

Environmental Consequences

4.1 Introduction

This chapter presents the results of the impacts analysis for the Proposed Action (USFWS issuance of an ITP amendment providing for the incidental take of eight owl pairs in addition to those permitted under the existing ITP), Alternative A (USFWS issuance of an ITP amendment providing for the incidental take of eight additional owl pairs and release of three set-asides), and a No Action Alternative (continued implementation of the 1992 NSO HCP without USFWS issuance of an amended ITP). The impact analysis focuses on the potential beneficial and adverse effects on resources that could result from implementing the Proposed Action, Alternative A, or the No Action Alternative. The impacts of the 1992 NSO HCP, that constitutes the No Action Alternative, were evaluated in a previous EA and a Finding of No Significant Impact (FONSI), issued on September 14, 1992, prepared by the USFWS.

Section 4.1 discusses the geographic scope of the analysis (Section 4.1.1) and the approach to the cumulative impact analysis (Section 4.1.2). Sections 4.2 through 4.13 present the impact analysis for the resource areas. Within each of these resource category Sections, analysis of the direct, indirect, and cumulative impacts of the Proposed Action and alternatives is conducted. Section 4.14 summarizes the individual resource category cumulative impact analyses.

In addition to the consideration of direct, indirect, and cumulative impacts, CEQ regulations implementing NEPA require that the analysis of potential impacts resulting from implementation of the Proposed Action and other action alternatives include a discussion of any adverse environmental impacts which cannot be avoided, the relationship between short-term uses of human environment and the maintenance and enhancement of long-term productivity, and any irreversible or irretrievable commitments of resources that would be involved (40 CFR Section 1502.16).

4.1.1 Scope of the Impacts Analysis

The physical scope for analysis of direct and indirect impacts in this EA is the Action Area, which includes 416,533 acres of Green Diamond ownership within the 11 hydrographic planning areas (HPAs) referenced in Chapter 1 (Introduction/Purpose and Need) and Chapter 3 (Affected Environment). The 11 HPAs are listed and described in Appendix A of this EA. As discussed in Chapter 2 (Proposed Action and Alternatives), it is important to note that the Proposed Action (USFWS issuance of an ITP amendment providing for the incidental take of an additional eight owl pairs) does not include authorization or regulation of future timber harvesting operations on Green Diamond lands. Under all alternatives considered in this document, future THPs will be authorized by CDF. Under the No Action Alternative, Green Diamond would continue to prepare THPs in accordance with the requirements of the CFPRs, other applicable laws, the 1992 NSO HCP, and Green Diamond's management policies. In contrast, under the Proposed Action, Green Diamond

would prepare THPs in accordance with the same requirements as the No Action, but also with the additional conservation measures associated with the amended HCP and ITP.

4.1.2 Cumulative Impacts Analysis

4.1.2.1 NEPA Requirements for Cumulative Impacts Assessment

The CEQ regulations implementing NEPA define a “cumulative impact” for purposes of NEPA as follows:

Cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable **future** actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. (40 CFR Section 1508.7)

The CEQ (1997) also requires development of a baseline (or benchmark) “against which to compare predictions of the effects of the proposed action and reasonable alternatives.”

4.1.2.2 Approach to Cumulative Effects in this EA

General Approach. Potential cumulative impacts (both beneficial and adverse) are assessed relative to the No Action Alternative for each of the separate resource category Sections in this chapter (see Sections 4.2 through 4.13). For the No Action Alternative, potential effects are assessed in terms of trends and future conditions resulting from continued implementation of the existing 1992 NSO HCP/ITP.

Cumulative impacts would occur if the **incremental** impacts of the Proposed Action (or the incremental impact of the individual proposed action alternatives, result in a significant effect when they are added to the environmental impacts of past, present and reasonably foreseeable actions. For an impact to be considered cumulative, these incremental impacts must be related in space and time, so that they are either capable of combining (when considering potential incremental impacts of future projects) or have, in fact, combined (when considering impacts of current and past projects).

Baseline. The CEQ requires that a baseline (or benchmark) be used for assessing incremental impacts to resource areas, and the CEQ cites the no action alternative as the appropriate benchmark (CEQ, 1997). The benchmark used in this EA is the No Action Alternative, as described in Chapter 2.

Actions that Could Have Associated Cumulative Effects. Past, present, and reasonably foreseeable future actions that have the potential to combine with incremental effects of the Proposed Action (or Alternative A) to result in cumulative impacts, are those that:

- Have an application for operations pending before an agency with permit authority, or
- Are of a similar character, could affect similar environmental resources, or are located in geographic proximity to the Proposed Action (CEQ, 1997).

On the basis of the criteria listed above, several actions were considered for inclusion in the cumulative impacts analysis, as follows:

1. Previously authorized take of NSO habitat on Green Diamond, PALCO, USFS, etc.
2. Implementation of conservation measures contained in the PALCO multispecies HCP on PALCO lands
3. Pursuant to the CFPRs, continued USFWS coordination with other landowners in the region who do not have existing HCPs
4. Continued implementation of NSO guidelines contained in the Northwest Forest Plan on Federal lands
5. NSO management within the Redwood National and State Parks based on USFWS consultation under ESA Section 7 process and decision documents
6. NSO management on Hoopa and Yurok tribal lands based on USFWS consultation under ESA Section 7 process and decision documents
7. Implementation of conservation measures contained in Green Diamond's proposed Aquatic HCP/Candidate Conservation Agreement with Assurances (CCAA)
8. Residential development and operation of existing residential infrastructure

On the basis of further review, actions (1 through 6) were determined to meet the criteria for consideration as other actions in this cumulative impacts analysis. These actions are described in detail in Section 4.1.2.3.

As noted in Section 1.6.3.2, the USFWS and NMFS are concurrently involved in evaluating a separate permit application from Green Diamond for an Aquatic HCP and CCAA (action number 7 above) for Green Diamond lands within this Action Area. That process is independent of the proposed amendment to Green Diamond's NSO HCP, and has its own NEPA analysis, which evaluates the impacts of issuance of an ITP and an Enhancement of Survival Permit (ESP) in association with the AHCP and CCAA, respectively. Since no decision on that permit had been made to date, the USFWS does not consider the potential issuance of the aquatic plan ESP/ITP a foreseeable action for the purposes of this analysis. However, we are aware of the potential impacts of the AHCP/CCAA and issuance of associated permits, and would consider those, if appropriate, when a final permit decision is made for this Proposed Action.

The remaining action (number 8 - residential development) is not considered an "other action" and is not included as "other cumulative actions" in the analysis of cumulative impacts in this EA because the extent of residential development is somewhat speculative and limited information is available about this activity within the 11 HPAs. Although some local residential development may be possible in the future, and could be destructive to northern spotted owl habitat, the majority of NSO habitat is located on public lands (USFS, NPS, BLM, CA administered lands, etc) or lands zoned for commercial timber production (TPZ). The development of such lands for residential use would be restricted due to significant legal constraints limiting residential development on state and federally owned public lands in addition to constraints posed by zoning laws at the local level. Therefore, potential impacts to NSO habitat from residential development would be insignificant.

Geographic Scope of Cumulative Assessment. The CEQ guidelines state that cumulative effects analyses should be limited to the effects that can be evaluated meaningfully by the decision makers. The guidelines further state that the area to use in defining the cumulative impacts geographical boundary should extend to the point at which the resource is no longer affected significantly (CEQ, 1997). The area for conducting the cumulative impact assessment for permitting additional take of the northern spotted owl is the California Coast Physiographic Province, as described in Section 3.6.2.7. The geographical boundary of the cumulative impact area for other resource areas (e.g., geology, hydrology and water quality, aquatic resources) described in this EA is defined as the 11 HPAs that encompass Green Diamond's California ownership and surrounding lands in common watersheds. The cumulative effects analysis groups the HPAs and analyzes them together, because the resource data are too limited at the individual HPA scale to allow quantitative analysis of cumulative impacts at the HPA scale.

4.1.2.3 Other Actions Assessed in the Cumulative Impacts Analysis

The other past, present, and reasonably foreseeable actions included in the cumulative analysis are discussed below. State and Federal land management actions outside the 11 HPAs are not assessed because almost no timber harvesting occurs on these State and Federal lands and activities on these lands are extremely limited. Other actions are as follows:

- **Implementation of Conservation Measures Contained in the PALCO Multi-Species HCP on PALCO Lands.** PALCO lands occur within the southern most HPAs of the Green Diamond ownership, primarily in the Eel River and Humboldt Bay HPAs. On these PALCO lands, which are outside the Action Area (per Section 1.4), the CFPRs are supplemented by additional measures contained in the PALCO HCP. The PALCO HCP and incidental take permit, implemented in 1999 and covering a 50-year period, authorizes take of northern spotted owls over approximately 211,000 acres of commercial timberland in Humboldt County, much of which is located within the Humboldt Bay and Eel River HPAs. The USFWS estimated the take of northern spotted owls over the 50-year permit term to include the loss of at least 48 activity centers due to removal of suitable habitat, and harassment of at least 156 activity centers due to disturbance from timber harvest activities during the breeding season. The conservation strategy for the northern spotted owl contained in the PALCO HCP is a habitat- and performance-based approach that includes the harvest, retention, and recruitment of requisite habitat types and elements within watershed assessment areas and around individual activity sites, as well as requirements to retain a specific number of owl activity sites on the covered lands (108 activity sites for the remainder of the PALCO permit term), with occupancy and reproductive performance criteria for those activity sites. Harvest of owl habitat is permitted in and around activity sites which are not among the 108 designated sites. The PALCO strategy is complemented by a number of activities that include (1) minimizing disturbance to northern spotted owls activity sites, (2) monitoring to determine whether these efforts maintain a high-density and productive population of spotted owls on the ownership, and (3) applying adaptive management techniques when PALCO, USFWS, CDFG, and the scientific community learn more about the biology of the northern spotted owl and/or assess how well management objectives are met.

PALCO's NSO strategy also relies on other conservation elements of the HCP for retention and recruitment of potential foraging, roosting, and nesting habitat in watersheds across the PALCO ownership. Specifically, PALCO establishes a series of marbled murrelet reserves that are large, contiguous areas of second growth and old growth incorporating most of the larger remaining stands of uncut old-growth redwood on the ownership. Timber harvesting within these reserves is limited to habitat enhancement projects that will provide secondary benefits to the northern spotted owl over the 50-year Permit term (1999 to 2049). In addition, PALCO will implement silvicultural prescriptions that favor attainment of mature forest conditions within a 300-foot selective harvest buffers on PALCO property that is directly adjacent to old-growth redwood in State parks. The PALCO HCP also establishes riparian management zones (RMZs) that extend out to 170 feet and 75 to 100 feet on Class I and Class II streams, respectively. RMZ management and widths may change based on watershed analysis. The RMZs include an inner no-cut area and an outer band of selective harvest where no even-aged management is allowed.

- **Continued USFWS Coordination with Other Landowners in the Region Who Do Not Have Existing HCPs.** The management regimes on non-Green Diamond commercial timberland throughout the 11 HPAs are characterized by application of the CFPRs. With the exception of the Pacific Lumber Company (PALCO) Multispecies HCP (PALCO HCP) (Pacific Lumber Company, 1999), and the Forster-Gill Safe Harbor Agreement for NSO covering 236 acres in the vicinity of Blue Lake, California, in the Mad River watershed, no other company-specific conservation strategy for the management of terrestrial wildlife or aquatic habitat is known to exist within the 11 HPAs. On non-Green Diamond and non-PALCO commercial timberlands within the 11 HPAs, therefore, the CFPRs (as described in Section 1.5.3.1 and Sections 2.1.4 and 2.1.5), would continue to be implemented under all the alternatives. These include requirements for landowners to coordinate with USFWS prior to timber harvest operations for the purpose of avoiding unauthorized take of the northern spotted owl and, as necessary, developing site-specific measures to mitigate or avoid significant environmental impacts.
- **Continued Implementation of NSO Guidelines Contained in the Northwest Forest Plan on Federal Lands.** The Northwest Forest Plan (NWFP) was approved and implemented through amendment of individual National Forest and BLM land management plans in 1994. This plan guides management of the vast majority of Federal lands within the range of the NSO, primarily through the standards and guidelines of various land use allocations. Five land use allocations (covering approximately 15.4 million acres or 63 percent of the Federal lands) likely contribute to development and maintenance of clusters of reproductively successful northern spotted owls. These reserve allocations include Late-Successional Reserves, Managed Late-Successional Areas, Congressionally Reserved Areas, Reserve Pair Areas, and some Adaptive Management Areas. The remaining allocations, including Administratively Withdrawn Areas, Riparian Reserves, Matrix, Connectivity Blocks, and some Adaptive Management Areas contribute in various ways to connectivity between the large reserve areas. In some cases, forest conditions on these connectivity allocations may aggregate into landscapes capable of supporting resident northern spotted owls. The location and duration of such conditions is unknown (USFWS, 2004). The NWFP also provides the basis for aquatic and riparian resource management on U.S. Forest Service and Bureau

of Land Management lands within the 11 HPAs. NWFP standards were developed to provide a wide range of benefits to many unlisted as well as listed species on the basis of Federal multiple-use management principles. Under the NWFP, riparian buffers of 300 feet, 150 feet, and 100 feet are applied around all Class I, Class II, and Class III streams, respectively. Minimal timber harvesting is allowed within these zones.

- NSO Management within Redwood Parks Based on USFWS Consultation under ESA Section 7 Process and Decision Documents.** Within the Redwood National and State Parks (RNSP) there are 40,921 acres of old-growth forest, all of which is considered suitable spotted owl nesting, roosting, and foraging habitat. Prior to park establishment and expansion, timber harvest occurred in old-growth stands on land that is now within the parks. Upwards of 50,000 acres were harvested using seed tree retention and clearcut harvest prescriptions. These stands are now between 24 and 100 years old. As of 2004, a total of 21,953 acres of second-growth forest is greater than or equal to 40 years of age and may be considered suitable for nesting and roosting by spotted owls. Forested stands greater than 40 years old may be suitable for spotted owls where they contain residual old growth trees in sufficient numbers to provide the stand structure requisite for nesting and roosting habitat (RNSP unpub. data). An estimated 263 acres contain residual old growth assumed to be suitable for spotted owls. Some unknown proportion of the remaining second growth may be suitable foraging habitat (Schmidt, 2005; USDI and C DPR, 1999). Home range inventories indicate a downward trend in spotted owl presence in the RNSP. In recent years, spotted owls have been located in just 2 out of 13 historic territories inventoried. In 9 of the other 11 instances, barred owls have moved into the former spotted owl core areas (in some cases occupying the old spotted owl nest tree). Any activities that may result in take of northern spotted owls will require consultation with USFWS under ESA Section 7.
- NSO Management on Hoopa and Yurok Tribal Lands Based on USFWS Consultation under ESA Section 7 Process and Decision Documents. Approximately 2,541 acres of suitable northern spotted owl habitat occur within Yurok reservation boundaries.** Past actions (through 1995) in the Yurok Indian Reservation have removed 234 acres and degraded 45 acres of suitable northern spotted owl habitat since 1994. In the year 2000, formal consultation for the Cappell Creek “B” timber sale, USFWS authorized the incidental take of two northern spotted owl activity centers as a result of removal of 115 acres of habitat within their home ranges. Proposed harvest for 2006 on the Yurok Reservation will likely occur in suitable owl habitat within the home range boundaries of two additional owl activity centers. Since both of these activity centers are already below habitat thresholds, it is anticipated that both of them will result in “take.” The proposed harvest will remove an additional 112 acres of nesting/roosting habitat and 135 acres of foraging habitat for a total of 247 acres of suitable habitat.

As of January 1, 2003, approximately 56,921 acres of suitable northern spotted owl habitat occurred within Hoopa reservation boundaries, including 36,891 acres of nesting/roosting habitat and 20,030 acres of foraging habitat. In addition, the reservation contains 5,985 acres of dispersal habitat not already identified as nesting/roosting/foraging habitat. Surveys conducted since 1991 have resulted in identification of 53 spotted owl territories known to occur on Hoopa reservation lands. Four of the 53 territory centers are currently below incidental take thresholds set by the USFWS

relative to the amount of available suitable habitat. Two of these territories are currently below the incidental take threshold within the 0.7-mile buffer surrounding the activity center; one territory is below the incidental take threshold within its 1.3-mile buffer; and one territory is below the threshold in both the 0.7-mile and 1.3-mile buffers.

Timber management through 2008 is expected to remove a total of 2,405 acres of nesting/roosting/foraging habitat, affecting 43 of 53 territories on the Reservation. As a result, three of the 43 activity centers would either fall below or be reduced further below the suitable habitat thresholds within the 0.7- or 1.3-mile analysis areas. Timber harvesting through 2008 would reduce the amount of dispersal habitat on the reservation from 62,906 acres (69 percent of the reservation area) to 60,113 acres (66 percent of the reservation area). The USFWS anticipates that owl pairs associated with 11 northern spotted owl activity centers could be taken through 2008 on Hoopa reservation lands.

Representative land ownership for the actions noted above that have been carried forward for detailed analysis (as a percentage of total HPA acreage) for the HPAs addressed in this EA is presented in Table 4.1-1. The geographic location of the representative land ownership for the actions is shown in Figure 4.1-1.

TABLE 4.1-1
Land Ownership as a Percentage of Total in the 11 HPAs

HPA	Green Diamond	PALCO	Other Commercial Timberland	USFS/BLM	Parks	Other
North Fork Mad River	89.8	0.0	0.0	0.0	0.0	10.2
Little River	87.7	0.0	0.0	0.4	0.4	11.5
Coastal Klamath	82.1	0.0	0.9	3.1	5.7	8.3
Coastal Lagoons	74.6	0.0	0.7	0.0	9.2	16.2
Interior Klamath	51.7	0.0	0.0	6.3	0.3	41.7
Mad River	41.3	0.3	4.7	0.9	0.0	52.8
Smith River	24.3	0.0	13.3	19.5	15.9	27.1
Blue Creek	19.2	0.0	0.0	47.2	0.0	33.6
Redwood Creek	17.5	0.0	4.5	3.3	41.8	32.8
Humboldt Bay	12.6	22.2	7.6	5.3	0.2	52.1
Eel River	3.9	27.0	4.4	0.5	0.0	64.1

4.2 Geology, Geomorphology, and Mineral Resources

The purpose of this Section is to evaluate the potential impacts of implementing the Proposed Action (amendments to the 1992 NSO HCP and associated ITP), Alternative A (HCP/ITP amendment plus release of three set-asides to timber harvest), and the No Action Alternative as they relate to geology, geomorphology, and mineral resources. Potential direct adverse impacts include acute or chronic changes in geomorphic and hydrologic

processes that affect soil productivity, delivery of surface materials to streams and rivers, and hillslope stability in the Action Area. Geomorphology and geologic resources in the Action Area can be affected in several ways. Primarily, the effects are related to movement of surface materials, including soils, weathered rock, and sediment (i.e., hillslope mass wasting). When delivered to streams, these materials can affect water quality (see Section 4.3, Hydrology and Water Quality) and fish habitat (see Section 4.4, Aquatic Resources). Currently, sediment inputs to Action Area stream networks result from existing roads, implementation of THPs, natural conditions, and legacy conditions.

Several potential resource issues within the Action Area (i.e., mineral-resource depletion, fire-prevention and fire-suppression activities, and earthquakes or volcanic eruptions) would have no or negligible direct or indirect impacts as a result of implementing the Proposed Action or Alternative A. These issues are discussed below, but are not analyzed in greater detail in this EA.

- The Proposed Action or the other alternatives would not affect the extraction and processing of mineral resources (Section 3.2.4, Mineral Resources) in the Action Area. Green Diamond's rock pits are generally less than 2 acres in size; are located more than 100 and 75 feet from Class I and II streams, respectively; and are exempt from SMARA regulations. Any extraction of in-stream gravel from locations throughout the Action Area would be conducted in compliance with permitting and regulatory requirements of the CDFG and other State or Federal regulations. These activities would be the same for the No Action Alternative, Proposed Action, and Alternative A. Also, instream gravel extraction would not be a covered activity under the Proposed Action or Alternative A.
- The Proposed Action or the alternatives would not affect wildfire prevention and suppression activities in the Action Area. Depending on the location and characteristics of a particular fire, uncontrolled fires, areas of high-intensity burns, and fire-suppression activities can potentially result in conditions leading to increased sediment delivery and hillslope mass wasting. Under the various alternatives, wildfire prevention and wildfire suppression activities would continue to be practiced by Green Diamond when and where necessary.
- Although the proposed ITP would provide increased operational flexibility regarding where harvest occurs, the total area harvested is expected to be similar under all the alternatives. The total area subject to harvest is speculative and could even be greater under the No Action, should restrictions around the eight NSO sites direct harvest toward younger stands not occupied by owls, and where yields per acre would be less than in the older forest typical around NSO nest sites. The potential for soil compaction to result from implementing the Proposed Action or any of the alternatives is, however, expected to be similar and are, therefore, not assessed in detail in this EA.
- The likelihood or magnitude of earthquakes or volcanic eruption will be unaffected by implementation of the Proposed Action or the other alternatives; therefore, these events are not assessed in detail in this EA.

4.2.1 Methodology

Potential direct adverse impacts include acute or chronic changes in geomorphic and hydrologic processes that affect soil productivity, delivery of surface materials to streams and rivers, and hillslope stability in the Action Area. Potential effects could be localized or dispersed over a wide area. As noted above, potential indirect adverse impacts relate to: (1) the possible loss of spotted owl habitat as a result of hillslope mass wasting triggered by timber harvest activities, and (2) the resulting effect this could have on spotted owls.

4.2.2 No Action Alternative

Continued implementation of the 1992 NSO HCP under the No Action Alternative would have no significant effects on the potential for mass soil movement or, consequently, the loss of northern spotted owl habitat compared to existing conditions.

4.2.3 Proposed Action

Authorization of an additional eight owl pair incidental takes under the Proposed Action would have insignificant adverse impacts on Action Area geology and geomorphology when compared to the No Action Alternative. As a result, potential impacts to the geology and geomorphology within the Action Area under the Proposed Action would be similar to those under the No Action Alternative.

4.2.4 Alternative A

With the exception of the release of the three set-asides under this alternative, general timber harvesting and forest management activities would be similar to those under Alternative A as in the Proposed Action. As a result, potential impacts to the geology and geomorphology within the Action Area would be similar. Release of the three set-aside areas may create some potential insignificant adverse impacts to geology and geomorphology in the Action Area.

4.2.5 Cumulative Impacts—Geology, Geomorphology, and Mineral Resources

The assessment of potential cumulative impacts on geology and geomorphology was conducted using the approach described in Section 4.1.2, Cumulative Impacts Analysis.

4.2.5.1 Impacts Associated with Other Actions

Cumulative effects on geology and geomorphology with respect to this analysis would be related to the potential for a cumulative increase in hillslope mass wasting and consequent loss of northern spotted owl habitat within the 11 HPAs. The conservation measures specific to the northern spotted owl and other wildlife species for the PALCO HCP and the NWFP, together with prohibitions on timber harvesting on Federal and State Park lands, will collectively serve to minimize the risk of hillslope mass wasting on PALCO and Federal lands within the 11 HPAs. Continued USFWS consultation and coordination with tribal representatives and other landowners in the region who do not have existing HCPs may not necessarily minimize the potential for management-related landslide occurrences in these areas. Some of these potential effects, such as those associated with timber harvest, may be minimized as a result of tribal consultations with NMFS (through the Bureau of Indian Affairs), when a tribal activity may adversely affect Federally-listed salmonids. A slightly

greater, albeit not significant, potential for hillslope mass wasting and an associated loss of northern spotted owl habitat exists on these lands compared to lands where HCP or NWFPC conservation measures provide additional protections.

4.2.5.2 Cumulative Impacts Associated with the Proposed Action and Alternative A

Overall, it is anticipated that the cumulative effect of implementing all of the resource management programs described in Section 4.1.2.3 will collectively serve to minimize the risk of hillslope mass wasting on PALCO and Federal lands within the 11 HPAs. As noted in Sections 4.2.3 and 4.2.4 above, implementation of the Proposed Action or Alternative A also would not result in significant adverse impacts to geology and geomorphology.

