

Environmental Consequences

4.1 Introduction

This chapter presents the results of the impacts analysis for the Proposed Action (i.e., the issuance of an ITP/ESP by the Services) and the alternatives. The impact assessment focuses on the potential beneficial and adverse effects on resources that could result from implementing the Proposed Action and alternatives. The resource categories included in this analysis are:

- Section 4.2 - Geology, Geomorphology, and Mineral Resources
- Section 4.3 - Hydrology and Water Quality
- Section 4.4 - Aquatic Resources
- Section 4.5 - Vegetation/Plant Species of Concern
- Section 4.6 - Terrestrial Habitat/Wildlife Species of Concern
- Section 4.7 - Air Quality
- Section 4.8 - Visual Resources
- Section 4.9 - Recreational Resources
- Section 4.10 - Cultural Resources
- Section 4.11 - Land Use
- Section 4.12 - Social and Economic Conditions

The AHCP/CCAA conservation strategy is designed to: (1) minimize and mitigate to the fullest extent practicable the impacts of take that could occur to listed covered species; and (2) avoid or minimize potential impacts to unlisted covered species to the extent that any authorized take, if the species become listed in the future, will not appreciably reduce the likelihood of survival and recovery in the wild of the species. On the basis of the assessment of direct and indirect impacts presented in this chapter, it is anticipated that implementing the proposed AHCP/CCAA or the action alternatives is anticipated not to result in significant adverse environmental impacts.

In addition to meeting the conservation strategy objectives stated above, the proposed AHCP/CCAA would also improve the overall condition of habitat for the covered species in the Action Area. Implementation of the AHCP/CCAA would contribute to the development and maintenance of properly functioning habitat and, therefore, would also help to preclude the possible need to list unlisted covered species in the future. Implementing the proposed AHCP/CCAA or the action alternatives would result overall in net benefits to the environment and would meet the requirements of Section 10 of the ESA.

Because the overall effects of implementation would generally result in net environmental benefits, it is anticipated that implementing either the proposed AHCP/CCAA or the alternatives in conjunction with other management actions (see Section 4.1.2, *Cumulative Impacts*) would not result in cumulative impacts, but would result in cumulative beneficial effects when compared to the No Action Alternative.

4.1.1 Scope of Analysis

The physical scope for analysis in this EIS is the Primary Assessment Area, which includes 683,673 acres of commercial timberlands within those portions of the 11 HPAs where Simpson operates or could operate in the future. (See Figure 4.1-1. Areas labeled in Figure 4.1-1 as “Simpson” and “Other Commercial Timberland” represent the Primary Assessment Area.) The HPA areas are described in detail in Section 3.1 and throughout Chapter 3. As discussed in greater detail in Sections 5 and 7 of Simpson’s proposed AHCP/CCAA, general habitat and relevant environmental conditions, as well as the potential impacts to the covered species, are sufficiently similar across the Primary Assessment Area to support the application of conservation measures contained in the proposed AHCP/CCAA on any lands on which Simpson operates within the 11 HPAs during the term of the permits. For purposes of analysis, site-specific information on Simpson-owned lands have been extrapolated to other commercial timberlands within the Primary Assessment Area. In addition to the Primary Assessment Area, the analysis of Alternative C (see Sections 2.5 and 3.1) includes an additional 26,116 acres of rain-on-snow area.

For purposes of assessing cumulative impacts, the assessment area is the 11 HPAs (plus the additional 26,116 acres of rain on snow for Alternative C). The Council on Environmental Quality (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). As discussed in Section 4.1.2, the area of assessment for cumulative impacts is the 11 HPAs.

Direct, indirect, and cumulative impacts (both beneficial and adverse) are assessed for the Proposed Action and alternatives in both the Primary Assessment Area and the additional Alternative C areas. For the No Action Alternative, potential effects are discussed in terms of trends and future conditions. The analysis of potential impacts focuses on the covered species, their habitat, and other resources that could be affected by the Proposed Action or action alternatives.

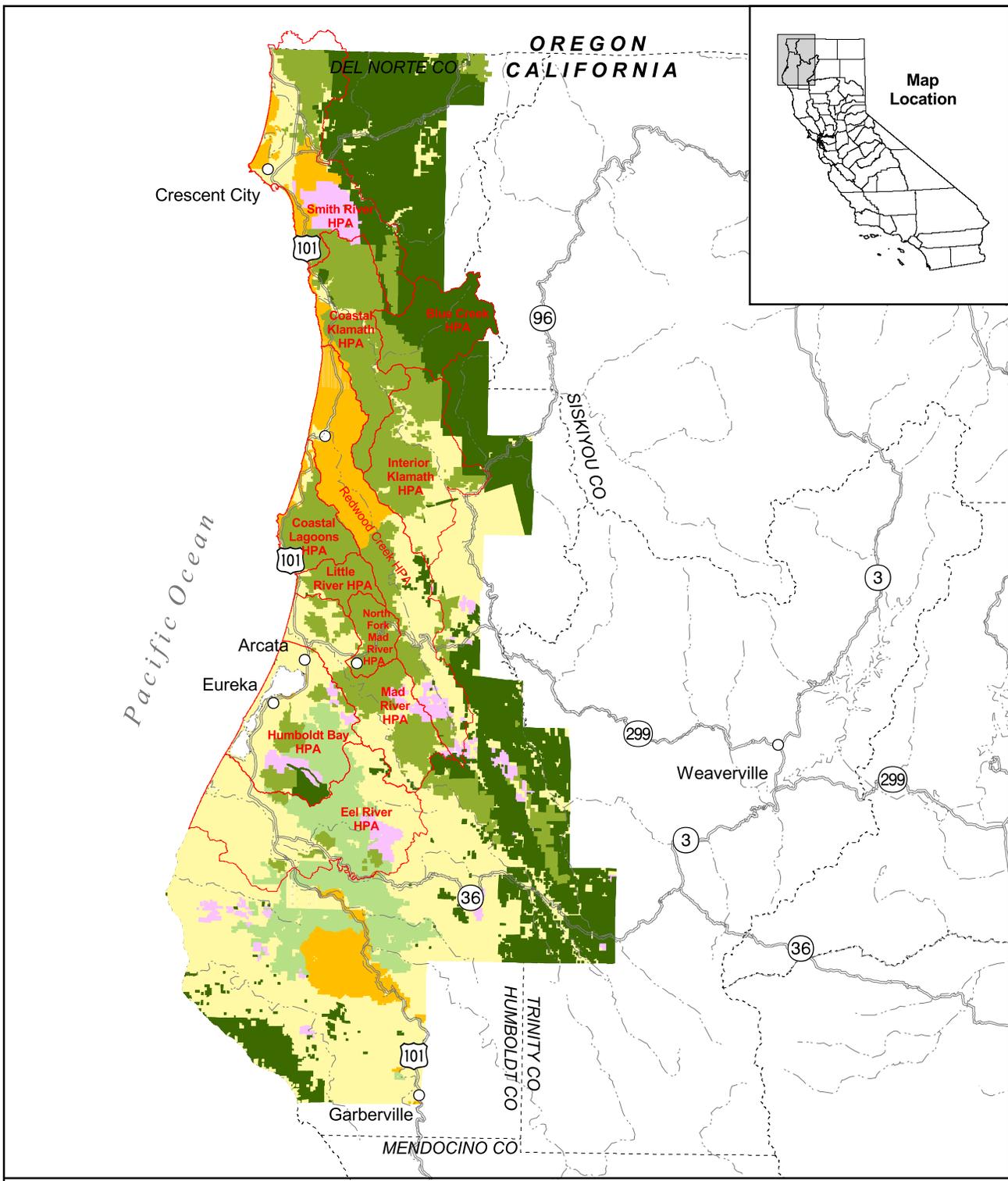
CEQ regulations implementing NEPA require that the analysis of potential impacts resulting from implementation of the Proposed Action and other action alternatives include a discussion of any adverse environmental effects which cannot be avoided, the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and any irreversible or irretrievable commitments of resources which would be involved. (40 CFR Section 1502.16). Because the effects on these three concepts would be the same for all alternatives, these concepts are not analyzed further in this document.

4.1.2 Cumulative Impacts

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



- LEGEND**
- SIMPSON RESOURCE COMPANY
 - PACIFIC LUMBER COMPANY
 - OTHER COMMERCIAL TIMBERLAND
 - USFS AND BLM
 - STATE AND NATIONAL PARKS
 - OTHER
 - HYDROGRAPHIC PLANNING AREAS
 - COUNTY BORDER
 - RIVERS
 - MAJOR ROADS
 - CITIES



10 0 10 Miles
SCALE IS APPROXIMATE

**Figure 4.1-1
Regional Land Ownership**

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 range of alternatives considered must include the No Action Alternative as a baseline against which to evaluate cumulative effects.

For the purposes of this EIS, significant cumulative impacts would occur if incremental impacts of the Proposed Action (or the alternatives) added to the environmental impacts of past, present and reasonably foreseeable actions (identified below), to result in an adverse significant effect to regional resources. For an impact to be considered cumulative, these incremental impacts and potential 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). Potential cumulative impacts are assessed within the separate resource area sections in this chapter (see Section 4.1).

4.1.2.2 Other Actions Assessed in the Cumulative Impacts Analysis

In consideration of actions to include in the cumulative impacts assessment in this EIS, past, present, and reasonably foreseeable future actions that have the potential to combine with incremental effects of the Proposed Action (or alternatives), if any, to result in cumulative impacts, are those that:

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

On the basis of these criteria, several actions have been identified as having a similar character to the Proposed Action and alternatives and/or having the potential to generate incremental environmental impacts that, when addressed collectively with the impacts of the Proposed Action or other action alternatives, could result in cumulative impacts. As part of the process of determining the projects or actions that could result in cumulative impacts, the range of activities with the potential to result in cumulative impacts to the environment was researched. One of the key criteria for determining if an activity would be included in the cumulative impacts assessment is whether a proposal was undergoing review in an EIS or being evaluated in a state environmental review document. Another criterion for inclusion is whether an action or project was the subject of a permit application or undergoing permit review. As a result of the identification process, other regional actions within the 11 HPAs (i.e., implementation of the *Northwest Forest Plan* [NWFP] on federal lands and continuation of management practices on lands managed by the State of California and the National Park Service) are included in the cumulative effects analysis. It is important to note that other actions may be in the planning stages or in other preliminary formulation processes (i.e., not subject to current environmental or permitting review), and these efforts would not be addressed in the context of this EIS.

In addition, 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 streamside and upslope activities on these lands that could affect aquatic resources are extremely limited.

The other regional management actions are described below and the cumulative impact of these actions in combination with the Proposed Action are assessed at the end of the resource sections in this chapter.

Continued Implementation of the CFPRs on Non-Simpson Commercial Timberland

This management regime is characterized by application of the CFPRs on non-Simpson commercial timberland throughout the 11 HPAs, as well as the rain-on-snow areas of Simpson ownership outside the HPAs (except under Alternative C). With the exception of the *Pacific Lumber Company (PALCO) Multi-species HCP* (PALCO HCP) (Pacific Lumber Company, 1999), no other company-specific conservation strategy for the management of aquatic or terrestrial wildlife habitat is known to exist within the 11 HPAs. On non-Simpson and non-PALCO commercial timberlands within the 11 HPAs, therefore, CFPRs (as described in Sections 1.5.3 and 2.1), would continue to be implemented under all the alternatives.

Continued Implementation of Conservation Measures Contained in the PALCO Multi-Species HCP on PALCO Lands

On PALCO lands within the southern most portion of the Primary Assessment Area, the CFPRs are supplemented by additional measures contained in the PALCO HCP. The PALCO HCP covers approximately 211,000 acres of commercial timberland in Humboldt County, much of which is located within the Humboldt Bay and Eel River HPAs. The aquatic conservation strategy contained in the PALCO HCP establishes riparian management zones (RMZs) that extend out to 170 feet and 100-130 feet on Class I and Class II streams, respectively. RMZ widths may change based on watershed analysis, extending to 170 feet on both Class I and II streams. The RMZs include an inner no-cut area and an outer band of selective harvest where no even-aged management is allowed. The use of heavy equipment is excluded from the riparian zones. Conservation measures also include limitations on wet weather use of roads, progressive stormproofing of existing logging roads, and special timber harvesting restrictions on potentially unstable areas and steep slopes that are designed to minimize the potential for sediment delivery to streams as a result of forest management operations. Additional watershed-specific restrictions may also apply based on results of watershed analyses that are ongoing.

The PALCO HCP conservation strategy also establishes a series of reserves that are large, contiguous areas of second growth and old growth surrounding the major remaining stands of uncut old-growth redwood on the ownership. Timber harvesting within these reserves is limited to habitat enhancement projects to benefit the marbled murrelet over the 50-year permit term (1999-2049). Outside of the reserve areas PALCO will implement silvicultural prescriptions that favor attainment of mature forest conditions within a 300-foot selective harvest buffers on PALCO property adjacent to old-growth redwood in state parks. Additional wildlife protections for the northern spotted owl, bald eagles, and requirements for snag and downed log retention will also be implemented.

Continued Implementation of Aquatic and Riparian Resource Guidelines Contained in the Northwest Forest Plan on Federal Lands

The NWFP 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.

Management within State and Federal Parks

Current management programs exist for lands managed by the State of California and the National Park Service outside the Primary Assessment Area but within the 11 HPAs. Essentially no commercial timber harvesting occurs on these state and federal lands; thinning of some timber stands may occur occasionally for stand improvement purposes. In addition, streamside and upslope activities that would affect aquatic resources are extremely limited and consist primarily of road and trail construction and use.

Representative land ownership for the actions noted above (as a percentage of total HPA acreage) for the HPAs addressed in this EIS 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

HCP	Simpson	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	80.6	0.0	2.3	3.1	5.6	8.4
Coastal Lagoons	74.6	0.0	0.7	0.0	6.4	18.3
Interior Klamath	51.7	0.0	0.0	6.4	0.3	41.6
Mad River	41.4	0.3	5.0	1.0	0.0	52.3
Smith River	22.6	0.0	14.7	20.1	15.8	26.8
Blue Creek	19.1	0.0	0.0	47.3	0.0	33.6
Redwood Creek	17.6	0.0	3.5	3.4	41.5	34.0
Humboldt Bay	12.6	22.2	6.8	6.2	0.2	52.0
Eel River	3.9	27.9	4.4	0.5	0.0	63.3

4.2 Geology, Geomorphology and Mineral Resources

The purpose of this section is to evaluate the potential impacts to geology, geomorphology, and mineral resources from implementing the Proposed Action (the conservation measures in the proposed AHCP/CCAA) and alternatives, including the No Action Alternative.

Geomorphology and geologic resources in the Primary Assessment 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*).

Overall, the Proposed Action would reduce the potential to deliver sediment to Primary Assessment Area watercourses from existing sediment sources (e.g., from existing roads and skid trails) by implementing the riparian management and slope stability measures (Sections 6.2.1 and 6.2.2 of the AHCP/CCAA), ownership-wide Road Management Plan (Section 6.2.3 of the AHCP/CCAA), harvest-related ground disturbance measures (Section 6.2.4 of the AHCP/CCAA) and monitoring and adaptive management measures (Section 6.2.5 and 6.2.6 of the AHCP/CCAA). In addition, the Proposed Action would implement these measures on an ownership-wide basis, rather than on a THP-by-THP basis, throughout the Action Area. This would result in consistent and expedited application of the conservation measures compared to existing conditions or conditions expected to occur over time under the No Action Alternative.

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

- The extraction and processing of mineral resources (Section 3.2.5, *Mineral Resources*) in the Primary Assessment Area would not be affected by the Proposed Action or the other alternatives. Simpson's rock pits are generally fewer 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 Primary Assessment Area would be conducted in compliance with permitting and regulatory requirements of the CDFG and state agencies. These activities would be the same for the No Action Alternative, Proposed Action, and other action alternatives. Also, instream gravel extraction would not be a covered activity under the Proposed Action and other action alternatives.
- Wildfire prevention and suppression activities in the Primary Assessment Area would not be affected by the Proposed Action or the alternatives. 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 Simpson when and where necessary.
- The potential for soil compaction to result from implementing the Proposed Action or alternatives is negligible and, therefore, less than significant. Road design and placement, and proper management of runoff from roads are the major influencing factors in the potential for soil compaction. The proposed AHCP/CCAA includes an ownership-wide Road Management Plan that describes processes and standards for both decommissioning existing roads that contribute to sediment loading and constructing new roads in ways that minimize the potential for soil compaction (see Section 6.2.3 of the proposed AHCP/CCAA). These measures would eliminate the potential for soil compaction.

- Implementing the Proposed Action conservation measures or the alternatives would not have any influence on the likelihood or magnitude of earthquakes or volcanic eruption; therefore, these events are not assessed in detail in this EIS.

4.2.1 Methodology

Geologic maps and watershed maps developed by the California Geologic Service (CGS) (formerly known as the California Division of Mines and Geology [CDMG]), CDF, and the U.S. Geological Survey (USGS) indicate the location of potentially unstable geologic features. However, the geologic and watershed maps and THPs that are currently available provide only partial coverage of the Primary Assessment Area. As a result, the quantification of impacts to geology and geomorphology for the entire Primary Assessment Area is limited to the analysis and assumptions discussed below. Potential adverse impacts include acute or chronic changes in geomorphic and hydrologic processes that affect soil productivity, and delivery of surface materials to streams and rivers in the Primary Assessment Area. Potential effects could be localized or dispersed over a wide area. The following subsections focus on: (1) the likelihood that slope stability and the rates of hillslope mass wasting and sediment delivery would change under the Proposed Action and other alternatives; (2) the effects of those changes; and (3) measures for avoiding potentially significant impacts or reducing them to insignificance.

4.2.2 No Action Alternative

Under the No Action Alternative, Simpson would continue to conduct timber harvesting and related operations in the Action Area, in accordance with the measures described in Section 2.1 of this EIS. NMFS and USFWS would not issue Simpson an ITP or ESP, and Simpson would not implement an AHCP/CCAA.

Forest management practices can affect slope stability and increase the potential for hillslope mass wasting by changing vegetative cover, hillslope shape, and water flow above and below the ground surface. Different forest management operations have distinct effects on the factors that control slope stability and hillslope mass wasting. The actual influence of specific forest management activities on slope stability, however, depends on topography, geologic material strengths, patterns of surface and subsurface flow, patterns of water inflow, the design and construction of the road network, harvesting practices that account for the density of residual trees and understory vegetation, and the rate and type of revegetation (Sidle et al., 1985; Yoshinori and Osamu, 1984).

Although distinguishing the effects of timber harvesting from the associated forest road system (including yarding and skid roads) can be difficult, most studies indicate that the sediment inputs from timber harvesting alone are substantially less than those from the associated road systems (Raines and Kelsey, 1991; Best et al., 1995). Correspondingly, landslide rates and hillslope mass wasting associated with roads are greater than landslide rates associated with timber harvesting alone (Sidle et al., 1985).

Under the No Action Alternative, sediment delivery would be reduced primarily through continued implementation of Simpson's practices as described in Section 2.1.1.3, that include employment by Simpson of best management practices (BMPs) based on techniques described in Weaver and Hagans (1994), and treatment of road sediment delivery sites

prioritized using a formal assessment methodology. Generally, roads would be upgraded to meet current standards when they are used to gain access to and haul logs from individual THP units. Some legacy roads would also be decommissioned. In combination, these practices will result in a trend towards a reduction in road-related hillslope mass wasting, surface erosion, and sediment delivery over time. (Also see Section 4.3, *Hydrology and Water Quality*, and Section 4.4, *Aquatic Resources*, for a discussions of impacts to hydrology/water quality and aquatic resources.)

Recognition of landslide-prone terrain and minimization of management practices that are known to increase the potential for hillslope mass wasting would also contribute towards minimizing the risk of sediment delivery from unstable areas and geologic features. Under the No Action Alternative, Simpson foresters and geologists would survey the THP area during THP preparation to identify potentially unstable features using existing geologic maps, such as those developed by the CGS, CDF (e.g., North Coast Watershed Mapping), USGS, and other agencies. The geologist would then determine the areal extent of unstable features, where obvious, and assess the likelihood of sediment delivery (particularly sediment delivery to fish-bearing streams). Relying on existing guidelines and professional judgment, Simpson foresters and geologists would also identify and implement measures to minimize impacts from potential hillslope mass wasting events, surface erosion, sediment input from roads, and reduced stream-bank stability within the THP area. This process provides opportunities to identify unstable areas with the highest risk of sediment delivery to streams.

On the basis of continued emphasis by Simpson on (1) BMPs based on techniques described in Weaver and Hagans (1994); (2) utilization of a formal methodology for assessing and prioritizing low-, moderate-, and high-risk sediment delivery sites on roads; and (3) identification of high-risk unstable areas and minimization of management practices on these areas within THP units, it is anticipated that impacts to geology and soils under the No Action Alternative would be reduced over the entire Action Area over time, compared with existing conditions.

4.2.3 Proposed Action

The overall amount of sediment delivered to Class I streams in the Primary Assessment Area would likely be reduced further as a result of implementation of the conservation measures under the Proposed Action, than it would under the No Action Alternative or existing conditions. These conservation commitments are included as part of the proposed harvesting and management activities (Section 2.2.4, *Covered Activities*) described in Simpson's proposed AHCP/CCAA.

The conservation measures to reduce impacts to geology and soils under the Proposed Action fundamentally differ from the No Action Alternative in two ways:

- Some measures (i.e., road management measures) to reduce sediment delivery under the Proposed Action would be applied consistently within the Action Area, whereas the No Action Alternative would apply conservation measures on a THP-by-THP basis (see Section 4.2.2).

- In addition to the CFPR procedures to address unstable hillslope features and other areas, the Proposed Action would include conservation measures designed to minimize erosion and sediment-causing activities throughout the Primary Assessment Area.

Four primary sediment-input processes were identified that have the potential to impact the geology and geomorphology of the Primary Assessment Area. The processes are:

- Surface erosion
- Hillslope mass wasting
- Reduced bank stability
- Road related sediment production

The following sections discuss measures and prescriptions, specified in the Proposed Action, to mitigate these sediment-input processes.

4.2.3.1 Surface Erosion

The Proposed Action prescriptions that address surface erosion are the riparian conservation measures and harvest-related ground disturbance measures.

