purple onion grass	Poaceae
Mimulus nudatus	bare monkeyflower	Scrophulariaceae
Navarretia cotulifolia	cotula navarretia	Polemoniaceae
Navarretia subuligera	awl-leaved navarretia	Polemoniaceae
Orobanche valida ssp. *howellii*	Howell's broomrape	Orobanchaceae
Perideridia gairdneri ssp. *gairdneri*	Gairdner's yampah	Apiaceae
Piperia candida	white-flowered rein orchid	Orchidaceae
Pityopus californicus	California pinefoot	Ericaceae
Pleuropogon californicus var. *davyi*	Davy's semaphore grass	Poaceae
Pleuropogon refractus	nodding semaphore grass	Poaceae
Ranunculus lobbii	Lobb's aquatic buttercup	Ranunculaceae
Ribes roezlii var. *amictum*	hoary gooseberry	Grossulariaceae
Ribes victoris	Victor's gooseberry	Grossulariaceae
Silene campanulata ssp. *campanulata*	Red Mountain catchfly	Caryophyllaceae
Stellaria littoralis	beach starwort	Caryophyllaceae
Streptanthus barbiger	bearded jewel-flower	Brassicaceae
Streptanthus drepanoides	sickle-fruit jewel-flower	Brassicaceae
Veratrum fimbriatum	fringed false-hellebore	Liliaceae
Wyethia longicaulis	Humboldt County wyethia	Asteraceae
Zigadenus micranthus var. *fontanus*	marsh zigadenus	Liliaceae

Federal and State-listed Plant Species

Marsh sandwort (*Arenaria paludicola*) is listed as federally and state endangered. Four additional plant species are considered by the State of California to be endangered or rare. Baker's meadowfoam (*Limnanthes bakeri*) and North Coast phacelia (*Phacelia insularis* var. *contenentis*) are state listed rare species, and Humboldt milk-vetch (*Astragalus agnicidus*), and Roderick's fritillary (*Fritillaria roderickii*) are state listed endangered.

6.2.2 Regulatory Framework for the Protection of Botanical Resources

Rare, threatened, endangered, and candidate plant species are recognized by the state as having inherent value. The protection of such species is provided primarily through CEQA standards, CDFG Codes, the NPPA. and the CESA. Protection for plant species is also provided in the CFPA and CFPR, and the THP review process. However, consultation with CDFG and MOUs with other agencies is also important in the preservation of plant diversity.

CEQA

CEQA provides that public agencies whose activities may affect the environment shall prevent environmental damage (CCR § 15000-15387). Rare, threatened, or endangered plant species, subspecies, and varieties are specifically considered in various sections of CEQA (CCR § 15380). State certified regulatory programs are subject to the provisions in CEQA regarding the avoidance of significant adverse effects on the environment, including native plant communities and rare, threatened, and endangered plants, where feasible (CCR § 15250). Public Resources Code § 21080.5(d)(2)(a) states that the rules and regulations adopted by the administering agency of a certified regulatory program shall "require that an activity will not be approved or adopted as proposed if there are feasible mitigation measures available which would substantially lessen any significant adverse effect which the activity may have on the environment." The FPRs are a State Certified Regulatory Program (CCR § 15251(a)) and are subject to these rules.

NPPA

The Native Plant Protection Act (Fish and Game Code § 1900-1913) was enacted in 1977. This act established the criteria for determining if a species, subspecies, or variety of native plant is endangered or rare. It has also been established that state agencies, in consultation with CDFG, shall implement programs for the conservation of endangered or rare native plants (Fish and Game Code § 1911). However, THP's submitted in accordance with the Z'berg-Nejedly Forest Practice Act of 1973 were exempt from this type of regulation (Fish and Game Code § 1913). Under this Fish and Game Code section, where CDFG notifies a landowner that a rare or endangered plant is growing on their land, the landowner shall notify the Department at least 10 days in advance of changing the land use to allow the Department to salvage the plant. Submission of a THP is considered notification of the Department of Fish and Game under this section.

CESA

The California Endangered Species Act (Fish and Game Code § 2050-2116) was enacted in 1984 and enhanced protection for endangered, rare, and threatened plant species. Indeed, "it is the policy of the state to conserve, protect, restore, and enhance any endangered species or any threatened species and its habitat" (Fish and Game Code § 2052). It is also state policy to disapprove projects that are proposed without feasible mitigation to reduce the impacts below the level of significance and that would jeopardize the continued existence of any endangered or threatened species or result in the adverse modification of habitat essential to the existence of those species (Fish and Game Code § 2053–2055).

6.2.3 Project Measures for Protection of Botanical Resources

Background

The DFMP addresses the protection of botanical resources throughout the document. The Forest management goals include improving the body of information concerning economic forest and timber management available to the general public, non- and industrial timber owners, resource professionals, and timber operators. Furthermore, land management activities that promote and maintain forest health, ecological processes, and biological diversity are mandated by the goals of the Forest. The DFMP addresses special habitat and vegetation communities; rare, threatened, and endangered plant species; and the impacts of invasive exotics. In addition, research and demonstration of proper management of improved forest management methods are mandates of JDSF.

Goals and Objectives

Research and Demonstration: 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.

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.

Watershed and Ecological Processes: Promote and maintain the health, sustainability, ecological processes, and biological diversity of the Forest and watersheds during the conduct of all land management activities.

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 therefore warrant extra concern.

Forest Restoration: Work towards achieving a balanced mix of forest structures and attributes in order to enhance forest health and productivity.

Minimize the influence of exotic plants and animals.

Information and Planning: Develop, maintain, and update management plans and other planning documents and processes. Manage and support the information needs of all State Forest Programs.

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.

6.2.4 Specific Management Actions

The DFMP includes specific management actions for each aspect of the botanical resource. Plants of special concern, Special Concern Areas, Unique Habitats, and Invasive Exotic control are all addressed. In general, the DFMP provides for the protection of special vegetation types, such as old-growth and pygmy forest or wetlands, through restricting activities in these communities and by utilizing an Integrated Weed Management approach to prevent spread of exotics into special communities. Special status species are afforded guidelines for protection on a project basis.

Special Concern Areas and Unique Habitats

Old-growth. The DFMP provides for the retention and protection of old-growth groves, old-growth aggregations and individual old-growth trees as discussed in the Timber Section of this document.

Activities that simulate natural disturbance, such as understory burning or snag creation, may occur in old-growth reserves.

In addition, the DFMP accounts for the recruitment of late seral stands.

Cypress Groups. Stands dominated by pygmy cypress occurring on unproductive soils outside of true pygmy forests will not be harvested.

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.

Eucalyptus Infestation Areas. JDSF intends to convert the Eucalyptus stands into conifer stands.

<u>Invasive Exotic Plant Species Control</u>

The DFMP supports integrated weed management (IWM) as an approach to controlling exotic invasive plants. IWM is a prevention oriented approach that emphasizes control of environmental conditions that cause or promote weed infestations. IWM may make use of the benefits of cultural, mechanical, herbicide application, prescribed fire, biological agents or other techniques to reduce exotic weed populations and to promote forest health. The DFMP includes 8 planned actions as summarized below.

- The impacts of invasive exotics and the potential for spread will be considered during the development of individual projects.

- Re-establishment of native vegetation will be considered in disturbed open areas adjacent to forest roads in order to minimize weed spread.
- Native conifers will be planted in high densities along forest roads and in timber harvest units where ground skidding equipment is used.
- A program to train staff in the identification and management of weed species will be implemented.
- The status of infestations and management effectiveness will be periodically evaluated.
- JDSF proposes a cooperative with local, state, and federal agencies, forest landowners, and private and public organizations to develop weed management strategies.
- Forest staff will attempt to periodically identify post-harvest emerging weed populations and determine treatment needs.
- JDSF will continue to support the International Broom Initiative.
- JDSF will continuously update staff on information regarding new exotic species infesting or with the potential to infest the Forest. Information will be derived from the exotic's list produced by the California Exotic Plant Pest Council.

Plant Species of Concern

The DFMP identifies the following six plant species of concern as occurring 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.

Habitat Protection: Management activities will be altered if necessary, including avoidance of plant populations, to prevent significant negative effects to habitat. FPR protections for wet meadows, springs, and other wetland habitats will be provided for riparian habitat.

Species Protection: A qualified botanist or trained staff will conduct seasonally appropriate rare plant surveys, as necessary, to assess plant occurrence in potential habitat subject to management activities. Surveys may include suitable on-and off-site habitat that may be

affected by 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.

Plant Species of Concern Possibly Present on JDSF: The DFMP identifies that the following plant species of concern, although not currently known from JDSF, may occur in areas of suitable habitat: Roderick's Fritillary, Leafy Reed Grass, North Coast Semaphore Grass, Blasdale's Bent Grass, Thurber's 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.

Tables 14 and 15 (Section 6.2.1) include additional plant species of concern that may occur on JDSF, based on the scoping described in section 6.2.1. Although not directly addressed in the DFMP, species of concern, such as those in Tables 14 and 15, are addressed in general terms under the discussion of scooping outlined below.

As resources allow, additional research, forest and watershed inventory, and pre-project survey and preparation/layout work in areas of suitable habitat will enhance the Forest's knowledge base concerning presence of these species and help foster the development of appropriate management strategies.

Guidelines for Species Surveys and Avoidance of Significant Impacts: The DFMP includes guidelines for conducting plant surveys and development of mitigation measures where management activities may impact rare plants.

- *Listed Species:* JDSF will evaluate the potential for individual land management actions to have a significant impact on listed (rare, threatened, or endangered) species. In those cases where that impact may be significant, appropriate survey and mitigation measures will be implemented. Individual project circumstances will dictate the procedures to be used to determine the degree of project associated impacts. In general, a scoping process that includes CDFG input, 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.
- *Unlisted 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 through the scoping process. Unlisted species include CNPS listed species as identified in Tables 14 and 15.

Scoping: The scoping process would normally begin with the identification of sensitive species and their habitats that may be affected by the project and are of management concern. For habitat issues, the scoping process may include habitat issue characteristics, a

description of presence in the assessment area, and where potentially impacted, a description of the 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. Mitigation measures will be developed with consideration of input provided by CDFG.

California Forest Practice Rules

The Forest Practice Act of 1973 requires that an agency adopt feasible mitigation to avoid significant environmental impacts. The FPR require that a THP be disapproved if the plan would "irreparably damage" CDFG listed rare or endangered species, and non-compliance with CDFG Code 1913 can be demonstrated (California Forest Practice Rules § 898.2(e)). In addition, the Forest Practice Rules implement the feasible mitigation standard under 14 Cal. Code Reg. § 896.

6.2.5 Thresholds of Significance

Based on policy and guidance provided by CEQA (Public Resources Code (PRC) Section 21001 and the CEQA Guidelines), an impact of the proposed project would be considered significant if it would result in one or more of the following:

- Threaten to eliminate a plant community.
- Reduce the number of an endangered, rare, or threatened plant species.
- Restrict the range of an endangered, rare, or threatened plant species.
- Have substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status plant species in local or regional plans, policies, or regulations, or by the CDFG or USFWS.
- Conflict with the provisions of an adopted Habitat Conservation Plan, or other approved local, regional, or State habitat conservation plan related to a botanical resource.

6.2.6 Impacts

Impacts to botanical resources are determined by assessing the potential type, level, and frequency of DFMP activities affecting the resource and predicting the response. Impacts to communities and habitats are assessed based on the potential for the projects proposed in the DFMP to alter the characteristics of the Forest and its communities. The activities that will have the largest potential for impacts are the timber harvest, road management, and fire protection programs. These programs will produce more impacts due to their broad scope and intensive ground disturbance. An intensive inventory of the botanical resources has not been conducted on JDSF. Potential impacts to botanical resources will be mitigated at the project implementation level by species-specific surveys that will be conducted following scoping.

Impact 1: *The project has the potential to threaten to eliminate a plant community*: (Less than significant)

The DFMP affords protection for rare and unique plant communities. The old-growth reserves, pygmy forests, bogs, and cypress groups are protected from logging. Timber harvest represents the largest source of potential impacts to these special communities. The DFMP also provided timber management practices that maintain the overall structure of forest communities. Although not at current levels, the hardwood component of the Forest will be maintained. The projects proposed in the DFMP are unlikely to eliminate a plant community.

JDSF has committed to maintaining the current distribution and species composition of the pygmy forest plant community and protecting it from harmful human disturbance.

Impact 2: *The project has the potential to threaten to reduce the number of an endangered, rare, or threatened species.* (Less than significant)

Potential impacts 2 and 3 are addressed together under impact 3.

Impact 3: *Have substantial adverse effects, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status plant species in local or regional plans, policies, or regulations, or by the CDFG or USFWS.* (Less than significant)

The management activities described in the DFMP have the potential to reduce the number, or have substantial adverse effects to rare, threatened, or endangered species if a listed species were to occur in an area subject to ground or vegetative disturbing management activities. As part of the DFMP, the Department has committed to having a qualified botanist (or other trained staff) conduct seasonally appropriate rare plant surveys, as necessary, to assess plant occurrence in potential habitat subject to management activities. Surveys are to include suitable on- and off-site habitat that may be affected by project implementation. Survey results will be documented and provided to CDFG. Management activities will be altered (including avoidance of the plant population) if necessary to prevent significant negative effects.

Management activities that result in ground and/or vegetation disturbance would be subject to rare plant surveys. This includes, but is not limited to, timber harvest and timber stand improvement

practices, road maintenance programs, prescribed fire, installation of shaded fuel breaks, campground maintenance or expansion, trail development, herbicide application and IWM activities.

Some rare, threatened, and endangered species will be protected by default. A rare species that is located in an SCA (e.g. WLPZ or pygmy forest) will receive incidental protection. This is an effective strategy for rare plant protection, but only for plants that are likely to occur in the habitat types within the SCAs. Three species show a great affinity to the pygmy forest, while another two are often associated with pygmy forest but are found in other habitats. The WLPZs will provide a measure of protection to some species. Approximately 10 to 15 percent of the CNPS listed species are found in wetlands, which are generally protected by WLPZs. Several species, such as coast fawn-lily and running-pine, are forest generalists and would not be protected by SCAs.

The Forest has committed to completing a scoping process, including rare plant surveys as necessary, on a management activity or project basis to determine if the management activity or project has the potential to significantly impact a listed species. For sensitive species that are not listed, the need for surveys and protection measures will be developed with input from CDFG. The scoping process as described in the DFMP is broad enough to address the need to consider surveys for non-listed sensitive plant species included in Table 14 and 15 but not listed as potentially occurring on the Forest in the DFMP, and to address additions or deletions of plant species from sensitive species lists.

Impact 4: *The project has the potential to threaten to restrict the range of an endangered, rare, or threatened species.* (Less than significant)

The DFMP projects have the potential to threaten to restrict the range of several listed species. Fifteen of the currently listed species that have the potential to occur on the JDSF are at the end of their range in Mendocino County. Another six are currently only known from Mendocino county. Ground and/or vegetation disturbing activities conducted on the JDSF that negatively impact population trends have the potential to restrict the range of endangered, rare, or threatened species.

As discussed above, JDSF has committed to completing a scoping process, including rare plant surveys as necessary, on a management activity or project basis to determine if the management activity or project has the potential to significantly impact a listed species and developing mitigation measures for the protection of endangered, rare, or threatened plants if they are identified.

Impact 5: *Conflict with the provisions of an adopted Habitat Conservation Plan, or other approved local, regional, or State habitat conservation plan related to a botanical resource.* (No Impact)

The DFMP policies do not conflict with local, regional, or State habitat conservation plans or policies and ordinances.

6.2.7 Mitigation and Monitoring

The DFMP includes specific protection measures for rare plant communities and sensitive plant species, including surveying for sensitive plant species on a project-by-project basis to determine if a project has the potential to affect a sensitive plant species. Use of the scoping, surveying, and mitigation development process outlined in the DFMP and in Section 6.2.4 above will allow for project design that will reduce project impacts to less than significant levels. No additional mitigation measures are needed.

6.2.8 Alternatives Analysis

Table 16 presents a comparison of impacts among alternatives for botany-related issues.

TABLE 16
COMPARISON OF BOTANY-RELATED ALTERNATIVES

Alternatives						Discussion
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant–Mitigation Feasible (5) Significant–Mitigation Not Feasible**
Impact 1: The project has the potential to threaten to eliminate a plant community.						
Alt. A						The primary land use on JDSF would be public recreation that would utilize current facilities. Substantial change would not occur in the plant communities as a result of this type of use.
Alt. B						The DFMP affords protection to communities that would, without mitigation, be imperiled. Pygmy forest and pygmy cypress groups, the communities most at risk, are included as SCAs. These areas are afforded protection from management activity related impacts. Other communities that are not designated SCAs, such as the redwood forest, would not be threatened under this option.
Alt. C (DFMP)						
Alt. D						
Alt. E						
Impact 2: The project has the potential to threaten to reduce the number of an endangered, rare, or threatened species. **Impact 3: The project has the potential to have substantial adverse effects, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status plant species in local or regional plans, policies, or regulations, or by the CDFG or USFWS.** **Impact 4: The project has the potential to threaten to restrict the range of an endangered, rare, or threatened species**						
Alt. A						Allowing natural processes to be the architect of the Forest would not negatively impact rare species.
Alt. B						Continuing to manage the Forest as directed by the 1983 management plan would not provide the same level of protection for endangered, rare, or threatened plant species as provided in the DFMP. Management activities subject to the Timber Harvest Plan review process would likely include protection measures similar to the measures proposed in the DFMP. However, other management activities that have the potential to impact plant species would not be likely to include the same level of protection. Mitigation similar to what is proposed for alternative C would be feasible for this alternative also.
Alt. C (DFMP)						Each of these alternatives would include the same protection measures for endangered, rare, or threatened plant species as included in the DFMP. The primary difference between the alternatives is the degree of timber harvest. Recreation levels may differ, but not significantly. The impacts of the alternatives are effectively equal with incorporation of the protection measures provided in the DFMP. The DFMP does have a higher degree of project activity proposed than any of the other options. For this reason, there is a higher probability of impacting rare plants. However, the DFMP, with the proposed protection measures, will reduce the level of impacts to below significant.
Alt. D						
Alt. E						
Impact 5: Conflict with the provisions of an adopted Habitat Conservation Plan, or other approved local, regional, or State habitat conservation plan related to a botanical resource.						
All Alternatives						There is no HCP for JDSF, and there are no other conflicts with approved local, regional or State HCP's, ordinances or policies.

6.3 Timber Resource

6.3.1 Setting

Historic Harvesting Activities

The Jackson Demonstration State Forest is located in the coastal redwood belt and has vegetation typical of other young-growth coastal redwood forests in Mendocino County and other parts of coastal northern California. Redwood and Douglas-fir trees dominate the Forest, while hardwoods and other conifers are also present as components of redwood or Douglas-fir dominated stands. Vegetation patterns on JDSF are largely the result of previous timber harvesting activities.

Activities within the boundaries of JDSF began in 1862 with harvesting of the original stands in the Caspar Creek drainage by the Caspar Lumber Company. Initial methods involved hand labor and the use of splash dams constructed in the upper watercourse reaches to transport logs to the mill pond at the mouth of Caspar Creek. This type of logging harvested only the trees near the stream channel and was limited to the Caspar Creek drainage just above the mill site, and to the lower slopes of larger watercourses such as the South Fork of the Noyo River and the North Fork of Big River. As logging methods progressed to the use of bull teams and steam donkeys, side gulches and more remote areas were harvested. In 1876, the construction of a railroad began and gradually extended, until over 20 miles of mainline were in use at the time it was abandoned in 1946. At this time, (and until present) operations were converted to the use of trucks for log hauling requiring a truck road network.

Early harvesting activities most closely resembled an intensive clearcut and burn silvicultural approach with no reforestation efforts and reliance on natural regeneration. This approach continued until the mid 1940's, where after World War II, harvesting practices changed to partial cutting due to implementation of the California *ad valorum* timber property tax and the first forest practice rules in 1945 which contained post harvest stocking standards. In 1947, the State of California purchased the property from Caspar Creek Lumber in five title transfers with the last occurring in 1955. Clearcutting had progressed eastward to Three Chop Ridge on the divide between the Noyo and Big River drainages. From here and continuing eastward into Chamberlain Creek, James Creek, and the rest of the North Fork of Big River, partial cutting to remove approximately 70% of the existing stands occurred until 1976 for taxation reasons. As regeneration became established in these partially cut areas, re-entries to remove the residual overstory began in 1963 and have been completed since approximately 1985. Overstory harvesting resulted in stands with irregular uneven-aged structure and a significant hardwood component. This type of stand structure is typical of current conditions on the east end of the Forest, and is significantly different from the west end.

While the old-growth harvesting was progressing in the eastern portion of JDSF, entries into the young-growth stands in the western portion of the Forest began in 1959, where partial cuts were conducted in the older stands first. The areas entered were in the Caspar, Jughandle, and South Fork of Noyo watersheds. Most of the early entries removed approximately 50% of the standing volume and later entries had a specified residual stand

density except for a large clearcut in 1964. As young-growth harvesting progressed, both even-aged and uneven-aged silvicultural methods were used and provided for research and demonstration projects in conjunction with timber production.

Forest Vegetation Classification on JDSF

Three general vegetation classification systems have been used to describe and map the vegetation and habitat types on JDSF. The timber sections of this analysis use the JDSF Vegetation Classification System, the wildlife sections use the California Wildlife Habitat Relationship (CWHR) system and the botanical sections use a system based on the series and associations developed by Sawyer and Keeler-Wolf (1995) and Holland (1986). Each system has been used for a specific purpose based on the strengths of the system. Appendix 8 provides a detailed description of the vegetation typing systems and comparison tables to crosswalk from one system to another.

JDSF Vegetation Classification System

Tables 17, 18, and 19 show the vegetation types, tree size, and canopy cover density classes used in this system, respectively.

TABLE 17
JDSF VEGETATION TYPES

Abbreviation	Vegetation Type
R	Redwood
RD	Redwood/Douglas-Fir
DR	Douglas-Fir/Redwood
MC	Mixed Conifer
HR	Hardwood/Redwood
AL	Alder
CPC	Closed-Cone Pine/Cypress (Bishop Pine/Cypress)
PYGMY	Pygmy Forest
HC	Mixed Hardwood/Conifer
GRBC	Grass/Bare Ground
BR	Brush

TABLE 18 TREE SIZES	
JDSF Size Class	**DBH Range**
1	<1"
2	1"-6"
2O	Size 2 (>75%) under 4, 5 or 6
3	6"-11"
4	11"-18"
4M	Size 4 over 2 or 3
5	18"-24"
5M	Size 5 over 2, 3 or 4
6	>24"
6M	Size 6 over 2, 3, 4 or 5

TABLE 19 DENSITY	
JDSF Density	**Percent Cover**
S	10-24.9
P	25-39.9
M	40-59.9
D	60-79.9
E	80-100

The dominant vegetation type on JDSF is redwood/Douglas-fir, which covers about half (54 percent) of the Forest (see Table 20). Other common vegetation types are redwood and Douglas-fir/redwood, each comprising about 15 percent of the area. The remaining forested vegetation types, in descending order of abundance, are hardwood/redwood, mixed hardwood/ conifer, pygmy forest, closed-cone (Bishop) pine/cypress, mixed conifer, and alder. Grassland/bare ground and brush vegetation types together make up less than 1 percent of JDSF.

TABLE 20 ACREAGE OF VEGETATION TYPES ON JDSF BY WWAA						
Vegetation Type	**Watershed**					
	Northern	**Western**	**Southern**	**Eastern**	**Other**	**Total**
Redwood	2,831	1,561	1,796	1,243	15	7,446
Redwood/Douglas-fir	7,832	8,335	3,725	6,225	127	26,244
Douglas-fir/Redwood	2,229	635	1,415	3,166	16	7,461
Mixed Conifer	14	137	0	86	0	237
Mixed Hardwood/Conifer	118	8	47	1,654	51	1,878
Hardwood/Redwood	758	0	155	2,890	12	3,815
Alder	0	57	0	0	0	57
Pygmy Forest	0	568	36	0	9	613
Closed-cone Pine/Cypress	0	577	33	0	13	623
Grassland/Bare Ground	54	90	6	58	7	215
Brush	0	0	0	63	0	63
Total	**13,836**	**11,968**	**7,213**	**15,385**	**250**	**48,652**

Old-Growth and Late Successional Development Areas

Old-growth forests are a unique vegetation community within the Forest. In addition to the biological functions of old-growth forest, a significant segment of the public believes that old-growth forests are a resource with significant values that should be preserved. There is currently no clear definition for "old-growth" in the FPRs or the 1983 Management Plan. 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.

Management activities have the potential to impact the old-growth forest resource. There are 11 old-growth groves designated on JDSF, totaling 459 acres. Residual old-growth trees are also present as isolated individuals or in small aggregations across JDSF. The designated old-growth groves are currently managed as non-harvest areas. Aggregations of residual old-growth trees and isolated individual old-growth trees have also been retained during recent timber harvesting except where trees were removed for safety reasons or to allow road construction.

In addition to true old-growth forest, JDSF contains young-growth forest that is beginning to developed late seral or late successional forest characteristics. The terms "late successional" and "late seral" are used interchangeably in this document. Based on the definition of a late successional forest stand contained in the FPRs, functional characteristics of late successional forests include large decadent trees, snags and large down logs. Similarly, late seral forests are characterized in the FPRs as having large trees, multi-layered canopy and a large number of snags and downed logs that contribute to an increased level of stand decadence.

Large young-growth trees have developed in many of the Forest stands. Approximately 60% of the Forest is classified as consisting of stands with trees larger than 24 inches DBH. Although large trees are not uncommon, the Forest is generally lacking large decadent trees, large snags, large down woody debris (LWD) and multi-story canopy structure. Forest inventory data indicate that there are less than 2 snags per acre across the Forest with an average diameter of approximately 18 inches. Approximately 57% of the snags are conifers; the remaining 43% are hardwoods. The limited inventory data for LWD indicates that there is approximately 8 pieces of LWD per acre larger than 16 inches diameter and 20 feet long. Most of the LWD is moderately to severely decayed. Past timber operations included harvest of most of the merchantable down material. A multi-story canopy structure is developing in some of the managed stands. Inventory data indicate that as much as 19% of the Forest may be occupied by multi-storied stands.

Several areas across the Forest have been designated as late successional or late seral development areas including class I and II WLPZs, and the Mendocino Woodlands Special Treatment Area (MWSTA). Management practices in these areas have been modified to promote the development of late successional forest characteristics. There is an exception to promoting late successional forest conditions in the MWSTA, where the Railroad Gulch

Silvicultural (Helms) Study involving approximately 270 acres was designed to study the long term effects of single tree and group selection, and not to promote late successional forest conditions.

Silvicultural Methods

Prior to discussion on present silviculture methods used in JDSF to achieve the goals outlined in the 1983 Management Plan, and which recognize changes in legislation, policy, regulation, and public values since implementation of that Plan, it is necessary to re-visit management objectives and constraints. 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).

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. These changes required elevating wildlife, watersheds, and ecosystem processes concerns to higher levels of importance in relation to the timber management and the research, demonstration and education programs.

In response to this increasing awareness, silvicultural constraints were established in a number of special concern areas for the protection of wildlife, watersheds, and ecosystems. Constraints have also been identified for other areas with special concern or administrative status.

Silvicultural Prescriptions in Special Concern Areas

Although not specifically addressed in the 1983 Management Plan, a number of Special Concern Areas have been developed across the Forest. Special concern areas (SCAs) are designated portions of the Forest with restrictions on forest management activities because of resource sensitivity or special administrative status. Although the timber stands that makeup the special concern areas are capable of supporting a wide range of silvicultural prescriptions, the application of certain prescriptions in these areas has been limited to avoid unacceptable results relative to the resource protection required or management objectives. Restricting possible silvicultural prescriptions helps to create or retain forest conditions in special concern areas that are consistent with the management objectives.

The following special concern areas are considered because of their natural resource value and sensitivity to disturbance:

- *Cypress groups*—forest stands dominated by pygmy cypress that occurs on sites with generally unproductive soils (i.e., sites that are considered non-timberland), but not considered to be true pygmy forest. These areas are non-harvest SCAs. Note that conifer stands containing cypress that occur on more productive sites (i.e., site quality I-V according to the FPRs) are subject to harvesting and are not included in this special concern area.
- *Pygmy forest*—a unique type of dwarf vegetation found on old marine terraces dominated by pygmy cypress and other species. This special concern area includes nearly all of the Jughandle Reserve special concern area, along with other pygmy forest stands on JDSF that occur outside of the Jughandle Reserve boundaries. These areas are non-harvest SCAs.
- *Jughandle Reserve*—an administrative area designated to protect pygmy forest found on JDSF and to manage recreational access to these lands in a manner compatible with human use in the adjacent Jughandle State Reserve. These special concern areas lie almost entirely within the pygmy forest special concern area. These areas are non-harvest SCAs.
- *Eucalyptus stand*—this is a forest stand located in the Caspar Creek planning watershed that includes a high density of eucalyptus mixed in with Douglas-fir, redwood, and other species. 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.
- *Old-growth grove reserves*—includes the eleven existing old-growth, grove reserves. These areas will not be harvested.
- *Northern spotted owl nest areas*—buffers around known nest sites that are managed to minimize disturbance to these sites and enhance their value as nesting habitat for the northern spotted owl.
- *Osprey nest areas*—buffers around known nest site locations that are managed to minimize disturbance to these sites and enhance their value as nesting habitat for osprey.
- *Watercourse and lake protection zones (WLPZ)*—areas requiring special management considerations to protect aquatic and riparian resources and promote development of late successional forest stand conditions.

The following special concern areas are presently designated due to human use concerns and, in some cases, natural resource sensitivity:

- *Campground buffers*—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*—areas occupied by the Parlin Fork and Chamberlain conservation camps.

- *Parlin Fork management area*—an area adjacent to the Parlin Fork Conservation Camp that is used as a demonstration area for small woodland management.
- *Water supply areas*—designated areas for domestic water supply on JDSF that are sensitive to disturbance. Only a limited range of silviculture is allowed in these areas.
- *Neighbor buffers*—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*—operated by PG&E. The power line right-of-way runs through the Forest, generally parallel to Highway 20. This area is not available for timber production.
- *Road and trail corridors*—buffer areas along trails and roads to maintain aesthetic qualities desired by the public. Only a limited range of silviculture is allowed in these areas.
- *Woodlands special treatment area*—a special management area adjacent to Mendocino Woodlands. Harvesting is restricted within 200 feet of camp areas, cabins and main roads. Silviculture activities are focused on promoting late successional forest conditions, maintaining aesthetic qualities desired by the public, and minimizing impacts on the operation of Mendocino Woodlands.
- *State Park Special Treatment Areas*-- areas along the boundary of JDSF adjacent to State Park boundaries where a buffer zone is designated to minimize impacts on State Park resources. Only a limited range of silviculture is allowed in these areas.
- *Research areas*—areas throughout the Forest that are designated research areas or have current research projects that limit the range of silvicultural methods that may be applied.

There are many special concern areas that overlap. Examples include the power line right-of-way crossing through the WLPZ or the uneven-aged management area; the overlap of pygmy forest and Jughandle Reserve; or road and trail corridors within the Woodlands special treatment area.

The SCA categories that account for the overlap areas as identified through GIS analysis, are as follows with their designated restrictions:

- No Harvest Areas—Total 1,660 acres
- Limited Silviculture—Total 15,447 acres
- Research, demonstration, and experimental areas set aside—Total 1,766 acres
- Eucalyptus infestation—Total 270 acres

In addition to these identified areas, unspecified acres are associated with osprey nest areas and northern spotted owl nest areas, which are constrained with limited silviculture while the nests are in use. Geologically sensitive areas may receive harvest restrictions including limited silviculture.

Total constrained volume estimated in the no cut categories is approximately 97.4 MMBF for the four WWAAs, while the volume in the limited silviculture categories is approximately 677 MMBF. Volumes were not estimated for the unspecified areas.

Parts of the Forest not affected by these constraints are generally available for management that can be planned to best meet the array of management goals.

Silviculture Methods Outside of Special Concern Areas

In keeping with the FPR mandate of maximum sustained production of high quality forest products and accounting for the needs of the various special concern areas, various silvicultural regimes are presently in use. This present use of various silvicultural methods have evolved from the 1983 JDSF Management Plan where primarily even-aged silviculture was emphasized except where " … reasons for choosing uneven-aged management … outweigh whatever economic loss is envisioned (as compared to even-aged management). These reasons might include aesthetics, wildlife values, site stability and, … demonstrational and experimental designs." Presently, three broad categories of silvicultural systems are used on JDSF— uneven-aged silviculture consisting of single tree/cluster selection and group selection methods, even-aged silviculture, and commercial thinning. These are further described below.

Uneven-aged Management: This is the dominant silvicultural 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. There are two predominant uneven-aged silvicultural systems defined in the FPR and practiced in this region, single tree/cluster selection and group selection.

Single Tree/Cluster Selection: Single tree/cluster selection creates 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 typical approach is 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, and the ratio of large trees to smaller trees are usually adjusted on a site-specific basis. The largest trees may be kept to meet objectives other than silviculture.

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 presently managed under the selection system are even-aged, single-canopy young-growth stands, or have had only one partial cut that may or may not have resulted in successful creation of a new age class. Within the region, the practice of selective harvest of young-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 is 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.

Group Selection: Group selection management creates 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 present cutting cycle for an area designated for group selection is 10 to 25 years with the goal to establish three to five separate age classes by the time the management compartment is regulated.

The size of group selection openings range from ¼ acre to 2½ acres as provided in the FPR. Within stands, group sizes remain fairly constant to maintain the ability for comparison between stand management options. The intent under this silvicultural method is to demonstrate and assess a range of harvest opening sizes, and maintain diversity for research within the Forest. 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.

An exception to the typical group opening size of ½ to 2½ acres is the 14 gulch compartment where openings will be as large as five acres. A five-acre opening roughly corresponds to the limit of influence from trees that are 180 feet tall. These larger openings are considered even-aged harvest areas under the FPRs.

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 are simplified by having groups that reach the full length of the cable setting. This has sometimes required 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 remain shaded along the south edge, while a north-south alignment allows more sunlight to reach the opening. This effect may be accentuated on north-facing slopes.
- **Site preparation and artificial regeneration**. Where these cultural practices are prescribed, their implementation can be more efficiently facilitated by larger opening sizes.

Even-aged Management: Even-aged regeneration methods include clearcutting, shelterwood, and seed tree methods. Even-aged harvests presently used in JDSF involves the treatment of areas between 2 ½ and 40 acres in size, although harvest units over 30 acres are uncommon on JDSF. Over the past decade, even-aged management in JDSF has evolved to include retention of forest structure elements such as variable densities, live trees, and understory vegetation. There is considerable potential to vary the schedule and placement of even-aged units to maintain or create different habitat patch sizes and habitat connectivity.

Even-aged management on JDSF has involved 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

Some of the criteria used 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, forest structural elements, patch size, and connectivity.
- **Diversity of age classes for Research and Demonstration Needs.** A research or demonstration project may require the acceleration or postponement of an even-aged regeneration harvest. Even-aged structure conditions are created in harvest units from 2 ½ to 40 acres in size. Sufficient sunlight reaches the Forest floor for newly established shade intolerant conifer species to grow vigorously, and influences from surrounding stands are minimized due to the size and configuration of the harvest unit. Even-aged regeneration harvests presently used in JDSF currently comply with the size spacing and timing restrictions of the FPR.
- **Rotation age**. The use of rotation age as a management variable serves as a simple planning tool in the scheduling of harvests. In past harvests, the Forest has incorporated a range of rotation ages. This range of regeneration ages has provided needed flexibility for management during the implementation of the 1983 JDSF Management Plan.

Commercial Thinning

Commercial thinning is used to control the structural attributes of a timber stand or compartment generally at intermediate points during an even-aged rotation period, but also may be used as a means of controlling stocking in an uneven-aged management area. Some considerations in deciding whether 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, thinning can extend the productivity of a stand nearing rotation age.

Table 21 provides a summary of the silvicultural methods used by the Forest between 1980 and 1999. Review of the table indicates a significant trend in the timber management practices of the Forest. The trend reflects a shift in forest research priorities during this period of time. Although total harvest acreage increased in the 1990's, the management shifted from Shelterwood Removal and Clearcuts to Selection and Commercial Thinning. In the 1980's, uneven-age management (selection and group selection) and commercial thinning accounted for approximately 25% of the harvested acres. In the 1990's, uneven-age management (selection and group selection) and commercial thinning accounted for more than 80% of the harvested acres.

TABLE 21 SUMMARY OF THE SILVICULTURAL METHODS USED BY THE FOREST BETWEEN 1980 AND 1999												
Year	**SEL**	**GS**	**CT**	**CC**	**SWR**	**SWP**	**SWSS**	**STRT**	**STSS**	**SS**	**PRW**	**Total**
1980					618							618
1981	223		239	12	294							768
1982			246	7	1,123							1,376
1983	96	182	142	94	1,360							1,874
1984	35	247		167								449
1985	42			90	546							678
1986	64	290		324	544							1,222
1987	30		48	291								369
1988	306		77	404			42					829
1989			65	256	346				43			710
1990	367			41			217					625
1991	513		10	119		94		102			171	1,009
1992	242	272	236	8					30			788
1993	63	303		61				19				446
1994	286	112	277							22		697
1995	426		1,687					332	190			2,635
1996	1,589	730	6	39								2,364
1997	559	154						238				951
1998	306	261										567
1999	559											559
1980-1989	796	719	817	1,645	4,831	0	42	0	43	0	0	8,893
1990-1999	4,910	1,832	2,216	268	0	94	217	691	220	22	171	10,641
Total	5,706	2,551	3,033	1,913	4,831	94	469	691	263	22	171	19,534

SEL: Selection, GS: Group Selection, CT: Commercial Thin, CC: Clearcut, SWR: Shelterwood Removal including diameter limit harvesting, SWP: Shelterwood Prep Step, SWSS: Shelterwood Seed Step, STRT: Structure Tree Retentionwith Evenage cut, STSS: Seedtree Seed Step, SS - Sanitation/Salvage, PRW: Power line Right of Way

Stand Improvement Practices

Timber stand improvement practices are forest management activities that commonly occur during the life of a timber stand and may be used regardless of the silvicultural method used. Timber stand improvement includes all activities necessary to establish, grow, and achieve the desired species composition, spacing, and rate of growth of young forest stands on Jackson Demonstration State Forest. These measures provide for the achievement of maximum sustained production of high quality forest products. Timber stand improvement activities include the following.

Tree Planting: Tree planting involves hand planting nursery-grown tree seedlings directly into the soil, ensuring good contact between the soil and roots. This method of regeneration is the most commonly used as better control of the species mix, seedling type, and stocking levels are achieved as compared to natural regeneration by seed cast. Regeneration by natural seed cast requires the timing of an adequate seed crop following site preparation of the site for adequate germination. With the prevalent sprouting properties of redwood, the most common and effective site regeneration technique used in this region is interplanting conifer seedlings in the openings between redwood sprouts. This best achieves better site occupancy with controlled spacing and preferred species.

Control of Competing Vegetation: To provide successful establishment and growth of desired tree species, it is often necessary to control species that compete with desired species for water and sunlight. Control methods include mechanical cutting and chipping, and use of herbicides.

Mechanical methods may include hand cutting, use of a "brush buster"-type mechanical device, use of portable chippers, other experimental methods, etc.

JDSF has effectively used herbicides for brush control following broadcast burning, hardwood control, road maintenance needs, and to treat exotics. Herbicide application is accomplished with ground techniques such as truck-mounted sprayers, backpack sprayers, and hack-and-squirt methods, aerial application has not been used. The use of herbicides on the Forest has declined in recent years, but some level of herbicide use will likely be desired for brush control through the DFMP period. The use of broadcast burning following logging has been dropped since 1993 in an effort to reduce the use of herbicides. It is anticipated that a combination of control methods will occur, and the preferred method(s) of choice of brush control will be determined at the project level.

Fertilization: Soil fertilization may be used to increase the growth of desired forest tree species. Fertilization generally involves aerial or ground-based dispersal of granular fertilizers, avoiding watercourses. Nutrients applied may include nitrogen, sulfur, potassium, and other elements. JDSF has not fertilized timber stands on a regular basis. One fertilization trial was completed in the 1970's with inconclusive results. Future fertilization will be used primarily for demonstration (personal communication, Marc Jameson 2002).

Pre-commercial Thinning and Pruning: Precommercial thinning involves thinning dense young forest trees by mechanical means, including cutting individual trees or mechanically sawing or chipping rows or groups of trees. Pruning removes the lower limbs of desirable tree species to increase the eventual product value of the pruned trees. Limbs are generally pruned with a chain saw.

Prescribed Burning: Prescribed burning is used to reduce slash concentrations or to reduce vegetative levels or control species composition. Broadcast burning is generally used after regeneration cut harvesting to remove or reduce slash loading and allow for planting access. As stated above, JDSF has voluntarily stopped the use of broadcast burning for the treatment of logging slash since 1993. Prescribed burning involves the introduction of fire under controlled conditions to remove specified forest elements with little risk of catastrophic fire

damage. Prescribed burning is also used to change species composition, change fuel loading, create wildlife habitat structural elements, change stocking levels, prune ladder fuels and to reduce fuel concentrations in established stands for wildfire prevention.

Cone Collection: Cone collection involves picking cones from selected trees to acquire seed for long-term seed collections and nursery production of desired tree species. Cones may be collected by climbing trees and cutting cone-bearing limbs, by falling individual cone-bearing trees, or by cone rake suspended from a helicopter.

Site Preparation: Mechanical site preparation involves the use of machinery to prepare a site for planting, seeding, or natural regeneration. The most common method is to use a crawler tractor and dozer blade with brush rakes for clearing vegetation and/or scarifying the soil. This may also involve burning the resulting slash piles. Other less intensive methods include clearing individual planting spots through use of a chainsaw and hand tools.

Slash Treatment: In general, slash created by logging activity associated with partial harvest silviculture systems is retained on site without treatment. The California Forest Practice Rules require that accidental deposits of slash within Class I and Class II watercourses be removed. Slash deposited into Class III watercourses must be removed unless it is stable within the channel.

The California Forest Practice Rules also require that slash be treated within specified distances (200 feet or less) of public highways and residential structures. The treatment generally consists of removal and/or lopping to a specific height above the ground surface. There are occasions along JDSF roads with high levels of public use, where logging slash is lopped within 50 to 100 feet from the edge of the road. This is an aesthetic consideration, and also tends to reduce the risk of fire.

Following timber harvesting and prior to planting of conifer seedlings, slash is retained untreated, mechanically cleared from small circular planting spots, or broadcast burned. In all logging areas, slash developed on log landings as a result of yarding and truck loading activities may be piled and burned on the landing.

Minor Forest Products

Minor forest products are a resource of the Forest used by the public. Forest management activities have the potential to impact the availability of this resource. The Forest currently sells minor forest products to the public and private commercial interests, subject to specific rules and constraints. The following products are offered: salvage sawlogs, poles, split products, greenery (e.g. boughs, shrubs, and ferns), mushrooms, and firewood. The Forest controls the sale of these products through the issuance of permits.

Salvage Sawlogs: Logs may be purchased from the State Forest, subject to permit constraints and applicable state regulations. The removal of salvage sawlogs requires the purchaser to be in possession of a valid timber operator's license. 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. Logs and wood products originating from standing snags or old-growth trees may be collected only when snags or old-growth trees are felled based on a determination that, if left standing, they represent a hazard near campgrounds and road roads, or threaten CDF or neighboring structures and improvements.

Firewood: Firewood permits are available from the State Forest. Firewood collection permits can be purchased for personal and commercial purposes. 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.

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. 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.

Harvesting 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 and/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. Skidding equipment can often work on slopes up to 35 percent without excavating skid trails. As slopes are steepened, 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 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 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. Communication between the yarder operator and the choker setters is by means of a horn, which can bother residents and recreationists near the logging operation. There is no practical limit to the steepness of slope that can be cable yarded. 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 logs clear of the ground and carries 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 is the harvest unit and with 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 is used in inaccessible and particularly sensitive areas. These 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 affect the decision to prescribe helicopter use. Cable systems are employed on steeper slopes (generally above 35 to 40 percent) and in other areas where sensitive resources require protection from ground disturbance. Ground based equipment is used on the gentler slopes, along ridgelines and on terraces in the western part of the Forest.

Table 22 indicates the acres of area harvested by yarding method between 1980 and 1999. Review of this table reveals a trend in the Forest management toward the increasing use of cable and helicopter yarding methods. In the period from 1980 to 1989, 65% of the harvested acres were tractor yarded with 35% cable yarded. In the 1990 to 1999 period, 35% was tractor yarded with 60% cable and 5% helicopter yarded.

TABLE 22
ACRES OF AREA HARVESTED BY YARDING METHOD BETWEEN 1980 AND 1999

Year	Total Acres	Helicopter	Cable	Tractor	Percent Helicopter	Percent Cable	Percent Tractor
1980	618		108	510		17	83
1981	769		73	696		9	91
1982	1,378		434	944		33	67
1983	1,874		611	1,263		33	67
1984	449		149	300		33	67
1985	678		361	317		53	47
1986	1,222		449	773		36	64
1987	369		193	176		52	48
1988	828		366	462		44	56
1989	709		329	380		46	54
1990	625		518	107		83	17
1991	1,008		592	416		59	41
1992	788		213	576		27	62
1993	446		241	205		54	44
1994	696	106	435	155	15	63	22
1995	2,633	151	1,602	880	6	61	33
1996	2,364	240	1,189	935	10	50	40
1997	952		817	135		86	14
1998	567		400	167		70	30
1999	558		328	230		59	41
1980-1989	8,894		3,073	5,821		35	65
1990-1999	10,637	497	6,335	3,806	5	60	35
Total	19,531	497	9,408	9,627	3	48	49

6.3.2 Transportation of Forest Products

Legacy and Existing Road Network. The Forest road network provides access to the Forest for management purposes as well as access for the recreational purposes. Management activities have the potential to impact access in a positive or negative may. 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 ditch relief culverts for drainage. This road type requires maintenance of the ditches and pipes to avoid water diversion or concentration of runoff.

The road section of the 1958 Jackson State Forest Management Plan illustrates the prevailing concepts for road building for the first decade under state ownership. This document stated "access for harvesting is easiest by following the streams (CDF 1958)." Two basic types of roads were constructed at that time: fire roads along ridgetops and timber access roads along drainages. By 1958, at least one-third of the currently existing roads in JDSF had been built, including the following main highways and logging roads: Caspar Logging Road (Rd 500), Willits- Mendocino County Road (Rd 408), West Chamberlain Creek Road (Rd 200), Main Chamberlain Creek Road (Rd 250), Road 800, Road 361, Road 300, Highway 20, Caspar-Little Lake Road (Rd 409), Road 700, and Road 730. Additionally, the following fire roads had been constructed: Indian Springs Road (Rd 330), Three Chop Road (Rd 1000), Chamberlain Ridge Road (Rd 230), Road 240, Road 310, and Road 360.

Significant amounts of young-growth harvest, nearly all of it in the west end of the Forest, began in the 1960s. In particular, considerable road work and young-growth harvesting were completed in the Hare and Caspar Creek planning watersheds. Roads were generally built along the bottoms of these drainages, and in some cases bisecting the sidehills.

By 1980, the majority of the roads on the Forest had been constructed. The 1983 Jackson State Forest Management Plan stated that, at that time, about 360 miles of road existed and were concentrated in the east and west ends of the Forest (CDF 1983). The 1983 plan indicated a need for about 55 miles of new road, mainly in the Noyo drainage, North Fork of Caspar Creek, and Fourteen Gulch (CDF 1983). Most of these proposed new roads have now been built.

Construction standards for roads on the Forest have changed greatly over the decades. Roads built in the 1950s were located "as high as practicable out of watercourse beds and on good soil" (CDF 1958). For fire control roads, embankments were allowed to contain limited amounts of brush where clearing was impractical. Logging roads were crowned, with an inside ditch and ditch relief culverts. Fire roads were outsloped for drainage. Winter use of logging roads was limited to those roads that would not be damaged by such use, and construction standards did not mention protecting water quality or watercourses. Culverts were to be made of metal, heart redwood, or concrete.

The Z'Berg Nejedly Forest Practice Act of 1973 established stricter standards for construction of new roads. Crossings had to accommodate a 25-year recurrence interval storm event and temporary crossings had to be removed by November 15. Timber operators could not use beds of streams as log landings, roads, or skid trails, except as provided by California Department of Fish and Game (CDFG) code. Passage of the Forest Practice Act in 1973 led to increased use of cable yarding and outsloped, ridge-top roads.

Residual impacts of old roads continue to affect stream channels in many locations on the Forest, including areas where JDSF roads use old railroad grades located along or adjacent to streambeds.

The total road density provides a standardized measure of the amount of a watershed covered by the road network. The road density is calculated as the total length of roads in a planning watershed divided by the total area of that planning watershed. Refer to the Geology section for discussion of road densities by planning watersheds.

Road Planning, Design, and Construction/Reconstruction

As stated above, the majority of the roads on the Forest have been constructed. The expected remaining roads necessary for the conduct of planned timber operations are secondary and temporary spur roads that will accommodate appropriate yarding and silvicultural systems. The FPRs provide the current standards that are used by JDSF in planning for roads and landings.

Road, landing, and stream crossing design and construction/reconstruction standards and procedures are described in the 1983 JDSF Management Plan section 74.12 as well as the FPRs.

Road Maintenance

Road maintenance commonly includes surface grading, clearing bank slumps, repairing slumping or sliding fills, clearing ditches, repairing or replacing culverts and bridges, adding surface material, dust abatement, and installing or replacing of surface drainage structures. Road maintenance for fire prevention, public access, and timber management may include mechanical, chemical, and biological control of roadside vegetation. The most commonly controlled species in JDSF include Scotch broom, French broom, pampas grass, Ceanothus, tanoak, coniferous species, and various grasses. Chemical control may include direct application of herbicides according to label directions and safety precautions. Mechanical control may include grading, hand cutting or pulling, use of a "brush buster"-type mechanical device, burning, steaming, and other experimental methods.

Current road maintenance standards used on JDSF are described in the 1983 JDSF Management Plan section 74.13 and as contained in the FPRs.

Rock Pit Use

Rock pits, also referred to as borrow pits or quarries, are locations where rock is excavated, crushed, blasted, or otherwise produced for eventual use as a road surface or road fill material. Activities associated with the use of rock pits also include loading rock into trucks, hauling of mined rock, and the construction and maintenance of rock pit access roads.

There are approximately 23 rock pits that have been historically used on JDSF. There has been no active quarrying within the past five or more years, except for small amounts (<100 cubic yards) of loose material taken from a couple of locations. Road surface rock used on the Forest has been brought in from off-site in recent years (personal communication, Marc

Jameson 2002). It is not presently known how much the rock pits will be used in the future, but some level of need is anticipated.

Water Drafting for Dust Abatement

Water drafting involves the direct drafting of stream flow into a water truck, which is then periodically sprinkled or otherwise applied to road surfaces to minimize dust production and help maintain a hard, compact surface. Occasionally, specific locations within or adjacent to watercourses are excavated or dammed to increase in-channel storage area for drafting purposes. Drafting is controlled to limit stream flow reductions and prevent injury to juvenile salmonids. Water drafting activities are subject to review by CDFG on a THP basis.

Wet Weather Road Use Restrictions

Present road use restrictions are described in FPR 923.6, where road use may not occur during generally wet conditions, or when sediment discharge from landings or roads will reach watercourses, and FPR 895.1 "saturated soil conditions" where reduced traction is present, noticeable turbidity in watercourses or drainage facilities occurs, pumping of road surface materials, or ruts are created. This is a year round restriction. The Forest also imposes a seasonal road closure that generally starts the end of October and extends through the spring of the following year. Roads are re-opened based on road and weather conditions. Rock surfaced main roads generally remain open during the winter for public access, but are closed if road or weather conditions are such that continued use would result in damage to the road or impact to other resources. The Forest also implements wet weather log hauling restrictions as an enforceable measure of individual THP's.

Conifer Species Diversity and Hardwood Management

Forest management activities have the potential to impact conifer species diversity and hardwood abundance. Presently, redwood and Douglas-fir are the favored conifer species for regeneration. Hemlock and grand fir are managed for no increase over current levels. Bishop pine is being controlled to remain a minor species where it occurs in commercial stands.

In selection silvicultural prescriptions, commercial thinning, 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 is 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 are planted. The relative numbers of each species is determined after an assessment of the site to evaluate whether it is more suited for one species or the other.

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 emphasis has been to restore the stands to a conifer-dominated condition. Hardwoods are a minor component of stands on the west end of the Forest, averaging approximately 10 percent of the basal area. On the east end, hardwoods make up approximately 24 percent of the basal area on average. To provide successful establishment and continuing, rapid growth of desired tree species, it is often necessary to control species that compete with desired species for water and sunlight. Control methods include mechanical cutting and chipping or burning, and use of herbicides.

6.3.3 Applicable Standards for Protection of Resources

Public Resources Code (PRC)

Jackson Demonstration State Forest was acquired for "demonstrating economical forest management" (PRC 4531). "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: retain the existing land base of state forests and timber production for research and demonstration purposes." (PRC 4631.5)

The legislature further gave the authority for the management of the Forest to the California Department of Forest and Fire Protection (CDF) with oversight from the State Board of Forestry and Fire Protection (BOF). The enabling legislation states, "the Department in accordance with plans approved by the Board, may engage in the management, protection, and reforestation of state forests" (PRC 4645), and goes on to state "the Director, acting in accordance with the policies adopted by the Board, shall administer this chapter. He can exercise all powers necessary to accomplish its purposes and intent." (PRC 4646) The legislature clarified the interaction between CDF and the BOF as follows "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 conformance 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." (PRC 4651)

Forest Practice Act (FPA) and Forest Practice Rules (FPRs)

Forest management activities on the Forest are subject to the requirements of the Forest Practice Act (FPA) as administered through the Forest Practice Rules (FPR). Registered Professional Foresters (RPFs) follow the provisions of the FPRs in preparation of Timber harvest plans (THPs). The THP preparation and review process substitutes for the EIR process under CEQA pursuant to PRC section 21080.5. THPs are 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 as directed by PRC 4651.

Compliance with Other Applicable State and Federal Laws. The FPRs require that activities on JDSF be in compliance with all other applicable state and federal regulations. This includes, but is not limited to the Federal Clean Water Act, the Federal Endangered Species Act, the State Endangered Species Act, State Porter Cologne Act. The State and Federal Endangered Species Acts are addressed in the wildlife and fisheries sections, and the Federal Clean Water Act and State Porter Cologne Act are addressed in the Hydrology and Geology sections.

6.3.4 Project Measures for Protection of Timber Resources

Old-Growth and Late Seral/Successional Characteristics

JDSF Management Plan Standards/Requirements. The Management Plan objective for old-growth groves is to protect existing old-growth groves and improve their value as wildlife habitat. 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. Within the old-growth reserves, 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. Old-growth trees and old-growth aggregations are defined below.

An old-growth conifer tree is any live conifer tree that was present prior to 1860, based on the professional judgment of JDSF staff. Old-growth conifer trees with one or more of the following structural characteristics will be retained as provided in the DFMP.

a) DBH greater than 48 inches.
b) Goose-pen (an opening one-foot or more in diameter inside and above the top of the trunk opening).
c) Platform branches greater than 8 inches in diameter.
d) Exfoliating flanged bark slabs.
e) Chimney top (hollowed upper stem).
f) Dead top at least 16 inches in diameter and 16 feet long.

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

significantly larger in diameter than expected for the stand age, site quality, and canopy closure may indicate an old-growth tree. Limbs often extend from the trunk at more of a downward angle than is common in younger trees.

Old-growth conifers 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.

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.

Old-Growth Groves: The DFMP has designated 11 reserved old-growth groves totaling 459 acres that are off limits to harvesting. Management of these areas will be relatively passive in nature, and designed to retain the characteristics of the groves. By policy, these areas will not be subject to timber harvesting. Additionally, there are late seral development areas totaling 780 acres 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.

Hardwoods: 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.

In addition to preserving old-growth groves, aggregations and individual trees as discussed above, the DFMP will retain and develop late seral/successional forest characteristics. 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 young-growth will be managed to expand the area of late seral forest. Large old-growth trees and old trees with specific structural habitat value will be retained within managed stands. The DFMP also includes areas in Class I and II stream riparian zones and the Woodlands Special Treatment Area in which recruitment of late seral stands will occur. These structure conditions will occupy about 23 percent of the State Forest and expected to total approximately 11,190 acres.

Current FPR and THP Requirements. FPR 919.16 addresses Late Succession Forest Stands (LSFS) as defined in 895.1, where if such stands are proposed for harvest and would significantly affect the amount and distribution of LSFS, information is required in the THP which would provide for avoidance, mitigation, or reasons for overriding concerns pursuant to 898.1(g), including a discussion of the alternatives and mitigation considered. LSFS are WHR 5M, 5D, or 6 and at least 20 acres in size. FPR 912.9 Technical Rule Addendum #2 under C. Biological Resources 4.f) and g), requires cumulative impacts evaluation and discussion of Late Seral Forest Characteristics (LSFC) and habitat continuity if such stands are present. LSFC stands are mature and over-mature stands exhibiting multi-layered canopies and decadence (snags, decay, down logs), and at least 80 acres in size. Stands that are of WHR 5 or 6 size will be checked in the field during THP preparation to determine if late seral/successional conditions are present.

Maximum Sustained Production (MSP) of High Quality Timber Products

JDSF Management Plan Standards/Requirements. The DFMP provides for an increase in inventory over time by identifying that it is a high priority to maintain non-declining inventory levels and harvesting less than growth. Growth monitoring is accomplished by the continuous forest inventory system, which has been re-measured 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. The DFMP identifies that through the 5-year growth monitoring intervals, adaptive management will provide for a reduction or increase in future annual harvest levels to more closely match the average growth levels and still maintain non-decreasing inventory levels.

Current FPR and THP Requirements. The FPRs require that timberland owners manage timberland to achieve maximum sustained productivity of high quality timber products (MSP). CDF operates eight Demonstration State Forests, totaling approximately 69,457 acres. Because the total acreage of state forest system exceeds 50,000 acres, and the ownership does not meet the definition of "scattered parcels" as contained in the FPRs, timber harvested from the state forest system must demonstrate maximum sustained productivity (MSP) pursuant to CCR 913.11(a) or 913.11(b). These two rule sections, respectively, are commonly referred to as "Option A" and a "sustained yield plan." This means that before harvesting can occur on THPs that were approved after December 31, 1999, either a sustained yield plan (SYP) or an "Option A" document must be submitted to CDF for review and approval.

All estimates of LTSY and future growth estimates in the DFMP and the EIR that are based on the current Option "A" plan are likely to change slightly in the future. The current "Option A" plan for the Forest will be updated to bring it into conformance with the JDSF Management Plan as approved. The update may change the growth and LTSY estimates slightly, however it is unlikely to result in any major changes.

JDSF Management Plan Standards/Requirements

Application of Silvicultural Methods

Silvicultural Allocation Plan: The DFMP contains a Silvicultural Allocation Plan, which provides site-specific silvicultural direction for the life of the Management Plan (see Figure F in the attached "Figures" section). The silvicultural allocation plan provides a comprehensive guide for assigning silvicultural methods to actual stands on the ground across the Forest. The objectives of this silvicultural allocation plan are to:

- create diverse forest stand structures across a wide variety of site classes and environmental conditions in order to facilitate future research opportunities, and
- create a mosaic of diverse habitats at the landscape level in order to maintain functional forest ecosystems and support biological diversity.

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.

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 thinning, 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.

Approximately two-thirds of the area devoted to timber production is planned for management under an uneven-aged management system, while the remaining third is planned for management under an even-aged system. State Forest staff will continue to conduct site specific assessments to determine the appropriateness of silvicultural prescriptions for any given area.

Short Term Harvest Schedule: The DFMP includes a short-term harvest schedule that identifies the locations of proposed harvest units and the general silvicultural treatments to be applied in the next five years (See Figure M in the attached "Figures" section). The short-term schedule identifies general areas that will be considered for harvest, and silvicultural methods that are consistent with the allocation plan discussed above. Actual harvest boundaries, yarding methods, road construction/reconstruction needs, etc. will be determined by a Registered Professional Forester (RPF) following site specific review of the area. 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.

Special Concern Areas (SCAs): The DFMP identifies 23 SCAs where forest management activities, including silvicultural practices, are limited to protect sensitive resources. No timber harvesting will occur in the old-growth reserves, the cypress groups, and Jughandle Reserve. In other special concern areas, limited operations may be allowed, 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. Although the timber stands that makeup the special concern areas are capable of supporting a wide range of silvicultural prescriptions, the application of certain prescriptions in these areas has been limited to avoid unacceptable results relative to the resource protection required or management objectives. Restricting possible silvicultural prescriptions helps to create or retain forest conditions in special concern areas that are consistent with the ecological and aesthetic goals.

Areas Not Covered by this Silvicultural Allocation Plan: There are portions of the 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).

Current FPR Requirements. In addition to the silvicultural allocation plan for JDSF, there are FPR requirements for silvicultural applications to THPs. FPR 913.1 contains measures for regeneration methods used in even-aged silviculture. Even-aged silvicultural methods include clearcutting, seed tree, and shelterwood.

- FPR 913.2 contains measures for regeneration methods used in uneven-aged silviculture. Uneven-aged management is utilized to establish and maintain an uneven-aged stand structure. Uneven-aged silviculture methods include single tree and group selection, and transition.
- FPR 913.3 contains measures for intermediate treatments performed in stands prior to a regeneration cut. Intermediate treatments include commercial thinning and sanitation-salvage.
- FPR 913.4 contains measures for special prescriptions and includes Special Treatment Area Prescriptions, Rehabilitation of Understocked Areas, and Fuelbreak/Defensible Space.

The application of silvicultural methods described above under the current FPR and THP requirements are applied on a THP basis, and have no pre-described requirement of silvicultural method allocation.

Conifer Species Diversity and Hardwood Management

Conifer Species Diversity: The DFMP identifies that redwood and Douglas-fir are the favored conifer species for regeneration. Hemlock and grand fir are to be managed for no increase over current levels. Bishop pine is being controlled to remain a minor species where it occurs in commercial stands.

In selection silvicultural prescriptions, commercial thinning, 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 is 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 is determined after an assessment of the site to evaluate whether it is more suited for one species or the other.

Hardwoods: 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, the emphasis will be to restore the stands to a conifer-dominated condition. To provide successful establishment and continuing, rapid growth of desired tree species, it is often necessary to control species that compete with desired species for water and sunlight. Control methods include mechanical cutting and chipping or burning, and use of herbicides.

In addition to native hardwood species control, within the Eucalyptus infestation area identified above in the Special Concern Areas, silviculture methods are prescribed to control the spread of Eucalyptus.

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.

Current FPR and THP Requirements: FPR sections 913.1, 913.2, 913.3, 913.4, 913.5, 913.10, and 913.11 contain measures that affect conifer species diversity and hardwood management. These rules are in Silvicultural Methods and pertain to retention of desired conifer species mix, stocking levels, tree sizes, phenotype selection, and hardwood management provisions.

CDF-Mendocino Woodlands State Park and Outdoor Center (Memorandum of Understanding [MOU])

CDF and State Parks entered into a MOU related to forest management practices surrounding the Mendocino Woodlands. This MOU includes provisions for:

- protection of the Mendocino Woodlands water collection systems to insure the integrity and purpose of the systems;
- consideration for managing a large portion of the Special Treatment Area in order to accelerate recruitment of late seral habitat;
- maintenance of Roads 700, 720, and 730;
- use of Mendocino Woodlands roads by CDF; and
- a 200-foot harvest exclusion buffer from camp areas, recreational cabins, or main roads located within the lands administered by State Parks. (This buffer does not apply to the Railroad Gulch Silvicultural Study area.)

The MOU is to be reviewed during the first quarter of each year and can be terminated by either party upon 30 days notice.

6.3.5 Thresholds of Significance

Based on the policy and guidance provided by CEQA and the CEQA guidelines, an impact of the proposed project would be considered significant if it causes one or more of the following:

- An adverse substantial effect on old-growth forest habitat (a unique habitat type).
- A conflict with the Forest Practice Rules, Public Resource Code or other applicable rules and regulations adopted for the purpose of avoiding or mitigating environmental effects relating to:
  - maximum sustained productivity of high quality forest products,
  - application of silvicultural methods,
  - protection of late seral/successional forest characteristics, and
  - conifer species diversity and hardwood management.

6.3.6 Timber Resources--Project Impacts

Implementation of the DFMP was determined to have a potential direct or indirect impact on the following Timber Resource value areas:

- Old-Growth Forest
- Late Seral/Late Successional Forest Characteristics
- Maximum Sustained Production of High Quality Forest Products (MSP)
- Application of Silvicultural Methods and effects to other resource areas
- Conifer Species Diversity and Hardwood Management

Discussions of impact levels to the above timber resource value areas are provided below.

Impact: *Old-Growth Forest*: (Less than Significant & Beneficial)

Old-growth management and protection on Jackson Demonstration State Forest is a complex issue that includes the both the biological function of old-growth trees and the values that society associate with older forests. "Old-growth" as a forest condition does not have a commonly agreed upon definition, primarily due to the variety of social and biological values assigned by the general public and resource management professionals. For this analysis, the Management Plan definition of old-growth is used. Refer to the wildlife section of this document for discussions regarding the biological value of old-growth trees for specific species. This analysis is based on the assumption that old-growth trees and old-growth habitat are valued by society for characteristics beyond the biological values. It is the goal of this analysis to determine if the proposed management plan would significantly impact old-growth in the Forest.

The management objectives of the DFMP for old-growth groves and trees are to protect existing old-growth groves and improve their value as wildlife habitat, and 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.

Presently, there are 11 reserved old-growth groves totaling 459 acres, which are off limits to harvesting. 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 buffer the groves from various types of disturbance.

Old-growth groves will be preserved, and additional forest adjacent to tree of the groves 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 largely retained within managed stands. 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. Impacts related to old-growth resource values are considered to be less than significant, and over time, the management practices of the DFMP are expected to be beneficial to old-growth resources.

Impact: *Protection of Late Seral/Successional Forest Characteristics:* (Less Than Significant and Beneficial)

The DFMP provides for retention of late seral and late successional forest characteristics, as well as recruitment of these habitat components. Preservation of old-growth groves and old-growth trees as discussed above is one aspect of retaining late seral forest characteristics. The DFMP also includes measures to retain and recruit late seral characteristics. Late seral forest characteristics will 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, will be managed to develop late seral characteristics. These areas managed for development of late seral structure conditions will occupy about 23 percent of the State Forest.

JDSF intends to recruit trees with late successional characteristics in areas that enhance the ecological effects of forests with these structural characteristics. Trees with late successional characteristics cannot be recruited during the life of the management plan. However, young-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.

In 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, 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. Single tree or group selection may be the appropriate silviculture system in certain stands to further the multi-storied effect, or to create openings found in late seral stand conditions. The determination of site specific silvicultural applications to achieve these goals will occur during THP preparation.

A qualitative analysis of late seral characteristic development was completed for the near term (15 years) and for the long term (out to 100-years). A complete discussion is provided in Appendix 8 for the proposed project and each of the alternatives. The following discussion is based on the conceptual changes that will occur following the selective harvest of an even-aged timber stand as found on JDSF.

Near Term Assessment Period, 15 Years

Expected Changes In Forest Stand Structure: After one or possible two harvest entries during a 15 year period, the overstory canopy will have a more varied canopy structure, both vertically and horizontal. The crowns of the released redwoods will rapidly grow into the new canopy gaps and the lowest branches will not slow in growth or die back but will increase in growth making the tree crowns larger in depth and diameter. As the canopy closes this type of growth will slow. The other canopy conifers, Douglas-fir, grand fir and hemlock will increase in the same dimensions as redwood but not as rapid.

A new age class of mixed conifer species in the lower canopy consisting of new seedlings and sprouts will slowly start after the selective timber harvests. These will have very slow growth in height because of the rapid closure of the overstory canopy.

The opening of the dense canopy may have some stand structural changes caused by wind storms. Some trees may have a portion of their upper crown broken off, followed by a branch taking over as the new top leader or in the case of redwood a sprout may take over as the new top leader. Some of the trees with broken tops may turn into snags. Some wind blowdown uproots may occur with varied root wads and holes. The blowdown trees or broken tops will increase the amount of large woody debris (down rotten logs).

Over this 15 year time period, there will be tree deaths caused by the competition between the increasing size of the canopy dominants and the suppressed lower canopy trees. This will still occur even though some trees are selectively removed from the overstory canopy. Depending on how these suppressed trees die, they will form either hard shelled snags or soft shelled snags. Some of these snags will fall and become woody debris.

Table 23 presents the development of late successional forest conditions: The development of late successional forest conditions will be minimal in the near term.

TABLE 23
LATE SUCCESSIONAL FOREST CONDITIONS IN THE NEAR TERM, 15 YEARS

Important Attributes	Development In The 15 Year Near Term Assessment
Large diameter trees	Very minimal, very few with deep bark fissures
Large diameter branches	Very minimal, not enough time to develop
Lower canopy tree community	Just starting to develop
Forest floor community	Slowly increasing, minimal herbs, no shrubs
Snags	A minimal number, mostly smaller snags
Large woody debris	A minimal number, mostly small logs
Uproots	Minimal if any
Forest floor humus layer	Very shallow, still developing
Vertical distribution of foliage/canopy	Slowly developing
Horizontal distribution of structure	Increasing because of irregular selection cuts
Canopy gaps	Minimal increase by selection cuts, decreased by crown growth. Minimal development
Anti--gaps	Developing on the lower canopy growth of the new seedlings and sprouts and the canopy closure in the un-thinned portion of the upper canopy
Biomass accumulation	The biomass is increasing slowly even with the irregular selection timber harvest
Achievement of maximum height and crown spread per tree	Slowly increasing, not near maximum
Canopy elaboration	Slowly developing
Live tree decadence	Very little of this on the upper canopy trees
Canopy epiphytic community	Not fully developed

Long Term--100 Year Term Projection of Future Forest Conditions

Selection areas are likely to have had 4 to 8 harvest entries using an irregular selection system from single-tree to small group selection cuts. If any of the conifer species did not regenerate naturally, the absent species would be planted. Selectively harvested stands are expected to have an upper canopy with approximately 60 – 70 trees per acre.

A new cohort of understory trees from 15 to 100 years of age will form a multi-aged understory canopy.

Expected Changes In Forest Stand Structure: After 100 years the overstory canopy will be a relatively even-aged uniform upper consisting of approximately 60 – 70 trees per acre, with an average age of over 150 years. The overstory trees will be primarily redwood and Douglas-fir. Grand fir and hemlock will have been harvested, turned into snags or blown down. The new age classes of younger trees will be primarily redwood, hemlock and grand fir. These younger trees will be irregularly spaced from tight clumps with relatively small crowns to openly spaced trees from 15 to 100 years of age. Redwood is likely to dominate in the openings and hemlock and grand fir under the older canopy. These trees will form a fairly dense sub-canopy level of trees.

Development of Late Successional Forest Conditions: The development of late successional forest conditions will be progressing toward the optimum conditions that are found in late successional forests, as presented in Table 24, below.

TABLE 24
LATE SUCCESSIONAL FOREST CONDITIONS IN THE LONG-TERM, 100 YEARS

Important Attributes	Development In The 100 Year Long Term Assessment
Large diameter trees	A few trees per acre will be 5 – 6 ft. in diameter with deep bark fissures starting to develop
Large diameter branches	These are developing on some of the larger released trees, especially redwood, they will get larger as the stand gets older
Lower canopy tree community	Well developed, multi-age, multi-size up to 100 years old
Forest floor community	Fairly high cover of herbaceous except under the anti-gaps
Snags	A small number, of small to medium size
Large woody debris	A small number, mostly small to medium size logs
Uproots	A few per acre
Forest floor humus layer	3 – 4 inches in depth of well developed humus if not disturbed by timber harvest
Vertical distribution of foliage/canopy	Moderate development
Horizontal distribution of structure	Moderate because of irregular selection cuts
Canopy gaps	Varied size from small to fairly large
Anti – gaps	The 15 to 100 year old lower canopy layer will have some very dense areas of canopy
Biomass accumulation	Increasing, since less than the annual growth is cut at each entry
Achievement of maximum height and crown spread per tree	Increasing, not near maximum
Canopy elaboration	Even heights of the upper canopy with gaps and anti-gaps in the lower canopy, very complex
Live tree decadence	Some of this on the upper canopy trees
Canopy epiphytic community	Not fully developed, too much exposure to light in the upper canopy.

Impacts related to these timber resource values are considered to be less than significant, and over time the DFMP is expected to provide a beneficial impact.

Impact: *Maximum Sustained Production of High Quality Forest Products (MSP):* (Less than Significant)

The JDSF allowable harvest level in the DFMP is predicated on the goal of non-declining inventory levels where it is the intent to harvest less than growth in any 10 year rolling planning period. During the DFMP period, the Forest proposes to harvest an average of 31 to 33 million board feet per year in any 10-year rolling planning period.

Within the 48,652 acre JDSF, there is an estimated present net conifer volume of 2,002,685 MBF determined by analysis of reported inventory by vegetation types. This includes areas identified as off limits to timber harvest and those with management constraints. After accounting for acres constrained for ecological goals and research and demonstration projects, JDSF staff has calculated the Long Term Sustained Yield (LTSY) to be 40 to 50 million board feet (MMBF) per year (based on Option "A" plan analysis). The present estimate of unconstrained annual conifer growth is approximately 65 MMBF per year based on re-measurement of growth plots. The proposed annual harvest level of 31 to 33 MMBF through the DFMP period would result in an approximate total annual inventory increase of 32 to 34 MMBF.

An analysis of the procedures JDSF staff used to calculate growth and yield is provided in Appendix 8. Growth and yield estimates for the DFMP must rely heavily on model predictions due to the long period considered and different management strategies considered. CRYPTOS, calibrated to the empirical yield tables and constrained to 80% of maximum Stand Density Index, was used for these predictions. CRYPTOS is currently the only growth and yield model available for use in redwood timber stands. The analysis indicated that there is one important limitation to the CRYPTOS model that may affect growth predictions on JDSF. Most of the data used to construct CRYPTOS came from even-aged stands (Wensel, et al., 1982) so the ability of the model to adequately represent uneven-age stand growth should be considered. As a test, the way CRYPTOS treats the growth of understory trees established following harvest operations (called ingrowth trees) was compared to measured growth of ingrowth trees following harvest in timber stands treated in JDSF as part of several research studies (Appendix 8). The comparison indicated that CRYPTOS over estimates the growth of ingrowth trees under partial cutting strategies and uneven-aged systems.

The DFMP specifies that a large part of the Forest be managed under uneven-aged partial cutting systems, and the growth and yield for these stands was modeled using the CRYPTOS system. In the short term of 10 to 15 years, CRYPTOS can be used to accurately predict the growth and yield of the uneven-aged stands. However, over the long term, the ability of CRYPTOS to accurately predict stand development in uneven-aged stands, particularly the ingrowth trees in the understory, is debatable. Basing allowable harvest levels solely on this type of modeling could result in a long-term significant impact to timber growth and yield.

The Forest staff recognized the potential for CRYPTOS to overestimate growth in uneven-aged management areas. In response to this concern and operational uncertainties associated with protected areas such a WLPZ and buffers adjacent to neighboring parcels, the annual harvest level was reduced. A harvest level that averages 31 to 33 million board feet per year is less than the modeled growth and LTSY projection of 40 to 50 million board feet per year, and significantly less than the measured growth of 65 million board feet per year. In addition, chapter 5 of the DFMP

commits the Forest to a monitoring and adaptive management program that includes growth and yield. Growth will be monitored as part of the continuous forest inventory system that will continue to be re-measured at five-year intervals.