4.3 Hydrology and Water Quality

As described in Section 3.3, Hydrology and Water Quality, the primary water quality parameters of concern for the evaluation of project impacts are suspended sediment, turbidity, and water temperature.

Potential impacts to hydrology and water quality are assessed in this EA over broad geographic areas rather than for individual project features. This evaluation focuses on impacts to watersheds through changes in flow, water temperature, and sediment inputs.

Hydrology in forested areas can be affected by peak flows during storm events that can cause scour, alter channel morphology, and cause flooding. Alteration of snow pack, enhancement of runoff throughout timber harvest units or along roads, interception of groundwater flows by roads, and alteration of evapotranspiration through changes in forest structure all have the potential to affect Action Area hydrology (Beschta et al., 1995; Lewis, 1998). Stream temperatures can be affected by changes to direct shading, reduced surface and groundwater flows, and sediment deposition (MacDonald et al., 1991).

4.3.1 Methodology

Methods to evaluate the significance of the alternatives to Action Area hydrology and water quality are those qualitative and quantitative techniques used in evaluating: (1) changes in peak and low (base) flows, (2) changes in slope stability and soil delivery to the streams (see Section 4.2, Geology, Geomorphology, and Mineral Resources), and (3) changes in riparian vegetation and shading (Section 4.4, Aquatic Resources). Those evaluations are used to assess relative changes in hydrology, sediment delivery, and water temperature, respectively.

Changes in stream hydrology and water quality would be significant: (1) if they result in increased flooding conditions or scouring, or (2) if they produce degraded water quality conditions that exceed water quality guidelines or criteria (such as Basin Plan limits).

Changes are evaluated by comparing conditions expected over time under the Proposed Action and Alternative A with those conditions expected over time under the No Action Alternative.

4.3.2 No Action Alternative

Under the No Action Alternative, owl habitat and forestry management measures would be implemented primarily through the THP process and governing CFPRs. The CFPRs include

measures to protect hydrology and water quality in the Action Area by incorporating WLPZ requirements such as buffers of specified widths along streams and other bodies of water. They also require maintenance of specified percentages of overstory canopy and understory vegetation in the buffers. These buffers are intended to: (1) provide a vegetative filter strip that will capture and reduce sediment carried by runoff from side-slopes; (2) preserve canopy cover to maintain water temperatures; and (3) provide for filtration of organic and inorganic material and vegetation, as well as streambed and flow modification by instream woody debris. In addition, the construction, use, and maintenance of logging roads, skid trails, and landings are regulated to minimize erosion and sedimentation impacts to watercourses and to remove or prevent instream obstructions to unrestricted fish passage.

Continued implementation of the 1992 NSO HCP and CFPRs under the No Action Alternative would not result in significant (1) increased flooding conditions or scouring, or (2) produce degraded water quality conditions that exceed water quality guidelines or criteria (such as Basin Plan limits). Implementation of the No Action Alternative would result in insignificant adverse effects on stream hydrology and water quality when compared to existing conditions.

4.3.3 Proposed Action

The ability to harvest around eight NSO sites has the potential to increase timber harvest compared to No Action, and for this to result in increased effects. The Proposed Action would allow timber harvest on up to 1,864 acres around eight NSO nest sites. As discussed below (Section 4.6.3), 1,864 acres represents a worst-case scenario; the actual effect is expected to be offset, at least in part, by reduced harvest elsewhere on the ownership. The Proposed Action would also be regulated under the THP process and governing CFPRs and impacts would be substantially similar to the No Action Alternative, i.e., the Proposed Action would not result in either increased flooding conditions or scouring, or degraded water quality conditions that exceed water quality guidelines or criteria. As such, implementation of the Proposed Action would have no significant impact on area hydrology and water quality when compared to the No Action Alternative.

4.3.4 Alternative A

Release of the three set-aside areas may create some potential adverse impacts to water quality because up to 903 acres may be made available for timber harvest under this alternative. However, these impacts would be insignificant. With the exception of the release of the three set-asides under this alternative, general timber harvesting and forest management activities would remain the same under Alternative A as in the Proposed Action and No Action Alternatives. As a result, potential impacts to the hydrology and water quality within the Action Area would be the same.

4.3.5 Cumulative Impacts—Hydrology and Water Quality

The assessment of potential cumulative impacts on hydrology and water quality was conducted using the approach described in Section 4.1.2, Cumulative Impacts Analysis.

Past timber management within the 11 HPAs has affected peak flows, water temperatures, and sedimentation of streams. Changes in peak flows (timing and intensities) have resulted in additional water runoff throughout timber harvest units or along roads, the interception

of groundwater flows by roads, and alteration of evapotranspiration through changes in forest structure. The normal hydrologic cycles for some of the HPAs have also been modified by dams, water diversions, development, and agriculture (see Section 3.3.2, Watershed Characteristics). These activities have resulted in adverse environmental conditions in some locations, including insufficient stream flows. Increases in stream temperatures also have occurred.

Several of the larger watercourses in the 11 HPAs are listed as water quality impaired under Section 303(d) of the CWA. In many cases, the listed cause of impairment is excessive sedimentation of streams. Adverse existing conditions relating to excessive sediment have resulted from past activities and include stream channel aggradation, pool filling, and cementation of bed substrate. It is assumed that during past sediment-loading activities, turbidity levels were above the desired levels.

4.3.5.1 Impacts Associated with Other Actions

Cumulative effects on hydrology and water quality with respect to this analysis would be related to the potential for a cumulative increase or potential increase in flooding conditions or scouring, or degraded water quality conditions that exceed water quality guidelines or criteria within the 11 HPAs. The conservation measures specific to the northern spotted owl and other wildlife species for the PALCO HCP and the NWFP, together with prohibitions on timber harvesting on Federal and State Park lands, will collectively serve to minimize the potential for management-induced events that could trigger flooding, and would generally help to maintain or improve existing water quality conditions on PALCO and Federal lands within the 11 HPAs.

On the other hand, continued USFWS consultation and coordination with tribal representatives and other landowners in the region who do not have existing HCPs may not necessarily minimize the potential for such impacts in these areas. Some of these potential effects, such as those associated with timber harvest, may be minimized as a result of tribal consultations with NMFS (through the Bureau of Indian Affairs), when a tribal activity may adversely affect Federally-listed salmonids. A slightly greater, albeit not significant, potential for flooding and degraded water quality conditions exists on these lands compared to lands where HCP or NWFP conservation measures provide additional protections.

4.3.5.2 Cumulative Impacts Associated with the Proposed Action and Alternative A

Overall, it is anticipated that the cumulative effect of implementing all of the resource management programs described in Section 4.1.2.3 will collectively serve to minimize the risk of flooding, stream channel scouring, or degraded water quality conditions on PALCO and Federal lands within the 11 HPAs. As noted in Sections 4.2.3 and 4.2.4 above, implementation of the Proposed Action or Alternative A also would not result in significant adverse impacts to hydrology and water quality.

4.4 Aquatic Resources

This Section addresses the potential for impacts to fisheries, plus aquatic and riparian function and habitat quality, in the Action Area as a result of implementing the Proposed

Action and Alternative A. The following discussion assesses the potential for impacts to occur to these aquatic resources.

4.4.1 Methodology

Methods used to evaluate the potential for adverse or beneficial effects on aquatic resources are based on anticipated changes in hydrology, riparian conditions, sediment production and delivery, and the resulting changes in aquatic habitat quality. These anticipated changes and potential effects are evaluated as part of the No Action Alternative, the Proposed Action, and Alternative A. Management activities have the potential to affect aquatic resources in several ways. The following potential impacts on habitat and biota are evaluated in this Section:

- Changes in peak flows that have the potential to affect channel morphology through bed scour and bank erosion
- Reduction (over time) in the amount of large woody debris that could be recruited into the watercourses, contributing to reduced sediment storage sites, and reduced pool numbers and volumes
- Removal of riparian vegetation resulting in altered thermal regimes, changes in nutrient cycling, and destabilization of streambanks
- Increases in sediment supplies from surface erosion, hillslope mass wasting, and bank erosion, leading to channel aggradation, loss of pool volume, and degradation of spawning gravels

These potential changes to the stream channel and associated riparian areas could adversely or beneficially affect the quantity and quality of aquatic habitat for species through changes in temperature, sedimentation, habitat complexity, and connectivity. Habitat complexity refers primarily to instream habitat, which provides cover for fish and helps define and add complexity to the stream channel through undercut banks, pools, and other features. Connectivity refers to stream corridor connectivity, which is important to those species with complex life histories (multiple developmental stages), movement, and migration strategies.

4.4.2 No Action Alternative

As noted in Section 4.2 (Geology and Geomorphology) and Section 4.3 (Hydrology and Water Quality), the hillslope mass wasting, hydrologic, and water quality conditions and processes that could impact aquatic species, as well as aquatic and riparian function, would not be significantly affected by continued implementation of the 1992 NSO HCP under the No Action Alternative compared to existing conditions. No significant changes in (1) peak flows with potential to affect channel morphology, (2) in-stream LWD, (3) quantity and quality of riparian vegetation, and (4) sedimentation and stream aggradation would be anticipated to occur as a result of continued implementation of the conservation measures contained in the 1992 NSO HCP.

4.4.3 Proposed Action

As noted in Section 4.2 (Geology and Geomorphology) and Section 4.3 (Hydrology and Water Quality), USFWS approval of an additional eight owl pair incidental takes in

conjunction with timber harvest around nest sites, and associated conservation measures under the Proposed Action, would have no significant impact on Action Area geology, geomorphology, hydrology, and water quality when compared to the No Action Alternative. As a result, potential impacts from implementation of the Proposed Action to aquatic species, as well as aquatic and riparian function, within the Action Area would be similar to those under the No Action Alternative.

4.4.4 Alternative A

With the exception of the release for timber harvest of the three set-asides noted above, general timber harvesting and forest management activities would remain the same under Alternative A as in the Proposed Action. As a result, potential impacts to geology, geomorphology, hydrology, and water quality within the Action Area would be similar. Release of the three set-aside areas under Alternative A may create some potential insignificant adverse impacts to these resources in the Action Area by virtue of being available for timber harvest under this alternative, and because all three set-asides contain Class I, Class II, or Class III watercourses.

4.4.5 Cumulative Impacts—Aquatic Resources

The purpose of this cumulative impact assessment is to evaluate the potential effects of the Proposed Action and Alternative A on aquatic species and aquatic and riparian function. The assessment of potential cumulative impacts on aquatic resources was conducted using the approach described in Section 4.1.2, Cumulative Impacts Analysis.

4.4.5.1 Impacts Associated with Other Actions

The conservation measures specific to the northern spotted owl and other wildlife species for the PALCO HCP and the NWFP, together with prohibitions on timber harvesting on Federal and State Park lands, will collectively serve to minimize the risk of hillslope mass wasting and to hydrologic and water quality conditions and processes with potential to impact aquatic species, as well as aquatic and riparian function. On the other hand, continued USFWS consultation and coordination with tribal representatives and other landowners in the region who do not have existing HCPs may not necessarily minimize the potential for impacts to geologic, hydrologic and water quality conditions and processes, and, by extension, impacts to aquatic species and aquatic/riparian function. Some of these potential effects, such as those associated with timber harvest, may be minimized as a result of tribal consultations with NMFS (through the Bureau of Indian Affairs), when a tribal activity may adversely affect listed salmonids. A slightly greater, albeit not significant, potential for impacts to aquatic species, as well as aquatic and riparian function, exists on these lands compared to lands where HCP or NWFP conservation measures provide additional protections.

4.4.5.2 Cumulative Impacts Associated with the Proposed Action and Alternative A

Overall, it is anticipated that the cumulative effect of implementing all of the resource management programs described in Section 4.1.2.3 will collectively serve to minimize the risk to aquatic species and aquatic and riparian function on PALCO and Federal lands within the 11 HPAs. As noted in Sections 4.2.3 and 4.2.4 above, implementation of the Proposed Action or Alternative A also would not result in significant adverse impacts to

geomorphology, hydrology, and water quality. Similarly, it follows that implementation of the Proposed Action or Alternative A would not result in significant incremental adverse impacts to aquatic species and aquatic/riparian function.

4.5 Vegetation/Plant Species of Concern

The purpose of this Section is to evaluate the potential impacts of implementing the Proposed Action, Alternative A, and the No Action Alternative as they relate to vegetation and plant species of special concern. Growth projections indicate that under the current management regime, forest trends on the Green Diamond ownership will lead to increased tree age class and size, as well as increased total acreage with dense canopy closure.

The timing of past harvesting activity over the Green Diamond ownership has resulted in a current mosaic of age classes dominated by forests types less than 60 years old, with approximately 85 percent of the ownership supporting forests in these age classes.

Twelve percent of the property is in forest types 60 years old or older. The proportion of the area in these older age classes is expected to remain at this level or increase over the remaining term of the NSO HCP permit for two reasons:

- CFPR adjacency constraints that are applied to even-aged harvesting units result in retention of many stands far past planned rotation age. If harvesting of a tract of mature timber is initiated around age 50, the harvesting of much of that tract will be constrained into the following decade, and the harvest of a few stands will be constrained past 70 years of age. This effect has been demonstrated in Green Diamond's long term operating plan (i.e., Option (a) document).
- Current rules and regulations, interacting with provisions of the NSO HCP, result in harvesting restraints or prohibitions on approximately 12 percent of the Action Area.

4.5.1 Methodology

The assessment for vegetation and plant species of concern is based on data collected and documented in the affected environment discussion of vegetation and plant species of special concern (see Section 3.5, Vegetation/Plant Species of Concern), widely accepted ecological principles of natural succession, and the latest understanding of forest succession in managed timberlands. A key premise of this assessment is that nonriparian lands under all the alternatives would be managed in accordance with existing regulations, other applicable laws, Green Diamond's NSO HCP, and Green Diamond operational policies and guidelines. The assessment focuses on habitat type, vegetation structure, and canopy closure for each of the alternatives. As discussed in Section 3.5, habitat types for vegetation are based on the California Wildlife Habitat Relationships (CWHR) System (Mayer and Laudenslayer, 1988). The CWHR classification identifies habitat type, size class, and canopy-cover class. In this EA, the CWHR classification system is applied in the context of continued management of Green Diamond's timber resources to achieve maximum sustained production (MSP) of high-quality timber products (see Sections 1.5.4.1 and 1.6.3). The CWHR system is used in this analysis to identify potential changes to habitat type within Green Diamond's ownership and to compare existing conditions with future

vegetative habitat conditions. The assessment in this Section is the basis for assessing impacts to the northern spotted owl (Section 4.6) and other wildlife species (Section 4.7).

4.5.2 No Action Alternative

4.5.2.1 General Effects

In the context of Green Diamond's Option (a) document, changes to habitat type (i.e., species composition), size class, and canopy-cover class can occur on an individual harvest-unit basis. Size class and canopy closure within an individual timber harvest unit could change depending on the extent of timber harvesting conducted. This could occur both in upland areas (where even-aged management is applied) and in riparian areas (where selective harvest is conducted). Species composition in individual harvest units, however, is not anticipated to change because areas are not CWHR-reclassified on the basis of timber harvesting. For example, when a montane hardwood/conifer forest is harvested, it retains its CWHR-assigned classification as a montane hardwood/conifer forest. Only the size class and canopy-cover class would change. This example applies to all the forest types described in Section 3.5, Vegetation/Plant Species of Concern.

4.5.2.2 Effects in Upland Areas

As stated in Green Diamond's Option (a) document, timber stands in upland (non-riparian) areas on the Green Diamond ownership are considered ready for harvest once they enter the 50-year age class. State law, however, constrains both the size of even-aged harvest units and the timing of adjacent even-age harvesting operations. As a result, many stands may not be harvested until they reach the 70-year age class. The estimated average age of stands harvested is expected to be approximately 55 years as the property approaches full "regulation."

4.5.2.3 Riparian Management Effects

The timber harvesting cycle within riparian corridors, where uneven-age management is predominately practiced, is generally between 10 and 50 years. Under the No Action Alternative, the potential for changes in species composition, size class, and canopy-cover class would be most evident in the riparian areas where complete stand replacement prescriptions, typical of the more upland areas, do not exist and individual tree selection and harvesting practices result in heavier emphasis on mid- to late-seral-stand development.

Historically, uneven-aged timber management within the Action Area has focused on WLPZs, water supply areas, visually sensitive road corridors, nest sites of selected bird species, and residential property lines. Throughout much of the Action Area, management practices that occurred prior to implementation of the CFPRs in 1973 emphasized removal of most large conifers from the riparian zone. Before the CFPRs were implemented, decades of timber harvesting in the riparian zone altered the species composition and age classes of trees along stream channels. The removal of valuable conifer species from riparian zones led to the establishment and later predominance of early successional hardwood species, such as alders and willows, during this period.

Existing regulations, while allowing harvesting in riparian areas, provide guidelines that are designed to promote riparian stand diversity and enhance aquatic habitats. Under the No

Action Alternative, these regulations and guidelines provide for retention of a variety of tree sizes (height and diameter) and species within RMZs, with priority given to wildlife habitat trees. Under the No Action Alternative, therefore, riparian areas would trend towards a stand composition comprised of a greater number of mature trees. Also, more conifers would be maintained compared to existing conditions, where mostly hardwoods currently exist in riparian areas.

The No Action Alternative is expected to provide the conditions in which a greater number of large trees could be present, over time, in riparian areas in the Action Area. These conditions indicate an overall trend toward development of a greater number of large trees within riparian areas. Vegetation management activities in riparian areas would be expected to remain relatively unchanged from existing timber-harvesting practices, and similar species compositions would be retained.

4.5.2.4 Listed Plant Species and Other Plant Species of Concern

Under the No Action Alternative, Green Diamond would continue to exercise the precautions necessary to comply with the prohibitions on take of listed plants. Take of Federally listed plants is not prohibited under the ESA on non-Federal lands, unless take prohibitions under State law exists. Green Diamond would continue to avoid or minimize potential adverse impacts to listed plants, including continuing to adhere to measures contained in the CFPRs (special protections afforded to meadows and wetlands), Green Diamond's own Plant Protection Program, and other measures identified during the THP preparation and review process. Existing regulations require that THPs include measures to avoid or minimize potential adverse impacts to listed plant species and other species of concern (if they occur) to a level of insignificance.

Green Diamond's Plant Protection Program (Green Diamond, 2001) is a three-tiered program that is based on an ongoing agreement with CDFG. Under Phase I of the agreement, Green Diamond avoids all listed plants/plant species of concern (referred to as "sensitive plants") or their habitats within THP project areas. Under Phase II of the agreement (currently being implemented by Green Diamond), Green Diamond surveys for sensitive plants in accordance with protocols approved by CDFG. Plant surveys are conducted in advance of operations within a project area or a generally larger area if specific project area boundaries are unknown. If the surveys indicate that sensitive plants do not exist within the project area, Green Diamond is allowed to initiate timber harvesting and related activities even if sensitive plant habitats are present. When plants are found, Green Diamond further consults with CDFG to determine appropriate site-specific mitigation for those plants that are incorporated into THPs, as necessary. If surveys are not possible due to project planning and timing, Green Diamond avoids sensitive plants and their habitats as provided under the Phase I portion of the agreement. Phase III plant protection measures, still under discussion with CDFG, would provide for development of a more comprehensive, long-term strategy for the entire ownership that will likely incorporate surveys for sensitive plants, impact avoidance and risk minimization measures, and monitoring. The suite of Phase III protection measures will be based on site-specific data collected during Phase II surveys. Green Diamond's botanist has responsibility for implementing the program, and training is provided to Green Diamond foresters on sensitive plant and habitat recognition. The Plant Protection Program is applied on all projects that are THP-related.

As described in Section 3.5.3, Plant Species of Concern, rare plant species were identified using a February 2006 query of the CNDD for species occurring within the 11 HPAs. Species identified as occurring within this area may, in fact, be located outside of the NSO HCP Action Area boundaries. Three plant species listed as Federal- or State-endangered occur within the 11 HPAs: beach layia (*Layia carnosa*), Kneeland Prairie penny-cress (*Thlaspi californicum*), and western lily (*Lilium occidentale*). Beach layia is a resident of coastal dune habitats and is unlikely to be found on the Green Diamond ownership. Kneeland Prairie penny-cress occurs locally on a single serpentine outcrop, and is not found on the current Green Diamond ownership. Western lily is not known to occur on Green Diamond lands, and is primarily associated with wetland habitats that are protected from forestry activities under the CFPRs. These circumstances minimize potential effects within the habitat associations for western lily, if it is found in the Action Area.

Table 4.5-1 presents: (1) a list of the rare plant species known to occur or likely to occur within the 11 HPAs and the Green Diamond ownership; (2) their habitat association; and (3) a summary of potential impacts associated with the No Action and other alternatives. For all species and all alternatives, either no impacts would occur or the impacts would be minimal and, therefore, less than significant. In addition, many of the species' habitats (e.g., coastal prairies, wetlands) would not be disturbed by Green Diamond's activities or would be disturbed only incidentally; changes to these habitats are anticipated to be negligible over time.

4.5.3 Proposed Action

4.5.3.1 General Effects

Because timber harvesting, forest management activities, as well as most NSO HCP conservation measures, under the Proposed Action would be similar to those of the No Action Alternative, potential effects on vegetation and plant species of concern and their habitats within the Action Area would be the same as described above for the No Action Alternative (see Section 4.5.2). The amount of habitat 46 years old or greater would continue to increase over the remainder of the permit period.

As with the No Action Alternative, the Proposed Action would provide for implementation of measures contained in the NSO HCP that could result in long-term beneficial effects on wildlife species associated with mid- to late-seral habitat types (see Section 4.7, Terrestrial Habitat/Wildlife Species of Concern). As described above for the No Action Alternative, only a small proportion of the trees within WLPZs would be harvested under the Proposed Action; those that remain would continue to mature, following removal of adjacent upland stands. The Proposed Action would permit timber harvest activities at eight additional spotted owl sites, thereby reducing the amount of older forest in these areas below the "no-take" habitat thresholds for owl sites, as defined in the NSO HCP. Apart from the authorized incidental take of those spotted owl pairs, the additional timber harvest at these sites would otherwise be subject to the management practices and regulatory requirements as described for the No Action, relative to Federal- and State-listed species, and to other species. This harvest would be dispersed over space and time in a manner such that it would represent a minimal annual increase in the amount of forest entering younger age classes, and a minimal annual decrease in the amount of forest in older age classes. In the context of Green Diamond's ownership, the additional area subject to harvest as a result of

TABLE 4.5-1
Plant Species of Special Concern—Habitat Association and Potential Impacts

Species	Habitat Associations	Impacts
Listed Species		
Western lily <i>Lilium occidentale</i>	Early successional bogs, fens, coastal scrub, and prairie, on poorly-drained soils, within about 4 miles of coast	None. Timber harvesting not allowed on bogs, fens, coastal scrub, and prairie habitats. Special protections for wetland areas in existing regulations. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Nonlisted Species of Concern		
Bald Mountain milk-vetch <i>Astragalus umbraticus</i>	Cismontane woodland, lower montane coniferous forest	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Bensoniella <i>Bensoniella oregana</i>	RIV, meadows, bogs, fens, coniferous forests	None. Not likely to occur in timberlands; mostly associated with wetlands. Special protections in existing regulations for habitat associations.
Bolander's reed grass <i>Calamagrostis bolanderi</i>	Bogs, fens, marshes, meadows, closed-cone conifer forest, coastal scrub	None. Incidental and less-than-significant disturbance possible in forest areas. Special protections in existing regulations for meadows and seeps. Other potential impacts mitigated through adherence to general protection measures contained in existing regulations.
California pinefoot <i>Pityopus californicus</i>	Broad-leaved upland forest, lower montane coniferous forest, north coast coniferous forest, upper montane coniferous forest	None. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
California pitcher plant <i>Darlingtonia californica</i>	Sphagnum bogs, seeps, and along trickling streams	None. Incidental and less-than-significant disturbance possible in forest areas. Special protections in existing regulations for meadows and seeps. Other potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Coastal triquetrella <i>Triquetrella californica</i>	Coastal bluff scrub, coastal scrub	None. No timber harvesting in habitat areas; incidental and less-than-significant disturbance possible. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Coast checkerbloom <i>Sidalcea oregana</i> ssp. <i>eximia</i>	Meadows and seeps, coniferous forests	None. Incidental and less-than-significant disturbance possible in forest areas. Special protections in existing regulations for meadows and seeps. Other potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Coast fawn lily <i>Erythronium revolutum</i>	Moist areas and streambanks within bogs and fens	None. Incidental and less-than-significant disturbance possible in forest areas. Special protections in existing regulations for meadows and seeps. Other potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Del Norte buckwheat <i>Eriogonum nudum</i> var. <i>paralinum</i>	CSC, PGS, open places along immediate coast	None. No timber harvesting in habitat areas (PGS and CSC); incidental and less-than-significant disturbance possible. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Flaccid sedge <i>Carex leptalea</i>	Meadows, bogs, fens, marshes and swamps	None. Not likely to occur in timberlands; mostly associated with wetlands. Special protections in existing regulations for habitat associations.