Within the Primary Assessment Area, surface erosion is characterized by a gradual, typically water-driven, two-part process that involves grain detachment and grain transport. Surface erosion can occur as a sheet process (which is typically difficult to recognize in the field) or as a rill and gully forming process (which is typically more readily identifiable) (Swanston, 1991). Surface erosion is most likely to occur in the Primary Assessment Area where bare mineral soil is exposed or Hortonian overland flow occurs (e.g., when the precipitation rate exceeds the infiltration capacity).

Grain detachment typically results from mechanical disturbance, such as rain-drop impact, or by overland flow, but may be facilitated by other mechanical influences such as ground disturbance by animals and harvest-related ground disturbance. Detached soil grains are typically transported by water, either by entrainment or suspension in overland flow, or by siltation.

Sediment delivery from hillslope erosion is of most concern on slopes that are adjacent to watercourses, although erosion does occur higher on the hillslope and within harvest units. Hillslopes adjacent to a watercourse are more likely to deliver sediment to that watercourse through erosion processes than hillslopes distant from that watercourse. This is because of the relative transport distance necessary to deliver sediment to the watercourse and the relative likelihood that, within those distances, eroded sediment will be stored on the hillslope. Naturally, the farther a grain has to travel, the more likely it is that it would be deposited on a hillslope before being delivered to a watercourse.

Under the Proposed Action, the RMZ conservation measures are designed to impede sediment delivery in areas where sediment would have relatively short transport distances to watercourses. These measures include minimum overstory canopy-retention standards within RMZ inner and outer zones, limitations on equipment use, and retention of trees judged to be critical to maintaining bank stability (see Section 6.2.1 of the AHCP/CCAA). Vegetation is well documented as an effective means of erosion prevention and control because it absorbs the impact of rain drops, reduces runoff velocity, increases water

percolating into the soils, and binds soils with roots (Goldman et al., 1986; Gray and Sotir, 1996). Vegetative buffers are also effective in preventing or impeding eroded sediment from reaching watercourses, which is, in part, why waterbars are often designed to be discharged into vegetation rather than onto bare slopes. Vegetative buffers on toe slopes have also been observed to intercept sediment from upslope landslides.

The harvest-related ground disturbance conservation measures (Section 6.2.4 of the AHCP/CCAA) are specifically designed to minimize management-related surface erosion. In particular, there are operational restrictions on silvicultural and logging activities during those time periods when timber operations have a greater potential for sediment delivery to watercourses. The time period restrictions allow only those harvest activities with relatively low ground disturbance (and associated low potential for surface erosion), such as certain ground-based yarding (not requiring constructed skid trails) and skyline and helicopter yarding, to be conducted during the winter period. Those harvest activities that have the potential to create more ground disturbance (e.g., skid trail construction and mechanized site preparation) are limited to the summer period, with some activities (e.g., ground-based yarding with tractors, skidders, or forwarders) extending into the early spring or late fall if certain favorable climatic conditions occur. More closely spaced waterbreaks are required on highly erodible soil types upslope of RMZs or EEZs where skyline yarding roads require treatment. In addition, some harvest-related ground disturbance measures focus on minimizing ground disturbance and the associated exposure of bare mineral soil within harvest units.

4.2.3.2 Hillslope Mass Wasting

In general, sediment production from hillslope mass wasting within the Primary Assessment Area is greatest in RMZs, steep streamside slope management zones (SMZs), headwall swales, and deep-seated landslides (see Section 3.2.3.3, *Landslide Classification and Landslide-Prone Terrain*). The Proposed Action includes slope stability conservation measures that would:

- Prohibit timber harvesting within the “inner zone” of all Class I RMZs and 2nd order or larger Class II RMZs that are located below designated “steep streamside slope management zones” (SMZs) (see Sections 6.2.2.1 and 6.3.2.1 of the proposed AHCP/CCAA), except for purposes of creating cable-yarding corridors when other options are impractical. (RMZ areas located below an SMZ are referred to as RSMZs in the proposed AHCP/CCAA.) Retention of a minimum 85 percent canopy closure would be required in Class I and 2nd order or larger Class II RSMZ “outer zones.”
- Allow limited timber harvesting within the first 1,000 feet of a 1st order Class II RSMZ inner zone subject to 85 percent canopy closure retention post-harvest. A minimum 75 percent canopy retention within the first 1,000 feet of a 1st order Class II RSMZ outer zone would also be required. (See Section 6.2.2.1 of the proposed AHCP/CCAA.)
- Prohibit timber harvesting within the entire RSMZ for the Coastal Klamath and Blue Creek Hydrographic Regions.
- Use single-tree selection as the initial silvicultural prescription within SMZs and headwall swales. In addition, one harvesting entry would be allowed within SMZs and headwall swales for the term of the permit. All hardwoods within SMZs and headwall

swales would be retained and, wherever possible, Simpson would provide for even spacing of unharvested conifers such that all species and size classes represented in pretreatment stands would generally be represented post harvest.

- Establish no-cut zones within the toe, and 25 feet upslope from the top of the toe of active deep-seated landslides, except for purposes of creating cable-yarding corridors when other options are impractical. Similarly establish no-cut zones upslope of the deep-seated landslide scarp so as to taper to the lateral margins of the scarp.
- Prohibit timber harvesting within the boundaries of shallow rapid landslides, and retain a minimum 70 percent overstory canopy within 50 feet above and 25 feet on the sides of shallow rapid landslides. This default prescription may be modified subsequent to a site-specific geologic review.

As under the No Action Alternative, Simpson foresters and geologists would survey THP areas to determine whether portions of these meet the CFPR definition of unstable areas. In addition to these measures, under the Proposed Action, Simpson foresters and geologists would determine if portions of the THP area meet the AHCP/CCAA's definition of unstable features. In particular, Simpson foresters and geologists would determine if a survey area contains headwall swales; steep streamside slopes; or historically active, deep-seated landslides. Forest management activities conducted in the vicinity of these unstable geologic features could increase the potential for hillslope mass wasting and sediment delivery.

During THP development, Simpson's registered professional forester would do one of the following when he or she determined that any portion of the THP met the definition of a steep streamside slope; headwall swale; or historically active, deep-seated landslide:

- Impose the default prescription applicable to that feature as set forth above, or
- Retain a California-registered geologist to:
 - Evaluate the likelihood that timber harvesting operations will cause, or significantly elevate the risk of causing or reactivating, landslides within the prescription zone that will likely result in sediment delivery to watercourses; and
 - Work with the RPF to prepare a more cost-effective, site-specific alternative to the default prescription designed to minimize that likelihood and minimize and mitigate potentially significant impacts on the covered species from sediment delivery resulting from landslides caused or exacerbated by timber harvest operations. Alternative prescriptions can be applied to any of the MWPZs except RSMZs. A qualified biologist will be involved in evaluating the potential biological consequences whenever a more cost effective alternative to the default prescription is proposed.

The alternate approach could be applied to portions of any SMZ outside of RMZs, field verified headwall scarps, or historically active, deep-seated landslides. THPs for which a geologic report has been prepared (and whose conclusions allow for measures other than those specified in the AHCP/CCAA) would be identified as such when submitted for review by CDF and other agencies. A THP map and letter of notice that describes the

alternative prescriptions would be sent to the Services when a THP with alternative prescriptions is proposed.

The AHCP/CCAA conservation measures are based on the following assumptions:

- Implementing harvest-related activities on any unstable feature that meets the definition of a headwall swale; steep streamside slope; or historically active, deep-seated landslide poses a certain level of environmental risk
- Applying the AHCP/CCAA measures to harvesting activities on that feature will achieve at least a 70 percent reduction in management-related sediment delivery from landslides relative to appropriate historical clearcut reference areas.

The goal of the steep streamside slope conservation measures in the proposed AHCP/CCAA is to reduce management-related landslide occurrences and contribute to decreased sediment loads, which will minimize the possible effects of management-related sediment input on the covered species from mass-soil movement. Applying the default prescriptions and the site-specific protocols (i.e., analyzing site-specific conditions and developing appropriate avoidance and conservation measures) of the Proposed Action would provide protections that exceed those of the No Action Alternative over the entire Action Area over time.

4.2.3.3 Reduced Streambank Stability

Erosion and landsliding of watercourse banks can potentially result from forest management operations. This can be the result, in part, of increased peak-flow intensity and duration, as well as reduced root reinforcement of total soil cohesion. As discussed in Section 4.3, *Hydrology and Water Quality*, peak flows are not expected to significantly change with implementation of the Proposed Action. The riparian conservation measures for Class I and II watercourses that require retention of 85 percent canopy closure in the RMZ inner zone and prohibit harvesting of trees that are likely to recruit to stream channels, plus Tier B Class-III measures that require retention of trees that are judged to be critical to maintaining bank stability, will likely lead to increased bank stability under the Proposed Action. In addition, implementation of the general riparian conservation measures under the Proposed Action is expected to contribute to streambank stabilization and reduced erosion.

4.2.3.4 Road Related Sediment Production

The Proposed Action identifies road-related erosion and road-related hillslope mass wasting as major contributors to the sediment budget in most managed watersheds. To address potential road-related sediment production, the proposed AHCP/CCAA includes road management conservation measures for both new and existing roads (see Section 6.2.3 of the AHCP/CCAA). These measures include: (1) specifications and standards for the location, design, timing, and construction of new roads; (2) methods to conduct a road-related risk assessment of primary sediment-delivery sources; (3) road decommissioning; and (4) standards and criteria for the upgrading and management of roads.

The proposed ownership-wide Road Management Plan provides for:

- A methodology to classify roads on the basis of use and to prioritize road work and site-specific repairs

- Improved standards for road repairs and upgrades relative to the No Action Alternative
- Improved standards for stream crossing, and culvert repairs and upgrades relative to the No Action Alternative
- Improved standards for temporary and permanent road decommissioning relative to the No Action Alternative
- A training program for equipment operators and supervisors on the Road Management Plan and other AHCP/CCAA standards and practices
- A net reduction in road density at the end of the permit term

The proposed Road Management Plan also provides for accelerated repair of high- and moderate-risk sediment delivery sites on roads on the Simpson fee ownership. These road-related conservation measures would reduce road-related sediment production, resulting in benefits to Primary Assessment Area streams because of reduced potential for sediment delivery. In addition, the reduction in sediment production and delivery under the Proposed Action would be greater than the reduction anticipated under the No Action Alternative because the Proposed Action measures emphasize strategic identification and classification of roads targeted for improvement. Under this alternative, high- and moderate-risk sediment delivery sites on the entire ownership would be addressed using an accelerated program. (Under the No Action Alternative, high- and moderate-risk sediment delivery sites would not receive accelerated treatment.) Under the Proposed Action, therefore, the incremental net benefit to water quality through reduced road-related sediment input is greater than the net benefit that is expected to occur under the No Action Alternative.

Simpson has performed a general assessment of its ownership within the Action Area that identifies road-related sediment sources requiring treatment (e.g., stabilization of dirt or other remediation to prevent road-related, sediment-producing failures or hillslope mass wasting events). At the time the sediment model was run in 2002, Simpson estimated the volume of potential sediment associated with high- and moderate-risk sediment delivery sites (based on both the probability of delivery to watercourses and the sediment volume associated with such delivery) to be 6,436,000 cubic yards (see Appendix F of the AHCP/CCAA). Under the AHCP/CCAA, Simpson's proposed Road Management Plan is designed to provide treatment of all high- and moderate-risk sediment delivery sites over the term of the AHCP/CCAA, to minimize potential delivery of sediment to riparian and aquatic areas. In addition, in the AHCP/CCAA, Simpson commits to provide an average of \$2.5 million per year for the first 15 years of the AHCP/CCAA (for a total of \$37.5 million) to accelerate implementation of the treatments for the high- and moderate-risk sites. (The acceleration period would be adjusted following revision of the estimate of sediment yield from high- and moderate-risk sediment delivery sites at the end of the first five years following permit issuance. The acceleration period and monetary commitment could be adjusted (upward or downward) by up to 1.5 years and \$3.75 million depending on the revised estimate of sediment yield.)

On the basis of the current estimate of 6,436,000 cubic yards of soil requiring treatment, \$2.5 million per year for 15 years would result in 48 percent of the overall volume being treated in the first 15 years of the AHCP/CCAA (see Figure 4.2-1). This 48 percent equates to 3,058,000 cubic yards of sediment, which could otherwise wash into streams on or

adjacent to Simpson's ownership, being treated within the first 15 years of the AHCP/CCAA. (See Appendix F of the AHCP/CCAA). In contrast, if the road-related treatment was performed without the acceleration provided by the \$2.5 million per year commitment, fewer than 1,223,000 cubic yards would be removed during the first 15 years, as based on Simpson's anticipated timber harvest levels over the next 15 years. Implementation of the Road Management Plan under the Proposed Action would result in improved sediment control by accelerating the reduction of sediment loading compared to the rate at which sediment would be reduced under the No Action Alternative.

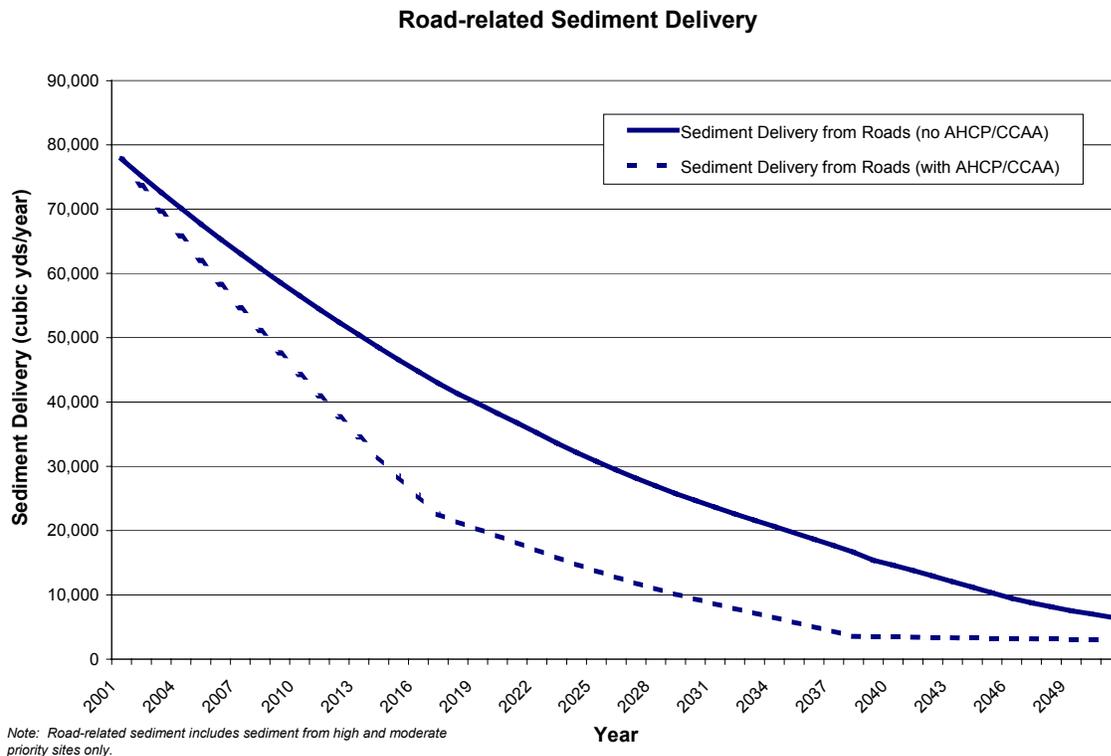


FIGURE 4.2-1
Road-Related Sediment Delivery

Figure 4.2-1 shows road-related sediment delivery asymptotically approaching 3,000 cubic yards per year during the last decade of the permit period. This suggests that the road management measures will not be 100 percent effective in controlling sediment associated with high- and moderate-risk sediment delivery sites. Some of the reasons why the road management measures will not be 100 percent effective are: (1) sediment delivery occurs before the site can be treated; (2) some sites are located in inaccessible areas where treatment is infeasible; and (3) the underlying geology and soils at the site preclude lowering the risk of sediment delivery, even with treatment.

As noted in the introduction to this section, the road-related conservation measures described above would be implemented within the Action Area on an accelerated basis, with anticipated application of protective new road design and existing road decommissioning, on a faster schedule than would occur under the No Action Alternative.

4.2.4 Alternative A

General timber harvesting and forest management activities, and road management and riparian conservation measures in the proposed AHCP/CCAA would remain the same under Alternative A as in the Proposed Action. As a result, potential impacts to the geology and geomorphology within the Primary Assessment Area would be the same (i.e., consistent and expedited coverage within the Action Area that results in improved conditions, expected to occur over time, compared with existing conditions and the No Action Alternative).

4.2.5 Alternative B

Under Alternative B, Simpson would continue to conduct timber harvesting on its property in accordance with existing regulations and management practices. Under Alternative B, existing measures implemented by Simpson would be supplemented by an AHCP/CCAA conservation strategy specific to this alternative. This strategy would include fixed riparian-buffer widths, within which no management or timber harvesting would occur, adjacent to Class I and II streams, and establishment of ELZs along Class III streams. Simpson would not implement a road management plan designed to accelerate reductions of sediment loading from priority sites on the ownership. Additional slope stability and ground disturbance measures also would not be implemented. Effectiveness monitoring would not be as extensive under this alternative as under the Proposed Action, and adaptive management with structured feedback loops would not be implemented.

Overall, implementation of Alternative B is anticipated to result in improved erosion and sediment control compared to existing conditions or to conditions anticipated to occur under the No Action Alternative, although the improvements would not be as great as those that would occur under the Proposed Action. Because Simpson would not implement a comprehensive, ownership-wide Road Management Plan, or slope stability or ground disturbance measures under this alternative, hillslope mass wasting would likely occur with more frequency and sediment volume to streams than would occur under the Proposed Action. Alternative B conservation measures would provide a degree of protection to geology and soils in the Primary Assessment Area above what would be anticipated under the No Action Alternative, but less than the degree of protection to geology and soils provided under the Proposed Action. Also, under Alternative B, sediment impacts would be addressed the same way as under the No Action Alternative, high- and moderate-risk sediment delivery sites would be addressed over the term of the AHCP/CCAA without an initial 15-year acceleration period, as provided under the Proposed Action and Alternative A.

4.2.6 Alternative C

Under Alternative C, general timber harvesting, forest management activities, road management, and riparian conservation measures would essentially be the same as the Proposed Action. Under Alternative C, adaptive management would provide a mechanism for strengthening or relaxing individual conservation measures in the rain-on-snow areas, if monitoring indicates, on the basis of specific performance criteria, that a change is necessary. Overall, implementation of Alternative C is anticipated to result in improved erosion and sediment control to existing conditions or to conditions anticipated to occur

under the No Action Alternative, although the improvements would not be as great as those that would occur under the Proposed Action. Simpson's commitment to provide \$2.5 million per year for the first 15 years of the AHCP/CCAA to accelerate implementation of treatments for high- and moderate-risk sediment delivery sites would be extended to include the additional 26,116-acre rain-on-snow areas under Alternative C. Because accelerated site treatments would be spread over a larger area, potential benefits would be diluted relative to what would be expected to occur under the Proposed Action. Also, since the adaptive management "account" for the Proposed Action would also apply to a larger area under Alternative C, potential benefits specific to adaptive management may also be diluted relative to what would be expected to occur under the Proposed Action. Implementation of Alternative C, therefore, would result in geomorphologic conditions comparable to or slightly less than the improved conditions that would result from implementing the Proposed Action.

4.2.7 Cumulative Impacts

The assessment of potential cumulative impacts on geology and geomorphology was conducted using the approach described in Section 4.1.2, *Cumulative Impacts*. The assessment area for cumulative impacts consists of the 11 HPAs that contain Action Area lands owned by Simpson and covered in its proposed AHCP/CCAA, as well as other lands that are predominantly either privately owned, administered by a federal-resource management agency, or state or federal park lands. There are four other predominant conservation or management strategies, besides Simpson's, that are being used in the 11 HPAs considered in this cumulative impact assessment (see Section 4.1.2, *Cumulative Impacts*, for a description of these strategies). Resource management strategies being applied in these HPAs, when combined with future management strategies that would be used by Simpson, have the potential to result in cumulative effects on geomorphologic processes. The purpose of this cumulative impact assessment is to evaluate the potential effects of these resource management strategies, including the Proposed Action of this EIS, on geomorphology in the 11 HPA assessment area.

As noted previously in this section, erosion and sediment control under the Proposed Action (and other action alternatives) would improve relative to existing conditions and the No Action Alternative. The overall benefits to geomorphology are expected to be slightly greater under the Proposed Action and Alternatives A and C than under Alternative B, because of differences (or, in some cases, absences) in a broad range of enhanced forest management practices and an adaptive management monitoring program with structured feedback mechanisms.

The eleven HPAs are a subset of nine contiguous coastal drainages that encompass 13.7 million acres in northwestern California and southern Oregon. Within these coastal drainages, Simpson's current HPA ownership constitutes as little as 3.9 percent and as much 86.9 percent of the total area. Simpson's ownership in the largest drainages (Klamath, Smith, and Eel Rivers) is concentrated near the coast and is very small relative to total basin size, limiting the influence of Simpson's operations on these watersheds. It is possible however, to have a proportionally larger impact on a coastal species within these drainages. Upstream factors including dams, water diversions, development, and commercial land uses such as agriculture and other (non-Simpson) timber management activities further reduce the

relative impact of Simpson's operations on these drainages. Some of the smaller watersheds, in contrast, are largely owned by Simpson, and Simpson's operations may be the main anthropogenic disturbance to these drainages.

The HPAs where incremental benefits would be greatest, because of implementing the Proposed Action or one of the action alternatives, are those where Simpson owns the greatest percentage of land (i.e., North Fork Mad River, Little River, Coastal Klamath, Coastal Lagoons, Interior Klamath, Mad River, and Smith River). Section 4.1.2, *Cumulative Impacts*, contains a detailed discussion of the acreage and ownership of all the land owners/managers considered in the cumulative impacts assessment. Incremental benefits would be relatively less in the Redwood Creek, Blue Creek, and Humboldt Bay HPAs, where Simpson ownership varies from about 10 to 20 percent of the total. Incremental benefits from Simpson management activities would be least, but still represent a positive influence on geomorphology, in the Eel River HPA, where Simpson ownership is less than 4 percent. These conclusions for the proposed AHCP/CCAA provide the basis for considering the incremental and cumulative effects of other actions in the HPAs. There are four other predominant conservation or management strategies, besides Simpson's, that are being used in the 11 HPAs considered in this cumulative impact assessment.

