6.2 Botanical Resources

This section focuses on analysis of higher plants. Because other non-mobile organisms including fungus and lichens experience similar effects, much of the analysis will be pertinent to them. Some aspects of fungi and lichen will be discussed as well.

6.2.1 Setting

Regional setting:

The region represents the central portion of the redwood forest region, which generally includes the western portions of Sonoma and Mendocino Counties. Plants found in the area vary from those with a limited, local distribution, such as Bolander's pine, to those with a global distribution, such as long beard lichen. The vegetation series, or communities, represented in this region vary in distribution and size from a narrow band along the Pacific to almost the entire west coast. Coastal dunes and other plant communities are located within the region but are beyond the scope of analysis for the management issues. The distribution of regionally relevant vegetation series will be summarized and a more detailed description of those series found within JDSF will follow.

The Redwood Series. The redwood series 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 1995). It is the dominant series in the analysis area, and it is also considered globally significant. The regional setting for this EIR falls in the center of the redwood region. Sawyer (2000) notes that in many ways this redwood forest is more similar compositionally and ecologically to the neighboring Douglas–fir tanoak forests than to the northern redwood forests. The California redwood region has 1.3 million acres of redwood with other conifers and hardwoods forest; Mendocino County has 542,000 acres (Fire and Resource Assessment Program 2002). JDSF comprises about 48,000 acres of this type or 4% and 9% of the redwood region and county totals, respectively, of this type.

The Red Alder Series. Holland describes the Red Alder Series distribution as occurring along steam banks and on moist locations along the coast from San Luis Obispo to Alaska. This series is most well developed in the mesic forest lower reaches of coastal perennial streams and rivers. In Mendocino County 3,200 acres have been classified as red alder series by CALVEG (1998) with about 1.5% (57 acres) found within JDSF.

The Pygmy Cypress Series. This series is more limited in distribution than other forest series and is considered globally significant. T. Sholars (2004) describes the distribution as occurring on the third though fifth marine terraces from the Ten Mile River to the Navarro River. Southern Mendocino and Northern Sonoma counties have pygmy-like vegetation, but without the presence of Bolander's beach pine. Based on CALVEG (1998) typing, 4,420 acres mapped as Pygmy Cypress type lie

in the area between Ten Mile and Navarro River with 14% (approximately 613 acres) found on JDSF. Other estimates of Pygmy forest extent vary. The DFMP states that JDSF contains approximately 40% of the Pygmy forest in the County. R. Sholars (1984) estimated an initial extent of approximately 4,000 acres, but noted that 13 of the 26 occurrences had been lost as of 1984.

The Bishop Pine Series. 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 on Mt. Tamalpais in 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 in Baja, California. CALVEG (1998) mapped 14,900 acres of Bishop Pine forest in Mendocino County of which JDSF contains approximately 4% (622 acres).

Other Communities or Series in the Region. California Natural Diversity Database (CNDDB, 6/04) lists the following: Northern Coastal Salt Marsh, Coastal Brackish Marsh, Coastal and Valley Freshwater Marsh, Fen, Freshwater Swamp, Coastal Terrace Prairie, Northern Coastal Bluff Scrub, Sphagnum Bog, and Grand Fir Forest. With the exception of the freshwater marsh and swamp, and sphagnum bog these types are associated with the coast.

Vegetation Communities and Habitats from JDSF

The JDSF has vegetation communities and associations typical of other 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 (*Pinus muricata*). 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 un-entered and residual old-growth forest remains.

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

Mendocino pygmy forest, a unique ecological unit recognized by the CNDDB as a sensitive plant community type, occurs in JDSF and adjacent public and private lands. This rare plant community occurs only in coastal Mendocino County. On JDSF, the Pygmy forest is concentrated in the western portion.

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 springs, and in areas where perched water tables influence the vegetation. Swamps (tree-dominated areas, such as on portions of alluvial redwood floodplains) and pygmy forests can also constitute wetlands, depending on site conditions. Wetlands vary in size and quality and are of special interest as habitat for plants of special concern.

There is a single sizable meadow (8 acres), the Bob Woods Meadow, located in the North Fork of South Fork Noyo River watershed. Forest management can result in the creation of temporary small grassy openings. There are localized shrub dominated areas, usually related to management disturbance. One 78-acre area of mixed chaparral and conifer forest exists towards the eastern edge of JDSF in the North Fork Big River watershed.

In addition to the unique vegetative communities, several 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 California Wildlife Habitat Relationships (CWHR) types in parentheses:

- Redwood Series (Redwood, Montane Hardwood Conifer)
- Red alder series (Redwood, Montane Riparian)
- Pygmy cypress series (Closed-cone pine/cypress)
- Bishop pine series (Closed-cone pine/cypress)

Native communities dominate the forest; however, isolated populations of introduced species exist. There is a single eucalyptus plantation located in the Caspar Creek watershed. There are scattered remains of logging camps and associated home sites with fruit trees and other introduced vegetation located along the old abandoned railroad grades within the forest. The current flora includes naturalized plants from other areas including some considered to be invasive.

Redwood Series

Coast 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*), 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. Each of the series would be considered to be North Coast Conifer forest utilizing the vegetation description used for the California Natural Diversity Database.

Ecological Factors. 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. Bare mineral soil conditions enhance seed germination, but reproduction from seed is infrequent. Redwoods most commonly reproduce vegetatively 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 principle vegetation type found within JDSF comprising approximately 48,600 acres with two main associations described below. Stands of pure redwood are uncommon; however, stands in which redwood is the sole dominant tree species include approximately 7,446 acres or 15% of JDSF.

Redwood/Douglas-fir Association

Douglas-fir is a common coniferous associate of coast redwood throughout its range (Sawyer and Keeler-Wolf). The relative occurrence of each of these species in a particular stand is related primarily to the environmental requirements of the dominant species as described below, and to past natural and anthropogenic disturbance. For example, soil disturbance on a moist north-facing slope, when accompanied by a viable seed source for Douglas-fir, will often result in abundant regeneration by the species.

Ecological Factors. The proportion of Douglas-fir or redwood 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 or rivers, 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 becomes relatively more abundant toward drier inland sites.

JDSF Distribution. The redwood/Douglas-fir vegetation type is a major vegetation type in JDSF, and is found throughout the Forest. Stands of this type are present in a variety of seral stages and with a range of canopy closure. The influence of moisture gradient effects is apparent in the relative abundance of these two species on the sites in JDSF. Although this series has not been mapped *per se* it comprises approximately 12,700 acres and 26 % of JDSF*.*

Redwood/Douglas-fir/Hardwood Associations

Various associations between redwood, other conifers, 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*), canyon live oak (*Quercus chrysolepis*) 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 can be found in most geographical areas of JDSF. Although this series has not been mapped *per se* it comprises approximately 27,800 acres and 51% of JDSF Variations in this association depend on environmental factors and stand seral stage. The dominant variations within this association are presented below.

One variation is principally composed of redwood, Douglas-fir, and tanoak. This variation occurs primarily on the more mesic sites and may include Pacific madrone, golden chinquapin (*Chrysolepis chrysophylla* var. *minor*) and grand fir (*Abies grandis*). The relative proportion of Douglas-fir and tanoak is generally controlled by the degree of Douglas-fir stocking. In the absence of successful Douglas-fir regeneration, open areas between redwood clumps tend to become occupied by tanoak over time.

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 and, canyon live oak (*Quercus chrysolepis*). Sites are typically more xeric than the previous variation. 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 common on dryer sites in the region. This type is also sometimes present as a seral stage in redwood stands and in the Redwood/Douglas-fir association. This association occurs in the eastern area of the Forest.

Red Alder Series

The Red alder series is dominated by, or solely composed of, Red alder (*Alnus rubra*) (Sawyer and Keeler-Wolf 1995). Other uncommon associated species include arroyo willow (*Salix lasiolepis*), black cottonwood (*Populus balsamifera*), Hooker's willow (*Salix hookeriana*), Scouler's willow (*Salix scouleriana*), and Sitka willow (*Salix sitchensis*).

Trees in this series are generally less than 40 meters tall. The tree canopy is continuous, and shrubs may be common to infrequent. The shrub salal (*Gaultheria shallon*) may be present. The herbaceous layer is often continuous and often dominated by fern, such as chain fern (*Woodwardia fimbriata),* lady fern *Athyrium filix-femina,* and herbs in the Saxifrage family.

Ecological Factors. The 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 perennial streams and river backwaters, banks, bottoms, floodplains, mouths, and terraces and can be associated with any aspect. Soils are typically sandstone, derived from schist. Elevations can range from sea level to 750 meters.

JDSF Distribution. The Red alder series covers approximately 57 acres in the western portion of JDSF.

Pygmy Cypress Series

Pygmy cypress (*Cupressus goveniana* ssp. *pygmaea*) is the dominant canopy tree in the Pygmy cypress series (Sawyer and Keeler-Wolf 1995). Other commonly

associated species include Bishop pine (*Pinus muricata*) and Bolander's beach pine (*Pinus contorta* ssp. *bolanderi*) *Chrysolepis chrysophylla* var. *chrysophylla* giant chinquapin. 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*), evergreen huckleberry (*Vaccinium ovatum*), and red huckleberry (*Vaccinium parvifolium)* (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 Mendocino pygmy forests are a unique ecological community that occurs only in coastal Mendocino County. It has been recognized by the California Natural Diversity Database as a sensitive plant community. Several individual species that occur in this type are also recognized as special status plants.

Pygmy cypress (*Cupressus goveniana* ssp. *Pigmaea*) is a CNPS list 1B species, as is *Pinus contorta* ssp. *bolanderi* ("Bolander's beach pine"). Pygmy manzanita (*Arctostaphylos mendocinensis*) is a CNPS list 1B species. The herbaceous layer can also include two CNPS list 1B species, swamp harebell (*Campanula californica*) and coast lily (*Lilium maritimum)*. *Carex californica* ("California sedge"), a CNPS list 2 species; can also be found within this type. It is likely that some poorly drained areas and low gradient areas in the pygmy forest also meet wetland criteria.

Ecological processes are discussed under Impact 6 relative to management effects. Both pygmy forest and bishop pine series seem to have different fire ecology dynamics than the other series so they will be discussed with the series descriptions. The role of fire in the ecology of this and the other forest communities of JDSF is not well understood. Preliminary research into the fire ecology of the pygmy forest has not been done. However, recent research on JDSF has found a fire return interval of 6 to 25 years in many areas of the Forest, including sample sites near the pygmy forest (Baxter and Brown, 2002). While most references note that the cones of Bolander's beach 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). The degree of serotiny and cause for seed release could be related to both genetic and environmental factors; and multiple strategies could be employed to cope with the stresses.

Some attributes suggest that fire plays a role in stand dynamics. 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 tolerating fire stress. The manzanita species are known to sprout after fire. In addition, the even-aged nature of the pygmy stands is often cited as an argument that stand-replacing fires are essential to reproduction.

The fact that swaths of non-dwarfed Bishop pine surround Bolander's beach pine and pygmy cypress 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 the pygmy forest species are surrounded by these stands, it is likely that the pygmy forest species can cope with some level of fire occurrence. Further work on the life history of the pygmy forest species is needed to fully understand the role of fire.

JDSF Distribution. The Pygmy cypress series covers approximately 613 acres of JDSF near the western extent of the Forest. CDF and California State Parks cooperate to manage some of this area.

Bishop Pine Series

Bishop pine (*Pinus muricata*) is the sole or dominant tree in the canopy of the 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*), 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. 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). Some areas are woodland like, with an open understory. 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 days with low humidity. The recruitment based on this type of seed release is not known, but seedlings are commonly found on JDSF at disturbed sites with bare soil following logging.

JDSF Distribution. The Bishop pine series covers approximately 622 acres (1.3%) of JDSF toward the western end of the Forest.

Microsites

Although the previously mentioned series and associations provide general descriptions of the forest stands present on JDSF, there are microsites supporting various habitats within each series, association, and type. Microsite features develop as the result of anthropogenic activities (road construction and maintenance, timber harvesting) and natural events (fire, wind, flooding). 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 can 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*).