TABLE 4.5-1
Plant Species of Special Concern—Habitat Association and Potential Impacts

Species	Habitat Associations	Impacts
Great Burnet <i>Sanguisorba officinalis</i>	Marshes, swamps, bogs, fens, seeps, RIV, meadows, broad-leaved and coniferous forests	None. Not likely to occur in timberlands; mostly associated with wetlands. Special protections in existing regulations for meadows, marshes, and other wetland areas. Other potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Henderson's fawn lily <i>Erythronium hendersonii</i>	Coniferous forests	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Howell's jewel flower <i>Streptanthus howellii</i>	Coniferous forests	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Howell's montia <i>Montia howellii</i>	Vernally wet sites, coniferous forest	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Howell's sandwort <i>Minuartia howellii</i>	Chaparral, Jeffrey-pine/oak woodland, serpentine	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Indian pipe <i>Monotropa uniflora</i>	Often associated with redwoods and western hemlock; broad-leaved and coniferous forests	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Kellogg's lily <i>Lilium kelloggii</i>	Openings, disturbed areas in redwood and yellow pine forests	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Koehler's stipitate rock cress <i>Arabis koehleri</i> var. <i>stipitata</i>	Chaparral, coniferous forests	Less than significant. Broad range of habitats. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Lakeshore sedge <i>Carex lenticularis</i> var. <i>limnophila</i>	Wetlands, meadows	None. Not likely to occur in timberlands; mostly associated with wetlands. Special protections in existing regulations for habitat associations.
Leafy-stemmed miterwort <i>Mitella caulescens</i>	North coast and lower montane coniferous forest, broad-leaved upland forest, meadows	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Longbeard lichen <i>Usnea longissima</i>	North coast coniferous forest, and broad-leaved upland forest	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Mad River fleabane daisy <i>Erigeron maniopotamicus</i>	Meadows and seeps, open disturbed areas (road cuts); rocky areas	None. Incidental and less-than-significant disturbance possible in forest areas. Special protections in existing regulations for meadows and seeps. Other potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Maple leaved checkerbloom <i>Sidalcea malachroides</i>	Coastal woodlands and clearings, often in disturbed areas. CSC, PGS, broad-leaved and coniferous forests	Less than significant. CSC and PGS not harvested, and little disturbance in broad-leaved forest types. Broad range of habitats. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.

TABLE 4.5-1
Plant Species of Special Concern—Habitat Association and Potential Impacts

Species	Habitat Associations	Impacts
Marsh pea <i>Lathyrus palustris</i>	PGS, CSC, bogs, fens, marshes, swamps, coniferous forests	None. CSC, PGS, and wetlands not harvested. Broad range of habitats. Special protections in existing regulations for wetland areas. Other potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Marsh violet <i>Viola palustris</i>	CSC, bogs and fens	None. CSC and wetlands not harvested. Special protections in existing regulations for bogs and fens.
Meadow Sedge <i>Carex praticola</i>	Moist to wet meadows	None. Mostly associated with wetlands. Meadow and wetland protections in existing regulations.
Nodding semaphore grass <i>Pleuropogon refractus</i>	Meadows, wetlands, riparian	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Northern clustered sedge <i>Carex arcta</i>	Bogs and fens, moist places in north coast coniferous forest	None. Special protections in existing regulations for bogs and fens.
Oregon coast Indian paintbrush <i>Castilleja affinis ssp. litoralis</i>	Coastal bluff scrub, Coastal dunes, Coastal scrub	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Oregon fireweed <i>Epilobium oregonum</i>	Bogs, fens, meadows, coniferous forests	Less than significant. Species mostly associated with wetlands. Wetland and meadow protections in existing regulations. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Pacific gilia <i>Gilia capitata ssp. pacifica</i>	Coastal bluff scrub, Chaparral, coastal prairie Valley and foothill grassland	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Robust false lupine <i>Thermopsis robusta</i>	Broad-leaved and coniferous forests	Less than significant. Little disturbance in broad-leaved forests. Broad range of habitats. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Running pine <i>Lycopodium clavatum</i>	Moist areas, marshes and swamps, coniferous forests	None. Species mostly associated with wetlands. Wetland protections in existing regulations. Other potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Seacoast ragwort <i>Senecio bolanderi var. bolanderi</i>	Coastal scrub, north coast coniferous forest	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Serpentine catchfly <i>Silene serpicicola</i>	Chaparral, lower montane coniferous forest/serpentinite openings	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.

TABLE 4.5-1
Plant Species of Special Concern—Habitat Association and Potential Impacts

Species	Habitat Associations	Impacts
Serpentine sedge <i>Carex septicola</i>	Meadows and seeps, serpentinite	None. Incidental and less-than-significant disturbance possible in forest areas. Special protections in existing regulations for meadows and seeps. Other potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Siskiyou checkerbloom <i>Sidalcea malviflora</i> ssp. <i>patula</i>	Coastal bluff scrub, coastal prairie, and North Coast coniferous forest	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Siskiyou false hellebore <i>Veratrum insolitum</i>	Stream banks, moist meadows	None. Incidental and less-than-significant disturbance possible in forest areas. Special protections in existing regulations for meadows and seeps. Other potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Small ground cone <i>Boschniakia hookeri</i>	Coniferous forests	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Sonoma manzanita <i>Arctostaphylos canescens</i> ssp. <i>Sonomensis</i>	Chaparral, coniferous forests	Less than significant. Broad range of habitats. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Sugar scoop; lace flower <i>Tiarella trifoliata</i> var. <i>trifoliata</i>	Lower montane coniferous forest, north coast coniferous forest	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Suksdorf's wood sorrel <i>Oxalis suksdorfii</i>	Broad-leaved upland forest, North Coast coniferous forest	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Trailing black currant <i>Ribes laxiflorum</i>	Redwood forest	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Vanilla grass <i>Hierochloe odorata</i>	Meadows and seeps	None. Incidental and less-than-significant disturbance possible in forest areas. Special protections in existing regulations for meadows and seeps. Other potential impacts mitigated through adherence to general protection measures contained in existing regulations.
White-flowered rein orchid <i>Piperia candida</i>	Coniferous and mixed evergreen forest	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.

CSC = Coastal Scrub
LAC = Lacustrine
PGS = Perennial Grassland
RIV = Riverine
WTM = Wet meadow

the eight additional incidental takes would not result in any significant impact to vegetation or plant species of concern. Timber harvest at eight additional NSO nest sites would result in short-term impacts to 1,864 acres, which represent 0.5 percent of the Action Area. This represents a worst-case scenario; the actual effect is expected to be offset, at least in part, by reduced harvest elsewhere on the ownership.

4.5.3.2 Listed Plant Species and Other Plant Species of Concern

The impacts described for beach layia, Kneeland Prairie pennycress, and western lily would be the same under the Proposed Action as those described for the No Action Alternative. Under the Proposed Action, Green Diamond would continue to minimize adverse effects on listed plants and plant species of concern, including continuing to adhere to measures contained in the CFPRs (special protections afforded to meadows and wetlands), Green Diamond's own Plant Protection Program, and other measures identified during the THP preparation and review process.

4.5.4 Alternative A

Because timber harvesting, forest management activities, and most NSO HCP conservation measures under Alternative A would be similar to those under the No Action Alternative and the Proposed Action, potential effects on vegetation and plant species of concern and their habitats within the Action Area would be similar to those described above for the No Action Alternative. The amount of habitat 46 years old or greater would continue to increase over the remainder of the permit period. Timber harvest around eight additional NSO nest sites (up to 1,864 acres) and within the three set-asides (up to 903 acres) would occur on up to 2,767 acres, which represents about 1.2 percent of current NSO habitat on the Green Diamond ownership. As discussed for the Proposed Action (see Section 4.5.3.1), this is a worst-case scenario.

Release of the three set-aside areas under Alternative A may create some potential insignificant adverse impacts to these resources in the Action Area because the areas will be available for timber harvest under this alternative. However, Green Diamond would continue to avoid or minimize potential adverse impacts to listed plants, including continuing to adhere to measures contained in the CFPRs (special protections afforded to meadows and wetlands), Green Diamond's own Plant Protection Program, and other measures identified during the THP preparation and review process. Existing regulations require that THPs include measures to avoid or minimize potential adverse impacts to listed plant species and other species of concern (if they occur) to a level of insignificance.

4.5.5 Cumulative Impacts—Vegetation/Plant Species of Concern

The assessment of potential cumulative impacts on vegetation and plant species of concern was conducted using the approach described in Section 4.1.2, Cumulative Impacts Analysis.

As noted in the previous impact discussions in this Section, growth projections indicate that under the current management regime, forest trends in the Green Diamond ownership will lead to increased age class and size, as well as increased total acreage with dense canopy closure. Changes in habitat type, size class, and canopy-cover class would be most evident in the riparian areas.

Although certain minimal habitat disturbances are anticipated to occur, no significant impacts to listed plant species or other plant species of concern are expected. Under all alternatives, including No Action, the Proposed Action, and Alternative A, Green Diamond would continue to exercise the precautions necessary to comply with the prohibitions on take of listed plants and would continue to minimize potential adverse effects on listed plants.

4.5.5.1 Impacts Associated with Other Actions

Conservation measures associated with the PALCO HCP are designed to avoid, mitigate, or reduce potential adverse impacts to plant species of concern by requiring surveys and implementing site-specific measures developed under consultation with CDFG and/or USFWS as appropriate. These measures augment existing regulatory protections for listed plant species and plant species of concern.

Continued implementation of the CFPRs on commercial timberlands and comparable measures on tribal timberlands, within the 11 HPAs where HCPs do not currently exist would result in a more varied vegetation mosaic over the landscape trending toward development of a greater number of mid- and late-seral forest types, especially in riparian areas. Continued implementation of the CFPR measures designed to protect riparian vegetation and avoid impacts to occupied marbled murrelet and bald eagle habitat would provide the conditions in which a greater number of large trees could become present, over time, in riparian areas that overlap with murrelet and bald eagle habitat in the Action Area. Vegetation management activities in riparian areas would be expected to remain relatively unchanged from existing timber-harvesting practices, and similar species compositions would be retained. On non-Green Diamond timberlands, continued implementation of measures contained in the CFPRs (special protections afforded to meadows and wetlands) and other measures identified during the THP preparation and review process would minimize potential adverse impacts to listed plants and other plant species of concern to a level of insignificance.

The NWFP is based on an ecosystem approach to conservation of natural resources and includes wide, fixed-width riparian buffers prior to a completed watershed analysis and provides a wide range of benefits to many listed and unlisted plant species and their habitats. Current benefits to vegetation resources and plant species in those HPAs where Federal agencies are the predominant land managers would be expected to continue into the future.

Resource management strategies in lands administered by the State of California and the National Park Service generally allow no commercial timber harvesting; although thinning of some timber stands may occur occasionally for stand improvement purposes. The low-level of active land management practices within park lands may result in a certain homogenization of upslope forest vegetation types over time, where the trend would be promotion of late-seral forests and associated shade-tolerant tree species.

Overall, the combined cumulative effect of these resource management programs would be a trend toward development of a greater number of mid- to late-seral forest stands within the 11-HPA assessment area, beyond currently existing levels. Impacts to plant species of concern would be less than significant.

4.5.5.2 Cumulative Impacts Associated with the Proposed Action and Alternative A

As noted in Sections 4.5.3 and 4.5.4 above, implementation of the Proposed Action or Alternative A would result in increased age class and size, as well as increased total acreage with dense canopy closure, in riparian and upland forest areas throughout the Green Diamond ownership within the 11 HPAs. In addition, Green Diamond would continue to minimize adverse effects on listed plants and plant species of concern by continuing to adhere to measures contained in the CFPRs (special protections afforded to meadows and wetlands), Green Diamond's own Plant Protection Program, and other measures identified during the THP preparation and review process. In combination with the other resource management programs described above in Section 4.5.5.1, implementation of the Proposed Action or Alternative A would result in insignificant impacts to vegetation and plant species of concern.

4.6 Northern Spotted Owls

The purpose of this Section is to evaluate the potential impacts of implementing the Proposed Action, Alternative A, and the No Action Alternative on the northern spotted owl.

4.6.1 Methodology

The assessment for northern spotted owls is based on information in the *Draft Northern Spotted Owl Habitat Conservation Plan Ten-Year Review* (Green Diamond, 2006a); data collected and documented in the Affected Environment discussion for the species (Section 3.6 of this EA); widely accepted ecological principles of natural succession; and information provided in the following three major northern spotted owl evaluations and status reviews: *Status and Trends in Demography of Northern Spotted Owls* (Anthony et al., 2004), *Scientific Evaluation of the Status of the Northern Spotted Owl* (Courtney et al., 2004), and *A Conservation Strategy for the Northern Spotted Owl* (Thomas et al., 1990). A key premise of this assessment is that nonriparian lands under all the alternatives would be managed in accordance with existing regulations, other applicable laws, Green Diamond's NSO HCP, and Green Diamond operational policies and guidelines.

The analysis of the northern spotted owl alternatives focuses on four types of effects:

- Effects related to projected habitat changes
- Effects related to the rate of northern spotted owl population change
- Effects at the local Green Diamond population level
- Effects at the northern spotted owl physiographic province level

Unavoidable overlap among the various discussions of these effects is addressed in the most appropriate location of this EA Section.

Expected habitat changes within certain riparian zones and implications for the northern spotted owl would be the same for all alternatives because the riparian conservation measures described in Chapter 2 of this EA for the No Action Alternative also apply to the Proposed Action and Alternative A. The assessment of impacts related to upland northern spotted owl habitat focuses on the effects of the projected changes in the distribution of northern spotted owl habitat age-classes among the alternatives. The assessment of impacts related to northern spotted owl demographic performance and trends on Green Diamond

lands focuses on potential effects of incidental take on λ (lambda, the rate of population change) at present and in the future. Relationships between the reported demographic performance and trends and potential northern spotted owl use of the observed and projected increasing area of suitable habitat are also addressed.

The assessment area for conducting the cumulative impact assessment for the northern spotted owl is the California Coast Physiographic Province, as described in Section 3.6.2.7.

4.6.2 No Action Alternative

Under the No Action Alternative, Green Diamond would continue to comply with measures contained in its 1992 NSO HCP and associated Implementation Agreement. The measures provide for the legal incidental take of northern spotted owls in connection with timber harvesting and management operations, including the authorized incidental take of up to 50 owl pairs. To date, 46 northern spotted owl pairs have been taken by displacement, leaving a balance of four owl pairs that can be taken under the current permit.

4.6.2.1 Effects Related to Projected Habitat Changes

Riparian Zones. Growth projections indicate that under the current management regime, forest trends on the Green Diamond ownership will lead to an increase in acreage of the 31 to 45 year and 46+ year age classes, as well as increased total acreage with dense canopy closure. Further, current rules and regulations, interacting with provisions of the NSO HCP, result in harvesting restraints or prohibitions on approximately 12 percent of Green Diamond's ownership in the Action Area. These trends and harvesting prohibitions would provide minor benefits to northern spotted owls. Managed riparian areas will provide improved movement corridors for northern spotted owls as they mature. The edge between these older riparian forests and adjacent younger forest stands may provide improved foraging conditions for spotted owls (Franklin et al., 2000). This topic is addressed below in more detail under *Potential Effects of Projected Changes in Habitat*.

Upland Areas. There was a net increase of over 55,000 acres in the 31 to 45 years and 46+ years age classes between 1992 and 2002 and additional areas of suitable habitat will develop in the future up to 2022 (see Table 3.6-2).

Another consideration is the age distribution of stands within the 46+ age class. Northern spotted owls are known to prefer the characteristics of structurally complex older forests for roosting and nesting (Thomas et al., 1990), including older, second-growth forests in northwest California (Folliard, 1993). If the current population is limited by the amount of suitable habitat, future increases in the area of suitable habitat would benefit the Green Diamond northern spotted owl population. If the current population is limited by the quality of suitable habitat, and if quality is related to stand age within older forests, the effect of future habitat changes is less clear. Information is unavailable, such as in Green Diamond (2006a), on whether stand age within the 46+ age class is currently a factor affecting the size or demographics of the northern spotted owl population. Green Diamond (2006a) stated that 18 percent of nests occurred in stands 31 to 45 yrs old, 35 percent in stands 46 to 60 yrs old, 30 percent in stands 61 to 80 yrs old, 7 percent in stands 81 to 200 yrs old, and 10 percent in stands >200 yrs old. Differences in reproductive success for northern spotted owl nesting in different age stands was not presented by Green Diamond (2006a), but the above data suggests that stand age may be an important factor in nest site selection.

In the NSO HCP, Green Diamond maintained that most stands 46+ would be used by owls in the future as they are now, but recognized that this could not be guaranteed. Green Diamond therefore proposed to monitor the ages of stands in relation to their use by spotted owls so that appropriate management changes to the conservation strategy could be made, if necessary.

Conclusions from 1992 NSO HCP EA. The 1992 NSO HCP EA (USFWS, 1992) reached several conclusions regarding the 1992 NSO HCP for Green Diamond lands. These conclusions, followed by current observations (*italicized*) regarding their validity in light of current northern spotted owl data, are presented below.

- “With respect to possible impacts of habitat loss, both the amount and long-term availability of potential habitat projected to result from forest maturation would benefit spotted owls in the plan area, including those displaced by timber harvesting.”

This conclusion is still appropriate and valid in light of projected and actual changes in suitable northern spotted owl habitat on Green Diamond lands (Table 3.6-2).

- “The set-asides and special management area, together with the other components of the proposed conservation program, are expected to fully mitigate the possible effects of ongoing timber harvesting on spotted owls.”

This conclusion may not be entirely valid today in light of the rate of northern spotted owl population change ($\lambda_{RJS} < 1.0$) on Green Diamond lands between 1993 and 2003. A detailed discussion regarding this conclusion using currently available data follows further below.

- “The mitigation and monitoring measures, together with the other components of the proposed conservation program, are expected to fully mitigate the possible effects of ongoing timber harvesting on spotted owls. No significant adverse impacts to the local, regional, or range-wide population of spotted owls would result, and the beneficial effects of the proposed conservation program would contribute to the survival and recovery of the species.”

This conclusion also may not be entirely valid today and a thorough discussion follows below.

Potential Effects of Projected Changes in Habitat. Under No Action, the NSO population on Green Diamond and nearby lands could respond to recent (since 1992) and projected increases in suitable habitat area in several ways. Projected increases in the area of suitable northern spotted owl habitat could fully or partially offset any adverse effects of ongoing timber harvest, including authorized incidental takes, or the effect could be minimal. These outcomes could be the result of timber harvest and land management, of factors unassociated with land management, or a combination of the two.

The area of suitable northern spotted owl habitat has increased since 1992 and is projected to increase by 23,321 acres between 2002 and 2012, based on a comparison of the same land base over time (Table 3.6-2). During this time, the increase occurs in the older (46+ year) forest age class, which generally is higher quality habitat. This area of new suitable habitat could potentially support additional northern spotted owl sites, or support owls displaced by timber harvest, but it is not possible to predict the actual response by owls, without knowledge of a number of factors, as discussed below.

In northwestern California, annual survival of territorial northern spotted owls was positively associated with the amounts of interior old-growth forest and with the length of edge between those forests and other vegetation types (Franklin et al., 2000). Reproductive output was negatively associated with interior forest, but positively associated with edge between mature and old-growth conifer forest and other vegetation types. Olson et al. (2004) and Dugger et al. (2005) reported a similar relationship between the amount of old-growth forest and increased survival in southern Oregon. Both Franklin et al. (2000) and Olson et al. (2004) reported that reproductive output was positively related to the amount of early successional edge habitat. Noon and Blakesley (2006) state that the findings of these three studies suggest that in southern Oregon and northwestern California a mixture of early-, mid-, and late-seral forests may be best for owl reproduction but that substantial amounts of old growth forest are needed for high survival rates. Noon and Blakesley (2006) summarized some general patterns that have emerged from these three studies and the recent demographic spotted owl meta-analyses as follows:

“Reproductive rates generally show extensive annual variation that is strongly related to climate variation. In contrast, annual survival rates show little temporal variation, but the spatial variance component is most strongly related to the amount of old growth forest within the vicinity of the nest or primary roost site.”

Besides providing more suitably-aged forest habitat for owls, the increased area of older forest under No Action may promote higher annual northern spotted owl survival rates (Franklin et al., 2000; Olson et al., 2004; and Dugger et al., 2005). However, spatial data to allow comparisons of the patch size and configuration of the old-growth and mature forest stands studied by others (Franklin et al., 2000; Olson et al., 2004; Dugger et al., 2005) with those projected to occur on Green Diamond lands are not available. In addition, it is not known whether spotted owls in coastal managed forests utilize forest structure in the same manner as spotted owls in more interior, less managed forests, as studied by the authors cited above. Therefore, while research indicates that annual survival may increase as the area of older forest stands increases, it is premature to draw a definitive conclusion regarding possible changes in northern spotted owl survival in response to Green Diamond forest management practices.

Green Diamond's management will also result in a higher degree of habitat heterogeneity, that will result from a mixture of early-, mid-, and late-seral forests and relatively large amounts of edge habitat between forest stands of different ages. Based on the studies discussed above, the increasing amount of older forest and heterogeneous stand conditions on Green Diamond's lands would be expected to be good for foraging and reproduction. As noted above, it is speculative to assume that spotted owls in coastal managed forests utilize forest structure in the same manner as spotted owls in more interior largely unmanaged forests. Studies done on Green Diamond's land indicated that dusky-footed woodrats, the primary prey of spotted owls in this area, increased rapidly in young regenerating stands (Hamm, 1995 and Hughes 2006). A similar pattern of high prey populations in younger stands has been reported for the more interior study areas of Franklin et al. (2000) and Olson et al. (2004), but the actual rate of stand and prey population development likely varies among these regions.

The studies by Franklin et al. (2000) and Olson et al. (2004) suggest that high quality NSO habitat represents a balance between older forest and large amounts of forest edge, in a diverse mosaic with small patches of younger forest with convoluted edges, dispersed within and around a main patch of mature and old-growth forest. They suggested that dispersed patches of different vegetation types and seral stages within a matrix of mature and old-growth forest may provide a stable prey resource that buffers against the effects of climate on prey populations, and hence, spotted owls. Dugger et al. (2005), on the other hand, concluded that their findings, from a more interior study area, provided more evidence for the importance of older forest habitats on both northern spotted owl reproductive success and apparent survival.

Based on the studies discussed above, the relationship between habitat heterogeneity and owl productivity depends on habitat types, habitat patch sizes, and the juxtaposition of patches of various ages. Specific data regarding these habitat attributes, and how prey species respond to them, are not available for comparisons among the areas studied by Franklin et al. (2000), Olson et al. (2004) on Green Diamond lands. Therefore, while increasing older forest and high habitat heterogeneity has the potential of improving owl productivity, and ultimately λ , it is not possible to estimate the specific effects of Green Diamond's ongoing forest management on future northern spotted owl population sizes and demographics.