Furthermore, the Forest is working towards a long-term solution to the uneven-aged modeling problem. The Forest has committed to a number of growth and yield studies including the Asymmetrical Coast Redwood Growth Model Study that was initiated in 1986 to develop a process based coast redwood growth model that can be used on partial harvest and uneven-aged management areas. Re-measurement 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. The Casper Creek Cutting trials, the Long Term Pre-commercial Thinning Study, the Railroad Gulch study, the Whiskey Springs Thinning Study and other studies all have potential to provide growth and yield data that may address the uneven-aged modeling problem.

Reducing the average annual harvest level below the LTSY level and committing to a monitoring and adaptive management approach to future harvest levels will reduce the level of impact on forest growth and yield to less than significant.

Impact: *Application of Silvicultural Methods:* (Less Than Significant)

Implementation of the silvicultural allocation plan and short-term harvest schedule will create a diverse mosaic of forest age-class structures at the landscape level that will contribute to habitat stability, research opportunities, maintenance of biodiversity, and functional forest ecosystems. 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. State Forest staff will continue to conduct site-specific assessments to determine the appropriateness of silvicultural prescriptions for any given area. The silvicultural allocation plan provides for protecting the recognized areas of special concern. Impacts related to these timber resource values are considered to be less than significant.

The silvicultural allocation plan limits even-aged practices to approximately 1/3 of the area available for harvest. Selection and group selection methods (uneven-aged) would be used on the remainder of the unconstrained areas available for harvest. As discussed above, currently there are no growth models available to project growth and yield response in an uneven-aged forest. Projections of future growth would have to be based on the data developed as part of the Forest's growth plot re-measurement program and other studies conducted on the Forest. These studies are summarized in Appendix 8. The previous studies conducted on JDSF regarding regeneration indicate that implementation of the single tree selection silviculture system in redwood timber stands may not result in the creation of a multi-aged timber stand as anticipated. What is likely to develop after several selection entries is a stand of widely spaced large trees with low levels of understory conifer regeneration. The growth (total volume in board feet) of these stands will likely remain at levels consistent with growth for stands not selectively harvested, with the growth concentrated on the fewer larger trees. However, at some point in the future, the tree density level

of the larger trees may not be adequate to support additional harvest entries, and a regeneration harvest may be needed to establish a new age class of timber to replace the harvested trees. This may not occur until there have been multiple selection entries over the course of 30 to 50 years.

The group selection method may provide a feasible solution to the regeneration problem of the selection system in redwood stands. Under the group selection method, up to 20% of the harvest area may be occupied by group openings created during that entry period. These openings provide the open canopy conditions needed for the establishment and growth of a new age class of redwoods.

During the life of the Management Plan, no significant impact to the timber resource is anticipated as a result of the silvicultural allocation plan. The Forest has committed to a monitoring and adaptive management approach that includes timber inventories and evaluation of forest stands. If the monitoring program indicates that conifers are not regenerating in uneven-aged management areas, then management practices will be adapted.

Table 25 summarizes the special concern areas within the Forest, the management activities proposed and the FPR standard. This table indicates that the FPR standards are met or exceeded for all areas. Impacts related to these timber resource values are considered to be less than significant.

TABLE 25
SPECIAL CONCERN AREAS WITHIN JDSF

SCA	Proposed Management	FPR Standard
Cypress groups	no harvesting	no current restrictions
Pygmy forest	no harvesting	no current restrictions
Jughandle Reserve	no harvesting within the Pygmy forest portion, limited silviculture in the remainder	no current restrictions
Eucalyptus infestation area	silviculture prescribed to control spread of Eucalyptus	no current restrictions
Inner gorges	THP specific, limited silviculture	THP specific, FPR 916.9 applies to impaired watersheds, limited silviculture
Northern spotted owl nest areas	nest buffers and limited silviculture to enhance habitat	FPR 919.9 applies, nest buffers and limited silviculture to retain habitat.
Osprey nest areas	nest buffers and limited silviculture to enhance habitat	FPR 919.3 applies, nest buffers to avoid disturbance
Watercourse and Lake Protection Zones (WLPZs)	no harvest or uneven-aged silviculture to promote late seral conditions	FPR 916 applies
Mendocino woodlands special treatment area (MWSTA)	silviculture to promote late seral conditions, except for the Railroad Gulch Study area and areas within the South Fork Caspar Creek watershed	no current restrictions

TABLE 25 SPECIAL CONCERN AREAS WITHIN JDSF		
SCA	**Proposed Management**	**FPR Standard**
Domestic water supplies	silviculture limitations to minimize disturbance	FPR 916.5 and 916.10 applies, silviculture limitations to minimize disturbance
Buffers adjacent to non-timberland neighbors	silviculture limitations to minimize disturbance	FPR 913.1(a)(7) may apply within 200 feet of adjoining properties
Power line right-of-way	not available for timber production	not available for timber production
State Park special treatment area	silviculture limitations to protect adjacent state park values	FPR 913.4(a) applies within 200 feet of the State Park
Reserved old-growth groves	no harvesting	FPR 919.16 may apply, also 912.9 Technical Rule Addendum #2 (C)(4) requires consideration
Late seral development areas	silviculture to promote late seral conditions	FPR 919.16 may apply, also 912.9 Technical Rule Addendum #2 (C)(4) requires consideration.
Campground buffers	silviculture limitations to minimize disturbance, no even-aged silviculture	no current restrictions
Conservation camps	no harvesting	no silviculture restrictions, FPR 917.2 would apply for hazard reduction
Public Road and Recreation trail corridors	silviculture limitations to minimize disturbance	FPR 913.1(a) (6) and 917.2 would apply along public roads for aesthetic value consideration and fire hazard reduction
Parlin Fork management area	demonstration area for small woodland management	exempt from FPR requirements, not from CEQA or CESA
Research areas	areas set aside for various research studies	no current restrictions

Impact: *Conifer Species Diversity and Hardwood Management:* (Less Than Significant)

The DFMP provides for retaining conifer species diversity as required by the FPRs and managing hardwood species at levels, which more closely resembles natural conditions and is conducive to attaining MSP for the Forest. Impacts related to these timber resource values through the DFMP period are considered to be less than significant.

A concern for long-term conifer species diversity exists where single tree selection or cluster selection silviculture is implemented over a longer period of time. The understory growth of shade intolerant redwood and Douglas-fir is expected to be retarded due to light conditions more favorable to shade tolerant species hemlock and grand fir. This would result in higher percentages of hemlock and grand fir in the composition of the under story of the future stand, changing the conifer species diversity desired. The overstory would be expected to trend toward all redwood and Douglas-fir.

Based on the preference for retention of redwood and Douglas-fir stated in the DFMP, the majority of hemlock and grand fir will have been harvested from the overstory. The trees not harvested would likely develop into snags or are blown down due to these species susceptibility to damage during logging operations. The continuing forest inventory will allow JDSF staff to monitor species diversity and adopt management techniques to prevent a significant change in species diversity.

6.3.7 Alternatives

A comparison of Timber Resource Impacts among the various alternatives is presented in Table 26.

TABLE 26 COMPARISON OF TIMBER-RELATED ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant–Mitigation Feasible (5) Significant–Mitigation Not Feasible**
Impact: The project has the potential to have an adverse substantial effect on old-growth forest habitat (a unique habitat type).						
Alt. A						The primary management on JDSF lands would be limited road maintenance to allow continued public access. No timber harvesting would occur. Although this alternative does not include specific protection for old-growth forests, the anticipated level of public use is unlikely to result in impact to the old-growth groves
Alt. B						The 1983 Management Plan establishes no-harvest protections for 115 acres of old-growth groves in the Forest; however, it has been the Forest's policy to protect 11 groves totaling 459 acres. Continued protection of the groves is a feasible mitigation to reduce the impact to less that significant.
Alt. C (DFMP)						The proposed project provides protection to old-growth groves, aggregations of old-growth trees and scattered single old-growth trees with some exceptions for management purposes. In addition, 3 of the protected groves will be buffered with late seral development areas. Retention of the groves and buffers as well as the other more scattered old-growth aggregations and trees will be a beneficial impact to this resource.
Alt. D						These alternatives are similar to alternative C in protection for old-growth forest habitat and would provide a similar beneficial impact.
Alt. E						
Impact: The project would result in a conflict with the Forest Practice Rules, Public Resource Code or other applicable rules and regulations adopted for the purpose of avoiding or mitigating environmental effects relating to Maximum Sustained Productivity of high quality forest products						
Alt. A						No timber harvesting, timber stand improvements or other intensive forest management activities would be undertaken in this alternative. Since no commercial harvest would occur, the Department would not be required to demonstrate compliance with MSP rule standards. However, the timber stands would continue to develop relatively undisturbed and the timber volume would continue to increase over time. Roads would be maintained to the degree necessary for protection of Forestlands from wildfire.
Alt. B						Commercial timber harvesting would continue at the current level of approximately 29 million board feet per year. Department would continue to demonstrate compliance with MSP rule standards on a individual THP basis using the option "A" document or through development of a SYP document. The use of even-aged silvicultural practices would not be constrained by a silvicultural allocation plan, so an emphasis could be placed on timber volume production with consideration to other forest resources as required by the Rules.

TABLE 26 COMPARISON OF TIMBER-RELATED ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant–Mitigation Feasible (5) Significant–Mitigation Not Feasible**
Alt. C (DFMP)						Refer to the projects impact section and Appendix 8 for a complete assessment of the potential impacts of the proposed project in regards to growth and yield. In summary, commercial timber harvesting would continue at approximately 31-33 million board feet per year, a slightly higher level of production than under the current management. The Department would continue to demonstrate compliance with MSP rule standards on an individual THP basis using the option "A" document, or through development of a SYP document. During the life of the Management Plan, no short term significant impact to MSP or growth and yield are anticipated because the proposed project includes a monitoring program and adaptive management approach to ensure that average annual harvest levels do not exceed average annual growth. The implementation of silvicultural practices as described in the management plan has the potential to reduce timber growth and yield in the long term. Similarly, a cumulative impact to timber growth and yield may occur as the result of harvesting numerous THPs across the Forest using the selection silviculture system. The DFMP includes an adaptive management program that addresses this potential impact and will prevent a significant adverse impact form occurring. LTSY is estimated to be 40 to 50 million board feet per year for this alternative.
Alt. D						Commercial timber harvesting would continue at approximately 20 million board feet per year, a reduced level compared to either alternative B or C. The Department would continue to demonstrate compliance with MSP rule standards on an individual THP basis using the option "A" document, or through development of a SYP document. This alternative limits silviculture to the selection method only, with no group openings. This could result in the same potential long tern and cumulative impact disused above in alternative C. The DFMP provides for a monitoring program and adaptive management approach that will be used to ensure that average annual harvest levels do not exceed average annual growth.
Alt. E						Commercial timber harvesting would continue at approximately 10 million board feet per year, a reduced level compared to either alternative B, C or D. The Department would continue to demonstrate compliance with MSP rule standards on an individual THP basis using the option "A" document, or through development of a SYP document. This alternative limits silviculture to the selection method only, with no group openings. This could result in the potential long tern impact disused above in alternative C. The DFMP provides for a monitoring program and adaptive management approach that will be used to ensure that average annual harvest levels do not exceed average annual growth.

TABLE 26 COMPARISON OF TIMBER-RELATED ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant–Mitigation Feasible (5) Significant–Mitigation Not Feasible**
Impact: The project would result in a conflict with the Forest Practice Rules, Public Resource Code or other applicable rules and regulations adopted for the purpose of avoiding or mitigating environmental effects relating to application of silvicultural methods						
Alt. A						No silvicultural methods would be applied in this alternative.
Alt. B						Individual THPs would be prepared and submitted at approximately the same rates as in the recent past or at reduced rates. Plans would be reviewed for compliance to the FPRs and would only be approved if found to be in compliance with the FPRs including all applicable rules pertaining to silviculture.
Alt. C (DFMP)						
Alt. D						
Alt. E						
Impact: The project would result in a conflict with the Forest Practice Rules, Public Resource Code or other applicable rules and regulations adopted for the purpose of avoiding or mitigating environmental effects relating to protection of late seral/successional forest characteristics						
Alt. A						No timber harvesting, timber stand improvements or other intensive forest management activities would be undertaken in this alternative. Since no commercial harvest would occur, no direct impacts to late seral forest characteristics would occur. The timber stands would continue to develop relatively undisturbed and slowly over time would naturally develop late seral characteristics. Although not intended as a late seral development alternative, late seral characteristics would develop over a long time frame.
Alt. B						Commercial timber harvesting would continue at the current level of approximately 29 million board feet per year. Individual THPs would continue to comply with FPRs pertaining to late seral/successional forest characteristics. The Mendocino Woodlands Special Treatment Area and WLPZ would continue to be managed to promote the development of these types of forest characteristics. In other areas of the Forest, development of late seral forest would not be emphasized.
Alt. C (DFMP)						The DFMP provides for retention of late seral and late successional forest characteristics, as well as recruitment of these habitat components. The areas managed for development of late seral structure conditions will occupy about 23 percent of the State Forest. The Forest intends to recruit trees with late successional characteristics in areas that enhance the ecological effects of forests with these structural characteristics. In the near term there would be limited development of late seral characteristics, however on the long term there would be a beneficial impact. Late seral characteristics would be most likely to develop in the areas managed under the group selection system.

TABLE 26 COMPARISON OF TIMBER-RELATED ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant–Mitigation Feasible (5) Significant–Mitigation Not Feasible**
Alt. D						This alternative would provide for retention of late seral and late successional forest characteristics, and set aside more areas where recruitment of these habitat components would be the management goal as compared to the proposed project. Harvest levels would be reduced across the Forest, rotation ages would be lengthened, and no even-aged harvests would be used. Selection would be the only silviculture method used. As discussed in the project impacts section, use of the selection system may not produce the desired late seral characteristics as anticipated, specifically, multiple age classes and canopy layers may not develop as anticipated.
Alt. E						The emphasis of this alternative is the development of late seral forest and the restoration of a natural forest ecosystem. Timber harvesting would be very limited and used to develop late seral characteristics. The majority of the Forest would not be actively managed, but would be allowed to develop without intervention. Given that all of the Forest, with the exception of the remaining old-growth reserves, has developed as a result of timber harvest, the time span to develop late seral forest may be on the order of 100's of years (refer to the impact section and Appendix 8 for more discussion). So there will likely be a beneficial impact to late seral habitat as a result of this alternative, but not for decades or centuries.

6.4 Forest Protection

This section is intended to supplement the Timber Resources Section of this document. A detailed discussion of pest management activities, while not necessarily required under CEQA, is an important component of JDSF management activities.

6.4.1 Setting: Integrated Pest Management of Forest Pests and Diseases

Common Forest Pests and Diseases on Jackson State Demonstration Forest (JDSF)

Both endemic and introduced forest pests such as insects, diseases, and vertebrates have long been established in California's native timberlands. Weeds are also considered forest pests (see the Botanical sections of this document). Pest populations are dynamic and fluctuate in response to climatic and environmental changes (i.e., drought, forest stocking, windthrow, and 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 (IPM) provides a means to address these issues [DFMP, Ch. 3].

The California State Board of Forestry and Fire Protection (CDF) has included Mendocino County within the Zones of Infestation for pitch canker disease since 1997 and for sudden oak death (SOD) since 2001. Both pitch canker and sudden oak death are present in southern Mendocino County, but are not known to occur on JDSF. CDF continues to sample for both pitch canker and SOD throughout JDSF, with all samples negative to date.

Pests known to have caused tree mortality within or adjacent to JDSF are listed in Table 27. There may be other pests of local tree species that are seldom detected or reported.

TABLE 27
COMMON FOREST PESTS ON JDSF[1]

	Douglas-Fir	Grand Fir	Mendocino Cypress	Western Hemlock	Redwood
DISEASES					
Heterobasidion annosum Annosus root disease	X	X			
Armillaria mellea Armillaria root disease	X	X	X	X	X
Leptographium wageneri var. *pseudotsugae* black stain root disease	X				
Phaeolus schweinitzii velvet top fungus	X				
Phellinus pini white pocket rot	X	X			

TABLE 27 COMMON FOREST PESTS ON JDSF[1]					
	Douglas-Fir	**Grand Fir**	**Mendocino Cypress**	**Western Hemlock**	**Redwood**
INSECTS					
Melanophila drummondi flathead fir borer	X				
Dendroctonus pseudostugae Douglas-fir bark beetle	X				
Scolytus unispinosus *Douglas*-fir engraver beetle	X				
Pseudohylesinus nebulosus Douglas-fir pole beetle	X				
Scolytus ventralis fir engraver beetle		X			
Pseudohylesinus seriaceus silver fir beetle	X	X			
Phloeosinus sequoiae redwood bark beetle					X
VERTEBRATES					
(*several species suspected*)[2] tree squirrel(s) (upper stem girdling)					X
Odocoileus hemionus[3] blacktail deer (seedling/sapling browsing damage)	X	X	X	X	X

1 (Robinson, 1993).
2 (Marshall, 2002)
3 Assumption based upon general knowledge (not documented in the original table).

Sudden Oak Death

Sudden oak death (SOD) is a canker disease of forest trees and shrubs, which was recently introduced to California from an unknown source. The disease symptoms were first reported in 1995 in Marin County, and have since spread to nine additional coastal counties in California (Alameda, Mendocino, Monterey, Napa, San Mateo, Santa Clara, Santa Cruz, Solano, and Sonoma), and portions of one in Southern Oregon (Curry County). SOD has not been found on JDSF, and geographically the nearest known incidence is approximately thirty miles to the south (south of Booneville, along Hwy. 128; Kelley, 2002). The rapid spread of SOD regionally, and the presence of most of the known potential host plants on JDSF, justify the need for careful forest management to minimize SOD impact upon the Forest. Presented here is an overview of our current knowledge of sudden oak death. For the most current information about sudden oak death, see the California Oak Mortality Task Force website (www.suddenoakdeath.org).

The pathogen, *Phytophthora ramorum* is a newly described fungus species. Dr. David Rizzo of UC-Davis and Dr. Matteo Garbelotto of UC-Berkeley identified it as the causal agent of SOD in the summer of 2000. In the brief time since, the pathogen has been detected in a number of California native plant species (Table 28).

TABLE 28
CALIFORNIA NATIVE PLANTS KNOWN TO BE AFFECTED BY *PHYTOPHTHORA RAMORUM*[1]

Common Name	Scientific Name
big leaf maple	*Acer macrophyllum*
black oak	*Quercus kelloggii*
California bay laurel (Oregon myrtle)	*Umbellularia californica*
California buckeye	*Aesculus californica*
California coffeeberry	*Rhamnus californica*
California honeysuckle	*Lonicera hispidula*
coast live oak	*Quercus agrifolia*
huckleberry	*Vaccinium ovatum*
madrone	*Arbutus menziesii*
manzanita	*Arctostaphylos manzanita*
California rhododendron	*Rhododendron macrophyllum*
Shreve's oak	*Quercus parvula* var. *Shrevei*
tanoak	*Lithocarpus densiflorus*
toyon	*Heteromeles arbutifolia*

1 USDA-APHIS, as of February 25, 2002.

Similar symptoms of infection by *P. ramorum* occur in tanoak, coast live oak, black oak, and Shreve's oak; although, their appearance, both chronologically and physically, varies. In **tanoak**, leaf symptoms are usually the first to appear, and new growth may droop or turn yellow to brown. In **coast live oak, black oak, and Shreve's oak**, the earliest symptom is the appearance of a bleeding canker. Burgundy-red to tar-black thick sap oozes on the bark surface. Similar bleeding, though less viscous, has been observed on **tanoak**; although, tanoak may not show the bleeding symptom at all. This bleeding is a response to infection with *P. ramorum* and is typically found from the root crown (the area where the trunk fans out to the roots) to a height of 6 feet. Bleeding has occasionally been observed at greater heights. Oaks showing these symptoms typically die within a few months of the appearance of symptoms. Other hosts may also be killed by *P. ramorum* (Garbelotto, et al., 2002).

The pathogen has also been isolated from soil and rainwater in proximity to infested hosts. Plant hosts having foliar symptoms are important in that the pathogen can rapidly reproduce on the leaf surface; allowing for rapid build-up and dispersal of *Phytophthora* spores in the vicinity, and serving as a source of infection.

In **big leaf maple**, *P. ramorum* foliar infection appears more like a leaf scorch, usually starting from the edges of the leaf. Generally this scorching has irregular borders, not following the leaf contour. Coloration of lesions is variable from orange to brown. Even after leaves die and turn yellow, the lesions should still be visible for some time. It is currently unknown whether associated branch dieback is caused by the pathogen (Garbelotto, et al., 2002).

Toyon, **California coffeeberry**, **California honeysuckle**, and **manzanita** are less understood hosts for *P. ramorum* (Garbelotto, et al., 2002). Dark foliar spots, at times demarked by a thick black line, may be one of the symptoms caused by *P. ramorum* on **toyon**. Less prominent foliar spots, branch lesion, and unusual death of entire plants have been reported. In general, lesions appear where water accumulates; they are dark in color, and have a fuzzy margin. Lesions with concentric rings have been reported in **honeysuckle**. The water-soaked appearance of the cankers and the absence of black fungal reproductive structures (*pycnidia*) may help to differentiate *P. ramorum* symptoms on **manzanita** from those caused by *Botryosphaeria.*

California bay laurel symptoms are confined to leaf spotting often surrounded by a chlorotic halo. Leaf spots are often at the leaf tip and may or may not have a blackened line at the border. Another fungus disease, anthracnose, can also cause this symptom. Twig dieback has also been observed on California bay laurel, but it is unknown whether this is due to *P. ramorum*. Plant mortality in bay laurel by *P. ramorum* has not been reported.

P. ramorum can infect the leaves, petioles and twigs of **California buckeye** trees. Early symptoms start as rounded individual spots that tend to coalesce later in the season. The symptoms are very similar to those of buckeye anthracnose. Darkened lesions on petioles and twigs indicate presence of *P. ramorum*. Early summer leaf loss in response to drought is normal, and should not be confused as being due to disease in California buckeye. This natural senescence can cause leaf distortion, which is similar to that caused by SOD, however.

Huckleberry symptoms include twig dieback, which in advanced stages will kill canes down to the ground, killing all the above ground portions of the plant. The small, blackened twig cankers may be dried and/or wilted. Infected huckleberry plants have been observed in areas of tanoak infection.

On **Pacific madrone** the symptoms include purplish leaf spots, and stem cankers that appear as blackened areas on twigs. At the advanced stages, the entire leaf and shoot become black. In the case of madrone, there are other fungal pathogens (i.e., *Botryosphaeria* and *Natrassia*) that are known to cause symptoms very similar to those of SOD. Both juvenile and adult plants may be killed by SOD.

On California **rhododendron (***R. macrophyllum***)**, the symptoms include twig dieback and leaf spotting, usually not mortality. However numerous rhododendrons have been reported killed by the disease in Curry County, Oregon. On rhododendron leaves, brown spots having diffuse, fuzzy margins (rather than sharp margins as caused by sunburn injury) occur, and generally do not involve the midrib of the leaf. Additional symptoms are blackened shoots with or without foliage still attached.

Pitch Canker

Pitch canker is an introduced fungal disease of pines which is injurious to timber or forest growth in fifteen coastal and adjacent counties in the State of California (Alameda, Contra Costa, Los Angeles, Marin, Mendocino, Monterey, Napa, Orange, Riverside, San Benito, San Bernardino, San Diego, San Francisco, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Solano, Sonoma, and Ventura).

A small number of infected trees have been found in native Bishop pine stands in southern coastal Mendocino County. Though Bishop pine is present in JDSF, pitch canker is not known to exist on the Forest. However, for regulatory purposes, the entire County of Mendocino is within the Zone of Infestation–including JDSF. CDF has sampled for pitch canker with observations of crown symptoms, and sterile water bark washings to detect spores. All were negative in recent surveys (Marshall, 2002).

Pitch canker is caused by the fungus *Fusarium circinatum*. The fungus was introduced into California, and occurs elsewhere in the United States. It was first detected and identified in California in 1986, at about the same time, in both Santa Cruz and Alameda Counties. It initially infects branch tips, causing needle wilt and tip death. The disease causes resinous or pitchy cankers on all woody parts of the tree. One of the first symptoms is the dieback of branch tips in the upper crown. Death of the tree or its top may result from secondary attack by bark beetles. Bark, twig, and cone beetles are implicated as vectors (carriers) of this pathogen.

Monterey pine (*Pinus radiata*) and Bishop pine (*P. muricata*) are the tree species most commonly infected in California. Douglas-fir (*Pseudotsuga menzieseii*) has very rarely become infected in natural stands (Erwin, 2002). The pathogen for pitch canker has been isolated from numerous pine species in California, and susceptibility has been determined for additional species by greenhouse tests (Table 29; Dallara, et al., 1995).

TABLE 29
TREE SPECIES FOUND INFECTED WITH PITCH CANKER FUNGUS IN NATURE, AND SPECIES SUSCEPTIBLE IN GREENHOUSE TESTS

Common Name	Scientific Name
NATURALLY INFECTED SPECIES	
Aleppo pine	*Pinus halepensis*
Bishop pine[1]	***P. muricata***
Canary Island pine	*P. canariensis*
Coulter pine	***P. coulteri***
Digger (gray) pine	***P. sabiniana***
Italian stone pine	*P. pinea*
knobcone pine	***P. attenuata***
Monterey pine	***P. radiata***
Monterey x knobcone pine	***P. radiata* x *attenuata***
Ponderosa pine	***P. ponderosa***
Shore pine	***P. contorta***
Torrey pine	***P. torreyana***

TABLE 29 TREE SPECIES FOUND INFECTED WITH PITCH CANKER FUNGUS IN NATURE, AND SPECIES SUSCEPTIBLE IN GREENHOUSE TESTS	
Common Name	**Scientific Name**
Douglas-fir	***Pseudotsuga menzieseii***
SPECIES SUSCEPTIBLE IN GREENHOUSE TESTS	
Eldarica pine	*Pinus eldarica*
Jeffrey pine	***P. jeffreyi***
Mugo pine	*P.mugo*
Scots pine	*P.sylvestris*
Sugar pine	***P. lambertiana***
1) **Bolded** species are California natives. Source: Dallara, et al., 1995	

California native conifers that demonstrated resistance to pitch canker disease in greenhouse seedling tests are **white fir** (*Abies concolor*), **coast *redwood*** *(Sequoia sempervirens*), and **giant sequoia** (*Sequoiadendron giganteum*). Brutia pine (*Pinus brutia*), a non-native species, also showed resistance in these tests (Dallara, et al., 1995).

Regulatory Framework

In the case of plant diseases injurious to timber or forest growth, the Director of the California Department of Forestry and Fire Protection (CDF), with the California State Board of Forestry and Fire Protection, is authorized to declare that a given geographic area is within a Zone of Infestation. Where a quarantine or regulation controls the movement of host plant material within or from infested counties or a Zone of Infestation, that movement is regulated by the California Department of Food and Agriculture (CDFA). In the case of interstate movement, the regulatory agency is the USDA-Animal and Plant Health Inspection Service (USDA-APHIS). The county agricultural commissioners represent both CDFA and USDA-APHIS for regulatory enforcement at the local level. CDF regulations regarding forest pests are restricted to properties under a current, approved permitted project designed to carry out commercial timber operations. Outside of such permits, CDF does not have authority to carry out enforced pest control on the Zone-defined pest; unless the Board has approved of the management strategies and a special budget has been approved for such actions.

Sudden Oak Death (SOD)

California Code of Regulations--The Oak Mortality Regulation, as Applied to State Lands.

JDSF is within the declared SOD Zone of Infestation established by the California State Board of Forestry and Fire Protection and is within the "regulated area" for SOD as designated by the California Department of Food and Agriculture. The zone and regulated area covers all portions of the ten infested counties identified in the California Department of Food and Agriculture (CDFA) Section 3700 regulation (refer to the list of counties

presented below, Regulated Area). Federal regulations from the USDA, Animal Plant Health Inspection Service (APHIS), and state regulations from CDFA address SOD concerns. CDFA regulations limiting the movement of host materials apply to forest management activities on JDSF including timber harvest, timber stand improvement activities and harvest of minor forest products. Under the state regulation, host material can not be transported within or out of the regulated area unless accompanied by a compliance agreement. The Forest Practice Rules (FPRs) do not specifically address SOD. However wherever a Zone of Infestation applies, the FPRs require that mitigations be included in Timber Harvest Plans (THPs) to prevent the spread of the infestation. The following section includes a discussion of the applicable regulations, descriptions of host material, the "free-from" protocol, what constitutes a "compliance agreement," and mitigation measures to prevent the spread of SOD.

A federal quarantine for *P. ramorum* was issued as an interim rule by USDA, Animal Plant Health Inspection Service (USDA-APHIS) on February 14, 2002. For more information on the Federal rule see www.aphis.usda.gov/ppq/ispm/sod/.

Host Material, The Oak Mortality Regulation. This is a California state law (Section 3700 in Title 3 of the Code of Regulations). The law defines the regulated articles–plant parts (except fruits, seeds, and acorns) from all confirmed hosts of *Phytophthora ramorum*. As of April 2002 there are 15 hosts: coast live oak (*Quercus agrifolia*), tanoak (*Lithocarpus densiflorus*), California black oak (*Quercus kelloggii*), Shreve's oak (*Quercus parvula* var. *Shrevei*), California bay laurel or Oregon myrtle (*Umbellularia californica*), toyon (*Heteromeles arbutifolia*), big leaf maple (*Acer macrophyllum*), California honeysuckle (*Lonicera hispidula*), California coffeeberry (*Rhamnus californica*), rhododendron (*Rhododendron* spp., including azaleas), huckleberry (*Vaccinium ovatum*), manzanita (*Arctostaphylos manzanita*), madrone (*Arbutus menziesii*), California buckeye (*Aesculus californica*), and arrowwood (*Viburnum* x *bodnantense*).

Based upon current available information, CDFA, the County Agricultural Commissioners, USDA Forest Service, and CDF have ranked the regulated articles according to their potential for transport of *P. ramorum* and believe that the highest risk for transport is from nursery stock of host species, followed by green waste, then firewood and logs. Lumber and manufactured wood products are not considered a risk for transport of *P. ramorum*. Soil is not included in California's regulations. The enforcement rules are strictest for the highest risk regulated articles. Green waste is considered higher risk than firewood because the pathogen sporulates readily on leaves from tanoak, rhododendron, bay, and some other hosts. However, sporulation is rare on wood.

On JDSF, host material that is likely to be transported may consist of logs from host species produced as part of a harvest plan. In addition, there is the potential for minor forest products such as salvage sawlogs, firewood, and greenery to be classified as host material.

As new hosts are identified by the Rizzo, Garbelotto or Hansen labs, or by CDFA, they are listed by CDFA as official hosts and are added to the regulation. To be listed as a new host, an "official sampler" must have collected the sample. The CDFA currently recognizes only RPFs or government agency personnel that have attended specific CDFA classes on SOD as

"official samplers." CDFA will use the class roster as a list of official samplers. Only an official sampler can complete a free-from survey as discussed below. The completed free-from survey can serve as a compliance agreement as discussed below.

Regulated Area: As of March 7, 2002, regulated counties are Alameda, Marin, Mendocino, Monterey, Napa, San Mateo, Santa Clara, Santa Cruz, Solano, and Sonoma.

Distribution of SOD: Check the website http://www.cnr.berkeley.edu/comtf/ for known infested areas. Information on local distribution may also be obtained from the County Agricultural Commissioner's office or CDF.

State Regulation: SOD can spread via host material. Therefore, plants, plant parts, unprocessed wood and wood products, and other products of the above mentioned hosts cannot be moved within or from counties infested with SOD without authorization by the County Agricultural Commissioner or CDF's harvest document approval process. The term "harvest document" refers to any document filed with the California Department of Forestry and Fire Protection that authorizes the removal of forest products for commercial purposes.

See http://pi.cdfa.ca.gov/pqm/manual/455.html for California Department of Food and Agriculture's (CDFA) regulations regarding commodities covered and restrictions of their movement.

Compliance Agreement. A compliance agreement is required to move host material within or out of the regulated area. A compliance agreement may be obtained through the County Agricultural Commissioner's office. An inspector will complete an inspection and make a determination that all the regulations are understood, that compliance with the regulations will be achieved and that all provisions of the compliance agreement will be carried out. Once a landowner and USDA-APHIS sign a compliance agreement, the regulated host material may be moved interstate as stipulated in the compliance agreement. A compliance agreement may also consist of a free-from certification. A THP or other "harvest document" approved by CDF may also serve as a compliance agreement. A CDF harvest document will allow transport of host material within the regulated area; a free-from certification is required for movement of host material out of the regulated area.

Free-from Protocol. A *P. ramorum* "free-from" survey is a survey of land with host trees or shrubs that is done to determine if *P. ramorum* is present in the area in which a commercial operation will be conducted. All survey results are good for one year, unless symptomatic hosts are observed during that year. A ¼ mile–perimeter buffer will be used around infested areas or confirmed host sites. If *P. ramorum* is confirmed, then an area with a radius of ¼ mile in all directions is considered infested. In addition a USDA-APHIS 2% minimum coverage inspection standard is required on forestlands/open space. Transects would be run designed to cover representative areas known to support SOD. Transect width is variable to allow for adequate inspection. The official sampler must look for symptoms on all hosts along transects (also as approaching site, etc.). CDFA's sampling protocol is to be used to confirm *P. ramorum* in the laboratory. Since the survey is to determine presence or absence–if more than 20 symptomatic trees/shrubs are found, the survey may be stopped to wait for lab results. However, if *P. ramorum* is not found the survey will need to be completed for the entire area.

The State of California Enforcement Rules to Prevent Spread of SOD

The restrictions established by the California Enforcement Rules to Prevent Spread of SOD are summarized in Table 30.

TABLE 30 SUMMARY OF SUDDEN OAK DEATH WOODY MATERIAL RULES UNDER STATE REGULATIONS
A "free-from" survey can act as a compliance agreement: • If the host material is **debarked** a compliance agreement is not needed and material is free to move. • If host material is **not debarked** a compliance agreement is needed to move off-site.
Host material less that 4" in diameter–Must be covered if moved and cannot be moved off-site without a compliance agreement and can only move out of the regulated area with a free-from survey or de-barked.
Host material greater than 4" in diameter–Cannot be moved off-site without a compliance agreement and can only move out of the regulated area with a free-from survey or be de-barked.

Host material less than 4" in diameter (green waste and some special forest products, except fruits, berries and acorns). Host material from within the regulated area and smaller than four inches in diameter (for example, logging slash resulting from a host species) may be left on site untreated, burned on site, or chipped/shredded and left on site. The material may be moved anywhere within the regulated counties if accompanied by a permit/compliance agreement. The permit will be issued by the responsible agency having jurisdiction. For shipment beyond the regulated counties the site must be either surveyed and determined "free-from," or debarked. It is recommended that materials be taken to an approved treatment or disposal facility (i.e., cogeneration plant or compost facility). Host material smaller than four inches in diameter, including chipped and shredded host material, shall be safeguarded during transport (in secured plastic bags, closed containers, or covered by a tarpaulin in such a manner that precludes the escape of any material).

Restrictions on firewood and logs (host woody material greater than 4" in diameter). Firewood and logs may move anywhere within the regulated counties if accompanied by a permit/compliance agreement. The permit will be issued by the responsible agency having jurisdiction. For shipment beyond the regulated counties the site must be either surveyed and determined "free-from," or firewood and logs must be debarked.

Firewood sales on State forest lands. Firewood sales for host material will not be permitted in areas with confirmed cases of sudden oak death (*P. ramorum*). Personnel setting up firewood sales must know how to recognize symptoms of *Phytophthora ramorum*. They should use the "free-from" protocol to determine if *P. ramorum* is present in the proposed firewood sale area. If *P. ramorum* is not detected in the "free-from" survey, the sale is set up as usual with no further regulation. For firewood permits, a provision will be added to the permit explaining the rules of the quarantine, and that compliance with the rules is required.

On State Forest lands, where the public is required to have a permit to collect firewood, CDF shall use this public contact to educate the person(s) about sudden oak death by providing a Pest Alert or other information on sudden oak death along with the firewood permit.

For Timber harvest plans. If host material is to be removed from the site one of two procedures shall be followed:

1. A survey to determine the area is "free-from" *P. ramorum* is completed by Registered Professional Foresters (RPFs) or other official sampler. Symptoms of P. *ramorum* will be surveyed for during the timber cruise or pre-sale layout done to develop the Timber harvest plan. If *P. ramorum* is detected then mitigation measures are required and the regulatory rules for logs, firewood, and those for material less that 4" would apply; or
2. A compliance agreement must be in place at the time of host material removal.

FPR compliance: For commercial harvest subject to the California Forest Practice Rules done in an area in the declared Zone of Infestation the plan submitter must address the mitigations that will be done during the harvest to reduce the possible spread of the pathogen during the harvest operations.

Timber Harvesting Operations: Pursuant to 14 CCR 917.9(a) as part of a THP, an RPF shall identify feasible measures to mitigate adverse infestation or infection impacts from the timber operations (PRC 4527).

Pitch Canker

CDF has authority to impose conditions on the commercial harvest of trees from timberland. For all timber operations regulated by CDF, the Department must be informed if pitch canker is present within the operating area. The State Board of Forestry and Fire Protection has declared a Coastal Pitch Canker Zone of Infestation, as mentioned above and can be checked on the pitch canker website (http://frap.cdf.ca.gov/pitch-canker/woody-guidelines.htm). CDF shall remain informed as to whether or not JDSF lands are infested.

Pitch canker is a "B"-rated disease by the California Department of Food and Agriculture. A Class B rating is for organisms of known economic importance subject to eradication, containment, control or other holding action at the discretion of the county agricultural commissioner. As a result, the local or destination California County Agricultural Commissioner may restrict the movement of known infected host material. In the event that pitch canker becomes present on JDSF, any movement of diseased material from an infested to an uninfested area must be cleared by both the local and destination agricultural commissioners' offices to determine if there are any restrictions.

Proposed Management Measures

State Forest staff will continue to monitor the Forest for early signs of forest pests or conditions that may lead to infestation. JDSF personnel 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 [DFMP, Ch. 3]. SOD and pitch canker disease would be included as forest pests to be monitored.

Specific Management Actions

Efforts to reduce pest damage or predisposition [DFMP, Ch. 3] 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 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.

JDSF DFMP does not include specific Management Actions for sudden oak death and for pitch canker disease.

Thresholds of Significance

Integrated Pest Management (IPM) is a *management activity* rather than a *resource*. The impacts of IPM on environmental resources are addressed in the various resource sections when appropriate. This chapter discusses ways to minimize the impact of forest pests and diseases upon forest health.

Impacts

Generally the impact of Integrated Pest Management activities upon the Forest is minimal due to the localized and sporadic occurrence of significant insect and plant disease outbreaks. These occurrences generally are part of the dynamics of the Forest, and do not pose a threat to the overall ecology of the Forest. Specific outbreaks are managed so as to minimize the negative impact to the surrounding area.

Sanitation/Salvage or other timber harvest operations would be the most likely response to a significant pest or disease outbreak on the Forest. Harvest operations would be considered a management activity of the Forest, and as such would be subject to all of the protection measures included in the Forest Management Plan. Furthermore, if the operations are a commercial operation, the activity would be subject to the FPRs and the THP review

process. The protection measures in the Forest Management Plan and the THP review process would insure that no significant adverse environmental impacts would occur as a result of the activity.

Pests and Diseases Known to Occur on JDSF. Black stain root disease of Douglas-fir was found to be the number one pest problem on the Forest in a 1993 tree mortality survey (Robinson, 1993). Not only were trees of all size classes killed (seedling-to-47.5" dbh), but the infected roots present a problem for reforestation. Insects also attacked a minority of the black stain-infected trees. Flatheaded fir borer (FFB) was the most common, attacking 13 percent of the infected Douglas-fir. There were many undersized Douglas-fir trees, which the FFB could not attack, however (Marshall, 2002).

Marshall (2002) found that where FFB occurred on Douglas-fir, 80 percent of those trees had root disease (72% black stain, 10% Armillaria, with some trees having both of these diseases). Since that survey, he has observed that many more Douglas-fir trees have been killed by the Douglas-fir bark beetle, following a build-up of that beetle in windthrown Douglas-fir after windstorms and saturated soil conditions in the mid-1990s,

Marshall (2002) has also observed an increase of Armillaria incidence, especially in tanoak and golden chinquapin (*Chrysolepis chrysophylla* var. *minor*), which he attributes to the extended drought and saturated conditions for a couple of succeeding years. Both tan oak and chinquapin are significant hardwood timber species on JDSF.

Diseases Known To Be In the Region, but not known To Occur on JDSF. To the south of Mendocino County, both pitch canker and sudden oak death (SOD) are causing widespread tree mortality. However, neither of these plant diseases is currently on JDSF. Disease management activities in the event that either or both should move onto JDSF could be on a large enough scale to impact the Forest resources.

Sudden Oak Death (SOD. Tanoak is the only significant timber species on JDSF known to be susceptible to sudden oak death. However most of the known hosts of the sudden oak death pathogen are present on the Forest. Tanoak is killed by SOD in large numbers elsewhere. The SOD management activities upon the natural resources of JDSF potentially could be on a large enough scale to impact Forest resources.

Pitch canker. Bishop pine is the only native species on JDSF considered being at high risk for pitch canker disease. Transplanted Monterey pines on the Forest are also at high risk. Douglas-fir is a major timber species in JDSF, but it is believed that the risk of pitch canker disease occurring in this species is small. Even where Douglas-fir is present in large numbers within mixed stands of infected Bishop pine and Monterey pine at Año Nuevo State Reserve, pitch canker disease is rare in Douglas-fir (Erwin, 2002).

Any Monterey pines present on JDSF are most likely introduced plantings, and are of limited distribution on the Forest. However, Bishop pine is a major natural component of the Forest. Management activities for pitch canker disease on Bishop pine on JDSF could have significant impacts upon the natural resources of the Forest. The disease itself has the potential to impact Bishop pine populations, particularly in the coastal portions of JDSF.

6.4.2 Biological Resources

The presence of pests and plant diseases can occasionally cause numerous secondary impacts upon the botanical, timber, wildlife, and soils resources of JDSF, in addition to the primary loss of tree growth and tree mortality. Forest pest and plant disease management activities may have additional significant impacts upon these biological resources.

Botanical

Removal of large numbers of dead trees would suddenly change understory conditions in the immediate vicinity by altering canopy density, leaf litter composition, soil moisture, relative humidity, root competition, etc. The more site-specific understory plants may not survive such changes, and could be displaced by species that are better adapted to these new conditions, i.e., invasive weeds. In the absence of sudden mortality and tree removal, there can be expected a more gradual adjustment of understory composition through the course of stand growth and succession.

There is some site disturbance in the course of natural tree fall. Intensive cutting and disposing of stricken trees could result in trampling of vegetation, soil compaction, effects of fire, etc. However, some of this site disturbance could be beneficial to the Forest environment by creating openings for spotted owl feeding and food source , terrestrial habitat of down woody debris, exposure of bare soil for seedbed preparation, etc.

Timber

Sanitation/Salvage is a likely management practice in diseased (i.e., black stain of Douglas-fir) or insect infested stands. Treating areas of significant pest or disease outbreak is intended to improve forest health and timber production.

Wildlife and Wildlife Habitat

Snags, down logs, hollow trees, living trees with brooms and decay are all structural elements of the Forest used by various wildlife species. The DFMP includes specific retention standards for snags and down logs (refer to wildlife section) and has allocated a majority of the Forest to uneven-aged management and development of forest Late Seral characteristics. This management direction is intended, in part, to provide these types of structural elements across the Forest for the benefit of wildlife.

The removal and disposal of diseased or insect-infested trees in these cases is necessary in order to prevent worse losses to the Forest and maintain public safety. Such activity would impact wildlife by changing the availability of shelter and food that is naturally available when trees ultimately die, become down wood on the Forest floor, and eventually return to the soil. The benefits of removal versus leaving infested and/or infected trees must be carefully considered for each situation before management activities proceed. Serious insect outbreaks have the potential to create conditions where snag or down log densities are

increased to a level that threatens forest health or public safety. Forest health and public safety are of great importance, but the role of diseased, dead and fallen trees in supporting wildlife must also be seriously considered. The management objectives for a specific site will ultimately determine to what degree retention of living trees with decay, hollow trees, snags, and logs, and living trees with brooms is permitted.

Benefits of removing dead and/or down trees resulting from severe insect or disease outbreak in a portion of the Forest could come with the ensuing shift in plant community composition. For example, forest clearings support grasses and these in turn support small mammals favored by predatory birds and mammals. Over time, this could induce a diversification of species associated with the affected area.

In contrast, the natural progression from healthy to diseased tree, to snag, to log, to duff and finally soil organic matter provides food and shelter for a myriad of forest creatures (i.e., fungi, nematodes and worms, arthropods, reptiles, amphibians, mammals, and birds) that inhabit the Forest. For example, the formation of cavities within heartwood decaying beetle-killed trees is favored by cavity nesting species including woodpeckers, swifts, nuthatches, small owls, martins, flying squirrels, bats, bears, etc. Hollow trees with broken tops provide nesting opportunities for large raptors. Black stain-killed Douglas-fir usually remains standing for a long period because the disease is a wilt, rather than a root decay. These Douglas-fir serve as snags for wildlife use for many years. The brooms in trees infected by dwarf mistletoe, rust fungi or needle cast fungi provide nesting sites for many wildlife species, including northern spotted owls, great horned owls, great grey owls, blue grouse, goshawks, and Cooper's hawks, as well as some song birds. Dwarf mistletoe provides winter food for porcupines, chipmunks, squirrels, as well. (Bull, Parks & Torensen, 1997).

Geology and Soils

The burning of slash and tree stems would release minerals that had previously been biologically bound back into the soil. This mineral material would be concentrated at the burn pile sites, however, rather than be returned directly to the site of origin. In addition, the organic material would no longer be available for soil organic matter, once burned.

Regulatory restrictions during wet periods may also keep traffic off roads and minimize erosion during "saturated soil conditions."

Hazards and Hazardous Materials

The sanitation/salvage approach of treating trees killed by insects and disease should minimize the level of fuel loading due to tree mortality by disease.

In contrast, the "no-action" approach to disease management could result in excessive fuel loading within the affected area. This is especially true in the case of SOD-infected oaks or tanoaks, which are often riddled with associative decays, contributing to early tree failure.

A "no-action" approach could also further this situation by allowing the pests to continue to spread. This could subject the entire forest to the high risk of a major forest fire.

Population, Housing, and Services

The regulatory restrictions upon public access to infested areas, movement of infested host plant material, extra permitting and inspection requirements, etc., would have a negative impact both economically and in loss of convenience for the public.

In the event of SOD presence, seasonal closure of campsites and trails in infested areas to minimize movement of the disease to disease-free areas would directly impact the public. However, such closures would be during the wet season when use of these features is typically less.

Recreation

Educational programs and distribution of educational materials to Forest visitors about SOD and pitch canker could help minimize impact on the public. These activities would raise awareness of the risks, and encourage public commitment to regulation compliance within JDSF.

The regulation of activities within infested areas could impact the public by possible loss of access to certain areas (roads, trails, campgrounds, etc.) during seasonal restriction.

Transportation and Traffic

The seasonal restriction of foot and vehicular traffic through infested areas could have a direct impact upon the use of certain bikeways, trails and roads located within infested areas.

Land Use and Planning

Most Integrated Pest Management activities are intended to maximize sustained yield and enhance overall forest health. A major land use on JDSF is as a timber harvesting Demonstration Forest. Sustained production is valuable to such production. IPM activities, including regulatory mandates or THP mitigation strategies, are designed to support, rather than impact such usage.

6.4.3 Mitigation

The intent of integrated pest management (IPM) is to attempt to prevent forest pests from causing economic or significant aesthetic or functional forest plant losses by using a variety of management methods that are cost effective and cause the least damage to the environment. IPM makes use of

the benefits of cultural, mechanical, chemical, semi-chemical (e.g. synthetic pheromones), and biological pest management alternatives; as well as regulatory action when necessary [DFMP, Ch 3].

SOD

Although the DFMP may indirectly address sudden oak death (SOD), the recently developed information on the distribution, spread and control of SOD indicates that SOD should be directly addressed in the DFMP. Language should be included in the Forest Management Plan to address the following mitigation measures.

Infected foliage and small diameter woody material of a number of host plants present a high risk for disease spread. Spread of the disease can occur through the unintentional transport of these materials.

Mitigation for operations where products do not move from the state are as follows:

- A "free-from" survey can be conducted and, if no infected hosts are found, no additional mitigations are required. If the survey is conducted it must be conducted by an RPF or other approved person that has attended training for survey and sampling, and is certified as an official sampler, and the plan must explain how the survey was conducted as explained in the training. The "free-from" certification and the approved harvest document explaining the survey process acts as the compliance agreement and the SOD mitigation measures.
- Currently there is no provision that allows moving any host material out-of-state under the federal regulations without removing all bark prior to shipment out-of-state.
- If a "free-from" survey is not conducted, all hosts are assumed to be infected and SOD mitigations as discussed below should be included in approved harvest documents and shall be discussed during the on-site RPF-LTO meeting prior to commencement of timber operations (14 CCR 1035.2).

When a free-from survey has not been conducted, the following mitigation measures to prevent the spread or introduction of SOD should be incorporated into THPs prepared on JDSF lands:

<u>Commercial Harvest on a Regulated Site Where Infected Trees Are Not Being Harvested</u>

Regulations for movement of host material still apply even though logs are not removed from the site. Infected host material (especially foliage) could be picked-up on logging equipment and transferred to other sites. Mitigation measures to minimize the unintended movement of host material are required. Forest Staff or contractors shall complete inspection of loads of logs and equipment leaving the site to ensure that no host material is being transported without a permit. This may require cleaning dirt or mud from the vehicle

to remove host plant material embedded in the dirt or mud, depending on conditions when the timber harvest is conducted.

If firewood from host material is being removed from the site for commercial or private use, a compliance agreement must be in place. The information as to where and what is being removed, how it will be transported, specifically where it will be moved to, and during what time period should be included in the harvest plan if the plan will act as the compliance agreement. If this information is not included in the plan, a separate compliance agreement will be necessary prior to movement of host material. In addition to the compliance agreement, contractors removing firewood on the Forest must still have the required firewood permit.

Commercial Harvest On An Infested Site Where Infected Trees Will Be Harvested.

State and Federal regulations apply. Host material cannot leave the site except as authorized by the County Agricultural Commissioner and/or mitigation measures specified in the approved harvest document. Infected host material (especially foliage) and contaminated soil could be picked-up on logging equipment and transferred to other sites. Mitigation measures to minimize the unintended movement of host material are required. Inspection of loads of logs and equipment leaving the site shall be done by Forest staff or contractors to ensure that no host material is being transported without a permit. This may require cleaning dirt and mud from the vehicle to remove host plant material contained in the dirt or mud, depending on conditions when the timber harvest is conducted.

If firewood from host material is being removed from the site for commercial or private use, a compliance agreement must be in place in addition to the required firewood permit. The information as to where and what is being removed, how it will be transported, specifically where it will be moved to, and during what time period, should be included in the harvest plan if the plan will act as the compliance agreement. If this information is not included in the plan, a separate compliance agreement will be necessary prior to movement of host material.

For Minor Forest Products: In the regulated area, the collection of minor special forest products that are known host plants will be restricted to areas where the "free-from" protocol has been implemented, or where a compliance agreement is in place.

Recommended Measures, Should SOD Be Identified On JDSF Lands.

Measures to minimize the unintended movement of host material from infested areas include:

- RPF shall inform personnel that they are working in an SOD-infested area, unauthorized movement of plant material is prohibited, and the intent of the mitigation measures is to prevent disease spread (914 CCR 1035.2).

- If some sites in the general operating area are found to be disease-free of have a low incidence of disease, initiate and complete operations on these sites before moving to more heavily infested sites.
- To the extent practical, locate landings, log decks, logging roads, tractor roads, and other sites of equipment activity away from host plants, especially areas with disease symptoms. Route equipment away from host plants and trees, especially areas with disease symptoms.
- Each time equipment or vehicles leave the site, the equipment or vehicles must be inspected for host plant debris (leaves, twigs, and branches). Host plant debris must be removed from the equipment and vehicles prior to their departure. This applies to all equipment and vehicles associated with the operation, including logging equipment, log-hauling trucks, pick-up trucks, employee's personal vehicles, etc. An exception will be granted for equipment or vehicles that leave the site temporarily and will not be traveling to uninfested areas prior to their return.
- In addition to following California Department of Fish and Game (CDFG) drafting guidelines (intake mesh size, etc.), water should not be drafted from a watercourse in a SOD-infected drainage and used in an uninfested area. This is because sporangia from infected leaves (or minute parts of infected leaves), themselves in the watercourse, could be suctioned in the draft and transported to new areas. Infection could be possible if abatement overspraying landed on susceptible hosts.

Measures to minimize the unintended movement of soil and host material from infested areas. These measures are not specifically required for operations on infested sites, but the RPF must state and justify what measures will be used to minimize the unintended movement of infested host material.

The SOD fungus resides in soil and duff in infested areas and soil/duff is therefore a potential carrier of the disease. The greatest threat of disease spread occurs when wet soil is present. Soil movement should be addressed.

- Because wet soil and mud will readily adhere to vehicles, equipment, and boots: conduct operations during the dry season; utilize paved and rocked roads and landings to the extent possible.
- After working in an infested area, remove or wash off accumulations of soil, mud, and organic debris from shoes, boots, vehicles and heavy equipment, etc. before traveling to an area that is not infested with SOD. Consider establishing an equipment power wash station.

The station should be:

- located within the generally infested area
- paved or rocked
- well-drained so that vehicles exiting the station do not become recontaminated by the wash water
- located where wash water and displaced soil does not have the potential to carry fines to a watercourse (see "Saturated Soil Conditions" in 14 CCR 895.1)

- Pay particular attention to sites where soil and organic debris may accumulate.

Recommended Measures, Should Pitch Canker Be Identified On JDSF Lands.

Pitch Canker

The timely removal and disposal of trees dying from pitch canker may help prevent the buildup of destructive beetles which can attack other trees, and can carry the pitch canker pathogen to uninfected trees.

The disposal of pitch canker diseased material should be done on-site so as not to spread the disease to uninfested areas. Limbs and small pieces of wood may be left on-site or they may be chipped or burned.

Logs cut from pitch canker diseased trees may be split for firewood for local use, but the wood should be seasoned beneath a tightly sealed, clear plastic tarp to prevent the buildup of destructive insects. California Department of Forestry and Fire Protection Tree Note #3, *Controlling Bark Beetles in Wood Residue and Firewood*, provides specific guidelines for placing tarps over and around firewood. Do not stack pine firewood next to living pine trees or transport it to uninfested areas (Sanford, 1996).

The distribution of the disease is discontinuous and thus there are infested as well as uninfested areas within the Zone of Infestation. At the time this document was prepared, pitch canker was not known to occur on JDSF. The Pitch Canker Task Force of the California Forest Pest Council and CDF have on-going monitoring underway for the disease. JDSF staff should report any symptomatic Bishop pines to the Task Force for determination of presence of pitch canker. CDF and the Mendocino County Agricultural Commissioner shall be notified immediately in the event that pitch canker is found on JDSF.

Directions for Registered Professional Foresters and Licensed Timber Operators

- Know when you are working within an infested area.
- The California Department of Forestry and Fire Protection (CDF) has the authority to impose conditions on the commercial harvest of trees from timberland within the Zone of Infestation. Such actions are to be carried out on a case by case basis and depend upon the harvest operation's potential to contribute to disease spread. For all timber operations regulated by the Department, the Department must be informed if pitch canker is present within the operating area.
- Do not transport infected or contaminated material to areas that are free of the disease.
- When cutting or pruning a diseased tree, clean tools with a disinfectant before using them in uninfested areas. Lysol® is an effective sterilizer. Make sure that clients and co-workers are aware of these guidelines (Pitch Canker Task Force, 2000a).

Directions for Firewood Cutters

- JDSF personnel should be kept informed whether pitch canker is determined to be present on the Forest. Any suspect areas shall be avoided for firewood harvest until an official determination is made as to presence or not of the disease. At time of firewood permit issuance, JDSF personnel shall direct firewood cutters to disease-free areas of the Forest. Information on pitch canker disease recognition and regulations shall be provided with the collection permit in the event that pitch canker becomes present on the Forest.
- Tools and machinery that are to cut trees with pitch canker disease **WILL BECOME CONTAMINATED** with the pitch canker fungus. There is little chance of spreading pitch canker if contaminated tools are only used on dead trees or on trees that are not pines. However, if contaminated tools or machinery will be used on living pines, the tools should be cleaned and sterilized before use on uninfected trees or in uninfested areas. Lysol® is a suitable sterilizer for this purpose. A logical alternative to repeated cleaning of equipment is to reserve one set of equipment for use only in infested areas, and another set for use only in uninfested areas.
- Do not transport pine firewood out of infested counties (Mendocino County is an infested county). Sell pine firewood locally, for local use guidelines (Pitch Canker Task Force, 2000a).

Directions for Other Forest Product Harvesters

- JDSF personnel, at time of collecting permit issuance shall direct collectors to disease-free areas of the Forest. Information on pitch canker disease recognition and regulations shall be provided with the collection permit.
- Collectors shall not be permitted to remove pine products from trees infested with pitch canker disease.

Directions for Reforestation in Areas Affected by Pitch Canker

- Material for replanting should be as local in origin as possible to retain the genetic integrity of the local population (Pitch Canker Task Force, 2000b).

  Option 1. The preferred strategy for reestablishing Bishop pine would be to allow natural regeneration to occur. Site improvement to encourage regeneration may be required where a dense overstory precludes the development of a seedling stand. Where natural regeneration does occur, it can be expected that pitch canker will eventually infect some or most of the young trees. However, the trees will vary in their susceptibility and some may sustain little or no damage. This is the least intrusive approach to reforestation, with the possibility that a level of pitch canker resistance will be attained that eventually provides the desired density of mature trees (Pitch Canker Task Force, 2000b).

Option 2. If option one is acceptable in principle but there is insufficient seed to produce a stand, locally collected seed could be introduced. By collecting seed from asymptomatic trees, there is more likelihood that some are resistant, and a certain percentage of the progeny will carry this trait as well. It is thought that a small percentage of resistant individuals may be sufficient to establish a stand. To diversify the seed source, it is recommended that seed be gathered from: 1) multiple trees, at least 100 meters apart where possible, 2) trees of differing ages, and 3) different heights within the same tree. Trees that have been planted should be avoided, as they may be non-local in origin. In addition, trees with evidence of disease or poor health should not be used as a seed source (Pitch Canker Task Force, 2000b).

Option 3. The least desirable measure for maintaining Bishop pine presence is to transplant known resistant seedlings from a reputable source. The potential loss of genetic integrity could result in a nonnative stand (Pitch Canker Task Force, 2000b).

6.5 Wetlands

6.5.1 Setting

Wetlands are defined by the ACOE as those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (ACOE 1987). The quality and relative value of a wetland is dependent on its age, extent, and structure, and wetlands develop from both natural and anthropogenic causes.

Known wetlands include two sphagnum bogs and the seeps in the Bob Wood's Meadow. Wetlands may also be associated with the seeps and springs elsewhere on the property. In addition, wetlands maybe associated with watercourses and along roadside drainage features.

6.5.2 Regulatory Framework for the Protection of Wetlands

Section 401, Clean Water Act: Federal protection is described in Section 401 of the Clean Water Act. This requires that State water quality standards not be violated by the discharge of fill or dredged material into "Waters of the United States." Section 404 of the Clean Water Act authorizes the ACOE to issue permits for discharges of dredged or fill material into streams and wetlands.

6.5.3 Project Measures for the Protection of Wetlands

Wetland protection is specifically addressed in the management plan. JDSF will manage wetland habitats in a manner that maintains or restores productivity and contributes to the aquatic habitat, water quality, and ecological functions and processes. JDSF will protect site integrity and hydrologic function of wetlands.

Wetlands that occur within riparian zones will also be protected by the JDSF riparian and stream management program. The aquatic resources section has a complete description of the riparian protection measures.

Watershed and Ecological Processes: A goal of the DFMP is to promote and maintain the health, sustainability, ecological processes, and biological diversity of the Forest and watersheds during the conduct of all land management activities.

6.5.4 Thresholds of Significance

Based on policy and guidance provided by CEQA (PRC Section 21001 and the CEQA Guidelines), an impact of the proposed project would be considered significant if the proposed project would have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act through direct removal, filling, hydrological interruption, or other means.

6.5.5 Impacts

Impact: ***A program-related management activity would have a substantial adverse effect on federally protected wetlands through direct removal, filling, hydrological interruption, or other means.*** **(Less Than Significant)**

In general, ground and vegetation disturbing activities have the potential to directly impact wetlands. Activities proposed on the JDSF with the potential to impact wetlands include timber harvest and log transport, road construction and maintenance, the fire protection program, and vegetation management.

Wetlands will be protected during management activities of the Forest. The DFMP specifically states that JDSF will protect the site integrity and hydrologic function of wetlands. In addition, JDSF will manage wetland habitats in a manner that maintains or restores productivity and contributes to the aquatic habitat, water quality, and ecological functions and processes.

In addition, the FPRs afford prescribed protection measures to wetlands in the form of WLPZ's. Watercourses, seeps, and springs are given standard buffers that vary in width based on slope with the width increasing as slopes increase. Since the incidence of wetlands are often associated with FPR defined watercourses, seeps and springs, it is expected that many of the wetlands that occur on the JDSF will be protected under these rules. Furthermore, the definition of a class II watercourse is more inclusive than the definition of an ACOE wetland. For this reason, wetlands within project areas will be encompassed by the WLPZ protections. Management activities that are subject to the THP review process will identify seeps, springs, and riparian habitat, and these areas will be incorporated in WLPZ's.

Indirect impacts to wetlands may also result from the implementation of the DFMP. There is a potential for sediment transport into wetlands due to point and non-point sources. This is mediated by several facets of the DFMP including the protections for riparian areas, inner gorges, review of

unstable areas by a licensed geologist, the road management plan and WLPZ's protections. For further discussion regarding project effects on sediment transport, refer to Section VII-6.1 (Aquatic Resources) and Section VII-7 (Geology and Soils).

6.5.6 Mitigation

None Required.

6.5.7 Alternatives

A comparison of wetland-impacts among the various alternatives is presented in Table 31.

TABLE 31 COMPARISON OF WETLAND IMPACTS IN RELATION TO THE VARIOUS ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant–Mitigation Feasible (5) Significant–Mitigation Not Feasible**
Impact: A program-related management activity would have a substantial adverse effect on federally protected wetlands through direct removal, filling, hydrological interruption, or other means.						
Alt. A						Under this alternative, the primary land use on JDSF would be public recreation that would utilize current facilities. Wetlands would not be significantly impacted either directly or indirectly by recreational use of the Forest
Alt. B						The 1983 Management Plan does not specifically address the protection of wetlands for non-THP projects. Feasible mitigations could be developed for non-THP projects that reduce impacts to less than significant. Activities subject to the THP review process will provide protection to riparian areas that could be defined as wetlands.
Alt. C (DFMP)						There is no substantial difference between Alternatives C, D and E regarding their potential impacts to wetlands. For each alternative, the DFMP requires protection of wetlands and activities subject to the THP review process will provide protection to riparian areas that could be defined as wetlands.
Alt. D						
Alt. E						

6.6 Wildlife and Wildlife Habitat

6.6.1 Affected Environment

Analysis of the potential impacts of the alternatives focuses on changes in wildlife habitat and populations on JDSF. While lands owned by other entities occur and contribute to the occurrence and persistence of wildlife species associated with JDSF, the future management of these lands is unpredictable. For this reason, the quantitative assessment of changes in habitat condition is limited to JDSF lands.

Existing Wildlife Habitat Conditions

<u>California Wildlife Habitat Relationships (CWHR)</u>

The CWHR is a classification system used to describe the type and structural characteristics of wildlife habitat (Mayer and Laudenslayer 1988) and predict associated wildlife species (CDFG 1999b). The CWHR classification system was used to describe wildlife habitats on JDSF. Forest habitat types cover about 97% of JDSF. Redwood, which includes a significant component of Douglas-fir, is the most common forest habitat type on JDSF (45,243 acres or 93%). Approximately 19% (9,444 acres) is currently classified as CWHR class 6, which is scattered throughout JDSF. Approximately 39% (18,864 acres) is in size class 5; six percent in size class 4; and 13% is redwood classified as size classes 1, 2, or 3. The remaining acreage includes about 4% (1,883 acres) montane hardwood-conifer of size class 3; about 3% (1,233 acres) of closed-cone pine-cypress and the remaining acreage consist of less than one percent of annual grassland (229 acres) and mixed chaparral (64 acres) (Table 32). Riparian, fresh water emergent, sphagnum bogs, ponds, riverine types are found within the habitats listed above and in Table 32.

Although the CWHR system encompasses several important attributes for wildlife habitats, its model does not account well for some elements or features that contribute to the overall quality for wildlife. As an example, CWHR considers redwood habitat 4S to 6 as high quality nesting habitat for Vaux's swifts. However, Vaux's swift nest in hollow snags which may or may not be available in these habitat types. The lack of snags in a given habitat would render it unsuitable for this species. In addition to snags, other features or elements including downed logs, talus, cliffs, caves, wetlands, hardwoods, or particular combinations of biotic and abiotic features that create unique habitat conditions. These additional wildlife habitat features are addressed below.

TABLE 32 JDSF CWHR HABITATS IN ACRES						
	AGS	**MCH**	**MHC**	**RDW**	**CPC**	**Total Acres**
1				194		**194**
2D				65		**65**
2M				1,733		**1,733**
3D			1,883	3,804		**5,687**
3P				648		**648**
4D				7,067	626	**7,692**
4M				187		**187**
4P				2,549		**2,549**
4S				331		**331**
5D				627		**627**
5M				5,989		**5,989**
5P				12,548		**12,548**
6				9,444		**9,444**
<>	229	64		57	*608	**958**
Total Acres	**229**	**64**	**1,883**	**45,243**	**1,233**	**48,652**

AGS: Annual Grassland
MCH: Mixed Chaparral
MHC: Montane hardwood-Conifer
RDW: Redwood
CPC: Closed-cone Pine-Cypress
<>: Lacks Canopy Cover or Unclassified
*: Pygmy Forest

Late-Successional/Old-Growth Forest Habitat

Late-successional/old-growth forest has characteristics unique among the various forest seral stages that combine to create habitat of high value to various wildlife species. Some species are believed to be dependent on such forests. As an example, marbled murrelets typically require large old-growth trees for nesting. For other species, late-successional/old-growth forest may be considered higher-quality habitat than younger forests, although their viability may not be dependent on these conditions. The availability of late-successional/old-growth forest habitat is a concern because of its value as wildlife habitat and the substantial reduction in this forest seral stage that has occurred throughout Pacific Northwest over the last 150 years.

Old-growth forests are distinguished from other forest seral stages in several respects. In most cases, trees form a single crown canopy layer as they grow through their juvenile and early-seral stages. They generally maintain this single canopy layer until competition, weather, insects, or disease cause mortality, resulting in holes in the canopy. Over time, seedlings become established and grow in these holes. This results in multiple canopy layers that include many large trees, some with broken tops and decaying wood, many large snags, and heavy accumulations of large logs on the Forest floor. This process can begin in

stands as young as 40 years in some areas, but take well over 100 years in others (Green 1985). See the Timber section of Appendix 8 for additional information on late seral development.

Definitions of what constitutes old-growth vary. Some authors use tree diameter to define it as 50 percent or more of the conifer canopy in trees over 24 inches dbh; others use over 20 inches dbh, or over 41 inches dbh. Some use age and define it as a certain percent of trees being over 100 years or being mature (Green 1985). The multi-storied stage, true old-growth, develops over the next 100 to 200 years, as the multiple canopies with large snags, and many large fallen trees become completely formed (USFS and BLM 1994). These multi-canopied, structurally complex forests create important habitat for many plant and animal species. The DFMP provides a definition for old-growth trees and old-growth aggregations.

Stand size and degree of fragmentation influence the value of late-successional stands to wildlife species. Fragmented forests composed of many small stands have a high ratio of forest edge to interior forest. A number of forest structure and environmental changes occur at the edges of forests that may reduce habitat value for some wildlife species while increasing the value for others. At forest edges, wind disturbance increases, temperature and humidity are more variable, and canopy cover and vegetation type can substantially differ from that of the interior forest (Chen et. al. 1992, 1993, 1995). Predation and parasitism on forest-nesting birds can also be greater along a forest edge relative to more interior forest areas (Brand and George 2000). On the other hand, some prey species, such as the dusky-footed wood rat, occur in greater densities in brushy stands and early-successional habitats (Sakai and Noon 1993) and are known to occur in early successional stands on JDSF (Fitts 1991). Woodrats are an important prey source for northern spotted owls, a late-successional nesting bird (Thomas et al. 1990, Zabel et al. 1995). In general, a mosaic of late, mid, and early-successional forested habitats will provide habitat for these and a wide range of other wildlife species.

Patches of both old-growth redwood and Douglas-fir forests are found in coastal northern California. The climatic and soil conditions in this area produce stands of very large, long-lived trees. The majority of the remaining old-growth redwood in California (about 90,000 acres) is in state and federal parks (Green 1985). These remnant multi-canopied, old-growth stands provide important habitat for many plant and animal species that cannot be provided by younger forests.

Old-growth forests and late successional forest as defined by the FPR are not well represented by the CWHR classification system. According to the FPR, "late successional forest" stands mean stands of dominant and predominant trees that meet the criteria of CWHR 5M, 5D, or 6 with an open, moderate, or dense canopy closure classification, often with multiple canopy layers, and are at least 20 acres in size. Functional characteristics of late successional forests include large decadent trees, snags, and large down logs."

Although stands classified as CWHR 5M and 5D have large trees and high canopy closures, characteristics of late successional forest habitat may be lacking. Individual stands of CWHR 6 contain multi-storied structure, but may lack decadence (i.e., snags and downed wood) required for the stand to function as late-successional forest habitat or be classified as late-successional under the FPRs.

As such, acreage of CWHR stands 5M, 5D, and 6 represent the maximum availability of late successional forest habitat on JDSF. More detailed information on the structure and composition of individual timber stands classified as 5M, 5D, or 6 could reveal that some of these stands do not have the characteristics necessary to function as late-successional forest habitat. Old-growth stands are a subset of those classified as CWHR 5M, 5D, or 6. Designation of a stand as old-growth or late successional requires an evaluation of individual characteristics, such as the stand's age, structural characteristics, and harvest history.

There are 11 designated old-growth groves on JDSF, totaling 459 acres (184 ha) (Table 33). 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 in the state parks located near JDSF.

TABLE 33
OLD-GROWTH GROVES ON JDSF

Name	WWAA	Acreage
Lower James Creek Groves (4 Groves)	Eastern	221
Camp 20 (1 Grove)	Eastern	78
Upper James Creek (1 Grove)	Eastern	67
Waterfall (1 Grove)	Eastern	37
Road 334 (1 Grove; NFSF Noyo)	Northern	24
Road 1000 (1 Grove; NFSF Noyo)	Northern	14
Upper NFSF Noyo (2 Groves)	Northern	18
Total		459

Snags and Downed Wood

Snags are standing dead trees, and downed wood (or LWD) is fallen dead trees, or parts thereof. These elements provide important micro-habitats or elements to wildlife species for denning, nesting, roosting, or foraging. Snags and LWD are recognized as critical habitat elements for a wide array of forest-dwelling wildlife species. Snags and decaying live trees can provide cavity nests, chimney roosts, platform nests, perches, food caches, foraging substrates, and nests or roosts beneath peeling bark. Similarly, LWD can provide food and cover for a variety of species. The abundance and size distribution of snags and LWD influence the presence and persistence of certain wildlife species. According to the CWHR,

over 90 vertebrate species that occur in Mendocino County prefer or require snags to fulfill a portion of their life history needs (2 amphibians, 54 birds, and 36 mammals) (CDFG 1999b).

For purposes of this analysis, snags are defined as dead trees greater than 11" dbh and 12' 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 ones because they last longer (before they decay and fall down), provide better thermal cover, and accommodate a more diverse spectrum of wildlife species. Therefore, the following summary of snag distribution on JDSF includes snags that are at least 11 dbh.

Target densities for snags in a variety of managed forests have been proposed by a number of authors using a variety of methods. Zarnowitz and Manuwal (1985) recommended 3.6 snags per acre for cavity-nesting birds in western hemlock Douglas-fir forests on the Olympic Peninsula of Washington. Mannan et al. (1980) recommended 4.3 snags per acre for breeding birds in Douglas-fir forests in western Oregon. Hunter (1990) suggested two to four large snags per acre as an average target for an array of habitat conditions across North America. In the Sierra Nevada of California, Raphael and White (1984) found that the abundance of cavity-nesting birds increased with snag density to a maximum at three snags per acre. Due to the longer life expectancy and high resistances to bugs, disease, and decay, redwood take much longer to develop into snags than other species such as Douglas-fir, white fir, grand fir, and hardwoods.

The average density of snags on JDSF is estimated to be 1.9 per acre, based on forest inventory plot data. Fifty-seven percent are conifer and 43% are hardwood (Table 34).

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 reduced the amount of LWD on the Forest floor of many managed forests. LWD is also an important structural component in aquatic and riparian habitats. Numerous wildlife species rely on LWD for cover, nest sites, or foraging habitats.

TABLE 34
CHARACTERISTICS OF SNAGS ON JDSF

Tree Species	Total # of Snags Surveyed in JDSF	Snag Diameter (DBH, in inches)			Density (snags/acre)			
		Average	Standard Deviation	Maximum	11-19"	20-29"	30+"	Total
Conifers								
old-growth redwood	2	19.0	1.7	20.2	0.01	0.01	0.00	0.02
old-growth Douglas-fir	0				0.00	0.00	0.00	0.00
young-growth redwood	12	17.7	5.5	28.7	0.12	0.02	0.00	0.15
young-growth	32	18.2	7.0	39.2	0.27	0.10	0.02	0.40

TABLE 34 CHARACTERISTICS OF SNAGS ON JDSF								
Tree Species	**Total # of Snags Surveyed in JDSF**	**Snag Diameter (DBH, in inches)**			**Density (snags/acre)**			
		Average	**Standard Deviation**	**Maximum**	**11-19”**	**20-29”**	**30+”**	**Total**
Douglas-fir								
grand fir	3	34.3	11.9	44.1	0.00	0.01	0.02	0.04
western hemlock	2	14.9	0.4	15.2	0.02	0.00	0.00	0.02
Bishop pine	32	17.1	4.4	34.7	0.33	0.05	0.01	0.40
cypress	2	12.6	0.3	12.8	0.02	0.00	0.00	0.02
other conifer	2	14.7	0.1	14.8	0.02	0.00	0.00	0.02
Hardwoods								
tanoak	34	18.8	6.3	35.1	0.26	0.12	0.04	0.42
Pacific madrone	23	14.2	2.9	21.3	0.27	0.01	0.00	0.28
red alder	4	17.2	4.3	22.3	0.04	0.01	0.00	0.05
California bay	0				0.00	0.00	0.00	0.00
canyon live oak	2	17.6	7.0	22.5	0.01	0.01	0.00	0.02
willow	0				0.00	0.00	0.00	0.00
bigleaf maple	0				0.00	0.00	0.00	0.00
eucalyptus	0				0.00	0.00	0.00	0.00
other hardwood	3	17.7	4.6	21.6	0.02	0.01	0.00	0.04
Summary								
conifer snags	87	18.0	6.5	44.1	0.81	0.20	0.06	**1.07**
hardwood snags	66	17.0	5.4	35.1	0.60	0.17	0.04	**0.81**
total snags	153	17.6	6.1	44.1	1.42	0.37	0.10	**1.89**

Hardwoods

Hardwood stands and inclusions in predominantly coniferous forests provide important habitats and/or elements for a variety of wildlife species. The acorn crops of oaks and chinquapin, as well as the berries of the madrone, provide an important food resource for many bird and mammal species (Martin et al. 1951, Diller 1996). Klug (1996) found that stands where fishers were detected had a greater percentage of hardwoods than stands where fishers were not detected. Northern spotted owls and northern goshawks have been observed nesting in various hardwood tree species in Mendocino County, California (D. Embree, pers. observ.). The presence of a hardwood component is particularly important for wildlife in conifer-dominated forests as it provides habitat diversity, food, and cover.