As noted in Section 1.5.3.1, continued implementation of the CFPRs on non-Simpson commercial timberlands within the 11 HPAs may not necessarily minimize potential impacts of activities that could otherwise result in hillslope mass wasting and sediment delivery. Forest practices operations conducted pursuant to this process in a particular area, land ownership, or region, however, may achieve such conditions.

Conservation measures associated with the PALCO HCP, like those being proposed by Simpson in its AHCP/CCAA, exceed the CFPR standards and are designed to minimize adverse geomorphologic effects using various prescriptions directed at riparian management, road management, and reduced sediment delivery from other upslope sources. The beneficial effects of the PALCO HCP on geomorphology would have a primary and positive influence on conditions in the Eel River and Humboldt Bay HPAs. These are the only HPAs being considered in this EIS where PALCO has significant ownership.

The USFS and/or BLM also manage federal lands in the Blue Creek and Smith River HPAs. Less than 7 percent of lands in the other HPAs are managed by either of these agencies. The resource management strategies on lands administered by the USFS and BLM include the continued implementation of guidelines contained in the NWFP for federal lands. These strategies do not allow timber harvesting or activities in wide, fixed-width riparian buffers before a completed watershed analysis, and are expected to result in incremental improvements to geomorphology within HPAs where the USFS/BLM administers public lands. Current protections for and benefits to geomorphology in those HPAs where federal agencies are the predominant land managers would be expected to continue into the future.

Incremental benefits associated with resource management on lands administered by the State of California and the National Park Service are most important in the Redwood Creek and Smith River HPAs, where state and federal park lands together comprise 41.5 percent and 15.8 percent of the total land ownership, respectively. Resource management strategies in parklands essentially allow no commercial timber harvesting. In addition, streamside and upslope activities that would affect water quality conditions are extremely limited.

Therefore, park management practices are anticipated to result in net benefits to geomorphology.

Overall, the cumulative effect of all of these resource management programs would be to improve geomorphologic conditions in the 11 HPAs beyond currently existing levels and beyond levels that would be expected under the No Action Alternative.

4.3 Hydrology and Water Quality

The purpose of this section is to evaluate the impacts of expected changes in watershed characteristics on hydrology and water quality of the associated streams within the Primary Assessment Area as a result of implementing the Proposed Action and other alternatives. 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.

Overall, implementation of the comprehensive prescriptive measures contained in the proposed AHCP/CCAA conservation strategy (i.e., enhanced riparian management zone (RMZ) widths, establishment of equipment exclusion zones (EEZs), and increased canopy closure and tree retention within the RMZs) would result in improved water quality conditions, as discussed in Sections 4.3.2 through 4.3.6). Hydrologic conditions associated with the Proposed Action and other alternatives are not anticipated to change compared with existing conditions or the No Action Alternative. The only potential for an impact is a slight (and less than significant) change in water temperature resulting from increased shade attributable to canopy closure retention requirements, and this impact would be insignificant given implementation of the riparian management prescriptive measures included in the Proposed Action. As noted in Section 4.3.7, *Cumulative Impacts*, these incremental benefits are anticipated to be greatest in HPAs where Simpson's ownership is greatest.

Presented below is an overview of the general types of hydrologic and water quality impacts than can occur in forested areas. This overview is followed (in Sections 4.3.2 through 4.3.6) by an assessment of the proposed AHCP/CCAA conservation measures (and the alternatives to it, including the No Action Alternative) on hydrologic and water quality conditions in the Action Area. Section 4.3.7 presents the cumulative impacts assessment for hydrology and water quality. 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 Primary Assessment Area hydrology (Beschta et al., 1995; Ziemer, 1998). In particular, snow buildup in logged areas above 2,000 feet elevation and subsequent melting during rainstorms (known as rain-on-snow events) results in enhanced flows and increased potential for erosion (Christner and Harr, 1982; Harr, 1986). Summer base flows could increase in logged versus unlogged areas in the short term and return to pre-harvest conditions within a few years (Ziemer et al., 1996).

Excessive sediment input can fill pools, eliminate spawning gravels, decrease channel stability, increase nutrient and contaminant loads, and modify overall channel morphology.

Sediment input is important in directly affecting fish and fish spawning success but is also useful as a surrogate for changes in concentrations of sediment-associated contaminants (primarily metals and many pesticides) (Lee et al., 1997) and nutrient input.

Stream temperatures can be affected by changes to direct shading, reduced surface and groundwater flows, and sediment deposition (MacDonald et al., 1991). Stream temperatures can affect the survival and/or reproduction of native salmonids and amphibians; streams can lose fish populations from increased water temperatures attributable to timber harvesting activities (Henjum et al., 1994).

Baseline and post-harvest temperature measurements have been conducted by Simpson. Average weekly temperatures have been described for a number of Primary Assessment Area streams (see Section 3.3). Simpson's studies of temperatures in harvested and unharvested watersheds, before and after treatment, indicate either increased or decreased average temperatures as a result of timber harvesting (see Appendix C-5.2 of the proposed AHCP/CCAA). The study results indicate that timber harvesting has no consistent effect on stream temperatures for the monitored watersheds.

Potential impacts to hydrology and water quality are assessed in this EIS 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.

4.3.1 Methodology

Methods to evaluate the significance of the alternatives to Primary Assessment 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). Whenever possible, quantitative water quality assessments are estimated. It is important to note, however, that determinants of water quality, such as relative rates of erosion or stream shading, do not lend themselves to precise numeric estimates of changes in sediment loading or the temperature regime. Instead, relative changes are based on the overall extent of change comparing conditions expected to occur over time under the No Action Alternative with current conditions, or by comparing conditions expected over time under the other alternatives with those conditions expected over time under the No Action Alternative.

4.3.2 No Action Alternative

Under the No Action Alternative, Simpson would continue to conduct timber harvesting and related operations in the Action Area in accordance with the measures described in Section 2.1 of this EIS. Hydrologic and water quality conditions are generally expected to improve over time throughout the Primary Assessment Area compared with existing

conditions. Specific changes anticipated to occur over time under the No Action Alternative are presented below.

4.3.2.1 Hydrology

The primary effects of timber harvesting on hydrology pertain to peak flows, low (base) flows, water yield, and run-off timing (Spence et al., 1996). In rain-dominated systems in the Coast Range, increases in peak flows, water yield, and summer flows have been observed following timber harvesting activities. The effect of timber harvesting on peak flows generally diminishes with increasing watershed size and with increasing flow magnitude (Beschta et al., 2000; Ziemer, 1998). Increases in summer flows generally diminish after a few years.

Under the No Action, Simpson would continue to implement its Road Management Plan (AHCP/CCAA, Section 6.2.3) that would result in the decommissioning of a number of roads in the Primary Assessment Area and improvements in the design and drainage of existing roads. Through the road upgrading and decommissioning program, the road network would be hydrologically disconnected from area watercourses. The use of decreased cross-drain/rolling dip spacings and outsloping, as specified in the Road Management Plan, would reduce the amount of concentrated surface runoff at any point along the road surface. Water from inboard ditches would be dispersed onto the forest floor where it would infiltrate, reducing the potential effects on peak flows and sediment delivery associated with road network runoff relative to existing conditions.

Under the No Action Alternative significant changes in the existing hydrologic conditions (i.e., magnitude and timing of naturally occurring peak and low flows) in Primary Assessment Area drainages are, therefore, not expected to occur. As such, channel morphology or the occurrence of bed scour and bank erosion is not anticipated to change substantially under the No Action Alternative compared to existing conditions.

4.3.2.2 Water Temperature

Under the No Action Alternative, stream shading is expected to improve over time in the Primary Assessment Area compared with current conditions. Current canopy closure requirements and tree retention standards are expected to help maintain stream shading in the critical "inner zone" where microclimate effects have the greatest potential to affect changes in water temperatures directly. Canopy closure would decline slightly after harvesting, but is anticipated to increase from current conditions in all stands as they re-grow after previous timber harvesting. Increased canopy closure could, therefore, result in slight decreases in water temperatures in Primary Assessment Area streams. (As discussed in Section 3.3.5 and 3.4.2.2, decreases in water temperature are generally beneficial to aquatic resources. See Section 4.4 for a discussion of impacts to aquatic resources.)

The reduced sediment delivery to streams expected under No Action Alternative also has the potential to result in decreases in water temperature compared to current conditions. Turbidity, sediment deposition, and the incidence of shallower, wider channels can increase the amount of solar radiation retained in the water column, leading to increased water temperatures. This effect is usually associated with larger, low-gradient rivers where turbidity is higher and exposure to sunlight is prolonged. Streams within the Primary Assessment Area are usually exposed to short-term, high-turbidity events only during

snowmelt and rain events, few of which occur during the period of highest temperatures. (As discussed in Section 3.3.5 and 3.4.2.2, decreases in water temperature are generally beneficial to aquatic resources. See Section 4.4 for a discussion of impacts to aquatic resources.)

4.3.2.3 Sediment Control

Although most sediment delivered to streams originates outside of the riparian zone, maintenance of riparian buffers aids in the filtration of overland sediment flow and helps to minimize direct sediment inputs from the riparian zone. Exclusion of heavy equipment and mechanical site preparation from Class I and II WLPZs and limits on heavy equipment use in Class III ELZs are anticipated to minimize ground disturbance that currently affects areas adjacent to Primary Assessment Area watercourses. Maintaining 75 percent surface cover and treatment of bare soil in excess of 100 square feet would also reduce the potential for management-related sediment delivery from within the WLPZs along Class I and Class II watercourses.

Under the No Action Alternative, sediment delivery would be reduced primarily through continued implementation of Simpson's practices as described in Section 2.1.1.3, that include employment by Simpson of best management practices (BMPs) based on techniques described in Weaver and Hagans (1994), and treatment of road sediment delivery sites prioritized using a formal assessment methodology. Generally, roads would be upgraded to meet current standards when they are used to gain access to and haul logs from individual THP units. Therefore, under this alternative, high- and moderate-risk sediment delivery sites on the entire ownership would be addressed over the duration of the AHCP/CCAA rather than under an accelerated program as described under the Proposed Action. This approach, however, would still result in substantial reduction of sediment delivery over existing conditions and over the life of the AHCP/CCAA. Although Simpson would continue to build new roads to gain access to and manage its lands, continued application of Simpson's practices as described in Section 2.1.1.3 would still be expected to result in a trend towards a reduction in road-related hillslope mass wasting, surface erosion, and sediment delivery over time throughout the Primary Assessment Area. Accordingly, under the No Action Alternative, in-stream and riparian habitat conditions affected by sediment delivery are also generally expected to result in a trend towards improved conditions compared to the existing baseline.

In addition, Primary Assessment Area streams generally have low levels of LWD that is small in size (< 2 feet in diameter) as a result of past management within stream channels and adjacent riparian areas. The canopy closure requirements and tree retention measures described as part of the No Action Alternative would likely contribute to increased LWD size in the future. Although no impacts to hydrology are expected, management practices that result in increased LWD recruitment would address any effects from potential changes to hydrology and sediment input that could occur as a result of upslope management. The presence of LWD in stream channels also aids in pool formation and sediment storage and sorting. Therefore, compared to current conditions, increases in LWD recruitment and the volume of LWD may improve aquatic habitat and stream substrate conditions in the Primary Assessment Area over the term of the AHCP/CCAA.

As discussed above, it is expected that that Simpson's practices would be expected to result in a trend towards a reduction in sediment delivery to watercourses and LWD recruitment in watercourses would increase over time under the No Action Alternative. It is also anticipated, therefore, that suspended sediment levels, turbidity, nutrient and contaminant loading would also decrease under the No Action Alternative compared to current conditions.

4.3.3 Proposed Action

Under the Proposed Action, Simpson would continue to conduct timber harvesting on the Action Area in accordance with existing regulations and management guidelines. In addition, the measures currently used by Simpson to protect Class I, II, and III streams would be supplemented by Simpson's AHCP/CCAA Conservation Strategy, which includes "enhanced" riparian management zone (RMZ) widths, establishment of equipment exclusion zones (EEZs), and enhanced riparian protection within the RMZs. Simpson also would implement ownership-wide mitigation, management, and monitoring measures. These measures are described in the AHCP/CCAA and summarized in this EIS in Chapter 2, *Proposed Action and Alternatives*. These measures include:

- Implementation of an ownership-wide Road Management Plan that provides for: selective and road-related fish passage enhancement (barrier removal); implementation of practices that are designed to minimize sediment discharge to Class I, II, and III streams; and decommissioning of some roads. The proposed Road Management Plan provides for accelerated repair (over a 15-year period) of high- and moderate-risk sediment delivery sites on roads on Simpson fee ownership in accordance with the schedule established in the proposed AHCP/CCAA.
- Protection of unique geomorphic features, such as channel migration zones and floodplains.
- Adoption of various slope stability and ground disturbance conservation measures.
- Implementation of effectiveness monitoring, plus adaptive management with structured feedback loops.

Overall, the conservation measures in the proposed AHCP/CCAA would not result in significant adverse impacts to hydrology and would result in improvements in water quality conditions (compared with either existing conditions or the improvements expected to occur over time under the No Action Alternative). The conservation measures would reduce harvest- and road-related sediment production and delivery to Primary Assessment Area streams and reduce water temperature and improve other water quality conditions (i.e., sediment) for the covered species. Monitoring and adaptive management activities would provide additional flexibility and a mechanism for changing or revising the AHCP/CCAA prescriptions, if needed, based on their demonstrated effectiveness and other new information.

4.3.3.1 Hydrology

In general, harvest-related ground disturbance can cause soil compaction and result in reduced infiltration capacity of soils and altered subsurface water movement, leading to

increased surface runoff. Under the Proposed Action, establishing EEZs would result in a reduction in Primary Assessment Area locations potentially exposed to soil compaction from use of heavy equipment. In addition, for those areas in which heavy equipment would be used, site preparation measures (including seasonal operating limitations for tractors, skidders, and forwarders, and minimized use of tractor and-brushrake piling) would result in reduced potential for ground compaction related to covered activities compared with what occurs under current conditions or is anticipated to occur over time under the No Action Alternative. These harvest-related ground disturbance prevention/conservation measures are expected to reduce: (1) any adverse impacts of operations-related alterations in hydrology (by minimizing soil compaction that can increase the magnitude of peak flows) and (2) the volume of sediment available for runoff during peak flow events.

In addition to implementing EEZs, the slope stability conservation measures in the Proposed Action would result in a greater reduction in road-related sediment production and delivery from steep streamside slopes and unstable areas and by avoiding new road construction or substantial upgrades of existing roads on these features without an evaluation by a registered geologist. Tree retention in these and other potentially unstable areas would preserve rainfall interception and evapotranspiration. Although the benefits of tree retention cannot be quantified, it is expected to contribute to slope stability by maintaining rainfall interception and evapotranspiration.

The riparian conservation measures under the Proposed Action would maintain in-channel LWD and provide increased potential for LWD recruitment compared with existing conditions or conditions expected to occur over time under the No Action Alternative. The presence of LWD in stream channels aids in pool formation, and sediment storage and sorting. Therefore, compared to current conditions or conditions expected to occur under the No Action Alternative, increased LWD recruitment and the volume of LWD are expected to improve aquatic habitat and stream substrate conditions in the Primary Assessment Area over the life of the AHCP/CCAA, resulting in a beneficial impact.

The conservation measures under the Proposed Action are anticipated to minimize the potential impacts that could otherwise result from altered hydrology in the Primary Assessment Area. They would reduce the impacts of forest management on surface runoff and peak flows, reduce soil compaction and disturbance, and maintain or enhance in-channel LWD. Any impacts to hydrology and water quality that would occur would be mitigated by improved riparian conditions resulting from riparian management and decreased sediment production and delivery, as described below.

4.3.3.2 Water Temperature

The Proposed Action's canopy closure requirements and tree retention standards are more protective than those that would be implemented under the No Action Alternative (see Section 6.2.1 of the proposed AHCP/CCAA and Chapter 2 of this EIS for a description of these measures). Implementation of Proposed Action measures would help to maintain stream shading in the critical "inner zone" where microclimate effects are anticipated to have the greatest potential to affect water temperatures. Although the inner zone width along Class I watercourses is slightly less under the Proposed Action (50-70 feet) than under the No Action Alternative (75 feet), the effects on microclimate and stream temperatures are not expected to result in significant adverse impacts. Canopy closure, while expected to

slightly decrease following harvesting, is likely to increase from current conditions in all stands as they re-grow after previous timber harvesting. The overall increase in canopy closure is anticipated to result in slight decreases in water temperatures in Primary Assessment Area streams. (As discussed in Section 3.3.5 and 3.4.2.2, decreases in water temperature are generally beneficial to aquatic resources. See Section 4.4 for a discussion of impacts to aquatic resources.)

Although the sample size is small, Simpson has direct experimental data to support the conclusion that the slight decrease in canopy closure following harvest that could potentially occur under the Proposed Action would not result in significant impacts on water temperature. Using a before-after-control-impact (BACI) experimental design, Simpson assessed the influence of even-aged timber harvesting on water temperature in small Class II watercourses where the influence of canopy reduction has the greatest potential to impact water temperature (see Appendix C-5.2 of the AHCP/CCAA, Class II Paired Watershed Temperature Monitoring). Two of the treated streams showed minor increases (ranging from 0.5°C to 1.0°C) in water temperature within the limits of the harvest unit relative to the controls during the warmest time of day in the warmest 14-day period of the summer; two of the treated streams showed minor decreases (ranging from 1.3°C to 1.4°C) in water temperature. These decreases likely resulted from increased ground water inputs following harvesting of the adjacent stand.

On the basis of the minimal changes in temperature (both positive and negative) under the most extreme annual conditions, and the increase in riparian protection under the Proposed Action, a measurable increase in water temperature in Class I or larger Class II streams caused by minor reductions in canopy closure following timber harvesting is not anticipated. Limiting entry (i.e., a single commercial entry during the term of the permit) into the RMZ would further reduce any potential minor impact from the slight temperature increases. Any increase in water temperature would be slight and less than significant, and over the life of the AHCP/CCAA, stream temperatures would be maintained or improved compared with existing conditions or with conditions expected to occur over time under the No Action Alternative.

Reduced sediment delivery to streams under the Proposed Action also could contribute to minor decreases in water temperature. Sediment input, particularly increases in fine sediment, can affect stream temperatures through changes in channel morphology such as reduced pool volume and increased channel width (Rhodes et al., 1994; Lewis, 1998). With the slope stability and road management measures designed to minimize management-related sediment inputs, sediment production and delivery would be reduced relative to existing conditions and conditions under the No Action Alternative. Given that water temperatures generally meet or exceed RWQCB Basin Standards (see Section 3.3.5), and are generally favorable for the covered aquatic species throughout the Primary Assessment Area even with past sediment inputs (see Appendix C-5 of the AHCP/CCAA), sediment minimization measures under the Proposed Action would further reduce the likelihood that aggradation of channels would result in elevated water temperatures.

4.3.3.3 Sediment Control

It is anticipated that the AHCP/CCAA conservation measures under the Proposed Action would reduce the potential for effects on water quality in Primary Assessment Area streams.

Under the Proposed Action, sediment production and delivery, that could result in increased sediment loading, sedimentation, and turbidity in Primary Assessment Area streams, would be reduced compared with both existing conditions and conditions anticipated to occur over time under the No Action Alternative. The Proposed Action identifies four primary sediment-input processes and proposes a number of specific prescriptions and conservation measures to mitigate potentially adverse effects associated with these processes. The primary sediment-input processes are:

- Surface erosion
- Hillslope mass wasting
- Reduced bank stability
- Road-related sediment production

Although erosion does occur higher on hill slopes and within harvest units, the assessment of sediment production resulting from surface erosion focuses on slopes adjacent to watercourses because these are the areas with the greatest potential to deliver sediment to watercourses over the life of the proposed AHCP/CCAA. As is the case for WLPZ management prescriptions contained in the No Action Alternative, RMZ management prescriptions under the Proposed Action include conservation measures designed to impede sediment delivery in areas where sediment would have relatively short transport distances to watercourses. These measures include high overstory canopy retention standards within RMZ inner and outer zones, limitations on equipment use, retention of trees likely to recruit as LWD, and retention of trees that contribute to maintaining bank stability. Implementing the retention standards is expected to result in almost no loss in total forest canopy in the inner zone of RMZs along Class I and Class II watercourses, and is anticipated to increase canopy along Class II watercourses relative to existing conditions. This canopy would impede grain detachment in these critical areas, where detached sediment would have relatively short transport distances to watercourses. On this basis, the proposed AHCP/CCAA measures are anticipated to result in reductions in sediment delivery over existing conditions as well as reductions compared to the No Action Alternative.

Harvest-related ground disturbance conservation measures focus on minimizing ground disturbance and exposure of bare mineral soil within harvest units. These measures include: (1) site-specific site preparation methods, (2) limited operating periods for the construction of skid trails and use of ground-based yarding equipment, (3) limiting use of ground-based yarding equipment that requires constructed skid roads to slopes less than or equal to 45 percent (with some exceptions), (4) preferential use of cable yarding systems, and (5) water-barring of cable corridors, where necessary. All of these ground disturbance conservation measures would minimize management related surface erosion within harvest units, resulting in beneficial effects over the life of the AHCP/CCAA.

Sediment production from hillslope mass wasting within the Primary Assessment Area is greatest in steep streamside slopes, headwall swales, and historically active deep-seated landslides (see Section 3.2.3.3, *Landslide Classification and Landslide Prone-Terrain*). Under the Proposed Action, these areas would be subject to specified slope stability conservation measures intended to reduce landslide occurrences and associated sediment production. The Proposed Action would result in these sensitive areas receiving additional protection by

establishing slope management zones (SMZs) upslope of the RMZ along Class I and Class II watercourses. The width of the SMZ would vary among the 11 HPAs, with wider more conservative SMZs identified for those HPAs most prone to hillslope mass wasting. Single tree selection harvest would be the most intensive silvicultural prescription allowed within the SMZ and no harvest would be allowed in the inner portion of the RMZ downslope of the SMZ (i.e., the RSMZ) along Class I and larger Class II watercourses. Timber harvesting would be prohibited within the entire RSMZ below SMZs in the Coastal Klamath and Blue Creek HPAs. In addition, no harvest would be allowed within the toe and 25 feet upslope from the top of the toe or scarp of historically active deep-seated landslides.