Demographic Trends. Table 4.6-1 lists the estimated λ_{RJS} for 13 northern spotted owl populations in Washington, Oregon, and California. Green Diamond (2006b) summarized current information regarding regional northern spotted owl populations. They indicate that:

“Based on recent genetics studies (Haig et al., 2001 and Haig et al., 2004) and documented movements of spotted owls within and outside the Green Diamond spotted owl study area (Green Diamond, 2006), the northern spotted owls within the study area are a functional part of the northern spotted owl population within coastal California extending north throughout the Klamath Province and into southern Oregon as far north as approximately Roseburg.”

The estimates of λ_{RJS} listed in Table 4.6-1 represent 13 demographic study areas of northern spotted owls throughout Washington, Oregon, and California. While the three demographic study areas in northwest California do not necessarily represent demographic characteristics throughout the entire region, they represent the best available data for the analysis area.

The best available data indicate that northern spotted owls are well distributed throughout most of northwestern California (see Figure 4.6-1), clearly indicating that Green Diamond owls are not an isolated population. Also, there is the potential for extensive movement of spotted owls throughout the region, particularly during the dispersal of juvenile owls. Green Diamond (2005) reported dispersal distances ranged from 0.5 to 93 miles, with a mean of 7.7 miles for 138 juvenile males. One hundred twenty-seven juvenile females dispersed an average of 10.3 miles, with a range of 0.8 to 87.4 miles. Diller (Green Diamond Resource Company, pers. comm., April 18, 2006) indicated that both juvenile immigration and emigration are occurring between Green Diamond and surrounding lands, and these movements are generally reciprocal.

The dispersal of owls into Green Diamond lands from adjacent habitat could provide demographic support for Green Diamond owl numbers, particularly if immigrants reproduce successfully. Data on the net effect of immigration/emigration are not available, but have a sustained effect on Green Diamond owls, immigration would require growing populations regionally. Currently, this is not the case, as λ is below 1.0 for the three demographic study areas in the region—Hoopa, Northwest California, and Green Diamond.

TABLE 4.6-1

Estimated Rate of Population Change for Northern Spotted Owls (λ_{RJS}), with Standard Error and 95% Confidence Interval (after Anthony et al. 2004, Table 22, and summary by Courtney et al. 2004)

Study Area	(λ_{RJS})	SE	95% CI	
			Lower	Upper
Washington				
Wenatchee	0.917	0.018	0.882	0.952
Cle Elum	0.938	0.019	0.901	0.976
Rainier	0.896	0.055	0.788	1.003
Olympic	0.956	0.032	0.893	1.018
Oregon				
Coast Ranges	0.968	0.018	0.932	1.004
H. J. Andrews	0.978	0.014	0.950	1.005
Warm Springs	0.908	0.022	0.866	0.951
Tyee	1.005	0.019	0.967	1.043
Klamath	0.997	0.034	0.930	1.063
South Cascades	0.974	0.035	0.906	1.042
California				
NW California	0.985	0.013	0.959	1.011
Hoopa	0.980	0.019	0.943	1.017
Green Diamond	0.970	0.012	0.947	0.993

Source: Table 4.3 from Green Diamond (2006a).

4.6.2.2 Effects Related to the Rate of Northern Spotted Owl Population Change

As described in Section 3.6, data from Green Diamond lands indicate that the population of northern spotted owls was apparently stable or increasing until the late 1990s, when the population appeared to begin a slight downward trend. For the period from 1993 through 2003, the estimated rate of northern spotted owl population change (λ_{RJS}) on Green Diamond land was 0.970 (SE = 0.012), slightly lower, but not statistically different from the two nearby study areas (Table 4.6-1). The 95 percent confidence interval for λ_{RJS} did not include 1.0 for Green Diamond lands, indicating that this rate of change was statistically below that of a stable population and providing evidence that the population was declining from 1993 to 2003 (Green Diamond, 2006a).

Conditions Affecting Rate of Population Change. The slight downward trend in λ_{RJS} for the northern spotted owl population on Green Diamond lands between 1993 and 2003 occurred during a period when the following conditions were in place:

- Area of suitable-aged forest was projected to increase between 1990 and 2003 (Table 3.6-1)
- Area of suitable-aged forest actually increased by over 55,000 acres between 1992 and 2002 (Table 3.6-2)
- Number of incidental takes (displacements) was below the number projected and authorized during the first 16 years of the HCP

Green Diamond (2006a) discussed the direct and indirect factors that determine or may influence, respectively, the rate of population change as follows:

“The direct demographic factors that determine rate of population change (λ) are survival, fecundity and adult emigration rates. We have no data on adult emigration, but there are no known reasons to hypothesize that this may have changed during the period of study. Since survival appeared constant, this suggests that a change in fecundity was responsible for the downward trend on λ starting in the late 1990s. In the early years of the study, fecundity showed an even-odd year effect with poor years of fecundity in the odd years being offset by higher fecundity in the even years. However, starting in 1998, this pattern changed and there were three years in a row with poor nesting success. Franklin et al. (2000) demonstrated that weather, specifically cold wet spring weather, had a strong negative influence on fecundity. Although we lack site-specific weather data, weather records from Eureka, California indicated that the years 1998-2000 had average amounts of late winter and spring rainfall. Depending on the timing of spring storms (e.g., extended rainfall during the initiation of incubation), it is still possible that weather was the driving factor in the poor reproduction during this period. It was also possible that there was a region-wide decline in key prey species, but all these explanations remain highly speculative.”

Other factors that could indirectly affect survival or fecundity may include interaction and competition with barred owls, potential adverse effects of displacements authorized under the ITP, or, as yet, other unidentified factors.

The cause(s) of Northern Spotted Owl population declines from 1990 to 2003 are poorly understood (USFWS, 2005). Hypothesized reasons for decline include displacement of spotted owls by barred owls, loss of habitat to wildfire, loss of habitat to logging on State, private, and tribal lands, forest defoliation due to insects, and advancing forest succession toward climax fir communities in the absence of fire (Anthony et al., 2004). Meta-analyses of Northern Spotted Owl demographic rates have not included habitat, weather, or prey covariates.

Possible Effects of Barred Owls on Northern Spotted Owl Population. Evidence for potential competition between barred owls and northern spotted owls is based on anecdotal information on encounters between the two species. Barred owls react more aggressively towards northern spotted owls than the reverse. With respect to competitive dynamics between the two species, although uncertainties exist with the available data, the preponderance of the evidence gathered thus far is consistent with the hypothesis that barred owls are playing some role in northern spotted owl population decline, particularly in Washington and portions of Oregon and the northern coast of California (USFWS, 2004).

The most recent summary of effects of the barred owl range expansion on spotted owls is provided by Noon and Blakesley (2006). They indicate that the mechanisms of competition may be through aggressive displacement of spotted owls by barred owls or competition for similar prey species. There was apparently little evidence for an effect of barred owls on spotted owl fecundity from 1990 to 2003, but some indication of an adverse effect on spotted owl survival in three Washington study areas (Anthony et al. 2004). Noon and Blakesley (2006) also state that because barred owls are habitat generalists, it was generally believed that spotted owls would find refuge in late-successional forests within late-successional reserves (LSRs). However, barred owls in parts of Washington reached their highest densities within LSRs not subject to timber harvest (Pearson and Livezey, 2003).

Occupancy of former spotted owl territories by barred owls has occurred on many types of land ownership including national parks, national forests and BLM lands, tribal land, State land, and timber company land (Courtney et al., 2004), including areas with timber harvest and areas not available for harvest. Anthony et al. (2004) reported few meaningful relationships between barred owl occurrence and fecundity and survival of spotted owls based on the few studies conducted to date. However, Olson et al. (2005) showed that barred owls had a negative influence on occupancy rates of spotted owls and productivity. Kelly et al. (2003) also found a significant effect on northern spotted owl site occupancy when barred owls sites were within 0.8 km. Schmidt (2005) suggested that barred owl presence within northern spotted owl territories negatively affected northern spotted owl occupancy (or survey detectability) on historical northern spotted owl sites within Redwood National and State Parks. In those parks, the number of historic and current spotted owl activity centers in which barred owls were detected has risen gradually between 1993 and 2004, concurrent with a decline in the number of spotted owls in the activity centers (Schmidt, 2005). Green Diamond (2005) reported an increase in barred owl sites in recent years, which corresponds to a period when spotted owls sites have decreased.

It should be noted that if barred owls are influencing occupancy rates by displaced spotted owls, there would be little potential impact on estimates of spotted owl fecundity, due to the way fecundity is measured (see below, Possible Effects of Timber Harvest on Northern Spotted Owl Population). This could explain the conclusion by Iverson (2004) that northern spotted owl reproductive success was independent of barred owl presence or absence. Displacement of northern spotted owls from nest sites or established territories may not influence estimates of spotted owl fecundity, but would reduce overall productivity of the spotted owl population by reducing the number of nesting attempts or the number of young fledged. Either of these outcomes would reduce recruitment into the breeding population and ultimately the overall population size in the areas where the displacements are occurring.

Competition for Habitat. Barred owls use a variety of habitats in both actively managed and undisturbed conditions (Hamer, 1988; Dunbar et al., 1991). Thus, in areas where timber harvesting has modified northern spotted owl habitat, barred owls may have a competitive advantage over northern spotted owls (Dark et al., 1998), which prefer structurally complex older forests for nesting and roosting (Barrows, 1981; Forsman et al., 1984). Barred owls may displace northern spotted owls in territorial interactions (Hamer, 1988; Dark et al., 1998). Further investigation may be warranted to determine implications on conservation of the northern spotted owl.

Green Diamond Land. Barred owl detections have been recorded while doing spotted owl surveys on Green Diamond lands since spotted owl surveys were first initiated in 1989. In recent years, some effort has been made to determine if barred owl detections represented barred owl nest sites or activity centers. However, assessment of barred owl sites on Green Diamond land has remained somewhat subjective since most barred owl detections have not been followed up with daytime site visits. Given these qualifications, the number of barred owl “sites” on Green Diamond lands remained low from 1993 to 1999, but began to increase in 2000 (Table 4.6-2). The increase between 1999 and 2000 coincided with an apparently stable or increasing northern spotted owl population until the late 1990s when the population appeared to begin a downward trend. Green Diamond (2006a) does not have data to evaluate whether a cause-and-effect relationship exists between the apparent increase in the number of barred owl sites and the decrease in northern spotted owls beginning in the late 1990s.

TABLE 4.6-2
Number of Barred Owl (BO) “Sites” on Green Diamond Lands by Year

Year	1993	1994	1995	1996	1998	1999	2000	2001	2002	2003	2004	2005
Number of BO sites	1	2	3	1	1	2	7	6	7	14	12	9

Source: Green Diamond (2006a), Figure 3.14.

Courtney et al. (2004) indicated that many of the field researchers participating in the meta-analysis believed that barred owls had a greater effect on spotted owl site occupancy than indicated by the analysis (Anthony et al., 2004; Kelly et al., 2003). Until further research is conducted, possible effects of barred owls on northern spotted owls also remains speculative.

Potential Effects of Timber Harvest on Northern Spotted Owl Population. Fecundity is estimated using the number of known adult females in the breeding population. If some action causes an adult female to leave the study area, to become undetected by surveys, or to die, that individual no longer contributes to the fecundity estimate for the Green Diamond population, although the action may in fact affect the fecundity of that individual. Thus, a displacement would affect the estimated owl fecundity statistic for Green Diamond lands only if the female survives, remains on, and is detected on the study area. Although fecundity estimates are female-based, male owls contribute significantly to the reproductive effort of a pair (Gutiérrez et al., 1995), and, thus displacement of a male may also affect fecundity.

Green Diamond timber harvest activities have resulted in 46 net displacements since implementation of the HCP, and 4 additional displacements are authorized under the current ITP. The survival and fecundity of northern spotted owl pairs displaced by timber

harvest activities under the current ITP were not presented by Green Diamond (2006a). Green Diamond has limited data regarding the fate of owls displaced by timber harvest under the existing ITP. Some northern spotted owls directly or indirectly displaced by timber harvest have been documented to move to adjacent suitable habitat and continue normal owl behaviors including successful nesting (Green Diamond, 2006b). However, other owls were never observed after being displaced, and these displaced owls had no effect on estimates of fecundity, but their survival was assumed to be “0”, and thus negatively affected population growth (λ) estimates, as would displaced owls that experienced lower fecundity after displacement.

The actual No Action scenario, including ongoing and future effects of Green Diamond land management (under implementation of the existing NSO HCP), likely lies somewhere between the two extremes of complete loss of displaced owls, and no effect on displaced owls. Some displaced females would probably nest successfully and others would not, and displacement would likely have some negative influence on survival of pair members, and hence on λ for the population of spotted owls on Green Diamond’s land.

The increasing area of suitable habitat over the ITP period might offset any reduction in the survival and recruitment rates of owls impacted by displacements, if it results in an overall increase in survival and fecundity for the owls not impacted by the timber harvest.

4.6.2.3 Effects at the Green Diamond Population and Province Levels

Neither the significance of λ less than 1.0 nor definitive conclusions regarding long-term northern spotted owl population viability at the local, regional, or range-wide population levels were addressed by expert teams of northern spotted owl biologists in any of the recent analyses: Status and Trends in Demography of Northern Spotted Owls, 1985-2003 (Anthony et al., 2004), Scientific Evaluation of the Status of the Northern Spotted Owl (Courtney et al. 2004), USFWS’ 5-Year Review for the species (USFWS, 2004), or Green Diamond (2006a). All these papers report the observed λ for the 13 study sites included in the demographic meta-analysis (Table 4.6-1). Our 5-year review found that populations of northern spotted owls continue to decline across the range of the species, with the most severe declines occurring in the northern portion of the range (Washington and British Columbia), while populations in the southern portion of the range are either slightly declining, stable, or slightly increasing (USFWS 2004).

An analysis of λ , by definition, only allows one to draw conclusions about what happened in the past. The conclusion that λ was less than 1.0 for most demographic study areas throughout the range of the northern spotted owls does not provide any direct predictions concerning long-term northern spotted owl population viability at local, regional, or range-wide scales. However, if the current negative rate of population change ($\lambda_{RJS} = 0.97$) continues, the northern spotted owl population occupying Green Diamond lands would decline slowly over time. For example, a constant population change at a rate of 0.97 (this equals a 3 percent annual decline) over a 15-year period would result in a total population decline of about 37 percent over that period. Assuming the factors that contributed to the recent negative rate of population change on Green Diamond lands continue to exert the same effect on λ , any further reduction in fecundity or survival because of the four remaining displacements authorized under the existing ITP would exert further downward pressure on populations.

To provide context regarding the scale of potential population level effects, the five remaining displacements authorized under the No Action Alternative represent 2.5 percent of the 203 northern spotted owl activity centers located on or adjacent to Green Diamond lands. Based on the continued recruitment of new owl habitat, there will continue to be a substantial area of unoccupied and suitable northern spotted owl habitat available within the Green Diamond ownership for displaced owls to occupy (Table 3.6-2).

At a broader scale, the 2006 California Department of Fish and Game's database indicates that roughly 1,390 northern spotted owl activity centers occur in the California Coast Physiographic Province (Gould, 2006). While this number has limitations (see Section 3.6.2.7), it represents the best available data at the province level. Based on this estimate, the four remaining displacements represent about 0.57 percent of the northern spotted owl activity centers within the province.

In summary, it is consistent with the authorized incidental take of NSO under Green Diamond's current NSO HCP that the population would experience at least temporary effects associated with displacement of owls from established nesting sites. Given the long-term trend of increasing suitable habitat, the net result of the interaction of displacement effects and habitat increases is unknown. In general, the individual and combined effects of the different factors potentially affecting northern spotted owl populations remains speculative based on the current science. Site-specific evidence exists for negative effects on fecundity from weather and site occupancy from apparent competition with barred owls, but the causal factors for the range-wide decline in the spotted owl population is not known. Declines in the past 13 years on Green Diamond lands coincided with a number of authorized NSO incidental "takes" under their NSO HCP. Regardless of the mechanism(s) for the decline, that trend does not appear to be specific to Green Diamond's management, since demographic parameters of the local owl population is similar, or only very slightly lower than, other owl populations studied within the region. Future demographic analyses incorporating additional data on habitat, weather, and barred owl covariates may lend insight to factors and interactions influencing spotted owl populations.

4.6.3 Proposed Action

Under the Proposed Action, USFWS would approve an amendment to the original NSO HCP ITP. Under this alternative, Green Diamond would: (1) reinstate until 2012 Green Diamond's monitoring and management obligations for the approximately 20,310 acres of the original special management area still owned by Green Diamond, (2) initiate new research on the habitat overlap and interaction between the barred owl and northern spotted owl; (3) in plan-year twenty (2012), review the efficacy of the conservation measures and the status of habitat overlap and interaction between the northern spotted owl and barred owl; and (4) authorize the incidental take of up to eight additional northern spotted owl pairs.

The Proposed Action, issuance of an amended ITP, would allow timber harvest to occur around up to eight NSO sites, where ESA take prohibitions would otherwise prevent or limit harvest. The NSO HCP defines take to occur based on forest characteristics within a 502-acre (1-mile diameter) circle centered on a nest site or activity center. Specifically, take is defined to occur if harvest causes either of the following: (1) the area of stands aged 31 years or older, within the 502-acre area, is reduced below 233 acres; or (2) the area of stands aged 46 years or older, within the 502-acre area, is reduced below 89 acres. In addition, take is

defined if harvest occurs within 500 feet of a nest site or activity center, regardless of the amount of habitat present within the larger circle. If the Proposed Action allowed harvest within the entire area of eight 502-acre circles, the area affected would be a maximum of about 1,864 acres (0.5 percent of the Action Area) of forest of 31 years or older, including about 712 acres (0.2 percent of the Action Area) of forest of 46 years or older.

The ability to harvest around eight NSO sites has the potential to increase timber harvest compared to No Action, and for this to result in increased effects. However, we expect the change in total area harvested, and thus of potential effects, to be limited by: (1) the small area of potential effects in the context of the entire Green Diamond ownership within the Action Area, and (2) constraints on Green Diamond harvest planning and operations, that include timber volume targets, maximum clearcut size of 20 acres, and adjacency restrictions that limit Green Diamond's rate of harvest and the effects on the entire acreage within a given owl circle.

The area affected consists of those acres where the Proposed Action would allow timber harvest over the ITP term, which represents a maximum of 0.5 percent of the Action Area. This represents a small area, relative to the ownership, and effects would be spread out over a period of about three years, based on the past rate of NSO "takes" under Green Diamond's current ITP. Second, Green Diamond's timber harvest is governed in part by a Maximum Sustainable Production (MSP) Plan under "Option A" of the CFPRs (see Section 1.5.3.1), that specifies timber yield (volumes) for the ownership. Although the proposed ITP would provide increased operational flexibility regarding where harvest occurs, the total area harvested is expected to be similar under all the alternatives, as Green Diamond would plan harvest to achieve MSP timber volume goals consistent with the CFPRs and its Option A plan. As a consequence, the total area subject to harvest could be greater under No Action, should restrictions around the eight NSO sites direct harvest toward younger stands not occupied by owls, and where yield per acre would be less than in the older forest typical around NSO nest sites.

Although harvest patterns are too uncertain to predict an actual decrease in forest area affected by harvest under the Proposed Action, the effect on size of the area subject to timber harvest is expected to be less than significant compared to No Action, and similarly to have an insignificant effect on those resources (e.g., water quality) for which adverse impacts could increase with a larger area of harvest.

4.6.3.1 Effects Related to Projected Habitat Changes

Riparian Zones. Potential benefits to northern spotted owls from additional older aged stands suitable for northern spotted owl occupancy within riparian zones would be similar to those described for the No Action Alternative.

Upland Areas. The set-asides, special management area, conservation and monitoring measures, and projected acres in each of the age-classes shown in Table 3.6-2 would also not change under the Proposed Action when compared to the No Action Alternative.

Green Diamond (2006b) analyzed the effects of the Proposed Action relative to the changes in forest age-classes over time, projecting increases in forest in the 46+ year age class (Tables 3.6-1 and 3.6-2). This analysis is summarized in *Proposed Amendments to the Habitat*

Conservation Plan for the Northern Spotted Owl on the California Timberlands of Green Diamond Resource Company (Green Diamond, 2006b), parts of which are included below.

One approach to assessing the impact of the increased level of incidental take on the northern spotted owl population proposed by Green Diamond (2006b) is to consider it in terms of available habitat for the maintenance of northern spotted owl territories or sites. As noted above, some northern spotted owls displaced by timber harvest have been documented to move to adjacent suitable habitat and continue normal owl behaviors including successful nesting.

Green Diamond (2006b) states:

“‘Conservation’ commitments and regulatory obligations governing Green Diamond timber harvests tend to accelerate regrowth of suitable Northern Spotted Owl habitat (e.g., habitat retention within harvest units and large robust riparian reserves) in most areas within Green Diamond ownership causing Northern Spotted Owl (displacement) sites to become suitable for re-occupation within 20 to 30 years following a displacement. In addition take will only result in a localized loss of owl sites. Across the (Green Diamond) ownership, harvested habitat will be replaced through maturing of younger timber stands with no net loss of habitat in the age classes currently used for nesting or roosting by Northern Spotted Owls. Therefore, the projected habitat change and availability of suitable habitat will not be affected by the 8 additional Northern Spotted Owl displacements.”

This conclusion regarding no significant effects of additional displacements on projected habitat change is appropriate, assuming that the replacement habitat is comparable in quality to that lost due to harvest. However, potential indirect effects related to the potential for northern spotted owls to disperse into and use these new suitable habitats in the future are discussed below.

Whether or not future increases in the area of suitable northern spotted owl habitat would mitigate some or all of the potential adverse effects of additional displacements on fecundity, survival and ultimately λ depends on the same factors discussed for the No Action Alternative. These relate to whether or not the additional suitable habitat results in an overall increase in fecundity and survival of the remaining spotted owl population on Green Diamond’s land such that it offsets potential negative effects due to the eight additional displacements.

Similarly, the potential benefits of future increases in suitable northern spotted owl habitat on Green Diamond lands would be the same as described for the No Action Alternative. Potential effects related to habitat attributes that would result from Green Diamond management actions would also be the same as described for the No Action alternative. Additional suitable habitat will be a potential positive result of Green Diamond’s management, but would only benefit the local northern spotted owl population if the population is being limited by the amount or quality of suitable roosting and nesting habitat. It is not known what has limited λ on Green Diamond lands in the past. However, given that fecundity is the only demographic parameter that has declined on Green Diamond lands in recent years (Anthony et al. *In press*) and habitat quantity has been relatively constant to

increasing over this period (Green Diamond 2006a), it is most likely related to either weather or prey populations, or, possibly, some subtle habitat quality changes not discernable from the available data. However, this is speculative and there is no way to predict whether or not population level benefits will result from the addition of suitable habitat.

4.6.3.2 Effects Related to the Rate of Northern Spotted Owl Population Change

As described in Section 4.6.2 for the No Action Alternative, there was a slight downward trend in the estimated λ for the Green Diamond northern spotted owl population between 1993 and 2003 in spite of an increase in the area of suitable nesting and roosting habitat for northern spotted owls between 1992 and 2002 (Table 3.6-2).

This occurred during a period when the rate of incidental takes (displacements) was below that projected and authorized in the 1992 NSO HCP and ITP. Green Diamond has only limited data regarding the fate of a portion of northern spotted owls that have been displaced by past timber harvest activities, and the effect of displacement on survival, fecundity and ultimately λ of the population under the current ITP is not known. The Proposed Action would result in eight displacements in addition to those allowed under the current ITP.

As described for the No Action Alternative, displacement through timber harvest has the potential to have a negative impact on fecundity (or population recruitment) and survival rates for the Green Diamond northern spotted owl population compared to an undisturbed population. There are several potential biological mechanisms for the impacts including inability to locate a new nest site, reduced survival or fecundity due to changes in the home range, and disruption of adjacent pairs of owls due to adjustments in the home range of the displaced owls. The actual effect lies between all displaced owls moving to a new location with no change in survival or reproduction of displaced or neighboring owls and the other extreme of all displaced owls dying without reproducing again and disrupting the normal behaviors of their neighboring owls. The actual effect of eight additional northern spotted owl displacements on λ likely lies somewhere between these two extremes; some displaced pairs would probably nest successfully with little effect on their survival and fecundity and that of their neighboring owls and others would not. However, any reduction in survival or fecundity of the overall northern spotted owl population on Green Diamond lands would contribute to lower λ .