Most of the hardwoods on JDSF occur as components of coniferous forests rather than in hardwood-dominated stands. This mixed coniferous forest type is common throughout Mendocino County, as well as in other portions of northern and southern California (Barbour and Major 1988, Holland and Keil 1995). On JDSF, hardwoods include madrone, black oak, canyon live oak, tanoak, California bay, chinquapin, red alder, bigleaf maple, willow, and eucalyptus (a non-native species). Alder, maple, and willow are generally

restricted to riparian areas. Very few stands consist entirely of hardwoods, although some riparian areas contain nearly pure stands of alder. A large infestation of eucalyptus that was originally planted as a wind break is found in Casper Creek. Additional information on the hardwood component of vegetation types on JDSF is provided in the Botanical Section (Section VI-6.2).

Riparian Habitat

Riparian forests are a special habitat type represented by transitional areas between aquatic and upland zones, encompassing sharp environmental gradients, unique ecological processes, and diverse communities (Naiman et al. 1993). In coniferous forests, the diverse vegetation structure and composition of riparian zones provide a mosaic of habitats and edges in a small area, making them a source of habitat diversity (Thomas 1979). Riparian zones provide important resources to both obligate riparian and upland species. Species diversity is typically higher in riparian zones than in upland vegetated zones, and the diversity of wildlife species using these zones is related to this habitat diversity.

As discussed in more detail in the Aquatic Resource Section (Section VI-6.1), stream shading and riparian canopy closure can influence water temperatures and microclimate conditions in the riparian zones. These parameters can strongly affect the habitat quality for some species. (Please refer to the Aquatic Resources Section for more information on JDSF riparian habitats.)

Wetland Habitat

Wetlands support specialized plant communities, which in turn provide foraging and breeding habitat for a variety of invertebrates, amphibians, reptiles, birds, and mammals. Wetland areas on JDSF are small in extent, but of high interest and value. They include a two (known) *Sphagnum* bogs, a few isolated ponds, stream margins and several springs and seeps.

Sphagnum bogs are rare in California, owing to the typical excess of evapotranspiration relative to precipitation. *Sphagnum* bogs develop in low-lying areas fed by mineral-poor seeps and springs that are invaded by various moss species, including those of the genus *Sphagnum*. Over time, the accumulation of peat formed from plant remains alters the hydrology of the bog, isolating it from input of groundwater. The increased dependence on direct input of rainwater, together with the organic acids released by decaying *Sphagnum*, lowers the pH of the bog. The low pH, saturated organic soil and very low nutrient availability create conditions favorable to a highly specialized group of plants, including a number of carnivorous plants (Schoenherr 1992 and Holland and Keil 1995). Because bogs are nutrient-poor, they are particularly vulnerable to watershed changes that cause an influx of organic matter or mineral-rich water (Guntenspergen and Stearns 1985) and to alteration of drainage patterns.

Springs are located where water emerges from the ground and flow is evident; seeps are generally thought of as those areas where water emerges from the ground, but flow is not evident. The springs and seeps on JDSF have generally not been mapped in detail. Springs and seeps in coastal Mendocino County provide an important water source and/or support many plant, invertebrate, and vertebrate species. (Please refer to the Aquatic and Botanical resources sections for additional information regarding wetlands on JDSF).

Other Unique/Special Habitats and Features

Snags and LWD (discussed above) are not the only important elements for wildlife species. Other special habitat elements required by some species include specific geologic features such as cliffs, caves, or talus; or specific non-forest habitats such as meadows, vertical banks, or sandy beaches. A particular species' life requirements may be met solely by the broad habitat type, or it may require many specific elements that are independent of the dominant vegetation. The absence of a particular key element can eliminate the species from otherwise suitable habitat.

No caves are known to occur on JDSF. The ownership does contain a few rock outcrops, although they are not steep or high enough to provide habitat for cliff-associated species such as peregrine falcons. JDSF also lacks talus that some amphibian species (e.g., Del Norte salamanders) require. Deposits of rock and dirt occur in association with debris slides on JDSF, but the large amount of soil filling interstitial spaces in these deposits limits their habitat value for talus-associated species.

Unusual habitat types that occur within the assessment area but outside of JDSF 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) and 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 Northern WWAA.

The Bob Woods Meadow is in a natural forest opening or glade, which is a type of grassland typical of the northern California coastal region. Forest openings or glades are usually at slightly higher elevations than coastal prairie grasslands, but are located closer to the coast than bald hill prairies (Barbour and Major 1988). Glades and forest openings typically occur where the soil is alkaline and high in clay content, which in combination may prevent tree establishment.

Wildlife Communities

The current mix of forest seral stages on JDSF has resulted in a high level of biodiversity. The CWHR (CDFG 1999) predicts that the range and habitat of 352 wildlife species' (mammals, birds, reptiles and amphibians) includes Mendocino County and habitats found on JDSF (DFMP, Appendix V, Table 1). The list was generated from the CWHR database by establishing query parameters consisting of Mendocino County (species range) and the primary habitats known to be present on JDSF (Table 32). This list 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, structural elements, key habitats) were met. It includes numerous species that have not been documented on JDSF.

Neotropical Migratory Birds

DeGraff and Rappole (1995) define neotropical migratory birds as "Western hemisphere species, all or part of whose populations breed north of the Tropic of Cancer and winter south of that line." Many of these species use the Pacific Flyway during migration. According to DeGraff and Rappole (1995), and populations of many neotropical birds have declined. Several factors are believed to explain these recent and dramatic declines in forest-dwelling neotropical migratory birds: 1) loss and fragmentation of habitat, 2) brood parasitism by brown-headed cowbirds, and 3) contaminant poisoning (DeGraff and Rappole 1995).

DeGraff and Rappole (1995) identified 361 species of neotropical migratory birds based on the above definition. From the list of species potentially occurring on JDSF generated through CWHR and based on DeGraff and Rappole's (1995) list of neotropical migrants, 133 species of neotropical birds have the potential to occur on JDSF (Table 35). Notably, some species have resident populations near JDSF, and remain in the area for a significant portion of the year although at the species' level they meet the definition of a neotropical migrant.

TABLE 35
NEOTROPICAL MIGRATORY BIRD SPECIES WITH THE POTENTIAL TO OCCUR ON THE JDSF

Pied-billed grebe	Killdeer	Barn swallow
Eared grebe	Greater yellowlegs	Cliff swallow
Western grebe	Lesser yellowlegs	Rock wren
Brown pelican	Willet	Bewick's wren
Double-crested cormorant	Wimbrel	House wren
Great blue heron	Long-billed curlew	Marsh wren
Great egret	Marbled godwit	Golden-crowned kinglet
Snowy egret	Western sandpiper	Ruby-crowned kinglet
Cattle egret	Least sandpiper	Blue-gray gnatcatcher
Green heron	Dunlin	Western bluebird
Black-crowned night heron	Common snipe	Townsend's solitaire
Turkey vulture	Bonaparte's gull	Swainson's thrush
Snow goose	Ring-billed gull	Hermit thrush
Wood duck	California gull	American robin
Green-winged teal	Herring gull	American pipit
Mallard	Caspian tern	Cedar waxwing
Northern pintail	Forster's tern	Orange-crowned warbler
Blue-winged teal	Band-tailed pigeon	Nashville warbler
Cinnamon teal	Mourning dove	Yellow warbler
Northern shoveler	Burrowing owl	Yellow-rumped warbler
Gadwall	Common nighthawk	Black-throated gray warbler
American wigeon	Common poorwill	Townsend's warbler

TABLE 35 NEOTROPICAL MIGRATORY BIRD SPECIES WITH THE POTENTIAL TO OCCUR ON THE JDSF		
Canvasback	Vaux's swift	Hermit warbler
Redhead	Chimney swift	Macgillivray's warbler
Ring-necked duck	White-throated swift	Common yellowthroat
Lesser scaup	Rufous hummingbird	Wilson's warbler
Hooded merganser	Allen's hummingbird	Yellow-breasted chat
Ruddy duck	Belted kingfisher	Western tanager
Osprey	Olive-sided flycatcher	Green-tailed towhee
Northern harrier	Western wood-pewee	Spotted towhee
Sharp-shinned hawk	Willow flycatcher	Rufous-crowned sparrow
Cooper's hawk	Hammond's flycatcher	Chipping sparrow
Red-shouldered hawk	Dusky flycatcher	Lark sparrow
Red-tailed hawk	Pacific-slope flycatcher	Savannah sparrow
Ferruginous hawk	Say's phoebe	Lincoln's sparrow
American kestrel	Ash-throated flycatcher	White-crowned sparrow
Merlin	Western kingbird	Black-headed grosbeak
Peregrine falcon	Loggerhead shrike	Red-winged blackbird
Prairie falcon	Warbling vireo	Western meadowlark
Virginia rail	Purple martin	Brown-headed cowbird
Sora	Tree swallow	Bullock's oriole
American coot	Violet-green swallow	Lesser goldfinch
Black-bellied plover	No. rough-winged swallow	American goldfinch
Semipalmated plover	Bank swallow	Evening grosbeak

The relationship of neotropical migrants to forest tree species composition, diversity, and stand age is not well understood. Several studies have indicated that land managers should implement varied silvicultural systems to maintain a mix of habitat types, stand sizes, tree species, and stand age on the landscape level to accommodate a wide variety of neotropical bird species. Although some studies in northern California indicate that overall bird species richness is not dependent on the age-class of vegetation, abundance of some bird species has been positively correlated with stand age (Ralph et al. 1991). Hagar (1999) found more bird species in logged riparian habitats (42) than in unlogged riparian habitats (27) in western Oregon. Notably, these studies show no difference in abundance between mature and old-growth forest, indicating that the difference in age between these two habitat types may not be significant for neotropical migrants and that both age classes contain required habitat features.

Of more concern for forest-breeding neotropical migrants may be the size of forest patches. Fragmentation of continuous forest cover resulting from natural events, such as fire, windthrow, or human activities, reduces the size of forest patches and increases the edge-to-area ratio of the patch. The creation of open habitats allows some predators and brood parasites (particularly brown-headed cowbirds), associated with open habitats, to access forested areas previously inaccessible. Brand and George (2000) found the "distance from forest edge to be an important variable in explaining the probability of predation." Thus, by creating edges of open habitats adjacent to forest cover, timber harvesting may have an adverse affect on reproductive success of some neotropical migratory birds.

Game Species

Numerous game species and fur-bearing mammals are known or suspected to occur on JDSF. Such species include ducks and geese, wild turkey (*Meleagris gallopao)*, California quail (*Callipepla californica),* mountain quail (*Oreortyx pictus*), western gray squirrel (*Sciurus griseus*), black bear (*Ursus americanus*), Columbian black-tailed deer *(Odocoileus hemionus columbianus*) and wild pig (*Sus scrofa*). The primary species hunted on JDSF include deer, bear, and California quail. Although population studies have not been completed, all three species are known to occur throughout JDSF.

California quail are typically associated with early successional habitats, chaparral, mixed hardwood-conifer, and riparian habitats. They forage primarily on seeds and leaves, but they also eat fresh shoots, berries, acorns, flowers, and insects (Kaufman 1996). Nests are typically located on the ground near or under some kind of cover such as a shrub, log, or brush pile (Kaufman 1996). Clutches of 10-16 eggs are laid in spring and up to two broods may be produced in a given year (Kaufman 1996).

The Columbian black-tailed deer is a subspecies of mule deer that occur in a variety of habitats throughout western California to Alaska. Although they are found in a variety of habitats, they prefer a mosaic of habitats, including open areas or early successional habitats for foraging, and dense forested or brushy vegetation for cover. Deer browse extensively on trees and shrubs but will also forage on herbaceous plants and grass. Breeding occurs autumn and from 1-3 young are born in spring (Zeiner et al. 1990b).

Black bears forage in a variety of habitats, including early successional and riparian habitats, hardwoods, and along watercourses, and require late successional habitat characteristics, such as hollow logs, snags, or stumps for denning and cover (Zeiner et al. 1990b). Bears are omnivores. They feed on a variety of fruits, grasses, berries, acorns, insects, small mammals, fish, garbage, carrion, etc. Breeding occurs in early to mid summer and young are born in winter (Zeiner et al. 1990b). In winter, bears are usually dormant although they may be active for brief periods (Zeiner et al. 1990b).

Special-Status Wildlife Species

The list of animal species considered for inclusion in this EIR included approximately 76 animal species that potentially occur in the region with a status of state or federally threatened, endangered, proposed threatened, proposed endangered, federal species of concern, state species of special concern, state special animal species, and California Board of Forestry sensitive species (TES Species). The list was generated by consulting the California Natural Diversity Data Base (CNDDB 2002), the California Wildlife Habitat Relationships System database (CWHR 7.0), State and Federally Listed Endangered, Threatened Animals of California, dated January 2002, and lists of special-status species generated by the USFWS (February 7, 2002). The CNDDB (2002) queries and the USFWS lists included the eight USGS quadrangles covering JDSF and the quadrangles adjacent to the analysis area (Burbeck, Comptche, Fort Bragg, Greenough Ridge, Northspur, Noyo Hill, Mathison Peak, and Mendocino).

Of the initial 76 animals species considered, about half were eliminated from further analysis either because appropriate habitat was not present or the species range did not include JDSF. This elimination process resulted in a list of 47 TES animal species that potentially occur on JDSF (Table 36). These include high-profile, well-known species such as the northern spotted owl, and lesser-known species such as the lotis blue butterfly. of these, 16 have been documented on JDSF; 11 have been recorded on lands adjacent to or near, but not on JDSF; and 20 have never been recorded in the analysis area.

TABLE 36
THREATENED, ENDANGERED, AND SENSITIVE TERRESTRIAL INVERTEBRATE, AMPHIBIAN, REPTILE, MAMMAL, AND BIRD SPECIES POTENTIALLY OCCURRING ON JDSF

Species	Regulatory Status	Habitat Associations	Habitat(s) Available on JDSF?	Project Area Occurrence
INVERTEBRATES				
Lotis blue butterfly *Lycaeides argyrognomon lotis*	Federal-E State-none	*Sphagnum* bog/wet meadow	Possible	Known previously to occur west of JDSF.
Behren's silverspot butterfly *Speyeria zerene behrensii*	Federal-PE State-none	Coastal dunes, meadows, open coniferous forest	Unlikely	Known previously to occur west of JDSF.
Pomo bronze shoulderband snail *Helminthoglypta arrosa pomoensis*	Federal-SC State-none	Dense redwood forest	Likely	No reported occurrences on or adjacent to JDSF.
Ground beetle *Scaphinotus behrensi*	Federal-SC State-CSC	Wooded areas with moist microhabitats	Likely	No reported occurrences on or adjacent to JDSF.
AMPHIBIANS and REPTILES				
Southern torrent salamander *Rhyacotriton variegatus*	Federal-SC State-CSC	Seeps, springs, and streams in conifer forest	Yes	Known to occur on JDSF.
Tailed frog *Ascaphus truei*	Federal-SC State-CSC	Streams in conifer forest	Yes	Known to occur on JDSF.
Northern red-legged frog *Rana aurora aurora*	Federal-SC State-CSC	Ponds and streams and adjacent forested and open habitats	Yes	Known to occur on JDSF.
Foothill yellow-legged frog *Rana Boylii*	Federal-SC State-CSC	Streams	Yes	Known to occur on JDSF.
Northwestern pond turtle *Clemmys marmorata marmorata*	Federal-SC State-CSC	Slow-moving waters with adjacent open habitats or forest	Yes	Known to occur on JDSF.
MAMMALS				
Yuma myotis *Myotis yumanensis*	Federal-SC State-none	Roosts in buildings, trees, mines, caves, crevices, and bridges; feeds over water	Likely	No reported occurrences on or adjacent to JDSF.
Long-eared myotis *Myotis evotis*	Federal-SC State-none	Roosts in trees, crevices, mines, caves and	Likely	No reported occurrences on or adjacent to JDSF.

TABLE 36 THREATENED, ENDANGERED, AND SENSITIVE TERRESTRIAL INVERTEBRATE, AMPHIBIAN, REPTILE, MAMMAL, AND BIRD SPECIES POTENTIALLY OCCURRING ON JDSF				
Species	**Regulatory Status**	**Habitat Associations**	**Habitat(s) Available on JDSF?**	**Project Area Occurrence**
		buildings; feeds within forest, and over water		
Fringed myotis *Myotis thysanodes*	Federal-SC State-none	Roosts in mines, caves, trees, and buildings; feeds along forest edges and over forest canopy	Likely	No reported occurrences on or adjacent to JDSF.
Long-legged myotis *Myotis volans*	Federal-SC State-none	Roosts in hollow trees, crevices, mines, and buildings; feeds in open habitats	Possible	No reported occurrences on or adjacent to JDSF.
Pacific (Townsend's) big-eared bat *Corynorhinus (Plecotus) townsendii townsendii*	Federal-SC State-CSC	Roosts in mines, caves, and buildings; feeds along habitat edges	Possible	No reported occurrences on or adjacent to JDSF.
Pallid Bat *Antrozous pallidus*	Federal-none State-CSC	Roosts in trees, caves, crevices, and buildings; feeds in a variety of open habitats	Likely	No reported occurrences on or adjacent to JDSF.
California red tree vole *Arborimus pomo*	Federal-SC State-CSC	Mid to late-seral Douglas-fir and mixed conifer forest	Yes	Known to occur on JDSF.
Pacific Fisher *Martes pennanti pacifica*	Federal-SC State-CSC	Late seral conifer and mixed conifer forest	Possible	No reported occurrences on or adjacent to JDSF.
Humboldt marten *Martes americana humboldtensis*	Federal-SC State-CSC	Late seral conifer forest	Unlikely	No reported occurrences on or adjacent to JDSF. Not likely to occur on JDSF since the only known population is located in Del Norte County
BIRDS				
Bald eagle *Haliaeetus leucocephalus*	Federal-T State-E CA Board of Forestry-S	Late seral conifer forest near open water	Yes	No records for this species in JDSF or adjacent areas.
American peregrine falcon *Falco peregrinum anatum*	Federal-E State-E CA Board of Forestry-S	Cliffs and canyons used for nesting; often feeds near water	Unlikely	Known to occur in adjacent areas east of JDSF.
Marbled murrelet *Brachyramphus marmoratus*	Federal-T State-E CA Board of Forestry- S	Late seral conifer forest and marine waters	Yes	Known to occur in adjacent areas west of JDSF.
Northern spotted owl *Strix occidentalis caurina*	Federal-T CA Board of	Late and mid-seral stage conifer forest	Yes	Known to occur on JDSF.

TABLE 36 THREATENED, ENDANGERED, AND SENSITIVE TERRESTRIAL INVERTEBRATE, AMPHIBIAN, REPTILE, MAMMAL, AND BIRD SPECIES POTENTIALLY OCCURRING ON JDSF				
Species	**Regulatory Status**	**Habitat Associations**	**Habitat(s) Available on JDSF?**	**Project Area Occurrence**
	Forestry-S			
Bank swallow Riparia riparia	Federal-none State-T	Nests in vertical banks along streams	Unlikely	No reported occurrences on or adjacent to JDSF.
Western snowy plover *Charadrius alexandrinus*	Federal-T State-	Dry, sandy coastal beaches and dunes; large gravel bars on large low-gradient rivers	Unlikely	No reported occurrences on or adjacent to JDSF.
Great blue heron *Ardea herodias*	Federal-none State-A CA Board of Forestry-S	Feeds and usually nests near open water; roosts and nests in trees and snags	Yes	Known to occur on lands adjacent to JDSF.
Great egret *Casmerodius albus*	Federal-none State-A CA Board of Forestry-S	Feeds and usually nests near open water; roosts and nests in trees and snags	Yes	Known to occur on lands adjacent to JDSF.
Double-crested cormorant *Phalacrocorax auritus*	Federal-none State-CSC	Coastal areas, bays, estuaries, freshwater lakes, ponds and rivers. Nests and roosts in trees, snags, and rock ledges	Possible	Known to occur on lands adjacent to JDSF.
Long-billed curlew *Numenius americanus*	Federal-none State-CSC	Estuaries, grasslands, croplands	Unlikely	No reported occurrences on or adjacent to JDSF.
White-tailed kite *Elanus leucurus*	Federal-none State-A	Grasslands and wetlands with nearby woodland	Unlikely	Known to occur on lands adjacent to JDSF.
Northern harrier *Circus cyaneus*	Federal-none State-CSC	Open habitats including grasslands, scrublands, and wetlands	Likely	No known occurrences on JDSF.
Sharp-shinned hawk *Accipiter striatus*	Federal-none State-CSC	Early to mid seral forest and riparian zones	Yes	Known to occur on JDSF.
Cooper's hawk *Accipiter cooperii*	Federal-none State-CSC	Coniferous and mixed forests, riparian areas	Yes	Known to occur on JDSF.
Merlin *Falco columbarius*	Federal-none State-CSC	Frequents coastlines, open grassland, woodlands, lakes, wetlands, edges and early successional forest stages.	Possible	No reported occurrences on or adjacent to JDSF.
Osprey *Pandion haliaetus*	Federal-none State-CSC CA Board of Forestry-S	Large trees near open, fish-bearing waters	Yes	Known to occur on JDSF.
Northern goshawk	Federal-SC	Coniferous forest	Yes	Not known to nest but has

TABLE 36 THREATENED, ENDANGERED, AND SENSITIVE TERRESTRIAL INVERTEBRATE, AMPHIBIAN, REPTILE, MAMMAL, AND BIRD SPECIES POTENTIALLY OCCURRING ON JDSF				
Species	**Regulatory Status**	**Habitat Associations**	**Habitat(s) Available on JDSF?**	**Project Area Occurrence**
Accipiter gentilis	State-CSC CA Board of Forestry-S			been observed on JDSF.
Golden eagle *Aquila chrysaetos*	Federal-none State-CSC CA Board of Forestry-S	Open woodland	Possible	No reported occurrences on or adjacent to JDSF.
Mountain quail *Oreortyx pictus*	Federal-SC State-none	Chaparral, open forest and woodland	Yes	Known to occur on JDSF.
Vaux's swift *Chaetura vauxi*	Federal-none State-CSC	Conifer forest with large snags	Yes	Known to occur on JDSF.
Purple martin *Progne subis*	Federal-none State-CSC	Forest and woodland with cavity trees and riparian zones	Yes	Known to occur on adjacent lands west of JDSF.
Western burrowing owl *Athene cunicularia*	Federal-SC State-CSC	Grasslands and shrublands	Unlikely	No reported occurrences on or adjacent to JDSF.
Short-eared owl *Asio flammeus*	Federal-SC State-CSC	Marshlands, grasslands, and forest clearings	Unlikely	Known to occur in urban areas adjacent to JDSF.
Tricolored blackbird *Agelaius tricolor*	Federal-SC State-CSC	Nests in freshwater marsh and occasionally in brush	Yes	No reported occurrences on or adjacent to JDSF.
Olive-sided flycatcher *Contpus borealis*	Federal-SC State-none	Forest and woodland riparian zones	Yes	Known to occur on JDSF.
Loggerhead shrike *Lanius ludovicianus*	Federal-SC State-CSC	Grassland, open woodland, and shrubland	Unlikely	No reported occurrences on or adjacent to JDSF.
Yellow warbler *Dendroica petechia brewsteri*	Federal-none State-CSC	Riparian woodland	Yes	Known to occur on JDSF.
Yellow-breasted chat *Icteria virens*	Federal-none State-CSC	Riparian thickets and early-seral forest	Possible	Known to occur on lands adjacent to JDSF.
Yellow-billed Cuckoo *Coccyzus americanus*	Federal Candidate. State endangered	Valley foothill and desert riparian, river bottoms	Unlikely	No reported occurrences on or adjacent to JDSF.

Species Addressed in this EIR

The list of 47 TES species (Table 36) was further reduced to those that are:

- State or Federally listed as threatened, endangered, or candidate species
- Sensitive species that might be significantly affected by ongoing and future JDSF operations
- Species for which sufficient information on their ecology (distribution, habitat requirements, life history, and population abundance and trend) would enable establishment of appropriate conservation strategies.

A total of 20 animal species meet one or more of the above criteria. The following sections describe the natural history, occurrence, and habitat of those species as they pertain to JDSF.

Lotis Blue Butterfly (*Lycaeides argyrognomon lotis*)

Federal: *Endangered*
State: *None*
BOF: *None*

Little is known about the lotis blue butterfly. Since 1930, it has only been recorded at one site, described as a sphagnum bog, under the Elk-Fort Bragg 60 kV transmission line operated and maintained by PG&E (deBecker et al. 1991). However, Arnold (personal communication, 2002) notes that a specimen was also collected in the 1950s or 1960s from a locale near Highway 20 about 1.9 mi. (3 km) east of Fort Bragg, but the exact location and habitat is unknown. Subsequent surveys in the 1970s and 1980s documented the lotis blue butterfly at the PG&E site, where it was last sighted in the early eighties (R. Arnold pers, comm. 2002). Intensive surveys completed along the PG& E right-of-way in 1990 failed to locate the butterfly in any life stages (deBecker et al. 1991).

Surveys at the PG&E site in the 1970s and 1980s documented a decline in the lotis blue butterfly population (de Becker et al. 1991). Although it has certainly been extirpated from the PG&E site, small populations could still be present elsewhere (R. Arnold, personal communication, 2002). Because the species is associated with moist, early-seral stages, it could be rediscovered if appropriate habitat were maintained or created within its range. The potential also exists for the species to occur or be discovered on JDSF (R. Arnold, personal communication, 2001).

Known habitat of the lotis blue butterfly is characterized by early successional wet meadows, mucky ditches, and *Sphagnum* bogs where the vegetation has been disturbed to allow the growth of the presumed principal host species, coast hosackia (*Lotus formosissimus*), of this butterfly (R. Arnold, personal communication, 2002). Appropriate foraging habitat is probably not limited to wetlands, and can likely be found in small, open, sunny patches in the Forest as well (R. Arnold, personal communication, 2002).

A combination of human activities and natural climatic events may have led to the decline or extinction of this species. Specifically, habitat formerly occupied by coast hosackia is probably being replaced by other vegetation types through natural plant succession (Arnold

et al., 1983). Fire suppression may also reduce the extent of early successional vegetation, as well as the number of small natural forest openings that may have once supported populations of the lotis blue butterfly.

No lotis blue butterflies have been documented on JDSF. However, observations during the 1950s or 1960s may have been on JDSF. The *Sphagnum* bog or early successional wetlands could provide suitable habitat for the host species of this butterfly (DFMP Appendix V, Table 2). The presence of this habitat and the possibility of extant populations suggest that lotis blue butterflies could occur on JDSF in the future.

Southern Torrent Salamander (*Rhyacotriton variegatus*)

Federal Species of Concern
State: Species of Special Concern
BOF: None

The southern torrent salamander occurs in suitable habitat in the coast ranges below about 4,820 ft (1,470 m) (Welsh and Lind 1996) from northwestern Oregon southward to Point Arena in Mendocino County (Jennings and Hayes 1994, Blaustein et al. 1995, Welsh and Lind 1996). Diller and Wallace (1996) found 1,475 southern torrent salamanders from 220 different streams on private timberlands located in western Del Norte and Humboldt counties, California.

Little information is available on the current population status or trends of the southern torrent salamander. Jennings and Hayes (1994) consider the species to be at risk because of its narrow hydric and thermal requirements. Populations may be threatened by removal of riparian forest cover, changes in seep hydrology, and increased deposition of fine sediments in streams (Corn and Bury 1989; Jennings and Hayes 1994; Diller and Wallace 1996).

Breeding habitat for the southern torrent salamander is generally considered to be forested permanent seeps, streams, and waterfalls with rocky substrates and cold water temperatures (Nussbaum et al. 1983). Foraging occurs in moist areas in or near streams and seeps (Corn and Bury 1991, Corkran and Thoms 1996, Welsh and Lind 1996). Welsh and Lind (1996) found that percent seep habitat was the single best variable for predicting abundance of southern torrent salamanders in their northwestern California study area. Diller and Wallace (1996) found a greater percentage of streams flowing through consolidated geologic materials contained southern torrent salamanders than those flowing through younger, unconsolidated materials.

Significantly greater numbers of southern torrent salamanders have been found in older (greater than 200 years old) Douglas-fir forest stands than in younger stands (Welsh and Lind 1988,1991; Welsh 1990; Welsh et al. 1992, Corn and Bury 1991). More recent data shows that younger managed forests are also known to provide habitat for this species (Diller and Wallace 1996, Welsh and Lind 1996). Although Diller and Wallace (1994) and Corn and Bury (1989) found southern torrent salamanders in some managed forests, they do not believe that this species favors a landscape dominated by young forests. Where the

salamanders persist on a managed redwood landscape, streams generally flowed through consolidated geologic materials on primarily northerly facing aspects (Diller and Wallace 1996).

Optimum substrate size and proportions to maintain adequate interstitial space used for cover and oviposition by this species consist of at least 68 percent gravel, boulder and bedrock, and less than 50 percent cobble with gravel, with a low percent sand component (Diller and Wallace 1996, Welsh and Lind 1996). High-gradient stream reaches provide suitable habitat because they are transport areas where finer sediments do not accumulate, and gravel and cobble do not become embedded (Diller and Wallace 1996). The coastal populations may not be as sensitive to loss of forest cover as interior populations because of cooler temperatures (Diller and Wallace 1996).

On JDSF, habitat for the southern torrent salamander consists of streams, seeps, and springs and adjacent riparian habitats in redwood and mixed conifer-hardwood WHR types. For this analysis, redwood and mixed hardwood-conifer habitats of CWHR classes 3D, 4D, 5M, 5D, and 6 within riparian zones are used to represent habitat for the southern torrent salamander. Approximately 34,294 acres of these CWHR classes are present on JDSF, but the acres adjacent to class II watercourses have not been quantified. JDSF contains about 186 miles of Class II streams with various amounts of canopy cover (DFMP Appendix V, Table 2). Potential habitat for southern torrent salamanders exists on JDSF where the above forest types are adjacent to these streams, seeps or springs.

Southern torrent salamanders have been recorded on JDSF lands (Kitchen 1992, CNDDB 2002). They have also been found at several locations on adjacent private timberlands (G-P 1997).

Tailed Frog (*Ascaphus truei*)

Federal: Species of Concern
State: Species of Special Concern
BOF: None

Tailed frogs are found in suitable habitat from sea level to near timberline throughout the coastal mountains from British Columbia south to northwestern California, and in the Rocky Mountains of Idaho, Montana, and British Columbia (Stebbins 1985).

Little information is available on the status and population trends of tailed frogs. Tailed frogs are considered sensitive to canopy disturbance and increased sedimentation associated with timber harvesting and forest management operations, modification ofhistorical flooding regimes, and grazing (Corn and Bury 1989, Welsh 1990, Jennings and Hayes 1994). However, according to Jennings and Hayes (1994), the coastal population persists in most of the drainages where it is known to have occurred historically. This may be due to the cooler temperatures found in coastal forests (Jennings and Hayes 1994). As an example, Diller and Wallace (1999) found tailed frogs in 54 (75%) of 72 randomly selected streams in managed redwood forests in Humboldt and Del Norte counties, California.

Tailed frogs occur in or near cold mountain streams and coastal creeks with large rocks and/or woody debris. They have been associated with many different forest types, including Douglas-fir, redwood, Sitka spruce, ponderosa pine, and western hemlock (Jennings and Hayes 1994). Breeding and developmental habitat for the tailed frog generally consists of permanent cool streams with cobble/boulder substrate and woody debris (Welsh et al. 1993). Adults forage mainly on land along streambanks, but will also forage underwater (Zeiner et al. 1988). In-stream rocks and woody debris provide shelter for this species (Zeiner et al. 1988).

For purpose of this analysis, habitat for the tailed frog is montane hardwood-conifer, redwood, and Douglas-fir forest. Specific habitat for the tailed frog is considered to be CWHR class 4M, 4D, 5M, 5D, and 6 of these habitat types that are adjacent to Class II streams. Approximately 28,794 acres of these CWHR classes are present on JDSF, however, the acres associated with class II watercourses have not been quantified. The JDSF contains about 186 miles of Class II streams (DFMP Appendix V, Table 2). Potential habitat for tailed frogs exists on JDSF where these forest types are adjacent to these streams.

Tailed frogs have been recorded on JDSF (CNDDB 2002). On the nearby private timberlands, a number of tailed frogs have been recorded (CNDDB 2002, G-P 1997).

Northern Red-legged Frog (*Rana aurora aurora*)

Federal: *Species of Concern*
State: *Species of Special Concern*
BOF: *None*

The species *Rana aurora* consists of two subspecies: the northern red-legged frog (*R. aurora aurora*) and the California red-legged frog (*R. aurora draytoni*). The northern red-legged frog ranges from Vancouver Island, British Columbia, Canada, south along the Pacific coast west of the Cascade ranges to northern Del Norte County, California (USFWS 1996a). Red-legged frogs found in areas from Humboldt to Marin Counties exhibit intergrading characteristics between the northern and California (*R. aurora draytoni*) subspecies (Krempels 1986 in USFWS 1996a, Jennings and Hayes 1994). According to USFWS (1996a), the ESA does not protect red-legged frogs found in Humboldt, Trinity, or Mendocino counties. Therefore, red-legged frogs present on JDSF are considered to belong to the northern subspecies. The known elevation range of the northern subspecies and associated intermediate populations extends from near sea level to 3,830 ft. (1,160 m) (Jennings and Hayes 1994).

Declines in northern red-legged frogs have been reported in British Columbia, Washington, and Oregon (Jennings and Hayes 1994). Sufficient information has not yet been collected in California to assess overall population trends (Jennings and Hayes 1994). Little information is available concerning the causes for the observed decline of this subspecies, but exotic predators and exotic predatory fish introductions, urban and coastal development, and grazing have been implicated as contributing factors (Jennings and Hayes 1994).

Red-legged frogs breed in water 0.5 to 2 m deep (occasionally deeper), in cool, usually well shaded ponds or lake edges, beaver ponds or slow streams, in winter to early spring (Corkran and Thoms 1996). Springs, marshes, and reservoirs may also be used for breeding (Nussbaum et al. 1983; Blaustein et al. 1995). Within these habitats, the red-legged frog usually frequents temporary and permanent pools that are bordered by dense grasses or shrubs (Jennings and Hayes 1994). Although not restricted to old-growth forests, red-legged frogs are frequently found in this habitat (Bury and Corn 1988). In southern Washington, Aubry and Hall (1991) found that red-legged frogs were most abundant in mature stands and least abundant in young stands. Red-legged frogs are frequently observed in managed coastal forested habitats of western Humboldt and Del Norte counties (D. Embree, pers. obser.). The presence of red-legged frogs in older forest stands may be correlated more with downed woody debris and ponds than stand age (Aubry and Hall 1991). Red-legged frogs can also be found considerable distances from breeding habitats on rainy nights (Zeiner et al. 1988).

Red-legged frogs rely on streams and ponds for reproduction, but often forage considerable distances from streams in upland habitats. The CWHR system rates all redwood and annual grassland, and montane hardwood-conifer, mixed chaparral, and closed-cone pine-cypress habitats as providing moderate and low quality habitat for red-legged frogs, respectively. Aquatic or breeding habitat is considered to be all Class I and II streams, ponds, and marshes. Based on this habitat definition, JDSF provides 284 miles of streams and other aquatic habitats for red-legged frogs (DFMP Appendix V, Table 2).

Northern red-legged frogs have been documented on JDSF (CNDDB 2002, Kitchen 1992). Almost 20 records of northern red-legged frogs have been reported on adjacent private timberlands adjacent to JDSF (CNDDB 2002, G-P 1997).

Foothill Yellow-Legged Frog (*Rana boylii*)

Federal: Species of Concern
State: Species of Special Concern
BOF: None

The foothill yellow-legged frog is limited to southwestern Oregon, California, and Baja California. In California, this species can be found in the Sierra Nevada foothills to approximately 6,000 ft (1830m) elevation, and in the Coast ranges from the Oregon border south to the San Gabriel River in southern California (Stebbins 1985).

The foothill yellow-legged frog has become absent from many locations where it was historically present, principally in the Sierra Nevada foothills and southern portions of its range (Jennings and Hayes 1994). However, it is still abundant in many drainages in northwestern California and appears to be distributed throughout its historic range in this region (Jennings and Hayes 1994). Breeding, larval, and developmental habitat for the foothill yellow-legged frog consists of shallow, low-velocity, small- to moderate-sized streams with cobble and boulder substrate, particularly near gravel bars and vegetated streambanks (Kupferberg 1996). Where similar flow conditions exist, larger streams can also provide suitable habitat. As an example, yellow-legged frogs of various life cycle

stages were observed, generally associated with cobble substrates, in and along the Trinity, Eel, Mad, and Van Duzen rivers, Humboldt County, California (NRM 1997,1998). Oviposition generally occurs between March and early June, with maturity reached after about two years (Jennings and Hayes 1994). Foraging usually occurs within or near streams (Zeiner et al. 1988, Kupferberg 1996). This species is associated with streams in a variety of habitats, including meadows, shrub, various aged forests, and water margins with cobble. It is tolerant of warm water conditions (up to 27°C [81°F]) (Zeiner et al. 1988, Welsh and Lind 1991, Jennings and Hayes 1994) and is frequently observed basking in full sunlight along coastal rivers in Humboldt County (D. Embree, pers. obser.).

The foothill yellow-legged frog is closely associated with streams and rivers (Stebbins 1985, Corkran and Thoms 1996). For this analysis, Class I and II streams and the adjacent riparian zones are considered habitat for foothill yellow-legged frogs. On JDSF, 284 miles of Class I and II streams and the associated riparian areas represent potential habitat for foothill yellow-legged frogs (DFMP Appendix V, Table 2).

Foothill yellow-legged frogs have been documented on JDSF lands and adjacent ownerships (CNDDB 2002, G-P 1997, M. Jameson pers. comm.). Field surveys on adjacent private timberlands suggest that foothill yellow-legged frogs are locally common (G-P 1997).

Northwestern Pond Turtle (*Clemmys marmorata marmorata*)

Federal: Species of Concern
State: Species of Special Concern
BOF: None

The western pond turtle (*C. marmorata*), of which the northwestern pond turtle is a subspecies, is the only freshwater turtle native to California. It can be found in suitable aquatic habitats from southern British Columbia south to northern Baja California (Ernst et al. 1994), from sea level to 6,000 ft (1,830 m) (Zeiner et al. 1988). The northwestern subspecies *(C. m. marmorata)* can be found from British Columbia south to Marin County, California (Stebbins 1985).

Jennings and Hayes (1994) consider the northwestern pond turtle to be threatened in California. Although the northwestern pond turtle appears to still occur in most areas where it was reported historically, some populations show little or no recruitment (Jennings and Hayes 1994). Aquatic altering activities, such as agriculture, urbanization, flood control, water diversion projects, dams, mining, timber harvest, grazing, and exotics are believed to have contributed to population declines (Jennings and Hayes 1994, Reese et al. 1998). However, this species is found in altered aquatic habitats such as canals, reservoirs, and stock ponds (USFWS 1993).

Population estimates for the northwestern subspecies are not available, but some estimates are available for certain areas. For example, in northern California, Reese (1996) estimates a population a total of 1,318 pond turtles in their 16 Trinity River study reaches.

Northwestern pond turtles are an aquatic species that requires basking sites for thermal regulation and upland areas for reproduction. In general, aquatic habitats include marshes, sloughs, ponds, reservoirs, and slow moving portions of creeks and rivers (USFWS 1993, Nussbaum et al. 1983, Zeiner et al. 1988, and others). They require basking sites such as partially submerged logs, rocks, mats of floating vegetation, or exposed mud (Jennings and Hayes 1994, Zeiner et al. 1988).

Nesting usually occurs in sunny areas along the water margin or in southern exposed upland habitats. Ernst (1994) indicates that most nests are located along the water margin of streams or ponds, but may be located up to 100m above and distant from the water. Nest sites require full sunlight such as open grassy or southern exposures (Ernst et al. 1994, Rathbun et al. 1992). Upland nesting habitats include dry meadows as well as young seral stages of most forest types, including hardwoods, mixed hardwoods, and conifer forests (Rathbun et al. 1992).

Throughout their range, western pond turtles nest from late April through August (Ernst et al. 1994); the peak in Oregon is thought to be June to mid-July (Blaustein et al. 1995). "Female turtles leave the water in late May to July to find nesting sites (Nussbaum et al. 1983)." Young generally emerge from the nest in spring (Holland 1985), but may emerge in late summer or fall (Ernst et al. 1994). Pond turtles hibernate in bottom mud of streams or ponds, or on land up to about 1,600 feet from water (Ernst and Barbour 1972).

Pond turtles are omnivores (Ernst et al. 1983). They forage on aquatic vegetation and a variety of invertebrates, small vertebrates including frogs, and carrion (Nussbaum et al. 1983).

The northwestern pond turtle occur in aquatic habitats, such as marshes, sloughs, moderately deep ponds, and slow-moving water, and nearby upland habitats. For this analysis, habitat for the northwestern pond turtle is considered to be low-gradient, unconfined Class I and II streams, ponds and the adjacent riparian and upland habitats. About 286 miles Class I and II watercourses occur on JDSF. (Gradient information is not available on JDSF watercourses). Pond turtles nest in open habitats and sparse forests. Thus, for purposes of this analysis early-successional stages of conifer (CWHR size classes 1, 2M, 3P and 4S), annual grasslands, pygmy forest, and chaparral habitats are used to represent nesting habitat for pond turtles. Based on this habitat definition, JDSF supports about 3,476 acres of potential nesting habitat for northwestern pond turtles (DFMP Appendix V, Table 2).

Northwestern pond turtles have been recorded on JDSF (Town 2000a), and on adjacent private lands (G-P 1997). Town's (2000a) observations came during her 1998-1999 study and consisted of one adult in North Fork Casper Creek, and two juveniles, one in Hare Creek and the other in the North Fork Big River.

Northern Goshawk (*Accipiter gentilis*)
Federal: Species of Concern
State: Species of Special Concern
BOF: Sensitive

Northern goshawks breed in the North Coast Ranges, throughout the Sierra Nevada, Klamath, Cascade, and Warner mountains, and possibly in the San Jacinto, San Bernardino, and White Mountains (Zeiner et al. 1990a). In the coastal redwood forest zone, northern goshawks are present at relatively low densities (G-P 1997). Harris (1996) considers the goshawk a rare resident breeder in northwestern California. Bloom et al. (1986) indicates that goshawks have always been rare in California.

Bloom et al. (1986) estimates there to be 1,300 nesting territories in California, of which an estimated 61% are active each year. In California, goshawk population declines are believed to be related to the loss and fragmentation of mature and old-growth conifer forests from timber harvesting (Bloom et al. 1986). However, the USFWS (1998a) found no evidence to suggest that goshawks are dependent upon large, unbroken tracts of old-growth and mature forest. The USFWS "found that while the goshawk typically does use mature forest or larger trees for nesting habitat, it appears to be a forest habitat generalist in terms of the types and ages of forests it will use to meet its life history requirements. Reynolds (1992) also describes the goshawk as a "forest habitat generalist that uses a variety of forest types, forest ages, structural conditions, and successional stages." Goshawks can use small patches of mature habitat to meet their nesting requirements within a mosaic of habitats of different age classes; a key factor appears to be availability of prey. Forest management practices, such as the use of controlled fire and selective thinning, also may make habitats more suitable to goshawks by opening up dense understory vegetation, creating snags, down logs, woody debris, and other conditions conducive to goshawks and their prey (Reynolds et al. 1992.

Northern goshawks initiate breeding by mid-June in northern California (Zeiner et al. 1990a). Nest construction can begin as early as two months before egg laying (Johnsgard 1990). Nests are constructed and many pairs will have two to four alternate nest areas within their home range (Reynolds 1992). One nest may be used in sequential years, but often the pair switches to an alternate nest. The young fledge within 45 days and begin to hunt within 50 days. Only one brood per season is produced. After fledgling, the family group stays together and remains in the general vicinity of the nesting territory. This post-fledging area tends to be larger than the nesting territory (Reynolds 1992). The diet of goshawks consists mostly of birds (from robin to grouse in size), though small mammals such as ground and tree squirrels are also taken (Zeiner et al. 1990a, Reynolds 1992).

In the northwest, northern goshawks nest in mature and old-growth stands of coniferous forest composed of large trees with high canopy closure. The nest is typically situated in the largest tree of the stand (Squires and Reynolds 1997). Although goshawks include both natural and human-made small forest openings in their territories (Squires and Reynolds 1997), it is unclear whether this is because large tracts of closed canopy forest are limited in

the modern landscape. Reynolds et al. (1982) similarly report that goshawks in Oregon frequently nest near breaks in the canopy created by logging trails or downed trees. Snags and dead-topped trees are often used for hunting perches (Zeiner et al. 1990a).

Based on 10 nest sites in northwestern California, Hall (1984) characterized typical nest sites as associated with a mature Douglas-fir stand within a young Douglas-fir forest containing a hardwood component. In Oregon, goshawks nested in live trees with a mean dbh of 11 inches (27.4 cm) (Reynolds et al. 1982). In California, Richter and Callas (1998) found goshawks nesting in a variety of large trees (range 11-84 inch dbh), including white fir (38%) and Douglas-fir (32%), and less often in red fir, Jeffery pine, ponderosa pine, sugar pine, incense cedar, and black oak. In the coastal redwood belt, specific habitat parameters for goshawk nesting have not been determined (G-P 1997). In northwestern California, forest stands used for nesting ranged from 4 to 74 acres (mean = 25 acres) and from 1.0 to 32 acres (mean = 6.7 acres) (Hall 1984, Squires and Ruggiero 1996).

Throughout its range, the northern goshawk forages in diverse habitat, which can vary from open sagebrush to dense forests (Squires and Reynolds 1997). However, in California mature and old-growth forest with dbh greater than 20 inches (52 cm) and canopy closure greater 40 percent was used for foraging, and open habitats such as meadows and seedling or sapling stands were avoided (Squires and Reynolds 1997).

Nesting habitat for the northern goshawk generally consists of mature or old-growth stands of conifer or mixed-conifer forests. Although they have been observed nesting in younger, mixed hardwood-conifer stands (D. Embree, pers. obser.). The CWHR system lists the classes 4M, 4D, 5M, 5D, and 6 of montane hardwood conifer as providing high–quality nesting habitat for northern goshawks. Moderate and high-quality foraging habitat is considered to be montane hardwood-conifer classes 2 through 6 (all canopy closures). According to the CWHR, redwood, of size classes 3-6 (all canopy closures), is only considered low quality foraging habitat. These designations are used for this analysis to represent habitat for northern goshawks. Therefore, JDSF contains about 1,883 and 39,389 acres of medium and low quality foraging habitats, respectively (DFMP Appendix V, Table 2).

The northern goshawk is a rare resident and nesting species in northwestern California (Harris 1996). Mendocino County is at the southern edge of the north coastal portion of the goshawk's nesting range (Zeiner et al. 1990a). The CNDDB (2002) lists four records for Mendocino County: 1) Plaskett Ridge (1981), 2) Cahto Peak, 3) Ornbaum Valley (1994), Leggett (1997), and 4) Bluenose Ridge (1998). Northern goshawks have also been recorded on adjacent private lands (G-P 1997).

Although no nests have been located, there have been two sightings of northern goshawks on JDSF (R. Motroni pers. comm.). According to R. Motroni, one was observed in March 1992 in the 14 Gulch area and the other in April 1994 in the NF Big River near Road 70. However, no goshawks have been detected during the course of surveys (Valentine et al. 1995, CDFG 1996, 1997, Jameson 1999, and others). In 2001, NCASI surveyed the entire forest for raptors and no goshawks were detected (Marc Jameson, comments dated 3/21/02).

Cooper's Hawk (Accipiter cooperi)
Federal: None
State: Species of Special Concern
BOF: None

In general, Cooper's hawks breed from southern Canada to northern Mexico and winters in most of North America to Central America. In California, they occur in suitable habitats throughout the state (Johnsgard 1990, Zeiner et al. 1990a, Small 1994). In the Northern Coast Range it is consider an uncommon resident (Harris 1996). Small (1994) considers nesting in woodlands and interior valleys from Humboldt County south to be spotty. However, populations increase throughout the state in winter (Small 1994).

Coopers hawks primarily nest at higher elevations in the northern one-third of the state (Small 1994). Reynolds (1983) found Cooper's hawks from sea level to near timberline in Oregon. According to Rosenfield and Bielefe (1993), Cooper's hawks breed in a variety of habitats including extensive forests; woodlots of deciduous, coniferous, and mixed pine hardwoods; pine plantations, and urban environments. According to Burridge (1995), Cooper's hawks prefer mixed forest habitats (Bay, cottonwood, pine, oaks) near creeks. Boal and Mannan found 60 different nest trees in 33 territories in their urban environment study area located in Tucson, Arizona. In California, most common breeding habitats include dense stands of live oak, riparian deciduous, or other forest habitats near water (Zeiner et al. 1990a). In Oregon, Reynolds (1983) found most Cooper's hawks nest sites on gentle to moderate slopes (0-30%) with northern aspects and located near water (Reynolds 1983). In steeper environments they were typically found on north-facing benches. Where they are found in large forested environments, they are usually found near forest edges, along roads or clearings, or at other openings such as stream or lake edges (Johnsgard 1990).

Reynolds (1983) found Cooper's hawk nests in Oregon primarily in 30 – 70 year old evenaged forested stands. Zeiner et al. (1990a) indicates that Cooper's hawks usually nest in second-growth conifer stands or in deciduous riparian areas, usually near streams. In Boal and Mannan's (1998) urban study, they found most Cooper's hawks nest sites in front and back yards of private residence or in high-use recreational areas. Although Cooper's hawks usually reuse the same site for more than one year, they typically build a new nest within 100 m of the old one (Reynolds 1983). Cooper's hawks' nests in northeastern Oregon were in trees with an average dbh of approximately 17 inches (43.7 cm) and nest height averaged about 39 feet (12.1 m) (Moore and Henny 1983). Reynolds (1983) found that Cooper's hawks in his Oregon study area usually appeared at their nest site in late March. The northeastern Oregon population studied by Moore and Henny (1983) found incubation to begin in April with brooding in May.

Cooper's hawks feed on a variety of small animals, including birds, mammals, reptiles, and amphibians (Zeiner et al. 1990a). They forage along edges and in broken woodlands (Zeiner et al. 1990a).

Cooper's hawks nest in a variety of wooded environments. The WHR does not indicate any association between Cooper's hawk nesting habitat and redwood of any size or density class, but it does consider all redwood habitats as medium quality foraging habitat. This is supported by the relatively few sightings of Cooper's hawks in redwood habitats. The CNDDB (2001) does not show any occurrences of Cooper's hawks in Mendocino County and only one from Humboldt County. Although Cooper's hawks are not known to nest on JDSF, they have been recorded there (CDFG 1996). They are also known to occur in the vicinity (G-P 1997). According to the CWHR model (CDFG 1999b), potential nesting habitats on JDSF include montane hardwood-conifer and closed-cone pine-cypress. Based on this model, JDSF currently provides 2,508 acres of medium quality nesting habitat and 46,143 acres of medium and low quality foraging habitat (DFMP Appendix V, Table 2).

Golden Eagle (Aquila chrysaetos)

Federal: None
State: Species of Special Concern and Fully Protected
BOF: Sensitive

Golden eagles occur throughout California except in the Central Valley (Zeiner et al. 1990a). However, they are considered rare along the immediate coast, in the southern deserts, in interior portions of the Central Valley, along the lower Colorado River, and around the Salton Sea (Small 1994).

Nesting by golden eagles typically occurs on cliffs or large trees in rugged open areas such as canyons and escarpments (Zeiner et al. 1990a). Foraging occurs in open terrain such as grasslands, deserts, sage-juniper flats, savannas, early successional stages of forest and shrub habitats, desert edges, farms, or ranches (Small 1974, Zeiner et al. 1990a). Golden eagles hunt over large open areas and feed on a variety of Lagomorphs, other mammals, birds, reptiles, and occasionally carrion (Zeiner et al. 1990a).

Based on the above discussion, golden eagle habitat for this analysis is considered to be cliffs and late-successional forest habitat, including individual residual old-growth trees. Although no cliffs occur on JDSF, golden eagles could nest in older conifer and mixed conifer stands, specifically montane hardwood-conifer and redwood stands. According to the CWHR model (CDFG 1999b), all montane hardwood-conifer, mixed chaparral, and 5P, 5S, 4P, and 4S are considered high quality nesting habitats for golden eagles. These definitions must assume that suitable nest sites are available within these habitats and that habitats classified as 6, 5D, 5M, 4D, and 4M are too dense or lack large residuals. For purposes of this analysis, nesting habitat will also include CWHR habitat 5P, 5S, 4P and 4S. Foraging habitat will include all 1 to 3P redwood habitats, annual grasslands, mixed chaparral, and pygmy forest habitats. Based on these habitat definitions, JDSF provides about 15,427 and 2,640 acres of potential golden eagle nesting and foraging habitat, respectively (DFMP Appendix V, Table 2).

In northwestern California, golden eagles are a rare to uncommon resident nesting species (Harris 1996). Although golden eagles are known to nest in interior Mendocino County (G-P 1997), they have not been reported within the JDSF, although potential habitat may be available outside the ownership. Individual golden eagles have been observed occasionally on nearby private timberlands, although no nests have been found (G-P 1997).

Bald Eagle (Haliaeetus leucocephalus)

Federal: Threatened; Bald Eagle Protection Act
State: Endangered
BOF: Sensitive

The status, distribution, and ecology of the bald eagle is described in the *Final rule to reclassify the bald eagle from endangered to threatened* (USFWS 1995); and the *Pacific Bald Eagle Recovery Plan* (USFWS 1986). The following summarizes the status, distribution, and ecology of the bald eagle as relevant to this analysis.

Bald eagles are widely distributed in North America, breeding in most of central and southern Canada south to the Great Lakes along the Atlantic and Gulf Coasts, and west along the Pacific Coast from Alaska to Baja California. Breeding populations of the bald eagle were formerly distributed throughout northern California and from Oregon south to Mexico. However, the majority of bald eagle nesting territories in California is currently concentrated in the northern part of the state in Butte, Lassen, Lake, Trinity, Modoc, Plumas, Siskiyou, and Shasta Counties (Zeiner et al. 1990a). Bald eagles winter throughout most of California, with large concentrations in the Klamath Basin (Zeiner et al. 1990a).

The primary reason for listing the bald eagle was the adverse effect of DDT on the reproductive success of nesting eagles. With the ban on DDT and implementation of the Pacific Bald Eagle Recovery Plan, numbers of bald eagles have increased. The USFWS is currently considering delisting the eagle. However, bald eagles are still locally impacted by loss of roosting, nesting, and foraging habitat owing to development; shooting; secondary lead poisoning; environmental contaminants; electrocution; and disturbance of nesting, roosting, and foraging by human intrusion or activity (USFWS 1986).

The bald eagle population levels have increased in response to improved conditions in the environment. Surveys of the lower 48 states documented a total of 417 pairs in 1963. Within about 20 years, bald eagles increased to 1,757 pairs in 1984 (USFWS 1995). Ten years later in 1994, a total of 4,452 pairs were observed in the lower 48 states (USFWS 1995). According CDFG (2001), bald eagle populations were increasing as of 1997.

Bald eagles are typically associated with aquatic systems (e.g., rivers, large lakes, reservoirs, major rivers, and some coastal habitats. Fish comprise most of the eagle's diet, although waterfowl, jackrabbits, and carrion can be important locally and/or seasonally (USFWS 1986). To support reproductive pairs, aquatic habitats must have an adequate food base with sufficient nearby perch and nest sites. In winter, roost sites are chosen in areas close to water and with many perch trees (USFWS 1995).

Bald eagles nest in large, old-growth, or dominant live tree with open branchwork, especially ponderosa pine, usually in stands with less than 40% canopy closure (Zeiner et al. 1990a). Nests are typically located within two miles of bodies of water (USFWS 1986). Pairs use the same territories each year and typically reuse the same nests. The critical period of the breeding season (from the formation of pair bonds through the young fledging) extends from January 1 to August 31 (Small 1994). Snags are important for providing perch sites or access to nests (USFWS 1986).

Wintering habitat and communal roosts are characterized as perch trees near water and with a view of the surrounding area (USFWS 1986). A variety of tree species are used as wintering habitat. Isolation from disturbance is an important feature of wintering habitat, and protection from inclement weather may also be an important factor in its selection. Communal roosts differ from winter perch sites. Communal roosts are typically located near rich food sources and in uneven-aged forest stands containing an old-growth component. Forest stands used as communal roosts also provide protection from inclement weather.

Habitat for bald eagles consists of large trees, snags, and dead-topped trees near large fishbearing rivers and lakes. The CWHR ranks even the best redwood habitat as low quality for bald eagles. This may be more of a function of the lack of nesting bald eagles in the redwood zone than of tree or habitat structure. Although bald eagles generally nest near large fish-bearing water, for this analysis, habitat for the bald eagle is considered older conifer and mixed conifer stands, specifically montane hardwood-conifer and redwood stands of CWHR size class 5 or 6. Individual residual old-growth trees also provide nesting opportunities. Conifer and mixed conifer stands of CWHR size class 4, 5, or 6 with a dense canopy are considered roosting habitat for bald eagles. Based on these definitions (CWHR 4D and all 5 and 6), JDSF provides about 35,674 acres of nesting/roosting habitat for bald eagles, respectively (DFMP Appendix V, Table 2). Equally important are exposed portions (typically the lower reaches) of the 98 miles of Class I watercourses present on JDSF.

The CNDDB (2002) lists five bald eagle nest sites in Humboldt County, none in Marin County, and one recently discovered in Mendocino County. The CNDDB (2002) does not reveal the exact location of the Mendocino site but it is somewhere within the Ornbaum valley 7.5' Quadrangle. The Georgia-Pacific SYP (G-P 1997) reports that no bald eagles currently nest in Mendocino County and that "historical information on nesting suggests that bald eagles have never been common in the coastal redwood zone." Harris (1996) considers the bald eagle to be a rare to uncommon resident and locally rare breeder in northwestern California. Breeding bald eagles in northern California are typically associated with large fish bearing reservoirs and rivers, such as Shasta Lake and the Klamath River.

There are no records of bald eagles on the JDSF. However, bald eagles have been sighted a few times on private timberlands near JDSF (G-P 1997). Prior to 1940, two nests were reported along the Big River, and several other nests were seen along Ten Mile River (Detrich 1985 in G-P 1997).

Osprey (Pandion haliaetus)
Federal: None
State: Species of Special Concern
BOF: Sensitive

Osprey breed in suitable habitats from Alaska to northern California and western United States and throughout south-central Canada to and along the Atlantic coast to Florida. In California, they formerly bred along the coast from the Oregon border south to San Diego County, in the northeastern plateau region, most of the Central Valley, on lakes in the Coast Range, and at a few sites in the central Sierra Nevada. Currently, principal breeding locations include Eagle Lake, Lake Almanor, the Sacramento River in Tehama County, Siskiyou and Del Norte Counties, and south to Marin County (Small 1994). In fall and winter, most ospreys migrate from extreme northern California to southern California, Mexico, or South America (Small 1994).

Osprey populations declined in California as a result of pesticide contamination, the removal of nesting trees, degradation of river and lake environmental quality, boating and other disturbances on nesting lakes, and shooting (Henny et al. 1978). Small (1994) estimates 400 breeding pairs in California. Osprey populations in Oregon increased from 1976 to 1993 after the ban on DDT (Henny and Kaiser 1996).

Osprey are generally associated with large fish-bearing waters, such as lakes, rivers, bays, estuaries, and surf zones (Zeiner et al. 1990a). Osprey require open, clear waters for foraging where they feed primarily on fish, although they may also take a few mammals, reptiles, birds, amphibians, and invertebrates (1990a).

Birds arrive on the nesting grounds in mid-March to early April, and breeding occurs in March through September. Nests are constructed in large dead-topped trees, snags, cliffs, or man-made structures (Zeiner et al. 1990a), usually within 440-yd (400 m) of fish-producing waters (Lederer 1976). Tall open-branched trees are required near the nest tree for landing by adults before approaching the nest and for practice flights by the young (1990a).

Habitat for osprey consists of large trees, snags, and dead-topped trees near large fishbearing rivers and lakes. On JDSF, older conifer and hardwood-conifer forest stands near Class I streams provide nesting opportunities for osprey. The CWHR system rates the following habitats as providing moderate or high quality nesting habitat for osprey: montane hardwood-conifer 4M, 4D, all size class 5, and 6; and redwood size classes 3 through 6. Based on this habitat definition, JDSF provides about 42,893 acres of potential nesting habitat for osprey (DFMP Appendix V, Table 2). Within these habitats, large trees and snags near fish-bearing streams are required. Approximately 98 miles of Class I watercourses are available on JDSF that represent potentially suitable foraging habitat.

Ospreys are a common summer resident and nesting species in northwestern California (Harris 1996). Nesting ospreys have been recorded on JDSF near Casper Creek (CDFG 1997) and are regularly observed on nearby private timberlands (G-P 1997).

American Peregrine Falcon (*Falco peregrinus anatum*)
Federal: None (delisted 1999)
State: Endangered
BOF: Sensitive

A detailed account of the taxonomy, ecology, and reproductive characteristics of the American peregrine falcon may be found in the following documents: *The Pacific Coast American Peregrine Falcon Recovery Plan* (USFWS 1982) and *Proposed Rule to Remove the Peregrine Falcon in North America from the List of Endangered and Threatened Wildlife: Proposed Rule* (USFWS 1998b).

The American peregrine falcon occurs throughout much of North America from the subartic boreal forests of Alaska and Canada south to Mexico. This subspecies nests from central Alaska, central Yukon Territory, and northern Alberta and Saskatchewan, east to the Maritimes and south (excluding coastal areas north of the Columbia River in Washington and British Columbia) throughout western Canada and the United States to Baja, California, Sonora, and the highlands of central Mexico.

The American peregrine falcon was delisted by the federal government on August 25, 1999. The primary reason for the original listing of the peregrine falcon was a significant reduction in numbers and distribution due to reproductive failure, caused primarily by eggshell thinning as a result of accumulations of DDE in its tissues. With the ban on DDT and implementation of the recovery plan, peregrine falcon numbers have increased. In some portions of California, the lingering effects of DDT have caused reproductive rates to remain low. Some predation from great horned owls (*Bubo virginiatus*), other raptors, and mammalian predators has been noted, and several diseases and parasites are known to occur in peregrine populations; however, no information exists as to the level of significance of these potential mortality factors. Additional threats as reported in the Pacific population recovery plan (USFWS 1982) include collisions with electrical transmissions lines, electrocution, shooting, and the capture of nestlings for falconry. In some California locations, these factors were responsible for a significant portion of the total known mortality.

Currently, populations of American peregrine falcons have increased to a minimum of 1,388 pairs in Alaska, Canada, and the western United States, and a minimum of 205 pairs are found in the eastern and midwestern United States. The American peregrine falcon has met or exceeded recovery goals for number of breeding pairs in each of the five recovery areas within its range. Currently, approximately 239 breeding pairs of peregrine falcons are known to occur within the Pacific coast region (California, Oregon, Washington, and Nevada). This exceeds the recovery goal of 185 breeding pairs within this area (established in the Pacific Coast Recovery Plan (USFWS 1982) for delisting the species.

The peregrine falcon is found in a wide variety of habitats, including arctic tundra, mountain ranges, open forests, and grasslands. In California, this species generally breeds near wetlands, lakes, rivers, or other water on high cliffs, banks, dunes, or mounds and occasionally in tree or snag cavity or old raptor nest (Zeiner et al. 1990a). Nest ledges often include a recessed platform that provides protection from inclement weather.

In northwestern California, the peregrine falcon is an uncommon migrant and winter visitor, and a rare, local nesting species and summer resident (Harris 1996). Nesting habitat is primarily cliffs, although large trees are occasionally used (Zeiner et al. 1990a). Foraging habitat consists of open areas such as grasslands, wetlands, and open forest habitats, such as recent clear cuts. No cliffs occur on JDSF. However, falcons nesting on adjacent properties could forage on JDSF. Habitats on JDSF potentially used by peregrine falcons for foraging include meadows, early-seral stages of conifer and hardwood-conifer forest stands, pygmy forest, and closed-cone pine-cypress and areas associated with water.

No cliffs occur on JDSF. The CWHR does not consider redwood of any size/density class as potential nesting habitat for peregrine falcons. The CWHR model ranks the closed-cone pine–cypress and montane hardwood-conifer as high quality nesting habitat for this species. However, given the lack of cliffs, for purposes of this analysis, this habitat is considered foraging.

Foraging habitat is considered to be CWHR redwood class 1 and 2S, grasslands, mixed chaparral, and closed-cone pine-cypress forest habitats. Based on the CWHR habitat definitions, JDSF does not provide any potential nesting habitat and about 3,539 acres of foraging habitat for peregrine falcons (DFMP Appendix V, Table 2). Peregrine falcons are known to nest on private land outside JDSF (G-P 1997).

Marbled Murrelet (Brachyramphus marmoratus)

Federal: Threatened
State: Endangered
BOF: Sensitive

Accounts of the taxonomy, ecology, and reproductive characteristics of the marbled murrelet are found in the following publications: *Endangered and threatened wildlife and plants; determination of threatened status for the marbled murrelet, final rule (USFWS 1992b)*; *Ecology and Conservation of the Marbled Murrelet* (Ralph et al. 1995); the *Final Designation of Critical Habitat for the Marbled Murrelet (USFWS 1996b); Final Recovery Plan for the Marbled Murrelet in Washington, Oregon, and California Populations* (Recovery Plan) (USFWS 1997); the *Final Supplemental Environmental Impact Statement on Management of Habitat for Late-successional and Old-growth Forest Related Species Within the Range of the Northern Spotted Owl* (FSEIS) (USFS and BLM 1994); the *Status of the Marbled Murrelet in North America: with Special Emphasis on Populations in California, Oregon, and Washington* (Marshall 1988), and in Nelson (1997).

The marbled murrelet ranges along the coast from the Aleutian Archipelago and the eastern Bering Sea in Alaska to Monterey Bay in California (Ralph et al. 1995). From Alaska to California marbled murrelets typically nest in old-growth coniferous forests up to 42 miles (70 km) or more inland (Ralph et al. 1995). Current breeding populations are discontinuous and generally concentrated at sea in areas near coastal old-growth forests (Ralph and Miller 1995). In California, two main breeding populations exist, one along the coast of Del Norte and Humboldt counties and the other approximately 300 miles south, in coastal areas of

Santa Cruz and San Mateo counties (USFWS 1996b, Nelson 1997). Few murrelets have been observed along the coast of Mendocino, Sonoma, or Marin counties (Paton and Ralph 1988, 1990).

The marbled murrelet was listed largely because of the loss of older forests that serve as nesting habitat (Ralph et al. 1995, USFWS 1996b). Gill-net fishing operations, oil spills, marine pollution, and changes in prey abundance and distribution are also considered potential threats to murrelets (USFWS 1996b, Ralph et al. 1995). Based on at-sea survey data, the estimated size of the North American population is around 300,000 murrelets (Ralph et al. 1995). Ralph and Miller (1995) estimated a population of about 6,450 murrelets in California.

Because of the murrelets small body size, cryptic plumage, crepuscular activity, fast flight speed, solitary nesting behavior, and secretive behavior near nests, relatively few nests have been located (Hamer and Nelson 1995a). Nest sites are typically located on large, moss covered limbs of coastal conifer species including: Douglas-fir, redwood, Sitka spruce, and western hemlock. In California, of 10 nests in reviewed by Hamer and Nelson (1995a), five were in redwood, four in Douglas-fir, and one was in western hemlock. The average distance between these nest trees and salt water was 7.8 miles (13 km) with the farthest being 17.34 miles (28.9 km) inland. Ralph and Miller (1995) found the greatest frequency of presence (89.05%) and occupancy (21.91%) of murrelets within six miles (10 km) of the coast.

According to Ralph and Miller (1995), the most important factor in indicating occupied stands was density of the old-growth canopy cover. Occupied stands had a greater percentage of old-growth canopy cover than stands with only murrelet presence or no detections (Ralph and Miller 1995). Hamer and Nelson (1995a) reported that overall canopy closure of most stands where nests were found was moderate to high, averaging 48 percent for 45 nest sites (range 12 to 99 percent). Canopy closure at seven stands in California where nests were discovered ranged from 25 to 48 percent and averaged 39 percent (Hamer and Nelson 1995a). Cover directly over the nests averaged 85% of nests located in the Pacific Northwest (Hamer and Nelson 1995a). of the 44 nests trees in the Pacific Northwest that were reviewed by Hamer and Nelson (1995a), 64% were recorded as alive/healthy, 36% as declining, and none were in snags.

Potential nest trees are generally more than 32 inches dbh with the presence of large branches, deformities, or other formations providing platforms of sufficient size to support adult birds (Hamer and Nelson 1995a). Most nests are located on large or deformed moss-covered branches; however, a few have been located on smaller branches, and some nests are situated on duff platforms composed of conifer needles or sticks rather than moss (Hamer and Nelson 1995a). In California, the diameter of nest branches, measured at the tree trunk, averaged 11 inches and ranged from 8 to 24 inches (Hamer and Nelson 1995a).

General landscape condition may influence the degree to which marbled murrelets nest in an area. In Washington, detections of murrelets increased when old-growth/mature forests comprised more than 30 percent of the landscape. Raphael et al. (1995) found that the percentage of old-growth forest and large sawtimber was significantly greater within

0.5 mile of sites that were occupied by murrelets than at sites where they were not detected. Raphael et al. (1995) suggested sites with 35 percent old-growth and large sawtimber in the landscape are more likely to be occupied. However, Miller and Ralph (1995) "did not find larger stands more likely to have murrelets present or to be occupied."

Marbled murrelets are diving seabirds that feed on a wide variety of small fish and invertebrates in near-shore marine waters (generally within one mile of the shore) (USFWS 1996b). Nesting birds carry one prey item to the nest at a time to feed their young (Hamer and Nelson 1995a).

Marbled murrelets produce one egg per nest (Hamer and Nelson 1995b). Nests are not built, but rather the egg is placed in a small depression or cup in moss or other debris on the limb (Nelson 1997). In California, egg-laying and incubation span a long period, beginning March 24 and ending August 25, with the nestling period beginning April 23 and ending September 9 (Hamer and Nelson 1995b). Marbled murrelets, like many Alcids, display a high level of fidelity to nest locations (Nelson 1997).

Suitable habitat has declined in Washington, Oregon, and California, as a result of commercial timber harvesting, with some loss attributable to natural disturbance such as fire and windthrow. According to Larson (1991 in USFWS 1996b), approximately 70,000 acres of old-growth coastal redwood forest remains in California.

Eleven old-growth stands, totaling 459 acres, occur on JDSF. These stands range in sized from 5 to 101 acres (Table 33). Although these stands are classified as old-growth, they represent marginal murrelet habitat at best (B. Valentine and P. Town Personal communication, 2002). In addition to the old-growth stands, other forested stands of various CWHR classes may provide suitable habitat in the form of single or small groups of large old-growth residuals. However, specific data is not available. Therefore, for purposes of this analysis, JDSF provides 459 acres of old-growth and numerous scattered residuals that are considered potential murrelet habitat (DFMP Appendix V, Table 2). The suitability for marbled murrelets would depend on the specific characteristics of the stand, including the presence of mature trees with large branches, deformities, and other formations that provide nesting platforms. For this analysis, these habitat types are used to represent potential habitat for marbled murrelets, although it is important to recognize that many of these stands may not provide suitable habitat.

The distribution of marbled murrelets in and near JDSF was determined by reviewing Cota and Papke (1994), Ralph et al. (1995), Georgia-Pacific SYP (G-P 1997), Camp Three THP (Jameson 1999), Town (2001), Jameson, Pers. comm. (2002), other wildlife reports, as well as interviewing biologists and foresters familiar with the area.

According to Jameson (1999), surveys for marbled murrelets have been conducted on JDSF without detection since 1992. However, Town (2001) indicates that Janet Stein had two possible detections in the vicinity of Digger Creek. The birds were apparently flying in a straight line, but she was unable to track them for more than one or two seconds. (DFMP Appendix V, Table 3) shows a partial summary of the murrelet surveys completed on JDSF to date.

There have been few inland detections near JDSF. The first detection was in Russian Gulch State Park in 1976 (Paton and Ralph 1988), and the second detection was apparently 1 km (0.6 mi.) east of the town of Mendocino in 1988 (F. Sharpe, personal communication, as cited in Paton and Ralph (1988). Town (2001) indicates that murrelets are known to occur within Russian Gulch State Park, but she does not provide the date or source of the information.

Limited surveys conducted elsewhere on the former Georgia-Pacific lands suggest that murrelets travel across their ownership in some areas to get to nesting sites. One pair of murrelets was observed flying across former Georgia-Pacific lands near the Wages Creek/Rider Gulch confluence, and other murrelets were detected on lands directly adjacent to the former Georgia-Pacific ownership in the Admiral Standley State Recreation Area. Suitable nesting habitat for the marbled murrelet is not thought to be present on the former Georgia-Pacific ownership (G-P 1997).

Aerial surveys and incidental sightings indicate that murrelets are present off-shore in the vicinity of JDSF during the breeding season. The presence of murrelets offshore near JDSF coupled with a few incidental inland sightings, suggest that a small population of murrelets may be nesting in the area.

Marbled Murrelet Critical Habitat

The ESA requires designation of critical habitat for species listed as federally threatened or endangered. Critical habitat is defined as "(I) the specific areas within the geographic area occupied by a species…on which are found those physical and biological features (i) essential to the conservation of the species, and (ii) that may require special management considerations or protection; and (II) specific areas outside the geographical area occupied by a species at the time it is listed, upon determination that such areas are essential for the conservation of the species." Critical habitat is protected under the ESA. A federal agency that authorizes, funds or implements an action with the potential to affect critical habitat must consult with the USFWS to ensure that the action does not result in the destruction or adverse modification of critical habitat.

The USFWS designated critical habitat for the marbled murrelet in 1996. In the Final Rule, the USFWS determined that the physical and biological habitat features (referred to as the primary constituent elements) associated with the terrestrial environment that support nesting, roosting and other normal behaviors are essential to the conservation of the marbled murrelet and require special management consideration. Within areas essential for successful marbled murrelet nesting, the USFWS focused on the following primary constituents: (1) individual trees with potential nesting platforms, and (2) forested areas within 0.5 miles of individual trees with potential nesting platforms, and with a canopy height of at least one-half the site potential tree height. This includes all forest, regardless of contiguity. These primary constituent elements are considered essential to provide and support suitable nesting habitat for successful reproduction of the marbled murrelet. In

addition, on a landscape basis, forests with a high canopy height of at least one-half the site potential tree height in proximity to potential nest trees are likely to contribute to the conservation of the marbled murrelet.