Some sensitive plant species, such as pygmy manzanita, show a great affinity to the pygmy forest, while others, such as swamp harebell, can be found in pygmy forest and less site-specific habitats. Restricting activities within the riparian zone will provide a measure of protection to some species that are generally restricted to these locations, such as livid sedge. Some species, such as coast fawn-lily and running-pine, are forest generalists that may extend beyond the riparian zone. Forest openings also provide potential habitat for Humboldt milkvetch (*Astragalus agnicidus).*

Other Community Components: Fungi and Lichen

Fungi and lichen (symbiotic association of fungus and either blue green bacterium or green algae) are examples of the smaller, less well known yet important organisms present at JDSF. Fungi and lichen will be briefly discussed

for both their ecological role and as surrogates for other limited mobility, small organisms. Just a few of the fungi roles in plant communities at JDSF include beneficial mycorrhizae, decomposers aiding nutrient cycling, and pathogens. Fruiting bodies including mushrooms benefit wildlife and human foragers. Douglas-fir is estimated to host over two thousand species of ectomycorrhizal fungi (O'Dell et al. in Pilz and Molina, 1996). At research plots in the northern part of the redwood's range, Langent (in Noss 2000) has identified almost 300 species associated with redwood and T. Sholars listed 93 lichen species in the area near JDSF (in Noss 2000).

The area 330-acre area known as Mushroom Corners near the intersection of roads 408 and 409 is utilized by several universities, colleges and scientific societies for educational and scientific purposes (Figure VII.6.2.1). A substantial level of mycological study has been conducted at JDSF relative to other forested sites in California (Desjardin, letter 2004) The combination of climate, topography, land use history, and access make this area a valuable scientific resource. The long term academic interest in Mushroom Corners has resulted in 26 species that were first described in scientific literature at this site, with some dating back to the 1960s. Unfortunately, many of the descriptions (especially the older ones) are general with locations too vague to identify site locations for specific management proposes. Three of the five endemic species site descriptions include hardwoods with one listing *Arctostaphylos,* suggesting not all collection sites where in older areas where overstory shading has eliminated the hardwoods. Most do describe the forest as dense.

The management history of Mushroom Corner's is similar to that of much of the forest. The old-growth forest in this area was removed at about the turn of the century. Subsequently, it is estimated that the area was subjected to periodic fires until about 1940. Since 1940, an effort has been made to suppress all wildfire in the area. The second-growth forest in the area has been managed on an uneven-aged basis since that time, with single tree and group selection harvests taking place in 1966 and 1977. The resulting stands have varied from moderate to closed canopy conditions with fine scale distribution of vegetation associated with several seral stages. The mushroom corners area partially overlaps the Caspar Experimental Watershed, county roads with visual and recreation concerns, and under some EIR alternatives, a Late Seral Recruitment area as well as proximity to State Parks and private land ownerships. Management in this area is clearly complex.

No fungi species are listed in California as Federal or State Endangered or in the more inclusive Department of Fish and Game, Natural Diversity Database special status lists. The January 2005 DFG-CNDDB Special Vascular Pants, Bryophytes, and Lichens List includes six lichens state wide. With respect to lichens CNDDB list notes that "We are not including lichens for which little is known, even if they are only know from a few sites in California because the level of information is not developed enough. As information on individual taxa becomes better

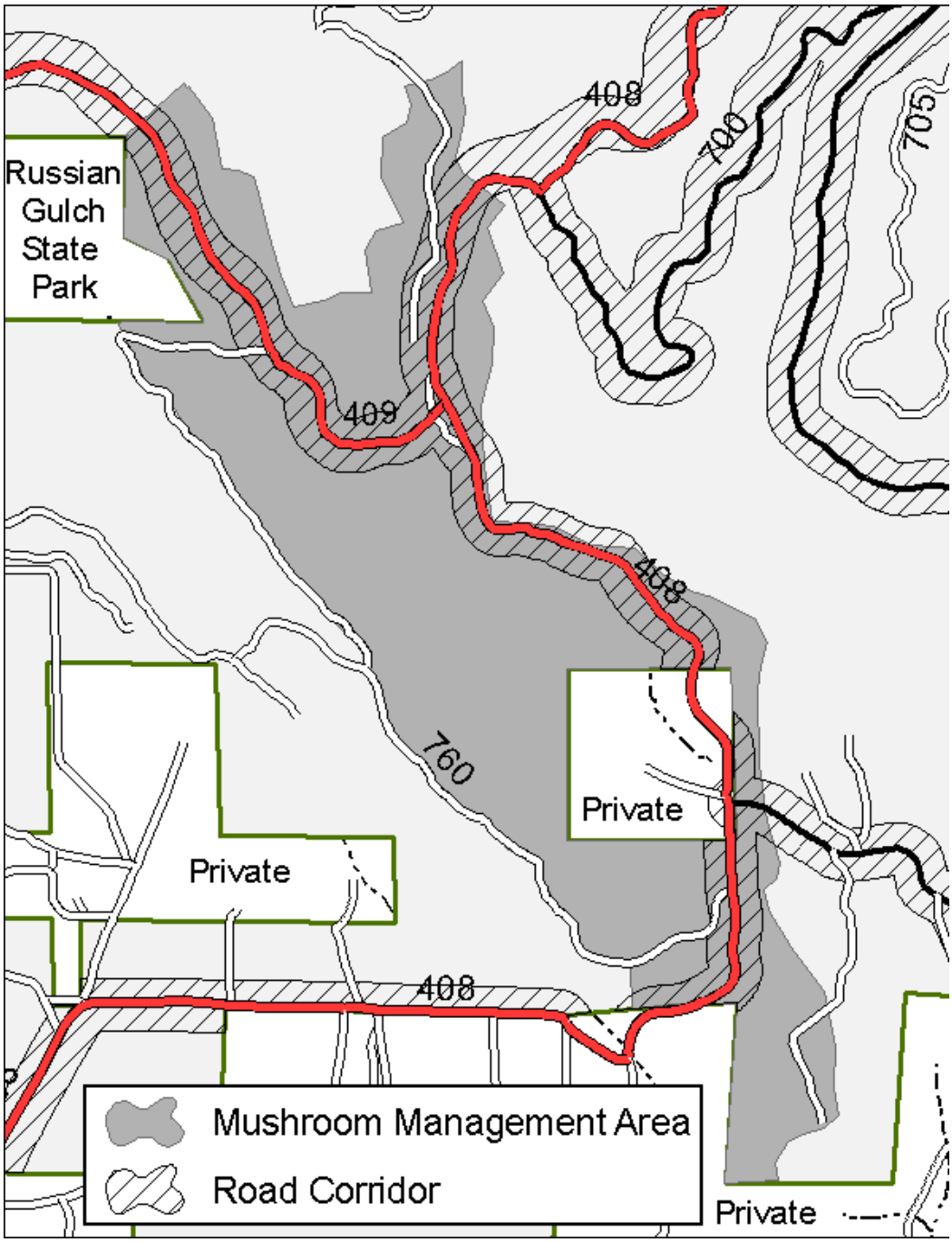

Figure VII.6.2.1. Mushroom Corners.

developed, more lichens may be added." The Federal Endangered Species program lists two lichen nation wide and no fungi. The Northwest Forest Plan, which applies to USDA Forest Service and USDI Bureau of Land Management lands within the range of the northern spotted owl, initially listed 234 fungi with a "Survey and Manage Species" status. Upon further taxonomic examination it was

determined that only 135 separate species existed, with the others reduced to synomomy. In April, 2004 the Survey and Manage species transitioned to the Special Status Species Program. The global IUCN Red List of Threatened Species 2004 edition (http://www.iucnredlist.org/) includes only two species of fungi both of which are actually lichenised fungi (lichens). Worldwide most fungi fall at present into the IUCN Data Deficient or Not Evaluated categories and numerous fungi are yet to be formally described. Rarities among fungi are not as well understood as in other groups.

The original sites or "type locations" from which a species is described are valuable for further study of that species. Species that are known from one occurrence (i.e., are endemic) would generally be considered rare. A species could also be labeled as endemic now because it is difficult to find and potential habitat has not been surveyed. Taxonomic uncertainty may also play a role in species that are currently known as endemic.

Invasive Exotic Species

Invasive exotic species can produce negative impacts to native species assemblages and can affect native species diversity. Rare native plant species associated with forest clearings are especially vulnerable to displacement by exotic invasives. Such rare plants include Humboldt milkvetch (*Astragalus agnicidus*) and maple-leaved checkerbloom (*Sidalcea malachroides*). The major invasive species found on JDSF are described in Appendix 7B-1.

There are currently six invasive exotic plant species that occur frequently across JDSF. All of these species are on the California Invasive Plant Council (CalIPC) 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*), Himalayan blackberry (*Rubus discolor*), and Tasmanian blue-gum (*Eucalyptus globosus*).

Additional List A-1 species that occur on JDSF and have the potential to become more wide-spread on the Forest are gorse (*Ulex europaea),* wild fennel (*Foeniculum vulgare*) and tamarisk (*Tamarix spp*.). Gorse occurrence is currently limited to the western portion of the Forest. Another List A-1 plant, Cape-ivy (*Scenecio mikanioides*), was known to be located in two isolated places within JDSF, and was removed.
List A-2 (the most invasive wildland pest plants in regional areas) plants known on JDSF are cotoneaster (*Contoneaster spp.*) and pennyroyal (*menthe pulegium*). Both occur frequently within the Forest.

English ivy (*Hedera helix)* is a list CalIPC List B (Wildland Pest Plant of Lesser Invasiveness) plant that has been found in riparian areas and in areas with substantial conifer overstory in JDSF.

This listing is not exhaustive. Unfortunately new species and occurrences continue to be identified on the forest. Some species seem to be restricted to old occupancy sites such as periwinkle (*Vica major*), Arrons beard (*Hypericum calycinum)*, and *Acata.sp* Others are spreading from nearby pastures (tansy ragwort, *Senecio jacobaea*)

Regional Setting: All of the above-listed A-1 species are widespread throughout much of California (with pampas grass and Cape-ivy restricted primarily to the coastal regions); all thrive in disturbed habitats. The various roads and skid trails, forest openings, and other disturbed open areas provide potential habitat for invasive species. The list A-2 and List B species are also found frequently in the cumulative effects analysis area. As noted above some species occur in areas with a substantial canopy cover on JDSF. The Mendocino District of the Department of Parks and Recreation noted *Cortaderia jubata* infestation in the Big River Unit and as expressed concern about invasive species on both public and private lands (Ron Munson 3/8/04). Invasive exotic species descriptions are incorporated in Appendix 7B-1.

Threatened, Endangered, and Sensitive Species

A list of 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 adjacent area. The species were initially identified using *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]). The list was refined by consultation with Clare Golec (DFG) and by review of updates of Rare Find 3.03 (Data Gov. Version December 5, 2004) and the CNPS Inventory (8/5/2003).

Species that are likely to occur within JDSF are presented in Table VII.6.2.1. As described in the Setting section, two minor vegetation types of less than 100 acres occur within the forest boundary. These unique plant communities, chaparral and alkaline soil grassland, will be evaluated individually, should any project activities be proposed in or near these areas. A detailed summary of the special concern species, including their identifying characteristics and habitat requirements, is presented in Appendix 7B-2. Included in Appendix 7B-3 is a table describing the habitat for all listed species of interest 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. Federal, State, and CNPS lists of rare, threatened, endangered, and special status species were used to construct the "special concern" plant species list for this analysis. The lists are updated annually. Any listing status additions or changes shall be reflected in subsequent iterations of these Plants of Special Concern lists. The current lists should be referenced as part of routine scoping for projects that have the potential to impact vegetation communities of JDSF.