Because it is not known what factors are responsible for the current downward trend in λ , there is no way to predict the impact that additional displacements would have on the long-term trends for the northern spotted owl population occupying Green Diamond lands. For example, in a demographic study area centered on national forest lands inland from Green Diamond, and where recent timber harvest is much less than on Green Diamond lands, λ appears to be declining (Anthony et al., *In press*), suggesting that factors other than timber harvest may be affecting spotted owl trends in the region.

4.6.3.3 Effects at the Green Diamond Population and Province Levels

As described for the No Action Alternative, definitive conclusions cannot be drawn regarding long-term northern spotted owl population viability at the local, physiographic province, or range-wide levels (Anthony et al., 2004; Courtney et al., 2004; USFWS, 2004; Green Diamond 2006a). As noted above, an analysis of λ , by definition, only allows one to

draw conclusions about what happened in the past. The conclusion that λ_{RJS} was < 1.0 for most demographic study areas throughout the range of the northern spotted owls does not provide any direct evidence concerning long-term northern spotted owl population viability at local, regional, or range-wide scales. Similar to the No Action Alternative, if the current negative rate of population change ($\lambda_{RJS} = 0.970$) continues, the northern spotted owl population occupying Green Diamond lands would decline slowly over time. Assuming all the factors remain constant that contributed to a λ of less than 1 in recent years on Green Diamond lands, any further reduction in fecundity or survival because of the eight additional displacements that would be authorized under the Proposed Action would incrementally exert further downward pressure on λ and have negative long-term implications for the northern spotted owl population on Green Diamond lands.

To provide perspective regarding potential population level effects, the eight additional incidental takes that would be permitted under the Proposed Action represent 2.5 percent of the 203 northern spotted owl activity centers located on or adjacent to Green Diamond lands in 2005. Based on current and projected amounts of forest habitat, there is and will continue to be a substantial area of unoccupied and suitable northern spotted owl habitat available within the Green Diamond ownership for displaced owls to occupy (Table 3.6-2).

As indicated above for the No Action Alternative, the eight additional incidental takes represent about 0.6 percent of the rough estimate of 1,390 northern spotted owl activity centers within the California Coast Physiographic Province.

4.6.4 Alternative A

Under this alternative, USFWS would amend the NSO HCP ITP to authorize the additional displacement of eight owl pair sites. The permitted total would be the original 50 pairs plus eight additional displacements for a total of 58. No direct injuring or killing of owls would be allowed. In addition to the harvest of suitable habitat around 8 additional NSO nest sites, three set-aside areas would be released for harvest entry. The three set-aside areas are Wiregrass, Fawn Prairie, and Bear Creek. The Wiregrass and Fawn Prairie set-asides are located in Green Diamond's Korb operating area and the Bear Creek set-aside is located in the Klamath operating area. The acreage of each set-aside is as follows: Wiregrass, 229.3; Fawn Prairie, 242.4; Bear Creek, 431.6. The total area of the three set-asides is 903.3 acres, which would leave 12,339.2 acres of the original 13,242.5 set-aside acres remaining in no harvest set-asides, or a 6.8 percent reduction in set-aside area and no loss of owl sites. Release of the Bear Creek set-aside would reduce the Klamath set-aside area by 14.8 percent and release of the two Korb set-asides would reduce the area by 4.6 percent. The amount of habitat 46+ years old continues to increase over the remainder of the permit period. Conservation and mitigation measures continue to include habitat management, nest site protection, research, set-asides, reinstatement of the special management area, plan review, and training programs.

4.6.4.1 Effects Related to Projected Habitat Changes

Riparian Zones. Minor benefits to northern spotted owls from additional older aged stands suitable for northern spotted owl occupancy within riparian zones because of implementation of the AHCP/CCAA would be similar to those described for the No Action Alternative.

Upland Areas. The set-aside areas were viewed as suitable for owl occupancy at the time they were established as set-asides. Except for the removal of the three set-asides the projected change in the future area of suitable northern spotted owl habitat would be similar to those under the Proposed Action. Compared to the actual net gain in suitable habitat area since 1990 and the projected gains between the current time and 2021 (Table 3.6-1), the removal of 903.3 acres represents 0.24 percent of the current and projected future area of suitable northern spotted owl habitat that will be present. The potential for the new suitable habitat to mitigate the additional incidental takes or to benefit the Green Diamond northern spotted owl population would be similar to those described for the Proposed Action because the affected acreages are similar in the context of the overall Green Diamond ownership. Timber harvest around eight additional NSO nest sites and within the three set-asides would occur over 2,767 acres, which represent about 1.2 percent of available NSO habitat on the Green Diamond ownership.

4.6.4.2 Effects Related to the Rate of Northern Spotted Owl Population Change

Alternative A would include the same additional incidental takes as the Proposed Action and the impacts related to the northern spotted owl rate of population change would be the same as those described for the Proposed Action.

4.6.4.3 Effects at the Green Diamond Population and Province Levels

Northern spotted owl population level effects at the local level would be virtually the same as those described for the Proposed Action.

4.6.5 Cumulative Impacts

4.6.5.1 Current Regional Conditions Relative to Potential Cumulative Effects

Industrial and nonindustrial private ownership dominate the California Coast Physiographic Province (USFWS, 1992), with Federal lands found in scattered small blocks of Bureau of Land Management and larger blocks of National Park Service lands (USFWS, 2003). Table 4.1-1 indicates that Green Diamond ownership ranges from 12.6 to 89.8 percent of the acreage of the 11 watershed units, with many exceeding 50 percent ownership by Green Diamond. State lands are limited to parks and a State forest. The continued presence of owls in the province depends on State and private lands; Federal lands alone are insufficient to maintain owls throughout the province (USFWS, 1992).

The draft recovery plan for the northern spotted owl (USFWS, 1992c) identified significant threats and their severity to the northern spotted owl in the province, summarized below. At the province level, these threats continued to persist (USFWS, 2003).

- Low populations – low threat
- Overall population decline – moderate threat
- Limited habitat – moderate threat
- Declining habitat – moderate threat
- Distribution of habitat or populations – moderate threat
- Isolation of provinces – severe threat
- Predation and competition – increasing threat
- Vulnerability to natural disturbance – low threat

Several options are available for management of owl population centers and dispersal opportunities. The primary purpose of these management options with respect to conservation needs of the northern spotted owl within the province is to provide demographic support by maintaining population centers (clusters of owls) throughout the province, and to maintain habitat connectivity between and among population centers within the province and with Federal Northwest Forest Plan (NWFP) lands in neighboring provinces. In general, the USFWS approach in the California Coastal Physiographic Province is to address conservation of the northern spotted owl through the development of HCPs and to manage individual owl sites on a case-by-case basis.

There are about 2.5 million acres of suitable northern spotted owl habitat within the California Coastal Physiographic Province. This estimate does not account for loss of suitable habitat on non-Federal lands since the last update in 1999 by the U.S. Forest Service's Remote Sensing Lab. Twenty-one small, scattered Northern Spotted Owl Critical Habitat Units occur in the province, all located on Federal lands. No tribal, State or private lands were designated as Critical Habitat.

The status of NSO in the California Physiographic Province is described in Section 3.6.2.7 and elsewhere, and demographic trends from available studies are described in Section 4.6.2. Green Diamond (2006a) data suggest that apparent survival rates for adult male and female northern spotted owl on their lands remained constant from 1990 to 2001, while fecundity declined.

4.6.5.2 Cumulative Effects of the Proposed Action

Cumulative effects on the northern spotted owl with respect to this analysis would be related to cumulative loss of habitat and potential incidental take of owl sites that could threaten northern spotted owl populations in the California Coastal Province. Each of the other actions included for consideration under this cumulative effects analysis (see Section 4.1.2.3) is intended to be consistent with the USFWS-identified California Coastal Province management options regarding conservation needs of the northern spotted owl within the province (USFWS, 2003). The USFWS goals, as stated in the draft recovery plan (USFWS, 1992c, 2003).

Habitat Loss. In the 1990 listing rule for the northern spotted owl, the USFWS identified historic loss of habitat and continuing loss of habitat to timber harvest among habitat-related threats (55 FR 26114). The USFWS' 5-Year Review found that the magnitude and intensity of the threat of habitat loss and modification has diminished considerably since 1990, at least on federally-managed lands (USFWS 2004). As described for the Proposed Action, Green Diamond's management policies on its lands have resulted in a substantial increase in the area of suitable northern spotted owl habitat and these increases are projected to continue into the future until at least 2022 (Table 3.6-2). In combination with the other actions listed in Section 4.1.2.3, a modified Green Diamond NSO HCP that continues to increase the amount of suitable northern spotted owl habitat would not be expected to contribute to significant cumulative adverse effects on this subspecies.

Take of Northern Spotted Owls. Under the other non-Federal and Federal activities potentially affecting the northern spotted owl in the province, as described in Section 4.1.2.3, no take of northern spotted owl is allowed except when permitted by USFWS under an ITP or recovery

permit. The amended Green Diamond HCP would not be expected to contribute to significant cumulative effects on this subspecies, as described above in Section 4.6.3. Potential cumulative benefits within the province may result from the increasing area of suitable habitat on Green Diamond lands if northern spotted owl populations use these areas in the future.

Population Trends. Predation and competition were identified as generally increasing threats to the northern spotted owl population within the province (USFWS, 1992, 2004). Barred owls may pose a significant threat to northern spotted owls due to competition for both nest sites and prey items using a variety of habitats in both actively managed and undisturbed conditions (Hamer, 1988; Dunbar et al., 1991; Courtney et al. 2004). The manner in which habitat management affects interactions between barred and spotted owls is largely unknown, although a recent review (Courtney et al. 2004) speculated that the apparent slower rate of barred owl invasion in some redwood areas might be explained by spotted owls using denser second-growth forests more widely, or lack of preference for these areas by barred owls. One hypothesis considered by Courtney et al. (2004) is that timber harvest may increase competition between the species, by favoring barred owls over spotted owls, which prefer structurally complex older forests for nesting and roosting (Barrows, 1981, Forsman et al., 1984). Also, initial reports suggested that barred owls are more associated with younger forest types, but more recent reports have found barred owls often in mature and old-growth forests (Courtney et al., 2004). The 46+ year-old forest stands that are projected to increase in area on Green Diamond lands (Table 3.6-2) are expected to include these more structurally complex stand characteristics and may favor northern spotted owls over barred owls. However, further research regarding competition and niche overlap between these species is required (and will be conducted under the Proposed Action) before definitive conclusions can be drawn. Other older HCPs, CCAAs, and management plans within the province and coordinated by USFWS and State agencies may not have addressed the issue of competition between barred owls and northern spotted owl. This type of analysis will be required before a thorough cumulative impact assessment of forest management practices on the dynamics of barred owl and northern spotted owl competition can be prepared.

Overall population decline was identified as a moderate-level threat to northern spotted owl population within the province (USFWS, 1992). The recent meta-analysis of 13 northern spotted owl populations conducted by Anthony et al. (2004) supports this evaluation, having found that the estimated rate of population change (λ_{RJS}) ranged from 0.896 to 1.005 and was less than 1.0 on 12 of 13 study areas across the range of the northern spotted owl. λ_{RJS} was less than 1.0 at the three areas within the California Coast Province included in the meta-analysis including the Northwest California, Hoopa, and Green Diamond sites (Table 4.6-1). Hypothesized reasons for the decline include displacement of spotted owls by barred owls, loss of habitat to wildfire, loss of habitat to logging on State, private, and tribal lands, forest defoliation due to insects, and advancing forest succession toward climax fir communities in the absence of fire (Anthony et al., 2004). None have been specifically identified as being responsible for the population decline.

Many areas that support nesting northern spotted owl within the province, including most of the other actions considered in this cumulative assessment (see Section 4.1.2.3), were not included in the meta-analysis. Therefore, it is not possible to draw definitive conclusions regarding the northern spotted owl population trend across the entire province. However, a

continuation of the observed downward trend in these three areas would have negative implications for the province-wide northern spotted owl population.

With respect to other non-Federal and Federal activities potentially affecting northern spotted owl populations within the province, including all of the other actions described in Section 4.1.2.3, no take of owl sites is allowed except as authorized by USFWS (e.g., under an incidental take permit with HCP or incidental take statement in a Section 7 biological opinion).

Finally, to provide some perspective regarding the magnitude of potential population level effects, the eight additional displacements that would be authorized under the Proposed Action represent 2.5 percent of the 203 northern spotted owl activity centers located on or adjacent to Green Diamond lands in 2005. The five permitted incidental takes of owl sites allowed by the existing ITP under the No Action Alternative would also be allowed under the Proposed Action for a total of 13 more incidental take of owl sites over the term of this amendment. These 13 incidental takes represent 6.4 percent of the 203 northern spotted owl activity centers located on or adjacent to Green Diamond lands. There is and will continue to be a substantial area of unoccupied and suitable northern spotted owl habitat available within the Green Diamond ownership for displaced owls to occupy (Table 3.6-2). At a larger geographic scale, the eight additional incidental takes represent about 0.6 percent of the rough estimate of 1,390 northern spotted owl activity centers within the California Coast Physiographic Province.

4.6.5.3 Cumulative Effects of Alternative A

The cumulative effects of Alternative A would be similar to those described for the Proposed Action because the differences between these alternatives are so small. About 903 fewer acres of suitable habitat would be available for owls in the future under this alternative compared to the Proposed Action. The three set-asides represent about 0.24 percent of the total NSO habitat available on the Green Diamond ownership.

4.7 Terrestrial Habitat/Wildlife Species of Concern

The purpose of this Section is to evaluate the potential impacts of implementing the Proposed Action, Alternative A, and the No Action Alternative as they relate to terrestrial habitat and wildlife species of concern.

4.7.1 Methodology

The assessment for terrestrial habitat and wildlife species of concern relies on information collected and documented in Section 3.7 (Terrestrial Habitat/Wildlife Species of Concern) and Section 4.5 (Vegetation/Plant Species of Concern). The assessment also relies on widely accepted associations between habitat type and wildlife use. As discussed below and in the affected environment discussion in Sections 3.5 (Vegetation/Plant Species of Concern) and 3.7 (Other Wildlife Species of Concern/Terrestrial Habitat), habitat types for terrestrial wildlife are based on the CWHR System (Mayer and Laudenslayer, 1988). The CWHR classification identifies habitat type, size class, and canopy-cover class. Projected changes in vegetation type and structure have the potential to affect various wildlife species that depend on particular habitat characteristics to meet life requisites. Changes resulting from

alterations in stand characteristics are simultaneously beneficial for some species groups and adverse for other groups.

As discussed in Section 4.5, Vegetation/Plant Species of Concern, a core premise of this assessment is that nonriparian lands under all the alternatives would generally be managed in accordance with the CFPRs, other applicable laws, Green Diamond's NSO HCP, and Green Diamond operational policies and guidelines.

The analysis of the alternatives is a qualitative assessment that focuses on the impacts associated with potential changes to habitat. The assessment focuses on CWHR habitat type, vegetation structure, and canopy closure for each of the alternatives considered for further evaluation. The existing terrestrial-wildlife habitat conditions are described in Section 3.7 of this EA. As indicated, this qualitative analysis focuses on the potential changes to wildlife within forested areas. Most of the nonforested natural habitat types described in Section 3.5 are either protected under existing regulations or do not have practical use to Green Diamond, other than as incidental access areas.

4.7.2 No Action Alternative

4.7.2.1 General Effects

Under the No Action Alternative, existing State regulations are augmented by additional measures identified in the Green Diamond NSO HCP, that provide for retention of a variety of tree sizes (height and diameter) and species within WLPZs, habitat retention areas (groups of retained trees greater than one-half acre) and individual tree clumps, with priority given to wildlife habitat trees. Over the term of the Permit, vegetation structure in riparian stands in the Action Area is expected to remain about the same or slowly improve, over time, as the No Action Alternative's riparian management prescriptions are implemented over greater portions of the Green Diamond ownership. Implementation of the No Action Alternative is, therefore, expected to result in static or improved wildlife habitat conditions within the Action Area relative to existing conditions. Under the No Action Alternative, a greater number of mature trees or late-seral-forest stands would exist within riparian areas throughout the Action Area, especially within northern spotted owl protection zones, relative to existing conditions. The species that would benefit the most from this effect include frogs, salamanders, herons, eagles, bats, marbled murrelets, and owls.

Similarly, as discussed in Section 4.5, under current management forest trends on the Green Diamond ownership in general will lead to increased age class and size, as well as increased total acreage with dense canopy closure. These trends would be expected to result in long-term beneficial effects on wildlife species that use these habitats relative to existing conditions.

Under the No Action Alternative, the number and acreage of stands with saplings and small-diameter trees would decrease over time. Wildlife species most adversely affected by these forest trends would be those that feed and breed in early successional riparian habitats (e.g., thrushes, some warbler species, and sparrows). However, because these species also use adjacent upland forests, impacts on these species are expected to be less than significant. Lands within the Action Area have been managed for timber production for decades and the species that thrive there today have done so in the presence of the disturbances associated with timber management.

4.7.2.2 Riparian Management Effects

Implementation of the No Action Alternative will continue to provide special benefits to frogs and salamanders as a result of the anticipated increase in the amount and quality of available habitat for breeding and feeding. Similar increases in riparian habitat for feeding and roosting, for bats, owls, and similar animals, should reduce competition for tree nesting and roosting sites among these types of animals. The increased amount of late-seral-forest habitat within riparian corridors, anticipated as a result of implementation of the No Action Alternative, would benefit herons and eagles through creation of a more varied habitat base for foraging and nesting.

4.7.2.3 Listed Wildlife Species and Other Wildlife Species of Concern

Under the No Action Alternative, Green Diamond would remain subject to State regulatory requirements to avoid or mitigate adverse effects of timber harvesting on all wildlife, including species listed or proposed for listing under the Federal and State ESAs. Continued compliance with existing regulations and implementation of Green Diamond's NSO HCP should result in a trend toward forest development that promotes greater structural diversity and a greater number of stands with late-seral forest characteristics, relative to what currently exists (especially within WLPZs). This trend is beneficial to listed species, presumed or known to occur in the Action Area, that breed or forage in older trees or late-seral stands. These species include the bald eagle and northern spotted owl. The trend is also beneficial to other wildlife species of concern presumed or known to occur in the Action Area that are associated with late-seral conditions (e.g., osprey, Vaux's swift, Pacific fisher, Humboldt marten, and red and Sonoma tree voles).

Table 4.7-1 presents: (1) a list of all the wildlife species of concern (listed and unlisted) known or likely to occur within the Action Area; and (2) a summary of potential impacts associated with the No Action and other alternatives. For all species and all action alternatives, either no impacts would occur or the impacts would be minor. Minor beneficial effects are anticipated to occur to those species that are in riparian or late seral forest habitats.

4.7.3 Proposed Action

4.7.3.1 General Effects

Because timber harvesting and forest management activities under the Proposed Action would be similar to those under the No Action Alternative, except for harvest of suitable habitat around eight additional NSO nest sites, potential effects on wildlife species of concern and their habitats within the Action Area would be the similar to those described above for the No Action Alternative (see Section 4.7.2). Timber harvest activities on 1,864 acres that would be allowed under this alternative within the additional eight incidental take sites would be conducted pursuant to the conservation measures contained in the NSO HCP. These measures provide for retention of a variety of tree sizes (height and diameter) and species within WLPZs, habitat retention areas (groups of retained trees greater than one-half acre) and individual tree clumps, with priority given to wildlife habitat trees. These measures could result in long-term beneficial effects on wildlife species associated with mid- to late-seral habitat, and are anticipated to result in the same or similar effects compared to those anticipated to occur under the No Action Alternative.

TABLE 4.7-1
Wildlife Species of Special Concern—Habitat Associations and Potential Impacts

Species	Habitat Associations	Potential Impacts		
		No Action	Proposed Action	Alternative A
Birds				
American peregrine falcon <i>Falco peregrinus anatum</i>	Breeds on high cliffs near wetlands, lakes and rivers	Changes in populations are anticipated to be negligible over time due to low species occurrence.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Bald eagle <i>Haliaeetus leucocephalus</i>	Nests in large old growth trees near ocean shore, lakes, and rivers	Other species-specific conservation measures could include timber stand retention adjacent to high-value habitat on public lands.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Bank swallow <i>Riparia riparia</i>	Colonial nester in riparian area with vertical sandy banks composed of fine soils	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Black swift <i>Cypseloides niger</i>	Breeds in small colonies adjacent to waterfalls in deep canyons and coastal bluffs, forages widely	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Black-crowned night heron <i>Nycticorax nycticorax</i>	Margins of lacustrine, large riverine, and fresh and saline emergent habitats	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Coopers hawk <i>Accipiter cooperi</i>	Open woodlands, nests in riparian areas	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Golden eagle <i>Aquila chrysaetos</i>	Rolling foothills and open mountain terrain in oak woodlands and most major forested habitats.	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Great blue heron <i>Ardea herodias</i>	Colonial nester in large trees near wet meadows, marshes, lake margins, rivers and streams, and tidal flats	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Great egret <i>Ardea alba</i>	Colonial nester in large trees near marshes, tidal flats, rivers, and lakes	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.

TABLE 4.7-1
Wildlife Species of Special Concern—Habitat Associations and Potential Impacts

Species	Habitat Associations	Potential Impacts		
		No Action	Proposed Action	Alternative A
Little willow flycatcher <i>Empidonax traillii brewsteri</i>	Riparian areas with extensive willow vegetation	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Marbled murrelet <i>Brachyramphys marmoratus</i>	Late-seral and old-growth conifer forest and marine waters	However, minor beneficial effects may occur in the long term as a result of implementation of enhanced riparian protection measures and other conservation measures, changes in associated habitats and populations are anticipated to be negligible over time. Other species-specific conservation measures could include timber stand retention adjacent to high-value habitat on public land.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Merlin <i>Falco columbarius</i>	Frequents coastlines, open grassland, woodlands, lakes, wetlands, edges, and early successional forest stages	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Northern harrier <i>Circus cyaneus</i>	Open habitats including grasslands, scrublands, and wetlands	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Northern goshawk <i>Accipiter gentilis</i>	Nests in mature and old-growth coniferous forests with sparse ground cover	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.

TABLE 4.7-1
Wildlife Species of Special Concern—Habitat Associations and Potential Impacts

Species	Habitat Associations	Potential Impacts		
		No Action	Proposed Action	Alternative A
Northern spotted owl <i>Strix occidentalis caurina</i>	Old growth or mixed mature-old growth forests	The No Action is anticipated to lead to impacts commensurate with the NSO HCP. Despite harvest of suitable habitat around eight NSO nest sites, suitable habitat would continue to increase over the Green Diamond ownership as projected. Currently permitted incidental takes may be one of several factors contributing to reduced NSO fecundity and a slight downward trend in the local population.	Despite harvest of suitable habitat around eight additional NSO nest sites, suitable habitat would continue to increase as projected over the Green Diamond ownership. Proposed additional displacements may be one of several factors that contribute to reduced NSO fecundity, which affects the rate of NSO population change. Planned barred owl research may provide information useful for NSO recovery	Despite harvest of suitable habitat around eight additional NSO sites and in three set-asides, Alternative A measures would provide similar benefits to this species as the Proposed Action. Potential effects of additional displacements on fecundity would also be similar to those described for the Proposed Action.
Olive-sided flycatcher <i>Contopus borealis</i>	Forest and woodland riparian zones	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Osprey <i>Pandion haliaetus</i>	Freshwater lakes, bays, ocean shore, large streams	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Purple martin <i>Progne subis</i>	Forest and woodland with cavity trees, and riparian zones	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Sharp-shinned hawk <i>Accipiter striatus</i>	Early- to mid-seral forest and riparian zones	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Short-eared owl <i>Asio flammeus</i>	Marshlands, grasslands, and forest clearings	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Snowy egret <i>Egretta thula</i>	Riverine, emergent wetland, lacustrine, and estuarine habitats. Nests in large trees in the vicinity of foraging areas.	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.