JDSF was designated as critical habitat by the USFWS (USFWS 1996b). Criteria for critical habitat include the presence of suitable nesting habitat, presence of murrelets, and proximity to foraging habitat. Critical habitat was also designated in zones of current low use by murrelets. These areas are intended to support the USFWS's goal to reduce gaps in the species' nesting distribution, and help buffer the species from future catastrophic events such as oil spills and forest fires. JDSF is the largest contiguous parcel of public land on the Mendocino County coast. In California, 175,500 acres (71,040 ha) of state lands were designated as critical habitat, of which JDSF constitutes about 29 percent.

Northern Spotted Owl (*Strix occidentalis caurina*)

Federal: Threatened
State: Species of Special Concern
BOF: Sensitive

A complete account of the taxonomy, ecology, and life history characteristics of the northern spotted owl is found in the following reports: *Conservation Strategy for the Northern Spotted Owl* (Thomas et al. 1990); the *Determination of threatened status for the northern spotted owl* (USFWS 1990a); *Recovery Plan for the northern spotted owl* (USFWS 1992c); *Report of the Forest Ecosystem Management Assessment Team* (FEMAT 1993); USFWS status reviews (USFWS 1987, 1990b); the 1989 status review supplement (USFWS 1989); and the biological opinion of the USFWS on Alternative 9 of the *Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl* (USFS and BLM 1994); and the Protocol for surveying proposed management activities that may impact northern spotted owls, as amended (USFWS 1992a).

The northern spotted owl is currently distributed in varying densities and numbers in suitable habitat throughout its range in Washington, Oregon, and California. The primary reasons for listing the northern spotted owl was the loss of suitable habitat and the inadequacy of existing regulatory mechanisms (i.e., management plans for federal lands) pertaining to timber harvesting to ensure the long-term viability of the species. The USFS and BLM (1994) summarized these threats to the northern spotted owls: loss of habitat, limited habitat, declining populations, low populations, distribution of habitat or populations, isolation of populations, predation, competition, lack of coordinated conservation measures, and vulnerability to natural disturbances.

Most (about 80 percent) owl pairs rangewide occur on federally managed lands. Distribution of these pairs varies by land ownership, state, and physiographic province. Inventories are least complete in California; however, 40 percent of the state population and habitat of spotted owls may occur in the California Coast Province. The California Coast Province encompasses about 40 percent of the northern spotted owl range in California (USFWS 1992c).

Inventories from 1987 through 1991 (some areas included 1992 surveys) indicated that spotted owls were located at approximately 4,600 sites, including 3,602 pairs and 957 resident single owls (USFS and BLM 1994). The estimates covered various ownerships, including federal, state, county, and private ownerships throughout the owl's range. Current estimates of population are undoubtedly underestimates, because not all suitable habitat has been surveyed. Gould (1995) reported that 978 northern spotted owl activity centers were known in the three California coastal counties of Del Norte, Humboldt, and Mendocino. Sixty-seven percent of these sites were on privately owned timberlands that had been subject to timber management for decades.

Northern spotted owls occur in a variety of coniferous forest types in the Pacific Northwest. Suitable habitat is generally described as forest stands with multiple canopy layers and a both conifers and hardwoods; moderate to high canopy closure; substantial decadence in the form of live trees with deformities (e.g., cavities, broken tops) and snags; and a large accumulation of logs and woody debris (Thomas et al. 1990). However, spotted owls are observed to use previously logged forests with late-seral forest characteristics in coastal California (Thomas 1990). Suitable habitat for the northern spotted owl occurs in CWHR Douglas-fir, montane hardwood-conifer, montane hardwood, and redwood forest types (Mayer and Laudenslayer 1988).

Spotted owls depend upon naturally occurring nest sites. Nests are typically located in tree cavities, or platforms of sticks or other debris on limbs or broken tops of trees (Forsman et al. 1984, Zeiner et al. 1990a). Platform nests may include abandoned raptor or squirrel nests and clumps of mistletoe or debris. The presence of suitable nest sites is suggested as a possible basis for the use of late successional forests (Forsman et al. 1984). In managed redwood forests of northwestern California, Thome (1997) found about one-third of the nest sites to be in stands without old-growth or residual components.

Juvenile spotted owls disperse from natal areas in the fall. Thomas et al. (1990) described adequate dispersal conditions as landscapes in which 50 percent of the area consists of trees with an average dbh greater than 11 inches and with a canopy closure of at least 40 percent. The USFWS (1992c) described dispersal habitat as stands with tree size and canopy closure adequate to provide protection from predators and at least minimal foraging opportunities.

Northern spotted owl feed on a variety of forest mammals, birds, and insects. From southern Oregon through northwestern California, the dusky-footed woodrat comprises the majority of prey biomass consumed by the northern spotted owl (Thomas et al. 1990). The description of suitable habitat for spotted owls above, does not address habitat components (i.e., early stages) that provide key habitat areas for the dusky-footed woodrat. Woodrats were to found to be most abundant in brushy stands of 20-30 year old saplings and pole timber (Sakai and Noon 1993). Where woodrats are the primary prey, silvicultural practices that maintain or enhance woodrat populations may benefit spotted owls (Sakai and Noon 1993).

Northern spotted owl nesting habitat consists of older coniferous and hardwood-conifer forests with dense canopy closure. Spotted owls use similar habitats for roosting, but may use more open canopied stands or stands lacking nest structures. For foraging, spotted owls use a greater diversity of stands than those used for nesting or roosting.

According to current FPR definitions, functional nesting, roosting, and foraging habitats are defined as follows:

> Functional nesting habitat means habitat with a dominant and co-dominant tree canopy closure of at least 40% and a total canopy (including dominant and co-dominant and intermediate) of at least 60%. Usually, the stand is distinctly multi-layered with an average stem diameter in dominant and co-dominant conifers and hardwoods >11" dbh. The stand usually consists of several tree species (including hardwoods) of mixed sizes. All nests, snags, down logs, and decadent trees shall also be considered as part of the habitat. Nesting substrates are provided by broken tops, cavities, or platforms created by a hawk or squirrel nest, mistletoe broom, or accumulated debris. Owls are known to nest is less than optimal habitat. Nesting areas may also be associated with characteristics of topographic relief and aspect that alter microclimates.

Functional nesting habitats on JDSF are recognized as WHR redwood and montane hardwood-conifer of size and density class 6, 5D, and 4D.

> Functional roosting during the territorial breeding season, consists of stands where average stem diameter is >11" dbh among dominant and co-dominant trees. Hardwoods and conifers provide an average of at least 40% canopy closure but the stand can have a high degree of variability. Stand size and configuration must be sufficient to provide multiple perch sites which are suitable for protection from various environmental conditions, including wind, heat, and precipitation.

Functional roosting habitats on JDSF are recognized as WHR redwood and montane hardwood-conifer of size and density class 6, 5D, and 4D.

> Functional foraging habitat is dependent upon the presence and availability of prey on the Forest floor or in the canopy; presence of accessible perching limbs; adjacency to stands with canopy closure >40%. Average stem diameter is usually 6" dbh for hardwoods and >11" dbh for conifers among dominant and co-dominants, and the total overhead canopy closure, including intermediate trees is at least 40%. Where the overall canopy closure is >80%, foraging habitat is limited to areas with ample flight space below and among the stems. Foraging habitat in smaller size classes and lower percentage canopy closures must be justified by local information.

Functional foraging habitats on JDSF are recognized as WHR redwood and montane hardwood-conifer of size and density class 5M and 4M.

For purposes of this analysis, northern spotted owl nesting and roosting habitats will be recognized as WHR redwood and montane hardwood-conifer of size class 6, 5D, and 4D; foraging habitats will be 5M and 4M (Table 37) and (DFMP Appendix V, Table 2).

TABLE 37
ACRES OF NESTING/ROOSTING AND FORAGING HABITAT BY WHR TYPES FOR NORTHERN SPOTTED OWLS

WHR Habitat	**Nesting/Roosting**		**Foraging**	
Redwood	6	9,444	5M	5,989
	5D	627	4M	187
	4D	7,067		
Sub-Total		**17,138**		**6,176**
Montane hardwood-conifer	6	0	5M	0
	5D	0	4M	0
	4D	0		
Sub-Total		**0**		**0**
Grand Total		**17,138**		**6,176**

The first northern spotted owl surveys on JDSF were initiated in 1989 (Henry 1990), and consisted of a general forest-wide reconnaissance. From 1990 forward, a number of formal protocol surveys have been conducted (Roberts et al. 1993; Jones and Stokes Associates Inc. 1994; RMI 1996; CDFG 1996, 1997, 1998 and 1999a, Town 2000b, and Stephens 2002). The entire JDSF ownership and was surveyed in 2001 (Stephens 2002). Fourteen active spotted owl territories, consisting of 11 pairs and 3 singles, were recorded (DFMP Appendix V, Table 5). In previous years, survey efforts had been less intensive and the number of active territories has varied from four in 1989 to 14 in 2001. Details on territories and nest productivity on JDSF are summarized in (DFMP Appendix V, Table 5).

Banding of spotted owls began in 1990 and had continued off and on through 2000 (Town 2000b). In 2001, attempts were made to capture and band all unbanded spotted owls (Stephens 2002). Only one spotted owl is known to be unbanded (Stephens 2002).

Vaux's Swift (*Chaetura vauxi*)
Federal: None
State: Species of Special Concern
BOF: None

The Vaux's swift breeds in western North America and winters in Mexico and Central America. In California, they primarily nest in the Coast Ranges south to Monterey County, but are also likely breed in low densities in Lake, Butte, Tehama, Plumas, and other interior California counties. Vaux's swifts are most commonly encountered in portions of Humboldt

and Del Norte Counties, including Redwood National Park (Sterling and Paton 1996). Early migrants arrive in the first week of April, with the majority of birds arriving and passing through the state from mid-April to late May (Small 1994).

Sterling and Paton (1996) reported low numbers of Vaux's swifts in northern California; the species' occurrence was limited to 7 of 29 Breeding Bird Survey routes. Vaux's swift populations are believed to be declining throughout the species' range (Bull and Collins 1993). Natural cavities and burned-out hollow trees are preferred nest sites (Small 1994). The removal of large broken-top trees and large hollow snags, most of which are found in late-seral stage forests, has an immediate effect in removing nest sites (Bull and Collins 1993).

Vaux's swifts feed primarily on insects and spiders (Bull and Collins 1993). Foraging occurs above the Forest canopy, and at lower levels in meadows, over lakes, rivers and ponds, and above burned areas (Bull and Collins 1993, Small 1994).

Vaux's swifts nest in coniferous forests along the central and northern California coast, and mixed oaks and conifers in the interior mountain ranges. At study sites in Oregon, nest trees averaged 26 inches (67.5 cm, n=21) in diameter (Bull and Cooper 1991). Vaux's swifts are often found in old-growth forest, probably because of the greater availability of large, hollow trees. Many of the trees chosen for nesting have been decayed by fungus and excavated by pileated woodpeckers (Sterling and Paton 1996). Access to hollow trees also occurs via holes in broken-topped trees or snags (Bull and Cooper 1991).

Large-diameter, hollow trees or snags are also important for roosting non-breeders, recently fledged young, and post-breeding adults. In Oregon, 100 non-breeding Vaux's swifts used a roost throughout the summer (Bull and Cooper 1991), and over 500 swifts, some of which were radio-tagged, were observed roosting communally some distance from the nesting trees (Bull and Blumton 1997).

Habitat for Vaux's swift is older conifer forests where the large snags that they use for roosting and nesting are typically found. The CWHR system considers redwood of size classes 4, 5, or 6 as moderate- or high-quality habitat for Vaux's swift. Using these habitat types to represent habitat for Vaux's swift, JDSF contains about 38,741 acres of habitat (DFMP Appendix V, Table 2).

The Vaux's swift is a common summer resident and nesting species in northwestern California (Harris 1996). In Mendocino County, there are a number of sightings for the coastal area, especially near Russian Gulch, Van Damme, and Standish Hickey State Parks; but in the interior portion of the county records are less frequent (Sterling and Patton 1996). Vaux's swifts have been recorded on JDSF.

Purple Martin (*Progne subis*)
Federal: None
State: Species of Special Concern
BOF: None

The purple martin is a neotropical migrant that breeds from southern Canada to northern Mexico. In California, it occurs in low abundance in the inner Coast Range in Lake County and northern Napa County. It is found along the east slope of the Sierra-Cascade crest and locally at a few locations in the foothills of the Sierra Nevada. In northern and central California, purple martins are discontinuously distributed through the Coast Range and in the Siskiyou Mountains (Small 1994).

There has been a long-term decline of the purple martin over its entire continental range, despite a substantial shift to use of human-made nest sites by martins in the eastern and southern states (Arbib 1979, Brown 1997). Purple martins began to decline in California in the late 1950s (Small 1994).

Peak nesting activity occurs in June with pairs, depending on the availability of sites, nest colonially or singly. According to most accounts (Small 1994, Brown 1997), during the nesting season in California the purple martin is most closely associated with coniferous and mixed conifer/hardwood forests that have large snags with cavities. Purple martin are generally associated with open forest stands than the dense stands typical of redwood forests (G-P 1997).

Purple martin feed on a large variety of insects, including beetles, true bugs, flies, dragonflies and damselflies, leafhoppers, butterflies, wasps, bees, and spiders (Brown 1997). Martins sometimes feed to heights of 492 ft (150 m). They forage over riparian areas, forests, and open woodlands.

For nesting, purple martins use large-diameter snags. Suitable snags for nesting may occur in older conifer forest stands or in natural or manmade clearings. For this analysis, montane hardwood-conifer and redwood stands of CWHR size classed 4, 5 or 6 are considered habitat for the purple martin with the exception of stands with dense canopy closure. Based on this habitat definition, JDSF provides about 31,047 acres of habitat for purple martin (DFMP Appendix V, Table 2).

In northwestern California, the purple martin is an uncommon summer resident and nesting species (Harris 1996). Although it has not been recorded within JDSF, there are records of purple martin occurring in the vicinity (CNDDB 2002, G-P 1997).

Yellow Warbler (Dendroica petechia brewsteri)
Federal: None
State: Species of Special Concern
BOF: None

The Yellow warbler is a neotropical migrant that breeds in suitable habitats from central America to Alaska, and throughout most of North America and Canada. In California, they breed the length of the state except for the Central Valley, southern Sierra Nevada, and southern desert regions (Zeiner et al. 1990a). Harris (1996) considers yellow warblers a common breeder in northwestern California. The decline in yellow warbler populations is attributed to habitat destruction and brood parasitism by brown headed cow birds (Small 1994).

Yellow warblers are generally associated with deciduous riparian plants, preferring willows, cottonwoods, aspen, sycamores, and alder for nesting and foraging (Zeiner et al. 1990a, Small 1994, CNDDB 2002). They also breed in dry montane chaparral with scattered trees and in montane coniferous forests with *Ceanothus* and manzanita (Small 1994). In migration, it occurs in woodland, forest, and shrub habitats (Zeiner et al. 1990a).

Nests are constructed between 2-16 feet off the ground in a deciduous sapling or shrub (Zeiner et al. 1990a). However, Small (1974) considers yellow warblers as high canopy nesters and feeders. They glean and hawk insects and spiders in the upper canopy of deciduous trees and shrubs in low, open canopy riparian woodlands (Zeiner et al. 1990a).

According to the CWHR, yellow warbler nesting habitat available on JDSF consists of montane riparian and mixed chaparral; redwood habitats 2S to 5P, mixed hardwood-conifer (3D) and closed-cone pine-cypress are considered foraging habitats. The amount of potentially suitable riparian habitats on JDSF is unknown. Based on the CWHR model, JDSF provides 64 acres of nesting habitat and 19, 191 acres of foraging habitat (DFMP Appendix V, Table 2).

Harris (1996) considers the yellow warbler a locally common summer resident and breeder. Yellow warblers have been occasionally observed on JDSF. Kitchen (1992) reports one in a redwood stand (CWHR 3D) and CDFG (1996) reports one near the road leading to Chamberlain Creek Conservation Camp.

Olive-sided flycatcher (*Contopus cooperi*)
Federal: Federal Species of Concern (Both species)
State: None (Both species)
BOF: None (Both species)

Olive-sided flycatchers are neotropical migrants that breed in suitable habitat from Alaska to Baja California, the Rocky Mountains, and throughout much of Canada and the Great lake states. In California, they occur in the Sierra-Nevada and Siskiyou mountains and Coast Range from the Oregon border to San Luis Obispo County.

Breeding habitats include mixed conifer, montane hardwood-conifer, Douglas-fir, redwood, red fir, lodgepole pine, and eucalyptus (Zeiner et al. 1990a, Small 1994, Fix and Bezener 2000). Within coniferous forests, they are most often associated with openings, edges near openings (e.g. meadows, canyons, watercourses, or harvest units) or in semi-open stands (Altman and Sallabanks 2000). In early successional habitats, this species appears to be dependent on the presence of snags or residual live trees that are used for foraging and singing perches (Altman and Sallabanks 2000). According to Rosenberg and Raphael (1986 in Altman and Sallabanks 2000), olive-sided flycatchers are the only common species detected more often at forest edges than in the interior portion of Douglas-fir stands in northwestern California. In Idaho, olive-sided flycatchers were significantly more abundant in watersheds with clearcuts than those without (Evans and Finch 1994 in Altman and Sallabanks 2000).

Nests are usually constructed on a horizontal branch of a conifer located well away from the bole (Fix and Bezener 2000). Foraging and singing perches are generally located in the uppermost branches of the tallest trees in the vicinity (Zeiner et al. 1990a). Olive-sided flycatchers sallie for flying insects over openings or forest canopy (Zeiner et al. 1990a).

According to the CWHR model, nesting and/or foraging habitats available on JDSF include the following: High quality nesting habitats include redwood 5S-6; medium quality nesting include redwood 4M and 4D; low quality nesting include redwood 4S and 4P, montane hardwood-conifer 3S – 4P, and mixed chaparral and eucalyptus habitats. Foraging habitats include a variety of habitats including those listed above and all of the remaining redwood montane mixed-hardwood-conifer size and density classes. Based on this model, JDSF currently provides 28,607, 7,254, and 4,827 acres of high, medium, and low quality nesting habitat, respectively, for olive-sided flycatchers (DFMP Appendix V, Table 2).

Harris (1996) considers olive-sided flycatchers as a common resident and breeder in woodlands and forests with a conifer component in northwestern California. Olive-sided flycatchers are known to occur on JDSF. Kitchen (1992) reported numerous observations from within a variety of habitats and CDFG (1996) reports two incidental sightings.

California Red Tree Vole (*Arborimus pomo*)

Federal: None
State: Species of Special Concern
BOF: None

The California red tree vole is distributed along the Pacific coastal lowlands in Oregon and northern California. In California, this species is restricted to coastal forests in the humid fog belt north of San Francisco Bay to the Oregon border (Williams 1986). Little information is available on the current status and trends in the population of California red tree voles. Because of the species apparent association with late-successional and old-growth forests

and limited dispersal capabilities (Huff et al. 1992), it has been considered vulnerable to loss and fragmentation of forested habitats from logging, road and power line construction, as well as urban and agricultural development (Williams 1986).

Red tree voles consume the needles of Douglas-fir and grand fir needles (Zeiner et al. 1990b) and Bishop pine (T. Wooster personal communication,). This species has been associated with late-successional Douglas-fir forests in some studies (Meiselman 1987, Meiselman and Doyle 1996, Aubry et al. 1991), but has also been known to nest in second-growth stands (PALCO 1998, D. Embree, pers. observ.). In Mendocino County, Meiselman and Doyle (1996) found that 77 percent of red tree vole nests occurred in old-growth (greater than 200 years old) or mature (100 to 200 years old) forests characterized by a canopy cover of greater than 93 percent. All nests were found in Douglas-fir trees (mean nest tree was 46.5 inches dbh and 185 feet tall). Similarly, in California, Zentner (1977) found old-growth Douglas-fir stands to contain more red tree vole nests and larger colonies than second-growth stands. The youngest stand in which red tree voles were captured in the Oregon Coast Range was 62 years old (Huff et al. 1992). Early seral forest may limit dispersal capabilities of this species (Hayes 1996).

The presence of Douglas-fir is clearly important to maintaining viable populations ofred tree voles. Huff et al. (1992) found that even though basal area and density were highly variable among stands, the basal area of Douglas-fir was greater than 40 percent of the total stand basal area in 15 of the 18 stands where red tree voles were captured in Oregon. In the Oregon Coast and Cascade Ranges, Huff et al. (1992) found that stands with red tree voles had a mean of 12 large Douglas-fir trees per acre (greater than 39 inches dbh), whereas those without voles had significantly fewer large Douglas-firs (6 per acre).

Red tree voles were captured in stands ranging in size from 75 to 1,280 acres (475-acre mean) in the Oregon Coast Range and were not captured in stands less than 75 acres in size (Huff et al. 1992). However, there is no conclusive information available concerning the minimum size stand necessary to support a population of red tree voles. Factors such as the number of suitable nest trees, canopy closure, predators, and past and present disturbances may be more important to the suitability of a stand than its acreage.

According to the CWHR model, redwood habitat types of classes 4P, 4D, all 5 classes, and 6 are considered marginal habitats for red tree voles. Using these CWHR types, JDSF contains about 38,741 acres of habitat for the red tree vole (DFMP Appendix V, Table 2).

The California red tree vole has been recorded on JDSF (CNDDB 2002).

Pacific Fisher (*Martes pennanti pacifica*)
Federal: Species of Concern
State: Species of Special Concern
BOF: None

The Pacific fisher is a resident of California's north coast region and portions of the Sierra Nevada. Recent surveys indicate that it is distributed across the northern Coast Range and Klamath Mountains (Zielinski et al. 1995). In the northern Coast Range and Klamath Province of California, fishers are located at elevations ranging from 83 to 3,300 ft above sea level (25 to 1,000 m) (Golightly 1997).

In California, observations compiled between 1961 and 1982 show fishers occurring in the northwestern portion of the state and throughout the Sierra Nevada Mountains (Maj and Garton 1994). Recent survey information indicates that the current distribution of fisher in California is now smaller with a gap between the northwestern population and the Sierra Nevada population (Zielinski et al. 1995). The northwestern coastal population in California appears stable with a relatively high abundance of fishers as compared to other populations in the western United States.

Historically, over-harvesting (trapping) of fishers has resulted in population reductions and extirpations over much of their original range (Aubry and Houston 1992, Powell and Zielinski 1994). Currently, the primary threat to the fisher is the reduction and fragmentation of late-successional forests, and the associated loss of habitat components necessary for resting and denning (Aubry and Houston 1992, Powell and Zielinski 1994). Increased fragmentation may cause fishers to travel long distances through unfamiliar or unsuitable habitat, thus increasing possible predation by coyotes, mountain lions, and other predators (Powell and Zielinski 1994). Based on the review of recent survey efforts, Pacific fisher populations may become increasingly and genetically isolated throughout the western states. The apparent gap between populations can be as much as 500 to 600 miles long as is the case of the Southern Sierra and Klamath Mountain populations, in California.

Breeding, resting, and foraging habitat for fishers usually consists of old-growth or late successional coniferous forests with greater than 50% canopy closure (Zeiner et al. 1990b). However, Klug (1996) found no relationship between fisher occurrence, old-growth habitats, stand age, or topography on managed forest lands in Humboldt and Del Norte counties, California. Denning and resting occur in live trees with cavities, snags, downed logs, and a variety of other cavities (Zielinski 1995). Young are born between February and May (Zeiner et al. 1990b). In northern California, natal and maternal dens have been found in medium to large (21 to 58 inches dbh) live trees and snags in a 39-inch downed log (Zielinski et al. 1995). Natal and maternal dens of fishers on Simpson Timber Company lands in northwestern coastal California have also been found in medium-to-large (25 to 73 inches dbh) live trees and snags of a variety of tree species (tanoak, chinquapin, Douglas-fir, western red cedar (R. Klug, pers. comm.).

Throughout their range, fishers display variation in habitat use. For example, in the eastern United States, fishers occur in various age-classes of both hardwood and conifer forests, while in the Pacific states they appear to prefer late-successional coniferous forests (Powell

and Zielinski 1994). Not all habitats used, however, should be considered of equal quality without habitat-specific information that allows comparisons of survivorship and fecundity (Powell and Zielinski 1994). While late-successional conifer forest is generally considered suitable fisher habitat in the Pacific states, other habitats are undoubtedly of value to fishers as long as suitable canopy closure and specific habitat elements are present. Klug (pers. comm.) also thought that large expanses of late-successional forest habitat were not required by fisher, and that younger stands with late-successional characteristics (e.g. LWD, snags, decadence, and hardwoods) would provide suitable habitat. Accordingly, the use of late-successional forest to define fisher habitat should be considered conservative.

Riparian areas serve as travel corridors for fishers. Although Pacific fishers tend to avoid open areas with less than or equal to 40 percent canopy cover, they are known to use heavily harvested riparian areas for travel (Buck et al. 1994, Jones and Garton 1994). In northern California, fishers have been detected in open areas and in second-growth forests (Klug pers. comm.). Use of these areas is generally attributable to individuals foraging where prey availability may be higher.

Fisher are generally associated with older conifer forests with moderate or dense canopy closure. Forest stands with dense canopy closure (>60%) are preferred for nesting and resting; stands with moderate canopy closure (>40%) are also used for foraging. For this analysis, montane hardwood-conifer, Douglas-fir, and redwood habitats of CWHR classes 4D, 5D, and 6 are used to represent denning and resting habitat. Foraging habitat is represented by these stands as well as the CWHR classes 4M and 5M. Based on these habitat definitions, JDSF provides about 17,138 and 6,176 acres of denning/resting and foraging habitat for fishers, respectively (DFMP Appendix V, Table 2).

The Pacific fisher has not been recorded on JDSF. According to the CNDDB (2002), there are four reports of fishers in Mendocino County, the most recent in 1995. Kitchen (1992) distributed 25 cameras and scent stations for 10-day intervals at various unspecified locations and dates on JDSF to detect furbearers; no fishers were detected.

6.6.2 Regulatory Framework for the Protection of Wildlife Resources

State agencies, including CDF, are directed through a variety of programs and policies to protect and manage California's wildlife resources. These include:

- CEQA
- California Forest Practice Rules
- California Fish and Game Code
- California State Endangered Species Act (CESA)
- Federal Endangered Species Act (FESA)

CEQA

CEQA provides that public agencies whose activities may affect the environment shall prevent environmental damage (CCR § 15000-15387). Rare, threatened, or endangered species, subspecies, and varieties are specifically considered in various sections of CEQA (CCR § 15380). State certified regulatory programs are subject to the provisions in CEQA regarding the avoidance of significant adverse effects on the environment, including rare, threatened, and endangered species, where feasible (CCR § 15250). Public Resources Code § 21080.5(d)(2)(a) states that the rules and regulations adopted by the administering agency of a certified regulatory program shall "require that an activity will not be approved or adopted as proposed if there are feasible mitigation measures available which would substantially lessen any significant adverse effect which the activity may have on the environment." The FPRs are a State Certified Regulatory Program (CCR § 15251(a)) and are subject to these rules.

California Forest Practice Rules

Forest management activities on the Forest are subject to the requirements of the Forest Practice Act (FPA) as administered through the Forest Practice Rules (FPR). Registered Professional Foresters (RPFs) follow the provisions of the FPRs in preparation of Timber harvest plans (THPs). The THP preparation and review process substitutes for the EIR process under CEQA pursuant to PRC section 21080.5. THPs are 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 as directed by PRC 4651. The FPRs specifically address wildlife under Article 9 sections 919 through 919.18. FPR sensitive species are defined in section 895.1.

California Fish and Game Code and CESA

The California Endangered Species Act (Fish and Game Code § 2050-2116) was enacted in 1984 and enhanced protection for endangered, rare, and threatened species. Indeed, "it is the policy of the state to conserve, protect, restore, and enhance any endangered species or any threatened species and its habitat" (Fish and Game Code § 2052). It is also state policy to disapprove projects that are proposed without feasible mitigation to reduce the impacts below the level of significance and that would jeopardize the continued existence of any endangered or threatened species or result in the adverse modification of habitat essential to the existence of those species (Fish and Game Code § 2053 - 2055).

Federal Endangered Species Act (FESA)

The Federal Endangered Species Act (FESA) requires formal or informal consultation with the US Fish and Wildlife Service or the National Marine Fisheries Service where it is likely that the project could affect federally listed threatened or endangered species.

6.6.3 Project Measures for Protection of Resources

The DFMP plan builds on the 1983 plan by elevating wildlife and other resources to a level of importance equivalent to the timber management and the research, demonstration and education programs. The DFMP includes specific protection measures for important wildlife habitat elements including riparian areas, old growth and late seral characteristics, hardwoods, snags, and LWD.

Protection Measures

Riparian Areas: Refer to the aquatic resources section for a complete description of protection measure for riparian areas. 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.

Old Growth and Late Seral: Refer to the timber section for a complete discussion of the old growth and late seral protection measures. Existing old growth groves will be retained as will aggregations and individual trees with limited exceptions (refer to the timber section). Approximately 23% of the Forest land base is designated as late seral development areas.

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.

Snags: A goal for the entire forest is to attain one snag per acre (on a 160-acre sub-watershed scale) that is at least 30 inches DBH. The desired future condition for snags in all 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. Periodic sampling will be utilized to monitor snag density, as part of the CFI inventory system. Snags will be unevenly distributed across the Forested landscape in both riparian and hillslope areas. The distribution pattern of snags will include grouped and scattered single trees. JDSF 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.

Species of Concern: The DFMP includes general riparian protection measures for the Yellow Warbler and Olive-sided Flycatcher. The DFMP includes specific protection measures for Northern Spotted Owls, ospreys, Snag and Cavity Dependent Species of Concern, Marbled Murrelet, Northern Goshawk, Cooper's hawk, Vaux's Swift, Purple Martin, and California Red Tree Vole. For other species, JDSF will evaluate the potential for individual land management actions to have a significant impact on listed (rare, threatened, or endangered) species. In those cases where that impact may be significant, appropriate survey and mitigation measures will be implemented. Although individual project circumstances will dictate the procedures to be used to determine degree of project associated impacts, in general, a scoping process followed by surveys and mitigation development will occur. An assessment area that extends beyond the boundaries of the planned activity 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

DFMP Wildlife Goal: Protect or improve current populations and habitat.

Parameters and Data Collection

Raptors: Since 1989, spotted owl surveys have been conducted on JDSF (CDFG 1997). Between 1989 and 2000, surveys and monitoring of known nest sites were completed sporadically on JDSF. In 2001, NCASI surveyed the entire JDSF for northern spotted owls, monitored all known nest sites, and attempted to band all unbanded spotted owls (Stephens 2002). 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 harvest 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 at the same time as 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: 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. Existing old growth groves will be retained as will aggregations and individual trees with limited exceptions (refer to the timber section). Approximately 23% of the Forest land base is designated as late seral development areas.

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.

6.6.4 Thresholds of Significance

Based on policy and guidance provided by CEQA (Public Resources Code (PRC) Section 21001 and the CEQA Guidelines), an impact of the proposed project would be considered significant if it results in one or more of the following:

- Have substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive or special status species in local or regional plans, policies, or regulations, or by the CDFG or USFWS.

- Interfere substantially with the movement of any native resident or migratory wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.

- Conflict with the provisions of an adopted Habitat Conservation Plan, or other approved local, regional, or State habitat conservation plan related to a wildlife resource.

- Cause a wildlife population to drop below self-sustaining levels or threaten to eliminate an animal community.

- Reduce the number or restrict the range of a rare or endangered animal

The degree to which timber management would affect wildlife (mammals, birds, reptiles, and amphibians) populations, was assessed based on the current condition of existing habitat, general life histories habitat requirements of selected species and the projected effect on specific habitat parameters resulting from the proposed project and the alternatives. Because quantitative relationships between proposed forest management activities and their effects have not been developed, the assessment of wildlife related impacts for each alternative was generally qualitative.

6.6.5 Project Impacts

The DFMP has been developed to minimize the potential for adverse impacts to sensitive animal species or their habitat. Two of the aforementioned thresholds of significance referring to adverse effects on 1) species either directly or through habitat modification and 2) impediment of movement or nursery site use, contain several individual components that, depending on the species, could be affected by various management activities. The various elements within each threshold of significance and associated impacts for the proposed action (Alternative C) are considered below.

Project Impact: ***Potential to have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive or special status species in local or regional plans, policies, or regulations, or by the CDFG or U.S. Fish and Wildlife Service.***

Habitat Modification Impacts: Adverse impacts including direct mortality, permanent habitat loss or modification, or reduced reproductive success are considered significant. Wildlife species use a variety of habitats and/or key habitat elements. What is considered suitable habitat for one species may not be considered suitable for another. Thus, depending on the species, habitat modifications can have either positive or negative consequences. Species at risk typically rely on habitats or key elements that are rare or diminishing. Therefore, modifications to these habitat types are more significant than they are to more common habitats. The proposed action does not propose the modification or removal of rare habitats, however, some key habitat elements, such as snags, could be at risk.

Late Successional and Old-Growth Habitats: As described in the DFMP, the proposed action does not propose the removal of old-growth forest habitat, which includes retaining designated old-growth groves (459 acres) and aggregates, maintaining special concern areas, and proposes the recruitment of late seral stands that are expected to total approximately 11,190 acres. Snags and LWD will also be retained in harvest areas, as described in the DFMP. Approximately 16,660 acres of JDSF are currently classified as CWHR 6, 5D, or 5M. This represents the greatest amount of potential late successional forest habitat currently present on JDSF. Although some stands of CWHR 6, 5M, or 5D may be harvested, the actual amount of late-successional habitat that will be removed under the propose action is unknown. The DFMP allocates approximately 23% of the Forest to late seral development either through application of silvicultural treatments or designation of no harvest zones. With the FPR requirements and restrictions for late successional habitat, snag and LWD recruitment, late-successional development, and the approximately 30% to 70% evenaged to uneven-aged management, respectively, the impacts of the proposed action Alternative C are expected to be less than significant on late successional habitats and associated species on JDSF.

Snags and Downed Wood: As described in the DFMP, the proposed action has specific snag and downed wood retention measures that require specific retention in general forest, WLPZs and special concern areas. In special concern areas, this the goal is to have three snags per acre, one that is at least 30 inches dbh and the other two at least 20 inches dbh. The goal for the entire forest is one snag per acre (160 acres subwatershed scale) of at least 30 inches dbh. Currently, JDSF has less than one snag of at least 30 inches dbh per 100 acres and between three and four snags per 100 acres of between 20-29 inches dbh. Therefore, in order for JDSF to achieve their desired goal, all snags greater than 20 inches dbh will have to be retained, unless they pose a safety hazard. However, this

does not consider snags of less than 20 inches dbh or the retention of the largest snags in a given subwatershed with excess snags. Since small snags are better than no snags and the majority of snags currently on JDSF are less than 20 inches dbh, without additional mitigation to protect small snags (less that 20 inches dbh), implementation of the proposed action could result in reduction of snags across the Forest. Since the availability of large snags is currently low, the loss of existing small snags could adversely impact species that require snags. A mitigation method has been developed to address this potential impact.

Hardwoods: As described in the DFMP, JDSF will maintain the naturally occurring hardwood component in the WLPZs and special concern areas and as 10 %(West end) to 15 % (East end) of the stand basal area. Although some hardwoods may be harvested, the proposed hardwood management actions will maintain hardwoods as a component of the Forest. The management of hardwoods under the proposed action will ensure a thorough distribution of hardwoods throughout JDSF.

Riparian Habitats: JDSF will manage riparian habitats according to the FPRs with increased protection. As described in the DFMP, the size and management of the WLPZ will vary depending on the watercourse classification and slope. Within each WLPZ, snags, LWD, and hardwoods will be retained and the overall management direction will be for the development of late successional habitat. Although some harvest activities will occur within the WLPZ, these measures are expected to maintain a properly functioning riparian system and provide important migration corridors and dispersal habitat.

Other Unique and Special Habitat Features: As described in the DFMP, unique habitats and special feature will be protected. These include several rare and sensitive habitat types (e.g. s*phagnum* bogs, pygmy forests, ponds, and meadow). Other key elements, such as trees with cavities or goose pens will be protected either directly or indirectly through mitigation for other habitats or elements. Goose pens will be protected through the protection of old-growth and snags, as will many of the trees and snags with cavities. However, there is the slight potential for removal of trees or snags with cavities. A mitigation measure has been developed to address the retention of snags and minimize potential impacts to special habitat features.

Species Specific Impacts: Direct impacts to wildlife species include direct mortality, permanent habitat loss, or lowered reproductive success. These impacts can usually be avoided for sensitive species through completing surveys and/or mitigating to minimize impacts. Indirect impacts may include, but are not limited to, the reduction of suitable nesting habitat or nest sites, habitat connectivity and dispersal corridors, canopy cover, key elements such as hardwoods, snags, LWD, and trees with cavities. Many of these impacts affect habitat quality and/or suitability and, ultimately, can adversely affect reproduction and the continued persistence of a species in a given area.

Lotis Blue Butterfly: Lotis blue butterflies have a close association with coast hosackia (*Lotus formosissimus*), it's host species, which occurs in disturbed early successional wetland habitats or *Sphagnum* bogs. Under Alternative C, JDSF would protect habitat by not conducting timber harvesting in the Pygmy Forest Reserve and establishing riparian buffers around any *Sphagnum*

bogs and other wetlands if timber harvesting is scheduled adjacent to one. Through the use of evenaged management, potential low quality habitat could be created. Surveys and mitigation would also be completed as necessary.

Southern Torrent Salamander and Tailed Frog: Southern torrent salamanders and tailed frogs prefer permanent cold headwater streams. There are approximately 186 miles of Class II streams on JDSF. As described in more detail in the DFMP and Aquatic Section of this document, the proposed protection measures for Class II watercourses, seeps, and springs, include variable width WLPZ (depending on slope) that includes a 25 foot wide inner band "no cut zone" or limited entry zone for habitat improvement. Basal area will not be reduced below 240 sq. ft. per acre. These measures exceed current FPR and will ensure adequate canopy closures important for maintaining cool stream temperatures. The Road Management Plan, ELZ and other erosion control measures described in the DFMP and Aquatic, Hydrology, and Geology sections will minimize sediment input into watercourses. These measures will help to minimize gravel embeddedness and subsequent deterioration of interstitial spaces of the gravel substrate. Per the DFMP and mitigation included in the Aquatic section, LWD recruitment would benefit southern torrent salamanders and tailed frogs on JDSF. However, individuals could be harmed incidentally during scientific or timber management activities. None the less, the impacts of the proposed action are not expected to adversely impact southern torrent salamanders or tailed frogs.

Northern Red-legged Frog: Red-legged frogs are found in the vicinity of quiet pools, marshes or ponds in a variety of habitats. On wet rainy nights, they can be found well away from permanent water. As described in more detail in the Aquatic section the protection measures proposed for Class I and II watercourses, seeps, springs and ponds will protect the breeding habitat of red legged frogs. These protection measures should avoid negative impacts to red legged frogs by avoiding disturbance of streamside benches and vegetation that they use for basking, foraging, and cover. In the long term, red legged frogs will benefit from the LWD and late successional development in the WLPZ as proposed. The mosaic of early, mid and late successional upland habitats will provide suitable habitat for foraging frogs during wet weather. However, upland habitat will be temporarily degraded through timber management and individuals could be incidentally harmed during scientific or land management activities. Red-legged frogs are known to occur in JDSF and the impacts to red-legged frogs or their habitat is expected to be less than significant under the proposed alternative.

Foothill Yellow-legged Frog: Foothill yellow-legged frogs are typically found associated with rocky streams or rivers in a variety of habitats. There are approximately 284 miles of class I and II watercourses available on JDSF. Overall WLPZs and other DFMP protection measures (e.g. LWD, late successional development) are expected to improve habitat conditions for yellow-legged frogs. These mitigations should avoid negative impacts to yellow-legged frogs by avoiding disturbance of streamside benches and vegetation that the they use for basking, foraging, and cover. The road management plan described in the DFMP will minimize sediment input into watercourses. However, individuals could be incidentally harmed by scientific and/or management activities. Yellow-legged frogs are known to occur in JDSF and the impacts to yellow-legged frogs or their habitat is expected to be less than significant under the proposed alternative.

Northwestern Pond Turtle: Northwestern pond turtles are typically associated with slow moving water, ponds, or other permanent aquatic habitats and associated upland habitats that are used for nesting. There are approximately 284 miles of Class I and II watercourses, and several ponds on JDSF that represent potential aquatic habitat for this species. As described in more detail in the DFMP, the protection measures proposed for Class I and II watercourses and ponds will protect the majority of breeding, resting, and foraging habitat of northwestern pond turtles. In addition, pond turtles will benefit from the late successional advancement and LWD recruitment in the WLPZ. These measures will provide important rest sites and cover. However, pond turtles require sunlight for thermoregulation. The closed canopy of the watercourses currently available and proposed under this and the other alternatives does not favor pond turtles. In addition, individuals may be incidentally harmed by scientific and/or management activities. Upland breeding habitat outside the WLPZ also require exposure and will be provided through an array of silvicultural prescriptions. Other habitats, such as grassland, pygmy forest, chaparral, and pockets of exposed riparian habitats will continue to provide potential nesting habitat for this species. Northwestern pond turtles are known to occur in JDSF and the impacts to pond turtles or their habitat is expected to be less than significant under the proposed alternative. .

Northern Goshawk: Northern goshawks are generally associated with late successional forest habitats. Approximately 1,883 acres of low quality nesting (montane hardwood-conifer) and 43,193 acres of foraging (redwood) habitats are available on JDSF. Under the DFMP, the amount and quality of northern goshawk nesting habitat is expected to remain similar to or slightly below existing conditions. According to the CWHR (version 7.0), the highest quality nesting habitat (montane hardwood-conifer, CWHR 3D) available on JDSF is considered low quality for nesting goshawks. As described in the DFMP, the proposed action will also protect snags, hardwoods, old-growth stands, limit harvest in WLPZs, and focus management activities in designated areas to advance the development of late successional habitats. These mitigation measures should improve habitat conditions and maintain connectivity for goshawks in the short and long term. As described in the DFMP, take of goshawks will be avoided through surveying potential habitat subject to timber management activities, protecting known nest sites (100 acre buffer) and post-fledging areas (300 acres), and contacting CDFG when an active goshawk nest is discovered. Although low quality foraging habitat in the form of redwood of various size and density classes is expected to drop below existing conditions, this habitat type will remain abundant on JDSF throughout the life of the DFMP.. Goshawks have been observed but are not known to nest on JDSF and the DFMP as mitigated will continue to provide nesting and foraging habitat at levels similar to existing conditions.

Cooper's Hawk: Coopers hawks are generally associated with woodlands and mid-successional forest habits. According to CWHR, 2,508 and 46,143 acres of nesting and foraging habitat are available on JDSF, respectively. Although redwood is not considered typical nesting habitat for Cooper' hawks by the CWHR, they do occasionally nest in it and it is considered suitable for foraging and cover. Cooper's hawks would benefit from the mosaic of habitats and edge created through a variety of timber harvest prescriptions, WLPZ protection, and snag and hardwood retention as proposed in the DFMP. However, pre-commercial thin of young non-redwood habitats and the advancement of late successional habitats could degrade some potential habitat in the short and long term. However, this is not expected to occur at significant levels due to the limited presence of young non-redwood stands on the Forest. As the montane hardwood-mixed conifer and closed-cone pine-cypress habitats mature, they will increase in quality for nesting Cooper's hawks.

As described in the DFMP, take of Cooper's hawks will be avoided through surveying potential habitat subject to timber management activities and protecting known nest sites through consultation with CDFG. However, foraging individuals could be temporarily disturbed through management activities on JDSF. Cooper's hawks have been observed but are not known to nest on JDSF and the DFMP as mitigated will continue to provide nesting and foraging habitat at levels similar to existing conditions.

Golden Eagle: Golden eagles nest on cliffs or on top of a large snag near open habitats. The DFMP will protect most snags, hardwoods, old-growth stands, limit harvest in WLPZs, and focus management activities in designated areas to advance the development of late successional habitats. These mitigation measures will protect potential nest trees, which are typically very large and located near open areas. The evenaged management as proposed in the DFMP will maintain a continuum of early successional habitats that could be used by foraging golden eagles. Take will be avoided through the protection of nest sites consistent with current FPR, which include the a minimum of eight acre buffer zone and the protection of the nest site, perch trees, screening trees, and replacement trees. However, potential temporary disturbance of foraging birds is possible. A mitigation measure has been developed for the retention of snags that supplements the snag protection presented in the DFMP and is presented below. Golden eagles are not known to occur on or near JDSF and the DFMP as mitigated will continue to provide nesting and foraging habitat at levels similar to existing conditions.

Bald Eagle: Bald eagles construct a large stick nest on top of a large broken top tree usually near large fish bearing water. Approximately 98 miles of Class I watercourses are available on JDSF. Under the DFMP, take will be avoided through the protection of nest sites and winter roosts consistent with current FPR and/or through consultation with CDFG or USFWS. Protection and development of potential habitat as described in the DFMP includes the retention of old-growth groves and buffers, snags, scattered residuals where possible, and the development of late successional habitat in specified areas. This will improve habitat conditions in the long term. A mitigation measure has been developed for the retention of snags that supplements the snag protection presented in the DFMP and is presented below. The potential for temporary disturbance to roosting or foraging birds does exist. However, the very limited winter operations and lack of summer residence will minimize this possibility. Bald eagles are not known to nest on or near JDSF and nesting habitat will continue to be provided at levels similar to existing conditions.

Osprey: Osprey typically construct a large stick nest on the top of a tall broken top tree or snag near large fish bearing lakes or rivers. There are approximately 98 miles of Class I watercourses on JDSF. Under the DFMP, take will be avoided through the protection of nest sites consistent with current FPR and through consultation with CDFG or USFWS. This will include, at minimum, the protection measures specified in the FPR which include the protection of the nest tree and silvicultural and noise disturbance buffers. These measures should prevent adverse impacts to nesting individuals. In addition and as described in the DFMP, the retention of old-growth groves and buffers, snags, scattered residuals where possible, and the development of late successional habitat in specified areas should improve habitat conditions in the long term. A mitigation measure has been developed for the retention of snags that supplements the snag protection presented in the DFMP and is presented below. The potential for temporary disturbance of foraging birds also

exists. However, this is also not expected to adversely impact osprey. Although foraging birds could be temporarily disturbed, all nest sites will be protected. Nesting osprey have been recorded on JDSF and are not expected to be adversely impacted by implementation of the DFMP.

Peregrine Falcon: Peregrine falcons typically nest on large cliffs, but have been occasionally observed nesting in tall trees or buildings. No suitable cliffs occur on JDSF. However, large trees are present and represent atypical nesting habitat for this species. Foraging habitat is also available on JDSF in the way of open habitats such as grasslands, chaparral, and early successional forest habitat. The evenaged management as proposed in the DFMP will maintain a continuum of early successional habitats that could be used by foraging peregrine falcons

The proposed action does not propose management activities that would impact or disturb typical peregrine falcon nesting or foraging habitat. However, temporary disturbance to foraging birds is possible. If a peregrine falcon is found nesting on JDSF, protection measures, as specified in the FPR, will be implemented to avoid take. Thus, the impacts to peregrine falcons are expected to be less than significant.

Marbled Murrelet: Marbled murrelets nest in large old-growth trees with platforms and forage off-shore in marine environments. The DFMP defines marbled murrelet habitat as any intact remnant stand of old-growth forest at least two acres in size and 200 feet across, or other forest areas agreed upon by consultation between CDF and CDFG. As described in the DFMP, JDSF will protect old-growth groves and associated buffers, old-growth remnants and manage designated areas (e.g. WLPZs, Mendocino Woodlands Special Treatment Area) to advance the development of late successional habitat. Although large limbs or other potential nesting platforms will not be grown or created within the life of the DFMP, these mitigation measures are expected to improve murrelet habitat conditions in the long term.

Take of murrelets will be avoided through protecting habitat as defined above, and, prior to commencing management activities near potential habitat, completing surveys in potential habitat on a project basis, consulting with CDFG if occupied habitat is discovered as a result of surveys, and development of mitigations if necessary. Although many individual old-growth trees will be retained under the DFMP, there is the potential for trees that pose a safety hazard to be harvested, and trees whose retention may result in the potential for greater long-term environmental damage to the Forest if retained may be harvested. In addition, potential temporary disturbance of birds flying over JDSF is possible.

Marbled murrelets have not been determined to use stands on JDSF, although they have been observed nearby. The measures proposed in the DFMP will ensure that marbled murrelets or their habitats are not significantly impacted.

Northern Spotted Owl: Northern spotted owls are generally associated with older, closed-canopied coniferous forests, particularly for nesting and roosting. Broader arrays of forest habitats are used for foraging. Based on FPR definitions translated to CWHR, there are currently 17,138 and 6,176 acres of habitat classified as nesting/roosting (CWHR 6, 5D, 4D) and foraging (5M and 4M) on JDSF, respectively. Under the DFMP, JDSF would avoid take of northern spotted owls by following the FPR requirements, which among other things, require nest site protection measures and minimum habitat retention standards. These requirements focus on protecting known and

historic nest sites and retaining sufficient habitat around the nest site within specified distances. As described in the DFMP, JDSF will also protect snags, hardwoods, old-growth stands, limit harvest in WLPZs, and focus management activities in designated areas to advance the development of late successional habitats. These activities will protect and increase the quality of habitat for spotted owls in the short and long term. The evenaged management proposed in the DFMP will benefit woodrats, the primary prey of spotted owls in the redwood zone. This will ensure an adequate supply of prey for spotted owls. The WLPZs Special Concern Areas, and other stands of suitable will provide habitat connectivity and provide dispersal corridors for spotted owls. However, potential temporary disturbance to non-nesting or dispersing individuals is possible.

In general, management under the DFMP should provide a mosaic of habitats, including late successional habitat, many key elements, and will avoid take of northern spotted owls. Northern spotted owls are known to occur on JDSF and potential impacts to spotted owls are expected to be less than significant.

Vaux's Swift and Purple Martin: Vaux's swifts and purple martins are associated with large snags, with overall habitats being of less importance. Vaux's swifts nest and roost in large hollow snags and purple martins nest in old woodpecker holes in large snags. As described in the DFMP, the proposed action would implement snag retention and recruitment measures that would maintain the majority of existing habitat for Vaux's swifts and purple martins. This includes retaining three snags per acre, of which two are 20" dbh or greater and the other is at least 30" dbh. All snags that do not pose a safety hazard will be retained in areas subject to even-age management. This will benefit purple martins, which prefer snags in more open habitats. However, the snag retention and recruitment measures described in the DFMP do not, necessarily, protect the largest snags or all residual old growth tree snags in a given area. Although unlikely, this could result in the removal of potential habitat for these species. In addition, potential temporary disturbance to nesting birds is possible.

Although the DFMP proposes snag retention and recruitment measures, the removal of large snags and/or residuals represents the potential loss of suitable habitat for these species. In addition, the potential for disturbance to nesting birds could negatively impact the reproductive success of Vaux's swifts and/or purple martins. A mitigation measure has been developed for the retention of snags that supplements the snag protection presented in the DFMP and is presented below.

Yellow Warbler: Yellow warblers are associated with riparian, early to mid successional habitats, and hardwoods. Although the CWHR does not consider redwood habitat of any size or density class as suitable for nesting by yellow warblers, upon closer inspection, portions of the riparian zone may represent suitable nesting habitat. Under the DFMP, the mixed chaparral habitats are not expected to be adversely impacted. As described in the DFMP, the WLPZ protection measures will protect large amounts of riparian habitats and hardwoods that can be used for foraging, and possibly nesting. The harvest prescriptions described in the DFMP will provide early-successional, mid-successional, and edge habitats for this species during migration. Although hardwoods will be retained as described in the DFMP, they are expected to be reduced outside the WLPZ, which will degrade foraging habitats for yellow warblers. In addition, individuals or nests may be incidentally harmed or disturbed during the course of timber operations and the increase in edge may increase

the potential for nest parasitism by brown-headed cowbirds. Since JDSF is not considered high quality nesting habitat and abundant foraging habitat will be available similar to existing conditions, yellow warblers are not expected to adversely impacted under the preferred alternative.

Olive-sided flycatcher: Olive-sided flycatchers are associated with a variety of open coniferous forest types, openings, and edge habitats. There are approximately 40,688 acres of potential nesting habitat available on JDSF. As described in the DFMP, the silvicultural prescriptions, late-successional development, snag retention, WLPZ protection, and the management of special concern areas are expected to improve habitat conditions for olive-sided flycatchers. The evenaged management will provide edges and open habitats that can be used for foraging. The areas of uneven-aged management and late successional advancement will open up the stand and improve habitat conditions for nesting and foraging. The retention of old-growth and snags will provide perch sites for foraging and singing. Although individuals or nests may be incidentally harmed though timber operations, the improvement in habitat conditions expected under the DFMP should result in an overall benefit to olive-sided flycatchers in the short and long term.

California Red Tree Vole: Red tree voles are associated with late successional, closed-canopied coniferous forests that contain a Douglas-fir component. There are currently 38,741 acres of red tree vole habitat available on JDSF. There are currently about 6,666 acres (4S, 3M and 3D) of unsuitable habitat with the potential to grow into suitable habitat within the life of the DFMP. Although some red tree vole habitat may be harvested or degraded under the DFMP, it is will continue to be abundant throughout the life of the DFMP. As described in the DFMP, red tree voles would benefit from the conservation strategies designed to manage for this and other species, including maintaining potential Douglas-fir habitat in a connected state, additional watercourse protection measures, old-growth retention, and late successional development. These conservation strategies would all contribute to the maintenance and development of late-successional, closed-canopied forest conditions that red tree voles require and provide dispersal corridors and habitat connectivity. Red tree voles are known to occur on JDSF and a some habitat may be degraded and a few individuals may be indecently impacted by management activities proposed in this alternative. However, large quantities of high quality habitat are expected to be available for red tree voles.

Pacific Fisher: Pacific fishers are generally associated with structurally complex, late successional, closed-canopied coniferous forests, particularly for denning and resting. Downed wood and snags are also required. Although some fisher habitat would be harvested, based on the CWHR model, habitats of 4S, 4P and 5P (18,723 acres) would likely become suitable for foraging, if not for denning. As described in the DFMP, Pacific fishers would benefit from the various conservation strategies, WLPZs, snag retention and old-growth retention, hardwoods management, and the advancement of late successional habitats as proposed. These conservation strategies would all contribute to the maintenance and development of late-successional, closed-canopied forest conditions that fishers require and provide dispersal corridors and habitat connectivity. Pacific fishers are not known to occur on JDSF or near JDSF. Under the DFMP, JDSF would continue to provide large quantities of suitable habitat for Pacific fishers and could potential support fisher in the future.

Project Impact: ***Interfere substantially with the movement of any native resident or migratory wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.***

Specific impacts to candidate, sensitive or special status species are addressed above. No significant adverse impacts to these species regarding movement or establishment are anticipated as a result of the DFMP. As identified in the species accounts above, the potential exists for the loss of large snags without additional mitigation. Large snags have the potential to provide nursery sites for native wildlife. A mitigation measure has been developed for the retention of snags that supplements the snag protection presented in the DFMP and is presented below.

Through the use of various silvicultural treatments, WLPZ protection measures, designation of approximately 23% of the Forest as having a late seral development emphasis and the other habitat related SCAs, the DFMP will provide for the habitat elements that allow movement, establishment, and rearing of native non-candidate, sensitive or special status species. No significant adverse impacts are expected to occur as a result of the DFMP as mitigated.

Project Impacts: ***Conflict with the provisions of an adopted Habitat Conservation Plan (HCP), or other approved local, regional, or State habitat conservation plan related to a wildlife resource.***

JDSF is not subject to the provisions of an adopted HCP or other approved local, regional, or State habitat conservation plan related to a wildlife resource.

Project Impacts: ***Cause a wildlife population to drop below self-sustaining levels or threaten to eliminate an animal community.***

Through the use of silvicultural methods, the proposed action would continue to provide a variety of habitats for the 352 wildlife species discusses in the wildlife setting section. Through the protection of Special Concern Areas and old-growth groves, aggregations and trees, and the advancement of late successional habitats, the proposed action will provide for the retention and development of late successional habitats.

The proposed action will provide for a variety of habitats including old-growth and late successional habitats, riparian, and uneven and even-aged stands. Management of hardwoods and other key elements will provide key habitat elements under this alternative. The overall affects of the proposed action on the wildlife communities on JDSF, including candidate, sensitive, or special status species, game species, neotropical migratory birds, or other species that occur would remain similar to existing conditions. The proposed action, with the incorporation of mitigations as presented below, does not have the potential to reduce the number or restrict the range of an animal community.

Project Impacts: ***Reduce the number or restrict the range of a rare or endangered animal.***

Refer to the discussions above. The proposed action, with the incorporation of mitigations as presented below, does not have the potential to reduce the number or restrict the range of a rare or endangered animal.

6.6.6 Mitigation and Monitoring

To address the potential impacts to wildlife species as discussed above, the DFMP should be revised to incorporate the following mitigation to supplement the snag retention standards presented in the DFMP.

Mitigation: Retain all snags within all timber harvest areas with the exception of snags that pose a fire or safety hazard, or are within the alignment of roads proposed for construction. The largest snags, including residual old-growth snags, should have priority for protection until the snag retention goals of the DFMP are met.

Monitoring: The DFMP establishes monitoring standards in-regards to the snag retention requirements. No changes to those standards are required.

6.6.7 Comparison of Alternatives

Potential impacts of each alternative (A-E) on key wildlife habitats and species were evaluated and compared to the proposed action (Alternative C). Impacts of Alternative C are presented in section "6.6.5: Project Impacts," and Table 38 presents a comparison of those impacts with the impacts of Alternatives A, B, D, and E.

TABLE 38 COMPARISON OF WILDLIFE-RELATED IMPACTS IN RELATION TO THE VARIOUS ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels**: **(1) Beneficial (2) No Impact (3) Less than Significant (4) Significant - Mitigation Feasible (5) Significant -Mitigation Not Feasible**
Impact: Late Successional/Old-growth Forest						
Alt. A						Alternative A does not propose the removal of old-growth habitats or the management to advance the development of late-successional habitats. Although the natural development of late successional habitats is a long process, the condition of late successional habitats on JDSF is expected to slightly improve under Alternative A. However, the development of late successional habitat is expected to take longer under Alternative A than under Alternative E.
Alt. B						The 1983 Management Plan establishes no-harvest protection zones for 115 acres of old-growth groves, however it has been the Forest's policy to protect 11 identified old-growth groves totaling 459 acres. There would be no specific provisions to recruit late-seral conditions in any portion of the Forest, therefore, an emphasis upon maximum timber production would tend to truncate stand development before late-seral conditions can be produced. Over time, there may be no late-seral habitat produced other than that found within the existing 459 acres of designated old-growth groves. The implementation of this alternative is likely to delay regional recovery of late-seral habitat. Mitigation is feasible to reduce potential effects to a level less than significant. Potential mitigation would include identification of additional area to be either maintained in a late-seral condition and/or managed to develop into a late-seral habitat condition.
Alt. C (DFMP)						Refer to section "6.6.5.:Project Impacts."
Alt. D						Under Alternative D, all timber management would be uneven-aged. Like Alternative C, existing stands of old-growth and aggregates will be retained, and designated areas will be managed for the development of late successional forest. Implementation of FEMAT-type watercourse protection zones would substantially increase the area allowed to develop into a late-seral condition. Thus, the impacts on late successional habitat are expected to be less under Alternative D than under Alternative C. Although not within the life of this document, the amount of late successional habitat would be expected to increase on JDSF in the long term under Alternative D.
Alt. E						Alternative E does not propose the removal of any late-successional or old-growth habitats. In addition, where harvesting did occur, it would be focus on the development of late successional habitat. Although late successional habitat is not expected to be developed within the life of this plan, the management direction under Alternative E is expected improve late successional habitat conditions in the short term and increase quality and quantity in the long term.
Impact: Snags and Down Wood						
Alt. A						Alternative A does not propose the removal or creation of snags and downed wood, although incidental removal of snags may occur due to collection of firewood and provisions to provide a safe environment for recreationalists. Overall, the number of snags and amount of downed wood is expected to increase slightly within the life of this document under Alternative A due to the absence of commercial timber operations.

TABLE 38 COMPARISON OF WILDLIFE-RELATED IMPACTS IN RELATION TO THE VARIOUS ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels**: **(1) Beneficial (2) No Impact (3) Less than Significant (4) Significant - Mitigation Feasible (5) Significant -Mitigation Not Feasible**
Alt. B						Although snags and downed wood will be retained as directed by the FPR, their removal is still likely to occur under Alternative B due to safety concerns and salvage operations. Without specific snag and downed wood retention and recruitment measures, the number of snags could be significantly reduced over time under Alternative B. Potential mitigation to reduce impacts to a level less than significant include limitations upon snag removal and provisions for snag recruitment.
Alt. C (DFMP)						Refer to section "6.6.5.:Project Impacts."
Alt. D						The potential impacts to snags under Alternative D are similar to Alternative C, except that wider unmanaged watercourse buffer zones would provide additional opportunity to produce snags and down logs.
Alt. E						The potential impacts to snags under Alternative E are less than Alternatives A and D. Alternative E limits harvest to only 25% of the forest and will focus on the development of late-successional habitat. This will likely include the retention of snags and will provide an opportunity for substantial natural development of snags and down logs. Although snags may be harvested for safety purposes, the impacts are expected to be less than significant.
Impact: Hardwoods						
Alt. A						Alternative A does not proposed the removal of hardwoods, but incidental firewood collection may result in an insignificant level of hardwood reduction. An absence of stand management would allow hardwoods to grow freely throughout the Forest. Therefore, Alternative A will not impact the number, distribution, or availability of hardwoods.
Alt. B						Under Alternative B, hardwoods are expected to be aggressively controlled to increase the potential for timber production. Hardwoods would continue to be a part of the timberstands, but would not develop into larger sizes and ages in areas other than stream zones and old-growth stands identified for retention.
Alt. C (DFMP)						Refer to section "6.6.5.:Project Impacts."
Alt. D						Under Alternative D, hardwoods will be managed as a significant component of the stand. Although some hardwoods are expected to be harvested under Alternative D, the impacts are expected to be less than significant
Alt. E						Under Alternative E, JDSF would manage hardwoods to maintain a species mix similar to old-growth forest conditions. Hardwoods would be managed to replicate conditions found in old-growth forests. Although some hardwoods may be harvested, the impacts are expected to be less than significant.
Impact: Riparian						
Alt. A						Alternative A does not propose active timber management within or adjacent to riparian habitats. Failure to actively manage the road system could result in impacts to riparian resources during stressing storms. Otherwise, riparian zones would be allowed to develop naturally. Mitigation to reduce the level of impact associated with the road system could include implementation of a road management plan.

TABLE 38 COMPARISON OF WILDLIFE-RELATED IMPACTS IN RELATION TO THE VARIOUS ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels**: **(1) Beneficial (2) No Impact (3) Less than Significant (4) Significant - Mitigation Feasible (5) Significant -Mitigation Not Feasible**
Alt. B						Under Alternative B, riparian habitats within timber management areas will be managed according to FPRs, including the extensive mitigation provisions found in the Rules themselves. Areas outside of active timber harvest plans would be allowed to develop naturally, and roads would be maintained, but without the advantage of a road management plan. Although the protection is somewhat less than Alternative C, the impacts of Alternative B are expected to be less than significant with application of FPR and road management similar to that implemented under the 1983 management plan
Alt. C (DFMP)						Refer to section "6.6.5.:Project Impacts."
Alt. D						Alternative D proposes larger WLPZs (FEMAT) than Alternative C. In addition, WLPZs will be managed for the development of late successional habitat. These measures, if implemented in conjunction with the mitigating provisions of the FPR and the road management plan, are expected to protect and/or improve the conditions of riparian habitats
Alt. E						The protection and management of riparian habitats are similar under Alternative E as under Alternative D. If the limited timber operations are conducted in compliance with, or with mitigation supplemental to the FPR and road management plan, the potential impacts to riparian systems is expected to be beneficial, and long-term conditions are expected to improve.
Impact: Other unique/Special Habitats and features						
Alt. A						Alternative A does not propose management activities that will impact or degrade unique habitats or special features. Therefore, Alternative A is not expected to impact unique or special habitat features.
Alt. B						Other than features associated with riparian zones and the identified 459 acres of old-growth to be protected, special habitat features not associated with listed species or otherwise protected by the Fish and Game Code or other laws, are not protected under the 1983 management plan. Impacts can potentially be reduced to a level less than significant by providing protection measures specific to the unique habitats and features so that they are not significantly affected by management activity.
Alt. C (DFMP)						Refer to section "6.6.5.:Project Impacts."
Alt. D						The protection and management of unique or special habitat features are similar under Alternative D as under Alternative C. To the extent that unique habitats and habitat features are associated with riparian zones and late-seral management areas, Alternative A provides greater protection than Alternative C.
Alt. E						The protection and management of unique or special habitat features are similar under Alternative E as under Alternative C, however, due to the reduced area available to timber operations, combined with expanded riparian buffers, impacts to these features is somewhat less than Alternatives C and D.

TABLE 38 COMPARISON OF WILDLIFE-RELATED IMPACTS IN RELATION TO THE VARIOUS ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels**: **(1) Beneficial (2) No Impact (3) Less than Significant (4) Significant - Mitigation Feasible (5) Significant -Mitigation Not Feasible**
Impact to: Wildlife Communities and Neotropical Migratory birds						
Alt. A						Implementation of Alternative A results in natural development of the forest stands. There would be very little variance between alternatives in the short-term, but variances may develop in the mid to long-term, due to differences in habitat development and subsequent loss of early successional habitats. Over time, stands would be free to grow and late-seral conditions would begin to develop. Riparian zones, which are utilized extensively by many migrant birds, would grow unaffected by stand management, which is expected to benefit these species. There would be a somewhat narrower range of habitat conditions in the long term than under Alternatives B, C, and D, but wildlife communities and neotropical migratory birds are expected to benefit under implementation of Alternative A within the 10-15 year planning period.
Alt. B						Through the use a various silvicultural methods, a variety of habitats would continue to provide habitats for the 352 wildlife species under Alternative B, like Alternative C. However, acres of early successional stands may increase and late seral stands may decrease compared to existing conditions and the conditions anticipated under Alternative A. An increase in early seral habitats would benefit a variety of species that prefer these habitat types. On the other hand, a decrease in late seral habitat may negatively affect species that require this type of habitat. These differences may not result in a composition of different species in the shortterm, but could affect relative abundance
Alt. C (DFMP)						Refer to section "6.6.5.:Project Impacts."
Alt. D						Alternative D would focus on unevenaged management and the development of late successional habitats in the large riparian protection zones. Increasing the amount of late successional habitats on JDSF would favor species associated with this habitat type. An absence of even-aged management would reduce early successional habitat over time, but this is considered insignificant in terms of the regional availability of habitat for these species. Relative to Alternative C, Alternative D would provide wider riparian zones, which are utilized by large numbers of species, thus providing a benefit to these species relative to that provided by Alternatives B and C.
Alt. E						The effects of Alternative E are similar to those of Alternatives A and D, but are expected to provide greater benefit to neotropical migrants and the less common wildlife communities due to greater emphasis upon development of late-seral habitat.
Impact: Game Species						
Alt. A						Alternative A does not propose management activities that would impact game species. However, the maturation of early successional habitats over time will reduce the amount of foraging habitat for most game species. This is likely to result in a significant decline in the populations of most game species on JDSF in the long term. A reduction in road density and frequency of travel and an increase in the amount of mast producing hardwoods will benefit deer and bear.

TABLE 38 COMPARISON OF WILDLIFE-RELATED IMPACTS IN RELATION TO THE VARIOUS ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels**: **(1) Beneficial (2) No Impact (3) Less than Significant (4) Significant - Mitigation Feasible (5) Significant -Mitigation Not Feasible**
Alt. B						The effects of Alternative B on game animals would be similar to the effects of Alternative C, except that aggressive hardwood control would negatively impact some game species. However, most game species can be expected to remain at levels similar to those at present and would benefit from the creation of early successional habitats, although population levels can be expected to fluctuate.
Alt. C (DFMP)						Refer to section "6.6.5.:Project Impacts.
Alt. D						The consequences of unevenaged management will result in a significant reduction of early successional habitats over time, but significant losses are not expected within the 10-15 year planning period. This would result in smaller populations of most game animals. Population levels of most game animals can be expected to decline due to a declining abundance of early seral stage habitat, but stand disturbances and natural forest conditions will continue to provide habitat.
Alt. E						Alternative E is similar to Alternative D with respect to impacts on game species and their habitat.
Impact: Lotis Blue Butterfly						
Alt. A						Since Alternative A does not allow for timber harvesting or other management activities that may harm individuals or degrade bogs or other potential habitat, implementation of this alternative is not expected to impact lotis blue butterflies.
Alt. B						Alternative B is similar to Alternative C with respect to lotis blue butterflies and their habitat. Therefore, the potential impacts of Alternative B are similar to the potential impacts of Alternative C.
Alt. C (DFMP)						Refer to section "6.6.5.: Project Impacts."
Alt. D						Riparian management measures, Pygmy Forest Reserve management, and species-specific management measures for the Lotis blue butterfly under Alternative C would be the same or greater under Alternative D. However, unlike Alternative C, no potential habitat would be created under Alternative D.
Alt. E						Alternative E is similar to Alternative D with respect to lotis blue butterflies and their habitat. Therefore, the impacts of Alternative E are the same as the impacts of Alternative D.
Impact: Southern Torrent Salamander and Tailed Frog						
Alt. A						Since no timber management would occur under this alternative, and there would be no road management plan, active correction of existing erosional sources would not occur. Conversely, an absence of active timber management would result in less sedimentation and canopy reduction than would otherwise occur. Shade canopy development would provide for cool water required by these species. Site-specific impacts to habitat are possible in the absence of an aggressive program to manage the road system. This can be mitigated by actively managing the road system near and upstream of potential habitat to reduce the potential for sediment production.

TABLE 38 COMPARISON OF WILDLIFE-RELATED IMPACTS IN RELATION TO THE VARIOUS ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels**: **(1) Beneficial (2) No Impact (3) Less than Significant (4) Significant - Mitigation Feasible (5) Significant -Mitigation Not Feasible**
Alt. B						Under this alternative, JDSF would continue current management practices in riparian areas adjacent to Class I and Class II watercourses, springs and seeps, as described in the FPR. Although these practices follow current FPR, they provide less protection than Alternative C. Road management under Alternative B would follow current FPRs and does not propose a road management plan, above current FPR requirements, to control sediment delivery into watercourses. High level of sediment input from the road system during large stressing storms could allow the degradation of breeding habitat of these species Therefore, without additional mitigation to manage roads and prevent road failure in areas not associated with a THPs, implementation of Alternative B may result in significant impacts to the breeding habitat of southern torrent salamanders and/or tailed frogs.
Alt. C (DFMP)						Refer to section "6.6.5.:Project Impacts."
Alt. D						Under Alternative D, JDSF would establish larger WLPZ protection buffers along Class I and Class II watercourses (170 feet) than the proposed protection under Alternative C. Like Alternative C, Alternative D would implement a Road Management Plan to minimize sediment input. These measures are expected to increase the quality and quantity of southern torrent salamander and tailed frog habitat over time. However, there is still the slight potential for sediment delivery to watercourses from road sediment in some areas that may degrade some potential breeding habitat in the short term. Impacts of Alternative D are not expected to adversely affect southern torrent salamanders or tailed frogs.
Alt. E						Under Alternative E, JDSF would follow the same riparian management practices and implement the same road management plan as under Alternative D. However, less timber harvest and recreation would be expected than under Alternative D. As under Alternative C and D, individuals could still be harmed by management activities and short term sediment delivery could temporarily degrade some potential breeding habitat. Nonetheless, the impacts of Alternative E on southern torrent salamanders and tailed frogs are not expected to adversely affect southern torrent salamanders or tailed frogs.
Impact: Northern Red-legged Frog						
Alt. A						Since no harvesting would occur under this alternative, habitat for this species would not be affected beyond the potential damage associated with erosion from the road system. However, red-legged frogs occur in habitats, such as ponds and marshes that have high levels of fine sediment thus the incidental habitat damage associated with sedimentation from the road system is expected to be less than significant overall. As the habitats mature over time, the quality of habitat can be expected to improve and result in an overall benefit to red-legged frogs.
Alt. B						Under this alternative, JDSF would continue current management practices in riparian areas adjacent to Class I and II watercourses, springs and seeps, and ponds, as described in the FPR. Although these practices follow current FPR, they provide less protection than Alternative C. Other factors are similar to those identified for Alternative C. Red legged frogs are known to occur on JDSF and are likely to continue to occur at levels similar to existing conditions under Alternative B.
Alt. C (DFMP)						Refer to section "6.6.5.:Project Impacts."

TABLE 38 COMPARISON OF WILDLIFE-RELATED IMPACTS IN RELATION TO THE VARIOUS ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***<u>Impact Levels</u>: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant - Mitigation Feasible (5) Significant -Mitigation Not Feasible**
Alt. D						In riparian areas, Alternative D would provide larger riparian buffers (340 feet no cut buffer) with more restrictions on management practices along Class I watercourses than Alternatives C. However, timber harvest that promotes late successional habitat could be conducted. Increased tree retention requirements under Alternative D could increase recruitment of LWD in riparian zones relative to Alternative C, which would improve habitat quality for red-legged frogs. As described for Alternative A, this measure would benefit red-legged by minimizing disturbance of streamside vegetation and benches that red-legged frogs use for foraging and resting. Because red-legged frogs depend on aquatic habitat to reproduce, the improvement in aquatic habitat conditions expected under Alternative D would benefit red-legged frogs. Red-legged frogs are currently known to inhabit JDSF. Under Alternative D, red-legged frogs are expected to continue to be distributed throughout JDSF at levels similar to or greater than current population levels.
Alt. E						Management measures for riparian areas would be the same under Alternative E as under Alternative D. Upland habitat would remain abundant on JDSF as under alternative D, except that lands would be managed for the development of late successional habitats. Effects of Alternative E on red-legged frogs would be similar to those described for Alternative D.
Impact: Foothill Yellow-legged Frog						
Alt. A						Under Alternative A, riparian habitats would not be affected by timber management operations. The lack of a road management plan may allow sediment input into the watercourses that could negatively impact cobble and rock substrates that are used by this species. However, this impact is expected to be minimal. Yellow-legged frogs are known to occur in JDSF and should continue to occur at populations similar to current levels.
Alt. B						Under this alternative, JDSF would continue current management practices in riparian areas adjacent to Class I and II watercourses, springs and seeps, and ponds, as described in the FPR. Although these practices follow current FPR, they provide less protection than Alternative C. Other factors are similar to those identified for Alternative C.
Alt. C (DFMP)						Refer to section "6.6.5.:Project Impacts."
Alt. D						Under Alternative D, JDSF would implement larger riparian buffers (FEMAT) and more harvest restrictions in Class I and II watercourses than under Alternative C. Alternative D would also implement a road management plan similar to that of Alternative C. The lack of timber harvest in the riparian zone may reduce the quality of habitat for yellow-legged frogs by allowing the stand to close in and reduce the availability of sunny basking sites. However, the overall impacts are expected to be less than significant.
Alt. E						Management measures for riparian areas and sediment control would be the same under Alternative E as under Alternative D. However, Alternative E proposes less of an emphasis on recreation than Alternative D. Additionally, timber harvest would only be completed on a fraction of JDSF and be focused on the development of late successional habitat. None the less, the impacts of Alternative E are expected to similar to Alternative D.