Table VII.6.2.1. Plant and Lichen Species of Special Concern (Listed or CNPS 1 and 2) Likely or Known to occur on JDSF. [1]

Scientific/Common Name (* Known to occur on JDSF)	CNPS	RED	State	Federal
*Arctostaphylos mendocinoensis "pygmy manzanita"	1B	3-2-3	None	None
*Astragalus agnicidus "Humboldt milkvetch"	1B	3-3-3	Endangered	None
Boschniakia hookeri "small ground-cone"	2	3-1-1	None	None
Calamagrostis crassiglumi "Thurbers reed grass"	2	3-3-1	None	None
*Campanula californica "swamp harebell"	1B	2-2-3	None	None
Carex arcta "northern clustered sedge"	2	2-2-1	None	None
*Carex californica "California sedge"	2	3-1-1	None	None
Carex comosa "bristly sedge"	2	3-1-1	None	None
Carex livida "livid sedge"	1A	None	None	None
Carex saliniformis "deceiving sedge"	1B	2-2-3	None	None
Carex viridula var. viridula "green sedge"	2	3-1-1	None	None
*Cupressus goveniana ssp. pygmaea "pygmy cypress"	1B	2-2-3	None	None
Erigeron supplex "supple daisy"	1B	3-2-3	None	None
Erythronium revolutum "coast fawn lily"	2	2-2-1	None	None
Fritillaria roderickii "Roderick's fritillary"	1B	3-3-3	Endangered	None
Gilia capitata ssp. pacifica Pacific gilia	1B	2-2-2	None	None
Glyceria grandis "American manna grass"	2	3-1-1	None	None
Hesperolinon adenopyllum "glandular western flax"	1B	2-2-3	None	None
Horkelia tenuiloba "thin lobbed horkelia"	1B	2-2-3	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
*Lycopodium clavatum "running-pine"	2	2-1-1	None	None
Microseris borealis "northern microseris"	2	3-3-1	None	None
*Mitella caulescens "leafy-stemmed mitrewort"	2	2-1-1	None	None
Monardella villosa ssp. globosa "robust monardella"	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	Threatened	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 checkerbloom"	1B	2-2-3	None	None
*Usnea longissima, "long–beard lichen"[2]	na	na	None	None
Viburnum ellipticum 'oval-leaved viburnum"	2	2-1-1	None	None

[1] For major vegetation types. Excludes minor types as described in text.

[2] Usnea longissima is considered a sensitive lichen due to a Global Rank of G 4 (apparently secure....some threat or somewhat narrow habitat) and a State Rank of S3.1 (21-80 element occurrences OR 3,000-10,000 individuals OR 10,000-50,000 acres; very threatened) as listed in DFG's Special Vascular Plants, Bryophytes, and Lichens List (Natural Diversity Database December 5 2004).

In addition, species that are listed by CNPS as plants about which we need more information (List 3) and plants of limited distribution (List 4) should be considered during scoping. Based on the understanding of the species at this time, *Erigeron biolettii* (streamside daisy) is a CNPS List 3 plant that should be added to scoping lists. The uncommon species that are known or likely to occur in JDSF are included in Table VII.6.2.2.

Table VII.6.2.2. CNPS List 3 and 4 Species that Are Known or Likely to Occur within JDSF.

Scientific Name (* Known to occur on JDSF)	Common Name	Family
**Calamagrostis bolanderi*	Bolander's reed grass	*Poaceae*
Calamagrostis foliosa	leafy reed grass	*Poaceae*
Calandrinia breweri	Brewer's calandrinia	*Portulacaceae*
Ceanothus gloriosus var. exaltatus	glory brush	*Rhamnaceae*
Ceanothus gloriosus var. gloriosus	Point Reyes ceanothus	*Rhamnaceae*
Collomia diversifolia	serpentine collomia	*Polemoniaceae*
Cypripedium montanum	mountain lady's-slipper	*Orchidaceae*
Epilobium septentrionale	Humboldt County fuchsia	*Onagraceae*
Erigeron biolettii	streamside daisy	*Compositae*
Hemizonia congesta ssp. leucocephala	hayfield tarplant	*Asteraceae*
Hemizonia congesta ssp. tracyi	Tracy's tarplant	*Asteraceae*
Lathyrus glandulosus	sticky pea	*Fabaceae*
**Lilium rubescens*	redwood lily	*Liliaceae*
Linanthus acicularis	bristly linanthus	*Polemoniaceae*
Listera cordata	heart-leaved twayblade	*Orchidaceae*
Perideridia gairdneri ssp. gairdneri	Gairdner's yampah	*Apiaceae*
Piperia candida	white-flowered rein orchid	*Orchidaceae*
**Pityopus californicus*	California pinefoot	*Ericaceae*
Pleuropogon refractus	nodding semaphore grass	*Poaceae*
Ranunculus lobbii	Lobb's aquatic buttercup	*Ranunculaceae*
Ribes victoris	Victor's gooseberry	*Grossulariaceae*
**Veratrum fimbriatum*	fringed false-hellebore	*Liliaceae*
List based on consultation with Clare Golec, CDFG, 9/3/02 and CNPS db 8/5/04)		

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. The CNPS lists are developed through a formal review process involving a scientific advisory committee composed of noted academic, professional, and amateur botanists across the state. The scientific advisory committee reviews the best available data to aid in compilation of rare, endangered, threatened, and uncommon plant lists. CDFG currently accepts the premise that placement of

plants on CNPS lists 1A, 1B and 2 provides a fair argument that they qualify as rare, endangered, or threatened under Section 15380(d) of CEQA.

Federal and State-listed Plant Species

Humboldt milkvetch (*Astragalus agnicidus*), and Roderick's fritillary (*Fritillaria roderickii*) are state listed endangered.[1] North Coast semaphore grass (*Pleuropogon hooverianus*) is a state listed rare species and is a candidate for 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. Authority for the protection of these species is provided primarily through CEQA standards, Fish and Game Codes, the Native Plant Protection Act, and the California Endangered Species Act (CESA). Protection for plant species is also authorized by Forest Practice Act, Forest Practice Rules, and the THP review process. However, consultation with CDFG and memoranda of understanding with other agencies also are important in the preservation of plant diversity.

California Environmental Quality Act (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). CEQA Guidelines Section 15380(b) provides the criteria for Endangered, Rare, and Threatened species. Section 15380(d) state that species that are not on state and federal lists, but that meet the criteria in subsection (b) of Section 15380, "shall nevertheless be considered to be endangered, rare, or threatened." CNPS List 1A, 1B, and 2 plant species will be initially presumed to meet these criteria subject to review and reassessment during scoping. Additionally, under Section 15380, species will be considered Endangered, Rare, or Threatened, if it is listed as such under the California or Federal Endangered Species Act. Species designated as candidates for listing by the Fish and Game Commission under the CESA also are "presumed to be endangered, rare, or threatened." The California ESA presumes that candidate species meet the criteria for listing as Endangered, Rare, or Threatened. 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

[1] California Forestry Note 116 (Decker et al. 2002) documents the 1997 finding of Humboldt milk-vetch on JDSF.

FPRs are a State Certified Regulatory Program (CCR § 15251(a)) and are subject to these rules.

Native Plant Protection Act (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 also has 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, THPs submitted in accordance with the Z'berg-Nejedly Forest Practice Act of 1973 are 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. Other management activities may not be exempted from Fish and Game Code Section 1911 (Fish and Game Code Section 1913). Regardless of the exemption allowed to THPs under Fish and Game Code Section 1913, it is the stated intent of JDSF to address sensitive plants and their habitats on a project basis through scoping in consultation with CDFG, surveys according to appropriate survey guidelines where indicated by the results of scoping, assessment of potential impacts, and avoidance or mitigation to reduce impacts to a level less than significant.

California Endangered Species Act (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 and management of botanical resources. Goals and objectives associated with the management of vegetation and habitats are stated below.

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.

Timber Management: 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 conditions, 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.

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

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.

Protection: Preserve native plant species. As feasible, prevent establishment of new exotic invasive plants and take action to prevent spread of existing populations of exotic invasive plants. Protect native communities from insect, disease, and plant pests using the concept of integrated pest 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 addressed. In general, the DFMP provides for the protection of special vegetation types, such as old-growth forest, pygmy forest, and wetlands, through restricting activities in these communities and by utilizing an Integrated Weed Management approach to prevent the spread of invasive species into special vegetation communities. Special status species are afforded guidelines for protection on a project basis.

Special Concern Areas and Unique Habitats

Old-growth trees and forest. 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 provides 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 restore the area infested by Eucalyptus to native coniferous forest.

Invasive Exotic Plant Species Control

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 or mechanical treatment, herbicide application, prescribed fire, biological agents, or other techniques to reduce invasive weed populations and to promote forest health. The DFMP includes eight 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 monitor post-harvest emerging weed populations and determine treatment needs.
- JDSF will continue to support the International Broom Initiative, and will continue to be involved in local weed management initiatives.
- 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 invasive wildland plant list produced by the California Invasive Plant Council.

Plant Species of Concern

The DFMP identifies the plant species of concern as occurring on JDSF (see DFMP Table 1 and list on page 62).[2] Table VII.6.2.1 in this EIR provides an updated and more complete listing of these. In Table VII.6.2.1, the plants that have been found on JDSF are designated with an asterisk (*). 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

[2] Page references to the DFMP refer to the electronic version (PDF) posted at the Board's website: http://www.bof.fire.ca.gov/pdfs/jdsf_mgtplan_master%203b.pdf.

potential habitat subject to management activities, including management activities intended to reduce or control invasive exotic species, such as road-side treatments. Survey designs will be based on the concepts contained in the DFG Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Plant Communities (DFG 2000). Surveys conducted as part of THP development will follow the practices commonly accepted by CDF and CDFG for THP review. Surveys for other types of projects will recognize the specific features of those projects. (For example, road surface maintenance and roadside brushing are ongoing activities that create repeated periodic disturbances, precommercial thinning typically occurs a few years following the more substantial disturbance of a commercial harvest, and shaded fuel break construction targets dense overstory and understory vegetation). 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. Observations of rare, threatened, or endangered plants or plant communities will be recorded on field survey forms and copies provided to CDFG's California Natural Diversity Database (CNDDB). JDSF will provide for, on an as-needed basis, sensitive plant identification training for field personnel.

Habitat Management Practices: Limited removal of species in the pygmy cypress forest may occur as a result of habitat development projects for the Lotis blue butterfly. Prior to habitat development projects, rare plant surveys will be conducted according to accepted survey guidelines (see previous section) to address sensitive plant resources. A qualified botanist will assess the appropriateness of removal of any sensitive plant species in relationship to fostering habitat for the growth of the butterfly's host species, *Lotus formosissimus*. Effectiveness monitoring will be conducted for any habitat management practice involving removal of plant species in the pygmy forest to assess the response of the forest to habitat alteration.

Plant Species of Concern Possibly Present on JDSF: The DFMP identifies the plant species of concern, and although they may not currently be known from JDSF, may occur in areas of suitable habitat. In Table VII.6.2.1, the plants that have not been found on JDSF to date lack an asterisk (*).

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 pre-project scoping, surveying, and mitigation development measures where management activities may impact rare plants. These guidelines are included below. Additional sensitive plant resource guidelines for Timber Harvest Plans have been recently developed by DFG (7/05) and complement the measures developed. Rare, threatened, and endangered species, as defined by Section 15380 of the CEQA Guidelines, will be addressed during the

scoping, surveying, and mitigation-development processes. For species that do not meet the Section 15380 definitions of a rare, threatened, or endangered species but that are CNPS list 3 or 4 species, evaluation, scoping, and mitigation practices are likely to vary according to identified need, the current state of species knowledge, and consideration of input provided by CDFG through the scoping process.

Scoping: The scoping process would normally begin with the identification of sensitive species and their habitats that may be affected by the project and are of management concern. For habitat issues, the scoping process may include habitat issue characteristics, a description of presence in the assessment area, and where potentially impacted, a description of the potential impact, measures to minimize the impacts, and an analysis of significance. For individual species, project-associated risks, limiting factors and current status will be considered. Project specific review may include an evaluation of the availability, quality, and quantity of suitable species habitat within the project and assessment area including an evaluation of known actual or potential presence of the species. To be thorough, the pre-project scoping process will include referencing updated Tables VII.6.2.1 and VII.6.2.2 of the EIR, Appendix 7B, available database information from the California Natural Diversity Database and CNPS Inventory, and other sources of sensitive plant habitat and occurrence data.

Surveys: When suitable habitat is present within or immediately adjacent to the project area, project-planning documentation will include surveys as described below, and a discussion of the efforts made to determine presence or absence of the species in question. An assessment area that extends beyond the boundaries of the planned activity may also be required for some species. Avoidance measures and other necessary mitigations will be specified.