TABLE 4.7-1
Wildlife Species of Special Concern—Habitat Associations and Potential Impacts

Species	Habitat Associations	Potential Impacts		
		No Action	Proposed Action	Alternative A
Tricolored blackbird <i>Agelaius tricolor</i>	Highly colonial species, largely endemic to California; requires open water with protected areas for nesting	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Vaux's swift <i>Chaetura vauxi</i>	Conifer forest with large snags	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Western burrowing owl <i>Athene cunicularia</i>	Grasslands and shrublands	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Western snowy plover <i>Charadrius alexandrinus nivosus</i>	Sandy beaches, salt ponds and levees, gravel bars along coastal rivers	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
White tailed kite <i>Elanus leucurus</i>	Nests along rivers and marshes associated with oak woodlands in foothills and valley margins, forages in open meadows and grasslands	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Yellow warbler <i>Dendroica petechia brewsteri</i>	Riparian woodland	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Yellow-breasted chat <i>Icteria virens</i>	Riparian thickets and early-seral forest	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.

TABLE 4.7-1
Wildlife Species of Special Concern—Habitat Associations and Potential Impacts

Species	Habitat Associations	Potential Impacts		
		No Action	Proposed Action	Alternative A
Mammals				
Fringed myotis <i>Myotis thysanodes</i>	Roosts in mines, caves, trees, and buildings; feeds along forest edges and over forest canopy	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
American marten <i>Martes americana</i>	Late-seral conifer forest	Changes in associated habitats and populations are anticipated to be negligible over time. Other species-specific conservation measures could include timber stand retention adjacent to high-value habitat on public land and thinning of overstocked stands in neighboring Redwood National Park (RNP).	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Long-legged myotis <i>Myotis volans</i>	Roosts in hollow trees, crevices, mines, and buildings; feeds in open habitats	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Long-eared myotis <i>Myotis evotis</i>	Roosts in trees, crevices, mines, caves, and buildings; feeds within forest and over water	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Pacific fisher <i>Martes pennanti pacifica</i>	Coniferous forests and shaded riparian areas; prefers large trees with structural features such as cavities and natural platforms denning and rest sites	Changes in associated habitats and populations are anticipated to be negligible over time. Other species-specific conservation measures could include timber stand retention adjacent to high-value habitat on public land.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Pallid bat <i>Antrozous pallidus</i>	Roosts in trees, caves, crevices, and buildings; feeds in a variety of open habitats	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.

TABLE 4.7-1
Wildlife Species of Special Concern—Habitat Associations and Potential Impacts

Species	Habitat Associations	Potential Impacts		
		No Action	Proposed Action	Alternative A
Sonoma tree vole <i>Arborimus pomo</i>	Douglas fir, redwood, and montane conifer-hardwood forests	Changes in associated habitats and populations are anticipated to be negligible over time. Other species-specific conservation measures could include timber stand retention adjacent to high-value habitat on public land.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Townsend's big-eared bat <i>Corynorhinus townsendii</i>	Humid coastal regions of central and northern California, and southern Oregon	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
White footed vole <i>Arborimus albipes</i>	Mature conifer forests, small streams with dense alder and shrub cover	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Yuma myotis <i>Myotis evotis</i>	Roosts in buildings, trees, mines, caves, crevices, and bridges; feeds over water	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Reptiles and Amphibians				
Del Norte salamander <i>Plethodon elongatus</i>	Redwood, Douglas-fir, mixed conifer, montane hardwood, mixed hardwood-conifer forests	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Foothill yellow legged frog <i>Rana boylei</i>	Partly shaded shallow streams with rocky substrate, in a variety of habitats	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Northern red-legged frog <i>Rana aurora aurora</i>	Humid forests with intermixed hardwoods and grasslands, streambanks	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Southern torrent salamander <i>Rhyacotriton variegatus</i>	Seeps, springs, and streams in coastal redwood, Douglas fir, mixed conifer, montane hardwood, and montane-riparian forests	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.

TABLE 4.7-1
Wildlife Species of Special Concern—Habitat Associations and Potential Impacts

Species	Habitat Associations	Potential Impacts		
		No Action	Proposed Action	Alternative A
Tailed frog <i>Ascaphus truei</i>	Permanent streams in montane-conifer hardwood, redwood, Douglas fir, and ponderosa pine forests	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Western pond turtle <i>Actinemys marmorata marmorata</i>	Ponds and swamps in grasslands, and mixed conifer-hardwood forests	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Invertebrates				
Fort Dick limnephilis caddisfly <i>Limnephilis atercus</i>	Unknown. Most <i>Limnephilus</i> larvae live in lentic habitats, but some are known from streams and cold springs	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Ground beetle <i>Scaphinotus behrensi</i>	Wooded areas with moist microhabitats, including logs and tree trunks	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Karok Indian snail <i>Vespericola karokorum</i>	Under leaf litter and woody debris in riparian areas with alder and maple	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Mardon skipper <i>Polites mardon</i>	Prairies and meadows, particularly in mesic serpentine soils	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Oregon silverspot butterfly <i>Speyeria zerene hippolyta</i>	Coastal meadows in Del Norte County; larvae feed only on the foliage of violets, primarily the western dog violet (<i>Viola adunca</i>)	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.
Pomo bronze shoulderband snail <i>Helminthoglypta arrosa pomoensis</i>	Dense redwood forest	Changes in associated habitats and populations are anticipated to be negligible over time.	Similar to No Action, with timber harvest around eight additional NSO nest sites.	Similar to Proposed Action, with release of three set-asides to timber harvest.

The Proposed Action would allow timber harvest activities at eight additional spotted owl sites, thereby reducing the amount of older forest in these areas below the “no-take” habitat thresholds for owl sites, as defined in the NSO HCP. Apart from the authorized incidental take of those spotted owl pairs, the additional timber harvest at these sites would otherwise be subject to the management practices and regulatory requirements as described for the No Action, relative to Federal- and State-listed species, and to other wildlife species. This harvest would be dispersed over space and time in a manner such that it would represent a minimal annual increase in the amount of forest entering younger age classes, and a minimal annual decrease in the amount of forest in older age classes. In some years, the amount of older forest harvested as a result of the action would be offset by forest growth and maturation of stands into suitable owl habitat, and the overall trend of increasing suitable owl habitat would occur. In the context of Green Diamond’s ownership, the additional area subject to harvest as a result of the eight additional incidental takes would not result in any significant impact to wildlife populations that use these forest age classes.

4.7.3.2 Riparian Management Effects

Implementation of the Proposed Action will continue to provide special benefits to frogs and salamanders as a result of the anticipated increase in the amount of available habitat for breeding and feeding. Similar increases in riparian habitat for feeding and roosting, for bats, owls, and similar animals, should reduce competition for tree nesting and roosting sites among these types of animals. The increased amount of late-seral-forest habitat within riparian corridors, anticipated as a result of implementation of the Proposed Action would benefit herons and eagles through creation of a more varied habitat base for foraging and feeding. These measures are anticipated to result in similar effects compared to those anticipated to occur under the No Action Alternative.

4.7.3.3 Listed Wildlife Species and Other Wildlife Species of Concern

Potential benefits to listed species under the Proposed Action would be similar to those described under the No Action Alternative. Implementation of State regulations, augmented by additional measures identified in the Green Diamond NSO HCP, would continue to provide benefits to listed species that breed or forage in older trees and late-seral-forest stands, such as bald eagles, and northern spotted owls (Table 4.7-1). These measures would also provide comparable benefits for other wildlife species of concern (unlisted species) presumed or known to occur in the Action Area. These would include species that breed or forage in older trees or late-seral stands (e.g., osprey, Vaux’s swift, Pacific fisher, Humboldt marten, and Sonoma and red tree voles).

4.7.4 Alternative A

Forest management activities and most NSO HCP conservation measures would be the same under Alternative A as under the No Action Alternative and the Proposed Action. Timber harvest would be allowed around eight additional NSO nest sites and in three set-asides. Potential effects on terrestrial wildlife habitat and wildlife species of concern within the Action Area would be similar to those described above for the Proposed Action. The amount of habitat 46 years old or greater would continue to increase over the remainder of the permit period.

Release of the three set-aside areas under Alternative A may create some potential insignificant adverse impacts to these resources in the Action Area by virtue of being available for timber harvest under this alternative. However, Green Diamond would continue to avoid or minimize potential adverse impacts to listed and unlisted wildlife species. Under this alternative, Green Diamond would remain subject to State regulatory requirements to avoid or mitigate adverse effects of timber harvesting on all wildlife, including species listed or proposed for listing under the Federal and State ESAs.

Continued compliance with existing regulations and implementation of Green Diamond's NSO HCP should over time also result in a trend toward forest development that promotes greater structural diversity and a greater number of stands with late-seral forest characteristics, relative to what currently exists, (especially within WLPZs). This trend is beneficial to listed species, presumed or known to occur in the Action Area, that breed or forage in older trees or late-seral stands. These species include the bald eagle, and northern spotted owl. The trend is also beneficial to other wildlife species of concern presumed or known to occur in the Action Area that are associated with late-seral conditions (e.g., osprey, Vaux's swift, Pacific fisher, Humboldt marten, and red and Sonoma tree voles).

4.7.5 Cumulative Impacts—Terrestrial Habitat/Wildlife Species of Concern

The assessment of potential cumulative impacts on terrestrial wildlife habitat and wildlife species of concern was conducted using the approach described in Section 4.1.2, Cumulative Impacts Analysis. The assessment area for cumulative impacts consists of the 11 HPAs that contain Action Area lands owned by Green Diamond, and other lands that are predominantly either privately owned, administered by a Federal resource management agency, or are State or Federal park lands. Resource management strategies being applied in these HPAs, combined with future management strategies that would be used by Green Diamond, have the potential to result in cumulative effects on terrestrial-wildlife habitat and wildlife species of concern.

Although certain habitat disturbances are anticipated to occur, no significant effects on listed terrestrial wildlife species or other wildlife species of concern are expected under any of the alternatives. Under all alternatives, including the No Action, Green Diamond would: (1) implement specific measures contained in existing regulations, or developed pursuant to the THP process; and (2) implement measures contained in the NSO HCP. Existing regulations also require that impacts to other wildlife species of concern (if they occur) be minimized to a level of insignificance. This cumulative impact assessment considers other predominant conservation or management strategies, besides Green Diamond's, that are being implemented in the 11 HPAs.

4.7.5.1 Impacts Associated with Other Actions

Conservation measures associated with the PALCO HCP are designed to: (1) promote riparian and upland wildlife habitat quality; (2) minimize and mitigate the impacts of incidental take of specified species; (3) minimize potential adverse impacts to listed wildlife species; and (4) minimize or mitigate potential adverse impacts to wildlife species of concern, using various general conservation prescriptions and species-specific conservation measures. Additional measures contained in the PALCO HCP that are specific to the marbled murrelet, but have secondary benefits to northern spotted owls and other

terrestrial wildlife species, include: (1) establishing a series of reserves, which are large, contiguous areas of second growth and residual old growth surrounding the major remaining stands of uncut old growth on PALCO lands; and (2) limiting timber harvesting within these reserves to habitat enhancement projects that benefit the marbled murrelet (through the year 2049); and (3) implementing silvicultural prescriptions, outside the reserve areas, that favor attainment of mature forest conditions within 300-foot selective harvest buffers on PALCO property, adjacent to old-growth redwood in State parks. These measures augment existing CFPR protections for listed wildlife species and wildlife species of concern. The beneficial effects of the PALCO HCP on terrestrial habitat and wildlife species of concern would primarily occur within the Eel River and Humboldt Bay HPAs, where PALCO has substantial ownership.

On private commercial timberlands where HCPs do not currently exist, continued implementation of measures contained in the CFPRs (special protections afforded to certain species of concern, and to features such as wetlands, wet meadows, watercourse and lake protection zones, and snags) and other measures identified during the THP preparation and review process would minimize potential adverse impacts to listed and other wildlife species of concern to a level of insignificance. Continued implementation of existing regulations on these lands would result in a more varied vegetation mosaic over the landscape, trending toward development of a greater number of mid- and late-seral forest types. Continued implementation of the CFPR measures designed to protect riparian vegetation and minimize potential impacts to marbled murrelet and bald eagle habitat would provide for a greater number of large trees, over time, in riparian areas. Vegetation management activities in riparian areas would be expected to remain relatively unchanged from existing timber-harvesting practices, and similar species compositions would be retained.

On the largest area of tribal timberlands in the assessment area, the Hoopa Valley Tribe manages its timberlands under a Forest Management Plan with habitat standards that meet or exceed those of the CFPRs.

The resource management strategies on lands administered by the USFS and BLM include the continued implementation of aquatic and riparian resource guidelines contained in the NWFP for Federal lands. These strategies are generally conservative and low-priority in nature; do not allow timber harvesting or other activities in wide, fixed-width riparian buffers prior to a completed watershed analysis; and provide a wide range of benefits to wildlife species of concern that rely on these habitats for feeding, roosting, or shelter. The NWFP strategy also places heavier emphasis on late-seral-stand development that would favor species with late-seral habitat associations, such as frogs, salamanders, herons, eagles, bats, marbled murrelets, and owls. The USFS management plan for the Six Rivers National Forest also contains general and species-specific management directions that provide benefits to wildlife species of concern that rely on upland habitat associations. Current benefits to terrestrial habitat and wildlife species of concern, in those HPAs where Federal agencies are the predominant land managers, would be expected to continue into the future.

Resource management strategies on lands administered by the State of California and the National Park Service essentially allow no commercial timber harvesting; although pre-commercial thinning of some timber stands may occur occasionally for purposes of stand improvement. In addition, streamside and upslope activities that would affect riparian resources are extremely limited. The absence of active land management practices within

park lands may result in a certain homogenization, over time, of upslope forest vegetation types, and, consequently, terrestrial habitat types, which favor species that rely primarily on late-seral habitat associations. Thinning of some stands in combination with the absence of commercial harvesting of mature and over-mature trees would accelerate this process. Positive benefits associated with continuation of low-level management in the parks would accrue to those species that rely on these habitat associations. Species that rely on early-seral or mid-seral habitat associations would not be as strongly favored, and populations of these species may actually decrease over time, as these habitats decline on park lands. However, current population levels of many early- and mid-seral species are not likely reflective of population levels that existed historically in the area, as a result of logging, mining, and other human activities in the past 100 years, which have increased the amount of these seral stages.

Overall, the cumulative result of implementing all of these resource management programs would be a trend toward development of more mid- to late-seral forest stands within each of the 11 HPAs, beyond currently existing levels. This trend would favor species with late seral habitat associations. Impacts to wildlife species of concern, however, would be relatively insignificant.

4.7.5.2 Cumulative Impacts Associated with the Proposed Action and Alternative A

As discussed in Section 4.5, Vegetation/Plant Species of Concern, under the current management regime, forest trends in the Green Diamond ownership will lead to increased age class and size, as well as increased total acreage with dense canopy closure. These trends are expected to continue under the Proposed Action and Alternative A. The development of mid- and late-seral stand types as a result of implementation of the conservation measures under the Proposed Action and other alternatives is anticipated to be most pronounced within riparian areas. These trends would be expected to result in some long-term beneficial effects on wildlife species that use these habitats. The impact of implementation of the Proposed Action or Alternative A would be to provide additional incremental benefits to wildlife species with mid- to late-seral habitat associations, as noted above.

4.8 Air Quality

The purpose of this Section is to evaluate the potential impacts to air quality associated with implementing the Proposed Action or Alternative A relative to the No Action Alternative.

4.8.1 Methodology

As discussed in Section 3.8, Green Diamond-owned lands in Del Norte and Humboldt counties are in attainment for all State and Federal air quality standards, with the exception of the California standard for PM₁₀. The analysis in this Section focuses on whether implementation of the Proposed Action or Alternative A would result in degradation of existing air quality.

4.8.2 No Action Alternative

Existing sources of PM₁₀ in Del Norte and Humboldt counties include vehicles, sea salts, wood stoves (particularly in the winter months), dust, pulp mills, nitrates, sulfates, and other unknown sources. Management actions by timberland owners in the vicinity of the

Action Area are also contributors to particulate emissions (see Section 3.8). Incidence of PM₁₀ from Green Diamond's timber management is typically attributable to slash burning and roadway dust entrainment.

In addition to the NSO HCP, Green Diamond would continue to implement ownership-wide mitigation, management, and monitoring measures in accordance with the requirements of the CFPRs.

Conservation measures (e.g., restrictions on areas in which timber can be harvested, exclusion of heavy equipment in WLPZs) could reduce Green Diamond's contributions to area PM₁₀ over time by improving road conditions (and reducing PM₁₀ visibility impacts). Although these measures are anticipated to result in some improvement in air quality (reduction in PM₁₀ generation by improved road conditions), the improvements are not anticipated to be measurably different than those anticipated under current conditions.

4.8.3 Proposed Action

Potential impacts to air quality from implementing the Proposed Action Alternative would be similar to those under the No Action Alternative. Green Diamond would continue to implement measures contained in the NSO HCP and the CFPRs. General timber harvesting and forest management activities, road management and riparian conservation measures would remain the same for the Proposed Action Alternative, but would occur around eight additional NSO nest sites.

4.8.4 Alternative A

As under the Proposed Action, Green Diamond would continue to implement measures contained in the NSO HCP and CFPRs. Impacts would be similar to those under the Proposed Action. General timber harvesting and forest management activities would remain the same under Alternative A as in the Proposed Action and No Action Alternatives.

4.8.5 Cumulative Impacts—Air Quality

Other commercial timberland owners, plus State and Federal land managers, who administer nearby publicly owned timberlands, are anticipated to continue with similar practices that have the potential to result in impacts to air quality in the 11 HPAs. On this basis (and because Green Diamond's timber operations with the potential to affect air quality would not change under the Proposed Action or any of the alternatives), the cumulative result of implementing any of these resource management programs is not expected to be significant.

4.9 Visual Resources

The purpose of this Section is to evaluate the potential impacts to visual resources associated with implementing the Proposed Action or Alternative A relative to the No Action Alternative.

4.9.1 Methodology

For this analysis, an impact to visual resources would occur if the quality of the landscape was diminished as a result of implementing the Proposed Action or Alternative A.

4.9.2 No Action Alternative

Green Diamond would continue to conduct timber harvesting in the Action Area in accordance with existing regulations and guidelines discussed in Section 2.1 of this EA, in accordance with the requirements of the CFPRs. This includes establishment of WLPZs for Class I, II, and III streams, limited activities within the Class I and II WLPZs, and ELZs for Class III WLPZs.

Green Diamond's activities have the potential to affect aesthetic resources by introducing elements that interrupt the visual continuity of the landscape, such as even-aged harvesting. Timber harvesting within the Action Area would be conducted within sight of scenic highways (e.g., U.S. Highway 101 and State Highway 299) and recreation areas on adjacent public lands (e.g., Redwood National and State Parks, Smith River National Recreation Area). These operations can diminish aesthetic resources enjoyed by the public. Existing visual conditions experienced by highway travelers and recreation area users would continue to occur under the No Action Alternative. Visual effects of timber harvesting could be expected to be reduced to some extent by implementing existing provisions that are designed, in part, to minimize the potential visual impacts of commercial forest management. These measures are:

- Individual clearcuts cannot exceed 30 acres.
- Individual clearcuts shall be separated by an area at least as large as the clearcut or 20 acres, whichever is smaller, and shall be separated by at least 300 feet in all directions.
- Units adjacent to a clearcut cannot undergo even-aged harvesting until after a specified amount of time has passed, or the clearcut has regenerated to an approved age- or size-class composition.
- Clearcuts should be defined by logical unit boundaries but may be irregularly shaped and variable in size in order to mimic natural patterns and features found in landscapes.
- Special consideration for aesthetic enjoyment must be given to silvicultural treatments and timber operations within 200 feet of the edge of the traveled surface of any permanent road maintained by the County or the State, or within 200 feet of adjacent non-Federal lands not zoned for timber production.

4.9.3 Proposed Action

As under the No Action Alternative, general timber harvesting and forest management activities would remain the same for the Proposed Action, but would occur around eight additional NSO nest sites. Green Diamond would continue to implement measures contained in the NSO HCP and the CFPRs. Accordingly, the potential for impacts to visual resources is expected to be similar to the conditions described above for the No Action Alternative.

4.9.4 Alternative A

As under the No Action Alternative (and the Proposed Action), Green Diamond would continue to implement the NSO HCP and CFPRs. With the exception of releasing the three set-aside areas noted above for harvest entry, general timber harvesting and forest management activities would remain the same under Alternative A as in the Proposed Action. As a result, potential impacts to visual resources within the Action Area would be substantially similar to impacts described under the Proposed Action

4.9.5 Cumulative Impacts—Visual Resources

Similar minor visual differences could also occur in other private forestlands in the 11 HPAs, but State and Federal lands located within the analysis area for determining cumulative impacts would continue to be managed to meet visual quality objectives. Accordingly, overall the individual and cumulative result of implementing any of these resource management programs would be less than significant in cumulative impact area over time.

4.10 Recreation

The purpose of this Section is to evaluate the potential impacts to recreation from implementation of the Proposed Action or Alternative A.

4.10.1 Methodology

As discussed in Section 3.10, Recreational Resources, Green Diamond offers limited access to its forestlands to groups and individuals for recreational activities of hunting, fishing, camping, picnicking, hiking, mountain biking, motorcycle and horseback riding, and shooting. A recreation impact would occur when the recreational experiences enjoyed by the public are diminished by activities conducted within the Action Area. This assessment is based on the potential for the Proposed Action or Alternative A to diminish enjoyment of recreational opportunities listed above. Because of the ongoing nature of timber harvesting activities over such a broad geographic area, it is not possible to accurately predict when and where specific impacts would occur.

4.10.2 No Action Alternative

Under the No Action Alternative, Green Diamond would continue to conduct timber harvesting in the Action Area in accordance with existing regulations, guidelines, and management practices discussed in Section 2.1 of this EA. Timber harvesting in the Action Area would be conducted within sight of recreation areas on adjacent public lands, including highly sensitive recreation areas such as the Smith River National Recreation Area and the Redwood National and State Parks complex. These operations can diminish aesthetic resources enjoyed by the public. However, timber harvest levels under the No Action Alternative are expected to be similar to current conditions throughout the Action Area and, therefore, such actions would be consistent with historical patterns of use, including the aesthetic impacts of such use. Green Diamond and other private forest landowners within the vicinity of the Action Area would continue to follow existing regulations designed to minimize visual and associated recreational effects (see Section 4.9, Visual Resources).

4.10.3 Proposed Action

As under the No Action Alternative, general timber harvesting and forest management activities would remain the same for the Proposed Action Alternative, but would occur around eight additional NSO nest sites. Green Diamond would continue to implement measures contained in the NSO HCP and the CFPRs. Accordingly, the potential for impacts to recreational resources is expected to be similar to that of the No Action Alternative.

4.10.4 Alternative A

As under the Proposed Action, Green Diamond would continue to implement the NSO HCP and CFPRs. With the exception of releasing the three set-aside areas noted above for harvest entry, general timber harvesting and forest management activities would remain the same as in the Proposed Action. As a result, potential impacts to recreational resources within the Action Area would be substantially similar to impacts described under the Proposed Action and No Action Alternatives.

4.10.5 Cumulative Impacts—Recreation

Because the Proposed Action's conservation measures are associated with existing timber harvesting activities, which would not change under the Proposed Action, no cumulative impact would occur from implementing the Proposed Action in association with other private forestlands in the 11 HPAs. In addition, State and Federal lands within the cumulative impact area would continue to be managed to meet recreational objectives. Accordingly, potential individual and cumulative impacts would be less than significant.

Further, alterations to fish and wildlife habitat resulting from timber harvesting conducted under the Proposed Action and alternatives including the No Action alternative, would also be consistent with historical practices. Based on the analysis in Section 4.4 (Aquatic Resources) and Section 4.7 (Terrestrial Habitat/Wildlife Species of Concern), changes to fish and wildlife habitat under all of the alternatives would continue to support wildlife viewing, hunting, and fishing opportunities. Other expected habitat improvements throughout the 11 HPAs as a result of continued implementation of the PALCO HCP, continued implementation of existing regulations on other commercial timberlands, continued management of USFS and BLM lands pursuant to Northwest Forest Plan guidelines, and continued management of State and national parks would also provide benefits. Accordingly, overall the individual and cumulative result of implementing any of these resource management programs would be less than significant in the 11-HPA assessment area over time.