Tree retention in the SMZs and associated RSMZs is expected to maintain a network of live roots that would preserve total soil cohesion and contribute to slope stability in these areas. Tree retention also is expected to help maintain forest canopy, which would preserve some measure of rainfall interception and evapotranspiration. Maintenance of rainfall interception and evapotranspiration is expected to contribute to slope stability conditions in some locations by minimizing the likelihood of high ground water ratios that are management related. Limited road construction and road reconstruction on unstable slopes and in RMZs would likely result in avoiding and reducing the undercutting and overburdening of sensitive hill slopes and help avoid unnatural concentration of storm runoff on these slopes. The implementation of SMZs (and the application of more conservative SMZ prescriptions in HPAs more susceptible to hillslope mass wasting) plus the prohibition of timber harvesting in certain landslide-prone areas, would result in a beneficial impact to water quality conditions because of a reduced potential for sediment delivery to streams in the Primary Assessment Area. On this basis, the proposed AHCP/CCAA measures are anticipated to result in improvements over existing conditions as well as improvements in conditions compared to the No Action Alternative.

Bank stability would increase under the Proposed Action because of the riparian conservation measures for Class I, II, and III streams requiring substantial canopy closure, retention of trees likely to recruit as LWD, or retention of trees (and their root systems) judged to be critical to maintaining streambank integrity. Implementation of these measures is designed to mitigate management-related sediment inputs that could otherwise occur because of bank instability. Increased bank stability is expected to reduce the potential for sediment delivery to Primary Assessment Area streams, resulting in beneficial effects to water quality conditions.

Road-related erosion and hillslope mass wasting are known to be substantial contributors to the sediment budget in most managed watersheds. The Road Management Plan and associated conservation measures under the Proposed Action would reduce road-related sediment production and delivery to Primary Assessment Area watercourses relative to measures under the No Action Alternative. Simpson's proposed Road Management Plan provides for: (1) a method to classify roads on the basis of use and to prioritize road work and site-specific repairs; (2) improved standards for road repairs and upgrades relative to the No Action Alternative; (3) improved standards for stream crossings and culvert repairs and upgrades relative to the No Action Alternative; (4) improved standards for temporary and permanent road decommissioning relative to the No Action Alternative; and (5) a training program for equipment operators and supervisors on the Road Management Plan and other AHCP/CCAA standards and practices. The proposed Road Management Plan

provides for accelerated repair of high- and moderate-risk sediment delivery sites on roads on the Simpson fee ownership. These road-related conservation measures would reduce road-related sediment production and, therefore, result in benefits to Primary Assessment Area streams because of reduced potential for sediment delivery. In addition, the reduction in sediment production and delivery under the Proposed Action would be greater than the reduction anticipated under the No Action Alternative because the Proposed Action measures emphasize strategic identification and classification of roads targeted for improvement. Under this alternative, high- and moderate-risk sediment delivery sites in the Primary Assessment Area would be addressed using an accelerated program. (Under the No Action Alternative, high- and moderate-risk sediment delivery sites would not receive accelerated treatment.) Under the Proposed Action, therefore, the incremental net improvement in water quality is greater than what is expected to occur under the No Action Alternative.

Simpson has performed a general assessment of its ownership within the Action Area that identifies road-related sediment sources requiring treatment (e.g., stabilization of dirt or other remediation to prevent road-related, sediment-producing failures or hillslope mass wasting events). At the time the sediment model was run in 2002, Simpson estimated the volume of potential sediment associated with high- and moderate-risk sediment delivery sites (based on both the probability of delivery to watercourses and the sediment volume associated with such delivery) to be 6,436,000 cubic yards (see Appendix F of the AHCP/CCAA). Under the AHCP/CCAA, Simpson's proposed Road Management Plan is designed to provide treatment of all high- and moderate-risk sediment delivery sites over the term of the AHCP/CCAA, to minimize potential delivery of sediment to riparian and aquatic areas. In addition, in the AHCP/CCAA, Simpson commits to provide an average of \$2.5 million per year for the first 15 years of the AHCP/CCAA (for a total of \$37.5 million) to accelerate implementation of the treatments for the high- and moderate-risk sites. (The acceleration period would be adjusted following revision of the estimate of sediment yield from high- and moderate-risk sediment delivery sites at the end of the first five years following permit issuance. The acceleration period and monetary commitment could be adjusted (upward or downward) by up to 1.5 years and \$3.75 million depending on the revised estimate of sediment yield.)

On the basis of the current estimate of 6,436,000 cubic yards of soil requiring treatment, \$2.5 million per year for 15 years would result in 48 percent of the overall volume being treated in the first 15 years of the AHCP/CCAA. This 48 percent equates to 3,058,000 cubic yards of sediment that could otherwise wash into streams on or adjacent to Simpson's ownership being removed within the first 15 years of the AHCP/CCAA. (See Appendix F of the AHCP/CCAA). In contrast, if the road-related treatment were performed without the acceleration provided by the \$2.5 million per year commitment, 19 percent of the overall volume equating to 1,223,000 cubic yards would be removed during the first 15 years (see Figure 4.3-1), as based on Simpson's anticipated timber harvest levels over the next 15 years. Implementation of the Road Management Plan under the Proposed Action would result in beneficial water quality conditions by accelerating the reduction of sediment loading compared to the rate at which sediment would be reduced under the No Action Alternative.

The figure shows the road-related sediment component asymptotically approaching 3,000 cubic yards per year during the last decade of the permit period. This implies that the Road Management Measures will not be 100 percent effective in controlling sediment associated with high- and moderate-risk sediment delivery sites. Some of the reasons why the road management measures will not be 100 percent effective are: (1) sediment delivery occurs before the site can be treated; (2) some sites are located in inaccessible areas where treatment is infeasible; and (3) the underlying geology and soils at the site preclude lowering the risk of sediment delivery, even with treatment.

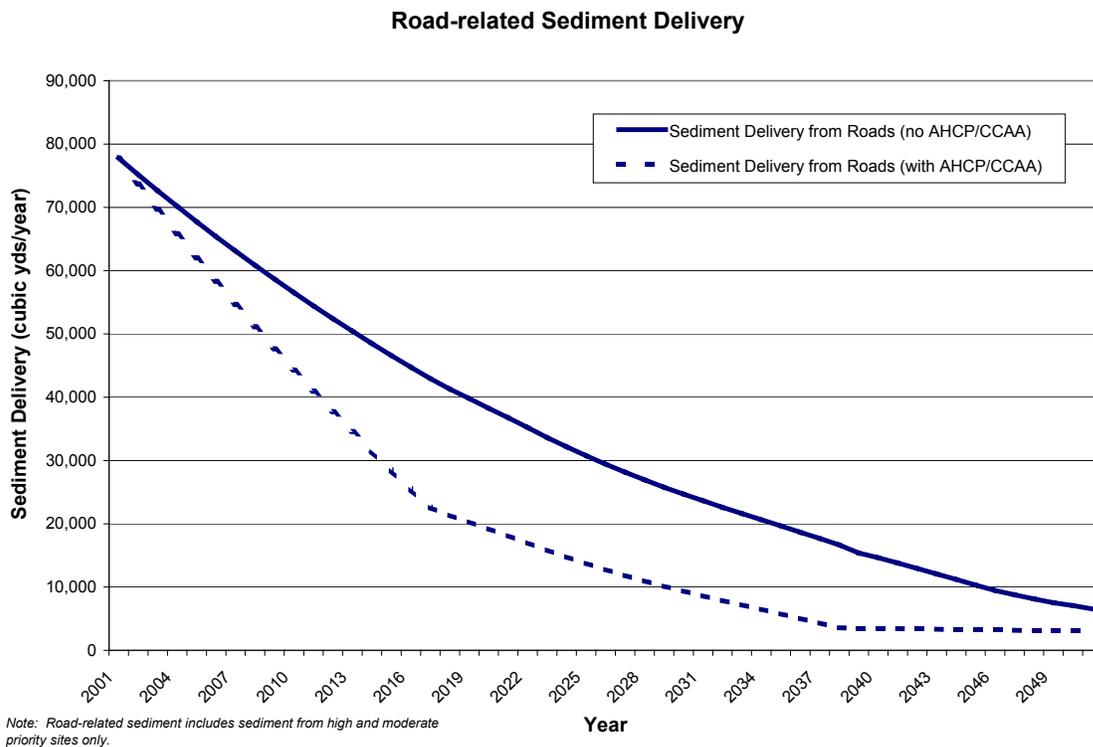


FIGURE 4.3-1
Road-Related Sediment Delivery

4.3.4 Alternative A

Because timber harvesting and forest management activities, as well as road management and riparian conservation measures, under Alternative A would be the same as under the Proposed Action, potential effects on hydrology and water quality within the Primary Assessment Area would be the same as described for the Proposed Action (see Section 4.3.2). Implementation of Alternative A, therefore, would result in beneficial effects by improving water quality to the same extent as the Proposed Action in that water quality would improve compared with existing conditions or with general improvements expected to occur under the No Action Alternative. Changes in hydrologic conditions under Alternative A would be comparable to those of the Proposed Action.

4.3.5 Alternative B

Under Alternative B, Simpson would continue to conduct timber harvesting on its property in accordance with existing regulations and management practices. Under Alternative B, existing measures implemented by Simpson to protect Class I, Class II, and Class III streams would be supplemented by an AHCP/CCAA conservation strategy specific to this alternative. This strategy would include fixed riparian buffer widths within which no management or timber harvesting would occur adjacent to Class I and Class II streams, and establishment of ELZs along Class III streams. Simpson would not implement an ownership-wide Road Management Plan designed to accelerate reductions of sediment loading from priority sites on the ownership, and would not provide protection for unique geomorphic features, such as channel migration zones (CMZs) and floodplains. Additional slope stability and ground disturbance measures also would not be implemented. Effectiveness monitoring would not be as extensive under this alternative as under the Proposed Action, and adaptive management with structured feedback loops would not be implemented.

Overall, implementation of Alternative B is anticipated to result in improved water quality compared to existing conditions or to conditions anticipated to occur under the No Action Alternative, although the improvements would not be as great as those that would occur under the Proposed Action. Enhanced riparian zone protection is also expected to result in additional improvement in water quality compared to existing conditions or improvements expected to occur over time under the No Action Alternative. Without implementation of an ownership-wide Road Management Plan and specific sediment minimization measures as provided under the Proposed Action and Alternative A, the conservation measures contained in Alternative B are not expected to reduce harvest- and road-related sediment production and delivery to Primary Assessment Area streams as greatly as would implementation of either the Proposed Action or Alternative A. (Under Alternative B, sediment impacts would be addressed the same way as under the No Action Alternative—high- and moderate-risk sediment delivery sites would be addressed over the term of the AHCP/CCAA without an initial 15-year acceleration period as provided under the Proposed Action and Alternative A.) Under Alternative B, impacts to hydrology would be the same as the Proposed Action and the No Action (i.e., no changes would occur to the hydrologic regime and, therefore, no impacts would occur).

4.3.5.1 Hydrology

Upslope management under Alternative B would be similar to that under the No Action Alternative (and other action alternatives), and would not result in changes in the existing hydrologic regime or in the magnitude and timing of naturally occurring peak and low flows in Primary Assessment Area drainages. Thus, as discussed under the No Action Alternative, no impacts to channel morphology and incidence of bed scour and bank erosion would result from implementing Alternative B.

4.3.5.2 Water Temperature

The prohibition of commercial harvest in the riparian buffers under Alternative B would help to maintain stream shading in the critical “inner zone” where microclimate effects would have the greatest potential to impact water temperatures directly. Canopy closure

would likely increase from current conditions in some stands as they re-grow after previous timber harvesting. Increased canopy closure could, therefore, result in slightly decreased water temperatures in Primary Assessment Area streams. (As discussed in Section 3.3.5 and 3.4.2.2, decreases in water temperature are generally beneficial to aquatic resources. See Section 4.4 for a discussion of impacts to aquatic resources.) The prohibition of commercial entry into the riparian buffers during the term of the permit, however, would help ensure that temperatures and microclimate would remain suitable during the permit term. Implementation of the no-harvest riparian buffer zone could result in incremental benefits compared to the improvements expected to occur over time under the No Action Alternative.

Turbidity, sediment deposition, and the incidence of shallower, wider channels can potentially increase the amount of solar radiation retained in the water column, leading to increased water temperatures. This effect is usually associated with larger, low-gradient rivers where turbidity is higher and exposure to sunlight is prolonged. Streams within the Primary Assessment Area, however, are usually exposed to short-term, high-turbidity events only during snowmelt and rain events, few of which occur during the period of highest temperatures. The reduction in sediment delivery to streams under Alternative B also has the potential to contribute to minor decreases in water temperature. These decreases, however, would be less than those anticipated under the Proposed Action because the Road Management Plan (and its sediment reducing conservation measures) would not be implemented under Alternative B. (As discussed in Section 3.3.5 and 3.4.2.2, decreases in water temperature are generally beneficial to aquatic resources. See Section 4.4 for a discussion of impacts to aquatic resources.)

4.3.5.3 Sediment Control

Sediment production and delivery to Primary Assessment Area streams under Alternative B would be comparable to levels anticipated to occur under the No Action Alternative (i.e., a trend towards general reduction in sediment production and delivery over time). Similar to the No Action Alternative, sediment reduction would occur primarily as a result of implementing current forest road management and maintenance practices on old roads that do not meet current standards. Generally, however, roads would be upgraded to meet current standards when those roads are used to gain access to and haul logs from individual THP units. Therefore, under this alternative, high- and moderate-risk sediment delivery sites on the entire ownership would be addressed over the duration of the AHCP/CCAA rather than under an accelerated program as described under the Proposed Action. This approach, however, would still result in a reduction of sediment delivery over existing conditions and over the life of the AHCP/CCAA. Also, Simpson would continue to build new roads to gain access to and manage its lands (i.e., comparable to the No Action Alternative). Continued implementation of Simpson's practices will result in a trend towards a reduction in road-related hillslope mass wasting and sediment delivery over time. This trend is expected to result in a gradual improvement in water quality conditions in the Primary Assessment Area compared with existing conditions.

4.3.6 Alternative C

General timber harvesting and forest management activities, as well as road management and riparian conservation measures, under Alternative C would essentially be the same as the Proposed Action.

Under Alternative C, adaptive management would provide a mechanism for strengthening or relaxing individual conservation measures in the rain-on-snow areas if monitoring indicates, on the basis of specific performance criteria, that a change is necessary. Overall, implementation of Alternative C is anticipated to result in improved water quality compared to existing conditions or to conditions anticipated to occur under the No Action Alternative, although the improvements would not be as great as those that would occur under the Proposed Action. Simpson's commitment to provide an average of \$2.5 million per year for the first 15 years of the AHCP/CCAA to accelerate implementation of treatments for high- and moderate-risk sediment delivery sites would be extended to include the additional 26,116-acre rain-on-snow areas under Alternative C. Because accelerated site treatments over the 15-year period would be spread over a larger area, potential benefits would be diluted relative to what would be expected to occur under the Proposed Action. Also, since the adaptive management "account" for the Proposed Action would also apply to a larger area under Alternative C, potential benefits specific to adaptive management would likewise be diluted relative to what would be expected to occur under the Proposed Action. Implementation of Alternative C, therefore, would result in water quality conditions comparable to or slightly less than the improved conditions that would result from implementing the Proposed Action.

Under Alternative C, impacts to hydrology would be the same as the Proposed Action and the No Action (i.e., no changes would occur to the hydrologic regime and, therefore, no impacts would occur).

4.3.7 Cumulative Impacts

The assessment of potential cumulative impacts on aquatic resources was conducted using the approach described in Section 4.1.2, *Cumulative Impacts*. The assessment area for cumulative impacts consists of the 11 HPAs that contain Action Area lands owned by Simpson and covered in its proposed AHCP/CCAA, as well as other lands that are predominantly either privately owned, administered by a federal resource management agency, or are state or federal parklands. Resource management strategies being applied in these HPAs, when combined with future management strategies that would be used by Simpson, have the potential to result in cumulative effects on hydrology and water quality. The purpose of this cumulative impact assessment is to evaluate the potential effects of these varied resource management strategies, including the Proposed Action of this EIS, on hydrology and water quality conditions in the 11 HPA assessment area.

As noted in the previous impact discussions in this section, hydrologic impacts would not occur and future water quality conditions under the Proposed Action (and other action alternatives) are expected to be improved relative to existing conditions and conditions expected to occur under the No Action Alternative. These overall benefits to water quality are expected to be slightly greater under the Proposed Action and Alternatives A and C than under Alternative B, because of differences (or in some cases, the absence) of a broad

range of enhanced forest management practices and an adaptive management monitoring program with structured feedback mechanisms. In addition, benefits would extend to a slightly larger area under Alternative C with the inclusion of rain-on-snow areas.

The HPAs where incremental benefits to water quality would be greatest because of implementing the Proposed Action or one of the action alternatives are those where Simpson owns the greatest percentage of land (i.e., North Fork Mad River, Little River, Coastal Klamath, Coastal Lagoons, Interior Klamath, Mad River, and Smith River). Section 4.1.2, *Cumulative Impacts*, contains a detailed discussion of the acreage and ownership of all the land owners/managers considered in the cumulative impacts assessment. Incremental benefits would be relatively less in the Redwood Creek, Blue Creek, and Humboldt Bay HPAs, where Simpson ownership varies from about 10 to 20 percent of the total. Incremental benefits from Simpson management activities would be least, but still represent a positive influence on hydrology and water quality in the Eel River HPA, where Simpson ownership is less than 4 percent. These conclusions for the proposed AHCP/CCAA provide the basis for considering the incremental and cumulative effects of other actions in the HPAs. There are four other predominant conservation or management strategies, besides Simpson's, that are being used in the 11 HPAs considered in this cumulative impact assessment.

As noted in Section 1.5.3.1, continued implementation of the CFPRs on non-Simpson commercial timberlands within the 11 HPAs may not necessarily minimize potential impacts of activities on water quality or hydrologic conditions. On the other hand, forest practices operations conducted pursuant to this process in a particular area, land ownership, or region, however, may achieve such conditions.

Conservation measures associated with the PALCO HCP, like those being proposed by Simpson in its AHCP/CCAA, exceed the CFPR standards and are designed to protect hydrology and water quality using various prescriptions directed at riparian management, road management, controlling sediment delivery, and exclusion areas. The beneficial effects of the PALCO HCP on hydrology and water quality would have a primary and positive influence on habitat conditions in the Eel River and Humboldt Bay HPAs. These are the only HPAs being considered in this EIS where PALCO has significant ownership.

The USFS and/or BLM also manage federal lands in the Blue Creek and Smith River HPAs. Less than 7 percent of lands in the other HPAs is managed by either of these agencies. 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 generally do not allow timber harvesting or activities in relatively wide, fixed-width riparian buffers before a completed watershed analysis, and are expected to result in incremental improved hydrology and water quality conditions within HPAs where the USFS/BLM administer public lands. Current protections for and benefits to hydrology and water quality conditions in those HPAs where federal agencies are the predominant land managers would be expected to continue into the future.

Incremental benefits associated with resource management on lands administered by the State of California and the National Park Service are most important in the Redwood Creek and Smith River HPAs, where state and federal parklands together comprise 41.5 percent and 15.8 percent of the total land ownership, respectively. Resource management strategies

in parklands essentially allow no commercial timber harvesting. In addition, streamside and upslope activities that would affect water quality conditions are extremely limited. Therefore, park management practices are anticipated to result in net benefits to hydrology and water quality.

Overall, the cumulative effect of all of these resource management programs would be to protect and/or improve hydrology and water quality conditions in each of the 11 HPAs beyond currently existing levels and beyond levels that would be expected under the No Action Alternative.

4.4 Aquatic Resources

This section addresses the potential for impacts to aquatic resources in the Primary Assessment Area as a result of implementing the Proposed Action and other alternatives, including the No Action Alternative. The following discussion assesses the potential for impacts to occur to aquatic and riparian function and habitat quality.

Overall, aquatic and riparian habitat conditions related to forestry management activities would improve under the Proposed Action relative to existing conditions and relative to continued implementation of the No Action Alternative. The anticipated improvement in riparian conditions and the reduction in sediment production and delivery to streams would exceed the improvements expected over time under the No Action Alternative, and would likely result in improved physical habitat for the seven covered fish species/ESUs and the two covered amphibian species. Improvements in aquatic and riparian habitat benefiting the covered species would, in general, benefit other species associated with these habitats. It is expected that benefits to all of these species and their habitats under the Proposed Action would continue to accrue over the 50-year permit period because of the extended time period in which the beneficial effects of the conservation measures and improved forest management practices would be realized.

In addition, the Proposed Action would implement these measures on an ownership-wide basis within the Action Area rather than on a THP-by-THP basis, which would result in consistent and expedited application of the conservation measures compared with existing conditions or conditions expected to occur over time under the No Action Alternative. The AHCP/CCAA measures expected to result in beneficial effects over the Action Area over time are riparian management and slope stability measures (Sections 6.2.1 and 6.2.2 of the AHCP/CCAA), the ownership-wide Road Management Plan (Section 6.2.3 of the AHCP/CCAA), harvest-related ground disturbance measures (Section 6.2.4 of the AHCP/CCAA), and the monitoring and adaptive management measures (Sections 6.2.5 and 6.2.6 of the AHCP/CCAA).

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 for the various management activities proposed for implementation under the Proposed Action, other action alternatives, and the No Action Alternative. As described in Section 3.4.5, *Ecological Implications of Land Management*

Activities on Aquatic and Riparian Habitat, Fish, and Amphibians, management activities have the potential to affect aquatic resources in several ways. The potential impacts on habitat and biota that are evaluated in this section include:

- 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 LWD 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 impacts on the stream channel and associated riparian areas could adversely affect or benefit the quantity and quality of aquatic habitat for covered 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 multiple life histories (developmental stages), movement, and migration strategies.

To the extent that the above factors can affect conditions for aquatic species, they are discussed individually in the following assessment. Most of these discussions are, by necessity, qualitative in context because of the nature of management activities proposed. Where possible, however, quantitative information is presented to facilitate comparisons among the Proposed Action, other action alternatives, and the No Action Alternative, as well as comparisons to current conditions. Many of these comparisons are based on the relative magnitude and direction of change in habitat conditions anticipated under the various alternatives evaluated and the consequences these changes would represent to the covered aquatic species. Supporting information for the aquatic resources analysis, including changes in sediment production and delivery and in hydrology, was described in greater detail in Sections 4.2 (*Geology, Geomorphology, and Mineral Resources*) and Section 4.3 (*Hydrology and Water Quality*). Other factors that can affect aquatic resources (e.g., fishing), as well as research and monitoring programs that would be implemented, also are described and their effects evaluated in this assessment.