Survey designs will be based on the concepts contained in the CDFG Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Plant Communities (CDFG, 2000). Surveys conducted as part of THP development will follow the practices commonly accepted by CDF and CDFG for THP review. Surveys for other types of projects will recognize the specific features of those projects. [For example, road surface maintenance and roadside brushing are ongoing activities that create repeated periodic disturbances, pre-commercial thinning typically occurs a few years following the more substantial disturbance of a commercial harvest, and shaded fuel break construction targets ground cover vegetation].

Observations of rare, threatened, or endangered plants or plant communities will be recorded on field survey forms and copies provided for the California Natural Diversity Database (CNDDB).

Mitigation Development: Upon determination that a proposed action is likely to result in a significant adverse effect, mitigation measures proposed to substantially

lessen or avoid the impact will be included in project-associated documentation. Some projects will require consultation with DFG Botanist and an adaptive management approach. An example is conducting invasive weed control and road maintenance in areas with exiting or potential Humboldt milkvetch (*Astragalus agnicidus*) occurrences.

California Forest Practice Act and Rules

The Forest Practice Act of 1973 requires that an agency adopt feasible mitigation to avoid significant environmental impacts. The Forest Practice Rules (FPRs) 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, 14 CCR § 898.2(e)]. In addition, the Forest Practice Rules implement the feasible mitigation standard under 14 CCR § 896. The FPRs also state "Where significant adverse impacts to non-listed species are identified, the Registered Professional Forester (RPF) and Director shall incorporate feasible practices to reduce impacts as described in 14 CCR § 898." (14 CCR § 919.4).

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 indirectly 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.
- Have cumulative effects resulting in reduction the range or local extirpation of a rare plant species on a spatial scale that includes the larger analysis area. This threshold includes changes in the environment caused by the interaction of ecological processes and multiple effects.

6.2.6 Impacts

Impacts to botanical resources are determined by assessing the potential type, level, and frequency of management activities affecting the resource, and predicting the response. The assessment of impacts to plant communities and habitats is based on the potential for

projects to alter the characteristics of the Forest and its plant communities. Land management activities and their potential impact on plant resources is related to their scope and level of ground disturbance. The JDSF management activities that may have the greatest potential for impact include timber harvesting, road management, and fire protection. Several activities may take place as part of a single project. For example, a timber harvest could include a combination of the following; road building, timber harvest, road rehabilitant or decommissioning, water quality enhancement measures, site preparation, tree planting, and possible release. In the past, the sequence often included prescribed burning of areas that had been recently clearcut. In the future, broadcast burning within harvest units is not expected to occur, but some burning to enhance ecological process may occur primarily in the form of research or demonstration projects. Operational burning in harvested areas would only occur with site-specific, unusual or unforeseen slash reduction or regeneration problems. Road maintenance operations may include the removal of encroaching vegetation, maintenance of drainage structures such as culverts and ditches, and grading of the road surface.

An extensive inventory of the botanical resources of JDSF has not been conducted. JDSF maintains a map of known rare plant occurrences and has compiled available supporting documents. Inventory is planned to occur on a project-by-project basis through surveys patterned after currently accepted protocol. Potential impacts to botanical resources will be addressed at the project implementation level through pre-survey scoping in consultation with DFG, survey, and development of measures that avoid or mitigate impacts to sensitive plant species.

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

The DFMP provides for the protection of rare and unique plant communities. Specific communities are protected in designated Special Concern Areas. Qualified Forest personnel or consultants will conduct appropriate rare plant surveys in potential habitat subject to proposed management activities. JDSF will provide site- and species-specific protection measures that contribute to the maintenance or long-term conservation of population viability of plant species of concern. Table VII.6.2.1 identifies the list of plant species of concern for JDSF. This list will be used to guide survey work.

Timber harvesting represents the largest potential source of impacts to these special communities. The old-growth reserves, pygmy forests, and cypress groups are protected from logging. The DFMP also specifies timber management practices that maintain the overall structure of forest communities. The native hardwood component of the Forest may be modified or reduced in places, but the native species diversity 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.

Given the protections provided in the DFMP, implementation of the proposed project (alternative C1) would result in a less than significant impact in terms of threatening or eliminating a plant community.

Alternative A involves only minimal management activity. There would be no timber harvesting, no implementation of a Road Management Plan, and no expansion of recreation facilities under this alternative. The current level of recreation facilities and utilization would continue. Invasive species would be largely uncontrolled. Plant communities would not be subject to change as a result of management activities under this alternative. It would have a less than significant impact.

Alternative B provides protection to plant communities to the extent required by regulation. Known and those incidentally discovered populations of rare, threatened, and endangered plants would be protected. Project plant surveys would be conducted as required by THP review processes and CEQA compliance. Protection of plant communities would be based on their status when evaluated in CEQA analysis for projects. Unless mitigated, alternative B has the potential to result in significant adverse impacts to plant communities. Mitigations could be developed similar to the provisions of the proposed project.

Alternatives C2 through F generally provide the same level of protection to plant communities as alternative C1, including Special Concern Areas. Alternatives D, E, and F generally involve lesser amounts of even-aged timber management than alternatives C1 and C2, resulting in less vegetation disturbance, and thus may pose a somewhat lesser risk to plant communities in general. Alternative F calls for phasing in forest-wide plant surveys, which could lead to improved knowledge of plant communities of concern and facilitate some planning. Alternatives C2 through F would have a less than significant impact.

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 indirectly 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 management-related activities. As part of the DFMP, the Department has committed to having a qualified botanist or trained

personnel 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. As needed, management activities will be altered (including avoidance of the plant population) or other measures will be developed and applied to prevent significant adverse effects.

Management activities that result in ground and/or vegetation disturbance would be subject to rare plant surveys. These activities include, but are 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, Road Management Plan implementation, and IWM activities (possibly including herbicide use, described in the preceding section 6.2.4.)

Some rare, threatened, and endangered species will be protected by default. A rare species that is located in certain SCAs (e.g., WLPZ, reserved old growth groves, or pygmy forest) will receive incidental protection. This approach is an effective strategy for rare plant protection, but only for plants that are likely to occur in the habitat types within the SCAs. Some sensitive plant species, such as pygmy manzanita, show a great affinity for the pygmy forest series, while others, such as swamp harebell, can be found in both pygmy forests and less site-specific habitats. The WLPZ will provide a measure of protection to some species that are generally found in riparian areas or wetlands, such as livid sedge. Some species, such as coast fawn-lily and running-pine, are forest generalists and would not necessarily be protected by SCAs.

Among the factors that can indirectly affect rare plant occurrences are changes in canopy cover, competing vegetation, and soil moisture (changes in drainage). Project analysis would recognize these factors and develop appropriate mitigation and protection measures. These measures will be developed in the context of other environmental conditions. For example, measures designed to protect or treat a rare plant occurrence in an unstable road planned for rehabilitation may differ from measures designed for a stable location.

For complex projects such as THPs, protection and mitigation measures will be designed in consideration of each major aspect of the project (e.g., road construction, timber harvesting, regeneration, road maintenance). Operationally, protection can be continued by refreshing on the ground identifiers (flagging or equivalent).

CDF 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 VII.6.2.1 and VII.6.2.2, but not known to occur on the Forest.

No substantial adverse effects, either directly or indirectly through habitat modifications, are expected for rare plants.

Given the above, implementation of the proposed project (alternative C1) would result in a less than significant impact to Impacts 2 and 3.

Alternative A involves only minimal management activity. There would be no timber harvesting, no implementation of a Road Management Plan, and no expansion of recreation facilities under this alternative. The current level of recreation facilities and utilization would continue. Candidate, sensitive, or special status plant species would not be subject to effects resulting from management activities under this alternative. It would have a less than significant impact.

Alternative B provides protection to plants to the extent required by regulation. Known and those incidentally discovered populations of rare, threatened, and endangered plants would be protected. Project plant surveys would be conducted as required by THP review processes and CEQA compliance. Protection of plant communities would be based on their status when evaluated in CEQA analysis for projects. Unless mitigated, alternative B has the potential to result in significant adverse impacts to rare, threatened, and endangered plants. Mitigations could be developed similar to the provisions of the proposed project.

Alternatives C2 through F generally provide the same level of protection to plants as alternative C1, including Special Concern Areas. Alternatives D, E, and F generally involve lesser amounts of even-aged timber management than alternatives C1 and C2, resulting in less vegetation disturbance, and thus may pose a somewhat lesser risk to plants in general. Alternative F calls for phasing in forest-wide plant surveys, which could lead to improved knowledge of plant species of concern and facilitate some planning. Alternatives C2-F would have a less than significant impact.

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

Forest management projects have the potential to restrict the range of several listed species. Some species, such as Humboldt milkvetch, that either occur or have the potential to occur on JDSF, are at the edge of their range in Mendocino County. Some species, including pygmy manzanita and pygmy cypress, are 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 or unlisted species that meets the definition of rare, threatened, or endangered under

CEQA Guidelines or California Fish and Game Code. JDSF has also committed to developing mitigation measures for the protection of endangered, rare, or threatened plants (as defined previously) and potential habitat if they are identified.

Given these considerations, the project alternative (C1) would have a less than significant effect on the range or rare, threatened, or endangered plant species.

Alternative A involves only minimal management activity. There would be no timber harvesting, no implementation of a Road Management Plan, and no expansion of recreation facilities under this alternative. The current level of recreation facilities and utilization would continue. Habitat or the range of candidate, sensitive, or special status plant species would not be subject to affects of management activities under this alternative. There would be little control of invasive plants beyond roads. It would have a less than significant impact on species range.

Alternative B provides protection to plants to the extent required by regulation. This alternative provides for more even-aged management, which results in greater vegetation disturbance, than any other alternative. Known and those incidentally discovered populations of rare, threatened, and endangered plants would be protected. Project plant surveys would be conducted as required by THP review processes and CEQA compliance. Protection of plant communities would be based on their status when evaluated in CEQA analysis for projects. Project-by-project protection of rare, threatened, and endangered plants may have a higher risk of impacting plant occurrences. There is no Integrated Weed Management Program to control invasive exotic species. Unless mitigated, alternative B has the potential to result in significant adverse impacts to the range of rare, threatened, and endangered plant species. Mitigations could be developed similar to the provisions of the proposed project.

Alternatives C2 through F generally provide a similar level of protection to plants as alternative C1, including Special Concern Areas. Alternatives D, E, and F generally involve lesser amounts of even-aged timber management, and more late seral stands, than alternatives C1 and C2, resulting in less vegetation disturbance, and thus may pose a somewhat lesser risk to plants in general. The three-year herbicide moratorium under alternative D has the potential to delay effective control of invasive weeds that could adversely affect rare plants. The permanent herbicide moratorium under alternative E has potential to increase the risk that some invasive weeds would not be effectively controlled, resulting in adverse effects on rare plants. Alternative F calls for phasing in forest-wide plant surveys, which would lead to improved knowledge of plant species of concern and facilitate some planning. Based on these considerations, alternatives C2 through F would have a less than significant impact on the range of rare, threatened, and endangered plant species.

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. None of the other alternatives conflict with these plans, policies, or ordinances. There is no impact.

Impact 6: ***Cumulative effects resulting in a reduction in the range of a species, or local extirpation of a plant species on a spatial scale that includes the larger analysis area. This threshold includes changes in the environment caused by the interaction of ecological processes and multiple effects.*** **(Less than Significant**)

The analysis of possible cumulative impacts to special status plants resulting in a reduction in range or extirpation is approached in several ways. First, future changes in growing conditions throughout the JDSF EIR Assessment Area are examined using changes in canopy cover classes from modeled California Wildlife Habitat Relationship System (CWHR) habitat types. Second, a review of literature regarding possible sources of cumulative effects to rare plants is discussed and compared to management measures. Last, the effects to rare plants as a result of ecological processes and multiple effects is discussed.

The regional setting and cumulative effect analysis area for botanical resources is the result of standard protocol for plant surveys, logical boundaries utilized analysis conducted for other resources, and local knowledge of plant species. Scoping prior to rare plant surveys typically begins with a query of rare plant occurrences within one standard quadrangle (USGS, 7.5 minute series map) in each cardinal and semi-cardinal direction from the quadrangle where the project is located (nine quad query). A query of the California Natural Diversity Database (CNDDB, December 2004) generated a list of plant species of interest for cumulative effects analysis and for Table VII.6.2.3 (20 quads in and around JDSF, approximately 720,000 acres). This list was supplemented with species suggested by local knowledge and will be referred to as " Plant and Lichen Species of Interest for Cumulative Effects...". Overstory vegetation changes (WHR forest type) are modeled within the watershed-based assessment area (210,561 acres). This spatial and temporal data is used for a cumulative effects analysis of Functional Vegetation Groups.