TABLE 38 COMPARISON OF WILDLIFE-RELATED IMPACTS IN RELATION TO THE VARIOUS ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels**: **(1) Beneficial (2) No Impact (3) Less than Significant (4) Significant - Mitigation Feasible (5) Significant -Mitigation Not Feasible**
Impact: Northwestern Pond Turtle						
Alt. A						Alternative A does not propose management activities that would impact northwestern pond turtles or their habitat. However, over time, the lack of timber management will allow the Forested stands to become too dense for suitable pond turtle nesting resultingin the possible degradation of breeding habitat. Northwestern pond turtles are known to occur on JDSF and although suitable breeding habitat may be degraded, they are expected to continue to persist at numbers similar to current populations.
Alt. B						Management activities that could affect northwestern pond turtles are the same under Alternative B as under Alternative C. Thus, the effects of Alternative B on northwestern pond turtles are the same as those described for Alternative C.
Alt. C (DFMP)						Refer to section "6.6.5.: Project Impacts."
Alt. D						Management measures that could impact northwestern pond turtle habitat under this alternative are similar to those described under Alternative C. However, the lack of evenaged management may reduce the availability of upland nesting habitat compared to Alternative C. The riparian protection measures of this alternative are greater than those of Alternative C and are expected to benefit this species by reducing the chance of incidental harm by management activities and allowing the recruitment of LWD, which is important for basking. However, like Alternative C, individuals could be incidentally harmed through scientific and, to a lesser extent, management activities. Like the frogs discussed above, increased recreation could negatively impact individuals. Northwestern pond turtles are known to occur on JDSF and will continue to persist at levels similar to existing conditions under Alternative D.
Alt. E						Management measures that could impact northwestern pond turtles are the same under Alternative E as under Alternative A, except that Alternative E has a greater chance of incidentally harming individuals through scientific and management activities. However, activities are expected to only occur on approximately 25% of JDSF, which diminished the chance of incidental harm. Thus the impacts of Alternative E on northwestern pond turtles are expected to be similar to the impacts of Alternative A.
Impact: Northern Goshawk						
Alt. A						Alternative A does not propose management activities that are likely to impact northern goshawk habitat. As the habitats mature over time, the quality and quantity would improve. As many of the younger stands mature, they may become too dense to be considered potential goshawk habitat for a limited period of time. Although nesting goshawks could be temporarily disturbed by road maintenance activities, implementation of Alternative A is not likely to significantly impact northern goshawks.

TABLE 38 COMPARISON OF WILDLIFE-RELATED IMPACTS IN RELATION TO THE VARIOUS ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels**: **(1) Beneficial (2) No Impact (3) Less than Significant (4) Significant - Mitigation Feasible (5) Significant -Mitigation Not Feasible**
Alt. B						The impacts to northern goshawk habitat under Alternative B are expected to be somewhat greater than the impacts of Alternative C. Alternative B is likely to result in equivalent implementation of even-aged and uneven-aged management, thus reducing nesting habitat for this species relative to Alternative C. Late-seral habitat development is not prescribed under Alternative B, which could reduce or prevent the development of additional habitat for this species, and could result in harvest of stands prior to development of higher quality goshawk habitat. Birds inhabiting areas of the forest outside of timber harvesting operations are expected to be largely unaffected, while those found within harvest areas are expected to be protected by application of the Forest Practice Rules and THP review process, which is likely to include recommendations for supplemental protection by the Department of Fish and Game.
Alt. C (DFMP)						Refer to section "6.6.5.:Project Impacts."
Alt. D						This alternative will provide additional late-seral habitat development relative to Alternative C, which is considered beneficial to the northern goshawk. Birds associated with harvest areas would be protected by provisions similar to those outlined in Alternative C. There would be no even-aged management, which will tend to maintain most of the nesting opportunities that currently exist. Over time, an absence of forest openings could reduce some foraging opportunities, but not at a substantial level. Alternative D is similar to Alternative C with respect to surveys and goshawk nest site protection. Habitat is expected to increase under Alternative D. Although northern goshawks prefer late successional habitats, small openings, meadows, or woodlands are necessary for providing prey and foraging opportunities. However, the overall impacts are expected to be less than significant with application of mitigation similar to Alternative C.
Alt. E						Under Alternative E, JDSF would follow the same general management practices as under Alternative D. However, recreation and the potential for associated disturbance would be less.
Impact: Cooper's Hawk						
Alt. A						Alternative A does not propose the removal or degradation of Cooper's hawk habitat. As the younger forested habitats on JDSF mature, they will become higher quality stands in the short term. However, in the long term, habitats under Alternative A would become late successional which do not favor Cooper's hawks. In addition, the lack of harvest would allow forest opening to close, and foraging opportunity would be reduced. In the short to medium-term, this alternative is not expected to affect the Cooper's Hawk.

TABLE 38 COMPARISON OF WILDLIFE-RELATED IMPACTS IN RELATION TO THE VARIOUS ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels**: **(1) Beneficial (2) No Impact (3) Less than Significant (4) Significant - Mitigation Feasible (5) Significant -Mitigation Not Feasible**
Alt. B						Although Alternative B proposes greater emphasis on evenaged management and lacks specific snag retention mitigation above FPR, potential impacts to Cooper's hawk habitat are expected to be similar to those under Alternative C. Cooper's hawks would benefit from the small openings, edge, evenaged management and lack of late successional development in the long and short term. The edge and openings would provide areas for hunting and the evenaged management would provide a continuum of evenaged stands for cover, if not for nesting over the long term. The removal of hardwoods under Alternative B would decrease the quality of habitat for Cooper's hawks in some areas, however, this is not expected to occur over large areas and impacts from this are expected to be minimal. Adverse impacts to nesting Cooper's hawks would be avoided on a project basis that requires, at minimum, the protection of the nest site, perch, screening trees and consultation with CDFG. Cooper's hawks are known to occur but not nest on JDSF and although foraging individuals may be temporarily disturbed by timber operations, nest sites would be protected and Cooper's hawks are likely to benefit under Alternative B
Alt. C (DFMP)						Refer to section "6.6.5.:Project Impacts."
Alt. D						Protection measures for existing occupied sites would be similar to those under Alternative C. Expanded riparian zones may increase foraging opportunities for this species. Conversely, an absence of even-aged management could reduce foraging opportunities in upland areas. An increase in late-seral management may reduce the long-term quality of habitat for this species. Increased numbers of snags and large woody debris are likely to increase the quality of foraging habitat by improving habitat for prey species. The larger riparian buffers favor Cooper's hawks in the short term, however, the late successional advancement may not favor this species. Nesting potential may be reduced in the montane hardwood-conifer habitats exposed to Selection harvest. Since Cooper's hawks are known to successfully nest in urban areas and other areas of high human use, the impacts of increased recreation are not expected to adversely impact Cooper's hawks
Alt. E						Under Alternative E, JDSF would follow the same general management practices as under Alternative D. Thus, the effects of Alternative E on Cooper's hawks would be similar to those described for Alternative D.
Impact: Golden Eagle						
Alt. A						Alternative A does not propose the removal or degradation of golden eagle habitat. However, as the early successional forested habitats mature, potential golden eagle foraging habitat is likely to decline coincidentally to an increase in the availability of very large nesting trees. Significant impacts to golden eagles are not expected to occur under any of the identified alternatives, since the Forest is most likely only used incidentally by the species, if at all. JDSF represents a very small portion of the range of this species.
Alt. B						Under Alternative B, forest stands that provide nesting opportunities for golden eagles are likely to decrease compared to existing conditions. However, through the use evenaged management, foraging habitat can be expected at levels similar to existing conditions. The decline in potential nesting habitat is not expected to adversely affect golden eagles because trees are only occasionally used for nest sites and golden eagles are not known to nest on JDSF.

TABLE 38 COMPARISON OF WILDLIFE-RELATED IMPACTS IN RELATION TO THE VARIOUS ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels**: **(1) Beneficial (2) No Impact (3) Less than Significant (4) Significant - Mitigation Feasible (5) Significant -Mitigation Not Feasible**
Alt. C (DFMP)						Refer to section "6.6.5.:Project Impacts."
Alt. D						Nest site protection under this alternative is the same as under Alternative C. Potential foraging habitat is likely to be reduced as young stands grow and due to an absence of even-aged management. Nesting habitat may increase slightly relative to Alternative C, due to an increase in area devoted to late-seral habitat development.
Alt. E						Under Alternative E, JDSF would follow the same general management practices as under Alternative D. Thus, the effects of Alternative E on golden eagles would be the same as those described for Alternative D.
Impact: Bald Eagle						
Alt. A						Forest stands would develop naturally under Alternative A. Impacts to foraging habitat may occur due to the absence of an aggressive road management plan and potential road improvements associated with timber harvest operations in areas with older roads. Overall, this potential for damage to the fishery is expected to be less than significant if a minimal road maintenance plan were instituted.
Alt. B						Alternative B protects foraging habitat for this species through implementation of the Forest Practice Rules and the current level of road maintenance. Potential nesting structure is limited to riparian zones and older second-growth trees. Development is significant new nesting structure is not likely, and a reduction in current levels is likely without provisions to retain large residual trees and to promote the development of late-seral forest stands. However, since nesting structure should continue to remain within riparian protection zones, and Forest Practice Rules protect existing sites when found, impacts to this species are expected to be less than significant. Potential impacts associated with noise disturbances are expected to be less than significant.
Alt. C (DFMP)						Refer to section "6.6.5.:Project Impacts."
Alt. D						The implementation of wider uncut watercourse buffers is expected to provide additional protection to steams and the fishery, as well as additional development of future nesting structure, which is beneficial for this species over time. Impacts to occupied sites as a result of timber operations can be mitigated through application of the FPR.
Alt. E						Alternative E significantly limits timber harvest, but retains riparian and erosional protection measures similar to Alternatives C and D. Therefore, the impacts of Alternative E are considered less than significant.
Impact: Osprey						
Alt. A						Alternative A does not propose the removal or degradation of osprey habitat. Under Alternative A, no management would occur that would require FPR protection or consultation with CDFG. Natural stand development is likely to increase the number of large trees and large snags utilized for nesting by osprey. Over time, the condition of the aquatic system is expected to improve. There remains some potential for effects to the aquatic system associated with sedimentation from the road system during large stressing storms. The impacts associated with this potential damage are expected to be less than significant, since osprey actively forage in estuary and surf zone habitats in this area.

TABLE 38 COMPARISON OF WILDLIFE-RELATED IMPACTS IN RELATION TO THE VARIOUS ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels**: **(1) Beneficial (2) No Impact (3) Less than Significant (4) Significant - Mitigation Feasible (5) Significant -Mitigation Not Feasible**
Alt. B						Protection of existing osprey nest sites in harvest areas is provided by the Forest Practice Rules. There is no provision in Alternative B for recruitment of snags outside of riparian zones, and there is no provision for retention of large residual old-growth trees. This alternative relies upon the current level of road maintenance, and improvements to the road system through implementation of individual harvest operations where older roads exist. In the short-term, this alternative protects existing nest sites and allows natural stream recovery to proceed, yet likely at a slower pace than under the other alternatives. Over the long term, this alternative is likely to result in a lower level of nesting structure than currently exists.
Alt. C (DFMP)						Refer to section "6.6.5.:Project Impacts."
Alt. D						Alternative D incorporates expanded riparian zones and a corresponding emphasis upon development of late-seral habitat. Similar to Alternative C, existing old-growth groves and large old-growth trees are protected. Ample opportunity for recruitment of nesting structure is provided by this alternative. Due to the protection of existing nest sites, and provisions for recruitment, effects are considered less than significant.
Alt. E						Alternative E is similar to alternative D.
Impact: Peregrine Falcon						
Alt. A						Nesting habitat for this species is not known to exist on JDSF. Large trees may provide nesting habitat for this species, although use of trees for nesting is uncommon. Alternative A does not propose management activities that would impact or disturb typical peregrine falcon nesting habitat. The maturation of the early successional habitats will reduce the amount of potential foraging habitat available on JDSF, since this species frequently forages over open habitats. However, this is not likely to occur within the life of this document.
Alt. B						This alternative perpetuates application of a range of even-aged and uneven-aged management techniques. Open habitats with potential value for foraging would be maintained over time. The production of large trees suitable for potential nesting would be limited to riparian zones, older second-growth trees, and a few existing old-growth groves protected under this alternative.
Alt. C (DFMP)						Refer to section "6.6.5.:Project Impacts."
Alt. D						With respect to Peregrine falcons, Alternative D would be similar to Alternative C, except that no new foraging habitats would be created and all old-growth trees would be retained. None-the-less, the effects of Alternative D on peregrine falcons would be similar to those of Alternative C.
Alt. E						With respect to peregrine falcons, Alternative E is similar to alternative D. Therefore, the impacts of Alternative E would be largely the same as those under Alternative D.

TABLE 38 COMPARISON OF WILDLIFE-RELATED IMPACTS IN RELATION TO THE VARIOUS ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels**: **(1) Beneficial (2) No Impact (3) Less than Significant (4) Significant - Mitigation Feasible (5) Significant -Mitigation Not Feasible**
Impact: Marbled Murrelet						
Alt. A						Alternative A allows the forest to develop naturally. Large trees with large limbs suitable for nesting are expected to develop very slowly over time, but not within the 10-15 year planning period. Incidental disturbance to nesting birds could occur as a result of road maintenance and recreational activities, but these are considered insignificant due to the limited extent and duration of expected disturbance. Due to potential to vastly increase potential habitat for this species over time, the effects are considered not to have an impact on the species overall.
Alt. B						Take of nesting marbled murrelets is unlikely under Alternative B because surveys will be completed prior to commencing timber operations in or near potential habitat. Other than the approximately 459 acres of old-growth to be retained under Alternative B, there is little potential for recruitment of new habitat, and there is potential to eliminate potentially suitable habitat that is not currently occupied. Disturbance associated with recreation would remain at current levels, as would the potential for disturbance associated with road maintenance. Due to provisions for survey associated with management and with the potential to eliminate murrelet nesting habitat, significant but mitigatable impact are expected to occur.
Alt. C (DFMP)						Refer to section "6.6.5.:Project Impacts."
Alt. D						Expanded riparian buffers and increased emphasis upon development of late-seral habitat is likely to increase available habitat over the long term. In the short-term, old-growth trees and identified old-growth groves will be retained, and potential active nest sites within harvest areas would be protected through provisions of the Forest Practice Rules. An expansion of recreational facilities may increase the potential for disturbance of nesting birds. Depending upon the extent of new recreational development, this could become potentially significant, but can be mitigated by avoiding development in proximity to potential nesting habitat.
Alt. E						Alternative E provides similar opportunity to Alternative A for recruitment of habitat for this species, and reduces the potential for disturbance associated with recreation and timber operations. Potential nesting sites are provided with similar protection as the other alternatives. Due to reduced likelihood for disturbance, and increased potential for habitat recruitment, this alternative is considered beneficial for the species.
Impact: Northern Spotted Owl						
Alt. A						Alternative A provides for natural forest development in the absence of active management. Nesting and roosting habitat is expected to increase over time, and the potential for disturbance of active sites is expected to be reduced in the absence of active timber management. In the long term, there is potential for a reduction in the prey base, due to the gradual elimination of early seral stands that produce prey species.

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Alternatives						**Discussion**
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Alt. B						Like Alternative C, take of northern spotted owls would be unlikely under Alternative B due to FPR nest site protection requirements, minimum habitat retention standards, and surveys. Alternative B also proposes the protection of approximately 459 acres of old growth. However, outside of these areas, forest management activities would not be specifically undertaken for spotted owls. Forest management would continue to maintain balanced application of silvicultural systems to maintain and create varied habitat conditions. Based upon past observations and expected rates of stand alteration and development, ample habitat would remain for this species.
Alt. C (DFMP)						Refer to section "6.6.5.:Project Impacts."
Alt. D						Alternative D is similar to Alternative C with regards to surveys and the protection of nesting spotted owls. However, the larger WLPZ and focus on unevenaged management will provide greater quantities of nesting, roosting, and dispersal habitat for spotted owls. Absence of even-aged management could potentially reduce the amount of prey habitat. Recreation associated impacts can be mitigated by survey prior to development of major recreational facilities and/or avoidance of potential habitat areas.
Alt. E						Alternative E is similar to Alternative D with respect to spotted owl habitat but with less of a focus on recreation.
Impact: Vaux's Swift and Purple Martin						
Alt. A						Alternative A does not propose management that will directly impact purple martin or Vaux's swifts habitat. Over time, nesting habitat will be recruited in the form of very large trees, snags, and screening vegetation. The martin is known to nest in large hollow snags in open areas near ridges. There is potential for this alternative, in the absence of stand-renewing fire, to prevent development of optimal habitat for this species over the long term.
Alt. B						Under Alternative B, snags are protected in timber harvest areas by provisions of the FPR. Additionally, snags are expected to develop within portions of the riparian zones and in areas not subject to timber operations. However, snags are subject to salvage under this alternative, and retention of trees suitable for recruitment is likely to be limited with regards to size. Additionally, large trees are subject to harvest under this alternative. While suitable recruitment trees are likely to exist and continue to exist, the very large snags preferred by these species are not likely to be recruited outside of protected groves and riparian areas. Mitigation designed to produce large snags or retain selected large trees for eventual habitat recruitment is feasible and easily implemented, however, creation of suitable structure is an extremely long process.
Alt. C (DFMP)						Refer to section "6.6.5.:Project Impacts."
Alt. D						Under Alternative D, JDSF would follow the same management practices as they pertain to snags as under Alternative C, but with greater emphasis upon development of late-seral habitat and habitat elements of value to these bird species. For the purple martin, an absence of even-aged management would provide an opportunity for trees to grow up around snags rendering them less suitable for purple martins. However, this loss is not likely to occur for several decades.

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Alternatives						**Discussion**
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Alt. E						Under Alternative E, JDSF would follow the same management practices as they pertain to snags as under Alternative C and D. Impacts to habitat would be similar to Alternative D.
Yellow warbler						
Alt. A						Alternative A does not impact or degrade yellow warbler habitat. Over time, the early successional habitats will mature and become too dense or mature to constitute yellow warbler foraging habitat. Although this is expected to occur within younger stands (e.g. 3P, 4P, and 4S) within the life of this document, the California Wildlife Habitat Relationships System estimates that these habitats represent less than one percent (3,528 acres) of JDSF. Thus, Alternative A is not expected to impact yellow warblers.
Alt. B						The WLPZ and harvest prescriptions under Alternative B are similar to Alternative C, except that Alternative B has the potential for more even-aged management. Thus, the impacts of Alternative B would be similar to the impacts of Alternative C on yellow warblers.
Alt. C (DFMP)						Refer to section "6.6.5.:Project Impacts."
Alt. D						Alternative D will implement larger WLPZ protection zones than Alternative C and manage hardwoods as a significant component of the stand. These measures are expected to protect and/or improve existing yellow warbler nesting habitat. Although creation of early successional habitat is not expected under this alternative, the opening of the younger stands through selective harvest will improve foraging conditions for yellow warblers.
Alt. E						Alternative E is similar to Alternative D. However, harvest is expected to be lighter and the focus will be on the advancement of late successional habitat. In the long run, forest development will degrade habitat conditions for yellow warblers. This can be mitigated by creating some open areas for this species.
Olive-sided flycatcher						
Alt. A						Alternative A does not propose management that will impact or degrade olive-sided flycatcher habitat. Over time, the early successional habitats and unnatural forest openings will diminish much of the edge habitats preferred by this species. However, through the course of natural development, the stand will improve in suitability in the very long term.
Alt. B						Although the silvicultural prescriptions under Alternative B are similar to those of Alternative C, Alternative B does not promote the development of late-seral habitat, does not provide for retention and recruitment of snags (other than those protected by the FPR), and does not provide protection for old-growth trees with wildlife structure attributes. Application of varied silviculture, including even-aged management, maintains and creates edge which is desired by this species.
Alt. C (DFMP)						Refer to section "6.6.5.:Project Impacts."
Alt. D						Although the management activities described in Alternative D are not expected to provide as much edge as Alternative C, the opening of the stand, retention of old-growth and snags, and the advancement of late-successional habitat in the large riparian protection zones should improve habitat for olive-sided flycatchers

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Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant - Mitigation Feasible (5) Significant -Mitigation Not Feasible**
Alt. E						Under Alternative E, JDSF would follow the same general management practices as under Alternative D. Thus, the effects of Alternative E on olive-sided flycatchers would be similar to those described for Alternative D.
Impact: California Red Tree Vole						
Alt. A						Alternative A does not adversely red tree vole habitat. In time, many of the young-growth conifers stands not currently classified as red tree vole habitat will develop into suitable habitat for this species. Therefore, red tree voles would likely benefit under Alternative A.
Alt. B						The impacts to red tree vole habitat under Alternative B are expected to be greater than the impacts of Alternative C. This is because of the greater focus on even-aged management under this alternative. Unlike Alternative C, this alternative does not propose any specific conservation strategies for red tree voles, nor mitigation designed to advance the development of late successional habitat. Suitable habitat is maintained in the form of Douglas-fir trees and forest, which is expected to remain in substantial quantities.
Alt. C (DFMP)						Refer to section "6.6.5.:Project Impacts."
Alt. D						Alternative D is similar to Alternative C. However, no even-aged management would occur under this alternative This alternative is not expected to remove or significantly degrade occupied habitat in the short term and is expected to improve overall habitat conditions for red tree voles in the long term.
Alt. E						Alternative E is similar to Alternative D with respect to red tree voles and silviculture. However, less timber is expected to be harvested annually under this alternative compared to Alternative D, resulting in a lower level of habitat disturbance. This alternative is not expected to remove or significantly degrade occupied habitat in the short term and is expected to improve overall habitat conditions for red tree voles in the long term.
Impact: Pacific Fisher						
Alt. A						Since no timber harvest or other stand disturbing activities would occur on JDSF under Alternative A, fisher habitat would not be impacted or degraded. However, the population and distribution of many important prey species may decrease as the early successional stands mature. Unlike Alternative C, management activities that enhance or advance the development of late successional habitat will not be conducted under this alternative. Although the development of late successional habitat will take more time under this alternative, Pacific fisher habitat is likely to improve under this alternative. Fisher are not known to exist on JDSF, which is near the edge of the historically known range of the species.

TABLE 38 COMPARISON OF WILDLIFE-RELATED IMPACTS IN RELATION TO THE VARIOUS ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***<u>Impact Levels</u>: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant - Mitigation Feasible (5) Significant -Mitigation Not Feasible**
Alt. B						Impacts to potential Pacific fisher habitat under Alternative B are expected to be somewhat greater than the impacts of Alternative C. This is due to a greater focus on even-aged management under this alternative. Unlike Alternative C, Alternative B does not propose any specific conservation strategies, snag recruitment, or mitigation designed to advance the development of late successional habitat. Although potential habitat and habitat quality for Pacific fishers is expected to decrease under this alternative, large acreage of potentially suitable habitat is expected to be available over time. Under Alternative B, JDSF would continue to provide suitable habitat for Pacific fishers and could potential support fisher in the future.
Alt. C (DFMP)						Refer to section "6.6.5.:Project Impacts."
Alt. D						The effects of Alternative D on fishers would be similar to those of Alternative A. However, Alternative D allows management that enhances and/or advances the development of late successional habitats. Large riparian buffers and uneven-aged management silvicultural prescriptions would increase the amount of habitat for this species. The management of hardwoods proposed in this alternative would also benefit fishers. However, the population and distribution of many important prey species may decrease as the early successional stands mature. Natural disturbances, such as wind throw and fire, may create early successional habitats, but the magnitude and timing of these events are unpredictable. Since these animals tend to avoid humans, the focus on recreation under this alternative may have a negative affect on fishers, should they occur on JDSF. Although fishers are not know to occur on JDSF, the management activities proposed under Alternative D would increase the amount and quality of fisher habitat
Alt. E						Under Alternative E, JDSF would follow the same general management practices as under Alternative D, but timber management would be substantially reduced. Thus, the effects of Alternative E on Pacific fishers would be somewhat less than those described for Alternative D.

7. GEOLOGY AND SOILS

7.1 Introduction

The geologic and geomorphic conditions in the JDSF are described in the DFMP (see discussions in Chapter 2, within the watersheds section on soils; geology; topography; and surface erosion, road-related erosion, and mass wasting). In addition, because JDSF operates as an experimental forest, considerable research has been conducted on the impacts of various management approaches on the geologic condition of the landscape. This is particularly true within the Caspar Creek watershed, where studies have focused on the relative impacts associated with various silvicultural and yarding methods for over 40 years. A list of pertinent studies of the geologic and geomorphic characteristics of the JDSF includes:

- the most comprehensive discussion of watershed studies within the Caspar Creek drainage is U.S. Forest Service General Technical Report PSW-GTR-168, "Proceedings of the Conference on Coastal Watersheds: The Caspar Creek Story";

- an entire catalog of Caspar Creek studies is accessible on-line at: www.rsl.psw.fs.fed.us/projects/water/caspar. Pertinent recent studies available at this web site include Lewis et al. (2001) and Zeimer (2001);

- the California Geological Survey (formerly California Division of Mines and Geology) recently compiled preliminary geologic and geomorphic maps of the JDSF lands showing existing landslides and "relative landslide potential";

- landslide mapping within the Caspar Creek watershed is depicted in Spittler and McKittrick (1995);

- the shallow landslide potential within the JDSF has been modeled via a distributive computer model (SHALSTAB) based on digital elevation data, drainage area, and slope (unpublished report for JDSF). This data was used in the development of the CGS preliminary map of relative landslide potential;

- sediment Storage and Transport in the South Fork Noyo River Watershed, Jackson State Demonstration Forest (William Lettis & Associates, 2001);

- an on-going study is being conducted by the California Geological Survey (CGS) to evaluate the frequency of landslides in areas under even-aged management. A future study phase will compare the landslide frequency in areas under even-aged management with those under uneven-aged management;

- an on-going study is being conducted by CGS to map and characterize inner gorge slopes within JDSF; and

- numerous site-specific geologic studies have been conducted for individual THPs within the State Forest.

These studies, and other published literature and maps, are the basis of the following discussion.

7.2 Geologic Setting

JDSF is located on the coastal side of the Mendocino Range, the westernmost range of the Coast Range geomorphic province in Mendocino County. According to published geologic maps, the area is underlain by bedrock of the Mesozoic to Cenozoic age Coastal belt of the Franciscan Complex (Kilbourne, 1986; Short and Spittler, 2002). The Franciscan Complex is a regional accretionary assemblage of bedrock materials representing the accumulation of ancient seafloor rocks and deposits along the western edge of the North American plate during subduction of the Pacific plate over the past 120+ million years. In simple terms, as the Pacific plate is subducted (from west to east) beneath the North American plate, some seafloor materials are scraped off and become "welded" (i.e., "accreted") to the continental margin. These rocks and sediments are extensively sheared, folded, mixed, and metamorphosed during this process, resulting in a heterogeneous assemblage of earth materials. The Franciscan Complex can be subdivided into three broad northwest-trending belts that span much of the Coast Ranges in northern California (Irwin, 1960). These belts, which become progressively younger from east to west, are generally referred to as the Eastern, Central, and Coastal belts. These belts, in turn, are subdivided into structural "terranes" that define discrete zones of accreted materials, based on the age, lithology, or metamorphic character of the particular rocks.

The Coastal belt of the Franciscan Complex underlies most of JDSF. The Coastal belt itself is subdivided into a series of terranes, the largest and most extensive of which is simply referred to as the "Coastal terrane." JDSF Coastal belt bedrock is part of the Coastal terrane. The Coastal terrane is composed of graywacke sandstone and argillite (shale), with minor amounts of volcanic basalt. Rocks within the Coastal terrane are typically penetratively sheared, although the DFMP discussion states that deformation is less intense in the eastern part of JDSF. Fossils within the Coastal terrane rocks between Fort Bragg and Willits are Paleocene to Eocene in age (about 33 to 65 million years old), although older (over 65 million years old) and younger (less than 23 million years old) fossils have been identified elsewhere (see discussion in DFMP).

The geomorphology of the coastal mountains of Mendocino County has been strongly influenced by two important factors: tectonic uplift and fluctuations in sea level. Tectonic uplift in the region is a result of the structural setting along the western margin of the North American plate. Uplift was originally associated with subduction along the plate margin, but has evolved over the last approximately 8 million years as the San Andreas fault system developed. Superimposed on this uplifting, emergent coastline are the effects of fluctuating sea level. Sea level during the Pleistocene epoch has fluctuated due to changes in the global water budget resulting from glacial advances and retreats. During glacial periods, sea level drops substantially; during interglacial periods (such as the present), sea level rises. The geomorphology of coastal watersheds is most significantly impacted during low sea level stands, when the ocean shoreline migrates to the west. Coastal streams down-cut to reach the reduced sea level, resulting in deeply incised stream valleys with steep-sided inner gorges. This combination of tectonic uplift and sea level-induced stream incision results in the steep, immature geomorphic expression that characterizes the region. During high sea level stands, the streams aggrade to compensate for the encroaching shoreline, thus filling the floors of coastal valleys and creating estuaries at the mouths of many coastal streams.

As the shoreline advances and recedes during sea level changes, wave-cut platforms are eroded along the migrating coastline. When associated with a high sea-level stand (during an interglacial period), the wave-cut platform occurs the farthest to the east, becomes less susceptible to reworking by later shorelines, and has a higher probability of being preserved. Along emergent coastlines such as California's, these high stand wave-cut platforms are often elevated out of the reach of later shorelines, and preserved as marine terraces. Marine terraces are common along the coast of North America (Lajoie, 1986), typically consisting of a wave-cut platform (dipping a few degrees toward the ocean) overlain by a sequence of nearshore marine (beach) and terrestrial (fluvial, colluvial) deposits. A sequence of at least seven marine terraces has been identified along the Mendocino coast; these terraces increase in age from west to east, as the terraces increase in elevation.

Dune deposits overlie the marine terrace deposits in the western part of JDSF. These loose to partially indurated sandy deposits generally occur as northwest-trending ridges up to several thousand feet long, several hundred feet wide, and up to 50 feet thick. The orientation of the dunes reflects the predominant wind pattern (i.e., northwesterly) during the dry season, when sand is mobile.

Hillslopes in the study area are covered with a veneer of late Pleistocene to Holocene age colluvium. This veneer represents the accumulation of weathered and/or reworked rock and soil that moves downslope via gravitational processes. It includes the debris deposited by landslides, so in some cases can be very thick. In general, colluvial thickness is greatest within swales (i.e., colluvial "hollows") and at slope toes where it is deposited as a colluvial apron. The texture and consistency of colluvial materials is a manifestation of the parent material from which it is derived. Colluvium derived from blocky, durable sandstone as is present within much of the Coastal terrane is often rocky and gravelly.

7.2.1 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 JDSF assessment area. In the eastern one-third of this assessment area, soils are dominated by those of the Ornbaun-Zeni and Van Damme series. These soils are deep (up to about 60 inches), well-drained, formed from weathered sandstone and mudstone, and contain 35 to 45 percent clay and 0 to 10 percent gravel (Zeimer and Albright, 1987).

In the western two-thirds of the JDSF assessment area, the Irmulco-Tramway series is the most common soil type; these soils are loamy, moderately deep to deep (up to about 80 inches), well-drained, and formed from weathered sandstone. In the North Fork Caspar Creek basin, Irmulco-Tramway soils typically are found on the middle portions of hillslopes (Napolitano, 1996).

Van Damme soils, which are found on upper portions of hillslopes and on ridges, are also common in the western two-thirds of the assessment area (Zeimer and Albright, 1987). Valley bottoms contain gravelly, deep, moderate- to low-permeability soils, and, along the southern margin of JDSF, floodplains are mantled with sandy, deep, highly permeable Big River soils. Inner gorge areas and the bases of hillslopes in the North Fork Caspar Creek basin are often characterized by gravelly Dehaven-Hotel complex loams (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 with high permeability and range from shallow to deep. Locally on the marine terraces, poor fertility, and an iron-rich hardpan restricts vegetation growth and has created pygmy forests.

7.2.2 Seismic Setting

Northern California is a seismically active region. Since 1853, approximately 110 moderate to large earthquakes have been documented in the northern California Coast Ranges (Stover and Coffman, 1993; Toppozada and Parke, 1982; Dengler, 1992). Many of these were probably felt in the JDSF region. There are no large magnitude earthquakes whose epicenters have been documented in the region during historic times, although the 1906 San Francisco earthquake apparently ruptured along the San Andreas fault offshore to the west. Two moderate magnitude earthquakes have occurred in the vicinity; a 4 to 4.9-magnitude earthquake occurred near or within the JDSF in the 1930's, and a 4.9 magnitude earthquake occurred in 1887 near Branscomb (Stover and Coffman, 1993).

The area is located between two active seismicity centers, the San Francisco Bay area to the south and the Mendocino Triple Junction to the north. The principal tectonic feature in the area, as throughout much of California, is the San Andreas fault, which is located about 6 miles offshore of the project area (Jennings, 1994). The north coast segment of the San Andreas fault is associated with a slip rate of about 24 mm/yr (Working Group, 1996), and last ruptured in 1906 (M_w 7.9). The other significant seismic source in the Mendocino County area is the Maacama fault, which lies about 6 miles east of the site. The Maacama fault represents the continuation of the Calaveras-Hayward-Rodgers Creek fault system into northern California. It is associated with a slip rate of about 9 mm/yr, and has not produced a large historic earthquake. It is creeping aseismically at a rate of about 6.5 mm/yr (nearly 10 years of data; Galehouse, personal communication, 2002). It is interpreted to be capable of generating a maximum magnitude earthquake on the order of 6.9 to 7.1 (Working Group, 1996). The Bartlett Springs fault, which is about 28 miles to the east, is associated with a slip rate of about 6 mm/yr, and is capable of generating a magnitude 7.1 earthquake. The site is approximately 68 miles south of the Mendocino Triple Junction, which is perhaps the most seismically active region in the state.

7.2.3 Geomorphic Processes: Surface Erosion, Road-related Erosion, and Mass Wasting

JDSF is located in a dynamic geomorphic environment. The combination of steep topography, locally sheared, weakened earth materials, high rainfall, and frequent seismicityresult in a landscape that is inherently susceptible to erosion and landsliding (processes referred to herein as "mass wasting"). Land management in this environment frequently results in increased rates of mass wasting, which typically leads to the production of loose sediment, much of which is transported to watercourses. A significant increase in sedimentation, especially its effect on fish-bearing streams, is the primary environmental impact associated with forestland management in northern California. As such, the potential for delivery of sediment to area watercourses is the most important potential geology-related impact of the proposed project.

Naturally occurring surface erosion in the California Coast Ranges typically involves sheetwash and gullying of bare soil areas produced by mass wasting (i.e., landsliding) and fire. Management-related erosion in forest lands is typically associated with activities that reduce the protective ground cover and canopy (i.e., harvest activities), and/or increase soil compaction through the use of heavy equipment. Road-related surface erosion is perhaps the largest source of management-related sediment (Reid and Dunne, 1984; Cafferata and Spittler, 1998), particularly at or near locations where roads cross or divert streams (Furniss et al., 1991). Below we discuss erosion and mass wasting processes to provide a basis for the analysis of potential environmental impacts associated with the proposed management plan.

Surface Erosion

Increased surface erosion resulting from management in forested environments is largely a function of canopy disruption, log yarding, and burning. The physical (i.e., mechanical) aspects of timber harvest are typically associated with the greatest increases in erosion rates, particularly where ground-based yarding is utilized. Heavy equipment operation and various yarding and skidding techniques can result in disturbance and exposure of surface soils, and concentration or disruption of runoff. The loss of trees and an intact forest canopy result in a reduction in rainfall interception. Where not buffered by forest canopy, more rain hits the ground with more force, and the ground surface is more susceptible to erosion. The susceptibility to erosion varies depending on the soil type, and the amount of understory canopy or slash that is retained on the slope to disrupt or filter runoff. Slopes that are burned to facilitate re-stocking with conifer are subject to higher short-term erosion rates because little organic buffer is retained on the slope. Burning for site preparation can increase soil erosion by creating bare ground, and if sufficiently hot, by slowing the revegetation process. The harvest- and site preparation-related impacts on surface erosion are greatest at the heads of Class III watercourses, where increased surface runoff causes uphill migration of the definable watercourse into previously unchanneled portions of the headwall swale (Lewis, 1998). Harvest-related surface erosion is a temporary impact, and occurs only until vegetation is re-established. Trees exposed to increased wind effects adjacent to canopy holes, particularly near clearcuts, roads, landings, or other clearings, are susceptible to windthrow that may disrupt large areas of soil. The surface erosion effects of different silvicultural and yarding practices in the Caspar Creek watershed are presented in Lewis (1998) and Cafferata and Spittler (1998).

Recreational use of the Forest environment can also result in increased levels of surface erosion. Recreational trails can be difficult to maintain for erosion control, especially where foot traffic is heavy, or where trails are utilized by horses or mountain bikes. Horse and mountain bike traffic, in particular, can quickly degrade drainage relief structures (water bars, etc.) on trails, and results in rutting and pitting, especially during wet weather use. Maintenance of recreational trails frequently must be completed by hand due to their inaccessibility, which can limit the scope of potential repairs. Public forest lands open for recreation are also subject to illegal operation of motorcycles and ATVs, which can result in significant environmental damage if occurring in areas without adequate erosion protection. Erosion may also occur due to the development and use of campgrounds and conservation camps, which for the most part, represent the only "developments" within JDSF. Grading

and construction of campsites and access roads associated with campgrounds may result in diversion of runoff, concentration of flows, and potential erosion. This may be especially problematic because campgrounds within JDSF are clustered in valley bottom locales near watercourses.

Road-related Erosion

Forest roads are responsible for the single most significant impact associated with forest management. They have the potential to interrupt and re-direct the natural flow of water across native hillslopes, and inevitably, result in increased rates of erosion. A road cut into a hillslope intercepts the flow of sheetwash and shallow subsurface flow, and frequently diverts and concentrates these flows to a single discharge point (usually closer to a watercourse than where the flow originated). The running surface of a road is commonly a low gradient, unimproved dirt surface that is highly susceptible to erosion, especially where subject to frequent traffic (especially during wet weather). Roads with inboard ditches result in erosion within the ditch itself, and at the outlet point, where concentrated flows can erode previously unchanneled slopes. Cut banks and fill slopes are subject to mass wasting. Where roads cross streams, the crossings usually involve culverts and large quantities of fill, which are subject to failure (i.e., plugging) and subsequent erosion of the crossing materials. At poorly designed crossings, a failed watercourse crossing may result in diversion of stream flow onto the road surface, significant erosion of the road prism, and incision of a new channel at a random outlet point. Through a largely inadvertent trial-and-error process over the past 50 to 60 years, forestland road building has evolved as the impacts associated with poorly located and constructed roads have become more evident (and watercourse protection has become more of a priority). The state-of-the-practice for road building, maintenance, and abandonment is compiled in Weaver and Hagans (1994); the techniques outlined in this handbook have been utilized at JDSF since its publication.

As described in the DFMP, the existing road network in JDSF reflects the evolution of logging and yarding techniques from the late 19th century to the present. Early mechanical phases of old-growth logging (circa 1870's) utilized railroads to transport logs from the woods. Railroad grades were frequently constructed along watercourses, and many of these low-lying grades were developed into truck roads. Most of the roads in JDSF were constructed from the 1950's through the 1970's. Roads constructed in this era were frequently placed on mid to lower slope positions, and commonly were located across steep slopes. In addition, the early roads utilized inboard ditches to capture and divert runoff. These roads were large sources of sediment because the inboard ditches invariably concentrate and divert sediment-laden runoff toward watercourses. Road construction techniques on JDSF lands changed considerably through the 1980's and 1990's. This more recent construction has typically occurred as out-sloped ridge line spurs to accommodate long-reach skyline yarders.

Information on the characteristics and location of the JDSF road network has been previously compiled in a Geographic Information System (GIS) database. The database includes both roads under JDSF ownership, and relevant nearby watersheds adjacent to

JDSF ownership. Attributes within the GIS data (i.e., road surface material, relative amount of use, time since construction, use status, etc.) can be used to estimate relative sediment production. Table 39 summarizes this information.

TABLE 39
LENGTH OF ROADS ON JDSF LANDS, BASED ON GIS ROADS COVERAGE*

Planning Watershed Name	Area (mi^2)	Length of Non-Riparian Roads (mi)	Length of Riparian Roads (mi)	Length of All Roads (mi)
Parlin Creek	11.8	34.6	8.8	43.4
Brandon Gulch	10.1	15.6	8.2	23.8
Kass Creek	5.5	11.8	7.0	18.8
Total	**27.4**	**62.0**	**24.0**	**86.0**
Hare Creek	9.7	32.9	12.9	45.8
Mitchell Creek	10.2	10.4	2.0	12.4
Caspar Creek	8.4	31.8	10.4	42.2
Russian Gulch	11.1	9.5	1.8	11.3
Total	**39.4**	**84.6**	**27.1**	**111.7**
Two Log Creek	17.9	2.8	2.2	5.0
Berry Gulch	12.5	29.0	11.0	40.0
Lower Big River	14.9	8.9	3.6	12.5
Total	**45.3**	**40.7**	**16.8**	**57.5**
Upper North Fork Big River	8.5	10.5	4.3	14.8
James Creek	7.0	18.8	13.3	32.1
Chamberlain Creek	12.3	30.1	27.5	57.6
East Branch North Fork Big River	8.1	2.4	0.1	2.5
Lower North Fork Big River	7.7	16.9	11.0	27.9
Total	**43.6**	**78.7**	**56.2**	**134.9**

*GIS roads coverage is derived from USGS 1:24,000 scale DLG data; updates by JDSF forest staff use 1:24,000 scale (or better) base map. Other updates use SPOT Panchromatic 10-meter image (June 1996).

The Chamberlain Creek planning watershed has the highest density (2.2 mi/mi^2) and longest total length (27.5 mi/mi^2) of riparian roads (i.e., those within 200 feet of a watercourse crossing) under JDSF ownership. The density of riparian roads on JDSF ownership is also relatively high (greater than 1 mi/mi^2) in the James Creek, Lower North Fork Big River, Kass Creek, Hare Creek, and Caspar Creek watersheds. The highest density of roads (riparian and non-riparian) is within the James Creek planning watershed; the lowest is in the Brandon Gulch planning watershed. The percentage of JDSF area covered by roads ranges from about 1.5% in the Brandon Gulch watershed to nearly 6% in the East Branch North Fork Big River watershed.

Field surveys in JDSF have indicated that the majority of road-related surface erosion is derived from the road surface, as opposed to erosion of fillslopes or cutslopes. Insloped roads and ditches draining to streams appear to be significant contributors. As such, riparian roads are the most likely to deliver road-related sediment to watercourses. This is true even

at Class III watercourse crossings, which are not typically protected by Watercourse and Lake Protections Zones, but which are connected to lower class watercourses (i.e., Class I and II) and can deliver sediment. The highest surface erosion hazard is in the eastern part of JDSF, where topography is steepest and the highest concentration of Class I watercourse crossings are present.

Mass Wasting

Mass wasting refers to the downslope transport of soil and rock material under the force of gravity. It includes slow displacements such as soil creep, as well as rapid displacements associated with the various forms of landsliding (e.g., earthflow, debris sliding, rotational/translational). Mass wasting processes are especially profound in the Coast Ranges of California due to the steep, immature topography, the weak nature of the sheared, deformed bedrock materials, high regional precipitation levels, and frequent seismic shaking.

According to previous geologic assessments (e.g., Spittler and McKittrick, 1995), mass wasting within JDSF is dominated by:

1) shallow debris flows and slides associated with roads and landings;
2) stream-side inner gorge landslides;
3) slow-moving, deep-seated bedrock landslides; and
4) debris flows from areas with steep, youthful geomorphology.

Landslides in the region range in size from small streamside bank failures and hillslope soil slips, to large deep-seated slump-type failures involving thousands of cubic yards of material. Shallow failures on streamside slopes typically occur during high flows due to stream undercutting and loss of toe support. Shallow failures on hillslopes tend to occur within the colluvial veneer mantling steeper slopes, and are typically initiated by high pore pressures resulting from concentrated precipitation during winter storms. Elevated pore pressure effects can be enhanced in topographic settings where convergent slopes concentrate subsurface water. Shallow debris slides, therefore, occur frequently in swales and along drainage headwalls. The potential for shallow failures is often increased by the placement of side-cast road fill on steep slopes, which adds additional driving force. Shallow soils can be sensitive to the loss of the cohesive effects of tree roots, so some shallow slope failures may occur following timber harvest if the root strength loss is substantial enough (this effect is not as important in redwood forests because redwood trees retain a living root mass following harvest and frequently re-sprout from the stump). Timber harvest also removes a tree's evapotranspiration capacity from the hydrologic budget for a harvest slope and its canopy buffer, both of which result in increased amounts of rainfall that flows across the ground surface (sheetwash) or enters the subsurface. This exposure to the elements may result in short term elevation of pore pressures during peak storm events (Keppeler and Brown, 1998). The relative impact associated with loss of evapotranspiration diminishes into the rainy season, because trees become dormant and the

soil, even in forested areas, becomes saturated. Transpiration reductions are relatively short-lived as new trees grow and older, retained trees are "released" (i.e., retained trees often experience a growth spurt because of the reduction of competition).

Deep-seated failures typically occur as earthflows, slow-moving masses of cohesive fine-grained sheared rock (typically in mélange areas within Franciscan Complex rock types), or as rotational/translational slumps (i.e., rock slides), slow- to rapid-moving failures of coherent rock masses along relatively deep planes of weakness (i.e., shears, joints, weathered zones). Earthflows are generally sensitive to moisture changes, and move more rapidly under wetter conditions. Slump-type failures are often triggered by dynamic forces (such as seismic shaking) and rapid fluctuations in the water table that result in buoyancy-related reductions in material strengths, or removal of toe support along streams or cuts

Landslide mapping within JDSF has been compiled by the California Geological Survey (CGS) (Short and Spittler, 2002). This recent map compilation supplements previous maps by CGS (see Kilbourne map set from 1982 through 1984); it includes recent field mapping and additional aerial photograph interpretation, as well as additional map sources. In general, this mapping indicates patterns in landslide distribution based on geomorphic conditions and topographic steepness. Slopes in the western part of JDSF, and adjacent to the Noyo River, are less steep with more mature topography than areas to the east. As such, deep-seated failures are of more relative importance on the western slopes. To the east, where slopes are taller and steeper, shallow debris slide slopes are more abundant. Deep-seated failures within JDSF are mostly translational/rotational block slides associated with the competent sandstone of the Coastal terrane; earthflows are relatively rare within JDSF.

Shallow landslide distribution in the Caspar Creek and James Creek watersheds was evaluated by Coyle and Stillwater (unpublished, undated report to CDF). That analysis involved interpretation of 1978 and 1996 aerial photography, and found that in the Caspar Creek watershed, 53% of shallow landslides were road related, 20 % were in inner gorges, and 27% were on other portions of hillslopes. In the James Creek watershed, 60% of shallow landslides were road related, 13% were located in inner gorges, and 27% were on other portions of hillslopes. The aerial photograph analysis also indicated that the number of road-related landslides in the Caspar Creek and James Creek watersheds appear to have decreased by an order of magnitude between 1978 and 1996. This change appears to reflect the improvement in road location and construction techniques, and the natural recovery from past damages. This trend was confirmed in landslide mapping within the North and South Forks of Caspar Creek (Spittler and McKittrick, 1995; Cafferata and Spittler, 1998) that indicate roads constructed prior to implementation of the modern Forest Practice Rules continue to be the dominant source of sediment in many areas.

7.2.4 "Rapid" Sediment Budget

A "rapid" sediment budget for the planning watersheds within JDSF is presented in the DFMP. The sediment budget is an estimate of the proportionate inputs from a variety of sources (e.g., surface erosion and mass wasting), and includes estimates of hillslope erosion, sediment yield to channels, and changes in sediment storage within channels. The sediment budget estimate covers the period from 1958 to 1997, so it spans a considerable range in forest management styles.

The sediment budget estimates the following:

- 74% of sediment results from road-related surface erosion and road-related landsliding;
- 19% results from hillslope landsliding (non road-related), surface erosion, and soil creep;
- 7% resulted from release of sediment stored within channels (primarily due to the removal of large woody debris, which was thought to be a favorable management approach in the 1970's)

The "Rapid Sediment Budget" presents an average rate of 856 tons/sq. mi/yr for the period from 1958 to 1997. This is approximately 2.5 times greater than estimated background rates that represent the inferred sediment delivery rate in an undisturbed watershed. Two results suggest that sediment inputs have been significantly reduced since inception of the modern Forest Practice Rules, which modernized the standards of forest management in 1974. First, logging prior to 1974 in the South Fork of Caspar Creek produced 2.4 to 3.7 times more suspended sediment compared to that produced in the North Fork of Caspar Creek under the Forest Practice Rules (Lewis, 1998). Secondly, the amount of sediment derived from shallow, road-related landslides was about twice as great between 1958 and 1978 relative to the period between 1979 and 1996, based on interpretation of historic aerial photographs. The amount of road-related sediment input is expected to further decrease under the proposed Road Management Plan within the DFMP.

For additional discussion regarding stream sedimentation, refer to the stream channel geomorphology discussion in Section VI-6.1" Aquatic: Resources.

7.3 Regulatory Framework

Because the principal geology-related impact associated with forest management in JDSF is an increase in the rate and amount of sediment delivery to area watercourses, the proposed Forest Management Plan is subject to Federal, State, and local regulations and policies regarding water quality. These include:

Federal Clean Water Act. The Noyo River and Big River have been listed as sediment impaired watercourses by the U.S. Environmental Protection Agency, under Section 303 (d) of the Clean Water Act. Based on this listing, technical Total Maximum Daily Load reports were prepared, which estimate the existing sediment load and the sources, and defines required reductions in

sediment input. Significant reductions are required for sediment derived from roads. The Big River was recommended in 2001 for inclusion on the 303 (d) list for temperature. Caspar Creek was recommended for inclusion on a "watch list" for pathogens.

State Porter-Cologne Water Quality Act. The Porter-Cologne Act mandates the development of a Water Quality Control Plan for the North Coast Region (i.e., a "basin plan"). The North Coast Basin Plan contains the following prohibitions pertaining to logging, construction, and associated activities (see p. 4-28.00 of the Basin Plan):

1. The discharge of soil, silt, bark, slash, sawdust, or other organic and earthen material from any logging, construction, or associated activities of whatever nature into any stream or watercourse in the basin in quantities deleterious to fish, wildlife, or other beneficial uses is prohibited.
2. The placing or disposal of soil, bark, slash, sawdust, or other organic and earthen material from any logging, construction, or associated activity of whatever nature at locations where such material could pass into any stream or watercourse in the basin in quantities which could be deleterious to fish, wildlife, or other beneficial uses is prohibited.

Forest Practice Rules. The Forest Practice Rules provide the baseline framework for management within JDSF. The Hillslope Management approach and Road Management Plan described above will supplement the guidelines already contained within the Forest Practice Rules regarding soil erosion and mass wasting impacts. Pertinent regulations within the Forest Practice Rules are described in Appendix 9.

7.4 Proposed JDSF Management Measures

The Forest Management Plan has been developed to minimize the potential for increased sedimentation to area watercourses, and in some cases to reduce the existing levels of sedimentation. The Forest Management Plan augments the applicable standards contained within the Forest Practice Rules, the pertinent portions of which are discussed in this section as well. The principal elements of the proposed management plan intended to address geological impacts (mass wasting, erosion, etc.) are discussed in DFMP Chapter 3 and Appendices III and VI. These are:

- **Special Concern Areas.** Special Concern Areas have been identified to denote geographically distinct areas that are in some way unique, or that require special management considerations. Both inner gorge slopes and "shallow landslide potential areas" are designated as Special Concern Areas in the Draft Forest Management Plan. The "shallow landslide potential areas" are locales identified via a distributive computer model (SHALSTAB) based on digital elevation data. In a review of the Draft Forest Management Plan by the California Geological Survey (CGS), however, it was determined that use of computer models is overly simplistic, and often misleading. As such, CGS proposed to utilize recently completed landslide maps (Short and Spittler, 2002) as the templates to define "Special Concern Areas" in the Final Forest Management Plan.

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

  The JDSF Management Plan outlines the following methodology for the assessment of slope stability to be conducted during preparation of THPs and other management related activities:

  - **Office Review of Existing Information.** This information includes: a) CGS maps of landslide related features and relative landslide potential, (the Draft Forest Management Plan calls for evaluation of shallow landslide potential maps derived from the SHALSTAB computer model at this step; however, that methodology was criticized as overly simplistic and potentially misleading in a technical review by CGS, and is likely to be changed in the Final FMP); b) aerial photographs; and c) prior THPs and their geologic reports.
  - **Field Review.** Once office review has been completed, an on-site evaluation will be conducted throughout the project area by an RPF. Areas highlighted during the office review of existing information will receive special attention. The RPF will follow the 1999 "California Licensed Foresters Association Guide to Determining the Need for Input From a Licensed Geologist During the THP Preparation."
  - **CEG Input.** A CEG is to be consulted as appropriate during the design phase of timber sale preparation work to address slope instability and erosion issues identified during office and field reviews, insuring that harvest units and road designs are proposed that adequately protect unstable areas and inner gorges. The 1999 CLFA guide will be used to aid in determining when to call for the services of a CEG.

    The 1999 CLFA guide described above as an integral part of the review process is a short checklist that states: "If proposed timber operations have a reasonable potential to affect slope stability, and there is a potential for materials from landslides or unstable areas to affect public safety, water quality, fish habitat, or other environmental resources, then a California licensed geologist with experience/ expertise in slope stability should be consulted to assess slope stability and assist with designing mitigation measures." The guidelines include a list of "features associated with unstable areas" intended to provide an RPF with the criteria to identify unstable areas during THP layout. As such, the determination whether a licensed geologist reviews a plan is within the purview of the RPF preparing the plan.

- **Road Management Plan.** "The intent of the Road Management Plan is to provide a systematic program to ensure that the design, construction, use, maintenance, surfacing and abandonment of the Forest's roads, landings, and road crossings will be conducted to avoid, minimize, or mitigate adverse impacts to aquatic habitats that support anadromous fish,

amphibians, and other aquatic organisms." The Road Management Plan includes provisions for both the correct abandonment (i.e., "decommissioning") of older, legacy roads, as well as guidelines for the location and construction of new roads. As described above, roads within JDSF, particularly the older (pre-modern FPR) roads, contribute significant amounts of sediment to area watercourses. The proposed Road Management Plan is a principal element of the DFMPs efforts to reduce management-related sedimentation. The goal of the Road Management Plan is to "enhance stream channel conditions…by reducing both fine and coarse sediment loading," and to "improve water quality by reducing suspended sediment concentrations and turbidity."

The Road Management Plan includes six major components:

- **Inventory.** All JDSF roads will be inventoried during the first 5 years of the plan. The inventory will allow the identification of problem areas, and prioritization of mitigation tasks.
- **Design and Construction.** Provides state-of-the-practice design criteria for new roads, landings, and crossings. The intent is to move as many roads as feasible to mid- or upper slope positions. "The goal for the final transportation network is to establish roads in low risk locations that will accommodate appropriate yarding and silvicultural systems, and serve other programs such as recreation and protection." Roads will generally avoid unstable areas, unless a CEG determines a low potential for sediment delivery to watercourses.
- **Use Restrictions.** Minimizes the use of JDSF roads during wet weather conditions, when the potential for road damage and/or drainage control structure damage and sediment generation is highest. Specific rainfall criteria are proposed as a basis for the use or closure of Forest roads during the rainy season.
- **Inspection and Maintenance**. Recognizing that "proper maintenance is a key to reducing the long-term contribution of road-related sediment," the DFMP proposes an Inspection and Maintenance program. Every road and crossing will be visited every two years as part of a "formal" inspection program; problem sites will be recorded on inventory sheets. Between formal inspections, JDSF foresters and other staff will observe road and crossing conditions on an informal basis. "Storm patrol inspections" of known problem areas will be required after large winter storm events. Abandoned roads will be inspected on at least two occasions following the completion of the decommissioning process.
- **Abandonment.** Problem road areas will be mitigated and "properly" abandoned. In the Road Abandonment Plan, "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. This definition is in contrast to that in the Forest Practice Rules, which provides for future access to an "abandoned" road (i.e., the road need only be "reasonably impassable" to standard production 4-wheel drive vehicles; drainage improvements such as culverts may be left in place). In recent literature, the term "decommissioning" has been used to describe the permanent, low-maintenance closure approach described in the JDSF Road Abandonment Plan; in this approach, watercourse crossings are removed, natural channel geometries are restored, and perched fills are pulled back). Target roads in

JDSF will include: roads in unstable areas; roads in close proximity to watercourses; roads not needed for management purposes; and roads with excessive amounts of perched fill.

- **Schedule.** Road repair work will be prioritized based on the relative impacts to critical habitat for coho salmon and steelhead. Secondary factors will include existing rates of sediment delivery to sensitive watercourses, and high potential areas (e.g., areas with high density of riparian roads and/or stream crossings).

- **Operational Implications of Watershed Analysis.** Guidelines are included for improved management of roads, riparian zones, watercourses, and hillslopes as follows:

  - **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 within WLPZs are to be abandoned where other existing feasible routes are available. Where there is no feasible alternative, 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.
    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.**

    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% coverage to a minimum depth of four inches where there is potential for soil detachment and transport.

  - **Watercourses.**

    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.

- **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.

- **Monitoring and Adaptive Management.** A description of the Monitoring and Adaptive Management goals are presented as Chapter 5 of the DFMP. Monitoring is described as "the process used to evaluate progress toward the stated goals in the management plan for JDSF." Adaptive management describes the "management strategies that will be implemented if analysis of monitoring results indicate that resource conditions begin to deviate from the desired trajectory." Under the heading "Watershed Resources," three goals are presented that are aimed at hillslope management and the reduction of sedimentation impacts:

  - **Goal: Hillslope Conditions.** Mitigate road and crossing problem sites (high priority). As described in the Road Management Plan, problem road sites will be inventoried, prioritized, and mitigated. The road network will be monitored on an informal basis by JDSF staff, and every two years as part of a formal monitoring program.
  - **Goal: Hillslope Monitoring.** Minimize erosion impacts resulting from forest management operations (high priority).

    Completed THPs that have over-wintered for 1 to 4 years will be monitored. The scope of this THP monitoring will include:

    - inspection of all watercourse crossings, road segments and landings;
    - mapping the location of rilling/gullying on roads, landings, etc. that are contributing sediment to watercourses;
    - mapping the location of mass wasting features (including cutbank/fillslope failures) associated with roads, crossings, and landings, or within harvest units;
    - mapping the location of road drainage structures (including crossings) that are contributing significant amounts of sediment to watercourses;
    - measurement of WLPZ canopy for Class I watercourses; and
    - recording information on the causes of erosion features, proposed improvements, and a schedule for mitigation treatments.

Documented erosion problems will be analyzed to determine what management practice or site-specific condition was responsible. Adaptive management solutions will be site specific and based on professional judgment of JDSF staff.

- **Goal: Minimize Landslides**. Minimize landslides associated with roads, landings, and harvest units (high priority).

  Landslides associated with roads/landings, harvest units, and natural slopes will be inventoried via direct field observations and interpretation of aerial photographs. Road-related landslides will be inventoried under the methodology described in the Road Management Plan. In-unit landslides will be inventoried when encountered; on-going research by the California Geological Survey (CGS) involving mapping landslides associated with clearcuts may be included in the overall inventory process.

  The landslide inventory will include a compilation of landslide type, frequency, size, slope, relative activity, certainty, sediment delivery potential, and relationship to past and current forest management practices. The information generated in the inventory will be used to update the CGS Landslide Potential map of JDSF lands on a periodic basis. The frequency of landslide occurrence on areas associated with relatively high landslide potential will be evaluated. This comparison may also apply to computer modeled landslide potential (i.e., SHALSTAB results).

  The adaptive management goal is to develop best management practices that minimize the risk of triggering landslides.

7.5 Thresholds of Significance

Based on policy and guidance provided by CEQA (PRC Section 21001 and the CEQA Guidelines), an impact of the proposed project would be considered significant if it results in one or more of the following:

- Exposure of people or structures to potential adverse effects, including the risk of loss, injury, or death involving:

  i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning map issued by the State Geologist for the area or based on other substantial evidence of a known fault.
  ii) Strong seismic ground shaking
  iii) Seismic-related ground failure, including liquefaction
  iv) Landslides

- Result in substantial soil erosion or the loss of topsoil.

- Location on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.

- Location on expansive soil, as defined in Table 18-1-B of the Uniform Building Code, creating substantial risks to life or property.

- Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.

7.6 Project Impacts

***Surface Fault Rupture*:** **(Less Than Significant)**

JDSF lands are not subject to surface rupture from a known active fault. State Earthquake Fault Zoning maps do not show active faults within the boundaries of JDSF. The nearest known active faults are the San Andreas fault, located offshore about 6 miles to the west, and the Maacama fault, which passes through Willits and the Little Lake Valley about 6 miles east of the area. Regardless, surface fault rupture is not a significant issue in rural timberland management. A surface rupture through a forested landscape would have the same effect and impact regardless of the management approach.

***Strong Ground Shaking*:** **(Less Than Significant)**

As discussed above, the site is located in a seismically active region, and is subject to periodic strong ground shaking. However, because the project is a Forest Management Plan that does not involve buildings or other structures that may be susceptible to strong seismic shaking, it does not "expose people or structures to potential substantial adverse effects." The effects of a strong earthquake in the Forest may include toppling or topping of trees, but these are natural consequences regardless of the management philosophy of JDSF. Earthquakes may trigger landslides, but in a forested setting, these will not have an impact on people or structures. The potential environmental impacts of landslides in general are discussed below.

***Seismic-Related Ground Failure, Including Liquefaction*:** **(Less Than Significant)**

Because the project area is located in a mostly upland, forested setting, it is not susceptible to secondary seismic effects such as liquefaction. Most secondary ground effects resulting from strong seismic shaking occur in young, unconsolidated deposits under saturated conditions. Within JDSF, these materials are confined to recent alluvial deposits in stream valley bottoms. In the rare occurrence that liquefaction, or other secondary seismic ground effects occur in a recent alluvial deposit, it will not "expose people or structures to potential adverse effects." In addition, the susceptibility of these materials to experience secondary seismic effects does not change under the proposed management plan.

Landslides: **(Less Than Significant)**

Landslides are a naturally occurring feature in the Forested, mountainous landscape that makes up JDSF. The potential for landsliding may be increased by land management practices, including road construction and timber harvest, but there is little potential for exposure to people or structures. Within the boundaries of JDSF, the only significant exposure (of people or structures) to landslide hazard would be in campgrounds or conservation camps near harvest areas or roads. The potential for landsliding is highest, however, during the winter rainy season, when recreational use is most likely at its lowest within the Forest. Furthermore, the DFMP defines a 300 foot special management corridor (i.e., "recreation corridor") around campgrounds. In these corridors, strong consideration will be given to "values associated with recreation." Although "appropriate management options within this corridor have been partially developed," they may include single tree selection, hazard tree removal, or no harvesting.

Outside the boundaries of JDSF, the exposure to landslide hazards is limited to long run-out associated with debris torrents that may originate within JDSF. The project would increase the likelihood of debris torrents only if management activities (i.e., road building or timber harvest) occur in a setting susceptible to generation of debris slides (i.e., drainage headwalls, etc.).

Debris sliding in the California Coast Ranges typically occurs in predictable settings where specific topographic and hydrologic conditions result in a susceptibility to shallow mass wasting. Specifically, shallow debris sliding occurs most frequently in areas where surface topography forces convergent subsurface flow (i.e., in swales, hollows, and drainage headwalls) and on steep, streamside slopes (i.e., inner gorges). These areas have been identified on recent "landslide potential" maps for JDSF produced by the California Geological Survey, and are subject to special management practices within the Forest Management Plan.

The DFMP proposes a Hillslope Management Element to provide for slope stability. Inner gorge areas and potential unstable features will be identified during THP preparation or road layout, and a Certified Engineering Geologist will be consulted for appropriate measures to avoid or minimize potential impacts (this is a continuation of a practice that has been in effect in JDSF for several years). We note that the Draft FMP calls for review of landslide potential maps derived from computer models; that approach is likely to be revised in the Final FMP. Historical evidence indicates that "modern" forest management practices results in fewer landslides than earlier methods (Spittler and McKittrick, 1995; Cafferata and Spittler, 1998), and the inclusion of trained geologists providing site-specific geomorphic analysis and mitigation recommendations will further reduce the potential for management-related landsliding. Incorporation of these measures within the management plan would reduce the potential for landslide-related impacts to people and structures to a less than significant level.

***Soil Erosion or Loss of Topsoil*:** **(Less Than Significant)**

Timber harvest, road construction and use, and recreational uses in JDSF can result in significant increases in surface erosion. The principal environmental impacts associated with increased surface erosion rates are degradation of water quality and aquatic habitat when this material is delivered to watercourses, and loss of soil productivity where fertile topsoils are lost.

Timber harvesting can increase surface soil erosion rates through the reduction in the buffering effects of forest canopy during rainfall, through the physical effects of yarding and skidding (especially when ground-based equipment is involved), and through site preparation burns (Lewis, 1998). The surface erosion potential of timber harvest can be managed by altering the quantity and spatial and temporal patterns of cutting (Lewis, 1998). Yarding impacts can be minimized by modifications in the type of equipment used, the time of year yarding is conducted, landing location, and yarding direction. The effects of site preparation burns can be minimized by controlling the heat of the fire, which is a function of the timing of the burn (relative to wind, temperature, and humidity) and the abundance of fuels.

Forestland roads (particularly legacy or old roads) contribute a disproportionate amount of the management-related surface erosion through the diversion of natural runoff paths, exposure of bare mineral soils along the road bed, and the creation of potentially unstable cut banks, fillslopes, and watercourse crossings. The erosional impacts of forestland roads can be managed through proper layout and construction, careful planning and implementation of watercourse crossings, diligent maintenance, and control of the type and timing of traffic. Poorly functioning or mis-located roads that are chronic sediment sources should be removed or decommissioned.

Trees at the margins of canopy openings may be subject to wind toppling that can expose large amounts of erodible, bare soil. In JDSF, these openings are likely to occur near developments (campgrounds, conservation camps), along roads and landings, and in harvest areas (especially clearcuts and Group Selection blocks).

Increased erosion associated with recreational uses of the Forest is primarily a result of grading within campgrounds, which can modify surface runoff patterns, and the use of recreational trails, which can be difficult to maintain. Mitigation of recreation-related impacts is accomplished by careful planning, construction, and maintenance of improvements and trails, as well as forest patrols to minimize illegal or inappropriate recreational activities.

The proposed Forest Management Plan prescribes modern, state-of-the-practice forestry, harvesting, and road building methodologies to minimize the impacts associated with soil erosion. The management guidelines of the DFMP are intended to supplement the Forest Practice Rules, which contain extensive mitigation of soil erosion. Elements of the DFMP intended to address erosion-related issues are:

- **Road Management Plan:** describes strategy to minimize road-related erosion by improving road layout, construction techniques, maintenance, and monitoring. Specific items in the plan call for hydrologic disconnection of inboard ditches, reduction of winter road use, proper abandonment of roads near watercourses, and annual inspection of roads to identify problem areas;

- **Hillslope Management to Provide for Slope Stability:** describes approach to minimizing potential for management-related landsliding;
- **Operational Implications of Watershed Analysis:** Discusses specific management guidelines intended to protect watershed resources, including several specifically intended to mitigate erosion potential. Guidelines are presented for treatment of Roads, Watercourses, Riparian Zones, and Hillslopes.
- **Other Management Measures:** Various portions of the language within the plan regarding Riparian Management, Silviculture, and Yarding, which define management practices to minimize ground disturbance. These include reduced tractor logging on steeper slopes, and use of wider equipment exclusion zones to keep ground disturbing activities further away from stream channels.

Location on Unstable Geologic Unit or Soil: **(Less Than Significant)**

The California Coast Ranges are a geomorphically dynamic environment with naturally high rates of landsliding. Land management in this sensitive environment may lead to an increased potential for landsliding if not carefully planned and implemented. The limited potential for lateral spreading, liquefaction, or subsidence is restricted to young alluvial deposits in stream channels, and is not influenced by the proposed project.

Landsliding potential may be increased by the proposed project primarily as a result of the effects of timber harvest (i.e., modification of the hydrologic budget of a slope, root strength issues) and the location or type of roads. Many landslides in the California Coast Ranges, however, occur in predictable topographic and geologic settings, or occur repeatedly in the same location. As such, the potential increase in landslide susceptibility can be controlled by identification of unstable or potentially unstable areas and special operational treatments to avoid or minimize potential impacts to those areas.

The DFMP proposes to mitigate the potential for management-related landsliding through the identification of unstable areas, and the implementation of low-impact management practices in those areas. Guidelines for these management strategies are contained primarily within the Road Management Plan, the Hillslope Management discussion, and the day-to-day guidelines presented in the Operational Implications of Watershed Analysis. These discussions include provisions for the identification and inventorying of unstable features associated with roads and hillslopes.

Problem areas will be mitigated or avoided, as appropriate, and Certified Engineering Geologists will be retained when operations or improvements are proposed on or near unstable areas. A Certified Engineering Geologist will review inner gorge slopes during layout of timber sales.

Impact: ***Location on Expansive Soil:*** **(No Impact)**

Soils with significantly expansive properties have not been identified in JDSF. Furthermore, because the project does not involve substantial development of engineered structures, it is not subject to the effects of problematic soil properties.

Impact: ***Soils Incapable of Supporting Septic Systems:*** **(No Impact)**

Again, because the project does not involve the development of significant numbers of structures, it is not subject to the constraints of site-specific soils conditions. Although some soils within the JDSF may be unsuitable for septic systems, the abundance of space allows for movement of facilities to an area with suitable conditions. The presence of existing campgrounds and conservation camps indicate that facilities can be successfully developed at the site.

7.7 Mitigation

Because the proposed DFMP provides adequate management strategies to reduce all potential impacts to less than significant levels, additional mitigation is not required.

7.8 Alternatives Analysis

A comparison of geology-related impacts among the various alternatives is presented in Table 40.

TABLE 40
COMPARISON OF GEOLOGY AND SOILS RELATED IMPACTS IN RELATION TO THE VARIOUS ALTERNATIVES

Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant–Mitigation Feasible (5) Significant–Mitigation Not Feasible**
Exposure of people or structures to adverse effects involving surface fault rupture, strong seismic shaking, or other seismic-related ground failure.						
Alt. A						No active faults are mapped or otherwise known to occur within JDSF lands. Furthermore, with the JDSF managed for natural resources, minimal human exposure to fault related hazards would occur. This impact is considered less than significant under all Forest management alternatives.
Alt. B						
Alt. C DFMP						
Alt. D						
Alt. E						
Exposure of people or structures to landslides						
Alt. A						No timber-harvest-related landslides would occur under this scenario; however, landslides could result from failure of existing roads, particularly older legacy roads, without proper mitigation similar to the management strategies presented in the DFMP.
Alt. B						Landsliding potential is less than significant under all management scenarios given measures proposed in the DFMP. These include avoidance or special treatment of unstable and potentially unstable areas. Identification of unstable and potentially unstable areas provided by licensed geologist per guidelines in Forest Practice Rules (Alt B) and Hillslope Management guidelines of the DFMP (Alt's C, D, and E).
Alt. C DFMP						
Alt. D						
Alt. E						
Substantial soil erosion or loss of topsoil						
Alt. A						Absence of a proactive road management or systematic evaluation of problematic road sites will result in significant soil erosion without proper mitigation similar to the management strategies presented in the DFMP.
Alt. B						
Alt. C DFMP						The Road Management Plan provides for an inventory and control of potentially significant road-related erosion sites, which will provide a beneficial long-term result. Amounts of harvest-related surface erosion are relative to the amount of area harvested, especially areas subject to even-aged management.
Alt. D						
Alt. E						
Location on unstable geologic unit or soil						
Alt. A						No timber-harvest-related landslides would occur under this scenario; however, landslides could result from failure of existing roads, particularly older legacy roads, without proper mitigation.
Alt. B						Geologic review of timber harvest areas and roads as per Forest Practice Rules provides minimal protection; however, absent Hillslope Management Guidelines, additional mitigation would be warranted similar to the management strategies presented in the DFMP.
Alt. C DFMP						Geologic review of timber harvest areas and roads as per Forest Practice Rules and Hillslope Management guidelines of DFMP will preclude operations on unstable features and soils; Alt's D and E preclude operations within inner gorges
Alt. D						
Alt. E						

TABLE 40 COMPARISON OF GEOLOGY AND SOILS RELATED IMPACTS IN RELATION TO THE VARIOUS ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant–Mitigation Feasible (5) Significant–Mitigation Not Feasible**
Location on expansive soil						
Alt. A						No such problematic soils have been identified.
Alt. B						
Alt. C DFMP						
Alt. D						
Alt. E						
Soils incapable of supporting on-site septic systems						
Alt. A						Future developments requiring on-site septic systems are minimal under any alternative; suitable soils for on-site sewage disposal are common in JDSF.
Alt. B						
Alt. C DFMP						
Alt. D						
Alt. E						

8. HAZARDS AND HAZARDOUS MATERIALS

Other than exposure to geologic and other natural hazards addressed elsewhere in this EIR, the hazards affected by the JDSF Draft Forest Management Plan (DFMP) are exposure to wildfire and other fire hazards, and exposure to hazardous materials. The DFMP prescribes measures for reducing the risk of wildfires and potential for other fire related hazards. The DFMP also addresses the continued use of pesticides and petroleum products in the general operations of JDSF programs and activities, including the use of herbicides to reduce the presence of exotic and competing vegetation that may be both ecologically and economically detrimental to the health and productive capacity of the Forest.

8.1 Wildfires

JDSF fire protection issues are included with all other State Responsibility Area (SRA) in the Mendocino Unit (MEU) Fire Management Plan. This prefire management process includes a systematic application of risk assessment (probability of ignition and initial attack suppression success, assets at risk, fire history), fire safety, fire prevention and fire hazard reduction techniques. Wildfires have the potential for significant impacts to JDSF through loss of timber, loss of wildlife habitat, and adverse effects on water quality and slope stability. The DFMP contains a fire protection program, specific to JDSF and consistent with MEU's Fire Management Plan, which reduces the risk of a wildfire starting and creates conditions favorable to controlling fires if they occur. Wildfires have the potential for significant impacts to the Forest through loss of timber, loss of wildlife habitat, and negative effects on water quality and slope stability. An updated fire protection plan is proposed for implementation on JDSF. The control efforts include using presuppression techniques such as silvicultural stand structure modification.

8.1.1 Existing Fire Protection Setting

Howard Forest, located near Willits, is the CDF Emergency Command Center (ECC) that is responsible for dispatching personnel to fire incidents within JDSF. Dispatch procedures for initial attack consist of dispatching the five closest fire fighting engines. In addition to fire engine crews responding to dispatch requests, a helicopter from Howard Forest typically responds to each wildland fire occurrence along with air tankers based out of Ukiah. There are three primary helispots located within JDSF, one at Parlin Fork Conservation Camp, another at Chamberlain Creek Conservation Camp, and a third at the landmark scale site at the western boundary of the Forest. Log landings and other open areas can serve as additional temporary helispots.

CDF's Mendocino Unit Chief is responsible for fire protection and law enforcement in JDSF in cooperation with the Forest Manager, the Operations Officer, and the Fire Prevention Battalion Chief. The period of high fire danger generally occurs between July and October, though it may be extended at either end of the period by abnormally dry conditions. During this period, JDSF follows the Mendocino Unit's Red Flag Alert Plan, and the Forest Manager coordinates with the Operations Officer to determine when and which detection strategies should be employed. These strategies include increased patrols within the Forest, searching for evidence of fires, and aerial patrol flights during extreme fire danger periods or after lightning storms (DFMP, pages 81-83).