4.4.2 No Action Alternative

Under the No Action Alternative, timber harvesting and related operations in the Primary Assessment Area would be conducted in accordance with Simpson's practices as described in Section 2.1 of this EIS. The NMFS and USFWS would not issue Simpson an ITP or an ESP, and Simpson would not implement an AHCP/CCAA.

As discussed in Sections 4.2 and 4.3, forest management practices can affect slope stability by changing vegetative cover, hillslope shape, and water flow above and below the ground surface. In addition, changes in stream temperatures that can occur from sedimentation and reduced recruitment of LWD can affect the survival and/or reproduction of salmonids and amphibians. Overall conditions for geology and hydrology are anticipated either not to change or to improve over time. (See Section 4.2, *Geology, Geomorphology, and Mineral Resources* and Section 4.3, *Hydrology and Water Quality*.)

For example, under the No Action Alternative, the canopy closure requirements and tree retention measures described as part of the No Action Alternative would contribute to LWD recruitment in a way that in-channel LWD loading, and LWD size could increase in the future (see Section 4.3.2). The presence of LWD in stream channels aids in pool formation and sediment storage and sorting. Therefore, compared to current conditions, increases in LWD recruitment and the volume of LWD could improve aquatic habitat and stream substrate conditions in the Primary Assessment Area. Current canopy closure requirements and tree retention standards are expected to help maintain stream shading in the critical “inner zone” where microclimate effects have the greatest potential to affect changes in water temperatures directly. In addition, a process would be implemented to survey unstable areas and geologic features, and subsequently develop site-specific risk minimization measures for incorporation into THPs, as necessary and appropriate. These measures are expected to result in improvements to aquatic and riparian habitat conditions in the Primary Assessment Area over time compared with existing conditions (see Section 4.2).

Current Simpson practices require establishment of WLPZs along fish-bearing and non-fish bearing streams, stipulate procedures for addressing “unstable areas,” and include requirements and guidance for activities including, but not limited to: road construction, maintenance, and use; restoration of disturbed areas; timber harvesting intensity and extent; and silvicultural practices. Methods of avoidance and mitigation of site conditions and activities that could result in adverse impacts on aquatic resources would be addressed to the degree required by current regulations and by other management guidelines employed by Simpson.

Because the factors that have the potential to affect aquatic and riparian habitat conditions adversely would either not change or are expected to improve over time, these conditions and the aquatic species dependent on their maintenance are also expected to improve over time compared with current conditions.

4.4.2.1 Hydrologic Effects

As discussed in Section 4.3, *Hydrology and Water Quality*, the primary effects of timber harvesting on surface water hydrology pertain to peak flows, low (base) flows, water yield, and run-off timing. In rain-dominated systems in the Coast Range, increases in peak flows, water yield, and summer flows have been observed following timber harvesting activities. The effect of timber harvesting on peak flows generally diminishes with increasing watershed size and with increasing flow magnitude. Increases in summer flows generally diminish after a few years.

Under the No Action, implementation of Simpson’s Road Management Plan (Section 6.2.3 of the AHCP/CCAA) would result in decommissioning of a number of roads within the

Primary Assessment Area and improvements in the design and drainage of existing roads. As discussed in Section 4.3.2.1, implementation of the road-upgrading and decommissioning program would result in the road network becoming hydrologically disconnected from area watercourses and would reduce the potential for sediment to reach Primary Assessment Area watercourses. The use of decreased cross-drain/rolling dip spacings and outsloping, as specified in the Road Management Plan, would reduce the amount of concentrated surface runoff at any point. Water from inboard ditches would be dispersed onto the forest floor where it can infiltrate, reducing the effects on peak flows and sediment delivery that can result from road network runoff.

Implementation of the No Action Alternative is not, therefore, expected to significantly change the existing hydrologic regime or the magnitude and timing of naturally occurring peak and low flows in Primary Assessment Area drainages. (See Section 4.3, *Hydrology and Water Quality*, for further discussion of flow regimes.) As such, no change from existing conditions is expected in channel morphology, incidence of bed scour and bank erosion, or quality of aquatic habitat as a result of altered hydrologic conditions. Increases in summer flows could have marginal beneficial effects by increasing available aquatic habitat. Any future conditions that could occur as a result of altered hydrology because of upslope management would be further mitigated by improved riparian conditions resulting from riparian management described below.

4.4.2.2 Riparian Conditions

Establishing minimum 150-foot-wide WLPZs along Class I watercourses and variable width WLPZs along Class II watercourses, in conjunction with harvest restrictions, canopy closure, and post-harvest tree stocking (i.e., leave tree) requirements within WLPZs are anticipated to help maintain riparian functions such as LWD recruitment, stream shading, sediment filtration, bank stability, and nutrient input. These measures are also expected to provide a suitable microclimate for amphibian and other species that use habitats along streams.

LWD Recruitment

The presence of LWD in stream channels aids in pool formation, provides refugia from peak flows, and maintains overwintering habitat for salmonids and other fishes. Primary Assessment Area streams generally have low levels of LWD that is small in size (< 2 feet in diameter) as a result of past management within stream channels and adjacent riparian areas. The canopy closure requirements and tree retention standards that would be implemented under the No Action Alternative are expected to help maintain potential LWD recruitment in a way that in-channel LWD loading and size increase in the future. Whether such an increase would occur within a given stream reach would depend on the current condition and trend of existing LWD levels and the length of time necessary to recruit additional wood to streams from adjacent riparian areas. For example, if little or no recruitment of wood has occurred recently and existing pieces of wood are decaying or being washed out of a stream reach, in-stream levels of wood could continue to decline for some time, despite the fact that riparian protection would provide increased potential for recruitment in the future.

Stream Shading

The canopy closure requirements and tree retention standards of the No Action Alternative are expected to help maintain stream shading in the critical “inner zone” where

microclimate effects would have the greatest potential to affect amphibians directly or affect anadromous and resident salmonids indirectly through changes in water temperatures. Canopy closure would likely increase from current conditions in some stands as they regrow after previous timber harvesting and could decline slightly following harvesting in the future. Increased canopy closure could, therefore, result in slightly decreased water temperatures in Primary Assessment Area streams. (Also see Section 4.3.2.2 for a discussion of water temperature.)

Sediment Filtration

Although most sediment delivered to streams originates outside of the riparian zone, maintenance of riparian buffers aids in the filtration of overland sediment flow and helps to minimize direct sediment inputs from the riparian zone. Exclusion of heavy equipment and mechanical site preparation from Class I and II WLPZs, plus limitations on heavy equipment use in Class III ELZs, is expected to help minimize the level of ground disturbance that occurs adjacent to Primary Assessment Area watercourses. Maintaining 75 percent surface cover and treatment of bare soil in excess of 100 square feet is expected to result in a trend towards a reduction of management-related sediment delivery from within the WLPZs along Class I and II watercourses.

Streambank Stability

Bank stability could increase under the No Action Alternative, relative to existing conditions, because of the riparian conservation measures requiring substantial canopy closure along Class I and II watercourses, and retention of all trees within 50 feet of the stream margin in Class I WLPZs.

Nutrient Input

The riparian conservation measures under the No Action Alternative would favor conifers over hardwoods in the WLPZs. The level of harvest in both the inner and outer zones of all WLPZs would maintain the overstory canopy, so that the longer-lived conifers would eventually replace the short-lived hardwoods. In the long term, this is anticipated to reduce the level of nutrient inputs relative to current levels. This is expected to be a lengthy process, however, that would extend perhaps decades into the future and, even then, would not result in complete elimination of hardwoods or insufficient nutrient input from riparian areas. It is anticipated that any effects on aquatic species and their habitats would likely be minimal (i.e., less than significant) and mitigated by increased LWD recruitment through the retention of conifers.

4.4.2.3 Sediment Production and Delivery

Hillslope erosion, sediment delivery, and sediment transport are all naturally occurring processes. After sediments are introduced to a watershed, they are stored and eventually transported through the channel. Sediments in stream channels influence channel shape and formation, substrate composition, and quality of aquatic habitat. Timber harvesting and the construction and use of the associated road system have the potential to affect sediment input to Primary Assessment Area streams.

As described in Section 4.2, *Geology, Geomorphology, and Mineral Resources*, it is anticipated that impacts to geology and soils would be reduced over time compared to existing conditions. Sediment loading to Primary Assessment Area streams would be reduced by

site preparation guidelines, tree planting, and stand maintenance. The potential for sediment delivery from these activities is much less than that caused by road construction and use.

Simpson's practices as described in Section 2.1.1.3 would be expected to result in a trend towards a reduction in road-related hillslope mass wasting, surface erosion, and sediment delivery over time throughout the Primary Assessment Area. Accordingly, under the No Action Alternative, in-stream and riparian habitat conditions affected by sediment delivery are also generally expected to result in a trend towards improved conditions compared to the existing conditions. Sediment delivery would be reduced primarily through continued implementation of Simpson's practices as described in Section 2.1.1.3, that include employment by Simpson of best management practices (BMPs) based on techniques described in Weaver and Hagans (1994), and treatment of road sediment delivery sites prioritized using a formal assessment methodology. Generally, roads would be upgraded to meet current standards when they are used to gain access to and haul logs from individual THP units. Simpson would continue to build new roads to access and manage its lands under the No Action Alternative (see Section 4.2.2). Potential benefits associated with reduced sediment loading, sedimentation, and turbidity include increased quantity and quality of suitable salmonid spawning gravels, greater survival of salmonid eggs and alevins in the gravels, and increased production of aquatic invertebrates that serve as foods for fish and other species. A gradual improvement in habitat conditions for all aquatic species is anticipated to occur because of the reduction in sediment delivery.

Sediment input, particularly increases in fine sediment, can affect stream temperatures through changes in channel morphology, such as reduced pool volume and increased channel width (Rhodes et al., 1994; Lewis, 1998). The trend towards reduced sediment delivery to streams under the No Action Alternative also has the potential to contribute to minor decreases in water temperature. Turbidity, sediment deposition, and the incidence of shallower, wider channels can increase the amount of solar radiation retained in the water column, leading to increased water temperatures. This effect is usually associated with larger, low-gradient rivers where turbidity is higher and exposure to sunlight is prolonged. Streams within the Primary Assessment Area are usually exposed to short-term, high-turbidity events only during snowmelt and rain events, few of which occur during the period of highest temperatures.

4.4.2.4 Aquatic Habitat

Overall, habitat conditions related to Simpson's forestry management activities for aquatic species are expected to improve under the No Action Alternative compared to existing conditions. The magnitude and rate of potential improvement in aquatic habitat during the term of the permit, however, are not known. Under the No Action Alternative, water quality and substrate in Primary Assessment Area streams is expected to improve because of reduced human-caused sediment delivery. There would be little or no change in other clean water parameters such as nutrient loading, contaminant loading (e.g., herbicides), and dissolved oxygen levels under this alternative. Because canopy closure is expected to increase from current conditions and little change in sedimentation/turbidity are expected under the No Action Alternative, future thermal conditions are expected to improve slightly relative to existing conditions as a result of implementing this alternative. Habitat complexity could increase slightly compared to existing conditions through increased LWD

loading, increased bank stability, and reduced sediment delivery. Stream connectivity would remain comparable to existing conditions.

There are no supplemental prescriptions under the No Action Alternative specifically directed at fish passage problems associated with culverts or stream crossings. Simpson's current guidelines and practices, however, require restoration or maintenance of fish passage during road upgrades and new road construction performed in association with THP implementation. Systematic and comprehensive removal of habitat connectivity barriers over the entire ownership would not occur. Barrier removal would generally be piecemeal and tied to implementation of individual THPs implemented on an opportunistic basis (i.e., not on an ownership-wide level) at any given point in time.

4.4.2.5 Other Factors

Factors other than hydrology, riparian conditions, sediment production and delivery, and aquatic habitat conditions can affect aquatic resources in Primary Assessment Area streams. These include the introduction and presence of non-native species, recreational fishing, illegal fishing, and covered activities associated with forest management, such as drafting of water from streams for dust abatement and fire suppression. The No Action Alternative does not contain specific prescriptions to address issues related to fishing and non-native fish species occurrence or management. Simpson's rock pits are generally less than 2 acres in size and are located more than 100 and 75 feet from Class I and Class II streams, respectively. Water drafting is done only under strict guidelines to ensure that covered species are not accidentally suctioned up with the water or harmed by dewatering of the stream where they reside. Under the No Action Alternative, these factors would not result in any changes to aquatic resources and their habitats relative to existing conditions.

4.4.2.6 Research and Monitoring

As part of the THP process and other regulatory requirements, including those of the NSOHCP, Simpson conducts a number of research and monitoring activities. These include compliance and effectiveness monitoring, wildlife surveys, environmental assessments, and watershed studies (e.g., in the TMDL context). In addition to these research and monitoring activities, Simpson may continue to conduct voluntarily, or allow the conduct of, various watershed, fish, and wildlife management activities for the enhancement or monitoring of watershed, wildlife, and fisheries resources. Examples of such activities that could be conducted in accordance with state and federal laws include:

- Aquatic habitat enhancement (e.g., instream boulder or LWD placement)
- Activities associated with improving fish passage (e.g., fish ladder construction or repair, culvert improvement or replacement with bridges, blockage removal)
- Instream surveys and sampling of fish (including but not limited to spawning surveys and downstream migrant trapping), aquatic habitat conditions, macroinvertebrates, and water quality

4.4.2.7 Summary of Effects

Overall, aquatic and riparian habitat conditions related to Simpson's forestry management activities and practices are expected to result in a trend towards improved conditions under

the No Action Alternative compared to the existing baseline. The magnitude and rate of potential habitat improvement over the next 50 years, however, are not known. Under the No Action Alternative, water quality and substrate in Primary Assessment Area streams are anticipated to improve because of reduced sediment loading, sedimentation, and turbidity. A reduction in sedimentation would primarily benefit the anadromous salmonids that use Primary Assessment Area streams for spawning and rearing during the freshwater phase of their life cycle. A reduction in substrate embeddedness resulting from reduced sediment input also could benefit amphibian species, as well as resident salmonid and non-salmonid fish species.

Because canopy closure is expected to increase from current conditions and a trend towards a reduction in sediment delivery is also expected to occur under the No Action Alternative, future thermal conditions are expected to improve slightly relative to existing conditions. While water temperatures are generally suitable for most species occurring in the Primary Assessment Area, any improvements in summer water temperatures would benefit both fish and amphibians.

Habitat complexity could increase compared to existing conditions through increased LWD loading, increased bank stability, and reduced sediment delivery. The physical processes associated with LWD include sediment sorting and storage, retention of organic debris, and modification of water quality. The biological functions associated with LWD structures include providing important rearing habitats, protective cover from predators and elevated stream flow, and regulation of organic material for the instream community of aquatic invertebrates. Creating and providing cover in pools, a primary function of LWD that benefits anadromous and resident salmonids, may be of limited benefit to headwater amphibian species, such as torrent salamanders and larval tailed frogs, because they prefer riffle habitats. The primary benefit of LWD to these amphibians would be the maintenance and creation of suitable riffle habitat through the storing and sorting of sediment.

4.4.3 Proposed Action

Under the Proposed Action, Simpson would continue to conduct timber harvesting on the Primary Assessment Area in accordance with existing regulations and guidelines discussed in Section 2.1 of this EIS. In addition, these existing measures used by Simpson to protect Class I, Class II, and Class III streams would be supplemented by Simpson's AHCP/CCAA Conservation Strategy, which includes enhanced RMZ widths, establishment of EEZs, and limited activities within the RMZs. Simpson also would implement ownership-wide mitigation, management, and monitoring measures. These measures are summarized in Chapter 2, *Proposed Action and Alternatives*, and include:

- Implementation of an ownership-wide Road Management Plan that provides for: selective and road-related fish passage enhancement (barrier removal); implementation of practices that are designed to minimize sediment discharge to Class I, Class II, and Class III streams; and decommissioning of some roads. The proposed Road Management Plan provides for accelerated repair of high- and moderate-risk sediment delivery sites on roads on the Simpson fee ownership in accordance with the schedule established in the proposed AHCP/CCAA.

- Protection of unique geomorphic features, such as channel migration zones and floodplains.
- Adoption of various slope stability and ground disturbance conservation measures.
- Implementation of effectiveness monitoring, plus adaptive management with structured feedback loops.

Under the Proposed Action, it is anticipated that habitat conditions would improve and aquatic and riparian resources would realize incremental benefits compared to the No Action Alternative. This would be largely attributable to implementation of the Road Management Plan, enhanced riparian zone protection, and other conservation measures described in Chapter 2 as part of the Proposed Action. Overall, the minimization and mitigation measures are expected to substantially reduce harvest- and road-related sediment production and delivery to Primary Assessment Area streams and to maintain or enhance existing riparian and aquatic conditions. The anticipated improvement in riparian conditions and the reduction in sediment production and delivery to streams would exceed the reductions expected under the No Action Alternative and would likely result in improved physical habitat for the seven covered fish species/ESUs and two covered amphibian species. Monitoring and adaptive management activities would provide additional flexibility and a mechanism for changing or fine-tuning the AHCP/CCAA prescriptions, if needed, based on their demonstrated effectiveness and other new information.

4.4.3.1 Hydrologic Effects

Upslope management under the Proposed Action would be similar to what would occur under the No Action Alternative and would not result in substantive changes in the existing hydrologic regime or in the magnitude and timing of naturally occurring peak and low flows in Primary Assessment Area drainages. (See Section 4.3, *Hydrology and Water Quality*, for further discussion of flow regimes.)

Harvest-related ground disturbance can reduce the infiltration capacity of soils and alter the process of subsurface water movement through soil compaction, leading to increased surface runoff. Under the Proposed Action, site preparation measures include seasonal operating limitations for tractors, skidders, and forwarders, and minimized use of tractor-and-brushrake piling. These harvest-related ground disturbance conservation measures would substantially reduce the impacts of any operations-related alterations in hydrology by minimizing soil compaction, which can increase the magnitude of peak flows and reduce the volume of sediment available for runoff during peak flow events.

Riparian conservation measures under the Proposed Action would reduce potential impacts of altered hydrology on aquatic habitat. Specifically, the riparian conservation measures would maintain in-channel LWD and provide increased LWD recruitment potential through enhanced riparian conservation measures compared to existing conditions and the No Action Alternative. The presence of LWD in stream channels aids in pool formation, sediment storage and sorting, provides refugia from peak flows, and maintains overwintering habitat for anadromous and resident salmonids and other fishes.

The conservation measures under the Proposed Action would reduce the impacts of forest management on surface runoff and peak flows, reduce soil compaction and disturbance, and maintain or enhance in-channel LWD beyond the reductions anticipated to occur over time under the No Action Alternative. Any impacts to aquatic habitat that could occur would be mitigated by improved riparian conditions resulting from riparian management and decreased sediment production and delivery, as described below.

4.4.3.2 Riparian Conditions

General Effects

In general, the riparian conservation measures under the Proposed Action are more protective of riparian functions than those described under the No Action Alternative, and they would, therefore, provide comparatively greater habitat benefits to the covered species. In addition to providing for enhanced riparian buffer widths, greater canopy closure, and increased tree retention, the proposed AHCP/CCAA limits commercial entry into the RMZs to one harvest entry during the term of the permit. The Proposed Action establishes RMZs at least 150 feet wide along Class I watercourses, with a variable-width inner zone ranging from 50 to 70 feet. The minimum RMZ width for Class I watercourses under the Proposed Action is comparable to the minimum WLPZ width for Class I watercourses under the No Action Alternative; however, additional protection is provided under the Proposed Action by extending the RMZ from the outer edge of the CMZ, where applicable. The outer boundary of a Class I RMZ also would be extended, where necessary, to include the entire floodplain and an additional 30 to 50 feet beyond the outer edge of the floodplain, depending on adjacent slopes. The Proposed Action also establishes SMZs upslope of Class I watercourses in areas identified as steep streamside slopes.

Minimum 100-foot-wide RMZs would be established along 2nd order or larger Class II watercourses under the Proposed Action; minimum RMZ width along 1st order Class II watercourses would be 70 feet. These widths are comparable to or greater than WLPZ widths along Class II watercourses under the No Action Alternative. The Proposed Action establishes a 30-foot wide inner zone for Class II RMZs within which 85 percent of the overstory canopy would be retained post-harvest; at least 70 percent overstory canopy would be retained within the outer zone of Class II RMZs. These retention standards exceed those for Class II WLPZs under the No Action Alternative, where a minimum of 50 percent to 70 percent total canopy closure (i.e., understory plus overstory) post-harvest is required. The Proposed Action also establishes SMZs upslope of Class II watercourses in areas identified as steep streamside slopes.

Overall, the Proposed Action provides additional riparian protection along Class III watercourses, compared to the No Action Alternative, by establishing minimum 30- to 50-foot-wide EEZs. The No Action provides for 25- to 50-foot equipment limitation zones (ELZs), within which all trees needed for bank stability would be retained. Within the EEZ of Tier A (less than 60 percent to 70 percent slopes) Class III watercourses, all existing LWD on the ground would be retained and there would be no fire ignition during site preparation. Within the EEZ of Tier B (greater than 60 percent to 70 percent slopes), all hardwoods and nonmerchantable trees would be retained, as would all conifers that contribute to bank stability or act as a control point in the channel; at least one conifer per 50 feet of stream length would be retained.

Overall, the riparian conservation measures under the Proposed Action would provide greater protection of riparian functions such as LWD recruitment, stream shading, sediment filtration, bank stability, and nutrient input than under the No Action Alternative. These measures would contribute to maintenance and development of a more suitable microclimate for amphibians and other species that use habitats along streams, and would benefit habitat used by the various life stages of the covered fish ESUs and species present in Primary Assessment Area drainages. The effects of the additional protection provided under the Proposed Action on individual riparian functions and related aquatic functions is described below.

LWD Recruitment

The canopy closure requirements and tree retention standards under the Proposed Action are more protective than what is included in the No Action Alternative. This would help to increase the potential for LWD recruitment so that in-channel LWD loading and size is likely to increase in the future. Whether such an increase would occur within a given stream reach would depend on the current condition and trend of existing LWD levels, and the length of time necessary to recruit additional wood to streams from adjacent riparian areas. For example, if little or no recruitment of wood has occurred recently, and existing pieces of wood are decaying or being washed out of a stream reach, in-stream levels of wood could continue to decline for some time, despite the fact that riparian management under the Proposed Action would provide an increase in sources of future LWD and thereby increased potential for wood recruitment in the future.