Change in Habitat Based upon Functional Plant Groups

The analysis of plant species of interest places species of plants into groups by similar habitat and plant community. Because these groupings reflect habitat and plant community, but also have management implications, they are referred to as Functional Plant Groups. This approach provides several advantages. It can build on projected forest vegetation changes over time. If a plant that is currently placed in one functional plant group is also found in association with plants of another group, analysis will consider both groups. Some of these species are known only from sparse records. Information on their water requirements, tolerance of shade or sun, and ability to compete with other vegetation is often unavailable. The listing status of plants is dynamic, thus a biological and management consequence-driven approach allows for

inferences to be made about newly identified species. Functional group analysis is imperfect, but is the best available model, given the current state of the knowledge about the 60 species of plants of interest.

Table VII.6.2.3 groups, by hierarchical function, the plant and lichen species of interest for cumulative effects assessment within the JDSF analysis area. Species that could fall within more than one group are included within the first appropriate group in the hierarchy. The first group in the sequence has a higher potential for negative effects from disturbances such as timber harvest. The next three have lower potential and the final group has the lowest potential. For some species, the most well known habitat (e.g., costal scrub) does not occur on JDSF. Therefore, plants were grouped into the JDSF Functional Group that is neighboring or shares species**.**

The Upland North Coast Conifer Functional Group The upland North Coast Conifer functional group has the highest potential to exhibit effects associated with timber management. It also comprises roughly 90% of the area found within the cumulative effect analysis area. Approximately 18% of the species of interest are found within this functional group. A range of microsites is represented by the plants within this group, from open to closed mesic areas. One aspect of cumulative effects analysis (Impact 6) is an examination of the risk that a reduction in range or extirpation of species from the Upland North Coast Conifer Forest Functional Group, extended over the analysis area, could result in a cumulative effect. The predicted future mix of canopy conditions, combined with information about the response of some of these species to disturbance, management regimes, and mitigation, allows for assessment of risk to these species.

Figure VII.6.2.2 displays the projected relative change in canopy cover for grouped CWHR habitat types/ Functional Groups for the analysis area, based on the project alternative (C1). North Coast Conifer forest (Redwood, Douglas-fir and Montane Hardwood-Conifer CWHR types) comprises the majority of the analysis area. The proportion of North Coast Conifer forest with relatively open canopy structure (CWHR "Open Cover" less than 40% canopy cover or trees <9 inches) declines from approximately 24,000 to 9,000 acres in 20-30 years. Modeling is done at a stand scale. The modeling is incapable of capturing small openings resulting from group selection or openings related to roads and landings.

Table VII.6.2.3. Plant and Lichen Species of Interest for Cumulative Effects Consideration within the JDSF Analysis Area, Grouped by Hierarchical Functional Group.

Upland North Coast Conifer Functional Group

This group includes redwood and mixes of fir and hardwood and is where the majority of the commercial harvests effects occur. The plants included would be expected to found in upland actively managed potions of JDSF but may occur in other habitats as well.

None to Moderate Canopy Closure *Early seral and possibly short lived*	**None to Moderate Canopy Closure** *Openings such as grassy areas or shallow soils*	**Light to Full Canopy Closure** *Mid seral or later* *Specialized substrate*	**Moderate to Full Canopy Closure** *Mid seral or later* *May be found in mesic sites*
• *Astragalus agnicidus* "Humboldt milk-vetch" • *Sidalcea malachroides* "maple-leaved checkerbloom"	• *Campanula californica* "swamp harebell" (open to partial canopy- mesic) • *Pleuropogon hooverianus* "North Coast semaphore grass" (grassy) • *Horkelia tenuiloba* "thin lobbed horkelia"	• *Usnea longissima,* "long–beard lichen" (on trees) • *Boschniakia hookeri* "small ground-cone" (parasitic on heath family) • *Lilium maritimum* "coast lily" (sandy soils near coast)	• *Erythronium revolutum* "coast fawn lily" • *Lycopodium clavatum* "running-pine" • *Senecio bolanderi* var. *bolanderi* "seacoast ragwort"

Closed Cone Forests or Openings Functional Group

Species found in Closed Cone (Bishop Pine) or grassy or other openings, but not typically found in upland forest.

- *Carex californica* "California sedge" (wet meadow, pygmy)
- *Cupressus goveniana* ssp. *pygmaea* (pygmy)
- *Erigeron supplex* "supple daisy" (openings)
- *Fritillaria roderickii* "Roderick's fritillary" (costal or grassland)
- *Gilia capitata* ssp. *pacifica* "Pacific gilia" (openings, grasslands)
- *Hesperolinon adenopyllum* "glandular western flax" (shrub, grass)
- *Lasthenia macrantha* ssp. *bakeri* "Baker's goldfields" (openings)
- *Monardella villosa* ssp. *globosa* "robust monardella" (openings, road banks)
- *Sidalcea malviflora* ssp. *purpurea* "purple-stemmed checkerbloom" (costal prairie& costal open forest)
- *Viburnum ellipitcum* "oval viburnum" (shrub, woodlands)

Table VII.6.2.3, continued. Plant and Lichen Species of Interest for Cumulative Effects Consideration within the JDSF Analysis Area, Grouped by Hierarchical Functional Group.

Limited to Pygmy Functional Group

Includes only species limited to Pygmy Cypress–Bolander Pine Forests. Plant species with occurrences beyond the Pygmy Forest are placed in other groups

- *Arctostaphylos mendocinoensis*- "pygmy manzanita"
- *Pinus contorta* ssp. *bolanderi* "Bolander's beach pine"

Wet Areas Functional Group

Includes areas near watercourses or features ranging from seeps and wet meadows to swamps and bogs. Species presence is typically tied to presence of water. This may range from seasonal wetness to continuously wet areas.

May be found by water in areas with North Coast Conifer overstory	Rage of moisture and range in canopy cover	Some occurrences in grassy openings
• *Mitella caulescens* "leafy-stemmed mitrewort" (partial to full canopy cover) • *Sanguisorba officinalis* "great burnet" (also bog and fen) • *Carex arcta* "northern clustered sedge" • *Carex viridula* var. *viridula* "green sedge"	• *Carex livida* "livid sedge" • *Carex saliniformis* "deceiving sedge" • *Glyceria grandis* "American manna grass" • *Juncus supiniformis* "hair-leaved rush" • *Sidalcea calycosa* ssp. *rhizomata* "Point Reyes checkerbloom" (costal)	• *Carex comosa* "bristly sedge" (costal prairie grassland) • *Calamagrostis crassiglumi* "Thurbers reed grass • *Rhynchospora alba* "white beaked-rush" • *Microseris borealis* "northern microseris"

Species Characterized by Communities or Habitats Not Represented on JDSF

Plant species were identified by standard scoping.

- *Abronia umbellate breviflora* "pink sand-verbena"
- *Agrostis blasdalei* "Blasdale's bent grass"
- *Alisma gramineum* "narrowed-leaved water-plantain"
- *Blenosperma naum var robstrum* "Point Reys blenosperma"
- *Calystegia purpurata* ssp. *saxicola* "costal bluff morning-glory"
- *Carex lyngbyei* "Lyngbye's sedge"
- *Castilleja affinis* ssp. *litoralis* "Oregon Coast Indian paint brush"
- *Castilleja ambigua humboldtiensis* "Humboldt Bay owl's clover"
- *Castilleja mendocinensis* "Mendocino coast Indian paintbrush"
- *Chorizanthe howellii* " Howell's spineflower"
- *Clarkia amoena ssp. whitneyi* "Whitney's farewell-to-spring"
- *Collinsia corymbosa* "round headed Chinese houses"
- *Erysimum menziesii* ssp. *menziesii* "Menzie's wallflower"
- *Gilia milefoiata* "dark-eyed gilia
- *Horkelia marinesis* "Point Reys horkelia"
- *Lasthenia macrantha ssp. macrantha* "perennial goldfields"
- *Limanthes bakeri* "Baker's meadowflower"
- *Lupinus milo-bakeri* "Milo Baker's lupine"
- *Navarretia leucocephala ssp. bakeri* "Baker's navarretia"
- *Phacelia insurlaris var. contenenis* "North Coast phacelia"
- *Potamogeton ephydrus ssp. nuttallii* "Nuttal's pondweed"
- *Puccinellia pumila* "dwarf alkali grass"
- *Triquetrella calfironica* "costal triquetrella"
- *Viola palustris* "marsh violet"

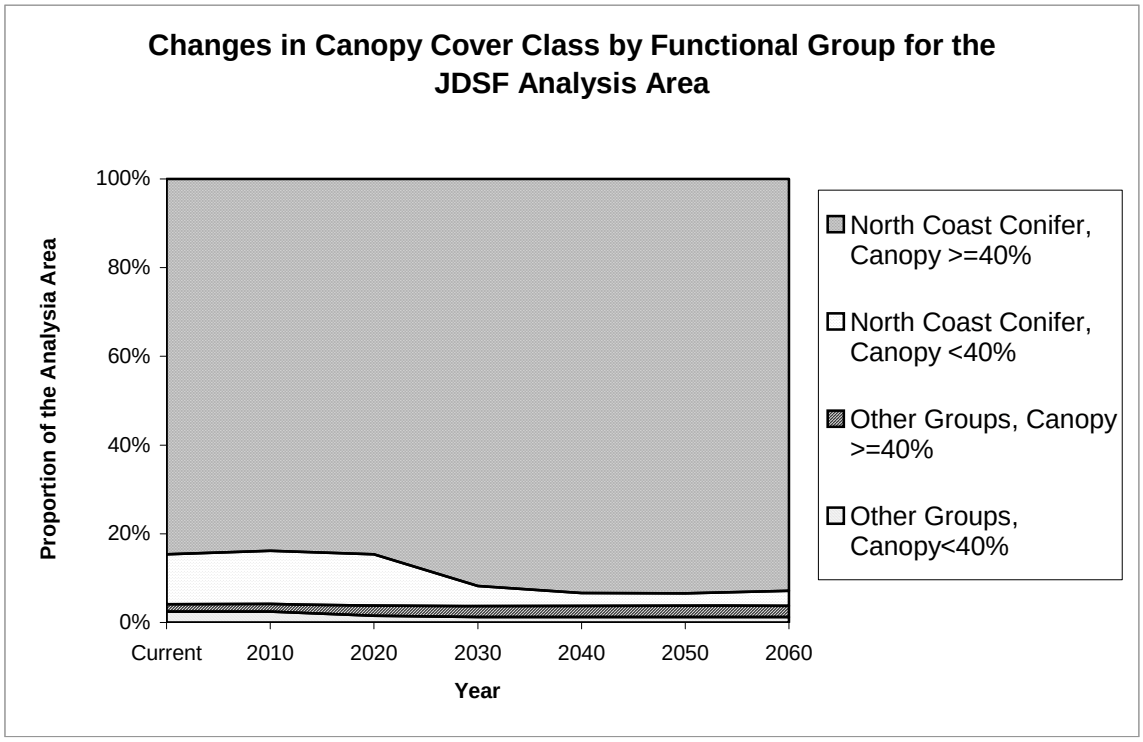

Figure VII.6.2.2. Changes in Canopy Cover Class by Functional Group for the JDSF Analysis Area based on the Project Alternative (C1).

In the Upland North Coast Conifer, the decline in the fraction of stands with open canopy reflects a shift in silviculture systems and continuing canopy growth in stands with no canopy management. Some openings will be created on a finer scale, resulting from forest management activities that utilize group or individual tree selection, as well as openings created by roads and landings. In even aged managed portions of the analysis area, the canopy cover will vary with time and space, but rapid canopy re-growth within cutting units will yield moderate to high canopy cover within a few years after initial harvest. An increase in canopy cover may benefit plants that occupy the understory and moist microsites, but continuity may not be as high at a fine scale.