The following list is a summary of specific fire protection measures practiced by JDSF as referenced in the Management Plan:

- Pre-suppression
- Analysis of fire history in and near JDSF
- Fire defense improvements-water sources, shaded fuel breaks, helispots
- Regulations (camp fires, smoking, fire danger periods, posting signs, area closures)
- Education
- Enforcement patrols
- Suppression
- Detection patrols and flights, lightning detection system
- Communication
- Prescribed fire for fuel management

The Mendocino Unit's Emergency Command Center personnel routinely inspect the Automatic Lightning Detection System for possible strikes in the Forest. Additional efforts may include posting alert signs, providing more fire prevention and awareness information of current conditions to visitors of the Forest, reducing activity in the Forest by closing specific areas, and maintaining frequent communication with local fire departments. CDF will maintain an adequate radio system to make communication with local fire departments feasible. Local CDF fire control personnel will remain familiar with the pre-suppression plan for the Forest. CDF's resource tracking system will be used to dispatch the appropriate personnel and equipment to any fires on JDSF.

8.1.2 Proposed Fire Prevention and Protection Measures

The local CDF battalion 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 coordination of these participants will produce a comprehensive plan addresses assessments of fire risk, hazard areas, maps of fire defense improvements, description of prevention techniques, and an evaluation of available resources. The plan will also identify potential locations for incident camps in the event of a large and extended fire. Additional improvements proposed in the Forest include water tanks, water drafting 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 (DFMP, pages 80-81).

Pre-suppression is defined as fire protection activities performed before a fire occurrence. Numerous fire prevention improvements would be put in place through the implementation of the DFMP. These improvements include, but are not limited to, water tanks, water sources, and helispot locations that are to be strategically placed within the Forest for the use of fire suppression and medical evacuation operations. All presuppression improvements will be constructed in compliance with appropriate CEQA documentation and disclosure.

In addition, fire hazard reduction requires adequate access to roads and trails, and appropriate road signing to assist personnel in finding fire locations. The major roads and trails in the Forest are being maintained and signed, in part, to provide access for fire protection purposes (DFMP, pages 82-83).

The pre-suppression plan considers a system of shaded fuel breaks for construction in the Forest to serve as preplanned fire control lines when a wildfire escapes initial attack. They will be constructed in defendable areas along main ridges, adjacent to high-use roads, and adjacent to rural residential neighborhoods (DFMP, page 81).

Post-suppression activities are performed by Mendocino Unit Personnel and include the evaluation of pre-suppression information, suppression actions, and rehabilitation needs. Rehabilitation entails erosion control (e.g. waterbreaks, use of straw, mulch, and fallen trees along the slope). Other restoration activities include planting conifers and other native species, and placing large organic debris in burned out channels to prevent accelerated erosion (Personal communication, Marc Jameson). If it is determined that an increase in wildfires can be attributed to increased public use of JDSF, appropriate measures as described above will be implemented to reduce these impacts to less than a significant level.

8.1.3 Prescribed Fires

Fire is a naturally occurring process within the coast redwood ecosystem. Fire is important in maintaining natural ecosystem processes, such as enhancing stand and species diversity. The Forest has potential to be used as an experimental site for conducting research on fire as a management tool. Numerous benefits would be realized through this research, such as the use of fire to reduce hazards (primarily through fuel reduction), as a silvicultural treatment (see Timber Resources, Section VI-6.3), and ecosystem management and habitat research. A prescribed fire program that focuses on these research goals would be implemented as resources allow (DFMP, page 82).

8.1.4 Forest Practice Rules

The DFMP also incorporates the Forest Practice Rules to reduce fire hazards. These are primarily intended to address accidental fires associated with timber harvest activities. The specific Forest Practice Rules are summarized as follows:

- Site preparation is to be conducted in a manner that minimizes fire hazards (Article 5 section 915).
- Standards for burning vegetation in regards to site preparation (section 915.2).
- Submittal each year, by timber operators, of fire suppression resource inventory either before April 1st or before the start of timber operations. The inventory must provide the following (Article 8, section 918):
    - Name, address and 24-hour telephone number of an individual and an alternate who has authority to respond to Department requests for resources to suppress fires

- Number of individuals available for fire fighting duty and their skills
- Available fire fighting equipment

- Timber operators must keep roads passable during the dry season until all snag and slash disposal has been completed (Section 918.3).
- Smoking and warming fire limitations on persons engaged in timber operations and a requirement that the timber operator specify procedures to guide actions of his employees or other persons in his employment consistent with these limitations (Sections 918.4 and 918.5).
- Timber operators shall provide a diligent fire watch service at the scene of any blasting or welding operations (Section 918.7).
- Timber operators shall conduct a diligent aerial or ground inspection within the first two hours after cessation of felling, yarding, or loading operations each day during the dry period when fire is likely to spread (Section 918.8).
- During the period that burning permits are required, all blocks on a cable setting will be located in the center of an area that is either cleared to mineral soil or covered with a fire proof blanket that is at least 15 feet in diameter. A shovel and an operational full five-gallon back pump or a fire extinguisher bearing a label showing at least a 4A rating must be located within 25 feet of each such block before yarding begins (Section 918.10).

8.2 Hazardous Materials

The DFMP addresses potential infestation by exotic plant species and overabundance of competing vegetation that might be both ecologically and economically detrimental to the health and productive capacity of the Forest. Various measures are proposed to prevent infestations, as well as combat to infestations in the event that they occur. The measures include the use of herbicides. There is opposition from some members of the public to herbicide and other pesticide use on JDSF.

In addition to pesticides, other regulated potentially hazardous materials that are anticipated to be used on JDSF include:

- Fuels
- Diesel, for equipment and for use as an adjuvant to herbicides
- Gasoline for equipment
- Helicopter fuel
- Lubricants for use on logging and CDF equipment
- Hydraulic fluid for use on equipment
- Chemical treatments on Forest roads for dust abatement
- Other pesticides, such as insecticides, fungicides, rodenticides

8.2.1 Existing Pesticide Use

Integrated Pest Management (IPM), as proposed in the DFMP, makes full use of the best benefits of mechanical, chemical, semi-chemical (e.g. synthetic pheromones), and biological pest management alternatives. (see DFMP, page 83) IPM in a forested setting includes such measures as:

- Maintain stocking levels and minimize competition such that trees grow rapidly and are capable of defending themselves against, or recover quickly from, attack by insect or disease organisms.
- Minimize injuries to residual trees during forest management activities.
- Reuse 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 become invasive (*e.g.*, eucalyptus).
- Offsite seed sources that may be predisposed to pests.
- Use of CDF or other forest pest management specialists to train employees in forest pest recognition and management.

It is the policy of JDSF "to encourage the growth of vegetation that is native to our area and genetically suited for the site" (DFMP, Page 58). Herbicides are proposed for use by JDSF as one method for preventing the establishment or reducing the impacts of unwanted plant species, including both exotic and competing plant species.

Integrated Weed Management (IWM), as part of an IPM program, focuses on preventing the colonization and spread of any invasive plant species through achieving the following goals (DFMP, page 58):

- Promptly detect and directly control potentially damaging 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.

Pesticides are among the several tools that can be used as part of a comprehensive IPM program which relies on a thorough understanding of the pest's biology, the affected environment, timing, identified economic thresholds, as well as cultural and chemical methodologies.

Since 1997, the only herbicide use has been targeted treatments directed at the exotic weed, gorse. Approximately 600 individual plants have received a direct foliar application of Garlon 4 and Accord concentrate (Personal communication, William Baxter). In order to control gorse plants, JDSF personnel conduct applications treating gorse plants while they are small, before they have a chance to flower and produce seed. The herbicide is usually applied with a backpack pump sprayer for spot applications on targeted vegetation.

JDSF maintains a chemical storage facility, which contains herbicides, located near the Mendocino Woodlands Forest Fire Station (Personal communication, Walt Decker). The facility is in full compliance with State and County regulations regarding pesticide storage and record keeping. The Forest has not identified a need for other pesticides, such as insecticides, fungicides or rodenticides, the Forest does not currently have a need for them, nor is such need identified in the reasonably foreseeable future. (Personal communication, Marc Jameson).

8.2.2 Projected Pesticide Use

JDSF's practice of encouraging the growth of native vegetation native genetically suited to the area will help to avoid conditions that could lead to pest outbreaks. This is because native genetic tree stock is more resilient to disease and insect infestations, thus reducing the overall need to manage non-plant pests.

Herbicide use is anticipated in the following categories (Personal communication, William Baxter):

- Controlling invasive exotics in order to maintain native plant communities, promote conifer habitat, and prevent the establishment and spread of new exotics. Specific treatments will focus on the following:
  - To reduce further spread of gorse and prevent new exotics, such as cape ivy, from spreading onto JDSF.
  - To control the blue gum eucalyptus infestation in the Caspar Orchard area.

- Control roadside vegetation, primarily exotic weed species such as broom and gorse that easily spread via roadways, but also native plant species that vigorously grow in these conditions and hamper road use and maintenance.

- For use, following broadcast burns and wildfires, to facilitate successful establishment and growth of planted conifer seedlings by reducing brush competition.

- to inhibit the regrowth of hardwoods and maintain high conifer occupancy in harvested areas.

There is little anticipated need for herbicide application following a broadcast burn or wildfire. The last broadcast burn was conducted in 1992. Over the next ten years most broadcast burning will be related to research and demonstration projects, operational burning in harvested areas will occur only if situations develop that require burning to solve an unusual or unforeseen problem. As stated above, the primary purpose for the use of herbicides after a burn is to reduce competition from brush species that are stimulated by fire. In lieu of burning to clear logging slash for planting access, the current and planned practice in most cases is to require planting contractors to manually clear planting spots in areas of heavy slash. (Personal communication, William Baxter)

Reduction of tanoak stocking in conifer stands will continue to be accomplished primarily by non-chemical manual methods. However, it is expected that some stands may benefit from supplemental herbicide application to prevent cut tanoaks from resprouting and overtopping young

conifer trees. This is most likely to occur in the eastern part of the Forest where conifer site quality is relatively low and current tanoak stocking is much higher than desired. (Personal communication, William Baxter)

8.2.3 Regulation of Pesticides and other Hazardous Materials

Hazardous materials are regulated by the Environmental Protection Agency (EPA) under *The Federal Clean Water Act*, as amended, *Title 40 CFR Parts 110 and 112*, which addresses the requirements for handling, storing, and discharging petroleum based products and other potentially hazardous materials. The Act details guidelines that are required for dealing with these hazardous substances, and are depicted in CDF's Spill Prevention Control and Countermeasure Plan (SPCC) as well. Some of the guidelines that are contained in the Act are as follows:

- All storage containers, whether they are temporary or permanent must have a secondary storage container that holds 110% of the capacity of the primary storage unit.
- Incompatible materials will not be stored in the same container.
- Pesticide mixing, loading, and equipment cleaning sites should be confined to an area where any spillage can be contained until cleanup.
- Appropriate clean up materials must be located within close proximity to the area that is used for handling and mixing the chemicals.
- A Professional Engineer must certify the SPCC.

Pesticide use in California is regulated by a number of federal and state laws, all of which are implemented by the California Department of Pesticide Regulation (DPR), under the authority of the EPA. In the state of California, each County Agricultural Commissioner (CAC) is responsible for implementing the various codes and regulations of the DPR. In addition to the federal applicable laws that pertain to pesticide use, *Title 40 of the Federal Clean Water Act,* the CDPR is regulated by the Food and Agricultural Code (FAC) and the California Code of Regulations (CCR). The basic premise of these additional Codes is that for pesticides to be approved for use in the State of California, they not only need to meet the EPA requirements, they must also meet the requirements of the State.

Federal and state law within California, such as the FAC and CCR, require that all pesticides must be thoroughly tested by the manufacturer prior to approval of application and adoption of label requirements. California is unique in this aspect because a chemical that has been approved by the EPA does not automatically mean that it can be used in this state. Federal and State law require that a pesticide will only be used according to the label requirements. For instance, some pesticide labels specify setback distances from watercourses and how long the reentry period is into the application site. The strict testing that chemicals must go through before approval and the presumption that applicators will accurately follow label instructions is a functional equivalent of the permit program, in regards to the application of non-restricted chemicals. Any divergence from strict adherence to the label is against the law.

In order to apply a restricted chemical, label requirements must be followed and the applicator must obtain a permit through the appropriate County Agricultural Commissioner, as well as complying with several other additional requirements that are mandatory for the use of restricted chemicals. The pesticide registration program (which includes all herbicides) of the DPR is a certified and functional equivalent of an Environmental Impact Report under CEQA. Specific treatments of chemicals must be developed by a licensed pest control advisor.

The Mendocino County Agricultural Commissioner requires a number of pesticide application standards and procedures as stated in the *Pesticide Regulation Manual, Title 3, 2002* (Personal Communication with Steve Hajiik, Assistant Agricultural Commissioner, and Cindy Beaver, Agricultural/Standards Specialist). The following is a summary of some of the applicable standards and procedures:

- Distribution of information and education material for safe handling of pesticides.
- Evaluation and issuance of pesticide permits and operator identification.
- Compliance monitoring.
- Illness and complaint investigation.
- Maintenance of records.
- Initiation of enforcement action for pesticide violations.
- All applications, both non-restricted and restricted chemicals, must be reported to County Agricultural Commissioner. Chemicals that are applied by licensed operators must be reported within seven days of the application. Applications that are conducted by forestry personnel must be reported by the tenth of the following month.
- A permit must be obtained and a Notice of Intent (NOI) must be filed if a restricted chemical is to be applied [Restrictions are determined by both Federal and State Definitions. Most of the herbicides that may potentially be used on JDSF are in Category 3, the least restrictive category].
- The landowner (JDSF) obtains an operator ID number to apply pesticides (certified private contractors will already have an operator ID number).
- All pesticide handlers, for both restricted and non-restricted chemicals, must undergo annual training in the safe and effective use of all pesticides they use.
- Protective gear must be worn, including, but not limited to, the following for every pesticide application:
    - Protective eyewear (Applicators must have side and brow protection eyewear and carry a pint of eyewash on their person, if a chemical label specifies eyewear is required)
    - Rubber gloves
    - Long sleeved shirt
    - Shoes and socks

An additional County requirement is that category 1 and 2 storage facilities must be locked and posted with a pesticide chemical warning sign, in both English and Spanish, at all times (Personal communication with Dave Bengston and Cindy Beaver of the Mendocino County Agricultural Commissioner).

The North Coast Regional Water Quality Control Board (NCRWQCB) has no additional requirements beyond those of the County. (Personal communication Christine Wright-Shacklet).

8.2.4 DFMP Hazardous Materials Measures

CDF recognizes that there is opposition among some members of the public to herbicide use, and has scaled back the use of herbicides on JDSF. The draft Plan states:

> 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.

The DFMP incorporates Forest Practice Rule standards regarding the safe handling of hazardous materials. The specific Forest Practice Rules (FPR; *Forest Practice Rules 2002)* are summarized as follows:

- Temporary fuel storage containment areas and setbacks from streams
- Handling of fuels and proper maintenance and inspection of equipment to ensure no leaks
- Reporting of accidental spills
- Handling of pesticides/herbicides
- Emergency response plans for accidental spills
- Prohibition against allowing petroleum products to enter a watercourse. (Article 6, Section 916.3)
- Prohibitions on the servicing of equipment used in timber operations in a manner or location which would allow grease, oil, or fuel to pass into lakes or watercourses (Article 4, Section 914.5)

The Department of Pesticide Regulation (DPR) has determined that pesticides that it has registered for use in the state can be used safely when used in compliance with its restrictions and the label requirements established by the U.S. Environmental Protection Agency. This determination was made after detailed and exhaustive consideration by both agencies.

Further, individual applications of restricted pesticides, including herbicides, require a permit from the county agricultural commissioner. The application must be prepared with the advice of a registered pesticide advisor, and the application must be done by a licensed pesticide applicator. These procedures help assure that safety and environmental restrictions will be followed.

For purposes of this EIR, pesticides and other hazardous materials, when properly used consistent with applicable regulations, do not present a potentially significant impact on biological resources, water quality, or human health. Nevertheless, the DFMP's references to the CDF policies for pesticide use on JDSF will have no impact on actual pesticide use and application during the life of the forest management plan. Furthermore, the DFMP will have no impact on the use and handling of any other hazardous material required for the forest management activities prescribed to by the Plan.

8.3 Thresholds of Significance

Based on policy and guidance provided by CEQA (Public Resources Code (PRC) Section 21001 and the CEQA Guidelines), an impact of the proposed project would be considered significant if it causes one or more of the following:

1. A hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;
2. A hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;
3. Hazardous materials or safety hazard risks within one-quarter mile of an existing or proposed school, within two miles of a public airport (or within an airport land use planning area) or private airstrip;
4. Activities on a site that is included on a list of hazardous material sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment;
5. Impairment or physical interference with an adopted emergency response plan or emergency evacuation plan;
6. Exposure of people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.

Under the California Environmental Quality Act, the determination of a significant effect must be based on substantial evidence in the record (Pub. Res. Code sec. 21082.2). Controversy or intensely held opinions not based on substantial evidence will not justify deciding that an effect is significant.

8.4 Impacts

Impact 1: ***Adoption of the DFMP will not impair or physically interfere with an adopted emergency response plan or emergency evacuation plan*** **(Beneficial).**

The DFMP is consistent with CDF's wildfire emergency response plan. The additional fire inspection, prevention, suppression, and post suppression measures in the DFMP will further implement the goals of existing emergency plans.

Mitigation: None Required.

Impact 2: ***Adoption of the DFMP will not expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands*** **(Less Than Significant**).

Increased hazards potentially resulting from increased public use and harvesting practices that might contribute to forest fuel loads will be reduced through aforementioned measures included in the DFMP and Forest Practice Rules.

Mitigation: None Required.

Impact 3: ***Adoption of the DFMP has a less than significant potential to cause a hazard to the public or the environment through the routine transport, use or disposal of hazardous materials, or through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment*** **(Less Than Significant).**

Implementation of the Plan will result in continued use of hazardous materials, such as fuels, lubricants, and pesticides in compliance with the Forest Practice Rules and other applicable regulations. Requirements for the transport, storage, handling, and disposal of the hazardous materials that might be used at JDSF are established and enforced by the NCRWQCB, Department of Pesticide Regulation, and County Agricultural Commissioner. Any foreseeable increase in hazardous chemical use would still be within the acceptable limits established by the Mendocino County Agricultural Commissioner and the NCRWQCB. Compliance with all Federal and State laws, codes, and regulations will minimize to less than significant levels any potential impact that may result from the transport, storage, handling, and disposal of the hazardous materials.

Furthermore, based on evaluations CDF has conducted on this issue in relation to herbicide use by other landowners, potentially significant impacts related to the actual application of herbicides on JDSF are not expected. A CDF report titled *Environmental Effects of Herbicide Related to Timber Harvesting* (Norm Hill and Wendy Wickizer March 4, 2002) states that "The effects are generally not cumulative impacts because uses related to different Timber Harvest Plans (THPs) are separated in time and distance so that their individual effects rarely reinforce or interact with each other." Additionally, the report states "the plan (THP) submitter is bound by State and Federal law to use herbicides only in accordance with their label restrictions: CDF finds that there is no significant adverse effect that will result from this plan related to herbicide use."

In the official response of THP 1-01-208 HUM, December 2001, CDF replied regarding the issue of herbicide use on this THP proposed by Pacific Lumber Company (PALCO). CDF based most of its responses on findings that were made in an EIR PALCO prepared for its Habitat Conservation Plan (HCP) as it relates to harvesting redwood timberland in Humboldt County. One of the responses states, "Applications will occur as part of the initial site preparation activities and are considered to the extent that vegetative re-invasion of the site will be delayed and because significant averse impacts on the environment are not expected to occur from the lawful use of herbicides." Additionally the response states, "No mitigations were determined to be necessary with respect to limiting herbicide use based on an identifiable significant adverse impact (as it relates to CEQA)." Ultimately the response finds "The herbicide use that could potentially be used in the plan area are not likely to have any significant impacts on the environment, humans, wildlife, or water quality."

Under the California Environmental Quality Act, the determination of a significant effect must be based on substantial evidence in the record (Pub. Res. Code sec. 21082.2). Controversy or intensely held opinions not based on substantial evidence will not justify deciding that an effect is significant. Due to the absence of substantial evidence that pesticides, when properly used, present a threat to the environment or human health, this EIR has concluded that pesticide use on JDSF is not a potentially significant effect on the environment.

Mitigation: None Required.

Impact 4: ***Adoption of the DFMP will not result in hazardous materials or safety hazard risks within one-quarter mile of an existing or proposed school, or within two miles of a public airport or private airstrip*** **(No Impact).**

No portion of the JDSF is within one-quarter mile of a school or within two miles of a public airport or private airstrip. While there are several schools, both public and private, located within the vicinity of JDSF, the two closest are approximately two miles north of the western property boundary in Fort Bragg, and one mile west of the southwestern boundary in Mendocino. The County Airport is located approximately 2.5 miles south of the Forest's southwestern border.

Mitigation: None Required.

Impact 5: ***Adoption of the DFMP will not cause activities on a site included on a list of hazardous materials site (compiled pursuant to Government Code Section 65962.5) thereby creating a significant hazard to the public or the environment*** **(No Impact).**

On February 26, 2001 a tanker truck overturned on Highway 20 at mile post 21.61 spilling approximately 7,000 gallons of fuel oil. The spill soaked into the ground and entered an unnamed tributary to James Creek. The initial cleanup began on February 28, 2001 and NCRWQCB requires further abatement by the responsible party. All JDSF activities within this area must be completely avoided until the site is remediated pursuant to NCRWQCB standards. The DFMP has no impact on this condition.

Mitigation: None Required.

8.5 Alternative Analysis

A comparison of impacts among the various alternatives related to hazards and hazardous materials is presented in Table 41.

TABLE 41
COMPARISON OF HAZARDS AND HAZARDOUS MATERIALS RELATED IMPACTS IN RELATION TO THE VARIOUS ALTERNATIVES

Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant–Mitigation Feasible (5) Significant–Mitigation Not Feasible**
A hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials or through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.						
Alt. A						No logging activity or vegetation control would occur under this alternation; therefore, no hazardous materials use would occur.
Alt. B						Alternatives B and C would provide for continued use of herbicides (though this is more limited under Alternative C) and continued use of hazardous materials associated with logging activities. Such uses are strictly regulated and under either alternative, the impact would be less than significant.
Alt. C DFMP						
Alt. D						Alternatives D and E would prohibit the use of herbicides; however logging would still occur to varying degrees resulting in the use of hazardous materials. Again, such uses would be strictly regulated and under either alternative, the impact would be less than significant.
Alt. E						
Hazardous materials or safety hazard risks within one-quarter mile of an existing or proposed school, within two miles of a public airport (air within an airport land use planning area) or private airstrip.						
Alt. A						JDSF is not located within one-quarter mile of a school or within two miles of a public airport or private airstrip.
Alt. B						
Alt. C DFMP						
Alt. D						
Alt. E						
Activities on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment.						
Alt. A						No activities are proposed or permitted within known hazardous sites, unless remediated pursuant to NCRWQCB standards.
Alt. B						
Alt. C DFMP						
Alt. D						
Alt. E						
Impairment or physical interference with an adopted emergency response plan or emergency evacuation plan.						
Alt. A						This alternative would have no active planning to respond to emergencies and no road management plan to inventory and maintain roads for emergency evacuations. Mitigation would consist of implementation of such plans and maintenance provisions for roads determined important for fire access/egress.
Alt. B						

TABLE 41
COMPARISON OF HAZARDS AND HAZARDOUS MATERIALS RELATED IMPACTS IN RELATION TO THE VARIOUS ALTERNATIVES

Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant–Mitigation Feasible (5) Significant–Mitigation Not Feasible**
Alt. C. DFMP						These management alternatives would provide the basis for implementing the SPCC Plan and the Road Management Plan resulting in beneficial effects.
Alt. D						
Alt. E						This alternative would maintain an SPCC plan but would also entail and aggressive road decommissioning program that could significantly hinder emergency fire egress. Mitigation would consist of an inventory and maintenance plan for roads determined to be important for this purpose. Such a strategy may conflict with this alternative's biological resource emphasis.
Exposure of people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.						
Alt. A						This alternative would have no active fire suppression activities and no road management plan to inventory and maintain roads for fire fighting access. Mitigation would consist of implementation of a fire prevention plan and a maintenance provision for roads determined important for fire access.
Alt. B						These management alternatives emphasize several wildfire suppression strategies as discussed to reduce fire hazards to nearby homes, thereby resulting in beneficial effects.
Alt. C. DFMP						
Alt. D						
Alt. E						This alternative would encourage less intensive Forest management to the detriment of fire protection measures such as maintaining roads to access fires and constructing fuel breaks. Mitigation would consist of developing fire suppression strategies, which may conflict with this alternative's biological resource emphasis.

9. HERITAGE RESOURCES

9.1 General Heritage Resources Setting

This section describes the known and anticipated heritage resources within JDSF. The text below supplements that information provided in Chapter 2 (Heritage Resources) of the JDSF Draft Forest Management Plan (DFMP). First, heritage resources are defined. Second, criteria for evaluating the significance of JDSF heritage resources per State and Federal regulations are presented. Third, the sources of information about JDSF heritage resources are identified. Fourth, the present inventory of prehistoric archaeological, traditional Native American, and historic period heritage resources at JDSF are described, along with discussion of potential significance and present resource conditions. Finally, the archaeological collections and archival records pertaining to JDSF are summarized.

9.1.1 Heritage Resources Defined

Heritage resource is the term used in the following discussions to describe several different types of properties that are known or may be expected within JDSF such as:

- Traditional cultural places important to contemporary Native Americans who have heritage ties to JDSF, such as sacred sites, burial grounds, areas where native plants are gathered for use in making regalia, baskets, or as traditional foods or medicines;
- Prehistoric Native American archaeological sites predating sustained Euro American settlement in 1850, such as habitation sites marked by house pit depressions, and temporary camps containing scatters of flaked and groundstone artifacts;
- Historic archaeological sites typically dating from the period from 1850 to 1952 (50 years is the general threshold for recognizing historic period resources), such as logging camps marked by collapsed structural remains and refuse dumps; and
- Historic period architectural features older than 50 years, such as buildings (e.g., schoolhouse) and structures (e.g., railroad trestles and grades).

Heritage resources also include existing archaeological collections and archives, including artifacts previously collected from JDSF sites, historic maps and records about past uses, particularly activities of the Caspar Lumber Company, and records pertaining to the State's administrative history of the Forest since 1947.

9.1.2 Heritage Resources Significance Criteria

The California Public Resources Code (PRC), the CDF Forest Practice Rules, and Federal law and regulations define criteria for determining the legal significance of heritage resources. The California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) recognize that only those heritage resources determined per the respective State or Federal criteria to be "significant" qualify for consideration of impacts in environmental impact analyses.

CDF is responsible for managing all heritage resources within JDSF, and to protect all known and discovered sites containing heritage resources unless and until such time as CDF and the California State Historic Preservation Officer (SHPO) concur that individual resources do not qualify for the California Register. While no formal "significance determination" criteria have been documented for JDSF heritage resources (Foster and Thornton, 2001), it is CDF's policy to evaluate significance if project related impacts cannot be avoided (Foster, 2002). The DFMP does not affect the administration of this responsibility and policy.

CEQA defines a significant heritage resource as "a resource listed or eligible for listing on the California Register of Historical Resources" (PRC 15064.5(a)(1)). For a heritage resource to be eligible for listing in the California Register, it must meet one or more of the following four criteria (PRC 5024.1(c)):

1. The resource is associated with events that have made a significant contribution to the broad patterns of California's history or cultural heritage.

2. The resource is associated with the lives of persons important in our past.

3. The resource embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.

4. The resource has yielded, or has the potential to yield, information important in prehistory or history.

Heritage resources determined eligible for or listed on the National Register of Historic Places are automatically included in the California Register. The State Register criteria listed above mirror those of the National Register of Historic Places (36 CFR 60.4) as follows: The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess "integrity of location, design, setting, materials, workmanship, feeling, and association" (see definition below), and that…

a. are associated with events that have made a significant contribution to the broad patterns of our history;
b. are associated with the lives of persons significant in our past;
c. embody the distinctive characteristics of a type, period, or method of construction, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
d. have yielded, or may be likely to yield, information important in prehistory or history.

In addition to meeting one or more of the above criteria, the resource must be at least 50 years of age. A resource less than 50 years of age may qualify for the National Register if it is exceptionally important to understanding our more recent history.

A significant resource that meets one or more of the above criteria must also retain at least two of the types of "integrity" as defined in *National Register Bulletin 15, How to Apply the National Register Criteria for Evaluation*, and described as follow:

- *Location* is the place where the historic property was constructed or the place where the historic event occurred;
- *Design* is the combination of elements that create the form, plan, space, structure, and style of a property;
- *Setting* is the physical environment of a historic property;
- *Materials* are the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property;
- *Workmanship* is the physical evidence of the crafts of a particular culture or people during any given period in history or prehistory;
- *Feeling* is a property's expression of the aesthetic or historic sense of a particular period of time; and
- *Association* is the direct link between an important historic event or person and a historic property.

The *Forest Practice Rules* (14 CCR 895.1, Definitions) reflects the criteria defined for the National and State Registers. It defines "Significant archaeological or historic site" to mean a specific location that may contain artifacts or objects, and where evidence clearly demonstrates a high probability that the site meets one or more of the following criteria:

1. The site contains information needed to answer important scientific research questions;

2. The site has a special and particular quality such as the oldest of its type or best available example of its type;

3. The site is directly associated with a scientifically recognized important prehistoric or historic event or persons;

4. The site involves important research questions that historical research has shown can be answered only with archaeological methods; or

5. The site has significant cultural or religious importance to California Indians as identified by the Native American Heritage Commission (NAHC) or Native American organization or individuals in concurrence with the NAHC; or local federally recognized tribal governments.

A heritage resource's potential value for interpretation for public benefit is another factor that is commonly addressed by heritage resource management plans. Typically, a resource of high interpretive value, which also meets one or more of the above criteria, qualifies for inclusion in the State and/or Federal Registers.

9.1.3 Heritage Resources Information Sources

Research for the preparation of this document included:

1. A formal records search and review of archives (including the review of reports, maps, documents and files at the Northwest Information Center of the California Historical Resources Information System (NWIC), located at Sonoma State University in Rohnert Park; the California Department of Forestry and Fire Protection (CDF) Archaeology Office in Santa Rosa; and the JDSF headquarters in Fort Bragg).

2. A field check of selected heritage resources and anticipated future impact areas related to timber harvesting, roads, and other proposed developments (a field visit to JDSF by the authors of this section was conducted on February 7, 2002).

3. Consultation with JDSF personnel, CDF professional archaeologists (Dan Foster, Chuck Whatford and Steve Grantham), and study team members addressing other topics for this EIR.

4. Consultation with staff of two registered[22] local Tribal governments (Sherwood Valley Band of Pomo Indians and the Coyote Valley Band of Pomo Indians).

Background research discloses that CDF has accomplished a relatively large number of heritage resource studies for JDSF, as documented in 48 reports (for full bibliography, see Foster and Thornton 2001:66-67). The majority document archaeological surveys performed for individual THPs. In addition, two reports describe archaeological excavations at two sites (Layton 1990; Hylkema 1995), several address the historic land-uses within present-day JDSF, and three are comprehensive reports that document the known prehistoric and historic archaeological sites at JDSF (Levulett and Bingham 1978; Gary and Hines 1993; Betts 1999). The three comprehensive reports provided the basis for the present discussion and are summarized below.

Foster and Thornton (2001) estimate that 75 percent of the JDSF has been surveyed at least once for archaeological resources. Research conducted at the NWIC for this EIR indicates that the coverage by recorded surveys is around 50 percent. This survey coverage by CDF at JDSF generally exceeds that of comparably sized public (or private) forest lands in northwest California and contributes to our knowledge about heritage resources in the region.

Updated discussion of the inventory and condition of the 19 prehistoric archaeological sites and one traditional Native American heritage resource recorded for the Forest is reported by Betts (1999) in *The Current Status of Prehistoric Resources on Jackson Demonstration State Forest, Mendocino County, California.* Betts field checked each site, prepared updated site records to current standards, documented site conditions based on visual observations, and made recommendations for the management of the known prehistoric sites.

[22] Recognized Local Tribes: as listed by the Nature American Heritage Commission (NAHC) for use for timber harvest plans (THPs)

Betts' (1999) project followed up on an initial heritage resources study for the Forest reported by Levulett and Bingham (1978) in a *Cultural Resource Overview of Jackson State Forest.* In 1978, archaeological survey of approximately 1400 acres of predicted high archaeological sensitivity in JDSF resulted in locating and formally recording 16 prehistoric archaeological sites. The Levulett and Bingham report provides brief information on the environmental setting and on the regional archaeology and local history, plus detailed ethnographic information about Native American groups who occupied JDSF and its vicinity. Their report includes discussion of the potential significance of the prehistoric resources, plus management recommendations.

In addition, Levulett and Bingham (1978) consulted with a local Pomo elder about traditional lifeways and places of importance within the JDSF. This led to recordation of a sacred site important to contemporary Pomo descendents. The Pomo consultant provided recommendations for the treatment of both the recorded ethnographic site and for additional cultural sites and resources of concern.

Historic period heritage resources are the subject of one CDF comprehensive report and a Master of Arts (M.A.) thesis in Cultural Resources Management at Sonoma State University. CDF archaeologists Gary and Hines (1993) wrote *An Inventory of Historical Resources within Jackson Demonstration State Forest, Mendocino County, California*. In this two-phase study, the authors first conducted archival research and interviews to identify possible locations of historic resources, and then field checked the 157 identified locations to document presence or absence of observed cultural remains and their present conditions. Their report provides tabular information about each historical resource, including presence or absence of remains, potential significance, applicable significance criteria, and management recommendations. Gary and Hines noted that this project was a preliminary study and that more detailed investigations, including formal site recordation, should follow.

In a 1994 M.A. thesis, *A Research Design for Determining Legal Significance of Logging Related Historic Properties in Jackson Demonstration State Forest*, Medin continued the work initiated by Gary and Hines (1993). She presents a detailed history of the Caspar Lumber Company and logging in JDSF, describes and establishes a typology for classifying the physical remains from this logging, establishes a research context for interpreting and for evaluating the significance of these remains, and suggests evaluation criteria to be used for determining management alternatives for historic resources.

Published by CDF in 2001 were the *Management Plan for CDF's Historic Buildings and Archaeological Sites* (Foster and Thornton 2001) and accompanying *Environmental Impact Report* (Foster and Sosa 2001). This ambitious work describes all the known historic buildings and archaeological sites for each CDF property across the state, outlines the treatment of these resources, and in the environmental impact report, documents the CEQA compliance for the management plan. An appendix includes pertinent texts of the legal requirements for this action.

9.1.4 Description of Known Heritage Resources

A total of 192 heritage resources have been identified at JDSF, including one recorded traditional cultural property, one recorded prehistoric isolate, 19 recorded prehistoric archaeological sites (five

of which have historic components), 40 recorded historic sites (five of which have prehistoric components), nine recorded historic isolates, and 127 historic sites that were identified from historic map research and oral interviews by Gary and Hines (1993) (See 46). of the 127 identified historic period sites, some were field checked and remains noted, some were field checked and no remains found, some were not field checked, and none of the confirmed sites were recorded on State of California site records by Gary and Hines.

TABLE 42 SUMMARY OF KNOWN HERITAGE RESOURCES AT JDSF	
Recorded prehistoric sites	19
Recorded traditional cultural property	1
Recorded prehistoric isolate	1
Recorded historic sites	40
Recorded historic isolates	9
Unrecorded historic sites*	127
TOTAL	**192****

* Gary and Hines (1993), based on archival research and oral interviews, mapped and tallied a large number of historic sites. Some of these were located and recorded; some were located but not recorded; some could not be relocated; some were not field checked.

** of the 60 recorded prehistoric and historic sites, five have both prehistoric and historic components and are therefore counted twice; therefore the correct total is 192

There is a reasonably complete mapping of archaeological survey coverage on JDSF on file at the CDF Northern Field Office in Santa Rosa. While this information is not, at the moment, readily available for use by Forest managers at JDSF Headquarters in Fort Bragg, a complete set of pertinent heritage resource records and reports for the Forest is presently kept on file at the CDF Northern Field Office and the NWIC. The NWIC composite record of survey coverage is incomplete for lands contained within JDSF, with data compiled on the large-scale USGS 15-minute topographic quadrangles. JDSF Headquarters in Fort Bragg has initiated development of a newer GIS-based map of heritage resources recorded on the Forest, and efforts to complete this GIS-based map are on going. Data collection for preparation of the current document has compiled and organized a full set of heritage resources records for JDSF, which will be turned over to CDF for their use.

Summarized below are the identified heritage resources of JDSF that are organized under three categories: (a) traditional Native American heritage resources; (b) prehistoric archaeological sites; and (c) historic period resources (archaeological and architectural). Archaeological collections and archives are also summarized below, although the DFMP does not affect how archaeological resources are or will be collected and archived.

9.2 Traditional Native American Heritage Resources

The following discussion is based on information garnered from Levulett and Bingham (1978) and Betts (1999). The brief information provided here focuses on those aspects of Native American culture history that are likely to be reflected in the archaeological or environmental record. JDSF lies within the ethnographic territory of the Northern Pomo, one of seven Pomo divisions that

shared a common language family. Specifically, JDSF is located in the northern portion of area occupied by Northern Pomo speakers, which extended 35 kilometers along the coast from just north of Fort Bragg to the south, and inland 85 kilometers to the northwestern shores of Clear Lake. The Northern Pomo were divided into several distinct factions, two of which, the Mato Pomo and the Mitom Pomo, were associated with lands now within the JDSF (McClendon and Oswalt 1978).

Just to the north of ethnographic Northern Pomo territory and north of JDSF was the ethnographic territory of the Coast Yuki. The ethnographic record for the Coast Yuki is very limited (Betts 1999). It has been hypothesized that Pomoan occupation of the JDSF occurred relatively recently in the archaeological record, approximately 800 years ago, and that prior to this time, the area was occupied by the Yukian peoples (Layton 1990:190-191). If this hypothesis is correct, the ethnographic record for the Coast Yuki may have important implications for understanding the prehistory of the JDSF.

At the time of sustained Euro American contact (ca. 1850), the majority of Northern Pomo permanent villages were located in the interior, along the Russian and Eel Rivers; some permanent villages also may have been located at the coast (Levulett and Bingham 1978). Seasonal camps were established both along the coast near rivers and creek mouths, and in favorable areas in the redwood forests, such as places along trails, without dense vegetation, or close to certain utilized resources (Bean and Theodoratus 1978:289). These camps were occupied at times during the spring, summer and fall, in conjunction with the seasonal availability of specific plant and animal subsistence resources. The coastal redwood forest was the least favored habitat used by the Northern Pomo and, according to some ethnographers, was rarely occupied for long periods of time. It is assumed by researchers that the seasonal camps were used repeatedly and revisited over the years. Resources found in the Forest and obtained by the Pomo include a wide variety of plants and animals used for food, medicine, ceremonies and technology.

Based on the above, and on general ethnographic information about northwest California Native Americans, a variety of Native American archaeological sites are expected within JDSF, including: seasonal camps, some of which might be fairly substantial due to repeated use; specific resource procurement sites, perhaps located near known resources of importance to the Pomo; sacred or ceremonial sites; stands of vegetation modified by past ethnographic management strategies such as fire; refuge sites or places where Native Americans lived after they were displaced by Euro Americans; and aboriginal trails between the coast and the inland settlements.

Today, the Pomo are members of numerous rancherias in Mendocino, Sonoma and Lake counties, some living on reservation lands and some living off the reservation, both near and far. In Mendocino County, at least ten Indian communities have members with Pomo ancestry (Native American Contacts List for CDF Projects, January 2002). Sherwood Valley Band of Pomo Indians tribal lands lie within the traditional territory of the Northern Pomo; the Coyote Valley Band of Pomo Indians tribal lands lie just to the south.

9.2.1 Inventory

CDF consulted with local Tribes during the development of the recently certified *Management Plan for CDF's Historic Buildings and Archaeological Sites* (Foster and Thornton 2001) and

accompanying *Environmental Impact Report* (Foster and Sosa 2001). Further, as required by the California Forest Practice Regulations (14 CCR 929.1), local Tribes have been provided the opportunity to comment regarding proposed timber harvest plans (THPs) over the past eleven years. However, only one Native American heritage site has been officially identified.

Levulett and Bingham (1978) worked with a Northern Pomo consultant, resulting in the identification of one Native American heritage resource, CA- MEN-1373, a natural waterfall with three pools. According to the consultant, this site is considered a sacred area, used in the past for religious and purification purposes. He learned about the place from his grandparents, who were Native consultants for early 1900s ethnographers. Betts (1999) updated the site record for CA-MEN-1373.

Another consultant believes other unrecorded Native American heritage resources may be located within JDSF (Javier Silva, personal communication 2002). However, no site other than CA-MEN-1373 has been identified and recorded.

9.2.2 Condition

Levulett and Bingham (1978) noted that the three pools at CA-MEN-1373 were partially filled with slide debris. Later, when CDF staff inspected the site in the 1990s in conjunction with the replacement of a downstream culvert, it was noted that the pools were not filled with debris. Prior to the nearby culvert replacement project, CDF archaeologist Mark Gary contacted representatives of the Pomo. No tribal objections or concerns were noted (Bill Baxter, personal communication 2002). Betts (1999) describes the setting of this heritage resource as poor and heavily impacted by heavy equipment operation and logging on the surrounding slopes.

9.2.3 Significance

Although impacted by past logging, CA-MEN-1373 is significant because it is the only recorded traditional Native American cultural resource in the Forest. The site is a rare example of a certain type of use, and may retain sufficient integrity to be significant to local Native Americans as a traditional cultural property as defined in *National Register Bulletin 38*.

9.3 Prehistoric Archaeological Sites

The North Coast Range region has played a prominent role in the development of archaeological research in California. From the early investigations at Borax Lake (Harrington 1948), to the refinement of the California Taxonomic Sequence (Fredrickson 1974, 1984), the rich prehistoric resources of this region have provided significant information towards the understanding of California prehistory. The history of archaeological research in the North Coast Range has been summarized by Fredrickson (1984), Hildebrandt (McCarthy et al. 1985:88-114), and Levulett (1985:67-68). Major research topics have included the establishment of site typologies (Levulett and Bingham 1978:66-71; McCarthy et al. 1985:120-139), the development of cultural chronologies

and dating techniques, paleoclimatic reconstructions, prehistoric exchange systems, settlement-subsistence patterns, and demographic relationships (Fredrickson 1984:527). The majority of these studies, however, have dealt with inland localities. (Betts 1999:5)

Early Northwest California archaeological research was focused on identifying Native American assemblages and deciphering the prehistoric chronology (Loud 1918; Heizer and Elsasser 1964; Elsasser and Heizer 1966; Fredrickson 1984). More recent studies have broadened their view to address such issues as paleoenvironmental reconstructions (West, in Hildebrandt and Hayes 1983), site catchment analysis (Simons, in Hildebrandt and Hayes 1983, and in Eidsness 1993), technology and adaptive responses to environment (Hildebrandt 1984; Levulett and Hildebrandt 1987; Hildebrandt and Hayes 1983; Hildebrandt and Swensen 1985), and trade (Hughes 1978; Levulett and Hildebrandt 1987). These studies have provided insights into some of the major environmental and archaeological trends within the region spanning the past 8000 years of human habitation.

Because much of the archaeological research in northwestern California has been focused in inland locations, the archaeology of the coastal and near-coastal portions of Mendocino County is not well known. However, a number of projects have been conducted in JDSF and the nearby vicinity, resulting in some information about the distribution of prehistoric sites, the time depth, population migrations, and obsidian exchange systems. Levulett and Bingham's (1978) survey results indicated that prehistoric sites in JDSF occur along major trending ridges, at the junction of adjoining ridges, and on gentle slopes near primary water sources. The prehistoric sites recorded in the JDSF since the 1978 work conform to the distribution noted by Levulett and Bingham (1978), and this pattern is also evident in more recent studies in northwestern California.

Based on materials collected from the sites recorded in 1978, analyzed in a later study, Levulett (1985) found that the majority of the obsidian tool-stone at JDSF sites came from Lake County sources via prehistoric trade and exchange systems. Levulett and Bingham (1978:66-71) also identified prehistoric site types in the JDSF. These include: procurement sites (limited activity areas reflecting short periods of occupation and task specific resource procurement activities); temporary seasonal camps (base camps where activities were not limited to the procurement of specific resources); permanent occupation sites (winter villages that housed a portion of the population year round, and possible contact period "refuge sites"); and sacred ceremonial areas.

Data from the archaeological excavation conducted at a prehistoric site within JDSF and from the excavation of a coastal archaeological site (Layton 1990), indicates that the time depth of the JDSF prehistory extends back in time some 700 years, possibly predating the arrival of the Pomo to this area. However, there may be other evidence suggesting much earlier occupation (Foster, 2002).

The time-sensitive projectile point forms and artifacts collected from JDSF sites by Levulett and Bingham (1978) and by Betts (1999), can be compared to the chronological typology for northwestern California (Hayes et al., 1985), which has undergone a recent age refinement for the older styles based on new data (Fitzgerald and Hildebrandt 2001). This comparison indicates that JDSF sites contains artifact types cross-dated to the Early, Middle and Late Prehistoric Periods in northwest California, which spans the past ca. 8,000 years.

9.3.1 Inventory

A total of 19 prehistoric archaeological sites have been recorded in JDSF, the majority by Levulett and Bingham (1978) and the rest through the THP heritage resources surveys. All but two not relocated by Betts (1999) have been recorded to contemporary standards with current descriptions of site constituents and conditions. Table 42 is included in order to provide the reader an overview of the types of Forest prehistoric archeological sites, their condition and potential significance.

9.3.2 Condition

In 1978 when Levulett and Bingham recorded most of the prehistoric sites, their conditions were noted. Although most had been impacted by logging and camps prior to state ownership, and by recent logging and recent recreational developments, only four were described as "severely disturbed." Betts (1999) rerecorded and assessed the condition of all of the known prehistoric sites, including those recorded since 1978. Regarding site conditions, he observed:

> … the degradation of the cultural resources on the JDSF has continued to occur, resulting in a substantial loss of valuable information. Impacts appear to have resulted from a variety of land use practices and activities, some of which are outside the scope of routine timber harvest planning. Some of these activities include road maintenance, construction projects, forest improvement projects, fires, and recreational activities. The net effect of these impacts is that the prehistoric archaeological record of JDSF is gradually but inexorably being depleted. (Betts 1999:23)

As discussed below in following sections, CDF has taken a number of steps to correct those activities that were degrading sites.

9.3.3 Significance

Archaeologists who have worked with the Forest prehistoric data all agree that these heritage resources are potentially significant. Although the sites have been disturbed, they retain data, and if sufficient integrity exists, they would meet two of the significance criteria listed above: the site (a) "contains information needed to answer important scientific research questions," and (b) "has yielded, or is likely to yield, information important to history and prehistory." As observed by Betts:

> The further investigation of these resources could provide a more complete understanding of the settlement-subsistence patterns of the Northern Pomo, as well as the larger pattern of prehistoric land use of the North Coast Range, by examining a variety of site types within a specific physiographic zone (Betts 1999:26-27).

9.4 Historic Period Heritage Resources

The history and historic resources of the JDSF are briefly described in the DFMP in Chapter 1 and in the Heritage Resources section of Chapter 2. The history of the Forest is, for the most part, a reflection of the history of the Caspar Lumber Company, whose holdings, with some additions, comprise JDSF. Prior to intensive, sustained commercial logging, there were a few homesteads on lands now within the Forest and limited cattle grazing occurred. Based on examination of historic maps, eight homesteads have been identified in the Forest to date (Medin 1994:87-88). A brief description of JDSF, the surrounding area, and the Caspar Lumber Company is included in Levulett and Bingham (1978:30-34). A thorough, well-organized and detailed description of Caspar Lumber Company history and associated heritage resources at JDSF is provided by Medin (1994).

According to Medin (1994), the Caspar Lumber Company was unique in the redwood industry because the family owned company maintained operations at one location for 93 years (1862-1955). As a result, the company's history demonstrates the history of changing developments in philosophies, in local, state, national and world economics, in technology, and in the regulatory and social situations of the logging industry. Developments in the company and the Forest which would be reflected in the Forest historic resources include: logging methods, from the later part of the 1800s through the 1900s, from hand to machines; an extensive transportation system, from water transport by floating logs down local creeks and rivers, through the evolution of a railroad system, to roads and trucks; lodging and services for the work force with camps, schools and stores; and more recently, developments associated with recreation such as campgrounds and trails.

9.4.1 Inventory

As described above, a preliminary inventory of the Forest historic resources, based on archival and field research, was reported by Gary and Hines (1993). Their report table listed the five prehistoric archaeological sites, which contained historic components, 15 recorded historic sites, five recorded historic isolates, and 132 sites documented through historic records research. Research conducted for the current Environmental Impact Report, resulted in 20 additional recorded historic sites, four additional recorded historic isolates, and site records for five of the historic resources listed on the Gary and Hines (1993) Inventory of Historic Resources. As shown in 46, 127 historic sites listed by Gary and Hines remain to be verified and recorded. It can be anticipated that other 'undiscovered' historic sites will also be found in the Forest.

A summary of the recorded and noted historic period heritage resources in JDSF is provided in Table 42.

In order to facilitate the systematic treatment and significance evaluation of the historic period resources at JDSF, Medin (1994) sorted the resources, using a site typology with categories found in National Register of Historic Places guidance on how to apply significance criteria. Pertinent categories for the Forest historic resources include sites, buildings, structures, objects and "other."

For each site category, the types of Forest historic resources are discussed, the remains expected to be found are described, the specific Forest historic resources that fit into the type are listed, and the total number of Forest resources in each type are tallied.

9.4.2 Condition

Similar to the prehistoric archaeological resources, various factors also have impacted the integrity of the historic period resources at JDSF. According to Medin (1994) and Gary and Hines (1993), some historic period resources were removed prior to the existence and implementation of heritage resources protection laws and policies. Others were removed by CDF for safety reasons or to "clean up" areas, and others have been impacted by illegal artifact collecting. Additional impacts include logging, construction and maintenance of roads, construction and maintenance of recreational facilities, erosion, and natural deterioration and decay of perishable structural elements and artifacts. One important component of this situation is that very few of the historic period resources have been professionally recorded. Current State of California historical resource records (DPR 523 forms) do not exist for the majority of the located historic period heritage resources. The condition, treatment and location of the two historic structures (the red schoolhouse and the cat barn), two steam donkeys, and one locomotive are described in Chapter 2 (Heritage Resources) of the DFMP.

9.4.3 Significance

As demonstrated by site data in Table 42, numerous historic period resources are present at JDSF. Although some of these resources, if evaluated individually, might not be significant, Medin (1994) argues that collectively, many comprise a potentially significant historic "district" associated with the Caspar Lumber Company. While the Caspar Lumber Company was only one of several family owned timber businesses that operated for several generations in northwest California (e.g., Union, PALCO, Crawford, Mendocino, etc.; Marc Jameson, personal communication 2002), the tangible remains of the historic Caspar operations within JDSF are relatively well preserved, in large part because they have been under CDF stewardship. Because of the presumed loss of many associated historic period sites and features, those which remain at JDSF may be even more important, especially for public enjoyment and interpretation of historic logging practices by a single family-owned company which spanned nearly a 100 years of technological change and innovation.

As summarized in Table 42 some of the historic resources of JDSF are potentially significant under California Register of Historical Resources criteria 1, 3 and 4 (defined above). Some are associated with important historic logging developments, others are architecturally distinctive, and a number have the potential to yield important historic data not reflected in the archival record. Medin (1994:114-127) illustrates the significance potential of the JDSF historic period resources by detailing their relevance, through examples of specific artifacts and features, to major themes in historic research such as land use, industrialization/technological innovation, social/cultural and economics.

Recognizing many elements of the historic Caspar Lumber Company railroad still exist, Medin (1994) proposed that the associated remains be recorded in segments or by elements as survey work proceeds on the Forest, but referencing a single site number. She also recommended that extant remains not associated with the railroad be recorded to professional standard standards and evaluated collectively as a reflection of activities associated with the Caspar Lumber Company. Extant structural or architectural remains should be assessed for their interpretive value; and historic archaeological sites should be assessed for their research value.

The National Register eligibility status of CDF's historic buildings statewide, completed in consultation with the California Office of Historic Preservation (OHP), was recently published by CDF (Foster and Thornton 2001: Table 1). It indicates that the Red Schoolhouse "appears eligible as separate property" and notes that it is slated for preservation.

The management directive for the Red Schoolhouse, codified by the accompanying EIR (Foster and Sosa 2001) asserts that…

> CDF shall carry out a treatment program to restore this historic building. A specific plan to carry out needed improvements to the building was completed in September 2000 by a consultant to CDF. This plan has been developed in consultation with the OHP, as required by PRC Sections 5024 and 5024.5. CDF shall initiate Phase I of the Treatment Plan as soon as possible and expects to have it completed within two years–by December 2003. (Foster and Thornton 2001:37)

With regard to the historic period Cat Barn at JDSF, its National Register status reads "not evaluated," and it is "not slated for preservation," because a 1989 analysis of its condition determined that restoration was not feasible (Foster and Thornton 2001: Table 1, 68). CDF archaeologist Mark Gary completed a detailed recording of the structure. CDF has determined that it will manage it as a "standing ruin," or possibly tear it down after appropriate approvals (Foster and Thornton 2001:68).

9.5 Museum Collections and Archives

Collections are an important component of a heritage resources management program. The collections from the Forest are significant because of their potential usefulness for additional scientific study, their relevance to future heritage resources investigations, and their value in "telling the story" of the Forest. Especially relevant to JDSF because it is the largest demonstration Forest in California under public ownership, are the archival materials that document the State's administrative history.

A sizeable collection of artifacts from JDSF exists. However, the provenience of many items is not precisely known (other than somewhere within JDSF), rendering them less useful for scientific research and factual interpretation.

Artifact collections from JDSF are derived from various sources: (a) archaeological excavations conducted on the Forest; (b) heritage resources surveys; and (c) a rare, occasional object collected over the past 30 years by JDSF staff or Forest visitors. The collections contain a variety of prehistoric and historic artifacts such as flaked chert and obsidian tools and discarded tool-making debris (cores and flakes), ground stone tools such as pestles and mortars, glass bottles, ceramic items, metal cans, items constructed of wood, and a range of tools and equipment associated with logging. The collections also include three major accessions: two steam donkeys and one

locomotive. No human remains, associated grave goods, sacred items or objects of cultural patrimony (as defined by NAPGRA) are included in the present collections for JDSF (Foster and Thornton 2001:47-49, 69).

Currently, the artifact collections are dispersed between several facilities: San Jose State University; State of California Department of Parks and Recreation (DPR) Archaeology Laboratory in Sacramento; CDF Regional Office in Santa Rosa; CDF Archaeology Office in Sacramento Headquarters; and JDSF Headquarters in Fort Bragg. In addition, at least two large items in the collection are on public display through loans by CDF to the Mendocino County Museum (steam donkey) for their "Roots of Motive Power" exhibit in Willits, and to the City of Fort Bragg ("Daisy," one of the original steam locomotives of the Caspar Lumber Company) (Foster and Thornton 2001:69). Another steam donkey is displayed at a popular visitor stop (Camp 20) in JDSF along State Highway 20.

Archival items also are or should be a component of the collections. These are comprised of archaeological excavation written and photographic records, historic maps and corporate records of the Caspar Lumber Company, and records that document the State's administrative history of the Forest since 1947. An overview of the history of CDF, in existence for over 75 years and the largest fire department of its type in the world with an international reputation as one of the premier wildland fire fighting organizations, is found in Foster and Thornton (2001:8-16).

Specific for JDSF, the CDF Heritage Management Plan and EIR (Foster and Thornton 2001:69; Foster and Sosa 2001) directs that CDF shall initiate a plan to manage the artifacts collected on the Forest. This will include an effort to gather all previous collections currently stored at several curatorial facilities, and to curate the entire collection at an appropriate facility at CDF. These collections will then be made available for interpretive programs on the Forest and for continued scientific study. If human [Native American] remains are ever encountered at JDSF, a plan for repatriation will have to be developed in consultation with local Native Americans as required by applicable law.

The DFMP (Sections 2 and 3, Heritage Resources) is silent on the issue of managing archaeological collections from JDSF. It does not affect directly or indirectly the issue of archival records pertaining to CDF's administrative history since 1947, or other pertinent historical records for the Caspar Lumber Company. The adoption and implementation of the DFMP does not impact the development and implementation of an artifacts management plan for JDSF. Because the DFMP makes no change in the handling of these resources, there is no significant effect on the environment for the purposes of CEQA.

9.6 Heritage Resource Management Regulatory Framework

California State and Federal laws and policies prescribe standards, policies and processes for adequately identifying, evaluating the significance, assessing potential project impacts, and resolving adverse effects to significant heritage resources in a manner subject to various levels of professional oversight and public disclosure. This section identifies those key laws, regulations,

standards and guidelines that apply to management of heritage resources at JDSF. The items listed below, as well as other relevant legislative and policy regulations, are described in more detailin Appendix 10.

9.6.1 State Regulation of Heritage Resources Management

As with all State Agencies, CDF is regulated by the following Heritage Resource Inventories and Preservation Program Requirements:

- California Governor Pete Wilson's 1992 Executive Order W-26-92 (State Policy for Heritage Resources)
- California Public Resources Code (PRC) Sections 5020 through 5024 (Historical Resources)
- California Environmental Quality Act, PRC Sections 21083.2 and 21084.1 (CEQA Statutes), and the implementing regulations (CEQA Guidelines) at Title 14 California Code of Regulations (CCR) Sections 15064.5 through 15360

Other key State legislative and policy sources of regulation of CDF's heritage resources management programs include:

- Protection of Native American Graves (Public and Private Lands), and Protection and Access by Native Americans to Native American Traditional Heritage Resources on State Lands (PRC Section 5097.9; Native American Historical, Cultural and Sacred Sites)
- Repatriation of Native American Human Remains and Cultural Items Held by State Agencies and Museums (Health and Safety Code Sections 8010-1030)
- Confidentiality of Heritage Resource Locations (Government Code Section 6254.10)
- Regulations and Standards for Managing Historic Buildings (Health and Safety Code Sections 18950 through 18961; State Historical Building Code)
- Programmatic Approaches to Managing Certain Archaeological Site Types (California Archaeological Resource Identification and Data Acquisition Program)

9.6.2 Federal Regulation of Heritage Resources Management

Activities potentially impacting heritage resources affected by "Federal Undertakings" are regulated by Section 106 of the National Historic Preservation Act (1966, as revised through 1992) and its Implementing Regulations at 36 CFR 800 (Protection of Historic Properties). Examples of future undertakings that may apply to JDSF include:

1. using Federal funds, in cooperation with the USDA Forest Service (John Griffen, personal communication 2002) to develop the Forest Learning Center and JDSF Interpretive Center discussed in the DFMP (Chapter 4, Research and Demonstration, Planning for Future Research and Demonstration);

2. conducting activities (watershed restoration, erosion control) that may affect navigable waters of the United States and require approval and issuance by the US Army Corps of Engineers of an individual permit pursuant to Section 404 of the Clean Water Act; or

3. road maintenance or improvements along State Highway 20 by the California Department of Transportation (Caltrans), involving use of Federal funding (Federal Highways Administration or FHWA).

Such undertakings are considered outside the scope of actions addressed by the current EIR and DFMP. If they occur, they are expected to be addressed by future NHPA Section 106 reviews.

Other key Federal legislative and policy sources of regulation of CDF's heritage resources management programs include:

- Impacts to heritage resources addressed by environmental reviews might be subject to the National Environmental Policy Act of 1969 (NEPA)
- Repatriation of Native American cultural items might be subject to the Native American Graves Protection and Repatriation Act of 1990

9.7 Proposed JDSF Management Measures

This section summarizes measures recently adopted for management of heritage resources on CDF lands statewide, including specific measures prescribed for JDSF (Foster and Thornton 2001; Foster and Sosa 2001). Also presented are those heritage resources management actions proposed for JDSF in the DFMP, including compliance with the *Forest Practice Rules* (implementing regulations for the *Z'berg-Nejedly Forest Practice Act of 1973*).

The following goal and objective of the DFMP is pertinent to heritage resources:

> DFMP Goal #7. Protect the Forest from damage and preserve the peace within.
>
> DFMP Objective #7-4. Inventory and protect historic and prehistoric archaeological resources. Identify and prioritize archaeological sites that are susceptible to disturbance and schedule data collection prior to planned activities.

The recently certified *Management Plan for CDF's Historic Buildings and Archaeological Sites* (Foster and Thornton 2001) and accompanying *Environmental Impact Report* (Foster and Sosa 2001) prescribe general measures for identifying, evaluating and managing heritage resources on CDF lands statewide, with specific measures adopted for JDSF. This statewide plan (hereafter referenced as the "CDF Heritage Management Plan") was initiated in 1991 pursuant to Executive Order W-26-92, CEQA and PRC Section 5020 et seq., in coordination with the SHPO and in consideration of comments from the interested public and Native American Tribes and organizations. For each of CDF's properties, including JDSF, the CDF Heritage Management Plan:

a. summarizes the inventory of recorded historic buildings and prehistoric and historic archaeological sites;

b. identifies those buildings and sites determined to be significant per National and State Registers criteria in consultation with SHPO;
c. establishes decision making criteria for managing its historic buildings and identifies those targeted for preservation;
d. describes CDF's archaeology program, role in fire protection, Native American gathering policy, and artifact collections; and
e. establishes specific management objectives and measures for each of its holdings including JDSF.

While the CDF Heritage Management Plan advances better management of state land heritage resources, it is not complete. It is CDF's intent to update the plan every ten years beginning in the year 2010.

9.7.1 Preferred Heritage Resources Management Approach: Preservation in Place

CDF's primary approach to managing significant heritage resources is to preserve them through avoidance of project-related impacts. The DFMP adopts this philosophy as the preferred management measure for heritage resources, as follows:

> JDSF will, whenever feasible, avoid damaging effects on any historical resources 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. (DFMP, Section 3, Heritage Resources).

Avoidance of impacts through project design is the management approach specified for JDSF in the CDF Heritage Management Plan, that says, "Where possible, resources will be protected by altering projects to avoid impacts on the resource." (Action #5 in Foster and Thornton 2001:68)

With regard to managing certain heritage resources at JDSF, the CDF Heritage Management Plan states that:

- *Old railroad trestles* will be protected from impacts of management activities, but there will be no efforts to maintain them (Action #6 in Foster and Thornton 2001:68)
- *Old railroad grades* (many converted to roads) will not be protected unless a portion of the grade demonstrates some unusual feature (Action #7 in Foster and Thornton 2001:68)
- The 1915 *Little Red Schoolhouse* at Camp 20 is slated for long-term preservation and will be rehabilitated and opened to the public, in consultation with the OHP (Action #8 in Foster and Thornton 2001:68)
- The 1940 *Cat Barn* at Camp 20 will be managed as a standing ruin or possibly torn down after appropriate approvals, since its deterioration is extensive and restoration costly and impractical (Action #8 in Foster and Thornton 2001:68)

9.7.2 Heritage Resources Management Through Timber Harvest Plans

Known and presently unidentified heritage resources are expected to be present within areas of future timber harvest plans (THPs) at JDSF.

For planning and management purposes, planning watershed units not exempt from future timber harvesting (SCAs) will be delineated, affording the opportunity to address heritage resources management opportunities and constraints (high or low site sensitivity, proximity to high public use areas, or interpretive values) on a unit-by-unit basis.

Direct adverse impacts to archaeological sites could result from ground disturbance from construction and/or re-use of existing log landings and their access roads (used by all three logging systems: tractor, cable and helicopter), and with use of stationary yarder equipment for cable logging. Direct short and long-term adverse impacts to Native American plant resources used for traditional purposes and/or traditional cultural properties as defined *by National Register Bulletin 38* could also result from logging at JDSF. Risks for impacts from vandalism and looting of archaeological resources and historic structures increase as human activity in the Forest increases during timber harvesting events. California's Forest Practice Rules provide protection from these potential adverse impacts.

The record of *Confidential Archaeological Addendums* and THP-specific survey reports for JDSF demonstrates that the impacts of proposed timber harvesting on heritage resources have been regularly considered by CDF, with impacts avoided through final plan design. The one exception to impact avoidance through plan design was mitigation by archaeological excavation data recovery of the Misery Whip Camp (CA-MEN-2296/H) by Hylkema (1995) (cf. DFMP, Section 2, Heritage Resources; Foster and Thornton 2001:66-67; NWIC files).

The CDF Heritage Management Plan (Foster and Thornton 2001:68) and the JDSF DFMP both adopt the following management procedures designed to assess and avoid impacts from timber harvesting on significant heritage resources.

California's Forest Practice Rules (14 CCR Sections 895, 929, 949, 969, 1035, 1038, 1052 and 1104) list required procedures for identifying and protecting significant heritage resources that may be impacted by timber harvesting on CDF administered lands, private and other non-federal lands in California (Foster and Thornton 2001:45-47, 151-159). Carried out by professional archaeologists or trained Registered Professional Foresters (RPF) who must satisfactorily complete a rigorous four-day training session in identification of archaeological resources (plus one-day refresher courses required every five years; cf. Foster 1999), the process requires:

- A formal, pre-field search of current archaeological records for the proposed THP area, conducted at the appropriate Information Center of the California Historical Resource Information System (CHRIS) operated under the auspices of the California Office of Historic Preservation (OHP).

- Written notification to local Native American tribes and individuals identified by CDF in consultation with the Native American Heritage Commission, to provide opportunities for

identification and protection of important tribal resources that may otherwise be overlooked during archaeological survey (e.g., sacred places, areas where traditional plants are collected).

- Field survey for prehistoric and historic archaeological resources.
- Formal recordation of all located heritage resources within a THP area, plus development of measures to avoid impacts to resources through project redesign or mitigation.
- Preparation of an archaeological investigation report (CDF's *Confidential Archaeological Addendum* format), summarizing methods, findings, and recommendations for protection of heritage resources, which is reviewed by a CDF professional archaeologist and once approved, submitted to the appropriate Information Center of CHRIS for entry in the State's database.
- Field monitoring by CDF Inspectors for conformance with the approved site protection measures, and enforcement actions if violations are identified.

Related management actions adopted for JDSF under the CDF Heritage Management Plan and EIR (Foster and Thornton 2001:68; Foster and Sosa 2001) include:

- All significant sites will be identified in THPs and protected in accordance with the Forest Practice Rules (see above) (Action #1 in Foster and Thornton 2001:68);
- An archaeological survey and records check will be conducted for all projects (Action #2 in Foster and Thornton 2001:68); and
- When new sites are identified, they will be fully recorded to professional standards (Action #3 in Foster and Thornton 2001:68).

The DFMP (Section 3, Heritage Resources) makes several observations and identifies strategies to improve the effectiveness of the above program at JDSF as follow:

- Survey Methods: Additional heritage resources are expected to be present at JDSF. Forest conditions (e.g., duff, slash, thick understory vegetation) hamper site discovery and definition of site boundaries. Traditional pedestrian survey techniques employed in the past at JDSF are inadequate where surface visibility is limited and archaeological sites are sparse. CDF recognizes that site discovery may be improved by employing more intensive survey techniques, including but not limited to: periodic surface raking; mechanical vegetation removal; soil chemical surveys; other remote sensing techniques; geoarchaeological studies designed to identify areas sensitive for buried archaeological sites (DFMP, page 78).
- Site Recording: CDF will appropriately document, per current California standards (OHP 1995) all newly identified archaeological sites. In addition, CDF will seek resources to record the known but undocumented historic era sites (see Table 43) and update records for those sites not documented to current standards (DFMP, page 78).
- Significance Evaluations and Research Designs: CDF will evaluate the potential significance of all newly discovered heritage resource sites at JDSF. Detailed site evaluations will be considered as potential research and demonstration projects. CDF shall

consider review and update of the research design and questions originally formulated for JDSF sites by Levulett and Bingham (1978), plus new data from more recent regional archaeological studies. Updating this research design will help clarify the information potential of prehistoric archaeological sites with reference to their eligibility for the California Register under criterion (4). CDF also recognizes that some historic period sites have the potential to answer scientific research questions (DFMP, pages 78-80).

9.7.3 Heritage Resources Management Through Wildfire Suppression Plan

Known and presently unidentified heritage resources are expected to be present within areas where wildfires may occur and in proposed prescribed burn areas.

In emergencies, wildfire suppression activities of CDF statewide are undertaken with the primary mission to protect human lives, property and the Forest. During wildfires, most environmental protection provisions of CEQA are suspended. In the past, CDF staff archaeologists have been assigned to assist suppression teams so that impacts to known heritage resources from fire lines, fire camps and other related activities might be minimized or avoided, to the extent practical. After fires have been extinguished, the professionals have been tasked on occasion to perform site damage assessments and to assist in site stabilization, data recovery or rehabilitation efforts (Foster and Thornton 2001:47).

The DFMP (Chapter 3, Forest Protection) tasks the CDF Battalion Chief, JDSF Manager and Fire Prevention Battalion Chief to update and make more comprehensive the current *Pre-Suppression Plan* for JDSF. In particular, this proactive plan for fighting fires at JDSF will identify locations for fire defense improvements (e.g., fire breaks, helispot locations, water tanks, adequate road and trail access) and potential locations of incident camps, all of which pose a potential impact threat to heritage resources if such facilities are constructed in their vicinities. Discussion of fire suppression and the *Pre-Suppression Plan* recognizes one related activity (below) that can impact heritage resources, "A program to locate archaeological and other sites requiring special protection measures will be established for shaded fuel-break areas since these areas will likely be subject to heavy equipment operations during an emergency wildfire situation." (DFMP, Chapter 3, Forest Protection).

9.7.4 Heritage Resources Management Through Road Management Plan

Impacts to heritage resources from roads (maintenance and construction) are the most commonly cited problem at JDSF by archaeologists, CDF managers and staff (cf. Betts 1999; Medin 1994; Levulett and Bingham 1978). Road corridors (existing and future proposed) are generally sensitive for the occurrence of significant heritage resources. Impacts from past road construction and their on-going maintenance are the foremost impact type identified for JDSF heritage resources to date. All of the known prehistoric archaeological sites and many of the known historic period sites are located along roads.

The DFMP (Section 2, Watersheds) acknowledges that the present road network in JDSF reflects a history of various transportation technologies and forest practices. JDSF contains an estimated 350

miles of actively used roads and 150 miles of abandoned roads (DFMP Appendix VI). Much of the existing road network was constructed between the 1950s and 1970s, before historic preservation laws were in force and without consideration of impacts on significant heritage resources. Many roads in JDSF utilize or follow historic logging railroad grades established after the 1870s by the Caspar Lumber Company.

CEQA Guidelines identify classes of projects, including routine road maintenance, that do not have a significant effect on the environment and are declared to be "categorically exempt" from the requirements for preparation of environmental documents. However, a standard Categorical Exemption does not apply (1) when the cumulative impact of successive projects of the same type in the same place, over time is significant, and/or (2) when a project may cause a substantial change in the significance of a historical resource (i.e., eligible for or listed in the California Register) (Title 14, CCR, Chapter 3, Article 19, Section 15300.2(b)(f)).

Presently, routine road maintenance activities that have the potential to impact known archaeological sites have been suspended by CDF in accordance with a CEQA Categorical Exemption (Number 15301, Existing Facilities) submitted by JDSF and received by the State Clearinghouse on February 23, 2001. This Notice of Exemption states, "Project involves the operation and maintenance of existing facilities involving negligible or no expansion of existing use. 'Maintenance activities will be scheduled and conducted so as to avoid impacts to cultural … resources.'"

Routine road maintenance at JDSF has the potential to impact undiscovered, potentially significant archaeological sites. In practice under the present Categorical Exemption, routine road maintenance activities are suspended in the areas of recorded sites by JDSF staff in reliance on existing site records. While progress is being made, CDF has not completed its archaeological surveys of all roads subject to routine maintenance at JDSF, and sites that may be affected by such maintenance have not all been identified. In addition, deferring routine maintenance along roads that bisect recorded sites could lead to greater road maintenance problems risking impacts to unrecorded heritage resources.

The CDF Heritage Management Plan and EIR (Foster and Thornton 2001:68; Foster and Sosa 2001) directs that the following will be carried out for JDSF, "CDF shall develop a plan to manage archaeological sites bisected by regularly maintained roads, to mitigate impacts to sites caused by regular road grading and maintenance." (Action #12 in Foster and Thornton 2001:68).
The proposed *Road Management Plan* for JDSF (DFMP Appendix VI) outlines a process for inventorying existing roads and stream crossings, improving road segments that will remain in the permanent transportation network, and abandoning (decommissioning) high sediment producing roads where possible. It also provides guidelines for new road construction, with the principal objective of enhancing stream channel conditions for anadromous fish, amphibians and other sediment-sensitive aquatic organisms. To be completed within five years of plan implementation, the road inventory will help staff (DFMP Section 3, Watersheds):

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.

Planning will take into consideration roads that may be adapted as recreational trails. In order to avoid or minimize impacts to heritage resources, the *Road Management Plan* specifies that, "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." (DFMP, Appendix VI, Road Construction and Reconstruction)

9.7.5 Heritage Resources Management Through Recreation Management Plan

JDSF offers a wider array of recreational activities (camping, hiking, swimming/wading, picnicking, horseback riding, hunting, fishing) than other nearby public parks.

JDSF currently has 14 developed campgrounds situated along or near creeks, which are among the most sensitive places for occurrence of historic and prehistoric heritage resources. All but one campground (along State Road 20) is closed during the winter. Recreation use statistics indicate that in 1999, 12,200-camp-user-days were logged, with approximately half coming from the local area (Mendocino County) and the average visit being two to four days. In addition, CDF estimates an annual visitor day-use population of 50,000.

Off-road-vehicle use is prohibited at JDSF (DFMP Section 1, Regional Economic Role of JDSF). High-use recreational areas have been buffered from visual impacts of on going logging over the past decade, both in response to public concerns and to reflect the multi-use standard of the Forest. Five multiple-use trails are currently shown on the free handout map provided to the public. The public has expressed desires for more rustic camp sites, expanding the Forest trail system for pedestrians and horseback riders and bicyclers, and to establish formal target shooting ranges (DFMP Section 1, Public Concerns and Their Effect on Management).

In addition, under its Non-timber Forest Products Program JDSF issues personal and small-scale commercial collecting permits for mushrooms (168 total permits issued in 1999), firewood (800 cords personal use, plus 40 commercial permits issued in 1999), forest greens (5 permits in 1999), and other specialty wood products (10 permits in 1999) (Section 1, Recreation and Personal Forest Products Collection). Collecting Permits issued by JDSF do not inform users about prohibitions on collecting artifacts or vandalizing heritage resources that may be encountered in the Forest. While non-permitted collecting likely occurs, Forest visitors need a permit to remove anything from the Forest.

Planned management (on-going and future) described in the DFMP (Section 3, Recreation, Aesthetics, and Public Use) includes:

a. improvements to Camp Host Sites (e.g., installing showers);
b. establishing new trails for hiking and bicycling;
c. improving existing camp sites (e.g., installing vault toilets, barbeque pits, planting native vegetation screens);
d. restoring the historic Little Red Schoolhouse for public visitation; and
e. regular maintenance of all existing recreational facilities.

The above activities have the potential to directly impact heritage resources if located in their vicinities.

Campgrounds and administrative facilities (including staff housing) are concentrated in creek side settings considered highly sensitive for significant historic and prehistoric heritage resources. Improvements and maintenance of existing, or development of new recreational developments (campgrounds, trails) and administration facilities pose direct and indirect impact threats on various levels:

a. by ground-disturbing activities,
b. by vandalism and looting,
c. by wildfires, and
d. by conflicting uses.