While the minimum RMZ width and canopy closure requirements of the Proposed Action are comparable to or greater than what is included in the No Action Alternative, the Proposed Action would provide additional LWD recruitment by retaining at least 15 conifer stems greater than 16 inches dbh per acre. All trees within the inner zone of RMZs along Class I streams and portions of Class II streams that are judged likely to recruit LWD to the stream channel would be retained. Numerous criteria would be used to make this judgment, including, but not restricted to, distance from the stream, direction of the lean, intercepting trees, and the potential for stream undercutting. The riparian conservation measures under the Proposed Action would ensure that all trees with the greatest potential for significant LWD function (e.g., that can influence fluvial processes or provide cover for fish) would be retained. The limitation to a single commercial harvest entry into the RMZ during the term of the permit would ensure that this additional LWD recruitment potential would be maintained during the permit term.

Geologic processes also can be important mechanisms that provide LWD to streams, and sometimes can be the primary mechanism by which LWD reaches streams. In particular, shallow rapid landslides have the potential to deliver large amounts of LWD when they form in inner gorges. In addition, debris torrents from small headwater Class II and Class III streams can be an important source of LWD when they empty directly into large Class II or Class I streams. The Proposed Action provides for tree retention in SMZs, primarily to minimize the likelihood of management-induced landslides. However, the SMZ prescriptions for tree retention would ensure that when a landslide does occur, it has the potential to deliver LWD to the adjacent stream.

Based on modeling conducted for the AHCP/CCAA of future LWD recruitment, it is anticipated that 99 percent and 88 percent of the total potential recruitment for managed

and site potential tree height would be provided along Class I watercourses, respectively, for site index 100. Along Class II watercourses, 95 percent and 73 percent of LWD recruitment would be attained for managed and site potential tree height, respectively, at site index 100. There would be little difference in the level of LWD recruitment expected at site index 120 or with differing inner zone widths along Class I watercourses. (See Section 7.2.3 of the AHCP/CCAA.)

The preceding discussion of future LWD recruitment potential focused on the proportion of trees that would be available for recruitment. The size of trees is also important in assessing impacts on LWD. Only a small proportion of the trees within RMZs would be harvested, and those that remain would continue to grow and age following removal of the adjacent upland stands. Trees in the RMZs would be increasing in age throughout the term of the proposed AHCP/CCAA, such that by the end of the term over one-third of the RMZ stands would be greater than 100 years old and the remainder would be between 51 and 100 years. At age 100 in a typical redwood zone, there would be approximately 120 trees per acre, with around 12 percent of the trees larger than 36 inches dbh. A few trees would exceed 48 inches dbh and the tallest trees in the stand would be about 170 feet tall.

While the RMZ measures are designed to replenish LWD into channels naturally, the time it would take to grow and recruit the larger pieces of LWD through natural processes would likely extend beyond the term of the proposed AHCP/CCAA. Therefore, Simpson has proposed projects to create off-channel habitat in selected stream reaches that appear to be severely limited by winter rearing habitat. Successful implementation of these projects would provide an alternative source of winter rearing habitat that can function during the time that potential LWD is developing sufficient size to create similar types of habitat naturally.

The proposed riparian conservation measures and certain slope stability conservation measures would minimize impacts of past practices and improve LWD recruitment in area streams. These measures would help to maintain and improve channel complexity and provide habitat necessary for all life stages of salmonids and amphibians. Implementation of riparian conservation measures under the Proposed Action would result in increased LWD recruitment that would help mitigate effects of altered hydrology that could occur as a result of upslope management. (See Section 4.3, *Hydrology and Water Quality*.)

Stream Shading

The canopy closure requirements and tree retention standards under the Proposed Action are even more protective than those included in the No Action Alternative. They would help to maintain stream shading in the critical “inner zone” where microclimate effects would have the greatest potential to impact amphibians directly or impact anadromous and resident salmonids indirectly through changes in water temperatures. Although the inner zone width along Class I watercourses is slightly less under the Proposed Action than under the No Action Alternative, the effects on microclimate and stream temperatures are not expected to be substantially different. Canopy closure would likely increase from current conditions in some stands as they regrow after previous timber harvesting and could decline slightly following harvesting in the future. There would be an immediate net reduction of canopy closure of up to approximately 15 percent to 20 percent following timber harvest in the outer zone that would be replaced within 5 to 10 years by recovery of the remaining tree crowns. On average, approximately 1,000 feet of watercourse would be

influenced by the average-sized harvest unit (currently about 25 acres) if the unit surrounds or is adjacent to a watercourse.

Although the sample size is small, Simpson has direct experimental data to support the conclusion that its proposed riparian conservation measures would not result in significant impacts to aquatic resources resulting from a slight change in water temperature (See Section 4.3.3.2 of this EIS and Appendix C-5.2 of the AHCP/CCAA, *Class II Paired Watershed Temperature Monitoring*.) Two of the treated streams showed minor increases (ranging from 0.5°C to 1.0°C) in water temperature within the limits of the harvest unit relative to the controls during the warmest time of day in the warmest 14-day period of the summer; two of the treated streams showed minor decreases (ranging from 1.3°C to 1.4°C) in water temperature. These decreases likely resulted from increased ground water inputs following harvesting of the adjacent stand.

On the basis of the minimal changes in temperature under the most extreme annual conditions, the opposite direction of the temperature responses, and the anticipated substantial increase in riparian protection under the Proposed Action, a measurable increase in water temperature in Class I or larger Class II streams caused by minor reductions in canopy closure following timber harvesting is not anticipated. Limiting entry (i.e., a single commercial entry during the term of the permit) into the RMZ would further reduce any potential minor impact from the slight temperature increases. Any increase in water temperature would be slight and less than significant, and over the term of the proposed AHCP/CCAA, stream temperatures would be maintained or improved compared with existing conditions or with conditions expected to occur over time under the No Action Alternative.

Sediment Filtration

Although most sediment delivered to streams originates outside of the riparian zone, maintenance of riparian buffers aids in filtering overland sediment flow and helps to minimize direct sediment inputs from the riparian zone. As under the No Action Alternative, exclusion of heavy equipment and mechanical site preparation within Class I and Class II RMZs, plus exclusion of heavy equipment in Class III EEZs, would minimize the level of ground disturbance that occurs adjacent to Primary Assessment Area watercourses. Maintaining 75 percent surface cover and treating bare soil in excess of 100 square feet would minimize the potential for management-related sediment delivery from within the RMZs along Class I and Class II watercourses. Greater retention of trees within the RMZ under the Proposed Action than under the No Action Alternative would likely enhance bank stability and contribute to higher levels of LWD recruitment. In turn, LWD recruitment would help minimize the effects of sediment production and delivery by providing in-channel LWD, which functions to sort and store sediment within stream channels. All of these improved functions would benefit aquatic and riparian habitat used by the covered species.

Streambank Stability

Management-induced erosion and hillslope mass wasting from watercourse banks can be amplified by increased peak flow intensity and duration, as well as by reductions in root reinforcement of soil cohesion when vegetation is removed. The riparian conservation measures for Class I and II watercourses that require 85 percent retention in the RMZ inner

zone and prohibit harvesting of trees that are likely to recruit to stream channels, plus Tier B Class-III measures that require retention of trees that are judged to be critical to maintaining bank stability, will likely lead to increased bank stability under the Proposed Action. Implementation of these measures is designed to mitigate management-related sediment inputs that could otherwise occur because of bank instability. Increased bank stability would reduce the potential for sediment delivery to Primary Assessment Area streams, resulting in benefits to water quality and aquatic habitat conditions.

Nutrient Input

The riparian conservation measures under the Proposed Action would favor conifers over hardwoods in the RMZs. Similar to the No Action Alternative for the WLPZs, the level of harvest in both the inner and outer zones of all RMZs under the Proposed Action would maintain the overstory canopy, so that the longer-lived conifers would eventually replace the short-lived hardwoods. In the long-term, this is anticipated to reduce the level of nutrient inputs relative to current levels. This is expected to be a lengthy process, however, that would extend perhaps decades into the future and, even then, would not result in complete elimination of hardwoods or insufficient nutrient input from riparian areas.

Aggradation of channels and scour from debris flows favor recolonization by the more rapidly growing hardwoods such as red alder. Therefore, both the slope stability and road management measures will tend to cause a decline in riparian hardwoods over time and a corresponding decrease in nutrient inputs. However, as noted above, this will be a long and gradual process that will not result in the total elimination of hardwoods.

It is anticipated that any effects on aquatic species and their habitats would likely be minimal (i.e., less than significant) and mitigated by increased LWD recruitment through the retention of conifers. This is particularly relevant where structural elements of aquatic habitat are more limiting than nutrient availability.

4.4.3.3 Sediment Production and Delivery

As discussed in Section 4.2, *Geology, Geomorphology, and Mineral Resources*, it is anticipated that the combined effect of the AHCP/CCAA conservation measures under the Proposed Action would reduce the potential to deliver sediment to Primary Assessment Area watercourses from existing sediment sources (e.g., from existing roads and skid trails) by implementing: (1) riparian management and slope stability measures, (2) the ownership-wide Road Management Plan, (3) harvest-related ground disturbance measures, and (4) the monitoring and adaptive management measures. In addition, the road-related conservation measures would be implemented within the Action Area on an accelerated basis, with anticipated application of protective new road design and existing road decommissioning on a schedule that is more fast-track than would occur under the No Action Alternative.

Sediment production and delivery to Primary Assessment Area streams would be reduced under the Proposed Action compared to the No Action Alternative. Potential benefits associated with reduced sediment loading, sedimentation, and turbidity were discussed in detail in Chapter 3 of this EIS. These benefits include, among others, increased quantity and quality of suitable salmonid spawning gravels, greater survival of salmonid eggs and alevins in the gravels, and increased production of aquatic invertebrates that serve as foods for fish and other species.

Reduced sediment delivery to streams under the Proposed Action also could contribute to minor decreases in water temperature. Sediment input, particularly increases in fine sediment, can affect stream temperatures through changes in channel morphology such as reduced pool volume and increased channel width (Rhodes et al., 1994; Lewis, 1998). With the slope stability and road management measures designed to minimize management-related sediment inputs, sediment production and delivery would be reduced relative to past practices and the No Action Alternative. Given that water temperatures are generally favorable throughout the Primary Assessment Area even with past sediment inputs (see Appendix C-5 of the AHCP/CCAA), sediment minimization measures under the Proposed Action would further reduce the likelihood that aggradation of channels would result in elevated water temperatures.

The Proposed Action identifies four primary sediment-input processes and proposes a number of specific prescriptions and conservation measures to mitigate potentially adverse effects associated with these processes. The primary sediment-input processes are as follows:

- Surface erosion
- Hillslope mass wasting
- Reduced bank stability
- Road-related sediment production

Sediment production from surface erosion is of most concern on slopes that are adjacent to watercourses, although erosion does occur higher on the hillslopes and within harvest units. As is the case for management prescriptions under the No Action Alternative, RMZ management prescriptions under the Proposed Action include conservation measures designed to impede sediment delivery in areas where sediment would have relatively short transport distances to watercourses. These measures include minimum overstory canopy retention standards within RMZ inner and outer zones, limitations on equipment use, and retention of trees judged to be critical to maintaining bank stability. The retention standards would ensure that there would be almost no net loss in total forest canopy in the inner zone of RMZs along Class I and Class II watercourses, and would greatly increase canopy along Class II watercourses relative to existing conditions. This canopy would impede grain detachment in these critical areas, where detached sediment would have relatively short transport distances to watercourses.

Also, harvest-related ground disturbance measures focus on minimizing ground disturbance and the exposure of bare mineral soil within harvest units. The proposed AHCP/CCAA describes conservation measures, including site preparation methods, limited operating periods for the construction of skid trails and use of ground-based yarding equipment, limiting use of ground-based yarding equipment that requires constructed skid roads to slopes less than or equal to 45 percent (with some exceptions), preferential use of cable yarding systems, and water-barring of cable corridors where necessary. The AHCP/CCAA also includes conservation measures for treatment of bare mineral soil within RMZs and on stream crossings. All of these ground disturbance conservation measures are expected to contribute directly to minimizing management related surface erosion within harvest units.

As discussed in Section 4.2.3.2, sediment production from hillslope mass wasting within the Primary Assessment Area is greatest in RMZs, steep streamside slopes, headwall swales, and historically active deep-seated landslides. (See Section 3.2.3.3, *Landslide Classification and Landslide-Prone Terrain*.) Under the Proposed Action, these areas are subject to specific slope stability conservation measures intended to achieve at least a 70 percent reduction in management-related sediment delivery from landslides relative to appropriate historical clearcut reference areas. These sensitive areas would receive additional protection through establishment of SMZs upslope of the RMZ along Class I and Class II watercourses. The width of the SMZ would vary among the 11 HPAs, with wider (and therefore, more protective) SMZs identified for those HPAs most prone to hillslope mass wasting. Selection harvest would be the most intensive silvicultural prescription allowed within the SMZ without geologic review, and no harvest would be allowed in the inner portion of the RMZ downslope of the SMZ (i.e., the RSMZ) along Class I and larger Class II watercourses. Timber harvesting would be prohibited within the entire RSMZ below SMZs in the Coastal Klamath and Blue Creek HPAs. In addition, no harvest would be allowed within the toe and 25 feet upslope from the top of the toe or scarp of historically active deep-seated landslides.

Tree retention in the SMZs and associated RMZs is expected to maintain a network of live roots that would preserve total soil cohesion and contribute to slope stability in these areas. Tree retention also would help maintain forest canopy, which would preserve some measure of rainfall interception and evapotranspiration. Maintenance of rainfall interception and evapotranspiration is expected to contribute to slope stability conditions in some locations by partially mitigating high ground water ratios that may be management related. Limited road construction and road reconstruction in SMZs and RMZs is expected to reduce the undercutting and overburdening of sensitive hillslopes and help avoid unnatural concentration of storm runoff on these slopes.

The riparian conservation measures for Class I and II watercourses that require 85 percent canopy retention in the RMZ inner zone and prohibit harvesting of trees that are likely to recruit to stream channels, plus Tier B Class-III measures that require retention of trees that are judged to be critical to maintaining bank stability, will likely lead to increased bank stability under the Proposed Action. Implementation of these measures is expected to provide an overall benefit to all covered species and their habitat by reducing sediment delivery to Primary Assessment Area drainages.

Road-related erosion and hillslope mass wasting are known to be significant contributors to the sediment budget in most managed watersheds. Eroded sediment can be delivered to watercourses through gullies or rills or through sheet transport processes from roads or through hillslope mass wasting. The Road Management Plan and associated conservation measures under the Proposed Action would reduce road related sediment production and delivery to Primary Assessment Area watercourses relative to measures under the No Action Alternative.

The AHCP/CCAA's proposed Road Management Plan provides for: (1) a method to classify roads on the basis of use and to prioritize road work and site-specific repairs; (2) improved standards for road repairs and upgrades relative to the No Action Alternative; (3) improved standards for stream crossings and culvert repairs and upgrades relative to the No Action Alternative; (4) improved standards for temporary and permanent road decommissioning relative to the No Action Alternative; and (5) a training program for equipment operators

and supervisors on the Road Management Plan and other AHCP/CCAA standards and practices. These general road-related conservation measures would reduce road-related sediment production to a greater extent than under the No Action Alternative.

Simpson has performed a general assessment of its ownership within the Action Area that identifies road-related sediment sources requiring treatment (e.g., stabilization of dirt or other remediation to prevent road-related, sediment-producing failures or hillslope mass wasting events). At the time the sediment model was run in 2002, Simpson estimated the volume of potential sediment associated with high- and moderate-risk sediment delivery sites (based on both the probability of delivery to watercourses and the sediment volume associated with such delivery) to be 6,436,000 cubic yards (see Appendix F of the AHCP/CCAA). Under the AHCP/CCAA, Simpson's proposed Road Management Plan is designed to provide treatment of all high- and moderate-risk sediment delivery sites over the term of the AHCP/CCAA, to minimize potential delivery of sediment to riparian and aquatic areas. In addition, in the AHCP/CCAA, Simpson commits to provide an average of \$2.5 million per year for the first 15 years of the AHCP/CCAA (for a total of \$37.5 million) to accelerate implementation of the treatments for the high- and moderate-risk sites. (The acceleration period would be adjusted following revision of the estimate of sediment yield from high- and moderate-risk sediment delivery sites at the end of the first five years following permit issuance. The acceleration period and monetary commitment could be adjusted (upward or downward) by up to 1.5 years and \$3.75 million depending on the revised estimate of sediment yield.)

As discussed in Section 4.2.3.4, approximately 48 percent of the total volume requiring treatment would receive treatment in the first 15 years of the plan. This 48 percent equates to 3,058,000 cubic yards of sediment that could otherwise wash into streams on or adjacent to Simpson's ownership being removed within the first 15 years of the AHCP/CCAA. (See Appendix F of the AHCP/CCAA.) (Also, see Figure 4.2-1 in Section 4.2, *Geology, Geomorphology, and Mineral Resources*, for a graphic depiction of the reduction in sediment delivery under the Proposed Action compared to the No Action.) Implementation of the Road Management Plan under the Proposed Action would result in improved sediment control by accelerating the reduction of sediment loading compared to the rate at which sediment would be reduced under the No Action Alternative. This would result in direct beneficial effects to aquatic and riparian species.

An additional benefit to aquatic species of treating the high- and moderate-risk sediment delivery sites on an accelerated basis is that less sediment would be delivered to Primary Assessment Area streams. These benefits would compound quickly over time because of the brief life-span of the covered species. On the basis of the sediment delivery study findings, it takes 38 years to stabilize 48 percent of the high- and moderate-risk sediment under the No Action Alternative. In contrast, under the "acceleration" scenario of the Proposed Action, 48 percent of the sediment would be stabilized within the first 15 years of the plan, which is 23 years earlier than under the No Action Alternative. Because most of the covered fish species have a short (2-6 year) life cycle, several generations of fish would benefit over the 23 years difference in the time that it takes to reach the 48 percent benchmark.

4.4.3.4 Aquatic Habitat

Overall, habitat conditions related to forestry management activities for aquatic species are expected to improve under the Proposed Action relative to existing conditions and relative to the No Action Alternative. The magnitude and rate of potential improvement in aquatic habitat over the proposed 50-year term of the permit, however, are unknown. Under the Proposed Action, water quality and substrate in Primary Assessment Area streams are expected to improve because of reduced sediment delivery. There would be little or no change in other clean water parameters such as nutrient loading, contaminant loading (e.g., herbicides), and dissolved oxygen levels. Because improvements in canopy closure, shading, sedimentation, and turbidity are expected under the Proposed Action, future thermal conditions for covered species would be similar to or better than existing conditions as a result of implementing the proposed AHCP/CCAA. Habitat complexity would likely increase compared to existing conditions through increased LWD loading, increased bank stability, and reduced sediment delivery relative to the No Action Alternative.

The Road Management Plan described under the No Action (see Section 2.1) addresses fish access issues associated with new roads by installing bridges on fish-bearing streams where feasible. When a bridge installation is not feasible, a “fish-friendly” structure would be installed that would provide upstream and downstream fish passage. Under the Proposed Action, potential fish passage problems at existing road crossings would be documented during the road inventory process, and culverts that are impeding fish passage would be prioritized for replacement with a bridge or other “fish friendly” structure. As culvert replacement is implemented over time, fish passage problems at road crossings would be eliminated. These actions would result in improved stream connectivity in the Primary Assessment Area and have the potential for providing covered species access to potentially suitable, but presently unavailable, habitat in some stream reaches.

Throughout the Primary Assessment Area, there are a variety of stream reaches that occur above natural barriers to anadromy that appear to have good habitat for anadromous salmonids, particularly coho salmon. Under the proposed AHCP/CCAA, Simpson would undertake a special project that is expected to expedite the conservation of this species by increasing the available habitat for spawning and rearing. Simpson would undertake one project involving trapping and transporting coho that are native to the stream system around a barrier during the spawning season for a one-year period and allow them to spawn. Prior to undertaking the project, Simpson would evaluate the selected stream to determine that salmonids residing in the basin above the barrier would not be adversely affected by the project. The translocation project would include monitoring of subsequent spawning, utilization of summer rearing habitat by the juvenile fish, and outmigrant trapping to document the number of smolts leaving the system. The upper North Fork of the Mad River has been identified as being one of the top candidate sites for the initial project. Impacts associated with relocating anadromous salmonids upstream of natural barriers are not significant, since these salmonids are being reintroduced in portions of watersheds where they have historically occurred.

Additionally, as part of the proposed AHCP/CCAA measures, Simpson would make its fee owned land within the Primary Assessment Area available for restoration and conservation groups to perform projects to create off-channel habitat in selected stream reaches that appear to be severely limited by winter rearing habitat. It is anticipated that

these projects would be carried out cooperatively with various restoration groups that are currently working within the Primary Assessment Area. Potential areas for this type of restoration include the lower reaches of the South Fork Winchuck River in the Smith River HPA, Wilson and Hunter Creeks in the coastal Klamath HPA, and Ryan Slough in the Humboldt Bay HPA. If implemented, these projects would benefit salmonids by providing an alternative source of winter rearing habitat that can function during the time that potential LWD is developing sufficient size to create this habitat naturally.

It is expected that benefits to the covered species and their habitats under the Proposed Action would continue to accrue over the 50-year permit period because of more time for the beneficial effects of the conservation measures and improved forest management practices to be realized. Examples of time-dependent benefits to covered species and their habitats include immediate and continued long-term reductions in sediment delivery from road and riparian management actions. In addition, a variety of improvements to riparian vegetation and function would interact to contribute collectively to long-term benefits to aquatic communities. These improvements include, among others, increased LWD recruitment, greater tree retention in riparian zones, and increased canopy closure and slightly reduced water temperature.