Sholars and Golec (2004) reviewed the effects of forest management to rare plants of the redwood region. They noted that there are 45 rare vascular plants closely associated with redwood forest. For the 10 species documented in detail, they found:

- Early successional species (Upland North Coast Conifer– none to moderate canopy closure early seral) in some cases, but not all cases, increase with canopy removal and soil disturbance.
- Forest opening species (Upland North Coast Conifer- none to moderate canopy closure openings) benefit with full light expose but not necessarily with soil disturbance and compaction.

- Forest understory species dependent on shade and moist forest microclimate (Upland North Coast Conifer -moderate to full canopy closure-mesic) were sensitive to soil disturbance.

The DFMP requirements for scoping, survey, and development of mitigation, will reduce the risk of significant cumulative effects at JDSF for the North Coast Conifer Functional Group rare plants. The protection of old growth stands and aggregations, and recruitment of late–seral forest conditions in specific areas of JDSF, limits the portion of the Forest potentially subjected to the more intensive effects of timber harvest. Nearby state parks will not experience timber harvest effects. On privately owned forestlands within the analysis area, direct impact to rare plants is minimized by the common practices of survey, protection and mitigation established for individual THPs and other CEQA projects.

For the North Coast Conifer Functional Group, significant cumulative effects related to a reduction in range or local extirpations are not expected. The modeling of future stand conditions indicates a general increase in canopy closure within the assessment area. Modeling does not reflect the extent of stand openings at a smaller than stand scale. This information, combined with knowledge of tolerance to disturbance of some species, mitigation established in the DFMP, and compliance with regulatory requirements, minimizes the risk to rare plants using this habitat.

The Pygmy Forest and Closed Cone Forest/Openings Functional Groups The Pygmy Forest and the Closed Cone Forest/Openings functional groups are not managed for timber production. Approximately 20% of the plant species of interest are found within these functional groups. These two functional groups were examined in relation to the potential for cumulative effects due to a reduction in range or local extirpation (Impact 6). Due to the management proposed, and mitigation adopted in the DFMP, significant cumulative effects are not expected to occur.

On JDSF, where the Pygmy Forest and Closed Cone and Openings groups border or transition into North Coast Conifer Forest, there is some potential for impacts related to roads. Pygmy and Closed Cone Groups lie within the western part of the forest, an area with a long and varied management history. Future road management is expected to focus upon upgrading exiting transportation routes while eliminating excess roadway. Illegal OHV use and other recreation actives have produced impacts in this area, primarily due to its proximity to rural residential areas, the gentle topography, and relatively low-lying vegetation. Rural residential development affects private and bordering public lands in the Pygmy and Closed Cone forest areas.

The rare plants from the Pygmy Forest and the Closed Cone Forests/Openings Functional Groups in JDSF will be protected by measures that call for maintaining and protecting the current Pygmy Forest, the Jughandle Reserve and Cypress Groups (on low productivity soils). The DFMP measures for scoping, survey, and mitigation development will be implemented for projects that have a potential to cause significant impacts. The DFMP describes the law enforcement responsibilities of CDF within the

Forest. OHV use is not legal on JDSF. CDF, and other law enforcement entities maintain a presence in and around JDSF, in an attempt to curtail illegal uses and illegal access into the pygmy forest areas of JDSF and adjoining state parks. Pygmy forest and pygmy-type vegetation on private lands are subject to Mendocino County land use planning and are designated as Environmentally Sensitive Habitat Areas. These areas are subject to more rigorous environmental review and restriction than most other areas (Mendocino Co. Plan Sect 20.532.060 and 20.496045).

The possibility of removal of Pygmy Forest vegetation (assumed by prescribed fire) was noted in the DFMP with reference to the habitat development for the Lotus Blue Butterfly. Later changes in the DEIR recognized that this type of project should be given careful analysis by qualified botanist in addition to species surveys and mitigation measures detailed previously. T. Sholars has described some possible restoration and research projects involving prescribed fire for Pygmy forest on JDSF (1997). These projects would require the survey and mitigation measures described previously in addition to analysis appropriate for a CNDDB recognized sensitive plant community.

Significant cumulative effects to rare plants within the Pygmy Forest and the Closed Cone Forests/Openings Functional Groups are not expected to occur. The DFMP provides for protection of these areas. Survey and mitigation associated with projects internal to JDSF, THPs beyond the borders of JDSF, and other projects subject to CEQA and county planning processes, provides a significant level of protection for rare plants in these groups.

Wet Areas Functional Group Roughly 22% of the plant species of interest fall within the Wet Areas Functional Group. Within JDSF, approximately 15% of the land base is located within the watercourse and lake protection zone (WLPZ). Cumulative effects related to a reduction in range or local extirpation are not expected to occur, due to the expected levels of canopy retention and development, protection offered through implementation of mitigation established for the DFMP, protection provided by the Forest Practice Rules, and the THP review process.

Modeling conducted for areas adjacent to the riparian zone predicts an increase in the proportion of stands with a closed canopy over time (North Coast Conifer and WHR Montane Riparian Forest). Rare plants associated with the Wet Area Functional Group will be benefit from several forms of protection. The DFMP provides for augmentation of existing Forest Practice regulations associated with the WLPZ. For Class I and II watercourses, canopy cover will remain high within the watercourse protection zone. The riparian zones within JDSF will be managed to develop late-seral forest structural conditions over time. Overstory canopy cover is expected to continue to develop and become more structurally complex, affecting habitat for forbs, grasses, and shrubs. The DFMP also includes a commitment to protect wetland site integrity and hydrologic function. On forestland beyond JDSF, the provisions of the Forest Practice Rules and the additional THP protections developed for addressing salmonids and water quality provide protection of habitat for wet area rare plants. Managers of timberland within the assessment increasingly recognize that retention of canopy within the WLPZ provides

benefits to both aquatic organisms and wildlife; thus the trend toward retaining high levels of increasingly complex canopy cover is expected to continue. The vast majority of recent timber harvest projects conducted within the assessment area have retained most of the existing canopy within the WLPZ, while canopy in areas not subject to timber harvest have continued to grow and develop. Mendocino Redwood Company currently has a policy of not harvesting in Class I and Class II WLPZs in the Noyo and Big River watersheds.

Significant cumulative effects related to a reduction in range or local extirpation associated with rare plants in the Wet Areas Functional Group are not expected to occur, due to continued canopy development within the assessment area, protection measures for wetlands and seeps provided by the DFMP, provisions for survey and mitigation, and the THP and CEQA planning processes in place throughout the assessment area.

The Species Characterized by Communities or Habitats Not Represented on JDSF Group Approximately 40% of the plants from the initial species of interest scoping are categorized as "Species Characterized by Communities or Habitats Not Represented on JDSF". This relatively large proportion of the species is the result of a methodology (adjacent quads) based on spatial queries, not based on habitat. These plants' habitat may lie near or within the JDSF analysis area (often west of forest in the same watersheds). Known habitat preferences and occurrences of these species place their habitat beyond the area normally impacted by timber management or related activities. An example is the Menzie's wallflower *(Erysimum menziesii* ssp. *menziesii),* which is restricted to coastal areas. The next section explores some of the variables influencing rare plant populations.

The potential for JDSF-related projects to contribute to cumulative effects to plants located well beyond the habitats found within or immediately adjacent to JDSF management activities is remote. Incremental effects to these plants resulting from projects associated with management of the state forest are not expected to occur. There are over 10,000 acres of State Park lands immediately adjacent to western portions of JDSF. These parklands are managed to protect plants populations and related ecosystem processes. Areas of the Forest adjacent to watercourses that flow from JDSF will be managed to promote long-term maintenance or recovery of ecological processes, and slopes extending downward and off of the state forest will be managed to maintain stability through the application of restrictions upon excavation of steep slopes, and through consultation with geologists when operations with potential to destabilize slopes are proposed (please refer to watershed assessment). The range of actions described in the DFMP also limits the nature of the effects. Rare plants that do occur in habitat not found on JDSF are provided protection through planning, review and application of mitigation processes associated with THPs, local development permits, zoning restrictions, and the CEQA process. Significant cumulative impact related to a reduction in range or local extirpations for these plants are not expected to occur as a consequence of this project.

Literature Review of Possible Sources of Cumulative Effects to Rare Plants

Impact 6 represents the potential for cumulative effects resulting in reduction in range or extirpation of rare plants over the analysis area. In the remaining part of section 6.2.7, "rare plants" should be understood to include the Special Concern Plants, and also those that would be considered rare on a biological basis. Aspects of this information are pertinent to other organisms that share some of plant attributes such as fungi and lichen. Some factors that contribute to the rarity of plant species are biological, and not limited to the effects of human disturbance. Fielder (in CNPS 2001) concluded that seldom does a single "cause" explain the rarity of given species. Many plants were infrequently found in nature, and human-induced changes have increased threats to some of these species. Some plants are rare because they are relatively new on an evolutionary time scale; either diverging from parent species or increasing in range. Other plant species are older, with a contracting range over a geologic time frame. Jirak (2001) notes that cumulative effects include the consequences of fragmentation. Isolation can have a negative effect upon gene flow and pollination. Additionally, low population numbers, low vigor, and loss of suitable habitat, can increase the risk of extirpation.

Plant distribution is strongly limited by the fact that typically only the propagules are mobile. In contrast to animals, for some plants stored seed can retain a species on site during many years when habitat is unfavorable. Sprouting ability and clonal growth makes the picture more complex. Rare plants often appear to have narrow environmental and/or temporal amplitude. Their distribution was likely to have been somewhat patchy in pre Euro-American settlement time. Fragmentation threats to rare plant distribution can be related to factors including patch size and connectivity.

Patch Size Literature and studies completed at JDSF verify that patch size and connectivity are complex. Jule's (1997) work on *Trillium ovatum* within clearcuts of the white fir forest and adjacent land showed that the clearcut areas had much lower *T.Ovatum* densities, and little recruitment in stands up to 30 years old. The adjacent stands had reduced *T. ovatum* recruitment near the windward edge of the stands. The dynamic of *Trillium ovatum* differs on JDSF (Rivas-Ederer and Kjldsen, 1998). This study contrasted old growth and clear-cut stands from one to 100 years of age, based upon vegetation with more than 10% cover. *T. ovatum* was associated with early seral (invader) species, (species not found in the old growth or 100-year-old stands at levels over 1%). The only forb or grass that was identified in the latter two forest types was *Viola sempervirens. T. ovatum* may well have been present in those older stands at a low level. Woodward's (1986) work on partial cut stands on JDSF focused on changes in the ten most prevalent spices. *T. ovatum* was noted, but not present in high enough numbers to be evaluated. Older stands in Woodward's study contained 1.4% cover in the forb and grass classes, suggesting mid to late seral stands are not rich in forbs and grasses in contrast to other seral stages on JDSF.

The JDSF FMP would result in a range of patch sizes. Even-aged management areas would result in relatively uniform conditions of up to 40 acres in size. Uneven-aged management areas would have openings ranging from several acres in to a single tree size. In areas managed on an even-aged basis, the DFMP provides for varied rotation ages, up to 150 years, which is expected to provide for a considerable level of vegetative stability, and a relatively low rate of even-aged harvesting over time. JDSF will continue to provide a range of patch sizes, many of which will remain stable over decades. Measures to retain and recruit snags and large woody debris combined with retention of old growth at an individual tree level will also increase heterogeneity. These structures will provide habitat for fungi and lichen as well as plants. Late seral emphasis areas designated by the DFMP range in size from individual old growth trees to the 474 acre Late Seral Development Area surrounding Pentagon Grove to the Woodlands Special Treatment Area of 2,511 acres to 7,440 acres in WLPZs. The DFMP will provide a reduction in the potential for fragmentation associated with timber harvest, when compared to the 1983 management plan. In areas managed on an even-aged basis, the DFMP provides for varied rotation ages, up to 150 years, which is expected to provide for a considerable level of vegetative stability, and a relatively low rate of even-aged harvesting over time. JDSF will continue to provide a range of patch sizes, many of which will remain stable over decades.

Connectivity Fragmentation also can be discussed in terms of connectivity, most simply corridors of similar habitat. Riparian zones will be managed to promote late-seral forest structural conditions, providing connectivity for riparian species and upland to riparian links. The DFMP proposes to manage much of the Forest on an uneven-aged basis, maintaining canopy and vegetative connectivity across the landscape. Roads provide connectivity for species that utilize canopy openings and the frequent low-level disturbance of road brushing. Conversely the roads serve as corridors for invasive weeds. Shaded fuel breaks would have similar conditions. Any shaded fuel break development would be subject to the scoping, survey and mitigation measures described previously. Protection measures associated with the WLPZ provide opportunities for connectivity for riparian species.