The DFMP does not propose any specific heritage resources management actions related to maintenance of and improvements to existing facilities at JDSF. The 1990 Recreation Master Plan described in the DFMP (Section 2, Recreation) has not been finalized (John Griffin, personal communication 2002). It is expected that the final plan will consider impacts on significant heritage resources under separate CEQA environmental review. Such planning will consider impacts to significant heritage resources and should coordinate development of new trails, recreational and visitor facilities with the interpretive program, to maximize public benefits and enjoyment of JDSF heritage resources and minimize risk for vandalism and looting.

9.7.6 Heritage Resources Management Through Management of Special Concern Areas

Restricted timber harvesting or no timber harvesting is prescribed for the 23 identified Special Concern Areas (SCAs), which include buffers around campgrounds, conservation camps and neighboring residential and Mendocino Woodlands camp properties, and certain stands of vegetation (cypress, pygmy forest, old-growth groves), among others (DFMP; Marc Jameson, personal communication 2002).

Parlin Fork and Chamberlain Creek conservation camps are both designated SCAs that occupy archaeologically sensitive areas (creek confluences) and have sustained considerable past ground alterations and development. Operations and activities within the bounds of both conservation camps have the potential to impact significant heritage resources. However, these SCAs are outside the scope of the present EIR and DFMP and will be addressed through separate CEQA review if changes are proposed in those on going activities.

Potential heritage resource impacts from logging, or from maintenance, improvements, new construction or abandonment of roads or facilities at either camp, or within other SCAs, are subsumed under the impacts analyses and mitigation measures presented below.

Two additional SCAs, the State Park Treatment Areas and the Woodlands Special Treatment Area contain a significant heritage resource. The Mendocino Woodlands Outdoor Center was listed as a National Historic Landmark in 1997. JDSF silviculture activities have the potential for adverse impacts to the cultural landscape associated with this heritage resource. However, those potential risks are addressed and removed through careful development of THPs with full consideration of potential impacts to these special heritage resources.

9.7.7 Heritage Resources Management Through Management of Watersheds

The goal of watershed restoration and wetlands management prescriptions is to maintain or enhance healthy and sustainable aquatic ecosystems in JDSF (DFMP Section 3, Watersheds). Wetland habitats associated with creeks, springs, seeps and bogs are generally considered highly sensitive for prehistoric and historic period heritage resources. Where forest management activities have the potential to destabilize slopes and/or damage aquatic habitats, specific mitigation measures will be developed and implemented under the THP process or in road planning, both of which activities consider impacts on heritage resources. (DFMP Section 3, Watersheds)

9.7.8 Heritage Resources Management Through Education

JDSF is the largest State owned forest in California with a research and demonstration mandate. The objectives of the research and demonstration program are to improve the amount and quality of information about how economic timber management practices can support maximum sustained production, in light of the level of mitigation needed to protect and enhance watersheds, wildlife habitat and heritage resources, among other environmental concerns.

The DFMP (Section 3, Heritage Resources) recognizes JDSF's role as Demonstration Forest. The draft Plan says:

> 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 (DFMP, page 79).

The DFMP (Section 4, Current Research and Demonstration Projects) describes numerous related on going and planned demonstration and research programs. There is the potential for integrating heritage resources management into plans into future research and demonstration. For example, the "Multi-Scaled Analysis of Fire History" study may provide data important to heritage resources, e.g., related to understanding the role of pre-contact Native American burning practices, the effects of fire on cultural resource preservation, and reconstructing paleoenvironmental conditions which affected Native Americans in prehistory.

CDF recognizes that JDSF offers the unique opportunity to be "a proving ground for the development and implementation of effective heritage resource management strategies and techniques." A Forest Learning Center complex and JDSF Interpretive Center at Camp 20 are planned for development over the next decade (these actions are assumed to be subject to separate heritage resources review per CEQA and/or NHPA Section 106, outside scope of current analysis). Both facilities can offer tremendous opportunities for public benefit by integrating heritage resources into Forest management demonstration, research and education programs to be offered to professionals, JDSF visitors and students at all levels from elementary to post-graduate. The landscape and composition of JDSF today has been greatly influenced and affected by historical logging practices and Native American land uses and subsistence strategies. This legacy is reflected

by the heritage resources at JDSF, which are fundamentally protected under various legal authorities for public appreciation and benefit, and to promote the continuation of Native American culture and traditions.

9.7.9 Heritage Resources Management Through Coordination with Other Agencies and Entities

JDSF staff coordinates with a number of other public agencies and entities whose actions may have an affect on the Forest's heritage resources. These include, but are not limited to, the following:

- California Department of Parks and Recreation (DPR), who manage several State Parks in the vicinity (including the adjacent Mendocino Woodlands Outdoor Center, a designated National Register Landmark) and who likely draw a similar recreational user population as JDSF;
- California Department of Transportation (Caltrans), which maintains State Highway 20, the primary thoroughfare through JDSF between Willits and Fort Bragg;
- Pacific Gas & Electric Company (PG&E), which maintains a major transmission line bisecting the Forest that parallels portions of Highway 20; and
- Neighboring property owners, including commercial entities that promote tourism or harvest timber from private timberlands, and local residents who recreate on JDSF, frequently gaining access through adjoining lands rather than from the established approaches from Highway 20.

Caltrans and PG&E have experienced, professional staff charged with complying with pertinent laws protecting heritage resources. Their staffs coordinate with CDF's staff on projects that fall within the exterior boundaries of JDSF.

As for coordination between CDF and DPR and neighboring property owners, therein lay opportunities to educate the public about local history and Native Americans, and laws protecting cultural sites on State lands. The DFMP (Section 3, Heritage Resources) directs that CDF shall seek opportunities with outside entities (e.g., State Universities), as part of project planning or through research grants to conduct additional archaeological and historical research on the Forest (Action #4 in Foster and Thornton 2001:68).

9.8 Thresholds for Determining Significant Impacts to Heritage Resources

The criteria for determining whether or not a project would have a significant adverse impact on heritage resources are set forth in the CEQA Guidelines (14 CCR 15064.5). The pertinent guidance found in this law is provided below.

A project with an effect that may cause a substantial adverse change in the significance of an historical resource [eligible for or listed in the California Register of Historical Resources] is a project that may have a significant effect on the environment. The phrase"substantial adverse change in the significance of an historical resource" means physical demolition, destruction,

relocation, or alteration of the resource or its immediate surroundings such that the significance of an historic resource would be materially impaired. The significance of an historical resource is materially impaired when a project demolishes or materially alters in an adverse manner those physical characteristics:

1. of an historical resource that convey its historical significance and that justify its inclusion in, or eligibility for, inclusion in the California Register of Historical Resources;
2. that account for its inclusion in a local register of historical resources, unless the public agency reviewing the effects of the project establishes by a preponderance of evidence that the resource is not historically or culturally significant; or
3. of an historical resource that convey its historical significance and that justify its eligibility for inclusion in the California Register of Historical Resources as determined by the lead agency for the purposes of CEQA.

CEQA Guidelines (14 CCR 15126.4(b)) address consideration of mitigation measures proposed to minimize adverse effects on significant heritage resources, as follows.

1. Where maintenance, repair, stabilization, rehabilitation, restoration, preservation, conservation or reconstruction of the historical resource [eligible for or listed in the California Register of Historical Resources] will be conducted in a manner consistent with the Secretary of the Interior's Standards and Guidelines for the Treatment of Historic Properties… the project's impacts on the historical resource shall generally be considered mitigated below a level of significance and thus is not significant.

2. In some circumstances, documentation of an historical resource, by way of historic narrative, photographs or architectural drawings, as mitigation for the effects of demolition of the resource will not mitigate the effects to a point where clearly no significant effect on the environment would occur.

3. Public agencies should, whenever feasible, seek to avoid damaging effects to any historical resource of an archaeological nature. The following factors shall be considered and discussed in an EIR for a project involving such an archaeological site:

    a. 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.

    b. Preservation in place may be accomplished by, but is not limited to, the following:

        (1) Planning construction to avoid archaeological sites;
        (2) Incorporation of sites within parks, green space, or other open space;
        (3) Covering the archaeological sites with a layer of chemically stable soil before building tennis courts, parking lots, or similar facilities on the site; or
        (4) Deeding the site into a permanent conservation easement.

c. When data recovery through excavation is the only feasible mitigation, a data recovery plan, which makes provision for adequately recovering the scientifically consequential information from and about the historical resource, shall be prepared and adopted prior to any excavation being undertaken. Such studies shall be deposited with the California Historical Resources Regional Information Center. Archaeological sites known to contain human remains shall be treated in accordance with the provisions of Section 7050.5 of the Health and Safety Code.

d. Data recovery shall not be required for an historical resource if the lead agency determines that testing or studies already completed have adequately recovered the scientifically consequential information from and about the archaeological or historical resource, provided that the determination is documented in the EIR and that the studies are deposited with the California Historical Resources Regional Information Center. (14 CCR Section 15126.4)

9.9 Impacts Analysis and Proposed Mitigation and Monitoring Measures

The following discussion identifies potential impacts (less than significant, significant and adverse or beneficial; plus direct, indirect and cumulative) on heritage resources related to implementation of the proposed alternative (C) described in the DFMP for JDSF.
The identification of impacts from DFMP implementation takes into account the above described, known and anticipated inventory of potentially significant heritage resources for JDSF, the regulatory framework, and thresholds for determining significant impacts to heritage resources. Mitigation measures are then discussed with reference to those heritage resources management actions prescribed by CDF in the DFMP and in the recently adopted CDF Heritage Management Plan (Foster and Thornton 2001), plus other measures deemed appropriate to mitigate potential impacts from JDSF various program activities to a less than significant level.

Programmatic activities described in the DFMP that are more fully considered in this impact analysis relate to the following: (a) future timber harvesting; (b) fire protection and prescribed burn programs; (c) maintenance, construction and abandonment of roads; (d) management of Special Concern Areas; (e) watershed restoration activities; (f) recreation and public uses, and maintenance of existing facilities; (g) interpretation and research; (h) management of archaeological collections and archives; and (i) coordination with other agencies and entities.

For all alternatives, Table 43 (at the end of this section) summarizes the heritage resource impacts analysis and identifies corresponding mitigation and monitoring measures.

9.9.1 Timber Harvesting

Impact 1. ***Adoption of the DFMP has the potential for impacts to significant heritage resources from timber harvesting unless the following mitigation measures are incorporated into DFMP Section 3, Heritage Resources, and Section 3, Planned Management to Achieve Desired Future Conditions*** **(Less than significant with incorporation of mitigation).**
Mitigation 1. THP-specific studies performed in accordance with *Forest Practice Rules* include (a) oversight and review of *Confidential Archaeological Addendums* by qualified professional archaeologist for studies conducted by certified RPFs, (b) a current archaeological records check as

defined in 14 CCR Section 895.1 that would include review of identified but unrecorded historic resources listed in Gary and Hines (1993), and (c) formal recordation to current standards of all identified heritage resources, among other standard procedures.

Monitoring 1.
Timing: During the life of the JDSF Management Plan
Scope: Forest-wide
Implementation Responsibility: the Department
Monitoring Responsibility: the Department

Mitigation 2. While preparing timber sales, JDSF staff will (a) regularly consider potential impacts to significant heritage resources located along regularly used or main logging access roads, (b) assess the potential for long-term site attrition, (c) consider the appropriateness of CARIDAP: Sparse Lithic Scatters (Jackson et al. 1988), and (d) for other types of sites, carry out data recovery excavations, site capping, and/or road realignment and proper abandonment where feasible. To do this, the access roads need to be mapped and included in the archaeological survey for the timber sale, in addition to the actual logging area. Road survey coverage shall be plotted on the JDSF archaeological survey database maps.

Monitoring 2.
Timing: During the life of the JDSF Management Plan
Scope: Forest-wide
Implementation Responsibility: the Department
Monitoring Responsibility: the Department

Mitigation 3. As funding and opportunities allow (e.g., competitive grants, interagency agreements with California State University anthropology programs), CDF will prioritize completion of a general (non-THP-specific) heritage resource inventory (including formal recordation and significance evaluation).

Monitoring 3.
Timing: As funding and opportunities allow, during life of the JDSF Management Plan
Scope: Forest-wide
Implementation Responsibility: the Department
Monitoring Responsibility: the Department

Mitigation 4. The JDSF Heritage Resource Officer shall initiate consultation with local Native American tribes to determine the presence or absence of Native American gathering areas or other locations of cultural or religious importance. These locations, if any can be confirmed, shall be plotted on the JDSF heritage resource database. This database will be reviewed prior to preparation of each timber sale, and specific management of those locations will be developed in consultation with affected local tribes.

Monitoring 4.
Timing: During life of the JDSF Management Plan
Scope: Forest-wide
Implementation Responsibility: the Department
Monitoring Responsibility: the Department

9.9.2 Fire Protection and Prescribed Burn Programs

Impact 2. ***Development and implementation of the Pre-Suppression Plan described in Section 3 of the DFMP may result in impacts to significant heritage resources unless the following mitigation measures are incorporated into the DFMP Section 3, Heritage Resources, and Section 3, Forest Protection*** **(Less than significant with incorporation of mitigation).**

Mitigation 5. In concert with the *Pre-Suppression Plan* to be developed for JDSF, employ standard procedures described in the *Forest Practice Rules* (i.e. to contact local tribes, conduct field survey, develop mitigation to protect significant sites) to avoid potential impacts to significant heritage resources where pre-fire defense improvements (fire breaks, helispot locations, water tanks, adequate road and trail access) and incident camps will be established. Any related construction or use shall be preceded by an archaeological survey and impact assessment, and documented on CDF survey report form, in accordance with Department procedures.

Monitoring 5.
Timing: During planning and implementation of the Pre-Suppression Plan
Scope: Forest-wide
Implementation Responsibility: the Department
Monitoring Responsibility: the Department

Mitigation 6. To the extent practical during emergency fire-fighting activities, rely on persons trained to identify archaeological sites (professional or certified RFPs), to avoid or minimize heritage resource impacts from fire suppression and support activities (e.g., grading or hand-digging of fuel breaks, establishment of incident camps).

Monitoring 6.
Timing: During the life of the JDSF Management Plan Scope: Forest-wide
Implementation Responsibility: the Department
Monitoring Responsibility: the Department

Mitigation 7. After a wildfire has been safely suppressed, rely on a professional CDF archaeologist to oversee and document site damage assessments and as needed, develop and supervise site stabilization, data recovery or rehabilitation efforts, with assistance, to the extent possible, from certified RFPs.
Monitoring 7.
Timing: During the life of the JDSF Management Plan Scope: Forest-wide
Implementation Responsibility: the Department
Monitoring Responsibility: the Department

Impact 3. ***Adoption of the DFMP has the potential for impacts to significant heritage resources from prescribed burns unless the following mitigation measures are incorporated into DFMP Section 3, Heritage Resources, and Section 3, Forest Protection*** **(Less than significant with incorporation of mitigation).**

Mitigation 8. When planning for prescribed burns, employ CDF's "Procedures for Archaeological Review of CFIP and VMP Projects" to avoid potential impacts to significant heritage resources. Emphasis must be placed on identifying, formally recording and devising appropriate treatment measures for constructed historic features made of lumber and surface or shallow archaeological deposits in heavy fuel settings that may be significantly altered or destroyed by fire. The archaeological survey and impact assessment shall be documented on CDF survey report form, in accordance with Department procedures.

Monitoring 8.
Timing: During the life of the JDSF Management Plan Scope: Forest-wide
Implementation Responsibility: the Department
Monitoring Responsibility: the Department

Mitigation 9. Potential impacts to important Native American plant collecting areas from prescribed burns will be avoided by consulting with interested, recognized local Tribes (as listed by the Native American Heritage Commission [NAHC] for use for Timber Harvest Plans) about potential effects (positive or negative) of fire on plant collecting areas, and if identified, by modifying prescribed burn plans, to the extent practical, to meet both CDF's and the Native Americans' desired results.

Monitoring 9.
Timing: During the life of the JDSF Management Plan Scope: Forest-wide
Implementation Responsibility: the Department
Monitoring Responsibility: the Department

9.9.3 Transportation Systems (Road Maintenance, Construction, and Abandonment)

Impact 4. ***Adoption of the DFMP has the potential for impacts to significant heritage resources from regular maintenance of roads and/or related appurtenances (e.g., culverts, bridges), construction of new roads and/or related appurtenances, substantial improvements to existing roads and/or related appurtenances, use of existing or establishment of new borrow pits, and/or road abandonment unless the following mitigation measures are incorporated into DFMP Section 3, Heritage Resources, and the Road Management Plan in DFMP Appendix VI*** **(Less than significant with incorporation of mitigation).**
Mitigation 10. Prior to any road grading work, the current database of heritage resources shall be checked to determine if any known sites exist along the road segments to be treated, and a archaeological survey of the road segment will be conducted by either a professional archaeologist or an RPF with current archaeological training. Any identified heritage resource will be recorded and its potential significance evaluated. Specific mitigation measures to protect the site(s) will be developed in consultation with a CDF Archaeologist an d documented in the project file.

Monitoring 10.
Timing: During the period applicable to the 2001 Categorical Exemption for road maintenance at JDSF
Scope: Forest-wide
Implementation Responsibility: the Department
Monitoring Responsibility: the Department

Mitigation 11. In concert with the road inventory described in the *Road Management Plan* for JDSF (DFMP Appendix VI), make it a priority to complete within the five year effort the heritage resources inventory for the existing road system (including rock borrow pits and related appurtenances) by employing standard procedures described in CDF's Archaeological Review Procedures. Consult with interested Tribes to determine if significant traditional cultural properties or other heritage resources such as plant collecting areas are present and may be affected. Planning for road improvements or abandonment needs to consider and implement measures to avoid or minimize potential impacts to significant heritage resources. The inventory shall be documented in the CDF Archaeological Report form, or other report format consistent with OHP (1989) guidelines.

Monitoring 11.
Timing: Complete inventory within first five years of implementation of JDSF Management Plan; implement protection measures in conjunction with development of JDSF Road Management Plan
Scope: Forest-wide
Implementation Responsibility: the Department
Monitoring Responsibility: the Department

Mitigation 12. For new road construction or substantial improvements to existing roads and appurtenances (including development of new rock borrow pits), or when planning for abandonment of roads and/or related appurtenances, apply standard procedures described in CDF's Archaeological Review Procedures to avoid potential impacts to significant heritage resources. Consult with interested Tribes to determine if significant traditional cultural properties or other heritage resources such as plant collecting areas are present and may be affected. Where known site boundaries are not systematically defined or in question, establish reasonable buffer zones for heritage resources where ground disturbing maintenance activities will be avoided, and monitor for compliance. The results shall be documented in the CDF Archaeological Report form, or other report format consistent with OHP (1989) guidelines.

Monitoring 12.
Timing: During the life of the JDSF Management Plan; in conjunction with development and implementation of JDSF Road Management Plan
Scope: Forest-wide
Implementation Responsibility: the Department
Monitoring Responsibility: the Department

9.9.4 Recreation and Public Uses, and Maintenance of Existing Facilities

Impact 5. ***Adoption of the DFMP has the potential for impacts to significant heritage resources from management activities related to maintenance of, improvements to, abandonment of, and/or construction or expansion of new or existing campgrounds, other recreational and visitor developments, and administrative facilities unless the following mitigation measures are incorporated into DFMP Section 3, Heritage Resources, and Section 3, Recreation, Aesthetics, and Public Use*** **(Less than significant with incorporation of mitigation).**

Mitigation 13: Before planned ground disturbing maintenance or improvements is carried out (e.g., installing toilets, showers, barbeque pits, constructing new trails, per DFMP Section 3, Recreation,

Aesthetics, and Public Use), an archaeological survey shall be performed. JDSF staff shall conduct an archaeological survey of the area considered for development. This survey must be conducted by a professional archaeologist or a person with current certification from CDF for archaeological surveys. The work must be done in consultation with a CDF Archaeologist and follow the procedures outlined in CDF's *Archaeological Review Procedures for CFIP and VMP Projects.* A check of the current database of heritage resources on JDSF shall be included in this work.

Monitoring 13.
Timing: During the life of the JDSF Management Plan
Scope: Forest-wide
Implementation Responsibility: the Department
Monitoring Responsibility: the Department

Impact 6. ***Adoption of the DFMP has the potential for impacts to significant heritage resources from vandalism and looting of significant heritage resources by some of those who use or frequent recreational, visitor and/or administrative facilities unless the following mitigation measures are incorporated into DFMP Section 3, Cultural Resources, and Section 3, Recreation, Aesthetics, and Public Use*** **(Less than significant with incorporation of mitigation).**

Mitigation 14: Revise JDSF visitor brochures to include an advisory statement that the unauthorized collecting of artifacts and the looting or vandalism of sites is prohibited by State law, and provide direction on what the visitor should do in the event that prehistoric or historic artifacts are encountered on the Forest. This shall include a section in the main Forest brochure, and the creation of a new brochure specifically addressing the archaeology and history of JDSF that will include a more detailed discussion of how visitors should respond to discovery of historic or prehistoric sites or artifacts on the Forest. Develop similar language in all permits issued to forest visitors and recreationists (including special events such as the annual Enduro equestrian race, Skunk Train bicycle ride, and collecting permits for non-timber forest products) and as part of the artifact display at Forest headquarters. JDSF staff shall look for evidence of vandalism and looting at heritage resource sites during patrols of the Forest, and shall promptly notify a CDF Staff Archaeologist in the event any such damage is observed, initiate an investigation to determine who has vandalized or looted the resource, and assist in taking enforcement action as appropriate. A CDF Staff Archaeologist shall be consulted during the development of a treatment plan to rehabilitate damaged sites.

Monitoring 14.
Timing: Within one year of implementation of the JDSF Management Plan
Scope: Forest-wide
Implementation Responsibility: the Department
Monitoring Responsibility: the Department

9.9.5 Herbicide Use and Native American Collecting

Impact 7: ***Adoption of the DFMP has the potential for impacts on traditional Native American plant collecting resource areas from herbicide use and applications, unless the following mitigation measure is incorporated into DFMP Section 3, Heritage Resources and Section 3, Exotic Species*** **(Less than significant with incorporation of mitigation).**

Mitigation 15. By using JDSF's Collecting Permit process, the JDSF staff shall work together with interested Tribes to identify important traditional plant collecting areas, and shall seek to minimize the application of herbicides to the plants of interest to the extent practical.

Monitoring 15.
Timing: During life of the JDSF Management Plan
Scope: Forest-wide
Implementation Responsibility: the Department
Monitoring Responsibility: the Department

9.9.6 Interpretation, Demonstration, and Research Programs

Impact 8. ***Adoption of the DFMP has the potential for impacts on significant heritage resources from implementation of JDSF demonstration and research programs, including direct effects from ground disturbing actions and indirect, short and long-term effects from illicit artifact collecting and vandalism from increased user population, including visiting public, school and other groups, professionals, contractors and researchers, unless the following mitigation measures are incorporated into DFMP Section 3, Heritage Resources, and Section 4.*** **(Less than significant with incorporation of mitigation).**
Mitigation 16. When planning for or reviewing proposed demonstration and research projects, employ standard procedures described in *CDF's Archaeological Review Procedures for CFIP and VMP Projects*, and include a check of the current JDSF heritage resource database, to avoid potential impacts to significant heritage resources. Document heritage resources study findings in the CDF Archaeological Report form, or other report format consistent with OHP (1989) guidelines.

Monitoring 16.
Timing: During life of the JDSF Management Plan
Scope: Forest-wide
Implementation Responsibility: the Department
Monitoring Responsibility: the Department

TABLE 43
COMPARISON OF ALTERNATIVE IMPACTS ON HERITAGE RESOURCES

Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant - Mitigation Feasible (5) Significant -Mitigation Not Feasible**
TIMBER HARVESTING. Impact 1. Potential for impacts to significant heritage resources from timber harvesting.						
Alt. A						No timber harvest would occur under this alternative.
Alt. B						There is no substantial difference among the active management alternatives. Each alternative will involve timber harvests, though at varied intensities, resulting in potentially significant impacts and the need for identical mitigation measures as specified (see Mitigations 1-4).
Alt. C DFMP						
Alt. D						
Alt. E						
FIRE PROTECTION AND PRESCRIBED BURN PROGRAMS. Impact 2: Potential for impacts to significant heritage resources from establishment of pre-suppression facilities, and during emergency fire protection and post-fire mop-up and stabilization activities. Impact 3: Potential for impacts to significant prehistoric sites and historic structures, buildings and sites from prescribed burn program activities (significant and adverse—mitigation feasible).						
Alt. A						This alternative would eliminate prescribed burns; however, natural fires would still occur and likely at greater intensities than on a managed Forest with prescribed burns and active fire suppression planning. Therefore, similar impacts would occur due to natural fires and measures to extinguish them. Mitigation measures would be needed as proposed for the alternatives below (see below).
Alt. B						There is no substantial difference among the active management alternatives. Each alternative will involve active fire suppression measures to some degree and the likelihood for naturally occurring fires. These activities will result in potentially significant impacts and the need for identical mitigation measures as specified (see Impact 2, Mitigations 5-7; Impact 3, Mitigations 8 & 9).
Alt. C DFMP						
Alt. D						
Alt. E						
ROAD MAINTENANCE, CONSTRUCTION AND ABANDONMENT. Impact 4. Potential for impacts to significant heritage resources from on-going maintenance of existing roads and related appurtenances (e.g., culverts, bridges), from new road construction, or substantial improvements to existing roads and related appurtenances (e.g., culverts, bridges), or use of existing or establishment of new rock borrow pits, and from abandonment (decommissioning) of roads and related appurtenances (e.g., culverts, bridges).						
Alt. A						No new roads would be constructed and no existing roads would be decommissioned; however, maintenance to existing roads would continue resulting in potentially significant impacts and the need for Mitigations 10-12 as specified.
Alt. B						No road management plan is proposed and no road decommissioning would occur; however, new roads would continue to be constructed resulting in potentially significant impacts and the need for Mitigations 10-12 as specified.

TABLE 43
COMPARISON OF ALTERNATIVE IMPACTS ON HERITAGE RESOURCES

Alternatives						Discussion
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant - Mitigation Feasible (5) Significant -Mitigation Not Feasible**
Alt. C DFMP						There is no substantial difference among alternatives C and D. Each alternative will involve construction of new roads (although fewer new roads under alternative D), and road decommissioning pursuant to the Road Management Plan. These activities will result in potentially significant impacts and the need for identical mitigation measures as specified (see Mitigations 10-12).
Alt. D						
Alt. E						No new roads would be constructed; however, maintenance to existing roads and an aggressive road decommissioning program would occur resulting in potentially significant impacts and the need for Mitigations 10-12 as specified.
RECREATION AND PUBLIC USES, AND MAINTENANCE OF EXISTING FACILITIES. Impact 5. Potential for impacts to significant heritage resources from ground-disturbing activities related to maintenance of and improvements to or abandonment of existing campgrounds, other existing recreational and visitor developments, and administrative facilities, and from construction of new recreational, visitor and administrative facilities. Impact 6. Potential for impacts from illicit artifact collecting or vandalism of significant heritage resources by the public, contractors and CDF staff and their families who use or frequent recreational, visitor and/or administrative facilities.						
Alt. A						There is no substantial difference among the alternatives. All will involve recreational use and either maintenance of existing facilities or construction of limited new facilities to varying degrees resulting in potentially significant impacts and the need for similar mitigation measures as specified (see Impact 5, Mitigation 13; Impact 6, Mitigation 14).
Alt. B						
Alt. C DFMP						
Alt. D						
Alt. E						
HERBICIDE USE AND NATIVE AMERICAN COLLECTING. Impact 7: Potential for impacts on traditional Native American plant collecting resources areas and for increased health risks from application of herbicides at JDSF.						
Alt. A						No herbicide use would occur. Native plants would be reduced in number due to lack of an active program to control invasive non-native species. This impact would be less than significant since no native plant is likely to be eliminated from the site due to lack of control program.
Alt. B						There is no substantial difference among alternatives B and C. Both will involve herbicide use (with more infrequent use under alternative C). Both would result in potentially significant impacts and the need for similar mitigation measures as specified (see Mitigation 15).
Alt. C DFMP						
Alt. D						No herbicide use would occur. Vegetation would continue to be managed with non-chemical means. This alternative also calls for proactive coordination with local Tribes.
Alt. E						

TABLE 43 COMPARISON OF ALTERNATIVE IMPACTS ON HERITAGE RESOURCES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant - Mitigation Feasible (5) Significant -Mitigation Not Feasible**
INTERPRETATION, DEMONSTRATION AND RESEARCH PROGRAMS. Impact 8: Potential impacts to significant heritage resources from JDSF demonstration and research programs, including direct effects from ground disturbing actions and indirect, short and long-term effects from illicit artifact collecting and vandalism from increased user population, including visiting public, school and other groups, professionals, contractors and researchers.						
Alt. A						No research or demonstration activities would occur.
Alt. B						There is no substantial difference among the active management alternatives. Each will involve research and demonstration activities to varying degrees resulting in potentially significant impacts and the need for mitigation measures as specified (see Mitigation 16).
Alt. C DFMP						
Alt. D						
Alt. E						

10. HYDROLOGY AND WATER QUALITY

10.1 Watersheds

JDSF contains 48,652 acres. There are 15 planning watersheds, delineated and defined by CALWATER version 2.2, that contain portions of JDSF ownership. In some cases, the planning watersheds were aggregated into four hydrologic units called Watershed and Wildlife Assessment Areas (WWAA) to facilitate evaluation of larger areas (Figure 3, below); although an effort was made to keep analyses on a property wide basis, or by planning watershed. Timber resources were divided into West end (Western, Northern, and Southern WWAAs) and East end (Eastern WWAA) due to the distinctive difference of vegetative characteristics between the Western and Eastern ends of the property.

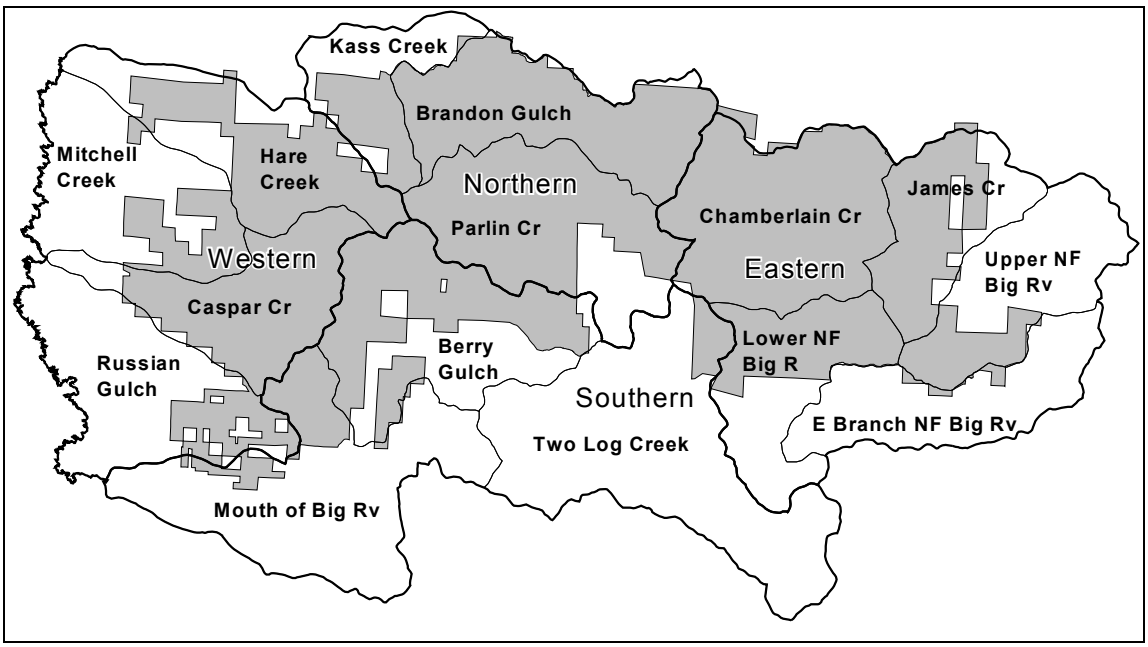

Figure 3. JDSF Planning Watersheds and 4 WWAAs.

The planning watersheds encapsulate over 99 percent of JDSF, less 250 acres located along the northern JDSF property line that fall to the other side of the dividing ridge lines. Table 44 summarizes the basic characteristics of the planning watersheds and associated WWAAs.

TABLE 44 CHARACTERISTICS OF JDSF PLANNING WATERSHEDS (PW) AND WWAA					
Planning Watersheds (% in JDSF) with CALWATER 2.2 Number	**PW Acres**	**JDSF Acres**	**WWAA (% of JDSF)**	**Highest Elevation**	**Tributaries to**
1113.200301 Brandon Gulch [NF of the SF Noyo] (97%)	6,449	6,244	Northern (28%)	1,726 ft.	SF Noyo River
1113.200302 Parlin Creek (80%)	7,578	6,058			
1113.200303 Kass Creek (43%)	3,533	1,532			
1113.200401 Hare Creek (66%)	6,184	4,078			
1113.200402 Mitchell Creek (27%)	6,554	1,743	Western (25%)	1,135 ft.	Pacific Ocean
1113.300404 Caspar Creek (90%)	5,360	4,838			
1113.300405 Russian Gulch (18%)	7,094	1,311			
1113.300402 Berry Gulch (63%)	7,999	5,020	Southern (15%)	1,568 ft.	Big River
1113.300403 Mouth Big River (17%)	9,548	1,649			
1113.300406 Two Log Creek (5%)	11,432	544			
1113.300301 James Creek (72%)	4,459	3,207			
1113.300302 Chamberlain Creek (99%)	7,868	7,791	Eastern (32%)	2,740 ft.	Big River
1113.300303 East Branch NF Big River (3%)	5,160	169			
1113.300304 Lower NF Big River (56%)	4,953	2,790			
1113.300305 Upper NF Big River (26%)	5,420	1,428			
Acres just north of listed Planning Watersheds		250	(< 1 %)		

10.2 Hydrology

Jackson Demonstration State Forest is hydrologically rain dominated, with the majority of the land base elevation under 2000 feet above mean sea level. Snowfall occurs occasionally in the higher elevations and rarely accumulates. Snow is thus not considered to have any appreciable effect on the watershed hydrology. Mean annual precipitation ranges from 39 inches on the coast at Fort Bragg (CDWR 1997), to 55 inches east of JDSF at Willits (CDWR 1997), to 70 inches on the eastern edge of JDSF based on isohyetal information. The majority of the rainfall occurs between October and April.

10.2.1 Streamflow

A USGS stream gauging station has operated on the Noyo River (67,840 acres) since 1951. Large runoff events have occurred in 1955, 1964, 1974, and 1993, with peak flows ranging from 22,000 to 26,600 cubic feet per second (cfs). Stream gauging sites were installed in at the South Fork Caspar Creek (1,047 acres) and the North Fork Caspar Creek (1,168 acres), and streamflow has been measured there by CDF and the U.S. Forest Service since water year 1963. Large runoff events were measured on the North Fork gage in 1964, 1966, 1974, and 1993, with peak flows ranging from 242 to 305 cfs (Cafferata and Spittler 1998). In 1985, thirteen additional stream gauging stations were constructed in the North Fork Caspar Creek to measure peak flows, flow volumes, and suspended sediment loads in anticipation of the future harvesting plans in the watershed. Currently

there are 10 tributary or mainstem stations operating in SF Caspar Creek in addition to the original SF weir; and six tributary or mainstem stations operating in the NF Caspar Creek in addition to the original NF weir.

10.2.2 Peak Flows

Timber harvesting and road building can increase peak flows (amount of runoff received to a stream during a storm event) of streams in several ways: alteration of evapotranspiration patterns, interception of subsurface flows by the road network, and alteration of snowmelt patterns. In 1998, peak flow studies on Caspar Creek yielded that the greatest effect of logging on streamflow peaks is to increase the size of the smallest peaks occurring during the driest antecedent conditions, with that effect declining as storm size and watershed wetness increases (Zeimer 1998). More recent studies of the peak flow data from Caspar Creek (Lewis et al. 2001), stated that logging influenced peak flows as a result of a reduction of rainfall interception and transpiration and that peak flow increases were proportional to the amount of area disturbed in a watershed. The estimated average peak flow increase for the two-year return period was 27 percent for the 100 percent clearcut tributary watersheds and nine percent for the 50 percent cut North Fork (Rice et al. 2001). Revegetation of an area diminished the effect of peak flow increases at a rate of eight percent per year. Appendix 11 elaborates further on the details of the Caspar Creek studies mentioned above.

10.2.3 Water Yield and Summer Low Flows

Keppeler and Zeimer (1990) surmised that after harvesting the water that would otherwise be taken up by trees and lost through evapotranspiration remains in the soil and contributes to base flow of streams during summer low flow periods. A number of studies have documented to this effect (Harr 1972, Hetherington 1987, Keppeler and Zeimer 1990, and Keppeler 1998). Flows typically returned to pre-logging levels within a few years. In the summary of lessons learned from northwest California (Rice et al., in press), increases in water yield and summer low flows diminish over time and will probably be of minimal importance compared to other forest management and production goals.

10.3 Water Quality

Water quality and beneficial uses are evaluated primarily based on the physical properties and chemical constituents of water. Water quality is measured by many parameters, but for the JDSF, the most important parameters are stream water temperature, sediment-related water parameters such as suspended sediment and turbidity, dissolved oxygen, nutrients, and fecal coliform (bacteria). However, water temperature is discussed in the Fisheries section and will not be elaborated on in this section.

10.3.1 Total Maximum Daily Load (TMDL)

Section 303(d) of the Clean Water Act requires each State to prepare a list of water bodies within its boundaries that do not meet water quality standards with existing management practices, and submit the list to the U.S. Environmental Protection Agency (EPA) for approval. Once a body of water is added to a 303(d) list, a TMDL (total maximum daily load) for that water body is calculated to meet water quality objectives. A TMDL is the maximum amount of a given pollutant a waterway can absorb from all sources, plus a margin of safety, without violating water quality standards for designated uses such as drinking water, aquatic life, and recreation. Both the Noyo River and Big River are listed as sediment impaired and had TMDL dates of 1999 and 2001, respectively.

10.3.2 Sediment

Although erosion rates in the Coast Ranges are naturally high, management-related activities have accelerated the naturally high rates in many areas. Erosion from roads can be associated with road surfaces, road fills, or slope failures associated with road construction (e.g., blocked culverts). Timber harvesting often results in surface erosion from landings, skid trails, and other compacted areas (MacDonald et al. 1991; Moring 1982). Furbish and Rice (1983) found that inner gorges, approximately 30 percent of the study area, contributed 88 percent of the landslide volume; and outside the inner gorges, 85 percent of the slide volume was associated with roads. Increased sediment yields tend to persist from slope failures and road surface runoff. Yet, implementation of modern Forest Practice Rules (FPR) and Best Management Practices (BMP) over the last 20 years are considered to have significantly decreased sediment input to streams relative to past practices (Rice 1999, Cafferata and Spittler 1998; Lewis 1998; CDF 1995; SWRCB 1987).

Research level monitoring in the Caspar Creek watershed has shown that the modern FPRs have successfully reduced water quality impacts. Selective tractor logging and roads along the stream in the South Fork prior to contemporary forest practices was shown to increase suspended sediment yields 2.4 times more than measured with clearcutting and cable logging operations in the North Fork that were implemented under the modern FPRs (Lewis 1998, Zeimer 2001). Numerous landslides were documented after road construction and logging in the South Fork, while the size and number of landslides to date have been similar in logged and unlogged units in the North Fork (Cafferata and Spittler 1998). Based on the results of eight logging treatments during 1989-1991 in the North Fork Caspar Creek, Bottorff and Knight (1996) found little or no evidence in their study of fine sediment related impacts on the benthic macroinvertebrate communities.

Characterization and quantification on suspended sediment and storm runoff was conducted through exploratory analysis and model fitting of the North Fork Caspar Creek data (Lewis et al. 2001). Appendix 11 elaborates further on the details of this study and associated turbidity frequencies determined on Caspar Creek.

Several of the main conclusions drawn from the sediment analyses were:

- As much of the increased sediment load was related to increased storm flow volumes--those increases are expected to be short-lived as the Forest grows back. In general, downstream suspended load increases were no greater than would be expected from the proportion of land disturbed. The effects of multiple disturbances on suspended loads were approximately additive.
- Sediment loads are influenced by deposition at temporary storage sites. Annual sediment loads increased 123 to 269 percent in the tributaries, but at mainstem stations increased loads were detected only in small storms and had little effect on annual sediment loads. Sediment loads were affected as much by channel conditions (e.g. organic debris, sediment storage sites, channel gradient, and width-to-depth ratio) as by sediment delivery from hillslopes.
- Sediment increases in North Fork tributaries probably could have been reduced by avoiding activities that denude or reshape the banks of small drainage channels.

Additionally, sediment related issues associated with geology (surface erosion, mass wasting) are discussed in the geology section.

10.3.3 Dissolved Oxygen

Dissolved oxygen (DO) refers to the concentration of oxygen dissolved in water. Adequate DO levels are important for supporting fish, invertebrates, and other aquatic life. The capacity of water to hold oxygen in solution is inversely proportional to temperature, e.g., higher stream temperatures result in lower DO. In general, most forest streams have cool temperatures, rapid aeration rates, and relatively low oxygen demands. As a result, stream water is normally close to or fully saturated with dissolved oxygen.

Most forest streams have low vulnerability to low DO because fine organic matter is generally minimal, and re-aeration of flowing water is more than sufficient to maintain high levels of DO. Dissolved oxygen was measured once in April, August, October, and February 1968-1969, in the unlogged North Fork Caspar Creek and in the South Fork Caspar Creek area, which has had road constructed recently. DO samples ranged from 9.4 to 12.0 ppm on the North Fork, and 8.6 to 12.0 ppm on the South Fork (Kopperdahl et al. 1971). These DO values are in the range of DO saturation; however decomposition of logging slash was seen as a cause for an increase in the amount of carbon dioxide concentration in the logged SF Caspar Creek. Current forest practices are not believed to input enough slash to cause management-induced depletion of DO through an increase in biological oxygen demand, except where DO is naturally low (Skaugset and Ice 1989).

10.3.4 Nutrients

Nitrogen and phosphorus are two nutrients that stimulate plant growth. The nitrogen-to-phosphorus ratio in solution in the water column determines the primary productivity of water bodies.

Forest streams in the region commonly have very low background concentrations of nitrogen compounds, often lower than 0.01 mg/l (MacDonald et al. 1991). Nitrogen export to the aquatic system varies greatly during the year, reaching annual maximums in autumn with leaf fall (WDNR 1997). Nitrogen-fixing plants such as alder can increase levels of dissolved nitrogen (nitrate) in stream runoff. Nitrate is the predominant form in unpolluted water, and ammonia may exist as an intermediate breakdown product of organic nitrogen, fertilizers, and animal wastes. Both ammonium and nitrate are readily taken up by aquatic biota, so an increase in nitrate concentrations upstream tends to diminish rapidly downstream. However, biological activity due to increased concentrations of nitrogen can deplete dissolved oxygen, which could affect fish and other aquatic organisms.

Phosphorus is tightly conserved within forest ecosystems (Salminen and Beschta 1991). Studies in forested watersheds indicate phosphorus tends to be adsorbed to and carried by fine sediment owing to the high proportion of surface area to volume of smaller grain sizes (Meyer 1979; Holton et al. 1988). The adsorbed phosphorus on the fine sediment is contained within the mineral lattice of the sediment and is therefore unavailable for dissolution or biological uptake. The net effect of phosphorus adsorption by stream sediments is to convert dissolved phosphorus to fine-particulate phosphorus, which is suspended during periods of high, turbulent flows, primarily during the winter months; the dependence upon high turbidity and suspended sediment reduces the effect of summertime phosphorus concentrations (WDNR 1997). However, the dynamics of phosphorus and sediment in stream systems of western coastal forests have received little attention.

Timber harvesting, burning, and grazing may cause an increase in stream nutrients. Harvesting of forests has been shown to increase nitrate levels as much as three to five times for up to 3 to 5 years (Fredricksen et al. 1975; Sollins and McCorison 1981), although severe burning has resulted in changes 10 times higher. Soil erosion and input of organic matter are the primary mechanisms for increasing phosphorous levels in aquatic systems. Systematic scientific reviews, however, have concluded that forest practices in the wetter forests are unlikely to increase phosphate concentrations substantially in aquatic systems (MacDonald et al. 1991; Salminen and Beschta 1991; Wolf 1992).

Water chemistry variables (total alkalinity, hardness, dissolved solids, total phosphate, nitrate, chloride, sulfate, tannin, and pH) measured in the North and South Forks of Caspar Creek 1968-1969, generally varied between seasons, but conditions in logged and unlogged streams were usually similar (Kopperdahl et al. 1971). A study by Dahlgren (1998) on the effects of clearcuts on nitrate concentration in stream water in the Caspar Creek watershed indicated that the nitrate concentrations in stream-water were increased after clear-cutting, especially during high-discharge storm events. However, the elevated nitrate concentrations were substantially reduced downstream, and they returned to background levels downstream of the experimental watershed. Bottorff and Knight (1996) found that an increase of light, water temperature, and/or nutrients, through the riparian buffer zone after logging lead to increases in benthic algae and corresponding increases in density, relative abundance, and number of taxa in macroinvertebrate populations.

10.3.5 Fecal Coliform

Fecal coliform is a group of bacteria commonly used for water quality monitoring. Fecal coliform bacteria are present in the gut and feces of warm-blooded animals, and contribute to gastro-intestinal illness in humans. In forested areas, high levels of coliform bacteria are associated with inadequate waste disposal by recreational users, the presence of livestock or other animals in the stream channel or riparian zone, and poorly maintained septic systems (MacDonald et al. 1991).

The day-use areas and campgrounds in JDSF all use pit toilets from which wastes are removed and trucked to a wastewater treatment plant. A septic tank and leachfield serves Mendocino Woodlands Camp. The Parlin Fork Conservation Camp is served by a septic tank, settling pond, and leachfield. Two additional leach fields are planned for the Parlin Camp. There are no data, however, that suggest contamination by fecal coliform bacteria is a problem in the JDSF assessment area.

10.3.6 Grazing Animals

The New McGuire Ranch supports about 80 cattle, and is upstream of JDSF lands in the headwaters of the South Fork Noyo River. The South Fork Noyo River is dammed at its headwaters, outside of JDSF, to provide a water source for the cattle. The Watershed Sanitary Survey prepared for the City of Fort Bragg's Water System (SHN 1995) rates the impact to water quality of grazing animals and other agricultural activities at Camp 19 as low.

Deer and other wild mammals are common on JDSF lands, and can be assumed to have minor water quality impacts; grazing and wild animals are probable sources for Giardia cysts, viruses, and bacteria that are present at low levels in the water sources that supply the City of Fort Bragg. Analysis of water samples collected from the Noyo River, Newman, and Simpson (Waterfall Gulch) diversions revealed no problems with general mineral, physical, or inorganic water quality parameters (SHN 1995).

10.3.7 Domestic Water Supplies

Approximately 60 percent of the City of Fort Bragg water supply is drawn from an intake on the mainstem Noyo River approximately 2.5 miles downstream of the confluence with the South Fork Noyo River. The City of Fort Bragg's water supply intake on the Noyo River consists of a direct diversion system installed in 1992 and a Ranney infiltration gallery system built in 1982. The latter system has perforated pipe buried in 8 feet of gravel in the river bed. The Ranney system has experienced considerable problems due to sealing of the bed surface by fine sediment, hence the development of the direct diversion system. The Ranney system is still used, however, when winter turbidity levels in the river exceed 80 to 100 NTUs (Ted Steinhardt, City of Fort Bragg, Water Plant Manager, personal communication). City of Fort Bragg records indicate an increase in turbidity levels in the mid-1980s to early 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 City also draws water by direct surface diversion from two small streams (Newman Gulch and Waterfall Gulch) in the Lower Noyo River and Hare Creek planning watersheds.

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 with 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.

10.4 Regulatory Framework

Evaluation of potential hydrologic and water quality impacts involves consideration of federal, state and local regulations, standards and policies. Actions resulting from the Forest Management Plan may be subject to one or more of the following standards relating to protection of these resources:

Federal Clean Water Act. The Noyo River and Big River have been listed as sediment impaired watercourses by the U.S. Environmental Protection Agency, under Section 303 (d) of the Clean Water Act. Based on this listing, technical Total Maximum Daily Load reports were prepared (1999 and 2001 respectively), which estimate the existing sediment load and the sources, and define required reductions in sediment input. Significant reductions are required for sediment derived from roads.

State Porter-Cologne Water Quality Act. This act mandates the development of a Water Quality Control Plan (i.e. Basin Plan) for the North Coast Region.

The following waste discharge prohibitions pertain to logging, construction, and associated activities in the North Coast Region.

1. The discharge of soil, silt, bark, slash, sawdust, or other organic and earthen material from any logging, construction, or associated activity of whatever nature into any stream or watercourse in the basin in quantities deleterious to fish, wildlife, or other beneficial uses is prohibited.
2. The placing or disposal of soil, silt, bark, slash, sawdust, or other organic and earthen material from any logging, construction, or associated activity of whatever nature at locations where such material could pass into any stream or watercourse in the basin in quantities which could be deleterious to fish, wildlife, or other beneficial uses is prohibited.

The following water quality objectives, from Section 3 of the Basin Plan, are considered of particular importance in protecting beneficial uses from unreasonable effects due to discharges from logging, construction, or associated activities:

1. Waters shall be free of coloration that causes nuisance or adversely affects beneficial uses.
2. Turbidity shall not be increased more than 20 percent above naturally occurring background levels.
3. Waters shall not contain taste or odor-producing substances in concentrations that impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin, which cause nuisance or adversely affect the beneficial uses.
4. Waters shall not contain floating material, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses.
5. Waters shall not contain substances in concentrations that result in deposition of material that causes nuisance or adversely affect beneficial uses.
6. The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.
7. All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life.
8. Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses.

California Forest Practice Rules (FPRs) The FPRs have several guidelines regarding soil erosion and water quality impacts. Examples include:

- Article 4, section 914.2: Limits tractor operations to minimize soil disturbance.
- Article 4, Section 914.6: Waterbreak spacing along roads and skid trails is discussed relative to the Erosion Hazard Rating;
- Article 6: "The purpose of this article is to ensure that the beneficial uses of water… are protected from potential significant adverse site-specific and cumulative impacts associated with timber operations." This section includes a number of provisions for the protection of water quality.
- Article 12: Logging roads and landings: "All logging roads and landings in the logging area shall be planned, located, constructed, reconstructed, used and maintained in a manner which… minimizes damage to soil resources and fish and wildlife habitat; and prevents degradation of the quality and beneficial uses of water." This section includes a number of provisions for the protection of water quality.

10.4.1 Proposed JDSF Management Measures

Appendix II of the DFMP contains detailed goals and objectives. Goals #3 (Watershed and Ecological Processes) and #4 (Forest Restoration) pertain to the protection of hydrologic and water quality resources as such:

- Maintain and recruit structural elements necessary for properly functioning habitats.

- Utilize forestry practices that will maintain stability of hillslope areas and control sedimentation caused by accelerated mass wasting and surface erosion.
- 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.
- Restore and decommission roads to minimize WLPZ and unstable roads.
- Minimize sediment production from roads.

In the effort to achieve the hydrologic and water quality goals, the DFMP incorporates measures addressing the following issues:

- Special Concern Areas (Appendix III of the DFMP), which includes watercourse and inner gorge protections
- Road Management Plan (Appendix VI of the DFMP)
- Silvicultural Allocation Plan (Chapter 3, DFMP pages 48-51)
- Hillslope Management to Provide for Slope Stability (Chapter 3, DFMP page 71)

These measures (detailed in the geology and forestry sections) effect hydrology and water quality by working to reduce sediment, turbidity, and peak flow issues related to timber management.

10.4.2 Thresholds of Significance

Based on policy and guidance provided by CEQA (Public Resources Code (PRC) Section 21001 and the CEQA Guidelines), an impact of the proposed project would be considered significant to hydrology or water quality if it results in or more of the following:

a) Violate any water quality standards or waste discharge requirements;
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted);
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site;
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;
f) Otherwise substantially degrade water quality;
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map;
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows;

i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam;
j) Inundation by seiche, tsunami, or mudflow.

10.4.3 Project Impacts

Hydrologic and water quality impacts are considered significant if they exceed targets set by federal, state, or local guidelines. Timber management and harvesting generally effects hydrology and water quality by the amount of tree removal, the silvicultural style of harvesting, the proximity to watercourses, and by the transportation network constructed to manage the property.
The project does not propose to include housing or any other structures, does not contain a levee or dam, nor is the area susceptible to seiche, tsunami, or mudflows. Hence impacts g) through j) above are not applicable to this project, and no impacts will occur under any alternative and no further evaluation is necessary.

Impact 1: *Violate any water quality standards or waste discharge requirements* (Less Than Significant)

Surface erosion and erosion from roads and timber harvesting can potentially increase turbidity levels in watercourses which in turn, can violate water quality standards. Appendix 11 shows several of the conclusions from watershed studies conducted in the Caspar Creek watershed, which have included suspended sediment measurements. In general, suspended sediment and related turbidity are complex and dynamic variables that vary from headwater to mainstem channels. However, increases in suspended sediment loads are likely to be minimized by efforts to reduce management caused sediment inputs to the drainage networks.

The DFMP incorporates watercourse protection measures (pages 47, 48, and 70 DFMP) including several practices above standard California Forest Practice Rules. The watercourse protections will significantly minimize equipment work in or near a stream channel. Vegetation requirements for watercourse protection zones will also minimize sediment delivery to the watercourses. The DFMP also has an extensive Road Management Plan (Appendix VI of the DFMP) to inventory, prioritize, and address road related erosion problems. Limited new road construction is anticipated, and upgrading and formal abandoning of roads are goals of the plan.

As discussed in the geology section, the DFMP proposes a Hillslope Management Element to provide for slope stability. Inner gorge areas and potential unstable features will be identified during THP preparation or road layout, and a Certified Engineering Geologist will be consulted for appropriate measures to avoid or minimize potential impacts. The DFMP proposes to mitigate the potential for management-related landsliding through the identification of unstable areas, and the implementation of low-impact management practices in those areas. Guidelines for these management strategies are contained primarily within the Road Management Plan, the Hillslope Management discussion, and the day-to-day guidelines presented in the Operational Implications of Watershed Analysis. Problem areas will be mitigated or avoided, as appropriate, and Certified Engineering Geologists will be retained when operations or improvements are proposed on or near unstable areas. A Certified Engineering Geologist will review inner gorge slopes during layout of timber sales.

There is no cattle-grazing on JDSF, although there are approximately 80 head of cattle on the New McGuire Ranch upstream of JDSF in the headwaters of the South Fork of the Noyo, with a dammed water source. The day-use areas and campgrounds in JDSF all use pit toilets from which wastes are removed and trucked to a wastewater treatment plant. No violations of waste discharge requirements are expected from implementation of the DFMP.

Mitigation: None required.

Impact 2: ***Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level.*** **(No Impact)**

Timber harvesting has had the effect of increasing summer low flows typically by decreasing evapotranspiration by trees so that water remains in the soil (Keppeler 1998; Keppeler and Zeimer 1990). No depletion of groundwater supplies is expected to result from the implementation of the DFMP.

Mitigation: None required.

Impact 3: ***Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site:*** **(Less Than Significant**.)

The DFMP does not propose any drainage pattern alterations. However, heavy equipment operations and road networks can indirectly cause stream course alterations which could possibly result in erosion or siltation on- or off site.

The DFMP incorporates watercourse protection measures (pages 47, 48, and 70 DFMP), including several practices above standard California Forest Practice Rules (FPRs). FPR 923.2 (h) requires crossings to be constructed to prevent diversion potential of stream overflow down the road. The watercourse protections will substantially minimize equipment work in or near a stream channel. Vegetation requirements for watercourse protection zones will also minimize sediment delivery to the watercourses. The DFMP also has an extensive Road Management Plan (Appendix VI of the DFMP) to inventory, prioritize, and address road related erosion problems. Limited new road construction is anticipated, and upgrading and formal abandoning of roads are goals of the plan.

Mitigation: None required.

Impact 4: ***Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site*****. (Less Than Significant)**

The DFMP does not propose any drainage pattern alterations. However, timber harvesting and road systems can indirectly cause increases in the amount of surface runoff that could result in flooding on- or off site. Timber harvesting can cause increases in peak flows resulting from decreased interception loss and decreased evapotranspiration. Roads can also alter the runoff patterns of a drainage network by more direct routing of runoff, and from compacted area of the road itself.

The DFMP incorporates watercourse protection measures (pages 47, 48, and 70 DFMP), including several practices above standard California Forest Practice Rules. The watercourse protections will significantly minimize equipment work in or near a stream channel. Vegetation requirements for watercourse protection zones will also minimize sediment delivery to the watercourses. The DFMP also has an extensive Road Management Plan (Appendix VI of the DFMP) to inventory, prioritize, and address road related erosion problems. Limited new road construction is anticipated, and upgrading and formal abandoning of roads are goals of the plan. Additionally, the Silviculture Allocation Plan (Chapter 3, DFMP pages 48-51) confines evenaged management to approximately one-third of the property, limiting the scope of potential clearcut acres.

Modeling of peak flow was conducted for the five alternatives (Appendix 11). Limited future road construction is anticipated in the project. Other than road construction, timber harvesting has the potential to create or contribute additional runoff in the area. Current and anticipated project peak flow increases are less than 11 percent for the 2-year storm return interval using a dry wetness index of 50. While no threshold standards have been determined for peak flow increases, studies (Lewis et al. 2001, Grant et al. 1999, Zeimer 1998) have indicated that peak flow increases in this range have been relatively benign, causing no significant adverse effects (see Appendix 11).

Mitigation: None required.

Impact 5: ***Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff.*** **(Less Than Significant)**

Limited future road construction is anticipated in the project. Other than road construction, timber harvesting has the potential to create or contribute additional runoff in the area. Modeling of peak flow was conducted for the alternatives (Appendix 11). Current and anticipated project peak flow increases are less than 11 percent for the 2-year storm return interval using a dry wetness index of 50. While no threshold standards have been determined for peak flow increases, studies (Lewis et al. 2001, Grant et al. 1999, Zeimer 1998) have indicated that peak flow increases in this range have been relatively benign, causing no significant adverse effects (see Appendix 11).

Mitigation: None required.

Impact 6: ***Otherwise substantially degrade water quality.*** **(No Impact)**

No other issues were identified as having the potential to substantially degrade water quality; however, related issues are discussed in the Biological Resources and Geology and Soils Sections of this report.

10.5 Alternatives

A comparison among the various alternatives regarding hydrology and water quality impacts is provided in Table 45.

TABLE 45
COMPARISON OF HYDROLOGY AND WATER QUALITY RELATED IMPACTS IN RELATION TO THE VARIOUS ALTERNATIVES

Alternatives						Discussion
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant–Mitigation Feasible (5) Significant–Mitigation Not Feasible**
Impact 1. Violate any water quality standards or waste discharge requirements						
Alt. A						Alternative A (No Action) would not result in timber harvest but would result in sedimentation impacts through deterioration and continued use of existing roads. The primary water quality standards associated with JDSF are turbidity, and to a very limited extent, campground facilities. Turbidity is minimized in the harvest management alternatives (B-E) by watercourse protection zones. The road management plan (Alternatives C-E) will also help to identify and reduce surface erosion from roads, particularly with roads that exist within riparian zones. Alternative A would not have harvest related turbidity, but both alternatives A and B could have more turbidity from roads due to a less aggressive road management program. Campground maintenance is unchanged in all alternatives, and is not anticipated to violate any waste discharge requirements. None of the alternatives are expected to violate water quality standards or waste discharge requirements.
Alt. B						
Alt. C DFMP						
Alt. D						
Alt. E						
Impact 2. Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level.						
Alt. A						None of the alternatives will result in a depletion of groundwater recharge. On the contrary, timber harvesting has been shown in a number of studies to increase seasonal low flows due to the net loss of evapotranspiration from trees.
Alt. B						
Alt. C DFMP						
Alt. D						
Alt. E						
Impact 3. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on- or off-site.						
Alt. A						None of the alternatives propose any drainage pattern alterations; however, heavy equipment operations and road networks can indirectly cause stream course alterations which could possibly result in erosion or siltation on- or off site. Each of the management alternatives (B-E) has watercourse protection measures and road improvements: the relative scope of the protections increase with each alternative (e.g. alternative B maintains the current standard protections, while alternative E has the most sweeping protections). Alternatives A and B could have more road related erosion than the other alternatives due to a less aggressive road management program.
Alt. B						
Alt. C DFMP						
Alt. D						
Alt. E						

TABLE 45
COMPARISON OF HYDROLOGY AND WATER QUALITY RELATED IMPACTS IN RELATION TO THE VARIOUS ALTERNATIVES

Alternatives						Discussion
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant–Mitigation Feasible (5) Significant–Mitigation Not Feasible**
Impact 4. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site.						
Alt. A						Alternative A has no action associated with it and therefore would have no impact. None of the alternatives propose any drainage pattern alterations; however, timber harvesting and road systems can indirectly cause increases in the amount of surface runoff, which could result in flooding on- or off site. Contemporary increases in peak flows from timber management have been apparently benign. None of the alternatives are expected to substantially alter the amount of surface runoff in a manner that would result in flooding.
Alt. B						
Alt. C DFMP						
Alt. D						
Alt. E						
Impact 5. Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff.						
Alt. A						Contemporary increases in peak flows from timber management have been apparently benign. None of the alternatives are expected to exceed the capacity of stormwater drainage systems or provide substantial additional sources of polluted runoff.
Alt. B						
Alt. C DFMP						
Alt. D						
Alt. E						

11. LAND USE AND PLANNING

11.1 Setting

11.1.1 Property Location

JDSF covers approximately 48,652 acres in central Mendocino County. It varies from 4 to 8 miles wide in a north-south direction, and is nearly 18 miles long on the east-west axis. Its western boundary is within 1.5 miles of the coast, and the eastern boundary generally lies on the crest of the Mendocino Ridge separating the coastal slopes from the inland valleys, approximately 7.0 miles west of Willits (See Figure 1).

The JDSF boundary is irregular, especially at the western end where the property line zigzags following section and subsection lines. There are 11 privately owned parcels within the ownership, most in the southwest corner. A large private ownership extends into the middle of JDSF from the south. (See Figure A in the attached Figures section)

The City of Fort Bragg, where JDSF headquarters facility is located, is 2 miles north of the western property boundary. The town of Mendocino is located 2 miles west of the southwest corner of JDSF; Ukiah, the county seat, is 35 miles southeast of JDSF.

11.1.2 JDSF Management Policies and Land Uses

Management of JDSF is dictated by the enabling legislation for the State Forest program (PRC Sections 4631–4658) and by the Board of Forestry's policies for management of State Forests (Board of Forestry, 1978). Essentially, the State Forest program exists to demonstrate economic forest management practices, as well as, promoting recreational use (refer to Project Information Section of this report).

The different land uses on JDSF include camping and picnicking facilities, two separate conservation camps (jointly administered by the CDF and California Department of Corrections) including four permanent residences and a mobile home park for state employees. In addition, the Woodlands Forest Fire Station is located on JDSF property near County Road 408 (Little Lake Road). Remnants from the Caspar Lumber Company include a schoolhouse, a large equipment barn and numerous railroad trestles in various conditions

11.1.3 Mendocino County General Plan Land Use Designation and Policies

JDSF is designated as Forest Lands in the Mendocino County General Plan (Mendocino County, 1981, rev. 1993). The Forest Lands classification applies to all lands that is suited for and is appropriately retained for the growing, harvesting, and production of timber and timber-related products. The classification should include lands eligible to be zoned Timberland Production, intermixed smaller parcels, and other contiguous lands. Uses consistent with the Forest Lands designation include forestry, timber processing, agricultural uses, cottage industries, residential uses, recreation, and uses determined to be related to and compatible with forestry. The incorporated

town of Fort Bragg is located near the Forest's western border but does not have a sphere of influence extending into JDSF boundaries; therefore plans that are submitted for JDSF do not need to be reviewed by the City for a consistency determination (Personal communication, Linda Ruffing, Community Development Director).

Currently, Mendocino County is updating their general plan. Although this plan will not be finalized for five years or so, there are no foreseeable changes occurring within the plan that may affect land use either within or adjacent to JDSF, according to the Mendocino County Senior Long Range Planner Pam Townsend (Personal communication).

11.1.4 Zoning

The entire JDSF ownership is zoned by Mendocino County as TPZ. This designation was created by Mendocino County in accordance with the State's Timberland Productivity Act of 1982. Land use in a TPZ district is restricted to growing and harvesting timber as well as certain other compatible uses, and establishes a presumption that timber harvesting will occur on such lands. Approximately 300 acres of JDSF is located within the Coastal Zone, but this portion of the Property does not qualify as a Special Treatment Area; therefore, special restrictions are not applicable (See Figure A in the attached Figures section).

11.1.5 Surrounding Lands

Lands to the north and south of JDSF are classified as FL in the Mendocino County General Plan. Lands to the east of JDSF are classified as FL and RL. The Land Use Classifications for the west side of JDSF are RR, RMR, PS, and SW (Mendocino County, 1981 rev. 1983; (See Figure A in the attached Figures section). Rural Residential is designated for small-scale agriculture; and Remote Residential designations put constraints on commercial agriculture, timber production, and/or grazing. The greatest potential for conflict between JDSF and private landowners is in the Rural Residential areas where harvesting practices on JDSF could indirectly impact the private lands. Examples of these impacts are aesthetics, loss of wildlife on the private lands, and noise impacts (See Figure A in the attached Figures section).

The DFMP discusses the potential purchase of inholdings within JDSF (DFMP, pages 7, 85, and 86). By filling in the existing inholdings, the property can be managed on a watershed basis, rather than arbitrary boundaries, thus facilitating the management goals of the Forest. The majority of inholdings are located within the western portion of JDSF, generally between County Roads 408 and 409. The inholding that is bisected by Highway 20 and is located in the headwaters of the SF Noyo River is currently owned by Soper-Wheeler and Hawthorne Timber Company. Pioneer Resources Timber Company currently owns the one inholding located within the eastern portion of JDSF. This property consists of approximately 160 acres within the James Creek watershed. These inholdings can be incorporated into the through either land or timber trades.

There is one major outholding of approximately 800 acres located on the east side of Mendocino Woodlands, near the mouth of the Little North Fork Big River. JDSF's property configuration can also be adjusted through minor property boundary changes. 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. Private timber companies generally own these areas, which make the adjustments potentially feasible through either land or timber trade with adjacent owners.

11.2 Regulatory Framework

Land use impacts are typically described as inconsistencies with applicable land use plans and policies. In accordance with California law, local governments directly control land use on privately-owned lands through general plans and zoning ordinances. The General Plan provides policy direction regarding land use, and the zoning code provides specific mechanisms to implement General Plan policies. JDSF, as a state-owned forest is not directly subject to the County General Plan or zoning standards; however, operation of JDSF should not result in conflicts with General Plan policies, particularly as the relate to compatibility with surrounding land uses.

The Mendocino Planning Department does not require a formal consistency determination for the adoption of the Management Plan (Personal communication with Frank Linch, Senior Planner). They do however request that a consistent setback zone for properties within and outside of the coastal zone that border TPZ be established. The Local Coastal Program (LCP) requires a 200-foot setback distance from residential areas adjacent to TPZ, but in prior instances with local land owners, they have requested that the setback zone be reduced from 200 feet to either 50 or 100 feet. The DFMP states that a 200 foot buffer will be maintained for residential areas that are adjacent to JDSF, which will comprise a total of approximately 1,153 acres. (DFMP page 147).

Other regulatory mechanisms, such as the California Forest Practice Rules (CDF, 2002), the Basin Plan of the RWQCB, and various endangered species recovery plans, indirectly control land use; compatibility with these plans is analyzed elsewhere in this report, under the appropriate resource category heading.

Management of JDSF is also dictated by the enabling legislation for the State Forest program (PRC Sections 4631–4658) and by the Board of Forestry's policies for management of State Forests (Board of Forestry, 1978).

11.3 Proposed JDSF Management Measures

The Project Information Section of this report contains additional discussion regarding legislative requirements for the State Demonstration Forests and Board Policy.

The JDSF management plan will be consistent with the Forest Practice Rules (CDF, 2002). Please refer to each applicable section for conformance guidelines as they relate to FPR.

CDF has verified that the DFMP is consistent with all other CDF plans and policies (Personal communication, Marc Jameson).

11.4 Thresholds of Significance

Based on policy and guidance provided by CEQA (PRC Section 21001 and the CEQA Guidelines), an impact of the proposed project would be considered significant if it causes one or more of the following

- Physical division of an established community or a conflict with any applicable habitat or community conservation plans;
- A conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project adopted for the purpose of avoiding or mitigating an environmental effect.

11.5 Impacts

Impact 1: *Would the project cause the physical division of an established community or a conflict with any applicable habitat or community conservation plans* (No Impact).

There are no habitat or community conservation plans that are applicable to the project area that may be in conflict with the adoption of the DFMP (Personal communication, Marc Jameson). JDSF is located within a rural area; therefore, the implementation of the Management Plan will not divide an established community.

Mitigation: None Required.

Impact 2*: Would the project conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project adopted for the purpose of avoiding or mitigating an environmental effect* (Less Than Significant).

The land use associated with inholdings and adjacent parcels is generally Timber or Rural Residential. JDSF is zoned TPZ, and there have been numerous years of harvesting activity within the Forest. The Timberland Productivity Act states, "Timber operations conducted [on TPZ land pursuant to the FPRs]…shall not constitute a nuisance, public or private."

The Mendocino Planning Department does not require a formal consistency determination for the adoption of the Management Plan (Personal communication with Frank Linch, Senior Planner). They do however; request a consistent setback zone from non-industrial timberland owners. The LCP requires a 200-foot setback distance from residential areas adjacent to TPZ. The DFMP states that a 200-foot buffer will be maintained whenever the adjacent land owner is a non-industrial timberland owner.

In addition, refer to the Noise, Recreation, and Aesthetic Sections for related discussion.

Mitigation: None Required.

11.6 Alternatives Analysis

A comparison of land use impacts among the various alternatives is presented in Table 46.

TABLE 46 COMPARISON OF LAND USE IMPACTS AMONG THE VARIOUS ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant–Mitigation Feasible (5) Significant–Mitigation Not Feasible**
Physically divide of an established community or a conflict with any applicable habitat or community conservation plans.						
Alt. A						The JDSF is within a rural, resource setting with several public access roads running through the site. None of the alternatives would result in the physical division of a community. No habitat or community conservation plans are applicable to JDSF.
Alt. B						
Alt. C DFMP						
Alt. D						
Alt. E						
Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project adopted for the purpose of avoiding or mitigating an environmental effect.						
Alt A						The DFMP states that a mutually agreeable silvicultural limitation will be established within 200 feet of an adjacent neighbor who is not an industrial timber owner; therefore, any potential impacts are less than significant.
Alt. B						
Alt. C DFMP						
Alt. D						
Alt. E						

12. NOISE

12.1 Setting

12.1.1 Existing Noise Levels

The relative loudness, or intensity of sound energy is measured in decibels (dB). A decibel is a logarithmic unit of sound energy that represents the smallest variance in sound that the human ear can detect. Environmental noise is usually measured in A-weighted decibels (dBA) and typically fluctuates over time. An A-weighted decibel (dBA) is a decibel corrected for the variation in frequency response of the typical human ear at commonly encountered noise levels. Noise measurement descriptors also include the energy-equivalent noise level (Leq), the day-night average noise level (Ldn), and the Community Noise Equivalent Level (CNEL).

The steep forested character of the land in and around JDSF creates an environment in which noise is trapped between the tops of surrounding ridges. Existing ambient noise levels for locations within the JDSF are generally a function of the distance from roads, especially State Route 20. State Route 20 traverses the Coast Range of mountains from the inland valley town of Willits to the coast, just south of Fort Bragg. State Route 20 handles most east to west commercial, recreational, and commute traffic for the region. The Mendocino County General Plan describes State Route 20 as "noisy at Fort Brag," but does not comment directly on noise levels within JDSF.

Other contributing factors to the ambient noise environment, including light traffic on lesser roads, target shooting, hunting related gunfire, wind noise, noise from bordering residences, and recreational use generated noise are likely minimal, seasonal, or temporary. Target shooting, hunting, and Off Highway Vehicle (OHV) are typically temporary seasonal sources of noise.

Logging operations conducted within and adjacent to JDSF potentially present a source of significant seasonal temporary noise. Individual logging operations, and the noise associated with them, are temporary in nature. CDF may place restrictions on time of day, day of week, and seasonal timing of timber harvest to protect wildlife, residents, and prevent problems associated with wet weather operations. Timber falling and associated tasks are generally conducted during daylight hours and proceed rapidly. Typical felling operations primarily require the use of chainsaws, with some use of all terrain vehicles and trucks. Log yarding within JDSF is conducted using either tractor, cable, or helicopter. Noise production levels vary widely depending on yarding method. Tractor yarding produces noise levels associated with the use of diesel heavy tracked and wheeled equipment. Cable yarding uses a yarder that is stationary during operation and generally positioned on or close to roads due to its size and limited mobility. The cable yarding process normally uses noisy whistle signals for communication between equipment operators and choker setting crews. Helicopter yarding has the greatest noise environment impact of yarding methods in use within JDSF.

12.1.2 Overview of Helicopter Logging

Since the early 1970s, helicopters have been used to haul logs from the areas in which traditional logging is difficult due to access and in sensitive environments such as steep, wet, or geologically unstable terrain. Within these environments, helicopter logging has generally been adopted by the timber industry as a means to diminish the undesirable impacts of traditional logging on streams and to minimize disturbance of soils and vegetation. Within JDSF, areas inaccessible for conventional ground based yarding methods are generally steep remote canyons and ridges, but some are created by odd ownership or management area configuration. Helicopter logging is used to haul logs from the harvest area to a landing where they can be transported by truck. Helicopter logging operations often use log landings and haul roads built during previous timber harvest operations. Economically effective use of helicopters generally keeps the flight times and distances for each load short.

Before a helicopter arrives at a logging site, timber fallers enter the area and cut an adequate volume of timber in lengths and weights appropriate for helicopter lifting. Radio communication is used to direct ground crews who set cables and hooks for the lift. The lift is accomplished by attaching a hook to a log choker cable. The helicopter hovers between 200 and 250 feet above the ground to retrieve logs. Lifting capacities vary, however the typical helicopters used can lift between 10,000 and 20,000 pounds. Because log loads are typically flown a short distance to the nearest roadside log landing and detached from the helicopter, loaded flights over adjacent properties are avoided. Typical daily helicopter use may range from twelve hours a day in summer to five hours per day in winter. CDF generally restricts timber harvest to daylight hours, often excluding weekends and holidays near residences or other sensitive receptors. The helicopter generally remains in flight at relatively low altitudes during the yarding process, except for refueling, maintenance, and shift changes. Helicopters en route to JDSF logging operations are subject to Federal Aviation Administration (FAA) requirements that impose a minimum flight altitude of 500 feet throughout the helicopter flight-path, with the exception of airports.

12.1.3 Characteristics of Helicopter Noise

The main noise from helicopter operation is from the rotors. Helicopters have two types of rotor configurations 1) a single overhead rotor with a smaller tail rotor for control; or, 2) a tandem overhead rotor system with no tail rotor. Generally, flight operations during approach and descent, and maneuvers such as banked turns produce the highest noise levels. The primary rotor-blade noise-sources are the sound pulses generated by "bladeslap," technically called the Blade-Vortex Interaction (BVI); and the High-Speed Impulsive (HSI) noise related to trans-sonic effects on the advancing blade. BVI noise is usually associated with descent or level flight at low to medium velocities. HSI is associated with the takeoff and high-speed flight. The interaction of the main rotor with its own blade-wake (horizontal), and the blade wake from the tail rotor (vertical), also may generate significant noise levels (although these noises usually occur together with the noise of the engine and the main BVI or BSI sounds).