4.4.3.5 Other Factors

As discussed previously for the No Action Alternative, factors other than hydrology, riparian conditions, sediment production and delivery, and aquatic habitat conditions can affect aquatic resources in Primary Assessment Area streams. These include the introduction and presence of non-native species, recreational fishing, illegal fishing, and covered activities associated with forest management, such as drafting of water from streams for dust abatement and fire suppression. Similar to the No Action Alternative, the Proposed Action does not contain specific prescriptions to address issues related to fishing and non-native fish species occurrence or management. Water drafting is conducted only under strict guidelines to ensure that covered species are not accidentally suctioned up with the water or harmed by dewatering of the stream where they reside. Under the Proposed Action, these factors would generally not result in any changes to aquatic resources and their habitats relative to existing conditions.

Under the Proposed Action, the conservation measures specific to rock pit use and development (see Section 2.2.2) would, however, further contribute to improvements in aquatic habitat and associated long-term benefits to aquatic communities.

4.4.3.6 Research and Monitoring

As part of the THP process and other regulatory requirements, including those of the NSOHCP, Simpson conducts a number of research and monitoring activities. These include effectiveness monitoring, wildlife surveys, environmental assessments, and watershed studies. Under the Proposed Action, the level of effectiveness monitoring would be greater than under the No Action Alternative.

In addition to the required and voluntary research and monitoring activities presently being conducted by Simpson, additional monitoring would be conducted under the Proposed Action to document the level of effectiveness of the AHCP/CCAA conservation measures.

Effectiveness monitoring would measure the success of the conservation program in achieving the AHCP/CCAA's biological goals and objectives. It would track trends in the quality and quantity of habitat for the covered species (as well as the distribution and relative abundance of the covered species) and provide information to better understand the relationships among specific aquatic habitat elements and the long-term persistence of the covered species. The effectiveness monitoring projects include temperature monitoring, channel and erosion monitoring, salmonid and amphibian population monitoring, and LWD assessments. These and other proposed monitoring efforts are described in detail in Appendix D of the proposed AHCP/CCAA.

Monitoring data could be collected year-round, as with some in-stream temperature recorders, or seasonally, as with the Class I channel dimensions monitoring. The data collected through each monitoring project would be analyzed on an annual basis for every monitoring project. The intent is to provide a timely review of monitoring data to allow for corrective actions, if necessary, to occur before the next field season. Based on the results of the effectiveness monitoring under the Proposed Action, changes to management and conservation measures could be implemented through adaptive management.

Adaptive management is an important tool for natural resource management when there is substantial scientific uncertainty regarding appropriate management and conservation strategies (Walters, 1986). Adaptive management has two key features: (1) a direct feedback loop between science and management, and (2) the use of management strategies as a scientific experiment (Halbert, 1993; Walters, 1986). Simpson's monitoring and adaptive management program incorporates both these features with the goals of: (1) increasing the understanding of watershed processes and the effects of management activities on the habitats and populations of the covered species over the term of the permits; and (2) modifying some of the proposed AHCP/CCAA's conservation measures in response to this new information. Under the Proposed Action, adaptive management would provide flexibility and a mechanism for strengthening or relaxing individual conservation measures, depending on how well the measure is or is not working based on specific performance criteria. Modification of conservation measures would be limited to the extent established in the AHCP/CCAA.

The overall benefit of the monitoring and adaptive management program would be to: (1) validate continually that habitat and populations of the covered species are in good condition where they currently exist; (2) document the trend in recovery in areas that have been affected by past management activities or natural disturbances; (3) modify or augment existing conservation measures where "fine tuning" is necessary; and (4) re-allocate resources to make the conservation program more efficient, where warranted. In addition, the monitoring and experimental studies that would be conducted as part of the AHCP/CCAA would further the knowledge on conservation of aquatic species on managed landscapes, potentially benefiting these species throughout their range.

Under the Proposed Action, Simpson would commit to continue the various watershed, fish, and wildlife management activities for the enhancement or monitoring of watershed, wildlife, and fisheries resources described under the No Action Alternative in Section 2.1.2.5. These include:

- Aquatic habitat enhancement (e.g., instream boulder or LWD placement)

- Activities associated with improving fish passage (e.g., fish ladder construction or repair, culvert improvement or replacement with bridges, blockage removal)
- Instream surveys and sampling of fish (including but not limited to spawning surveys and downstream migrant trapping), aquatic habitat conditions, macroinvertebrates, and water quality

4.4.3.7 Summary of Effects

Overall, aquatic and riparian habitat conditions related to forestry management activities are expected to improve under the Proposed Action relative to existing conditions and relative to continued implementation of the No Action Alternative. The anticipated improvement in riparian conditions and the reduction in sediment production and delivery to streams would exceed the improvements anticipated to occur over time under the No Action Alternative, and would likely result in improved physical habitat for the seven covered fish species/ESUs and the two covered amphibian species. Improvements in aquatic and riparian habitat benefiting the covered species would, in general, benefit other species associated with these habitats. It is expected that benefits to all these species and their habitats under the Proposed Action would continue to accrue over the 50-year permit period because of more time for the beneficial effects of the conservation measures and improved forest management practices to be realized.

Under the Proposed Action, water quality and substrate in Primary Assessment Area streams would improve because of reduced sediment loading, sedimentation, and turbidity. Potential benefits associated with reduced sediment loading, sedimentation, and turbidity include increased quantity and quality of salmonid spawning gravels, greater survival of salmonid eggs and alevins in the gravels, and increased production of aquatic invertebrates that serve as foods for fish and other species. A reduction in sedimentation would primarily benefit the covered salmonids that use Primary Assessment Area streams for spawning and rearing during the freshwater phase of their life cycle. These fish species are coho salmon, chinook salmon, steelhead, and rainbow and coastal cutthroat trout. A reduction in substrate embeddedness resulting from reduced sediment input also may benefit the two covered amphibian species – southern torrent salamander and tailed frog. Because management-related sediment production and delivery is expected to decrease substantially under the Proposed Action compared to the No Action Alternative, the benefits to covered species are anticipated to be correspondingly greater under the Proposed Action.

Because improvements in canopy closure, shading, sedimentation, and turbidity are expected under the Proposed Action, future thermal conditions for covered species would be similar to or better than existing conditions as a result of implementing the proposed AHCP/CCAA. Water temperature monitoring has shown that water temperatures in Primary Assessment Area streams are generally suitable for anadromous and resident salmonids. Although the covered amphibian species have temperature thresholds below those of the covered fish ESU, surveys indicate that tailed frogs and southern torrent salamanders are present in most streams sampled across the entire Primary Assessment Area, in stands ranging from recent even-aged harvesting units to mature second growth. This suggests that temperatures and microclimate variables are currently suitable for these and other amphibian species in the majority of streams in the Primary Assessment Area. Any improvements (reductions) in summer water temperatures would benefit both the

covered fish species and covered amphibian species, as well as other species associated with aquatic habitats.

Habitat complexity would increase relative to existing conditions and relative to the No Action Alternative through increased LWD loading, increased bank stability, and reduced sediment delivery. LWD is recognized as a vital component of salmonid habitat. The physical processes associated with LWD include sediment sorting and storage, retention of organic debris, and modification of water quality. The biological functions associated with LWD structures include providing important rearing habitats, protective cover from predators and elevated stream flow, retention of gravels for salmonid redds, and regulation of organic material for the instream community of aquatic invertebrates. Maintaining a high percentage of the potential LWD recruitment would ensure that these functions would be provided over the proposed 50-year term of the permit.

Creating and providing cover in pools, a primary function of LWD that benefits the covered salmonid species, may be of limited benefit to the headwater amphibian species covered in the AHCP/CCAA, since torrent salamanders and larval tailed frogs prefer riffle habitats. The primary benefit of LWD to the covered amphibian species is the creation of suitable riffle habitat through the storing and sorting of sediment. Increased LWD recruitment under the Proposed Action would help to maintain riffle habitats for the covered amphibians.

4.4.4 Alternative A

The major difference between this alternative and the Proposed Action is that no monitoring would be conducted for the southern torrent salamander or tailed frog and the adaptive management provisions of the AHCP would not apply to these species. As a result, these species would not have the benefit of possible adjustments to the AHCP that would otherwise occur through the implementation of the monitoring and adaptive management provisions together.

Because general timber harvesting and forest management activities, as well as road management and riparian conservation measures, would be the same under Alternative A as under the Proposed Action, potential effects on aquatic and riparian resources within the Primary Assessment Area would also generally be the same as described for the Proposed Action.

Implementation of Alternative A, therefore, would improve aquatic and riparian habitat conditions to the same degree as the Proposed Action (except for the southern torrent salamander and tailed frog), which exceeds improvements anticipated to occur over time under the No Action Alternative.

These improvements would primarily benefit the three covered fish ESUs, but they would also have general beneficial effects on other species associated with aquatic and riparian habitats. The three covered fish ESUs under Alternative A are the Southern Oregon/Northern California Coasts coho salmon ESU, the California Coastal chinook salmon ESU, and the Northern California steelhead ESU that have been listed by NMFS as threatened under the federal ESA.

4.4.5 Alternative B

Under Alternative B, Simpson would continue to conduct timber harvesting on its property as described under the No Action Alternative. Existing measures used by Simpson to protect Class I, II, and III streams would be supplemented by an AHCP/CCAA conservation strategy specific to this alternative. This strategy would include fixed riparian buffer widths within which no management or timber harvesting would occur adjacent to Class I and II streams, and establishment of ELZs along Class III streams. Simpson would not implement an ownership-wide Road Management Plan, and would not provide protection for unique geomorphic features, such as CMZs and floodplains. Additional slope stability and ground disturbance measures would also not be implemented. Effectiveness monitoring would not be as extensive under this alternative as under the Proposed Action, and adaptive management with structured feedback loops would not be implemented.

Overall, under Alternative B, it is anticipated that beneficial effects on aquatic and riparian resources resulting from forest management activities would be increased from what currently exists and what is anticipated to occur under the No Action Alternative. Enhanced riparian zone protection could lead to additional improvement in riparian conditions over time compared to the No Action Alternative. Without implementation of a more comprehensive, ownership-wide Road Management Plan and specific sediment minimization measures, the conservation measures contained in Alternative B are not expected to reduce substantially harvest- and road-related sediment production and delivery to Primary Assessment Area streams relative to the Proposed Alternative and Alternative A. The anticipated improvement in riparian conditions could result in slightly improved physical habitat for aquatic and riparian species.

4.4.5.1 Hydrologic Effects

Upslope management under Alternative B would be similar to that under the No Action Alternative (and other action alternatives), and would not result in substantive changes in the existing hydrologic regime or in the magnitude and timing of naturally occurring peak and low flows in Primary Assessment Area drainages. (See Section 4.3, *Hydrology and Water Quality* for further discussion of flow regimes.) As such, relatively little change from existing conditions is expected in channel morphology, incidence of bed scour and bank erosion, or quality of aquatic habitat as a result of altered hydrologic conditions. Any impacts that may occur as a result of altered hydrology because of upslope management would be mitigated somewhat by improved riparian conditions resulting from riparian management described below.

4.4.5.2 Riparian Conditions

General Effects

In general, the riparian conservation measures under Alternative B are more protective of riparian functions than those described under the No Action Alternative. Riparian buffers for Class I streams would have fixed widths of 150 feet (slope distance), as measured from the first line of perennial vegetation. Under Alternative B, there would be no forest management or riparian habitat management within Class I riparian buffers (with the exception of creating cable-yarding corridors when other options are impractical). The use of heavy equipment within Class I riparian buffers also would be prohibited under this

alternative, except for the use of existing roads and stream crossings for log-hauling purposes (unless otherwise qualified by the CFPRs).

Riparian buffers for Class II streams would have fixed widths of 100 feet (slope distance), as measured from the first line of perennial vegetation. Under this alternative, there also would be no forest management or riparian habitat management within Class II riparian buffers (with the exception of creating cable-yarding corridors when other options are impractical). As for Class I riparian buffers, the use of heavy equipment within Class II riparian buffers would also be prohibited. Under Alternative B, protection of Class III streams would be the same as under the No Action Alternative.

Overall, the riparian conservation measures under Alternative B would provide a level of protection for riparian functions such as LWD recruitment, stream shading, sediment filtration, bank stability, and nutrient input similar to that under the No Action Alternative. With the prohibition of forest management within riparian buffers along Class I and Class II watercourses, LWD recruitment would be maintained at a higher level than under the No Action Alternative. These measures also would provide a similar microclimate for amphibian and other species that utilize habitats along streams. The effect of riparian protection provided under Alternative B on individual riparian functions is described below.

LWD Recruitment

Because forest management would not be allowed in riparian buffers along Class I and II watercourses under Alternative B, LWD recruitment potential would be increased over that under the No Action Alternative, so that in-channel LWD loading and size would likely increase in the future; however, the benefits of management activities carried out under the No Action Alternative that could encourage accelerated growth of conifers would not occur. Whether such an increase would occur within a given stream reach would depend on the current condition and trend of existing LWD levels, and the length of time necessary to recruit additional wood to streams from adjacent riparian areas. For example, if little or no recruitment of wood has occurred recently, and existing pieces of wood are decaying or being washed out of a stream reach, in-stream levels of wood could continue to decline for some time, despite the fact that riparian conservation measures under Alternative B would provide increased potential for recruitment in the future. The prohibition of commercial harvest entry into the riparian buffers during the term of the permit would ensure that this additional LWD recruitment potential would be maintained over the 50-year period.

Although no changes to the hydrologic regime are expected to occur, implementation of riparian conservation measures under Alternative B would result in increased LWD recruitment that would help mitigate effects of altered hydrology that could occur as a result of upslope management (see Section 4.3, *Hydrology and Water Quality*).

Stream Shading

The prohibition of commercial harvest in the riparian buffers under Alternative B would help to maintain stream shading in the riparian buffer where microclimate effects would have the greatest potential to result in direct impacts to amphibians or indirect impacts to anadromous and resident salmonids through changes in water temperatures. Canopy closure would likely increase from current conditions in some stands as they recover from previous timber harvesting. Increased canopy closure could, therefore, result in slightly decreased water temperatures in Primary Assessment Area streams. The prohibition of

commercial entry into the riparian buffers during the term of the permit would help ensure that temperatures and microclimate would remain suitable during the permit term.

Sediment Filtration

Although most sediment delivered to streams originates outside of the riparian zone, maintenance of riparian buffers aids in the filtration of overland sediment flow and helps to minimize direct sediment inputs from the riparian zone. Prohibiting forest management activities within Class I and Class II riparian buffers would minimize the level of ground disturbance that occurs adjacent to Primary Assessment Area watercourses and would minimize the potential for management-related sediment delivery from within the riparian buffers along Class I and Class II watercourses. Prohibiting forest management in the riparian buffers under Alternative B would likely enhance bank stability and contribute to higher levels of LWD recruitment relative to existing conditions and the No Action Alternative. In turn, LWD recruitment would help mitigate the effects of sediment production and delivery by providing in-channel LWD, which functions to sort and store sediment within stream channels.

Streambank Stability

Bank stability would increase under Alternative B, relative to existing conditions and the No Action Alternative because of the establishment of riparian buffers along Class I and Class II watercourses in which no management would be allowed. Retention of all trees (and their root systems) within the riparian buffer would minimize management-related sediment inputs that could otherwise occur because of bank instability, and provide an overall benefit to covered species and their habitat by reducing sediment delivery to Primary Assessment Area drainages.

Nutrient Input

The riparian conservation measures under Alternative B would favor conifers over hardwoods in the RMZs. Maintenance of no-cut riparian buffers would maintain the overstory canopy, so that the longer-lived conifers would eventually replace the short-lived hardwoods. In the long term, this would reduce the level of nutrient inputs relative to current levels.

This is expected to be a lengthy process, however, that would extend perhaps decades into the future and, even then, would not result in complete elimination of hardwoods or insufficient nutrient input from riparian areas. It is anticipated that any effects on aquatic species and their habitats would likely be minimal (i.e., less than significant) and mitigated by increased LWD recruitment through the retention of conifers. This is particularly relevant where structural elements of aquatic habitat are more limiting than nutrient availability.

4.4.5.3 Sediment Production and Delivery

As described in Section 4.2 (*Geology, Geomorphology, and Mineral Resources*), implementation of the conservation measures under Alternative B would provide a greater protection to geology and soils in the Primary Assessment Area compared to what would be anticipated under the No Action Alternative. The Alternative B measures, however, would likely result in less protection to geology and soils than anticipated under the Proposed Action. Hillslope mass wasting would likely occur more frequently, resulting in greater sediment volume delivery to streams under Alternative B than the Proposed Action.

Sediment production and delivery to Primary Assessment Area streams under Alternative B would likely be generally comparable to the No Action Alternative. Similar to the No Action Alternative, sediment reduction would occur primarily through implementation of current forest road management and maintenance practices on old roads that do not meet current standards. Generally, however, roads would be upgraded to current standards only as those roads are used to gain access to and haul logs from individual THP units. Also, Simpson would continue to build new roads to gain access to and manage its lands, which would be the same as under the No Action Alternative. Under Alternative B, the design standards of new roads would be the same as the No Action Alternative. Road-related hillslope mass wasting and sediment delivery would still be expected to decrease over time through the application of Simpson's existing practices. This reduction in sediment delivery is expected to result in a gradual improvement in habitat conditions for aquatic resources, particularly anadromous and resident salmonids (rather than the accelerated improvement that would occur under the Proposed Action and Alternatives A and C).

Sediment input, particularly increases in fine sediment, can affect stream temperatures through changes in channel morphology such as reduced pool volume and increased channel width (Rhodes et al., 1994; Lewis, 1998). Reduced sediment delivery to streams under Alternative B could also contribute to minor beneficial decreases in water temperature. Turbidity, sediment deposition, and the incidence of shallower, wider channels can increase the amount of solar radiation retained in the water column, leading to increased water temperatures. This effect is usually associated with larger, low-gradient rivers where turbidity is higher and exposure to sunlight is prolonged. Streams within the Primary Assessment Area are usually exposed to short-term, high-turbidity events only during snowmelt and rain events, few of which occur during the period of highest temperatures.

4.4.5.4 Aquatic Habitat

Overall, habitat conditions related to forestry management activities for aquatic and riparian species are expected to improve under Alternative B compared to existing conditions. The magnitude and rate of potential improvement in aquatic and riparian habitat during the term of the permit, however, are unknown. Under Alternative B, water quality and substrate in Primary Assessment Area streams would improve because of reduced sediment delivery. There would be little or no change in other water quality parameters, such as nutrient loading, contaminant loading (e.g., herbicides), and dissolved oxygen levels under this alternative. Because canopy closure would likely increase and there would be little change in sedimentation and turbidity under Alternative B, future thermal conditions could improve slightly as a result of implementing this alternative. Habitat complexity could increase slightly compared to existing conditions through increased LWD loading, increased bank stability, and reduced sediment delivery. There are no supplemental prescriptions under Alternative B specifically directed at fish passage problems associated with culverts or stream crossings. Alternative B is similar to the No Action Alternative in that restoration or maintenance of fish passage during road upgrades and new road construction performed in association with THP implementation would be required. Systematic and comprehensive removal of habitat connectivity barriers over the entire ownership would not occur, and stream connectivity would remain comparable to existing conditions. Barrier removal would generally be piecemeal and tied to implementation of individual THPs scattered across the ownership at any given point in time.

4.4.5.5 Other Factors

As discussed previously for the No Action Alternative, factors besides hydrology, riparian conditions, sediment production and delivery, and aquatic habitat conditions can affect aquatic resources in Primary Assessment Area streams. These other factors include the introduction and presence of non-native species, recreational fishing, illegal fishing, and covered activities associated with forest management, such as drafting of water from streams for dust abatement and fire suppression. Similar to the No Action Alternative, Alternative B does not contain specific prescriptions to address issues related to fishing and non-native fish species occurrence or management. Simpson's rock pits are generally less than 2 acres in size and are located more than 100 and 75 feet from Class I and Class II streams, respectively. Water drafting is conducted only under strict guidelines and in compliance with applicable laws to ensure that covered species are not accidentally suctioned up with the water or harmed by dewatering of the stream where they reside. Under Alternative B, these factors would not result in any changes to aquatic resources and their habitats relative to existing conditions.

4.4.5.6 Research and Monitoring

As described previously for the No Action Alternative, Simpson conducts a number of research and monitoring activities as part of the THP process and other regulatory requirements. These include effectiveness monitoring, wildlife surveys, environmental assessments, and watershed studies. Under Alternative B, the level of effectiveness monitoring would be comparable to the No Action Alternative and less than under the Proposed Action and other action alternatives.

As with the No Action Alternative, Simpson could continue to conduct voluntarily, or allow the conduct of, various watershed, fish, and wildlife management activities for the enhancement or monitoring of watershed, wildlife, and fisheries resources. Examples of such activities that could be conducted in accordance with state and federal laws include:

- Aquatic habitat enhancement (e.g., instream boulder or LWD placement)
- Activities associated with improving fish passage (e.g., fish ladder construction or repair, culvert improvement or replacement with bridges, blockage removal)
- Instream surveys and sampling of fish (including but not limited to spawning surveys and downstream migrant trapping), aquatic habitat conditions, macroinvertebrates, and water quality

4.4.5.7 Summary of Effects

Overall, aquatic and riparian habitat conditions related to forestry management activities are expected to improve under Alternative B relative to existing conditions and relative to the No Action Alternative. The magnitude and rate of potential improvement in aquatic habitat during the term of the permit, however, are unknown. As described for the Proposed Action, it is expected that benefits to covered species and their habitats would accrue over the 50-year permit period because of more time for the beneficial effects of the conservation measures and improved forest management practices associated with Alternative B to be realized. Covered species under Alternative B include the same fish species/ESUs and amphibian species that are covered under the Proposed Action.

Under Alternative B, water and substrate in Primary Assessment Area streams could become cleaner because of reduced sediment loading, sedimentation, and turbidity. A reduction in sedimentation would primarily benefit the anadromous salmonids that utilize Primary Assessment Area streams for spawning and rearing during the freshwater phase of their life cycle. A reduction in substrate embeddedness resulting from reduced sediment input also may benefit the covered amphibian species. The anticipated level of sediment reduction under Alternative B would be less than under the Proposed Action and other action alternatives.

Because canopy closure would likely increase and there would be little change in sedimentation and turbidity under Alternative B, future thermal conditions could improve slightly as a result of implementing this alternative. While water temperatures are generally suitable for most of the covered species, any improvement (reduction) in summer water temperatures would benefit both fish and amphibians. Alternative B would develop and maintain the highest level of canopy closure of any of the action alternatives, including the Proposed Action.