Other Aspects of Fragmentation Plants that are rare could be expected to have less opportunity for gene flow between occurrences. This could lead to a loss in genetic fitness and decrease the long-term viability of the species. This issue is quite complex, as the examples that follow demonstrate. The study of *Carex viridula (*ssp. *viridula)* found less genetic variation in North American populations than in those of Europe. The authors postulate that this could be the result of a genetic bottleneck from a small number of colonizing plants from Europe, growth form (clumped cushion like), the species breeding system (self-pollinating), and a narrow ecological distribution (Kuchel 2000). Research on *Campanula cervicaria* in Finland showed that decreasing population sizes seemed not be caused by lowered germination or growth rate in small populations. The reductions appeared to correlate with increasing canopy cover (Eisto et al. 2000).

Issues of genetic fitness, pollination, and fragmentation are difficult to generalize. Rare plants species present today have persisted though initial harvests and other environmental changes, though numbers have been reduced for some species. In the Pre Euro-American times disturbances occurred at a variety of severity and scales. Species may have been extirpated over large areas by extreme shifts. Over time these shifts in forest structure favored migration for either species needing openings or closed structure but not both types simultaneously. The fluctuations in forest structure and populations allowed for periods of selection and genetic drift in isolated populations. When populations could again expand, genetic exchange among these populations would occur (Oliver and Larson, 1996). Beyond the individual stand basis the DFMP management direction will build on temporal and spatial patterns in the forest. The shifting mosaics of forest conditions are of value to both plants and fungi. Maintaining fungi on a landscape scale would require creation and or maintenance of a range of habitats with appropriate size and connectivity (Pliz et al.1996).

The current distribution of forest in Mendocino County is relatively stable, though some urbanization and vineyard conversion continues. Although there may be less continuity of some habitat attributes, forest cover remains continuous, though varying in stand age and development. Menges (2000) notes that dormancy of seeds and underground structures provide sources of variability. Periodic recruitment and flowering, as well as clonal growth, also add complexity. Menges states that plant population viability analysis appears to be in its infancy.

Among the Species of Special Concern (Table VII.6.2.1), some species are known from occurrences dated 50 years ago. Other species were added based upon a professional estimate that the plant's range extends into the analysis area, though the species has not been found to date. Current population numbers can be assumed to be low for some species, and the vigor of existing occurrences can vary. In areas subject to survey (e.g., JDSF project-specific, and THPs), if provided with appropriate levels of planning and protection, the vigor of the occurrence is expected to be maintained. Available habitat for rare plants has been detailed by function groups and discussed in terms of patch size and connectivity.

Significant cumulative effects related to a reduction in range across the assessment area or local extirpation are not expected due to the protection measures for individual occurrences, range of forest conditions and patch sizes and the level of connectivity throughout the Forest and assessment area.

Ecological Processes

Another aspect of cumulative effects related to Impact 6 is the effect of ecological processes on the environment where rare plants occur. Succession appears to be the ecological process with most potential to effect rare plants. The ground and vegetative disturbance associated with timber harvest produces changes similar to secondary succession. Seral stages have some utility in describing habitat attributes for plants

(e.g., canopy cover). Halpern and Spies (1995) found that actual plant presence was not always limited to a particular successional stage in their study of managed and natural stands in the Pacific Northwest.

Woodward (1986) examined stands with partial canopy removal, and found that some understory species on JDSF had increased numbers (*Whipplea modesta, Gaultheria shallon, Vaccinium ovatum*), while others (*Oxalis oregana*) decreased. *Boschniakia hookeri* is parasitic on *Gaultheria shallon,* so declines in the latter species as canopy closure increases could affect the rare associate. Conversely, increasing canopy closure may allow a shade tolerant plant species to compete more successfully with less shade tolerant species.

Happen and Spies' (1995) results generally support the idea that plant diversity peaks during two periods of succession. The first period is prior to overstory crown closure, and the second is when the canopy begins to open up again as the stand ages. Conversely, there could be a loss of species when canopy closure occurs and there can be a loss of residual forest species immediately after harvest. Small-scale disturbances, such as tree blow-down, root disease pockets, and decline or loss of crown associated with dying trees can decrease canopy cover on the scale of individual plant occurrences.

Efforts to duplicate the old forest characteristic mosaics have resulted in increased diversity. In southeast Oregon Douglas-fir forests, Carey (2003) observed both understory plants and fungi, specifically truffles, in control stands and stands thinned to recreate spatial heterogeneity. Although there was an initial depression in truffle productivity, it recovered and the species diversity was much higher than controls. Understory plants the mosaics experienced a 150% increase in species diversity three years after the treatment.

Ongoing ecological processes, such as increasing density of overstory canopy within the assessment area, have potential for both positive and negative effects, depending upon the species being considered. Individual project analysis can assess the varying potential negative and positive effects on rare plants. The potential for cumulative effects to rare plants will be reduced through implementation of the protection measures included in the JDSF Management plan, as well as protection measures developed during the THP or CEQA preparation and review process.

Changes in the extent and frequency of fires have altered the processes of succession. Prior to Euro-American settlement, lighting and Indian vegetation management ignitions occurred. This pattern was replaced by ignitions to clear slash for the earliest logging as well as for grazing, other agricultural purposes, and by accident. Fire suppression has limited fire size and frequency in more recent years. In the face of an altered fire regime, disturbance associated with logging has some potential to create or maintain habitat that was once created and maintained by fire; however, successional development within these areas can be expected to differ somewhat from that produced by burning. Periodic fire and plant relationships are not as well understood as those in

other areas. The DFMP calls for demonstration and examination of understory burning within JDSF.

The changes in frequency and intensity of wildfire have the potential to affect rare plants. Brown and Baxter (2002) identified a fire interval of 6 to 25 years, based upon an examination of fire scars on trees or stumps. Agee (1993) describes the redwood forest as having a moderate severity fire regime with fairly frequent fire return intervals. The even-aged Bishop pine portions of the closed cone forests are assumed to have less frequent but higher intensity fire (Barbour and Major 1988). Jirak (2001) stated that fire suppression has eliminated the opportunities for plants that require light and bare soil to flourish. Timber management and prescribed fire can create some of these conditions, but the scale, uniformity, and other factors, are different from those resulting from pre Euro-American era fires.

Ecological processes are not expected to result in cumulative impacts on rare plant species in the analysis area based on range of stand conditions as that will be present a result of the DFMP as well as protection measures developed from the DFMP, THPs and CEQA process.

Multiple Effects

The effect of two or more factors is another aspect of cumulative effects related to Impact 6. The combination of multiple environmental effects is capable of increasing the level of impact in a cumulative fashion. The effects of ecological processes are detailed above. The remaining source for multiple effects would most likely occur as the result of human caused effects on rare plants that occur with or without active management. Invasive plants (exotic weeds) are results of human introduction but are spread by both human and natural means. They are the primary factor that could combine with other management effects or ecological processes.

Invasive plants have the potential to affect native species with a preference for forest openings. However, some species, such as English ivy, have become established in relatively undisturbed areas with moderate canopy cover. The Integrated Weed Management (IWM) approach described in the DFMP offers an opportunity to protect rare plant occurrences and develop opportunities for species conservation. The DFMP includes the goal to control existing infestations to maintain ecological process. The protection of rare plant occurrences from invasive plant infestation is a high priority for IWM. The recognition and establishment of this priority is expected to help prevent negative effects to rare plant occurrences when they threatened by invasive plants.

An example of a measure developed as a result of consideration of invasive weeds during specific projects involves the selection of a mulching material with a low risk of introducing invasive weeds. Alternative C2 clarifies a commitment to rare plant survey in areas with the greatest invasive plant problems, roadsides. JDSF involvement in developing biocontrols (International Broom Initiative), and participation in weed

management areas, will contribute to reducing the threat of invasive weeds to rare plants within the larger analysis area. Beyond JDSF, both State Parks and some timberland mangers conduct invasive plant control programs and have expressed interest in cooperating with JDSF on control measures (P. Warner, P. Ederer personal communication).

Project-specific THP and CEQA analyses can identify and mitigate potentially significant cumulative effects resulting from multiple effects. The principle method proposed to avoid cumulative effects is survey and avoidance of plant occurrences. This provides a means to avoid direct incremental effects, as well as cumulative effects. Over the long term, and on a broader scale, maintenance of forest cover, protection of old growth groves, development of late-seral forest in specific areas, and use of viable forest harvest techniques that minimize ground disturbance and compaction, will contribute to preventing long term cumulative impacts. The expected maintenance of the adjacent 10,000-plus acres of State Park lands for the protection of plants and related ecosystem processes also will help to ensure that long-term cumulative impacts do not occur.

Invasive plants were identified as a threat to rare plants that may occur without active management. Cumulative impacts to rare plant species are not expected to occur, due to the combination of protection measures incorporated into the DFMP, measures developed on a site-specific basis for individual projects such as THPs, and application of the IWM goals and measures to mitigate the threat of invasive plants.

Analysis of Other Alternatives for Potential Cumulative Impacts

This section briefly analyzes the potential for alternatives A, B, C2, D, E, and F to result in cumulative impacts to plant species.

Under alternative A, there would be only minimal Forest management, with no timber harvesting or significant alteration of road systems. Protection measures for plants are limited to those required by laws, rules and regulations. Biological processes including canopy closure and further spread of invasive weeds to areas where habitat is available would continue except along roads. The overall cumulative impact on plants is expected to be less than significant.

Continuing to manage the Forest as directed by the 1983 management plan (alternative B) would not be expected to provide the endangered, rare, or threatened plant species the same protection from cumulative effects as provided in the DFMP (alternative C1). Project-by-project analysis and protection will not be likely to result in the same level of protection as would be provided by alternatives C1 through F. Lacking mitigations, alternative B would likely result in significant adverse cumulative impacts. Mitigation similar to what is proposed for alternative C1 would be feasible for this alternative also and would result in a less than significant level of cumulative impacts to plants.

Alternative C2 is similar to C1 with two exceptions. A higher proportion of JDSF would be managed for late seral conditions, with a potential for more habitat for species using closed canopy North Coast Conifer Forest. The proposed Supplemental Mitigation 1 would reduce risk of multiple effects by making protection of rare plant occurrences from invasive weeds a priority. Alternative C2 would result in a less than significant cumulative impact to plants.

Alternative D is similar to C1, although the proposed management mix includes more late-seral and uneven age management, and less even-aged management. This alterative would result in narrower range of patch sizes and a different mix of seral stages than C1. Including Supplemental Mitigation 1 will further strengthen the protections provided to plants. Alternative D would result in a less than significant cumulative impact to plants.

Alternative E is similar to D except for more emphasis on late-seral habitat. This alterative would result in narrower range of patch sizes and a different mix of seral stages than C1. Including Supplemental Mitigation 1 will further strengthen the protections provided to plants. Alternative E would result in a less than significant cumulative impact to plants.

Alternative F is similar to D except for more emphasis on retention of closed canopy mid-seral stands (last cut prior to 1925). This alterative would result in narrower range of patch sizes and a more uniform stand conditions across a swath of the forest as compared to alternative C1. Mitigation similar to what is proposed for alternative C2 would be feasible for this alternative also. This alternative calls for phasing in forest-wide plant surveys, which could lead to improved knowledge of plant species of concern and facilitate some planning.. Including Supplemental Mitigation 1 will further strengthen the protections provided to plants. Alternative F would result in a less than significant cumulative impact to plants.

Impact 7: Forest management activity impacts to the Mushroom Corners area could cause adverse impacts to the type localities for 26 fungi species with a resulting loss of scientific value. **(Less than significant)**

Loss of type localities would occur if the fungi could no longer be found due to local extirpation or loss of habitat. This loss would impair study of taxonomic, genetic and biotic interactions. Timber harvest or other activities could have adverse effects on these species resulting in loss of occurrences. Impact 7 focuses on the scientific value of the 26 type locations in the Mushroom Corners area while Impact 6 addresses the cumulative impact to species.