4.11 Cultural Resources

The purpose of this Section is to evaluate the potential impacts of implementing the Proposed Action or Alternative A, relative to the No Action Alternative, on cultural resources.

4.11.1 Methodology

Timber harvesting and other management operations can result in impacts to individual sites (or resources) and to resource networks (e.g., trails). Impacts to cultural resources would be significant if they did not comply with existing regulations for protecting cultural resources. Federal agencies have a duty under the National Historic Preservation Act (NHPA) to consider

potential impacts to cultural resources for actions which are determined to be undertakings. The USFWS has determined that issuance of the amended ITP to Green Diamond, as described in the Proposed Action and Alternative A, constitutes an undertaking to the limited extent that we authorize take incidental to non-Federal actions that are not themselves Federal undertakings, but which may result in take of northern spotted owls and in such an instance would require Federal authorization to lawfully proceed.

4.11.2 No Action Alternative

Under the No Action Alternative, Green Diamond will continue to comply with the CFPRs in the preparation of THPs, when conducting timber harvest operations in the Action Area. Pursuant to the CFPRs, the following steps must be taken in preparation of THPs:

- Conduct an archaeological record search at the Northwest Information Center North Coast Information Center (Yurok Tribe, Culture Department).
- Contact local Native Americans identified by the Native American Heritage Commission (NAHC) and allow for their participation, particularly in regard to sacred site areas.
- Provide a professional archaeologist or a person with archaeological training (in accordance with the CFPRs) to conduct a field survey for archaeological and historical sites in the area covered by the THP (previous archaeological surveys within the site survey area may also be used to partially or entirely satisfy this requirement).
- Prepare a confidential addendum to the THP, including a survey coverage map showing the locations of identified cultural resources. The addendum should describe record search and survey methods, results of contact with Native Americans, qualifications of the surveyor, a description of identified archaeological and historical sites, and a description of specific enforceable protection measures to be implemented both within the site boundaries and within 100 feet of the site.
- If a known archaeological or historical site could not be avoided during timber harvesting, then a preliminary determination of significance would be necessary. California Department of Forestry and Fire Protection (CDF) would determine if a substantial adverse change to the resource would occur, and protection measures would be developed to reduce the impact to a less than significant level.
- Submit completed site records for each site determined to be a “significant” archaeological or historical site in a manner consistent with the recording standards identified in the State Office of Historic Preservation’s Instruction for Recording Historical Resources.

Typical examples of site specific measures which have been used by Green Diamond and other commercial timber land owners that are designed to achieve a finding from CDF of “no substantial adverse change” include, but are not limited to:

- No timber operations within a site’s boundary or within a site’s Special Treatment Zone (STZ). The STZ is defined as the area extending outward from a site’s boundary to a distance of 100 feet.

- Allowance of limited timber operations within a site and STZ or only within the STZ. These limited operations are designed to avoid impact on a site's cultural or historical value. Such limited operations may include, but are not limited to:
 - Directional falling of timber from within a site's boundary, towards a site's edge and into the STZ and beyond, contingent upon the ability to yard the material with minimal ground disturbance (i.e., through helicopter or high lead cable yarding) and without ground based equipment entering the site, except on previously existing and treated roads, landing or skid trails. RPFs must mark trees in advance, and if trees cannot be directionally fallen, for reasons of safety, they may not be cut without submission and approval of alternative approaches which will achieve the same outcome.
 - Required extensive archeological surveys (i.e., subsurface testing) and onsite monitoring to ensure road construction or reconstruction within a site or STZ avoids impacts on the site's cultural or historical value.
 - Roads and landings within a site or STZ, which are proposed for use and maintenance, are covered with geotextile fabric and capped with culturally sterile material sufficient to conduct use and maintenance without scarifying preexisting road material. These roads and landings are also drained to avoid deflection of water onto site areas.
 - Skid trails within a site or STZ, which are proposed for use and maintenance, may be required to be covered with slash or other debris, prior to use, depending on the size of timber to be skidded and distance to haul roads.

If an archeological or historical site that was not identified in a THP is discovered during timber operations, the licensed timber operator would immediately stop operations within 100 feet of the site and notify CDF, and resource protection measures would be implemented. In the event of discovery or recognition of any human remains outside a dedicated cemetery, no further disturbance of the site or any nearby area would occur until the county coroner determined that no investigation of the cause of death is required. If the remains are of Native American origin, then the descendants of the deceased Native Americans must make a recommendation to the landowner or the person responsible for the excavation work for means of treating or disposing of, with appropriate dignity, the human remains of any associated grave goods as provided in Public Resources Code Section 5097.98. Further work could occur if the NAHC was unable to identify a descendant or the descendant failed to make a recommendation within 24 hours after being notified by the Commission.

4.11.3 Proposed Action

Under the Proposed Action, Green Diamond would continue timber harvest activities in the Action Area in accordance with existing regulations and ownership-wide mitigation, management, and monitoring measures in accordance with the requirements of the CFPRs, and the cultural resources protections discussed above for the No Action Alternative. The minimization and mitigation measures in this alternative would not change the way in which State cultural resources regulations are applied. Green Diamond would continue to implement ownership-wide mitigation, management, and monitoring measures in

accordance with the requirements of the CFPRs, and would continue to comply with the cultural resources protections discussed above for the No Action Alternative.

All of the activities that could result in the incidental take of NSO, and thus require an ITP, are timber harvest activities subject to the Timber Harvesting Plan (THP) review process, pursuant to the CFPRs administered by CDF. As a result of applying the CFPRs, effects to cultural and historic properties are expected to be equivalent to or less than those of the No Action Alternative.

4.11.4 Alternative A

Under Alternative A, Green Diamond would continue timber harvest activities in the Action Area in accordance with existing regulations and ownership-wide mitigation, management, and monitoring measures in accordance with the requirements of the CFPRs, and the cultural resources protections discussed above for the No Action Alternative. The minimization and mitigation measures in this alternative would not change the way in which State cultural resources regulations are applied. Green Diamond would continue to implement ownership-wide mitigation, management, and monitoring measures in accordance with the requirements of the CFPRs, and would continue to comply with the cultural resources protections discussed above for the No Action Alternative.

All of the activities that could result in the incidental take of NSO, and thus require an ITP, are timber harvest activities subject to the Timber Harvesting Plan (THP) review process, pursuant to the CFPRs administered by CDF. As a result of applying the CFPRs, effects to cultural and historic properties are expected to be equivalent to or less than those of the No Action Alternative.

4.12 Land Use

The purpose of this Section is to evaluate the potential impacts on land use from implementing the Proposed Action or Alternative A relative to the No Action Alternative.

4.12.1 Methodology

Land use impacts are typically described as inconsistencies with applicable land use plans and policies. In accordance with California law, local governments directly control land use through the adoption of general plans and zoning ordinances. The general plan provides policy direction regarding land use, and the zoning code provides specific mechanisms to implement general plan policies. As described in Section 3.12, Land Use, the Green Diamond forestlands and other private forestlands in the vicinity of the Action Area are included within the General Plans and Zoning Ordinances of Del Norte and Humboldt counties. Conflicts with adjacent land uses (e.g., incompatibilities with the type or intensity of existing or planned surrounding uses) are also a type of land use impact. Other regulatory mechanisms, such as the CFPRs, the Basin Plan of the North Coast Regional Water Quality Control Board, and various endangered species recovery plans, indirectly control land use; compatibility with these plans is described elsewhere in this document, under the appropriate resource category heading.

4.12.2 No Action Alternative

The General Plans of both Del Norte and Humboldt counties designate the Green Diamond forestlands in the Action Area as suitable for timber production. This designation is consistent with past and intended future use of the Action Area. Because the No Action Alternative would continue essentially the same type of management activity as is currently practiced (i.e., timber production), it is consistent with the Del Norte County and Humboldt County General Plans. With regard to zoning, most of the Green Diamond forestlands in the Action Area are designated as Timberland Protection Zone (TPZ) in the Zoning Ordinances of Del Norte County and Humboldt County. As described above, land use in the TPZ district is restricted to growing and harvesting timber and compatible uses and establishes a presumption that timber harvesting is expected to and will occur on such lands. Because the No Action Alternative involves the continued production of timber on the Green Diamond forestlands, it is consistent with the intent of the TPZ district.

4.12.3 Proposed Action and Alternative A

Implementation of the Proposed Action or Alternative A would not result in the creation of a new and incompatible land use and would, therefore, have no impact on land use plans and policies within the Action Area.

4.12.4 Cumulative Impacts—Land Use

Timber management activities on the Green Diamond forestlands are also consistent with activities occurring on other commercial forestlands in the areas. Implementation of the No Action Alternative would not result in the creation of a new and incompatible land use, because timber management activities on the Green Diamond forestlands would be consistent with past management activities and with existing land use plans and policies. Additionally, the TPZ zoning establishes the presumption that timber harvesting is expected to and would occur in the future, and the Timberland Productivity Act states that “timber operations conducted [on TPZ land pursuant to the CFPRs]...shall not constitute a nuisance, public or private.”

Land use activities under the Proposed Action and Alternative A would occur in a similar manner as under the No Action Alternative. Accordingly, the cumulative result on land use of any of these resource management programs would be less than significant in the 11-HPA assessment area over time.

4.13 Socioeconomic Conditions

The purpose of this Section is to evaluate the potential impacts of implementing the Proposed Action or Alternative A, relative to the No Action Alternative, on socioeconomic conditions.

4.13.1 Methodology

Over the term of NSO HCP and its amendments, key socioeconomic indicators (e.g., Green Diamond employment) are likely to be affected by several internal and external influences (e.g., market forces in the lumber and wood products sector) that are unrelated to the NSO HCP and its amendments. This analysis assesses the potential for such changes to occur

under the Proposed Action and the alternatives. In addition, environmental justice impacts are assessed in accordance with Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (February 11, 1994).

4.13.2 No Action Alternative

As discussed above, key socioeconomic indicators are likely to be affected by several internal (i.e., Green Diamond-related) and external influences that are unrelated to the NSO HCP and its amendments. In addition, regulatory requirements will continue to affect management activities in the vicinity of the Action Area and have the potential to affect timber harvesting (and socioeconomic conditions, including subsistence and commercial fishing by Native Americans) in the absence of an approved amendment to the NSO HCP. Consequently, some changes in socioeconomic conditions relative to current conditions could occur. The ability to predict them, however, is subject to market indicators and influences that are not readily evident or are unknown. For the purposes of this analysis, timber harvest levels under the No Action Alternative are expected to remain about the same as current levels and, therefore, changes in socioeconomic conditions are assumed to be minor.

4.13.3 Proposed Action and Alternative A

Overall, the average volume of timber harvested from the Action Area would be the same under the Proposed Action and Alternative A as would be expected under the No Action Alternative. The socioeconomic consequences of changes in timber harvesting levels are not expected to be significant. Timber harvesting activities would continue to occur on the Green Diamond forestlands and, therefore, the need would still exist for Green Diamond to employ timber management and support staff.

No changes in timber harvesting levels are anticipated from one alternative to another and would, therefore, have a negligible effect on local businesses supported by the indirect effects of Green Diamond employment. Likewise, yield taxes paid to Del Norte and Humboldt counties would not change by a substantial amount. Similarly, implementation of the Proposed Action or Alternative A would have a negligible effect on Native Americans dependent on subsistence and commercial fishing in the region and improvements in Native American socioeconomic conditions would be minor.

Overall effects on the local economy due to timber harvesting on other private forestlands in the vicinity of the Action Area are not expected to be substantial for the reasons described above. Management activities on adjacent State and Federal lands are expected to remain similar to current conditions. For these reasons, potential individual impacts on socioeconomic conditions would be less than significant.

4.13.4 Environmental Justice

Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (February 11, 1994), requires Federal agencies to make the achievement of environmental justice part of their mission by identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. EO 12898 further stipulates that the agencies conduct their programs and activities in a manner that does not have the

effect of excluding persons from participation in, denying persons the benefits of, or subjecting persons to discrimination because of their race, color, or national origin. The Presidential Memorandum that accompanied EO 12898 states that a NEPA document should include analysis of “effects in minority communities and low-income communities.”

Potentially affected minority populations in the Action Area include the Yurok Nation and Hoopa Tribe. The close proximity of Yurok and Hoopa lands to Green Diamond lands has resulted in close coordination between Green Diamond and the tribes regarding issues of shared concern, such as road use, timber harvesting, and wildlife.

As presented in Sections 4.2 through 4.13, the potential impacts of the Proposed Action and alternatives would be less than significant. In addition, under all alternatives, timber harvesting levels are expected to remain similar to current levels. On this basis, the Green Diamond workforce (as of January 1, 2006) and other local employment would remain similar to current conditions, and the potential for increased unemployment, including disproportionate job losses affecting minority populations, is not expected to occur as a result of implementing the Proposed Action or Alternative A. Because all impacts would be less than significant, there would be no environmental justice impacts.

4.13.5 Cumulative Impacts—Socioeconomic Conditions

Covered activities on the Green Diamond forestlands are consistent with activities occurring on other commercial forestlands in the 11-HPA assessment area for cumulative impacts. Implementation of the Proposed Action and Alternative A would not substantively change the socioeconomic conditions compared with the No Action Alternative and existing conditions and, therefore, would not result in cumulative impacts.

4.14 Summary of Cumulative Impacts

This Section presents a summary of the detailed cumulative effects analyses located at the end of each of the resources discussion in this chapter.

4.14.1 No Action Alternative

4.14.1.1 Northern Spotted Owls

Growth projections indicate that under the current management regime, forest trends in the Green Diamond ownership will lead to increased age class and size, as well as increased total acreage with dense canopy closure. Changes in habitat type, size class, and canopy-cover class would be most evident in the riparian areas. There was a net increase of over 55,000 acres in the 31 to 45 and 46+ age classes between 1992 and 2002 and additional areas of suitable habitat will develop in the future up to 2022. Future increases in the area of suitable habitat are expected to benefit the Green Diamond northern spotted owl population. However, recent demographic studies indicate that the local population may be in a slight decline. A number of factors, including (1) weather conditions; (2) a region-wide decline in key prey species; (3) interaction and competition with barred owls; (4) loss of habitat to wildfire; (5) loss of habitat to logging on State, private, and tribal lands; (6) forest defoliation from insects; (7) advancing forest succession toward climax fir communities in the absence of fire; (8) potential adverse effects of displacements allowed under the ITP; and other factors have been identified as potential contributors to the recent decline in

reproduction by spotted owls on the ownership, as well as within the region. These explanations remain speculative.

4.14.1.2 Other Environmental Resources

Hillslope mass wasting, hydrologic, and water quality conditions and processes that could impact aquatic species, as well as aquatic and riparian function, would not be affected by continued implementation of the 1992 NSO HCP under the No Action Alternative compared to existing conditions. Changes in (1) peak flows with potential to affect channel morphology, (2) in-stream LWD, (3) quantity and quality of riparian vegetation, and (4) sedimentation and stream aggradation would not be anticipated to occur as a result of continued implementation of the conservation measures contained in the 1992 NSO HCP. Likewise, although certain minimal habitat disturbances are anticipated to occur, no significant impacts to listed plant species or other plant species of concern are expected.

Growth projections indicate that under the current management regime, forest trends in the Green Diamond ownership will lead to increased age class and size, as well as increased total acreage with dense canopy closure. The species that would benefit the most from this effect include frogs, salamanders, herons, eagles, bats, marbled murrelets, and owls. Likewise, the number and acreage of stands with saplings and small-diameter trees would decrease over time. Wildlife species most adversely affected by these forest trends would be those that feed and breed in early successional riparian habitats (e.g., thrushes, warblers, and sparrows). However, because these species also use adjacent upland forests, impacts on these species are expected to be less than significant.

Potential impacts to air quality; visual, recreational, and cultural resources; and land use and socio-economics under the No Action Alternative are not anticipated to be measurably different than those anticipated under current conditions.

4.14.2 Proposed Action and Alternative A

4.14.2.1 Northern Spotted Owls

The Proposed Action would result in timber harvest around eight additional NSO nest sites. Green Diamond's management policies have resulted in a substantial increase in the area of suitable northern spotted owl habitat and these increases are projected to continue into the future until at least 2022. In combination with the other actions listed in Section 4.1.2.3, a modified Green Diamond NSO HCP that continues to increase the amount of suitable northern spotted owl habitat would not be expected to contribute to significant cumulative adverse effects on the NSO. Potential cumulative benefits within the California Coastal Province may result from the increasing area of suitable habitat on Green Diamond lands if northern spotted owl populations use these areas in the future. The 46+ year-old forest stands that are projected to increase in area on Green Diamond lands are expected to include more structurally complex stand characteristics that may favor northern spotted owls over barred owls. However, further research regarding competition and niche overlap between these species is required (and would be conducted under the Proposed Action and Alternative A) before conclusions can be drawn.

The incidental take of eight additional NSO pairs that would be authorized under the Proposed Action represents 2.4 percent of the 203 northern spotted owl activity centers

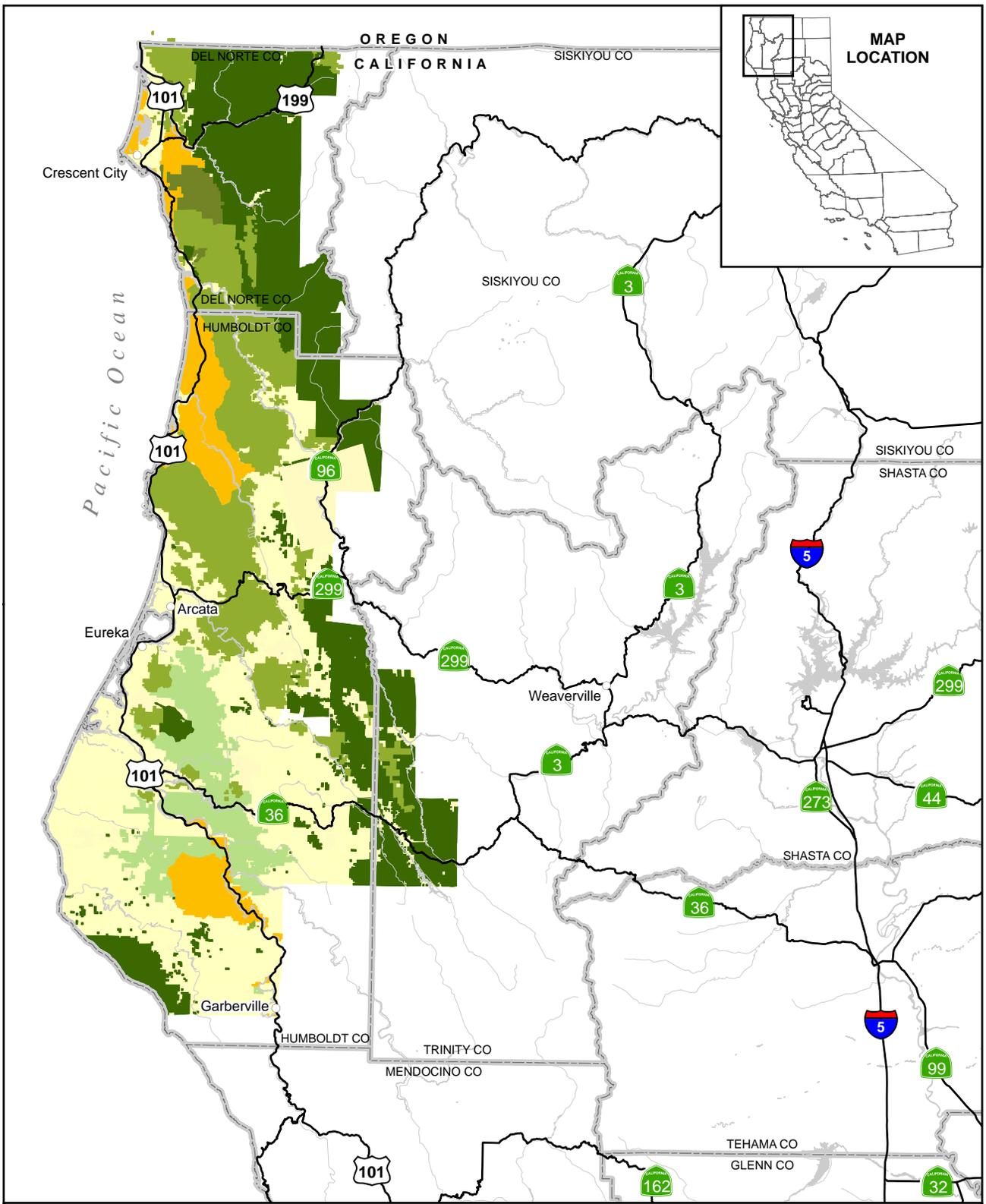
located on or adjacent to Green Diamond lands in 2005. The four permitted incidental takes of owl sites allowed by the existing ITP under the No Action Alternative would also be allowed under the Proposed Action for a total of 12 more incidental take of owl sites over the term of this amendment. These 12 incidental takes represent 5.9 percent of the 203 northern spotted owl activity centers located on or adjacent to Green Diamond lands. There is and will continue to be a substantial area of unoccupied and suitable northern spotted owl habitat available within the Green Diamond ownership for displaced owls to occupy.

The eight additional incidental takes represent about 0.6 percent of the rough estimate of 1,390 northern spotted owl activity centers within the California Coast Physiographic Province.

The cumulative effects of Alternative A would be similar to those described for the Proposed Action because the differences between these alternatives are small in the context of the overall Green Diamond ownership. About 903 fewer acres of suitable habitat in three set-asides would be available for owls in the future under this alternative compared to the Proposed Action.

4.14.2.2 Other Environmental Resources

Implementation of the Proposed Action or Alternative A, in combination with other Federal and non-Federal resource protection and management programs within the 11 HPA cumulative assessment area, would not result in adverse impacts to other environmental resources and, for the most part, would be indistinguishable from effects anticipated under the No Action Alternative.