Logging helicopters typically use turboshaft jet engines. The noise associated with the air disturbance produced by the engine at takeoff can equal the noise of the rotors. The air compressor, the combustion chamber, and exhaust (jet nozzle) generate engine noise. These jet engine features produce three types of noise:

1) noise radiated outward from the air intake (primarily compressor noise plus aerodynamic noise);
2) noise radiated from vibration of the engine shell; or
3) exhaust noise.

Exhaust noise is primarily generated outside the jet engine nozzle in the mixing region of the high-velocity jet wash and the surrounding air. Engine noise on the landing pad is generally greatest in the plane of the engine air intake/exhaust.

Helicopter noise when landing is often a product of blade functions, especially BVI, and jet engine noise is much less than during take off. At take off, the helicopter engine is usually near maximum power, and jet engine noise becomes very significant. The pilot will often change blade angle at take-off to increase lift, which increases rotor noise. When the helicopter hovers to pick up a load, noise is relatively constant, but the jet engine must be increased to near maximum power to accomplish the lift, with an accompanying increase in noise. Typically, if multiple loads are being ferried a small distance, operations will use "hot fueling" that does not require shutting down the helicopter. Hot fueling lasts approximately 3 minutes and eliminates the additional time required to shut down and restart the helicopter, but produces more prolonged periods of noise compared with shutting down and restarting for refueling operations.

12.1.4 Characteristics of Helicopter Noise Propagation

Helicopter noise tends to propagate outward and downward from the aircraft, and may be affected by air temperature, humidity, wind, and terrain. Helicopter noise is loudest when the aircraft is passing directly overhead. Flight speed, altitude, and load as well as relative position of the noise receptor to the helicopter are all factors affecting the noise level heard while the helicopter is approaching, overhead, and departing. As an example, at a flight speed of approximately 55 knots and over a period of four seconds, the difference in noise levels would be approximately 5 dB as the helicopter approaches and reaches a position directly overhead. Some newer helicopters incorporate quieter technology, such as fiberglass rotor blades, which reduce noise through a decrease in required rotor blade speeds. Typical sound frequencies range from 5 to 9000 hertz, with the greatest sound pressure in the 30 to 1000 hertz range. Noise tends to be higher frequency when the aircraft is approaching and low frequency as the aircraft moves away. The long duration for which the noise persists is caused by the low-frequency jet engine components, since low frequency noise propagates through the atmosphere for long distances with little attenuation. The noise level frequencies generated by a helicopter also vary depending on the blade configuration. Typically, helicopters with tandem blades generate less high frequency noise than tail rotor helicopters.

12.1.5 Helicopter Noise Impacts to Domestic Animals and Wildlife

Numerous studies have been conducted to evaluate the impacts of noise on animals. Noise impacts fall into several categories:

1) nesting disturbance;
2) interference with predator detection;
3) interference with food searching;
4) generalized stress that can sap energy reserves; or
5) flight or fight response (nesting hawks will chase helicopters if they come too close, with some mortality due to being struck by rotors reported).

Some research indicates that birds are more disturbed by helicopter noise than fixed-wing aircraft noise. Non-breeding birds appear to be more disturbed by both types of aircraft than breeding birds. Raptor surveys in Alaska by fixed-wing and helicopter craft indicate that birds may be tolerant of noise, but exhibited panic and flight if surprised (as by flying over a cliff edge from above).

Noise impacts would depend on the type of helicopter used in the operation. According to FAA Advisory Circular- AC36-1G, Bell Series and Hughes models noise levels in decibels (dBA) are as follows:

TABLE 47
NOISE LEVELS FOR HELICOPTERS
(decibels = dBA)

Aircraft	Flyover*	Takeoff	Landing
Bell 206 L- III	86.9	87.6	91.1
Bell 206 L-IV	83.3	84.1	87.3
Bell 206 B-III	85.2	88.4	90.7
Hughes 500 D	88.7	NA	NA

Fly over was measured at 150 meters (487.5 feet).

Some comparable sound levels of common sound sources are as follows:

- Auto (60 mph) at 100 feet–65 dBA
- Vacuum cleaner at 10 feet–70 dBA
- Electric lawn mower at 3 feet–85 dBA
- Food blender at 3 feet–90 dBA”

12.1.6 Noise Levels Associated with Traditional Tractor Logging

Traditional tractor logging procedures in JDSF and other timber lands in the region involve felling trees, and then bringing logs to a landing with a tractor or cable wire line. Depending on the size of logs, equipment may vary, although typically either equipment similar to the Caterpillar D6 or D7 bulldozer or a log skidder is used. Following yarding to the log landing, logs are sorted by a either a heel boom or loader equipped with log forks and loaded on to a log truck bound for the mill.

The following table represents the results of noise measurements conducted during active timber harvest operations under traditional tractor logging conditions:

TABLE 48 ACTIVE TIMBER HARVEST SITE EQUIPMENT AND ACTIVITY NOISE LEVEL MEASUREMENTS		
EQUIPMENT/ ACTIVITY	**SOURCE**	**EQUIVALENT CONTINUOUS NOISE LEVEL (Leq)–dB[1]**
Heel Boom Loader	Caterpillar 325	60[2]
Bull Dozer	Caterpillar D8N	63
Bull Dozer	Caterpillar D7G	63[3]
Chainsaw	Stihl 046	65
Clearing Deck Debris & Stacking Logs	Caterpillar 325	60
Skidding & Stacking Logs	Caterpillar 325, Caterpillar S8N w/ backup alarm	65
Shaking Heel Boom Grappler	Caterpillar 325	70
Skidding & Stacking Logs	Caterpillar 325, Caterpillar D7G	64
Skidding & Stacking Logs	Caterpillar 325, Caterpillar D8N, Caterpillar D7G	68
Cutting Trees	Stihl 046	68
Tree Falling	Tree	58[4]

1. Sight line noise measurements distance = 150 feet
2. Idling 56 dB
3. Idling 58 dB
4. Sight line noise measurement distance = 250 feet

Fifteen minute equivalent noise levels (Leq), measured at an active tractor logging operation included the following attributes:

- two fallers in the woods using Stihl 046 chainsaws, with an additional Stihl 046 saw used occasionally on the landing to trim branches or log ends;
- two Caterpillar D7 high-track skidder units;
- one Caterpillar 966 loader equipped with log forks; and
- semi-trucks to haul logs from the landing to the mill. Up to three semi trucks were on site, with the trucks not being loaded usually left idling on the near-by haul road, until they were brought to the landing.

The Leq measurements reported herein include tree falling, limbing, skidding, stacking, sorting, and loading logs onto semi trucks. Noise measurements for these operations resulted in equivalent noise levels between 68 dBA and 83 dBA Leq at a distance of approximately 50 feet.

Traditional tractor logging generates sounds from many sources, throughout the harvest area, and usually throughout the duration of the harvest period. However, the sounds from heavy equipment operating on the ground in the Forest is often dampened, or attenuated, by the surrounding trees and soft ground surface. This type of attenuation would not occur with helicopter logging, since air does not attenuate sounds the same way the ground surface does.

Generally, in even terrain, noise level is reduced by one-half with a doubling of distance between the noise source and the receptor.

12.1.7 Sensitive Receptors

Certain land uses are considered more sensitive to noise levels than others. For example, residential dwellings, motels and hotels, schools, libraries, churches, hospitals, nursing homes, auditoriums, parks, and other outdoor recreation areas generally are more sensitive to noise than are commercial and industrial areas. Rural residential areas are generally considered to be more sensitive to noise than suburban or urban residential areas. Sensitive receptors involving JDSF include areas within the Forest, adjacent to the Forest, and remote from the Forest. Within JDSF, camping areas, hiking trails, and scenic viewpoints may be considered sensitive receptors. Several rural residential dwellings are located near the western boundary of JDSF.

Noise generated within JDSF, or close to the borders of JDSF has potential to impact sensitive receptors within JDSF, adjacent parks, and rural residences. Mendocino Woodlands State Park and Jughandle State Reserve, abutting the west side of JDSF, and Russian Gulch State Park, within the southern portion of JDSF, are potential sensitive receptors to noise produced within JDSF. The state park proposed for the vicinity of lower Big River would also border JDSF. Additional sensitive receptors associated with, but remote from JDSF, include any residences that are subject to truck-generated noise on potential log haul routes between JDSF and area mills, and helicopter noise along flight paths to and from potential logging sites within JDSF.

12.1.8 Noise Standards

The Mendocino County General Plan has identified exterior noise standards, adopted from Environmental Protection Agency suggested standards, applicable to specific categories of land use. For one and two family residential dwellings in rural suburban communities, the maximum exterior noise standard is 40 dBA Ldn between the hours of 10 P.M. and 7 A.M., 45 dBA Ldn between the hours of 7 P.M. and 10 P.M., and 50 dBA Ldn between the hours of 7 A.M. and 7 P.M. The Mendocino County General Plan lacks specific noise standards for every zoning type. The Division of Environmental Health in the County Health Department has established preferred levels or goals for some of the land uses, and the Noise Element of the General Plan defines ranges of acceptability that are used to determine land use compatibility with various noise exposure levels. Mendocino noise policy generally targets protection of the environment from noise, but finds lumbering and agriculture significantly important to warrant the production of necessary noise. This is also reflected in General Plan land use and zoning designations which try to avoid placing an excess of noise sensitive land uses adjacent to agricultural and timber production areas (Mendocino County, 1991).

12.2 Regulatory Framework

Evaluation of potential noise impacts involves consideration of federal, state and local regulations, standards and policies. Actions resulting from the Forest Management Plan may be subject to one or more of the following standards relating to protection of biological resources:

- Noise Control Act of 1972 (42 USC4901 et seq.). Authorizes federal regulation of noise emission standards. The federal government regulates noise emissions of aircraft, railroads, and interstate carrier.

- California Noise Control Act of 1973 (Health and Safety Code 46000 et seq.). The California Noise Control Act requires a noise control element within local general plans.

- The California Code of Regulations, Chapter 9. State Forests-Use and Sales. Subchapter 1. Recreational Use. Article 2. General Restrictions. Section 1412. Noise. The California Code of Regulations states that,

  > No person shall create noise that 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 that produce a sound that can be heard at more than 100 feet from the source.

- The Mendocino County General Plan includes a Noise Element that establishes goals recommending appropriate land use as it relates to the noise environment. The County has not formally adopted a specific noise policy. The Goals and Policies of the Noise Element states, "Lumbering and agriculture are basic to the economy of Mendocino County and necessary noise associated with them must be tolerated; however residential buyers should be informed of the noise potential of sites affected by these industries."

- The 2002 California Forest Practice Act and Rules apply to timber operations within JDSF. CDF provides compliance review and enforcement of THPS under California's FPRs for commercial timber harvesting on all non-federal timberlands. Within JDSF, CDF personnel who are not employed by JDSF review THPs and perform inspections for compliance with the Forest Practice Act and rules adopted by the State Board of Forestry and Fire Protection as well as other state and federal laws that protect watersheds and wildlife.

12.3 Proposed JDSF Management Measures

The DFMP states, as part of Goal #5 Recreation and Aesthetic Enjoyment, "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."

Noise control measures and issues are identified throughout the DFMP. These measures are summarized below:

- Implementation of timber management options may include restricting the timing of timber operations to avoid conflicts with high visitor-use weekends of restricting operating hours to minimize noise pollution (DFMP, Page 76).
- Considerations of noise and disturbance impacts on nest sites and neighbors will affect the decision to prescribe helicopter use in logging operations (DFMP, Page 72).
- Active timber operations within the vicinity (to be discussed at the 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 100 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 (DFMP, Page 77).
- In protecting visitors and neighbors from shooting and related noise, JDSF has declined to establish formal shooting areas (DFMP, Page 28).
- The DFMP identifies the law enforcement jurisdiction of the Mendocino Ranger Unit Chief. Unit chief responsible for upholding state laws, including those specific to noise, in order to protect JDSF from damage and to preserve the peace within JDSF (DFMP, Page 82).
- Timber harvesting within 300 feet of campgrounds and day-use areas will be planned and conducted with the designated site use in mind (DFMP, Page 77).

12.4 Thresholds of Significance

Based on policy and guidance provided by CEQA (PRC Section 21001 and the CEQA Guidelines), an impact of the proposed project would be considered significant if it results in one or more of the following:

- exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;
- a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;
- a substantial temporary increase in ambient noise levels in the project vicinity above levels existing without the project; and
- for a project located within two miles of an airport (or within an airport land use planning area) or a private airstrip, the project would expose people residing or working in the project area to excessive noise levels.

12.5 Impacts

Noise impacts are generally considered significant if they are not consistent with the local general plan. Sensitive receptors considered in the analysis of implementation ofthe DFMP include recreation areas within the Forest itself and rural residences bordering the western edge of JDSF.

Logging related noise generally temporarily and intermittently generates noise levels significantly above ambient noise levels. Specific levels of noise generated during logging operations depend on the particular types, number, and usage rates of equipment used. In the absence of mitigation measures, implementation of the DFMP may significantly increase the level of noise that certain sensitive receptors currently experience.

Impact 1: ***Expose persons to or generate noise levels in excess of standards established in the local general plan or noise ordinance or applicable standards of other agencies.*** **(No Impact)**

The implementation of the DFMP is not expected to result in the production of noise in excess of established levels. The Mendocino General Plan does not specifically set acceptable noise levels for parks or timber properties. Established levels for similar land uses, suchas agricultural areas, are deemed a compatible land uses in noisy environments. The General Plan also recognizes timber harvest related noise as necessary within timber production areas. Timber operations are generally limited to daylight hours.

Mitigation: None required.

Impact 2: ***Expose persons to or generate excessive groundborne vibration or groundborne noise levels.*** **(No Impact)**

Significant groundborne noise and vibration are typically caused by activities such as blasting and pile driving which are not anticipated to result from implementation of the DFMP.

Mitigation: None required.

Impact 3: ***Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.*** **(No Impact)**

All substantial noise levels resulting from implementation of the JDSF Management Plan are temporary and infrequent. No permanent increases in ambient noise levels in the project vicinity above existing levels are expected to result from implementation of the DFMP.

Mitigation: None Required.

Impact 4: ***A substantial temporary or periodic increase in ambient noise levels above levels existing without the project will accompany any logging operations conducted under the DFMP. Sources of noise associated with logging likely to impact the noise environment in JDSF may include log trucks, yarding equipment, tractors, helicopters, saws, and other equipment.*** **(Less Than Significant with Incorporation of Mitigation)**

Mitigation: Active timber operations within the vicinity of occupied campgrounds and picnic areas will be limited to weekdays and non-holidays. Noise abatement mitigation will be included in any timber sale within 100 feet of an open campground or within 200 feet of a residence, park, or other identified sensitive receptor. Camp hosts will be kept informed of activities associated with timber operations affecting campgrounds under their jurisdiction. In addition, noise impacts on nest sites of listed species and neighbors will be considered in decisions to prescribe helicopter use in logging operations. The Mendocino General Plan standards for residential dwellings in rural suburban communities will be used as a guide in estimating noise impacts of specific timber harvest operations. Potential noise levels can generally be determined by considering the equipment used, time of use, terrain, and distance to sensitive receptors.

The following helicopter flight characteristics will be considered in the design of timber management operations to further mitigate noise impacts within and adjacent to JDSF where sensitive receptors are identified:

1) Buffer helicopter pads by using ridges or other solid sound attenuating landscape features where available and practical.

2) Design helicopter flight paths to provide buffering distance from hiking trails, campgrounds, and nest sites of listed species.

3) Where practical, design helicopter flight paths using terrain features that would reduce noise reception by sensitive receptors (i.e. fly behind ridges).

4) Limit times of day for helicopter use to reduce impacts when operating near residential neighborhoods and occupied campgrounds.

Logging operations will increase ambient noise levels near an active timber harvest; however, given the temporary, remote and seasonal nature of timber harvest, the above mitigation measures will reduce noise impacts to a less than significant level.

Monitoring:
Timing: During the life of the JDSF Management Plan
Scope: Forest-wide
Implementation: the Department
Monitoring Responsibility: the Department

Impact: ***For a project located within two miles of an airport (or within an airport land use planning area) or a private airstrip, the project would expose people residing or working in the project area to excessive noise levels.*** **(No Impact)**

The project is not within two miles of a public or private airport and is not within an airport land use planning area.

Mitigation: None Required.

12.6 Alternatives

A comparison of noise impacts among the various alternatives is presented in Table 49.

TABLE 49
COMPARISON OF NOISE RELATED IMPACTS AMONG THE VARIOUS ALTERNATIVES

Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant–Mitigation Feasible (5) Significant–Mitigation Not Feasible**
Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.						
Alt. A						All activities are consistent the policies of the General Plan which provides specific allowances for timber operations.
Alt. B						
Alt. C DFMP						
Alt. D						
Alt. E						
Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels.						
Alt. A						Substantial groundborne noise typically results from blasting or pile driving. None of the alternatives would involve these or other groundborne activities.
Alt. B						
Alt. C DFMP						
Alt. D						
Alt. E						
A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.						
Alt. A						All noise resulting from the project is temporary. None of the alternatives would result in permanent noise increase.
Alt. B						
Alt. C DFMP						
Alt. D						
Alt. E						
A substantial temporary increase in ambient noise levels in the project vicinity above levels existing without the project.						
Alt. A						This alternative would result in no logging-related noise. It would result in no active management regarding shooting and ORVs.
Alt. B						These alternatives will have some logging activities to varying intensities and frequencies, which will result in noise impacts that, in all cases, are less than significant given the mitigation measures specified.
Alt. C DFMP						

TABLE 49 COMPARISON OF NOISE RELATED IMPACTS AMONG THE VARIOUS ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant–Mitigation Feasible (5) Significant–Mitigation Not Feasible**
Alt. D						
Alt. E						
For a project located within two miles of an airport (or within an airport land use planning area) or a private airstrip, the project would exposepeople residing or working in the project area to excessive noise levels.						
Alt. A						The project is not within an airport land use planning area, or within two miles of a public airport or private airstrip.
Alt. B						
Alt. C DFMP						
Alt. D						
Alt. E						

13. PUBLIC SERVICES, POPULATION AND HOUSING, UTILITIES, AND SERVICE SYSTEMS

13.1 Environmental Setting

General descriptions of JDSF setting as it related to Pubic Services, Population and Housing, and Utilities and Service Systems can be located in the Introduction and Land Use section of this EIR. Due to its nature as a demonstration forest, JDSF does not have a population, experience population growth, undergo development that impacts public services, utilities, or service systems.

13.1.1 Significance Criteria

CEQA states that a project would be considered to have a significant effect on public services, population and housing, or utilities and service systems if it would result in one or more of the following:

- Induce substantial population growth.
- Displace a substantial number of existing housing units of people, necessitating construction of replacement housing.
- Result in substantial physical effects from construction of new or altered governmental facilities needed to maintain acceptable service ratios, response times. Or other performance objectives for (1) fire protection, (2) police protection, (3) schools, (4) parks, (5) other public services.
- Fail to comply with wastewater treatment requirements of Regional Water Quality Control Board.
- Require or result in the construction of new or expanded water, wastewater treatment facilities, or stormwater drainage facilities.
- Exceed existing water supplies, wastewater capacity, or landfill capacity.
- Conflict with federal, state, and local statutes and regulations related to solid waste.

13.1.2 Impacts

The DFMP will have no impact on Pubic Services, Population and Housing, and Utilities and Service Systems. None of the above thresholds of significance will be met or exceeded by the proposed DFMP or by any of the identified project alternatives. Further analysis is not warranted.

Mitigation: None required

14. RECREATION

14.1 Affected Environment/Environmental Setting

14.1.1 Jurisdictional Setting

There are no designated wild, scenic, or recreational rivers on the JDSF in either the Federal or State Wild and Scenic Rivers programs.

Recreation on State Forests is governed by a series of specific regulations contained in the California Public Resources Code and California Code of Regulations, Chapter 9, Subchapter 1: Recreation. These code provisions are presented in "Appendix I" of the DFMP and are referenced below where appropriate.

Board of Forestry and Fire Protection Policies (February 21, 2001).

The primary purpose of the State Forest program is to conduct innovative demonstrations, experiments, and education in forest management. Timber production is the primary land use on JDSF. Recreation is recognized as a secondary but compatible land use. (0351.2). Forest management is 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 and aesthetic enjoyment (Section 4639, Public Resources Code). Demonstrations and investigations are to balance a variety of uses, including recreation, with forest management (0351.3).

Additional policies that direct recreation management on JDSF are:

- The recreation program 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 (0351.5).
- Campgrounds, picnic areas, and trails will be developed, as funds become available, but only consistent with the recreational carrying capacity as determined in the management plan (0351.5).
- Recreation improvements will generally be rustic in character with sanitary facilities and water sources which meet public health requirements. Special attention should be given to maintaining safe and sanitary conditions in all recreation sites utilized by the public (0351.5).
- Recreation use will be integrated with timber management activities to demonstrate how these uses can be compatible. The presence of recreation on the State forests presents a unique opportunity to explain timber management to the general public (0351.5).

- 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 (0351.5). Areas on the JDSF that are closed to hunting, trapping, and the use of firearms (CCR Chapter 9, Subchapter 1, Section 1435) include:
    - Approximately 3,000 acres surrounding the Mendocino Woodlands located south and east of the Little Lake Road, and south of Road 740.
    - Approximately 1,500 acres around Parlin Fork Conservation Camp area.
    - Approximately 1,020 acres around the Chamberlain Creek Conservation Camp area.
- 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 (0351.3).

California Fish and Game Code 1-89

Fish and Game Code establishes the California Fish and Game Commission for the purpose of enacting regulations for the protection of fish and wildlife. Regulations are enforced by the California Department of Fish and Wildlife. The Fish and Game Commission establishes hunting regulations, including hunting areas, hunting seasons, hunting hours, and caliber and type of firearms allowed within JDSF.

Mendocino Woodlands Outdoor Center Act (PRC 5820.)

The area around the existing Mendocino Woodlands State Park and Outdoor Center was originally deeded to the State of California from the United States for public park, recreational, and conservation purposes (PRC 5822.). In 1977 the California Legislature identified the Mendocino Woodlands as especially well suited to serve primarily as an outdoor education center 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 (PRC 5821). The legislature transferred ownership of the Mendocino Woodlands Outdoor Center, consisting of approximately 720 acres, to the California Department of Parks and Recreation (State Parks) and identified the Mendocino Woodlands Special Treatment Area within the Jackson State Forest, consisting of approximately 2,550 acres (PRC 5823).

The legislature also directed that prior to authorizing the sale and cutting of timber from the Mendocino Woodlands Special Treatment Area, 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 operations of the Outdoor Center (PRC 5829).

CDF-Mendocino Woodlands State Park and Outdoor Center (Memorandum of Understanding (MOU)

CDF and State Parks entered into a MOU related to forest management practices surrounding the Mendocino Woodlands. This MOU includes provisions for:

- Protection of the Mendocino Woodlands water collection systems to insure the integrity and purpose of the systems;
- Consideration for managing a large portion of the Special Treatment Area in order to accelerate recruitment of late-seral habitat
- Maintenance of Roads 700, 720, and 730;
- Use of Mendocino Woodlands roads by CDF; and
- A 200-foot harvest exclusion buffer from of camp areas, recreational cabins, or main roads located within the lands administered by State Parks. This buffer does not apply to the Railroad Gulch Silvicultural Study area.

The MOU is to be reviewed during the first quarter of each year and can be terminated by either party upon 30 days notice.

California Recreational Trails Act (PRC 5070-5077.8)

Heritage Corridors are one component of the California Recreational Trails System Plan that was established by the California legislature and is administered by the California Department of Parks and Recreation. Heritage Corridors are regional, state, or nationwide alignments of historical, natural, or conservation education significance, with roads, state and other parks, greenways, or parallel recreational trails. Heritage Corridors are intended to have guidebooks, signs, and other features to enable self-guiding tourism, and environmental conservation education along most of its length and all or some of the facilities open to the public along its length. Emphasis is on facilities whose physical and interpretive accessibility meet whole-access goals.

The Tahoe Pacific/Farms & Forests State Heritage Corridor is identified as an alternate portion of the Transcontinental Scenic Heritage Corridor, to extend from Fort Bragg to the Pacific Crest along Highway 20. (PRC 5077.5 (a) (2)). The California DPR has not yet formulated specific plans for interpretive or user facilities for the part of the Heritage Corridor passing through JDSF, and it is not specifically addressed in the text of DPR's July, 2001, Draft California Recreational Trails Plan.

The California Recreational Trails Act directs all State agencies and departments whose operations are affected by, or related to, the goals, policies, and proposals of the California Recreational Trails System Plan to utilize the plan as a guide in their operations. 20 (PRC 5072.7).

Mendocino County General Plan

The following trail routes are identified in the Coastal Element of the Mendocino County General Plan and designated on the Mendocino County Trails Plan:

- Fern Creek Road–Caspar Orchard Road Inland Trail–East of Caspar, from Highway 1 east along County Road 410, then southeasterly along County Road 411A into JDSF.
- Caspar-Little Lake Road (Road 409) Inland Trail–South of Caspar, from Highway 1 southeasterly to its intersection with Little Lake Road (County Road 408) and connecting to the to Little Lake-Sherwood Inland Trail.

The General Plan also encourages the California Department of Parks and Recreation (State Parks) to develop a hiking and equestrian trail from: Caspar Beach to Jackson State Forest, and from Jug Handle State Reserve to Jackson State Forest.

14.1.2 Existing Recreation on JDSF

General Access Conditions

With the exception of the two Conservation Camps on the JDSF and temporary area closures during active timber operations, nearly all of the 48,652-acre forest is open to public access. During the wet winter months, many roads are closed to vehicular access, but remain open to non-motorized recreation.

Recreation Activities

Recreational opportunities found on Jackson Demonstration State Forest are unique to the coastal region. They are informal, free of charge, generally unsupervised, and diverse. Primary recreational activities occurring on JDSF include vehicular and hike-in camping, picnicking, hiking, biking, equestrian activities, environmental education, hunting, and shooting.

Target shooting occurs as a dispersed activity across the ownership. Though formal shooting ranges have not been developed, unsanctioned shooting sites have been created by users, particularly at abandoned quarry sites of the JDSF. The discharge of any firearm, air or gas weapon, or bow and arrow within 150 yards of any designated camping area on the JDSF is prohibited (CCR Chapter 9, Subchapter 1, Section 1413) as is the discharge of firearms within 500 yards of any occupied residences and their appurtenant structures. (Mendocino County Ordinance, Chapter 8.04).

Though prohibited by State law (CCR Chapter 9, Subchapter 1, Section 1431), substantial off-road motor vehicle usage occurs. Most of this use is related to access from rural residential neighborhoods.

Recreation Use

In the past 10 years, average use has not been quantified other than by tracking the annual camping days per year. In 1999, there were over 12,200 visitor days of use by campers who typically stay for two to four days. In the past 10-year period, overnight-use has averaged 16,000 visitor days per year. Easy access from Fort Bragg, Mendocino and Willits allows for extensive day use. It is estimated by CDF that day use is about three times that of overnight use, or about 50,000 visits per year.

A recreational use survey of adjacent landowners was conducted in 1988. The findings of this study show that 25 percent of the respondents visit JDSF for the purpose of environmental education, with the majority of respondents (50 percent) visit JDSF to observe nature. The survey also confirmed that Mendocino County residents comprise the majority of visitors to the Forest and that visitors value the fact that access and camping is free on the Forest.

JDSF does not collect any fees for recreational uses. Additionally, because of its size, availability of roads, and recreation use policies, the JDSF is unlike the surrounding smaller State Parks, allowing a much wider range of dispersed recreational opportunities for horseback riding, mountain biking, and hunting.

Developed Recreation Facilities

Pursuant to CDF's management objectives, developed campgrounds and picnic areas are primitive, with limited development, pit toilets, and no running water. Appendix VII of the DFMP presents a complete listing of developed facilities. Developed use facilities are located in areas that are adjacent or near to Highway 20 along the North Fork of the Big River (east end) of the South Fork of the Noyo River (west end). These are the primary visitor-use areas on the JDSF, both historically and currently.

Campgrounds: There are a series of designated campgrounds within the boundaries of JDSF. Most developed sites have an outhouse, picnic table, trashcan, and barbecue or fire ring. No potable water is available. Some of the campgrounds have outhouses and picnic tables that are accessible to the disabled. Most of the campgrounds offer opportunities for swimming or wading. Campgrounds are:

- West-end: Camp One (w/ Camp host), Roundhouse, South Fork 1, 2, and 3, Red Tail, Southbend, Wagon, Tilley (Group Camp), Trillium, Tin Can, Teacher's, Poison Oak, Camp 4, Camp 6 (hike-in use), and Camp 8.
- East-end: Dunlap (w/ Camp host), Horse Camp (equestrian use), Big River Camp, and Indian Springs (hike-in only).

CDF issues permits for the campsites, but does not charge for camping. There are signs along Highway 20 for Big River and Dunlap Camps.

Day-Use Facilities: CDF maintains three day use areas in the JDSF: the Camp 20 Recreation Area and Dogwood Picnic Area along Highway 20; and the Camp One picnic area on Road 350.

The Camp 20 Recreation Area includes a vault toilet, pay phone, picnic tables, and ample room for parking of cars and heavy trucks. The Camp 20 Recreation Area also includes a displayed donkey engine once used by the Caspar Lumber Company and interpretive displays about the JDSF. There are two standing historic buildings at Camp 20. These are the Little Red Schoolhouse and the Cat Barn. In 1989, it was determined by CDF that maintenance or restoration of the Cat Barn was not feasible. A very large number of people utilize Camp 20 as a highway rest stop, or to stop and make phone calls from the phone booth.

The Camp One picnic area is suitable for large group gatherings and includes an interpretive display explaining the Department of Fish & Game's Egg Collection Station.

The Dogwood Picnic Area 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.

Staging Areas: One equestrian staging area is provided adjacent to the CDF Station, off Little Lake Road. Other than the camps and day use areas, no formal staging areas to access the Forest's trail system are provided. There are ample opportunities for individuals or small groups to park off of the main forest roads for non-motorized recreational trail access.

Roads and Trails

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. CDF estimates that there are approximately 350 miles of actively-used roads on the Forest, with another 150 miles of abandoned roads. Many of these routes are not mapped. Virtually all of these roads are used for non-motorized recreation. Illegal off-road motor vehicle recreation use is commonplace, particularly in the western portions of the JDSF

Many of these roads are seasonally closed to use by CDF to prevent erosion. Many are open only during the dry summer months. Roads are also used for scenic driving and for hunting access. 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).

The JDSF recognizes and manages about 16 miles of developed hiking trails. These include: the Chamberlain Creek Demonstration Trail; trails located along the South Fork Noyo River and North Fork of the South Fork of the Noyo River; and the Forest History Trail near the Mendocino Woodlands State Park and Outdoor Center.

Another two to three miles of trails serve the outdoor education program at the Mendocino Woodlands, including the Manly Gulch Trail, Fern Loop Trail, Eagle's Roost Trail, Old Jeep Trail, Marsh Creek Trail, and Big Tree Trail.

Four designated recreational hiking trails 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, once a County trail route designed for equestrian use, is located in the western portion of the JDSF and continues towards Willits across private property. Much of the Sherwood Trail is coincidental with forest roads and trails. The majority of the trail route on the Forest is maintained through normal road and trail maintenance by JDSF with the southerly most section in the vicinity of Russian Gulch maintained by volunteer groups. The County of Mendocino has discontinued its involvement with this trail route, and its continued existence is due primarily to the efforts of the Northern California Trails Council.

Special Events

Several special events occur each year on the JDSF requiring specific contracts for using the Forest. These include weekly equestrian trail rides, an annual Enduro equestrian race, and an annual Skunk Train bicycle ride.

Other Public Uses

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. JDSF represents a significant public resource for mushroom collection as is evidenced by use from universities and mushroom societies from the Bay Area.

Permits are required for collection of any forest products from JDSF. 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.

Substantial casual, but unquantified, recreational use of the JDSF occurs by residential neighbors on the west end of the Forest for walking, jogging, walking their dogs, and horseback riding. In some instances unsanctioned trails have been developed for this use.

14.1.3 Carrying Capacity

As called for in Board policy, the DFMP includes a determination of recreational carrying capacity for the purpose of guiding development of campgrounds, picnic areas, and trails. Three types of

carrying capacity are calculated for each of the recreation use categories: maximum physical carrying capacity, current sustainable carrying capacity, and potential future sustainable carrying capacity. These values are presented in the following table:

TABLE 50 RECREATIONAL CARRYING CAPACITIES			
Recreation Use	**Maximum Physical**	**Current Sustainable**	**Potential Sustainable**
Campgrounds (camper-days)	120,296	24,059	30,074
Picnic areas (picnic-days)	45,260	9,052	11,315
Trails (hiker-days)	186,880	81,030	162,060

The DFMP suggests that JDSF could accommodate a 25% increase in campground and picnic capacity and a doubling of hiking trail capacity without severely impacting the Forest's recreation program resources.

14.1.4 Existing Recreation on Adjacent and Surrounding Lands

The Mendocino coast is a popular Northern California recreation destination, and there are numerous state parks, beaches, and reserves in close proximity to JDSF. The Mendocino Woodlands and Russian Gulch State Park all abut JDSF. A portion of Jughandle State Reserve is located within JDSF by agreement between CDF and the California Department of parks and Recreation.

- The Mendocino Woodlands State Park and Outdoor Center (Mendocino Woodlands): The Mendocino Woodlands is located about 7 miles inland from the Town of Mendocino. It is sited around the Little North Fork of the Big River and is almost completely surrounded by JDSF. The Mendocino Woodlands was originally granted to CDF from the United States Department of the Interior, but ownership was transferred to the State Parks in 1977. In doing so, the California Legislature identified the Mendocino Woodlands as especially-well suited to serve as an outdoor education center. The Mendocino Woodlands is managed by the Mendocino Woodlands Camp Association, a non-profit corporation. In 1997, the Mendocino Woodlands was designated as a National Historic Landmark (Program Ref: NHL-9700126).

  Vehicular access to the Mendocino Woodlands is through JDSF lands via Road 408 (Little Lake Road) and Road 700. Mendocino County maintains Road 408. State Parks, through an MOU with JDSF, maintains Road 700. Road 720 provides an alternate access route to Road 700. In its current condition, it is subject to seasonal closures and is not as direct.

The 720-acre Mendocino Woodlands facility is designed to accommodate groups of 30-200 people, and includes developed facilities such as cabins, dining halls with kitchens, and showers. Its primary use season begins in April and extends through October. The facility is generally operating at full capacity from Memorial Day through Labor Day weekend (personal communication: Don Taylor, Mendocino Woodlands Association).

- Jughandle State Reserve. The primary feature of this 769-acre park is a 2.5-mile nature trail exploring the ancient marine terraces typical of the Mendocino coast area. Jughandle State Reserve is located off Highway 1, about halfway between Mendocino and Fort Bragg, and receives about 70,000 visitors a year. The eastern end of the park abuts JDSF.

- Russian Gulch State Park. This park, about 2 miles north of Mendocino, offers both coastal and inland recreation activities. Inland, there are several miles of hiking trails and a 3-mile paved biking trail in the heavily-forested Russian Gulch Creek Canyon. The eastern end of the park abuts JDSF. An equestrian staging area is located along Road 409 just at the JDSF boundary and is sometimes used to access the trails on the JDSF. It is estimated that about 92,000 people a year visit Russian Gulch State Park.

- An offer to purchase approximately 7,400 acres of forest and estuary adjacent to JDSF in the lower Big River area has been accepted by the owner. This area is very likely to become a state park in the near future.

Several other state parks, including Mendocino Headlands State Park, Caspar Headlands State Beach, McKerricher State Park and Van Damme State Park, are also nearby along the Mendocino coast. The park facilities host uses similar to those described above, focusing on access to beaches and interior forest areas. The Skunk Train, a historical rail line and popular tourist attraction, runs between Fort Bragg and Willits just north of JDSF.

14.2 Regulatory Framework

Evaluation of potential impacts to recreation resources involves consideration of Federal, State and local regulations, standards and policies. Actions resulting from implementation of the Forest Management Plan may be subject to one or more of the following standards relating to protection of recreation resources.

California Recreational Trails Act (California Public Resources Code Section 5070-5077.8). Requires the State DPR to prepare and continuously maintain, a comprehensive plan for the development and operation of a statewide system of recreation trails, including heritage corridors. This plan is to include standards and criteria to be followed by the State Department of Parks and Recreation and other participating public agencies in providing facilities such as overnight camps, hostels, rest areas, access points, corrals, launching ramps, staging areas, and parking areas to complement trail routes and area.

The July 2001, Draft California Recreational Trails Plan in itself has no direct effect on management of JDSF, although it provides an opportunity for the Forest's recreation and education

programs to participate in a more far-reaching project. Until the DPR develops specific plans for the portion of the Tahoe Pacific Heritage Corridor that passes through JDSF, the actual types of facilities and improvements, if any, and their potential environmental effects are unknown.

Americans with Disabilities Act (ADA). Provides ADA Accessibility Guidelines for Buildings and Facilities (ADAAG)

California Building Code. Establishes design requirements for outdoor education facilities, classrooms, and trails.

14.3 Proposed JDSF Management Measures

14.3.1 Goals and Objectives

Goals and objectives of the DFMP that involve recreation resources are:

Goal #2--Timber Management: Manage the forest on the sustained yield principle 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.

Goal #5–Recreation and Aesthetic Enjoyment: 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.

14.3.2 Specific Management Actions

To implement these goals and objectives, the DFMP identifies limited proposals for the enhancement of recreation resources. The emphasis of the DFMP is to maintain the status quo, a rustic outdoor recreational experience, with some expansion of the trail system.

Specific management actions that are proposed in the DFMP that would increase recreation access and use are:

- Improving Camp Host sites.
- Improving individual campsites with native vegetation where necessary to enhance privacy and reduce compaction. Vehicle parking areas will be rocked to limit vehicle travel within each campsite.
- Improving each campground with a functional fire/barbecue pit, picnic table and vault toilet.
- Restoring the historic Little Red Schoolhouse located at Camp 20. Hours of operation will be determined based on the public's interest and availability of volunteers to assist in staffing the building
- Upgrading road surfaces on heavily-used recreational roads in order to limit erosion, protect water quality and provide safe driving conditions.
- Maintaining and keeping up-to-date a map that includes recreational facilities, points of interest, and main access roads as well as general information concerning the Forest. This map would be available to the public without charge.
- Developing route maps for mountain biking and equestrian access.
- Treating day-use areas, campgrounds, and picnic areas as necessary to reduce fire hazards for safety and demonstration purposes.
- Maintaining major roads and trails in the Forest to provide access for fire protection purposes.
- Provide a system of road signing.

Two major facility developments are proposed that will likely increase recreation use of the JDSF. These are:

- a Forest Learning Center to include lodging, conference center, classrooms, a resource and research library, research lab, video conferencing, and administrative offices; and
- a JDSF Interpretive Center to be developed in conjunction with the Forestry Learning Center.

14.3.3 Other Management Actions

The DFMP directs that a recreation survey and needs assessment will be conducted to help guide future changes to the existing recreation resources on the JDSF. The DFMP also identifies a number of broad management parameters to be used in: the planning and development of new recreation facilities, the management of recreation resources, and the planning and management of other forest

programs. Particular attention is given to timber harvests and road abandonment, as those activities would affect the availability and quality of recreation resources. These parameters are described below.

Recreation Surveys

The DFMP proposes a two-step planning approach to future recreation improvements beyond maintaining the status quo and implementing the proposals described in Section 3.16.3.3 of the DFMP. The first step is to conduct recreation surveys during the planning period, the results of which will guide future recreation development and management proposals. The DFMP states that the Department would implement visitor-use and countywide surveys that might include current users, (both individuals and special interest groups), county residents, forest neighbors, and other California residents. The surveys are also intended to document interest for utilizing the Forest for special events that, in turn, would bring additional revenue and visibility to the area.

The second step is to use the results of the user survey to identify specific recreation management actions to be undertaken. These would include both specific recreation improvements and management actions, such as defining Recreation Corridors, which would influence management of the Forest's resources in a way that gives consideration to values associated with recreation.

Recreation Corridor: The Recreation Corridor concept involves designating spatial areas in the Forest to integrate the JDSF recreation program with timber management, resource protection, demonstration and education about forest management practices, and the neighboring community. Within a recreation corridor, other forest management activities such as timber harvesting should give strong consideration to values associated with recreation. In the DFMP, explicit definitions of the Recreation Corridor concept are deferred until the Recreation Use Survey has been completed. The DFMP, however, does identify current and potential practices relating to Recreation Corridors. These include:

- Incorporation of a 300-foot buffer area around campgrounds and day use areas.
- Limiting active timber operations within the vicinity of occupied campgrounds and picnic areas to weekdays and non-holidays.
- Including noise abatement mitigation in any timber sale within 1,000 feet of an open campground for timber operations occurring between July 1 and Labor Day.

Timber harvesting options that are identified in the DFMP as potentially appropriate and that could be implemented in areas that are designated Recreation Corridors, but not necessarily so, include:

- single tree selection, hazard tree removal, or no harvesting
- restricting the timing of timber operations to avoid conflicts with high visitor-use weekends; or
- restricting operating hours to minimize noise pollution

Other recreation facilities such as trails and roads used for recreation are addressed in the DFMP by their inclusion in the Road and Trail Corridor Special Concern Area.

Slash Abatement: The DFMP identifies that current management practices involve a slash abatement zone within 50 feet of "main access routes to high-use recreation areas." These routes coincide with road and trail corridors identified on "Figure 5: Special Concern Areas" in the DFMP.

Road Abandonment: The Road Management Plan within the DFMP addresses the pro-active abandonment of roads. The Road Management Plan states that "roads on JDSF that are no longer required for management and recreation purposes will be evaluated for proactive abandonment." The Management Plan also includes provisions that should any riparian roads be 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," thus maintaining or expanding the streamside trail network.

Trails within Timber Harvest Area: The DFMP states th999at major trails within timber harvest areas are to be closed prior to harvest, and reopened upon completion of such harvest. An exception is made for non-sanctioned trails that are located such that they are damaging to the environment.

Trail Expansion: Additional designated trails that will be considered include: a loop trail for linking the Trestle Trail to Indian Springs (a hike-in campsite), a trail linking various parts of the Forest; an access trail designed for those with disabilities; and a trail through the Upper James Creek Grove. During the planning period, expansion of the system will be implemented only to the extent that staffing and funding allow. Top priority will be given to loop trail segments that have proximity to campgrounds, watering locations, and other areas with easy access.

Camping: The decision to open historically-used camping areas throughout the Forest that are now closed will be based on the results of the user survey, cultural resource impacts, and other environmental sensitivities.

Mendocino Woodlands Special Treatment Area: 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.

Boundary Line Adjustments and Trades: Potential property boundary changes that are identified in the DFMP include Three Chop Ridge (between Big River and Noyo River), and various locations along the southern boundary of the Forest. This ownership adjustment would provide the State with control of a significantly shorter and safer route than Road 200 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 the DFMP identifies as a candidate for abandonment due to its somewhat hazardous, inner gorge location that could be potentially damaging to the environment.

14.4 Thresholds of Significance

Recreation impacts are determined by assessing how the different alternatives support recreation opportunities and the quality of those opportunities. Recreation opportunities include the facilities provided on JDSF (e.g., campgrounds, trails) and access to those facilities. The quality of the recreation experience is generally defined in terms of aesthetic effects such as how management activities like timber harvesting may or may not interfere with the enjoyment of recreation opportunities. Section VI-2 (Aesthetics) describes the impacts of the DFMP and its alternatives on the quality of the visitor's experience.

Program impacts of the DFMP would be considered significant if:

- Implementation of the DFMP would contradict existing State or local policies about recreation resources.
- Existing JDSF recreation facilities, including roads and/or trails used for recreation, would be substantially eliminated based on management actions defined in the DFMP.

Based on guidance provided by CEQA (Public Resources Code (PRC) Section 21001 and the CEQA Guidelines), an impact of the DFMP on recreation would be considered significant if it:

- Increases use of existing parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.
- Includes recreational facilities or requires the construction or expansion of recreational facilities which might have an adverse physical effect on the environment.

14.5 Impacts

The DFMP does not directly propose to reduce or eliminate any existing recreation opportunities on the JDSF. The JDSF will remain open to public recreation with seasonal and area restrictions consistent with past forest management practices. There are no new restrictions or limits proposed in the DFMP to dispersed recreation use on the Forest. There will likely be no significant increases in the use of existing parks or other recreational facilities such that substantial physical deterioration of those facilities would occur or be accelerated.

As discussed previously, the DFMP includes limited new recreational facilities during the planning period and the potential to construct a interpretive center and learning center which would be subject to environmental review when the design, location and funding is more certain. The impact of new recreational facilities are considered as part of the project description and assessed in the appropriate resources sections of this report.

Impact 1: *The recreation programs outlined in the DFMP are not consistent with State or local recreation policies*. (No Impact)

The DFMP does not address the Tahoe Pacific/Farms & Forests State Heritage Corridor along Highway 20 or other trail routes identified in the Coastal Element of the Mendocino County General Plan. However, these are general, conceptual proposals at this time, and no proposals within the DFMP would preclude implementation of these concepts.

Mitigation: None required.

Impact 2: *Existing use of the JDSF roads and trails for recreation would be substantially reduced or eliminated if roads are abandoned or sanctioned trails are not reconstructed after a timber harvest operation*. (Less Than Significant)

Dispersed recreation on the JDSF relies upon sanctioned interpretive and hiking trails, skid trails, and logging roads, both old and new. The DFMP identifies two scenarios where trails could potentially be closed to public non-motorized use, or eliminated.

The DFMP states that major trails within timber harvest areas "are to be examined prior to harvest, and reopened upon completion with the exception of non-sanctioned trails in locations that are damaging to the environment."

Through formal road abandonment as defined in the Road Management Plan, it is estimated in the DFMP that such road abandonment would involve between 50 and 100 miles of roads, or between 10% and 20% of the roads within the JDSF. Until completion of the road inventory, it is not possible to determine the extent of impact road abandonment may have on dispersed recreation activities. As stated in the DFMP, abandonment of roads in riparian areas will specifically involve a goal of retaining or relocating affected trail routes.

A related action identified in the DFMP and one mentioned during public scoping that would indirectly influence the abandonment of Road 200 is a property boundary change involving Three Chop Ridge. Road 200 provides access to the Waterfall Grove Trail, one of the most popular recreation destination points in the JDSF.

Mitigation: None required.

A number of issues were raised during the public Scoping process about potential recreation impacts not included in the above analysis. These are described below.

Impact 3: ***A lack of public information jeopardizes the public's health and safety. (Less Than Significant*** **With Incorporation of Mitigation)**

A concern raised during public Scoping was that current forest management practices and the DFMP do not include programs for notifying the public about closures and/or avoiding conflicts between timber harvest operations, hunting, and other recreation uses that may jeopardize the public's health and safety. Though there are limited areas of the JDSF closed to hunting, these areas are not necessarily signed and may create conflicts between hunters and other forest visitors.

Mitigation 3. For public safety, post and maintain signs around all areas closed to public access for timber operations that includes information defining the period of closure. In order to avoid conflicts between recreation uses and for public safety, post and maintain appropriate signs around all areas closed to hunting, trapping, and the use of firearms. Signs should be posted at all points where roads and trails enter such areas and, in the case of hunting restrictions, at legally required intervals along the perimeter of such areas.

Monitoring 3.
Timing: During the life of the JDSF Management Plan
Scope: Forest-wide
Implementation: the Department
Monitoring Responsibility: the Department

Impact 4: ***The DFMP precludes some year-round motorized access throughout the JDSF and, hence, recreation opportunities such as hunting.*** **(No Impact)**

A specific request voiced during public Scoping included maintaining year-round motorized access for hunting and off-highway vehicle use. State Forest regulations prohibit cross-country travel by motorized vehicles. Motorized vehicles must utilize roads and parking areas constructed for vehicle use, and not utilize roads that are gated, shut, or posted as closed. Selected roads are closed to motor-vehicle access during the winter months to minimize impacts of vehicular use on easily eroded soils and water quality. These roads are open during the winter months to non-motorized access for a variety of recreation activities, including hunting as permitted by State Fish and Game code. This is a request for additional recreational opportunities beyond those currently existing. It is not a changed condition resulting from the JDSF Management Plan. As such, no mitigation is required.

Impact 5: ***The DFMP does not provide specific opportunities for recreational target shooting.*** **(No Impact)**

The DFMP recognizes target shooting as a recreation activity in the JDSF, but neither condones nor forbids it except in areas posted or restricted by County or State rules. Formal shooting areas or "ranges" for recreational shooters are not proposed in the DFMP due to concern regarding potential for impacts resulting from concentrated shooting activity, including noise and public safety concerns. This is a request for additional recreational opportunities beyond those currently existing. It is not a changed condition resulting from the JDSF Management Plan. As such, no mitigation is required.

14.6 Alternatives Analysis

A comparison of recreation impacts among the various alternatives is presented in Table 51.

TABLE 51
COMPARISON OF RECREATION RELATED IMPACTS AMONG THE VARIOUS ALTERNATIVES

Alternatives						Discussion
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant–Mitigation Feasible (5) Significant–Mitigation Not Feasible**
Impact 1. The recreation programs outlined in the DFMP are not consistent with Sate or local recreation policies.						
Alt. A						The Tahoe Pacific/Farms & Forests State Heritage Corridor along Highway 20 or other trail routes identified in the Coastal Element of the Mendocino County General Plan. are general, conceptual proposals at this time, and no proposals within the DFMP would preclude implementation of these concepts
Alt. B						
Alt. C (DFMP)						
Alt. D						
Alt. E						
Impact 2. Existing use of the JDSF roads and trails for recreation would be substantially reduced or eliminated if roads are abandoned or sanctioned trails are not reconstructed after a timber harvest operation.						
Alt. A						Road abandonment would involve between 50 and 100 miles of roads, or between 10% and 20% of the roads within the JDSF. Abandonment of roads in riparian areas will specifically involve a goal of retaining or relocating affected trail routes.
Alt. B						
Alt. C (DFMP)						
Alt. D						
Alt. E						
Impact 3. A lack of public information jeopardizes the public's health and safety.						
Alt. A						All alternatives involve minimal levels of recreation management. Potential public health and safety could be protected by the installation and maintenance of signs at road and trail entrances to timber harvest areas where called for in the alternatives and around all areas excluded from hunting.
Alt. B						
Alt. C (DFMP)						
Alt. D						
Alt. E						
Impact 4: The DFMP precludes some year-round motorized access throughout the JDSF and, hence, recreation opportunities such as hunting.						
Alt. A						State Forest regulations prohibit cross-country travel by motorized vehicles. Motorized vehicles must utilize roads and parking areas constructed for vehicle use, and not utilize roads that are gated, shut, or posted as closed. Selected roads are open to non-motorized access during winter months. This is a request for additional recreational opportunities beyond those currently existing. It is not a changed condition resulting from the JDSF Management
Alt. B						
Alt. C (DFMP)						

TABLE 51 COMPARISON OF RECREATION RELATED IMPACTS AMONG THE VARIOUS ALTERNATIVES						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant (4) Significant–Mitigation Feasible (5) Significant–Mitigation Not Feasible**
Alt. D						Plan. As such, no mitigation is required.
Alt. E						
Impact 5: The DFMP does not provide specific opportunities for recreational target shooting.						
Alt. A						Formal shooting areas or "ranges" for recreational shooters are not proposed in the DFMP due to concern regarding potential for impacts resulting from concentrated shooting activity, including noise and public safety concerns. This is a request for additional recreational opportunities beyond those currently existing. It is not a changed condition resulting from the JDSF Management Plan. As such, no mitigation is required.
Alt. B						
Alt. C (DFMP)						
Alt. D						
Alt. E						

15. TRANSPORTATION AND TRAFFIC

15.1 Environmental Setting

15.1.1 Existing Traffic Routes and Volumes

The JDSF is located in central Mendocino County. The primary state highway used to reach JDSF is State Highway 20. State Highway 20 is accessed from the west at the junction of State Highway 1 near Fort Bragg, approximately 1.0 mile west of the Forest. State Highway 20 is accessed from the east at the junction of U.S. Highway 101 at Willits, approximately 7.0 miles east of the Forest. Both Highway 20 and U.S. Highway 101 are considered Routes of Statewide Significance (Mendocino County General Plan, Section III Circulation Element, page 2).

The portion of State Highway 20, from Fort Bragg east to Willits is highly scenic and relatively unpopulated. This portion of State Highway 20 is currently eligible to be listed as a California Scenic Highway (Caltrans Scenic Highway Database). This classification requires that the local jurisdiction enact a scenic corridor protection program. To date, Mendocino County has no plans to implement the program.

According to the Mendocino County General Plan, Section III Circulation Element, Highway 101 is the most traveled highway in the County (page 2); therefore, it has been upgraded to four-lane freeway or expressway standards at several locations, as part of the Level of Service proposed in the Circulation Element. Level of Service is a planning tool that is used to determine highway deficiencies; primarily pertaining to how well equipped particular routes are for traffic capacities. Due to the expected continued heavy use of this primary highway, the entire route should be upgraded to full freeway standards as rapidly as possible. The direction of work should begin at the County's southern boundary and continue northward. Highway 101 is the only route that the Mendocino County General Plan recommends for freeway conversion. The only other project that is proposed for this Highway is a bypass at Willits (Personal Communication with the Mendocino County Senior Civil Engineer, Doug Ellinger). The Environmental Impact Report has been completed but final location of the bypass has yet to be determined.

Highway 20 is a two-lane highway except for a 0.6 miles four-lane section (Mendocino County General Plan, Section III Circulation Element, page 2). According to the General Plan, the only proposed Level of Service for this Route is that it should be improved and upgraded. Safe two-lane standards with truck turnouts of reasonable length should be implemented. This would allow residents in the Fort Bragg-Mendocino area easier access to the County seat in Ukiah, (Mendocino County General Plan, Section III Circulation Element Page 5). An additional benefit of improved and increased number of turnouts would be less traffic congestion along the route when there are heavy traffic volumes and/or special events.

A project that is not mentioned in the Circulation Element but is being considered by the Mendocino Department of Transportation is for the installation of a diversion on Highway 20 to reach the Brooketrails Subdivision, located northwest of Willits (Personal Communication, Doug Ellinger January 23 and 24). Currently, this 5,000-acre subdivision only has one access, Sherwood

Road, which is accessed via Highway 101. This traffic diversion would result in an increase of traffic on Highway 20, but the increase would only affect the eastern-most 0.50 miles of Highway 20, before the intersection with Highway 101.

According to Caltrans traffic data (personal communication with Larry Look January 29, 2002, Caltrans Traffic Census Coordinator) traffic volumes during 1999 at the Broaddus Creek Bridge (Station 765), approximately 1.0 mile west of Willits, do not generally exceed 1750 vehicles per day in a single direction, even during the heaviest traffic month, as displayed in Table 52.

TABLE 52
1999 CALTRANS DAILY AVERAGE TRAFFIC COUNTS AT THE BROADDUS CREEK BRIDGE

Direction	Seven Day Week				Five Day Week			
	January	April	July	October	January	April	July	October
Eastbound	993	1,278	1,756	1,401	1,016	1,165	1,701	1,373
Westbound	978	1,268	1,673	1,345	998	1,230	1,731	1,363

Traffic volumes are characteristic of typical commuting traffic, with heavier volumes in an easterly direction during the winter months of October and January, particularly during the evening hours of the five-day work week, compared to the summer months of April and July. There is a substantial increase in traffic volumes traveling westbound during the summer months, July having the heaviest traffic volumes. Although CDF does not conduct traffic counts within JDSF, the Caltrans data most likely reflects the increase in recreational travel during the summer months. The impact of recreational traffic is diminished because trips are generally spread out over the day thereby limiting the effect on peak hour demand.

Traffic related to logging truck volumes is minor and will continue similar to existing conditions under the new management plan. Logging truck volumes will most likely be concentrated in the early morning hours, before 8:00 am. At that time, several trucks may depart from the Forest. After the morning peak, truck volumes will be spread out throughout the day, typically one to two trucks will depart per hour but this is heavily dependant on weather conditions (i.e. more trucks may be running at a given time if road conditions are ideal). Impacts from logging truck volumes will not be significant because volumes are spread out over the day and not all trucks will travel on the same roads in the same directions (Personal communication, Marc Jameson).

Thousands of travelers pass through JDSF annually along Highway 20, and county roads 408 (Little Lake Road), 500, and 700. 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). However, this does not appear to discourage use, perhaps because the majority of users are residents of Mendocino County (DFMP, pages 33 and 34). In 1999, there were over 12,200 days of use by campers who typically stay for two to four days. Approximately, 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; DFMP page 25).

Intercity bus service is available through the Mendocino Transit Authority (MTA). MTA provides transportation to a number of towns within the County including Willits and Fort Bragg, as well as small communities in between (Mendocino County General Plan, Section III Circulation Element, page 16).

15.1.2 Air Traffic

The closest airport is the County Airport located approximately 2.50 miles south of the Forest's southwestern boundary.

15.1.3 Bikeways and Other Improvements

The Mendocino Department of Transportation has plans for a bikeway improvement project located at the intersection of Highway 1 and road 408 east for approximately 3.0 miles, to the junction of road 408 and a private road (Personal Communication, Doug Ellinger). The improvement proposal includes both type 1 and type 2 bikeway improvements to be located on the road shoulder. The County's long-term intent of the project is to connect the communities of Fort Bragg and Mendocino via an undetermined portion of JDSF. The bikeway would consist of a route through JDSF that connects to road 408, which would then connect to Highway 1.

The only other County Road that may be proposed for minor improvement is road 410 (Caspar Orchard Road). This is a low volume road located within the southwest portion of the Forest, generally north of road 408. Minor improvements may consist of filling potholes and improving shoulders and turnouts.

A chip sealed resurfacing project has recently been completed on a number of roads near the western boundary of the Forest. The roads that were improved include Mitchell Creek Road, Franklin Road, Turner Road, and the cul-de-sacs off Turner Road, Emerald Drive, Amethyst Drive, and Jade Drive.

Caltrans has proposed a few projects within the vicinity of JDSF. The following is a list of the potential road activities that may occur along the route within the next five years (personal communication with Lana Ashley, Caltrans Project Manager for middle Mendocino County and personal communication with Doris Alkebulum, Caltrans Project Manager for Lake County and Portions of Mendocino County):

- a left turn lane to be installed from mile-post 0.90 (east of Fort Bragg) to mile-post 2.3, just west of JDSF;
- culvert replacements at various locations;
- a passing lane that is within the boundary of JDSF has been proposed;
- a passing lane, the location of which has not yet been determined (the project has not been submitted for funding approval); and
- electronic changeable message road signs located at mile markers 0.30 and 3.56.

15.1.4 Traffic Safety within and Adjacent to JDSF

Several special events that occur each year require specific contracts for using the Forest. These events include: weekly equestrian trail rides, an annual Enduro equestrian race, and an annual Skunk Train bicycle ride, (DFMP, Page 34).

A large number of people utilize the Camp 20 facility, located adjacent to Highway 20, as a highway rest stop, or to stop and make phone calls from the phone booth. The area has a newly constructed vault toilet (installed in 2000), pay phone, picnic tables, and ample room for parking of cars and heavy trucks (DFMP, Page 34).

There are no parking capacity problems within JDSF. Increased trailhead parking, while desirable and convenient, is not required to alleviate a congestion or safety concern.

Due to the fact that timber harvesting occurs on JDSF, there is the potential that logging truck traffic could interfere with other vehicles at junctions where trucks enter Highway 20. To prevent these potential conflicts, proper signage that indicates trucks are entering the highway are placed in an obvious location for motorists, bicyclists, and pedestrians. If there is limited sight-distance from where logging trucks enter the highway, either the appropriate revisions will be made that meet Caltrans safety guidelines or an encroachment permit will be required where more detailed safety considerations are necessary (Personal Communication with Caltrans Permit Specialist, Jerry Sheldon).

15.1.5 Roads Within and Adjacent to JDSF

The history of JDSF road system dates back to the first harvesting practices that took place within the Forest. Beginning in the 1870's, railroads located along or adjacent to stream beds were used to transport logs. Subsequently, many dirt access roads have been built along these old railroad grades, several of which are still currently in use. This has produced a scenario in which many roads are in poor shape, resulting in mass wasting, and erosion into adjacent watersheds (Please see Geology Section VII-7 for specifics related to sediment, erosion, and mass wasting). Additionally, many roads that are still currently used were constructed during the 1950's to the 1970's, which included the construction of inboard ditches and cross drains. These construction techniques have subsequently proven to be major contributors of sediments into fish bearing streams (DFMP, Page 178)

The most frequently used roads, including both highways and logging roads, consist of:

- Caspar Logging Road (road 500)
- Willits- Mendocino County Road (road 408)
- West Chamberlain Creek Road (road 200)
- Main Chamberlain Creek Road (road 250)
- Road 800
- Road 361
- Road 300
- Highway 20

- Caspar-Little Lake Road (road 409)
- Road 700
- Road 730

15.1.6 Emergency Access

Currently, several roads serve as emergency access and exit routes for fire control. Primary routes include road 408 (adjacent to Woodlands Forest Fire Station), and CDF roads 200, 230, 240, 300, 310, 330, 360, and 500. 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 (DFMP, Page 81).

15.2 Regulatory Framework

Mendocino County does not require an encroachment permit for logging truck traffic that enters a county roadway. The only requirement is that large signs indicating trucks are entering the roadway be placed in an obvious location for motorists, bicyclists, and pedestrians to view (Personal communication, Doug Ellinger).

Caltrans does not always require an encroachment permits for trucks entering roadways. A permit does not need to be obtained if the entryway has been newly upgraded or if there is a reasonable site distance from primary road to the arterial road. If there is a limited sight distance from where logging trucks enter the highway, either the appropriate revisions need to be made that meet the Caltrans project engineer's guidelines, or an encroachment permit needs to be obtained (Personal communication with Caltrans Permit Specialist, Jerry Sheldon).

15.3 Proposed JDSF Management Measures

There are approximately 350 miles of actively used roads within the Forest. The primary uses of these roads includes, but is not limited to, logging trucks, recreational traffic, hiking, biking, horseback riding, and forestry personnel vehicles.

The JDSF Forest Management Plan has been compiled to address the road management system (in conjunction with the stated goals of the Forest, Section III-2.2: Goals and Objectives). The following summarizes the principals stated in the DFMP (Chapter 2 Current Management Situation, Forest Management Section) that are correlated to traffic/transportation:

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. Roads that are not in acceptable condition will be properly abandoned.

New roads will be designed to the minimum width necessary to safely accommodate required traffic, with turnouts spaced appropriately for the road class (as per the guidelines in the FPR, Article 12, section 923.4). All roads will be classified according to expected use (high, medium, or light) and maintained accordingly.

The Forest Manager to authorized to close roads or other areas of the Forest for specific activities (14 CCR 1438). There are 150 miles of roads that could potentially be decommissioned. Any new construction activities or areas that need to be closed during the winter months must occur before the rainy season, approximately November 1 of each year. Sensitive roads that are closed during the winter months will remain closed until March or April, usually when wet weather conditions improve (Personal correspondence, Marc Jameson).

The major area of the Forest that will require significant road development is the eastern third (upper Big River tributaries such as Chamberlain Creek, James Creek, and upper North Fork (NF) of Big River (Personal Communication, Marc Jameson). Road development will generally occur as forest plans are approved for sale. All road construction that is related to log hauling will be built in accordance with the guidelines in the FPR.

The proposed Road Management Plan (DFMP, Appendix VI: Road Management Plan) specifies that road inventories should be completed over the next five years. Approximately 20% of the total roads within JDSF will be inventoried each year. The inventory will compile a list of roads that qualify for decommissioning, based on a schedule of priority. One factor that will affect the schedule will be the availability of alternative access for management, recreation, and fire control. Thus, wide-scale road decommissioning in areas with no alternative access will not be conducted. Selective decommissioning of high-risk road segments in these areas will occur on a gradual basis. Road 200 is a potential candidate for road abandonment due to its "somewhat hazardous and potentially damaging inner gorge location" (DFMP, Page 86). This road is currently used as the primarily route for logging trucks that haul out of Noyo River Drainage and recreational vehicles that visit the San Francisco Boys and Girls Club and Camp Noyo Boy Scouts Camp. In order to accommodate the traffic that currently uses this road, the Forest proposes acquiring Three Chop Ridge, also known as CDF road 1000, which would incorporate Three Chop Ridge Road into the Forest's road system. (See Figure O in the attached "Figures" section).

The addition of this road will provide a safer route of travel to the intersection of State Highway 20 for both commercial and recreational vehicle traffic. The additional benefit of incorporating Three Chop Ridge Road into JDSF is that it would provide the State with control of a major fire suppression ridge, which is also an asset for adjacent landowners.

2002 Forest Practice Rules. The following is a summary of applicable Forest Practice Rules as they relate to traffic issues:

- Article 6 section 916.3 lists guidelines that must be adhered to in regards to road construction limitations near watercourses and other wet areas to prevent material from entering the waterway. The guidelines consist of maintaining a buffer that ranges from 50 to 150 feet from the wet area, dependent on the slope gradient and watercourse class (Class I having the most restrictions, Class III having the least restrictions).

- Article 12 section 923.1 lists the standards that must be complied with when planning new logging roads and landings. For example, road lanes and turnouts must be wide enough to accommodate the largest type of equipment that may be used at a timber harvest operation.
- Article 12 section 923.4 Road Maintenance, states that during timber operations, road running surfaces in the logging area shall be treated as necessary to prevent excessive loss of road surface materials by, but not limited to, rocking, watering, chemically treating, asphalting or oiling.

The annual special events that takes place either within or adjacent to JDSF require specific contracts for using the Forest (DFMP, Page 34). All special events that may occur within JDSF have appropriate and adequate parking and staging facilities; therefore, there will not be a significant impact on the existing facilities within the Forest. If a special event is to occur that may exceed the existing accommodations, CDF will limit the size of the proposed event, or otherwise control traffic, to ensure that adequate facilities are maintained (Personal communication, John Griffen).

15.4 Thresholds of Significance

Based on the policy and guidelines provided by CEQA (PRC Section 21001 and the CEQA Guidelines), an impact of the proposed project would be significant if it results in one or more of the following:

- Cause an increase in traffic which is substantial in relation to existing traffic load and capacity of the street system;
- Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways;
- Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks;
- Substantially increase hazards due to a design feature;
- Result in inadequate parking capacity; or
- Conflict with adopted policies, plans, or programs supporting alternative transportation.

15.5 Impacts

Impact 1*: **An increase in traffic, which is substantial in relation to existing traffic load and capacity of the street system*. (Less Than Significant)**

Project generated traffic increases over existing conditions will not be substantial. Recreation-generated traffic would occur with or without approval of the project. Seasonally, two to five logging trucks trips may be generated during the peak hour. Logging and recreational trips are spread throughout the day rather than at peak hours, as is the case with commuter traffic

Impact 2: ***Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways*** **(Less Than Significant)**

Mendocino County is considered rural and has no Congestion Management Agency. Level of service is calculated based on peak-hour traffic. As stated in Section VII-15.1.1, contribution to peak-hour traffic demand is minimal since recreational traffic would remain regardless of project approval and since traffic is spread throughout the day. Peak hour recreation traffic is higher on weekends, when peak hour Level of Service demand is lightest.

Impact 3: ***Cause a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks*** **(No impact).**

The nearest airport is 2.5 miles away and management of JDSF for timber and related resources has no effect on air traffic levels or safety.

Impact 4: ***Would the project cause a substantial increase in hazards due to design feature?*** **(Less Than Significant)**

As discussed above, road safety design standards for logging roads are incorporated into the Forest Practice Rules. Additionally, CDF will coordinate with Caltrans and/or the County in instances where there may be safety issues associated with logging truck cross traffic.

Impact 5: ***Would the project significantly affect Parking capacity?*** **(Less Than Significant)**

All special events that may occur within JDSF have appropriate and adequate parking and staging facilities; therefore, there will not be a significant impact on the existing facilities within the Forest. If a special event is to occur that may exceed the existing accommodations, CDF will limit the size of the proposed event to ensure that adequate facilities are maintained. Additional trailhead parking is desirable but not required or otherwise needed to mitigate a significant transportation-related impact.

Impact 6: ***Conflict with adopted policies, plans, or programs supporting alternative transportation*** **(Beneficial)**

As part of the JDSF management goals, JDSF provides foot and bicycle trails. CDF will continue to work with the County in developing regional bikeways that may cross over JDSF property. Such opportunities for bikeway improvements are not readily available on surrounding private lands. Therefore, the impact is beneficial.

15.6 Mitigation

Because the JDSF Management Plan will not result in potentially significant environmental effects related to transportation and traffic, no mitigation is required.

15.7 Alternative Analysis

A comparison of transportation-related impacts among the various alternatives is presented in Table 53.

TABLE 53
COMPARISON OF TRAFFIC AND TRANSPORTATION RELATED IMPACTS AMONG THE VARIOUS ALTERNATIVES

Alternatives						Discussion
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less Than Significant (4) Significant - Mitigation Feasible (5) Significant -Mitigation Not Feasible**
Cause an increase in traffic, which is substantial in relation to the existing traffic load and capacity of the street system.						
Alt. A						There would be no logging related traffic associated with this alternative. Recreational traffic is presumed to remain at current levels, with a potential increase in ORV use and unauthorized camping.
Alt. B						There is no substantial difference among the active management alternatives. Each would result in some level of logging and recreation traffic to varying degrees that would remain well below the significance thresholds.
Alt. C DFMP						
Alt. D						
Alt. E						
Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways.						
Alt. A						There would be no logging related traffic associated with this alternative. Recreational traffic is presumed to remain at current levels, with a potential increase in ORV use and unauthorized camping.
Alt. B						Mendocino County is considered rural and has no Congestion Management Agency. There is no substantial difference among the active management alternatives. Each would result in some level of logging and recreational traffic to varying degrees that would remain below the significance thresholds.
Alt. C DFMP						
Alt. D						
Alt. E						
Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks.						
Alt. A						The nearest airport is 2.5 miles away and management of JDSF for timber and related resources would have no effect on air traffic levels or air traffic safety under any of the alternatives.
Alt. B						
Alt. C DFMP						
Alt. D						
Alt. E						
Substantially increase hazards due to design feature.						

TABLE 53
COMPARISON OF TRAFFIC AND TRANSPORTATION RELATED IMPACTS AMONG THE VARIOUS ALTERNATIVES

Alternatives						Discussion
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less Than Significant (4) Significant - Mitigation Feasible (5) Significant -Mitigation Not Feasible**
Alt. A						This alternative could result in deterioration of existing roads in the absence of a proactive road management policy. It is presumed that minimal maintenance would occur under this alternative where safety hazards exist, or the road would simply be closed to traffic.
Alt. B						There is no substantial difference among the active management alternatives. Each would result in maintenance of existing roads and construction of new roads pursuant to Forest Practice Rules. Logging truck traffic would continue to be appropriately signed and coordinated with Caltrans and the County.
Alt. C DFMP						
Alt. D						
Alt. E						
Substantially result in inadequate parking capacity.						
Alt. A						In the absence of active management, unauthorized and unsafe parking could become more prevalent. Particularly along higher-speed roads. Mitigation is feasible and would consist of signing, an enforcement program, and permits for special events (similar to current management practices).
Alt. B						All special events that may occur within JDSF have appropriate and adequate parking and staging facilities; therefore, there will not be a significant impact on the existing facilities within the Forest. If a special event is to occur that may exceed the existing accommodations, CDF will limit the size of the proposed event, or otherwise control traffic, to ensure that adequate facilities are maintained
Alt. C DFMP						
Alt. D						
Alt. E						
Conflict with adopted policies, plans, or programs supporting alternative transportation.						
Alt. A						This alternative will not affect the County's plans for expanded alternative transportation.
Alt. B						There is no substantial difference among the active management alternatives. Each would facilitate bikeways and other trails consistent with management goals thereby resulting in a beneficial effect.
Alt. C DFMP						
Alt. D						
Alt. E						

VIII. OTHER CEQA REQUIRED ANALYSIS

1. GROWTH INDUCING IMPACTS

1.1 Introduction

Certain projects, such as freeway interchanges and wastewater treatment plants, clearly result in secondary growth inducing impacts that must be analyzed. This section provides limited discussion regarding the lack on conditions associated with the JDSF Management Plan that would result in significant growth inducing impacts (CCR §15126.2(d)).

1.2 Discussion

Projects that foster economic or population growth, or remove obstacles to population growth, are considered to have a growth-inducing effect. As described in Section III (Project Information) economic growth is projected to be constant or grow modestly over several decades commensurate with timber inventories and environmental constraints.

Recreation-related growth is also anticipated, but at levels consistent with general increased use of all recreational facilities throughout the State. This is particularly true for JDSF, where recreation is secondary to forest demonstration activities, and only limited new recreational facilities will be provided.

Based on the above discussion, no reasonably foreseeable growth-inducing impacts have been identified that would result from proposed JDSF forest management activities.

2. CUMULATIVE IMPACTS

CEQA requires the discussion of cumulative impacts in an EIR when a project's incremental effects are cumulatively considerable (CCR §15130). "Cumulatively considerable" means that the incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects (CCR §15065c).

As such, cumulative impacts assessments are inherent in the programmatic approach to development the JDSF Management Plan EIR. This approach documents past activities and anticipated future activities for all potential projects. The Resource Specific Analysis in Section VI, addresses impacts from a broad, Forest-wide perspective which, where appropriate, considered off-site as well as on-site impacts. For example, discussion in the hydrology, air quality, and aesthetic sections include consideration of short- and long-term cumulative effects.

Specified long-term cumulative impacts have been identified within the various resource sections. In each of these cases, programmatic-level mitigation has been specified to reduce all impacts to less than significant levels. As stated previously, mitigation measures will be incorporated into the JDSF Management Plan. This is the most effective means for addressing cumulative effects, particularly given adaptive management and monitoring policies built into the DFMP (CCR §15130 c).

3. UNAVOIDABLE IMPACTS RESULTING FROM PROJECT

No significant unavoidable impacts have been identified that would result from adoption of the JDSF Management Plan, or any of the active management alternatives. As identified in Section VI (Resource Specific Analysis), all identified impacts can be mitigated to less than significant levels.

4. SIGNIFICANT IRREVERSIBLE ENVIRONMENTAL CHANGES

For some projects, the environmental impacts caused by implementing the project may result in the irreversible or irretrievable commitment of environmental resources (CCR §15126.2c). For this project, no irreversible changes to the environment would occur as a result of implementing any of the alternatives. As identified in Section VI (Resource Specific Analysis), resources would not be significantly adversely affected by JDSF Management under any of the alternatives. Additionally, given protection of old growth groves and special status species, no management decision is irreversible. Management approaches may change if monitoring and adaptive management measures reveal potential problems developing.

5. MITIGATION MONITORING

All mitigation provisions will be incorporated into the JDSF Management Plan and is, therefore, subject to adaptive management and monitoring provisions therein. CEQA provides that where a project consists of adoption of a plan-level document, the monitoring plan may consist of policies included in the plan-level documents (CCR § 15097 (b)). For plan-level documents, mitigation measures can be incorporated into the plan (15126.4 (A)(2)). As stated in Section II (Introduction), all mitigation measures developed in the Final EIR will be incorporated into the approved JDSF Management Plan.