Usnea longissima, a lichen that occurs on the forest, is listed in Table VII.6.2.1, the list of plant species of concern for JDSF. Under the DFMP this list will be used to guide survey work. Because this list is dynamic, as knowledge of lichens and fungi increase other species could be added to this list.

The project alternative (C1) includes the DMFP goals to promote and maintain ecological processes and biological diversity during the conduct of all land management activities. It also seeks to determine which native species are most susceptible to adverse impacts s from land management activities and therefore warrant extra concern. The DFMP also specifies timber management practices that maintain the overall structure of forest communities including hardwood components and structural elements such as large woody debris and snags. This alternative calls for a Late Seral Development area that would roughly overlay the eastern 1/3 of Mushroom Corners area. For the majority of the Mushroom Corners Area, future stand conditions would generally be within the historic range of conditions for past 45 years while Mushroom Corners has been used as a scientific and educational resource. Given these considerations, Alternative C1 would have a less than significant impact. Application of Supplemental Mitigation 2 would further help to ensure the protection and enhancement of the scientific values of the Mushroom Corners area.

Alternative A involves only minimal management activity. There would be no timber harvesting, no implementation of a Road Management Plan, and no expansion of recreation facilities under this alternative. Protection measures for plants and other organisms are limited to those required by laws, rules and regulations. Biological processes would result in continuing successional patterns in the forest, which could slowly change species composition over the entire Mushroom Corners area. The result would be a less than significant impact.

Alternative B continues to manage the Forest as directed by the 1983 management plan and would not be expected to provide the protection of the scientific value of the Mushroom Corners area from effects of timber management. Depending on the types of harvests, future stand conditions could be quite different than they have been in the past 45 years while Mushroom Corners has been used as a scientific and educational resource. Lacking mitigations, alternative B could result in adverse impacts to scientific value of this unique area. Mitigation similar to what is proposed below for alternative Supplemental Mitigation 2 would be feasible for this alternative also and would result in a less than significant level of cumulative impact to these resources.

Alternative C2 includes the measures in C1 and the expansion of the Late-seral Development area would overlay approximately twice as much area as alternative C1. With these protections in place, alternative C2 would result in a less than significant impact. Application of Supplemental Mitigation 2 would further help to ensure the protection and enhancement of the scientific values of the Mushroom Corners area.

Alternatives D through F generally provide the same level of protection to scientific value of fungi type localities as alternative C1. Depending on where the various alternatives emphasized reserves or late seral development areas, stand conditions in the Mushroom Corners could gradually become less representative of conditions that have existed during recent history (e.g., the entire area would become late seral forest under alternative E). Mitigation similar to Supplemental Mitigation 2 would be feasible

for these alternatives also and would result in a less than significant level of cumulative to these resources.

6.2.8 Supplemental Mitigation and Monitoring

Supplemental Mitigation 1

Protection of rare plants (candidate, sensitive, or special status species) from invasive plants will be a high priority for Integrated Weed Management activities. Although the analysis did not find mitigation necessary to prevent the project alternative from impacting rare plants due to invasive species, this Supplemental Mitigation was developed to provide further protection.

Some examples of project-specific mitigation include: retaining canopy cover for rare plants that favor this condition while discouraging invasive plants that favor more sunlight, and planning continued monitoring for rare plant occurrences in areas at risk for invasive plant infestations.

Implementation and effectiveness monitoring would occur during the course of project implementation, as well as post-operation, including timber sale follow-up, such as erosion control maintenance inspections, and road maintenance surveys.

Mitigation Monitoring:

Timing:	During the life of the JDSF Management Plan
Scope:	Forest-wide
Implementation:	CDF
Monitoring Responsibility:	CDF

Supplemental Mitigation 2

While the analysis did not find mitigation necessary to prevent the project alternative from resulting in a significant adverse impact, Supplemental Mitigation 2 would further reduce any remaining risk of impact by initiating a consultation process with representatives of the mycological research community while planning for future harvest activities or fire or fuels reduction activities. It would also set a high to moderate priority to control invasive plants in this area to insure continued presence of native species that interact with the fungi.

Mushroom Corners Management Area:

Location: The extent of the Mushroom Corners Management Area is 330 acres and is designated in Figure VII.6.2.1, above.

Harvests: The area is available for future study related to the relationship between fungi and the forested habitat. Most of the future harvests in this area will utilize various forms of uneven-aged management, including single tree and small group selection. Consultation will be initiated with representatives of the mycological research community while planning for future harvest activities.

Fire, Fuels Reduction or other Active Management: Consultation will be initiated with representatives of the mycological research community during planning of any management-related fire or fuels reduction activities.

Invasive Plant Management: Invasive plant control will have a high to moderate priority in this area to insure continued presence of native species that interact with the fungi in the area.

Mitigation Monitoring:

Timing:	During the life of the JDSF Management Plan
Scope:	Mushroom Corners
Implementation:	CDF
Monitoring Responsibility:	CDF

Table VII.6.2.4 presents a comparison of impacts among alternatives for botanical issues.

Table VII.6.2.4. 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) Less than Significant with Mitigation (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						Special concern areas limited to those required by regulation. Protection of plant communities based only on status when evaluated in CEQA projects.
Alt. C1 May 2002 DFMP						The DFMP affords protection to communities that, without mitigation, could be adversely affected. Pygmy forest and pygmy cypress groups, the communities most at risk, are included as SCAs. Other communities that are not designated SCAs, such as the redwood forest, would not be threatened under this option.
Alt. C2 Nov. 2002 Plan						Same as C1 with some individual species protection measures clarified.
Alt. D						Same as C1 for SCAs for rare communities. These alternatives have lesser amounts of more ground-disturbing even-aged timber management than C1 and C2. F calls for phasing in forest-wide plant surveys, which could lead to improved knowledge of plant communities and facilitate some planning.
Alt. E						
Alt. F						

Table VII.6.2.4. 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) Less than Significant with Mitigation (5) Significant–Mitigation Not Feasible**
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						Protections for rare plants via individual CEQA analysis only. Limited active management could reduce potential threats to rare plants but also limits control of invasive plants beyond roads.
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. Largest portion of the forest in active management. 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. Rare plant protection and invasive plant control on a project-by-project basis may have higher risk of effects on occurrences. Mitigation similar to what is proposed for alternative C1 would be feasible for this alternative also.
Alt. C1 May 2002 DFMP						DFMP includes protection measures for endangered, rare, or threatened plant species. Mix of management techniques and age classes in North Coast conifer forest. Risks for negative or positive effects to rare plants as a result of active management would proportionally be higher for this alternative than alternatives C2-F. The DFMP, with the proposed mitigation measure incorporated and effectively executed, will reduce the level of impacts to below significant. IWM approach to has potential to reduce effects of invasive weeds on rare, threatened, and endangered plants in active managed areas.
Alt. C2 Nov. 2002 Plan						Protection measures clarified but similar to Alt C1. Management mix includes slightly more late-seral. As in Alt C1, measures incorporated and effectively executed will reduce the level of potential impacts to below significant. IWM plus mitigation measure has highest potential to reduce effects of invasive weeds on rare plants.
Alt. D						Protection measures similar to Alt C1. Management mix includes more late-seral and uneven age management, and less even-aged management. As in Alt C1, measures incorporated and effectively executed will reduce the level of impacts to below significant. Three-year herbicide moratorium has potential to delay effective control of invasive weeds that could adversely affect rare plants.

Table VII.6.2.4. 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) Less than Significant with Mitigation (5) Significant–Mitigation Not Feasible**
Alt. E						Same as D except: emphasis on more late-seral. Herbicide moratorium has potential to increase the risk that some invasive weeds would not be effectively controlled resulting in adverse effects on rare plants.
Alt. F						Same as D except: emphasis on retention of closed canopy mid-seral stands (Initial cut prior to 1925). "Last resort" requirement for herbicide use has potential to delay effective control of invasive weeds that could adversely affect rare plants. Calls for phasing in forest-wide plant surveys, which could lead to improved knowledge of plant species of concern and facilitate some planning.
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.						
Alt. A						None of the alternatives conflict with approved local, regional, or State plans.
Alt. B						
Alt. C1 May 2002 DFMP						
Alt. C2 Nov. 2002 Plan						
Alt. D						
Alt. E						
Alt. F						

Table VII.6.2.4. Comparison of Botany-Related Alternatives.						
Alternatives						**Discussion**
Impact*	**1**	**2**	**3**	**4**	**5**	***Impact Levels: (1) Beneficial (2) No Impact (3) Less than Significant, add impact (4) Less than Significant with Mitigation (5) Significant–Mitigation Not Feasible**
Impact 6: Cumulative effects resulting in a reduction in the range of a species, or local extirpation of a plant species on a spatial scale that includes the larger analysis area. This includes changes in the environment caused by the interaction of ecological processes or multiple effects.						
Alt. A						Protection measures for rare plants limited to those required by laws, rules and regulations. Biological processes including canopy closure and further spread of invasive weeds to areas where habitat is available would continue except along roads.
Alt. B						Continuing to manage the Forest as directed by the 1983 management plan would not be expected to provide the endangered, rare, or threatened plant species the same protection from cumulative effects as provided in the DFMP. Project by project analysis and protection will not be likely to result in same level of protection as remaining Alts. Mitigation similar to what is proposed for alternative C2 would be feasible for this alternative also.
Alt. C1 May 2002 DFMP						DFMP protection measures would be expected to prevent significant cumulative impact to rare, threatened and endeared species. Within the cumulative effects analysis area, open canopy structure is expected to decline slightly in 20-30 years. There should still be a range of canopy conditions in Upland North Coast Conifer Forest. Some risks of effects from invasive weeds effects on rare plant occurrences in areas not part of ongoing projects.
Alt. C2 Nov. 2002 Plan						Similar to C1 with 2 exceptions. Higher proportion of JDSF would be managed for late seral conditions, with a potential for more habitat for species using closed canopy North Coast Conifer Forest. New Mitigation Measure will reduce risk of multiple effects by making protection of rare plant occurrences from invasive weeds a priority.
Alt. D						Similar to C1 Management mix includes more late-seral and uneven age management. Mitigation similar to what is proposed for alternative C2 would be feasible for this alternative also.
Alt. E						Same as D except: emphasis on more late-seral. Mitigation similar to what is proposed for alternative C2 would be feasible for this alternative also.
Alt. F						Same as D except: emphasis on retention of closed canopy mid-seral stands (Initial cut prior to 1925). Mitigation similar to what is proposed for alternative C2 would be feasible for this alternative also. Calls for phasing in forest-wide plant surveys, which could lead to improved knowledge of plant species of concern and facilitate some planning.

Table VII.6.2.4. 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) Less than Significant with Mitigation (5) Significant–Mitigation Not Feasible**
Impact 7: Forest management activity impacts to the Mushroom Corners area could cause adverse impacts to the type localities for 26 fungi species with a resulting loss of scientific value.						
Alt. A			■			The primary land use on JDSF would be public recreation that would utilize current facilities. Substantial management effects would not occur in the Mushroom Corners area though a less than significant increase in stand density would be experienced in the fungi type localities.
Alt. B				■		Species protections limited to those required by regulation for THP and CEQA projects. Future stand conditions could be different than during the time period Mushroom Corners has been used as a scientific resource. Loss of individual type localities could occur, resulting in a potentially significant impact. Mitigation similar to what is proposed in Supplemental Mitigation 2 would be feasible for this alternative and would result in a less than significant impact.
Alt. C1 May 2002 DFMP			■			Approximately 1/3 the Mushroom Corners area would fall in a Late Seral Development area. The DFMP also affords protection to habitat elements and retains stand structure within the range of conditions during the period Mushroom Corners has been a scientific resource. Application of Supplemental Mitigation 2 would further help to ensure the protection and enhancement of the scientific values of the Mushroom Corners area.
Alt. C2 Nov. 2002 Plan			■			Same as C1 with increased proportion of the Mushroom Corners area overlain by Late Seral Development Area Designation. Application of Supplemental Mitigation 2 would further help to ensure the protection and enhancement of the scientific values of the Mushroom Corners area.
Alt. D				■		Alternatives D through F generally provide the same level of protection to scientific value of fungi type localities alternative C1. Mitigation similar to what is proposed for Supplemental Mitigation 2 would be feasible for these alternatives and would help to ensure that appropriate levels of management continue to protect the type localities.
Alt. E				■		
Alt. F				■		