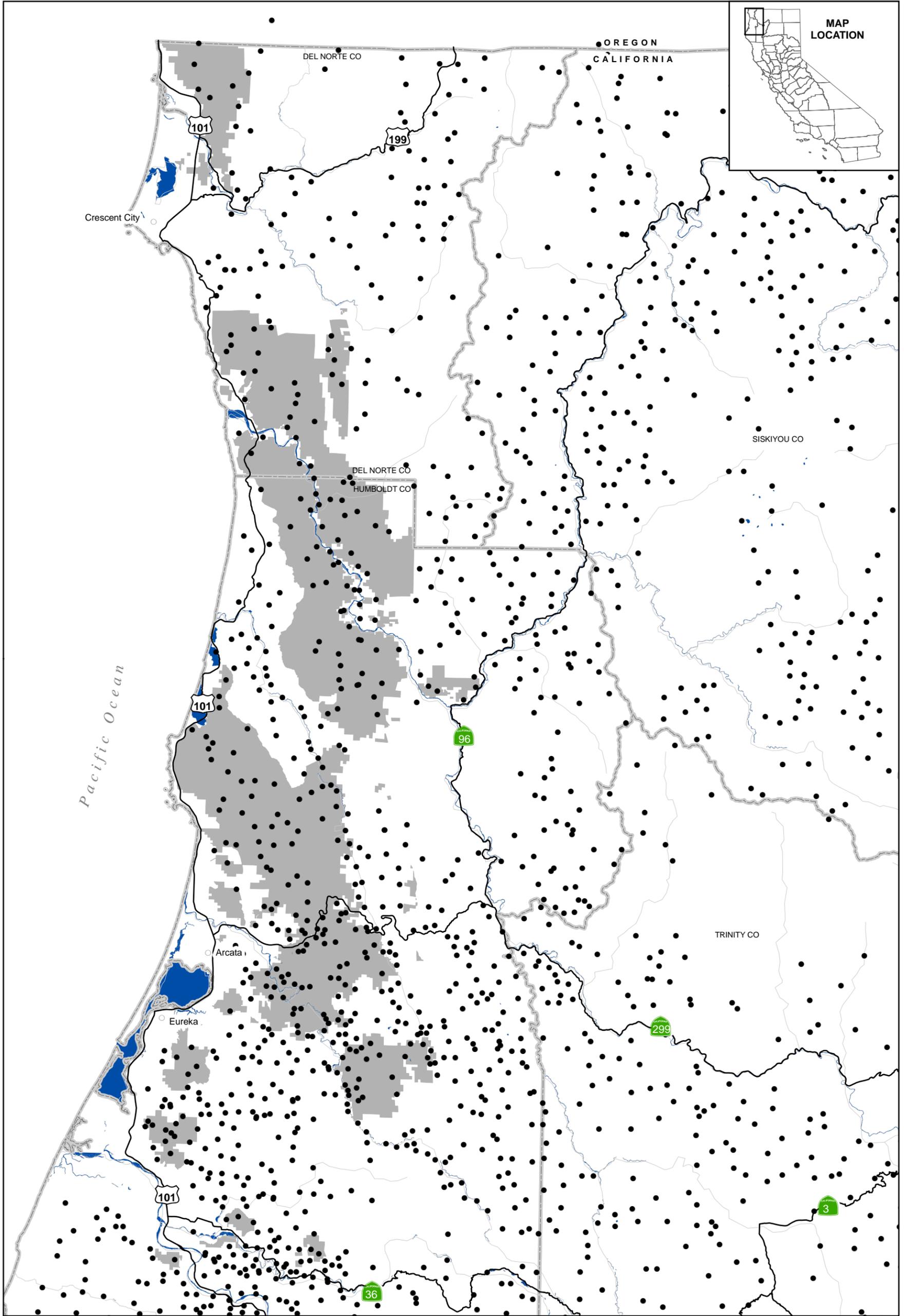


LEGEND

○ CITY	■ GREEN DIAMOND RESOURCE COMPANY
— RIVERS	■ PACIFIC LUMBER COMPANY
▭ COUNTY BOUNDARIES	■ USFS AND BLM
— MAJOR ROADS	■ STATE AND NATIONAL PARKS
	■ OTHER

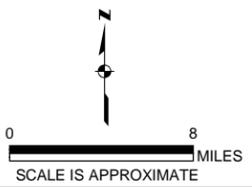

 0 20
 MILES
 SCALE IS APPROXIMATE

**Figure 4.1-1
Regional Land
Ownership**



- LEGEND**
- NSO SITES
 - CITY
 - ACTION AREA
 - RIVERS
 - COUNTY BOUNDARIES
 - MAJOR ROADS
 - MAJOR WATER BODIES

SOURCE: CDEG DATABASE (GOULD, 2006)



**Figure 4.6-1
Historic NSO Sites
1974 to Present on or in the
Vicinity of the Action Area**

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Glossary

λ_{RJS}	Estimated rate of population change (lambda) for Northern Spotted Owls, based on the reparameterized Jolly-Seber method. λ_{RJS} is estimated directly from mark-recapture data and does not require the assumption of a stationary population. λ_{RJS} incorporates reproduction, survival, and recruitment, and allows for time-specific estimation of λ (estimate of population trend). λ_{RJS} reflects whether the population of territorial female owls had been replaced (Franklin et al., 1999; Franklin et al., 2004). $\lambda = 1$ indicates a stationary population, $\lambda < 1$ indicates a declining population, and $\lambda > 1$ indicates an increasing population.
Action Area	Green Diamond ownership within the 11 Hydrographic Planning Areas (see below) on the west slopes of the Klamath Mountains and the Coast Range of California in Del Norte and Humboldt counties, during the period of such ownership within the term of the Incidental Take Permit (ITP).
Age class	One of the intervals into which the age range of trees is divided for classification or use in management.
Basal area	The cross-sectional area of a single stem, including the bark, measured at breast height (4.5 feet above the ground).
Broadcast burning	A prescribed fire allowed to burn over a designated area with well-defined boundaries to achieve some land management objective.
Bucking	Use of a saw to remove log lengths from a tree after it has been felled.
Cable logging/ yarding	Taking logs from the stump area to a landing using an overhead system of winch-driven cables to which logs are attached with chokers.
California Forest Practice Rules (CFPRs)	Rules promulgated by the California Board of Forestry and administered by the California Department of Forestry and Fire Protection governing the conduct of commercial timber operations on State and private land in California.

Candidate Conservation Agreement with Assurances (CCAA)	An agreement between a non-Federal property owner and the Service(s), in which the property owner commits to implement conservation measures for a proposed or candidate species or a species likely to become a candidate or proposed in the near future. The property owner also receives assurances from the Service(s) that additional conservation measures will not be required and additional land, water, or resource use restrictions will not be imposed should the currently unlisted species become listed in the future (64 Federal Register 116, 32727). This agreement accompanies an Enhancement of Survival Permit (see below) issued under Section 10(a)(1)(A) of the ESA.
Class I watercourse	All current or historical fish-bearing watercourses or domestic water supplies, including springs, that are on site or within 100 feet downstream of an operations area.
Class II watercourse	Defined by the California Forest Practices Rules as watercourses in which fish are always or seasonally present offsite within 1,000 feet downstream, or that provide aquatic habitat for non-fish aquatic species. This designation excludes Class III waters that are tributary to Class I waters. As defined in Green Diamond's AHCP/CCAA, Class II watercourses do not contain fish, but do support or provide habitat for aquatic vertebrates. Seeps or springs that support or provide habitat for aquatic vertebrates are also considered Class II watercourses with respect to the conservation measures.
Class III watercourse	Defined by the California Forest Practices Rules as watercourses in which no aquatic life is present. The watercourse shows evidence of being capable of sediment transport to Class I and II waters under normal high water flow conditions after completion of timber operations.
Clearcutting	Even-aged regeneration method where all the merchantable trees in the stand are removed in one harvest. Regeneration is accomplished by natural or artificial means.
Codominant trees	Trees with crowns that form the general level of the forest canopy and receive full light from above, but comparatively little light from the sides. Codominants usually have medium-sized crowns, but are crowded on the sides.
Commercial harvest	Removal of merchantable trees from a stand.
Covered Activities	Certain activities carried out by Green Diamond in the Action Area that may result in incidental take of covered species and all those activities necessary to carry out the commitments reflected in the NSO HCP and IA.
Cull	A tree or log that does not meet merchantable specifications.

Cumulative effect	As defined by NEPA, the change in environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time.
Diameter at breast height (dbh)	The diameter of a tree 4.5 feet above the ground on the uphill side of the tree.
Distinct Population Segment (DPS)	A discrete population (or group of populations) that is markedly separated from other population units of the same species and is significant to the taxon.
Dominant tree	A tree whose crown extends above the general level of the forest canopy and receiving full light from above and partly from the sides.
Downed woody debris	Logs, rootwads, and large branches on the forest floor.
Drainage	An area (basin) mostly bounded by ridges or other similar topographic features, encompassing part, most, or all of a watershed.
Early-seral	The biotic community that develops immediately following the removal or destruction of the vegetation in an area. The stage in forest development that includes seedling, sapling, and pole-sized trees.
Edge	The place where different plant communities meet or where different successional stages or vegetative conditions within plant communities come together.
Element	A biotic or abiotic feature that is a component of a habitat patch, but which occurs somewhat independent of overall patch conditions.
Eleven (11) HPAs	The area encompassed by the 11 Hydrographic Planning Areas identified in Appendix A of the EA.
Endangered	A plant or animal that is in danger of extinction throughout all or a significant portion of its range.
Enhancement of Survival Permit (ESP)	A permit issued by the Service(s) pursuant to ESA Section 10(a)(1)(A) for any act that enhances the propagation or survival of a listed species and that would otherwise be prohibited by ESA Section 9. The permit that authorizes incidental take of species covered by a CCAA.
Even-aged	A forest stand composed of trees with less than a 20-year age difference.
Even-aged management	The application of a combination of actions that results in the creation of stands in which trees of essentially the same age grow together. Clearcut, shelterwood, or seed tree cutting methods produce even-aged stands.

Evolutionarily Significant Unit (ESU)	A population (or group of populations) that is substantially reproductively isolated from other population units of the same species, and represents an important component in the evolutionary legacy of the species.
Extirpate	The elimination of a species from a particular area.
Feasible	Capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, operational, and technological factors, and considering what is allowable under law.
Forest fragmentation	Isolating or breaking up large tracts of forest as a result of natural events (such as wildfire) or by the implementation of timber management or other human activities.
Forest management	Activities undertaken for the purpose of harvesting, traversing, transporting, protecting, changing, replenishing, or otherwise using forest resources.
Green Diamond's ownership	Commercial timberlands that Green Diamond owns in fee and lands owned by others subject to Green Diamond harvesting rights.
Ground-based yarding	Movement of logs to a landing by use of tractors, either tracked or rubber tired (rubber tired skidders) or shovels (hydraulic boom log loaders).
Habitat	The place, natural or otherwise, (including climate, food, cover, and water) where an animal, plant, or population naturally or normally lives and develops.
Habitat Conservation Plan (HCP)	As defined in the Services' HCP Handbook, a planning document that is a mandatory component of an application for an Incidental Take Permit under ESA Section 10(a)(1)(B). The document that, among other things, identifies the operating conservation program that will be implemented to minimize, mitigate, and monitor the effects of incidental take on the species covered by a Section 10(a)(1)(B) permit.
Harass	A form of take under the Federal Endangered Species Act; defined in Federal regulations as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR 17.3). The Department of Commerce/NOAA Fisheries has not defined "harass" by regulation.
Harm	A form of take under the Federal Endangered Species Act; defined in Federal regulations as an act that actually kills or injures wildlife. Such acts may include significant habitat modification or degradation when it actually kills wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

Harvesting	All activities necessary to cut, remove, and transport timber products from the Action Area. Also see Timber Harvesting.
Harvesting rights	Rights to conduct timber operations on lands owned in fee by another. Short-term harvesting rights generally expire upon the conclusion of timber operations, upon a date certain, or a combination of the two. Perpetual harvesting rights pertain to existing and subsequent crops of timber and continue without expiration.
Heel-boom loader	A stationary piece of log loading equipment located on roads and landings, similar to a construction crane, that uses a crane-like grapple to deck, move, and load logs onto log trucks from one central pivot point.
Hydrographic Planning Area (HPA)	The hydrographic areas and hydrologic units that encompass Green Diamond's California ownership and surrounding lands in common watersheds.
Implementation Agreement (IA)	An agreement between the Service(s) and the incidental take permittee(s) that identifies the obligations of the parties, identifies remedies if parties fail to meet their obligations, provides assurances to the Service(s) that the conservation plan will be implemented, and provides assurances to the permittee(s) that implementation of the plan satisfies ESA requirements for the species and activities covered by the plan and permit.
Incidental take	Take of any Federally listed or State-listed wildlife species that is incidental to, but not the purpose of, otherwise lawful activities.
Incidental Take Permit (ITP)	Permit issued by the USFWS or NMFS pursuant to Section 10(a)(1)(B) of the ESA to a non-Federal entity (State, tribe, private landowner) that authorizes incidental take of a threatened or endangered species named on the permit. The permit also requires the permittee to develop, fund, and implement a Habitat Conservation Plan (HCP) that minimize and mitigate the impacts of incidental take.
Issuance criteria	The criteria specified in the ESA and Federal regulations for issuance of an ITP or ESP; also, the criteria specified in the CCAA policy for an ESP.
ITP species	The covered species for which Green Diamond is seeking an ITP or ESP.
Landings	The areas where harvested trees are gathered (through skidding or yarding) for subsequent transport out of the forest.
Landscape	An area composed of interacting ecosystems that are variously repeated in response to geology, landform, soils, climate, biota, and human influences throughout the area.
Large woody debris (LWD)	Larger pieces of wood in stream channels or on the ground, including logs, root wads, and large chunks of wood, that provide important biological and physical functions.

Late-seral	The stage in forest development that includes mature and old-growth forest.
Late-successional	See “late-seral.”
Legacy conditions	Conditions that exist across the landscape that result from previous land and forest management activities.
Listed species	Species, including subspecies and distinct populations, of fish, wildlife, or plants listed as either endangered or threatened under Section 4 of the Federal Endangered Species Act or under the California Endangered Species Act.
Mature forest	A defined stand of trees for which the annual net rate of growth has culminated. Stand age, diameter of dominant trees, and stand structure at maturity vary by forest cover types and local site conditions. Mature stands generally contain trees with a smaller average diameter, less age-class variation, and less structural complexity than old-growth stands of the same forest type.
Maximum extent practicable	Term used in the ESA and Federal regulations to describe the level of impact minimization and mitigation required for incidental take of a listed species to be authorized under ESA Section 10(a)(1)(B).
Maximum sustained timber production	Harvest levels planned under CFPRs to balance forest growth and timber harvest over a 100-year period and to achieve maximum sustained production of high quality timber products while protecting resource values such as water quality and wildlife.
Merchantable	Trees or stands having the size, quality, and condition suitable for marketing under a give economic condition, even if not immediately accessible for logging.
Mid-seral	The period in the life of a forest stand from crown closure to first merchantability, usually at 8 inches dbh. Brush, grass, or herbs rapidly decrease in the stand because of stand density.
Minor forest products	Secondary forest materials including tree burls, stump products, boughs and greenery for wreaths and floral arrangements or similar purposes.
Multilayered	Term applied to forest stands that contain trees of various heights and diameter classes and, therefore, support foliage at various heights in the vertical profile of the stand.
Multistoried	See “multilayered.”
National Marine Fisheries Service (NMFS)	The Federal agency that is the listing authority for marine resources and anadromous fish under the Endangered Species Act.

Old-growth	A forest stand with moderate-to-high canopy closure; a multilayered canopy dominated by large overstory trees; a high incidence of large trees with large, broken tops, and other indications of decadence; numerous large snags; and heavy accumulations of logs and other woody debris on the ground.
Overstory	That portion of trees in a forest that forms the uppermost layer of foliage.
Permit	The Incidental Take Permit (ITP) issued by USFWS to Green Diamond pursuant to ESA Section 10(a)(1)(A).
Population	A collection of individuals that share a common gene pool.
Practicable	Defined in Section 404 Clean Water Act regulations as “capable of being done (or capable of achieving the project purpose and need), taking into account costs, existing technology, and logistics (40 C.F.R. § 230.10(a)(2)).” “Practicable” is not specifically defined in the Endangered Species Act.
Precommercial thinning	Thinning or pruning of dense young forest trees to achieve optimum diameter growth and increase the eventual value of the tree.
Prescribed burning	Introduction of fire under controlled conditions to remove unwanted brush, logging slash, or woody debris.
Rare	A State of California classification for a plant species that is not presently threatened with extinction, but the species, subspecies, or variety is found in such small numbers throughout its range that it may be endangered if its environment worsens.
Recovery	The process by which the decline of an endangered or threatened species is arrested or reversed, or threats to its survival are neutralized so that the species’ long-term survival in nature can be ensured.
Regeneration	The renewal of tree cover by natural or artificial means. Also the young tree crop (seedlings and saplings).
Registered Geologist	A person who holds a valid California license as a professional geologist pursuant to California’s Department of Consumer Affairs Geologist and Geophysicist Act.
Registered Professional Forester (RPF)	A person who holds a valid license as a professional forester pursuant to Article 3, Section 2, Division 1 of the California Public Resources Code.
Residual	A tree that remains standing after some event such as selection harvest.
Rookery	A nesting or roosting colony of gregarious birds.
Rotation	The planned number of years between the regeneration of an even-aged stands and its final cutting at a specified stage.

Rotation age	The age of a stand when it is harvested at the end of a rotation.
Salvage operations	The removal of dead trees or trees damaged or dying because of injurious agents other than competition, to recover economic value that would otherwise be lost.
Second-growth	Timber stands established after natural or human-caused removal of the original stand or previous forest growth.
Selection harvest	The removal of trees, individually or in small groups, from the forest.
Sensitive species	A species designated by the California Board of Forestry pursuant to 14 CCR 898.2(d). Currently, these species are bald eagle, golden eagle, great blue heron, great egret, northern goshawk, osprey, peregrine falcon, California condor, great gray owl, northern spotted owl, and marbled murrelet.
Seral stage	One of several successional stages of plant community development, beginning with an early seral stage, following a major disturbance, and ending with a late-seral stage near or at climax stage.
Shade tolerant trees	Tree species capable of reproducing under the shade of parent trees. These species have characteristics such as the ability to photosynthesize in limited light intensity and ability to withstand root competition from competing trees.
Silviculture	The specific methods by which a forest stand or area is harvested and regenerated over time to achieve the desired management objectives.
Single-tree selection harvest	The selection of individual trees for harvest, where new regeneration occurs in their place and all species represented in pretreatment stands are represented post harvest where feasible. Retention standards in stands after harvest are as follows: Site I – 125-square-foot basal area; Sites II and III – 75-square-foot basal area; Sites IV and V – 50-square-foot basal area.
Site index	A measure of forest productivity expressed as the height of the dominant trees in a stand at an index age.
Site potential tree height	The height that a dominant tree may attain given the site conditions where it occurs.
Size class	The categorization of trees into one of the following four dbh classes: seedling (<1"), sapling (1" to 4.9"), pole (5" to 11.9"), sawtimber (12" and larger).
Skid trail	An access cut through the woods for skidding logs with ground-based equipment. It is not a high enough standard for use by highway vehicles, such as a log truck, and is therefore not a road.
Slash	Woody residue left on the ground after trees are felled, or accumulated there as a result of a storm, fire, or silvicultural treatment.

Snag	A standing dead tree.
Special-status species	A species listed as threatened or endangered by the Federal or State government; classified as a California Species of Special Concern, a Federal Species of Concern, Rare, or a Board of Forestry Sensitive species; or designated a Fully Protected Species under the California Fish and Game Code.
Species	As defined in ESA Section 3(15), “the term ‘species’ includes any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife, which interbreeds when mature.” Also, a population of individuals that are more or less alike and that are able to breed and produce fertile offspring under natural conditions.
Species of concern	An informal means of referring to species listed as threatened or endangered under the Federal or State of California endangered species acts, classified as a Federal “species of concern” or State of California “species of special concern,” or classified as a “sensitive species” by the California Board of Forestry.
Stand	A group of trees that possesses sufficient uniformity in composition, structure, age, spatial arrangement, or condition to distinguish it from adjacent groups.
Status	The classification of a species regarding its position in the listing process under the State or Federal endangered species acts.
Stocking level	The degree to which trees occupy the land, measured by basal area or number of trees by size and spacing, compared with a stocking standard; that is, the basal area or number of trees required to fully use the land’s growth potential.
Stream	A natural watercourse with a well-defined channel and distinguishable bed and bank showing evidence of having contained flowing water indicated by deposit of rock, sand, gravel, or soil.
Sustained yield	The yield of commercial wood that an area can produce continuously at a given intensity of management. These yields are professionally planned to achieve over time a balance between growth and removal over time.

Take	Defined under Section 3(18) of the Federal Endangered Species Act as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct with respect to Federally listed endangered species of wildlife.” Federal regulations further define these terms and provide the same taking prohibitions for threatened wildlife species. Take of threatened and endangered species is prohibited under Section 9 of the Federal ESA. Defined under Section 86 of the California Fish and Game Code, take for solely State-listed species means “hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, capture, or kill.”
Terrace	A valley bottom landform composed of glacial or alluvial fill that occurs at a higher elevation than the active floodplain or channel migration zone.
Thinning	A treatment made to reduce stand density of trees primarily to improve growth, enhance forest health, or recover potential mortality.
Threatened	The classification given to a plant or animal species likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
Timber felling	Physically cutting a tree from its stump including cutting of the felled tree into predetermined log lengths.
Timber Harvesting	All activities necessary to cut, remove, and transport timber products from the Action Area. Also see Harvesting.
Timber Harvesting Plan (THP)	A plan describing a proposed timber harvesting operation pursuant tot 14 CCR Section 4582.
Tractor logging	Use of a tractor to carry logs from the harvest site to a landing.
Understory	Vegetation (trees or shrubs) growing under the canopy formed by larger trees.
Uneven-aged	A stand with trees of three or more distinct age classes, either intimately mixed or in small groups.
Uneven-aged management	The application of a combination of actions needed to simultaneously maintain continuous forest cover, recurring regeneration of desirable species, and orderly growth and development of trees through the range of diameter or age classes. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection.
Unlisted species	Fish, wildlife, or plant species not currently listed as threatened or endangered under the Federal or State Endangered Species Acts.

Watercourse and Lake Protection Zone (WLPZ)	A strip of land, along both sides of a watercourse or around the circumference of a lake or spring, where additional management practices may be required for erosion control and for protection of the quality and beneficial uses of water, fish, and riparian wildlife habitat. (14 CCR 895.1)
Watershed	The catchment area of land draining into a river, river system, or body of water; the drainage basin contributing water, organic matter, dissolved nutrients, and sediments to a stream or lake.
Windthrow	Trees blown down by wind; also called blowdown.
Yarding	A method of bringing logs to a roadside area or landing for truck transport.

CHAPTER 8

Index

A comprehensive index will be included in the next draft of this document.

APPENDIX A

Hydrographic Planning Areas

APPENDIX A

Hydrographic Planning Areas

The Action Area is located within eleven (11) Hydrographic Planning Areas (HPAs). The HPA areas are part of nine contiguous coastal drainage basins that encompass approximately 13.7 million acres in northwestern California and southern Oregon. Some of the HPAs represent a small proportion of the total area in the coastal basins of which they are a part, while others encompass the entire basin.

TABLE A-1
Hydrographic Planning Areas

HPA	HPA Acreage	Green Diamond Acreage Within HPA (Action Area)	Approximate Green Diamond Percentage of Total
Smith River Hydrographic Region	181,999	44,177	24.3
Coastal Klamath Hydrographic Region	108,150	88,760	82.16
Blue Creek Hydrologic Unit	80,303	15,393	19.2
Interior Klamath Hydrographic Region	128,006	66,139	51.7
Redwood Creek Hydrologic Unit	188,335	33,038	17.5
Coastal Lagoons Hydrographic Region	53,592	39,981	74.6
Little River Hydrologic Unit	29,703	26,041	87.7
Mad River Hydrographic Region	119,686	49,376	41.3
North Fork Mad River Hydrologic Unit	31,416	28,209	89.8
Humboldt Bay Hydrographic Region	138,719	17,484	12.6
Eel River Hydrographic Region	205,160	7,933	3.9
Total	1,265,069	416,532	32.9

APPENDIX B

Public Review Draft Distribution List

Public Review Draft Distribution List

Federal Government

U.S. Congress

Senator Dianne Feinstein
331 Hart Senate Office Building
Washington, D.C. 20510-0504

Senator Barbara Boxer
112 Hart Senate Office Building
Washington, D.C. 20510-0505

Congressman Mike Thompson
U.S. House of Representatives
119 Cannon House Office Building
Washington, D.C. 20515

National Parks

Supervisor
Redwood National Park
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Bureau of Land Management

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Local Boards of Supervisors

Board of Supervisors
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825 Fifth Street
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Board of Supervisors
County of Del Norte
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Local Organizations

Tribal Organizations

Hoopa Tribal Council
P.O. Box 1348
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Karuk Tribal Council
P.O. Box 1016
Happy Camp, CA 96039

Kara Brundin Miller
Smith River Rancheria
140 Rowdy Creek Road
Smith River, CA 95567

Yurok Tribal Council
190 Klamath Blvd
Klamath, CA 95548

Dan Gale
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Libraries

Eureka Main Library
1313 3rd Street
Eureka, CA 95501

Fortuna Branch
Humboldt County Library
775 14th Street
Fortuna, CA 95540

Arcata Branch
 Humboldt County Library
 500 7th Street
 Arcata, CA 95521

Del Norte County Library
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**U.S. Department of the Interior
U.S. Fish & Wildlife Service**

<http://www.fws.gov>



**Federal Relay
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Owl Photo Courtesy of John and Karen Hollingworth,
U.S. Fish & Wildlife Service