Habitat complexity could increase slightly compared to existing conditions through increased LWD loading, increased bank stability, and reduced sediment delivery. The physical processes associated with LWD include sediment sorting and storage, retention of organic debris, and modification of water quality. The biological functions associated with LWD structures include providing important rearing habitats, protective cover from predators and elevated stream flow, and regulation of organic material for the instream community of aquatic invertebrates. Creating and providing cover for pools, a primary function of LWD that benefits covered salmonids, may be of limited benefit to the headwater amphibian species covered in the AHCP/CCAA, since southern torrent salamanders and larval tailed frogs prefer riffle habitats. The primary benefit of LWD to the covered amphibians is the creation of suitable riffle habitat through the storing and sorting of sediment. Riparian buffers with no management would maintain a high percentage of the potential LWD recruitment and ensure that these functions would be provided over the term of the permit.

4.4.6 Alternative C

General timber harvesting and forest management activities, as well as road management and riparian conservation measures, under Alternative C would essentially be the same as under the Proposed Action.

Under Alternative C, adaptive management would provide a mechanism for strengthening or relaxing individual conservation measures in the rain-on-snow areas if monitoring indicates, on the basis of specific performance criteria, that a change is necessary. Overall, implementation of Alternative C is anticipated to result in improved aquatic and riparian habitat conditions compared to existing conditions or to conditions anticipated to occur under the No Action Alternative, although the improvements would not be as great as those that would occur under the Proposed Action. Simpson's commitment to provide \$2.5 million per year for the first 15 years of the AHCP/CCAA to accelerate implementation of treatments for high- and moderate-risk sediment delivery sites would be extended to include the additional 26,116-acre rain-on-snow areas under Alternative C. Because accelerated site treatments over the 15-year period would be spread over a larger area, potential benefits may be diluted relative to what would be expected to occur under the

Proposed Action. Also, since the adaptive management “account” for the Proposed Action would also apply to a larger area under Alternative C, potential benefits specific to adaptive management may also be diluted relative to what would be expected to occur under the Proposed Action. Implementation of Alternative C, therefore, would result in aquatic and riparian habitat conditions comparable to or slightly less improved relative to conditions that would result from implementing the Proposed Action.

Improvements would primarily benefit the eight fish species and ESUs covered under Alternative C, but they also would have general beneficial effects on the four amphibian species and one reptile species covered under this alternative that are associated with aquatic and riparian habitats.

4.4.7 Cumulative Impacts

The assessment of potential cumulative impacts on aquatic resources was conducted using the approach described in Section 4.1.2, *Cumulative Impacts*, of this EIS. The assessment area for cumulative impacts consists of the 11 HPAs that contain Action Area lands operated by Simpson and covered in its proposed AHCP/CCAA, as well as other lands that are predominantly either privately owned, administered by a federal resource management agency, or are state or federal park lands. Habitat and species present in watersheds within each HPA are largely influenced by management strategies of the various land and resource managers. Resource management strategies being employed in these HPAs, when combined with future management strategies that would be employed by Simpson, can cumulatively affect covered species and their habitats, especially in those HPAs where covered species are widely distributed. The purpose of this cumulative impact assessment is to evaluate the potential collective effects of these varied resource management strategies on the covered species being evaluated in this EIS.

As noted in this section (4.4, *Aquatic Resources*) and in other impact assessment discussions in this EIS (Section 4.2, *Geology, Geomorphology, and Mineral Resources*; and Section 4.3, *Hydrology and Water Quality*), continued implementation of Simpson’s practices under the No Action Alternative will result in a trend towards improved future aquatic and riparian habitat conditions in the Primary Assessment Area compared to existing conditions. They would be further improved under the Proposed Action and each of the other action alternatives. Implementing the proposed AHCP/CCAA or the action alternatives would result overall in net benefits to aquatic and riparian habitats and covered species using these habitats, and would meet the requirements of Section 10 of the ESA. In addition, these benefits would accrue over the proposed 50-year term of the permit for the Proposed Action and the action alternatives, because of the additional time for the beneficial effects of the conservation measures and improved forest management practices to be realized. These overall benefits to aquatic and riparian habitats and covered species are expected to be slightly greater under the Proposed Action and Alternatives A and C than under Alternative B, because of differences (or in some cases, the absence) of a broad range of enhanced forest management practices and an adaptive management monitoring program with structured feedback mechanism. In addition, benefits would extend to a slightly larger area under Alternative C with the inclusion of rain-on-snow areas.

The HPAs where incremental benefits to habitats and covered species would be greatest because of implementing the Proposed Action or one of the action alternatives are those

where Simpson owns the greatest percentage of land (i.e., North Fork Mad River, Little River, Coastal Klamath, Coastal Lagoons, Interior Klamath, Mad River, and Smith River). Section 4.1.2, *Cumulative Impacts*, contains a detailed discussion of the acreage and ownership of all the land owners/managers considered in the cumulative impacts assessment. Incremental benefits would be relatively less in the Redwood Creek, Blue Creek, and Humboldt Bay HPAs, where Simpson ownership varies from about 10 percent to 20 percent of the total. Incremental benefits from Simpson management activities would be least, but still represent a positive influence on aquatic and riparian habitats and covered species, in the Eel River HPA, where Simpson ownership is less than 4 percent. These conclusions for the proposed AHCP/CCAA provide the basis for considering the incremental and cumulative effects of other actions in the HPAs.

There are four other predominant conservation or management strategies, besides Simpson's, that are being used in the 11 HPAs considered in this cumulative impact assessment. (See Section 4.1.2, *Cumulative Impacts*, for a description of these strategies.)

As noted in Section 1.5.3.1, continued implementation of the CFPRs themselves (and the THP review and approval process) do not necessarily ensure "achievement of properly functioning habitat conditions" necessary to "adequately conserve anadromous salmonids" listed under the ESA. Since then the BOF has adopted "interim" rules for Class I watercourses that further strengthen the forest practice rules and the THP process. NMFS continues to find that the CFPRs do not ensure the achievement of properly functioning habitat for conservation of anadromous salmonids throughout their range in California, although forest practices operations conducted pursuant to this process in a particular area, land ownership, or region under this process may achieve such conditions.

Conservation measures associated with the PALCO HCP, like those being proposed by Simpson in its AHCP/CCAA, exceed the CFPR standards and are designed to improve riparian and aquatic habitats for covered species using various prescriptions directed at riparian management, road management, controlling sediment delivery, and exclusion areas. The beneficial effects of the PALCO HCP on covered species would have a primary and positive influence on habitat conditions in the Eel River and Humboldt Bay HPAs. These are the only HPAs being considered in this EIS where PALCO has ownership.

The USFS and/or BLM also manage federal lands in the Blue Creek and the Smith River HPAs. Less than 7 percent of lands in the other HPAs is managed by either of these agencies. 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 do not allow timber harvesting or activities in wide, fixed-width riparian buffers prior to a completed watershed analysis, and are expected to result in incremental improvements in aquatic and riparian habitat conditions within HPAs where the USFS/BLM administer public lands. Current protections for and benefits to aquatic resources and riparian habitat in those HPAs where federal agencies are the predominant land managers would be expected to continue into the future.

Incremental benefits associated with resource management on lands administered by the State of California and the National Park Service are most important in the Redwood Creek and Smith River HPAs, where state and federal parklands together comprise 41.5 percent and 15.8 percent of the total land ownership, respectively. Resource management strategies

in parklands essentially allow no commercial timber harvesting. In addition, streamside and upslope activities that would affect water quality conditions are extremely limited. Therefore, net benefits are anticipated to result aquatic resources and riparian habitat conditions in parkland drainages.

Overall, the cumulative effect of all of these resource management programs would be to protect and/or improve aquatic resources and riparian habitat conditions in each of the 11 HPAs beyond currently existing levels and beyond levels that would be expected under the No Action Alternative.

4.5 Vegetation/Plant Species of Concern

The purpose of this section is to evaluate the potential impacts of implementing the Proposed Action (the conservation measures in the proposed AHCP/CCAA) and the alternatives, including the No Action Alternative, on vegetation and plant species of special concern. Growth projections indicate that under the current management regime, forest trends in the Simpson ownership will lead to increased age class and size, as well as increased total acreage with dense canopy closure. These trends are expected to accelerate under the Proposed Action and other action alternatives over the duration of the term of the permits. The timing of past harvesting activity over the Simpson ownership has resulted in a current mosaic of age classes dominated by forests types less than 60 years old, with approximately 80 percent of the ownership supporting forests in these age classes. Seventeen 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 term of the permits 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 Simpson's long term operating plan (i.e., Option (a) document).
- Current rules and regulations, interacting with provisions of the NSOHCP, result in harvesting restraints or prohibitions on approximately 12 percent of Simpson's ownership in the Primary Assessment Area. Provisions of the proposed AHCP/CCAA would add to the area subject to such restrictions. Trees in these areas will be retained at least through term of the permits and will thus add to the total acreage in older age classes.

The accelerated development of mid- and late-seral stand types as a result of implementation of the conservation measures under the Proposed Action and other action alternatives is anticipated to be most pronounced within riparian areas. These trends would be expected to result in some long-term beneficial effects to wildlife species that use these habitats relative to the No Action (See Section 4.6, *Terrestrial Habitat/Wildlife Species of Concern*).

4.5.1 Methodology

The assessment for vegetation and plant species of concern is based on information in the proposed AHCP/CCAA; 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 non-riparian lands under all the alternatives would be managed in accordance with existing regulations, other applicable laws, Simpson's NSOHCP, and Simpson operational policies and guidelines (i.e., the No Action Alternative, see Section 2.1). The Proposed Action and the other action alternatives would also apply all, or portions of, the conservation measures from the proposed AHCP/CCAA. The analysis of the action alternatives is a qualitative assessment that focuses on the impacts of potential changes to habitat within the riparian zones; the greatest potential for vegetation changes exists within these areas. The assessment focuses on habitat type, vegetation structure, and canopy closure for each of the alternatives. As discussed in Section 3.5, *Vegetation/Plant Species of Concern*, 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 EIS, the CWHR classification system is applied in the context of continued management of Simpson's timber resources achieve to maximum sustained production (MSP) of high-quality timber products (see Sections 1.5.3.1 and 1.6.3.2). The CWHR system is used in this analysis to identify potential changes to habitat type within Simpson's ownership and to compare existing conditions with future vegetative habitat conditions. (The assessment in this section is the basis for assessing impacts to wildlife species in Section 4.6, *Terrestrial Habitat/Wildlife Species of Concern*.) For those lands in the Primary Assessment Area not owned by Simpson, a general characterization is presented.

4.5.2 No Action Alternative

4.5.2.1 General Effects

In the context of Simpson'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 the CWHR-classified areas are not 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*.

As stated in Simpson's Option (a) document, timber stands in upland (non-riparian) areas on the Simpson ownership are considered ready for harvest once they enter the 50-year age class. State law, however, constrain both the size of even-aged management 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.”

The timber-cutting cycle for uneven-age management areas (mostly riparian corridors) 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.

4.5.2.2 Riparian Management Effects

Historically, uneven-aged timber management within the Primary Assessment Area has focused on WLPZs, water supply areas, visually-sensitive road corridors, nest sites of selected bird species (e.g., northern spotted owl), and residential property lines. Throughout much of the Primary Assessment 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 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 are augmented by additional measures, identified in the Simpson NSOHCP, that provide for retention of a variety of tree sizes (height and diameter) and species within WLPZs, with priority given to wildlife habitat trees.

The No Action Alternative, including the continued implementation of the measures designed to protect riparian vegetation and avoid impacts to occupied marbled murrelet habitat, plus continued implementation of Simpson’s NSOHCP, is expected to provide the conditions in which a greater number of large trees could be present, over time, in riparian areas in the Primary Assessment 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.

4.5.2.3 Listed Plant Species and Other Plant Species of Concern

Under the No Action Alternative, Simpson 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, unless take prohibitions under state law exists. Simpson 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), Simpson’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.

Simpson's Plant Protection Program (Simpson, 2001) is a three-tiered program that is based on an ongoing agreement with CDFG. Under Phase I of the agreement, Simpson 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 Simpson), Simpson 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, Simpson is allowed to initiate timber harvesting and related activities even if sensitive plant habitats are present. When plants are found, Simpson 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, Simpson 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, 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. Simpson's botanist has responsibility for implementing the program, and training is provided to Simpson foresters on sensitive plant and habitat recognition. The Plant Protection Program is applied on all projects that are THP-related.

Four plant species listed as federal- or state-endangered occur within the Primary Assessment Area, including Humboldt milk-vetch (*Astragalus agnicidus*), Kneeland prairie pennycress (*Thlaspi californicum*), McDonald's rock cress (*Arabis macdonaldiana*), and western lily (*Lilium occidentale*). Potential habitat for Humboldt milk-vetch (*Astragalus agnicidus*), a species listed by the State of California as endangered, occurs within the Primary Assessment Area; however, this species has not been observed in the Primary Assessment Area.

Western lily 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. Kneeland prairie pennycress is associated with broad-leaved upland forests and coastal prairies. Only activities incidental to the management of Simpson's merchantable timber would be expected to occur within broad-leaved forests and coastal prairie habitats. On this basis, minimal effects are anticipated in the habitat preferred by Kneeland prairie pennycress and Humboldt milk-vetch. McDonald's rock cress is associated with montane coniferous forests. Forest management activities would occur within this habitat type, and the potential for incidental disturbance of McDonald's rock cress exists.

Table 4.5-1 presents: (1) a list of all the plant species of concern known to occur or likely to occur within the 11 HPAs and Simpson ownership outside of the HPAs; (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 Simpson's activities or would be disturbed only incidentally; changes to these habitats are anticipated to be negligible over time.

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

Species	Habitat Associations	Impacts
Listed Species		
Humboldt milk-vetch <i>Astragalus agnicidus</i>	broad-leaved forests	None. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Kneeland prairie pennycress <i>Thlaspi californicum</i>	CSC	None; CSC not harvested and little disturbance in broad-leaved forests. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
McDonald's rock cress <i>Arabis macdonaldiana</i>	coniferous forests	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Western lily <i>Lilium occidentale</i>	CSC, freshwater marshes, bogs, fens, PGS, coniferous forests	None; CSC, PGS, and wetlands not harvested. Broad range of habitats. Special protections for wetland areas in existing regulations. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Non-Listed Species of Concern		
American Manna Grass <i>Glycera grandis</i>	WTM, ditches, RIV, LAC	None. Habitat is non-timberland. No direct disturbance. Special protections in existing regulations for habitat associations.
Arctic spoonwort <i>Cochlearia officinalis</i> var. <i>arctica</i>	CSC	None. Habitat is non-timberland. Incidental and less-than-significant disturbance possible. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Arctic starflower <i>Trientalis arctica</i>	Meadows, seeps, bogs, fens	None. Wetlands not harvested. Special protections in existing regulations for habitat associations.
Bensoniella <i>Bensoniella oregona</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.
Black crowberry <i>Empetrum nigrum</i> ssp. <i>hermaphroditum</i>	CSC, PGS	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.
Bog club moss <i>Lycopodiella inundata</i>	Bogs, fens, marshes, swamps, coniferous forests,	None. Not likely to occur in timberlands; mostly associated with wetlands. Special protections in existing regulations for habitat associations. Other 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
Coast checkerbloom <i>Sidalcea oregana ssp. 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 Range lomatium <i>Lomatium martindalei</i>	CSC, meadows, coniferous forests	None; no timber harvesting in habitat areas (CSC); incidental and less-than-significant disturbance possible. Special protections in existing regulations for meadows. Other potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Del Norte buckwheat <i>Eriogonum nudum var 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.
Dwarf alkali grass <i>Puccinellia pumila</i>	Mineral springs and coastal salt marshes	None. No activity in salt marshes. Special protections in existing regulations for habitat associations.
English peak greenbriar <i>Smilax jamesii</i>	Marshes, LAC, swamps, RIV, coniferous forests	None. No direct disturbance. Species associated primarily with wetlands and waterbody edges. Special protections in existing regulations for wetlands and waterbodies. Other potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Fibrous pondweed <i>Potamogeton foliosus var. fibrillosus</i>	Marshes, ponds, small streams	None. Habitat is non-timberland. No direct disturbance. Special protections in existing regulations for habitat associations.
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.
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>Erthronium hendersonii</i>	Coniferous forests	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Horned butterwort <i>Pinguicula vulgaris ssp. macroceras</i>	Bogs, fens, meadows, seeps	None. Wetlands not harvested. 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
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.
Humboldt milk-vetch <i>Astragalus agnicidus</i>	Broad-leaved forests	None. 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.
Koehler's stipitate rock cress <i>Arabis koehleri var. 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.
Langsdorf's violet <i>Viola langsdorfii</i>	Bogs, fens and wet areas in CSC	None. Wetlands and CSC not harvested. Special protections in existing regulations for bogs, fens, and other wetland areas..
Maidenhair spleenwort <i>Asplenium trichomanes ssp. trichomanes</i>	Coniferous forests	Less-than-significant. 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.
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.

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

Species	Habitat Associations	Impacts
Mendocino gentain <i>Gentiana setigera</i>	Meadows, coniferous forests	Less than significant. Special protections for meadows in existing regulations. Other potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Northern microseris <i>Microseris borealis</i>	Meadows, bogs, fens, marshes and swamps, coniferous forests	None. Mostly associated with wetlands. Wetland and meadow protections in existing regulations. Other potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Nuttall's saxifrage <i>Saxifraga nuttallii</i>	Coniferous forests	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Opposite leaved lewisia <i>Lewisia oppositifolia</i>	Coniferous forests	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.
Oregon lungwort <i>Mertansia bella</i>	Meadows, seeps, coniferous forests	Less than significant. Special protections for meadows and seeps in existing regulations. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Purple stemmed checkerbloom <i>Sidalcea malvaeflora</i> ssp. <i>patula</i>	PGS, broad-leaved forests	None. PGS not harvested, and little disturbance in broad-leaved forests. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Robust false Lupin <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.
Robust monardella <i>Monardella villosa</i> ssp. <i>globosa</i>	Chaparral, montane woodlands	Less than significant. 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.

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

Species	Habitat Associations	Impacts
Sanford's arrowhead <i>Sagittaria sanfordii</i>	Marshes, swamps, ponds, ditches	None. Mostly associated with wetlands. Wetland protections in existing regulations.
Siskiyou Indian paintbrush <i>Castilleja miniata</i> ssp. <i>elata</i>	Bogs, fens, RIV, coniferous forests	Less than significant. Broad range of habitats. Special protections for bogs, fens, and other wetlands in existing regulations. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Siskiyou phacelia <i>Phacelia leonis</i>	Meadows and seeps, coniferous forests	Less than significant. Broad range of habitats. Special protections for meadows and seeps in existing regulations. 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.
Thurber's reed grass <i>Calamagrostis crassiglumis</i>	CSC, freshwater marshes	None. CSC and wetlands not harvested. Special protections for wetland areas in existing regulations.
Two Flowered Pea <i>Lathyrus biflorus</i>	Coniferous forests	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Waldo Buckwheat <i>Erogonum pendulum</i>	Coniferous forests	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Waldo Daisy <i>Erigonium bloomeri</i> var. <i>nudatus</i>	Coniferous forests	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Waldo rock cress <i>Arabis aculeolata</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.
Water bulrush <i>Scirpus Subterminalis</i>	Marshes and swamps; LAC	Less than significant. Species is associated with wetlands and waterbody edges. Wetland protections in existing regulations.

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

Species	Habitat Associations	Impacts
Western Bog Violet <i>Viola primulifolia</i> ssp. <i>Occidentalis</i>	Bogs, fens, marshes, swamps, streamside flats	Less than significant. Species associated w/ wetlands and waterbody edges. Wetland protections in existing regulations.
Wolf's evening primrose <i>Oenothera wolfii</i>	CSC, PGS, dunes, coniferous forests	Less than significant. No activity in dunes. CSC and PGS not harvested. Broad range of habitats. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
Yellow-tubered toothwort <i>Cardamine nuttallii</i> var. <i>gemmata</i>	Coniferous forests	Less than significant. Potential impacts mitigated through adherence to general protection measures contained in existing regulations.
CSC Coastal Scrub		
PGS Perennial Grassland		
LAC Lacustrine		
RIV Riverine		
WTM Wet meadow		

4.5.3 Proposed Action

Under the Proposed Action, Simpson's management of its lands and the conduct of timber harvesting in the Primary Assessment Area would be the same as under the No Action. In addition, existing measures used by Simpson to protect Class I, II, and III streams would be supplemented by Simpson's AHCP/CCAA Conservation Strategy, which includes enhanced RMZ widths for Class I and II streams, establishment of EEZs for Class III streams, and limited activities within the RMZs and EEZs. Simpson also would implement ownership-wide mitigation, management, and monitoring measures.

4.5.3.1 General Effects

In general, vegetation resources in the Primary Assessment Area and the 11 HPAs would be similar to the conditions described for the No Action Alternative, with the exception of riparian areas, landslide hazard areas, and in the vicinity of roads (current and future). The Proposed Action would implement additional measures (compared with the No Action Alternative) that could result in long-term beneficial effects to wildlife species associated with mid- to late-seral habitat types (see Section 4.6, *Terrestrial Habitat/Wildlife Species of Concern*). Beneficial effects on vegetation resources within these areas are anticipated to be greater under the Proposed Action than under the No Action Alternative, as a result of implementing proposed AHCP/CCAA measures designed to protect riparian areas. These measures include:

- RMZ widths of 70 to 100 feet compared to WLPZ widths of 50 to 100 feet for Class II streams under the No Action Alternative
- EEZs of 30 to 50 feet for Class III streams compared to ELZs of 25 to 50 feet under the No Action Alternative
- Inner- and outer-zone tree and canopy retention standards for RMZs
- No mechanical site preparation by wheeled or tracked equipment in Class I or Class II RMZs

In addition, the proposed AHCP/CCAA would:

- Prohibit timber harvesting within the "inner zone" of all Class I RMZs and 2nd order or larger Class II RMZs (see Section 2.2.3.1) that are located below designated "steep streamside slope management zones" (SMZs) (see Sections 6.2.2.1 and 6.3.2.1 of the proposed AHCP/CCAA), except for purposes of creating cable-yarding corridors when other options are impractical. (RMZ areas located below an SMZ are referred to as RSMZs in the proposed AHCP/CCAA.) Retention of a minimum 85 percent canopy closure would be required in Class I and 2nd order or larger Class II RSMZ "outer zones."
- Allow limited timber harvesting within the first 1,000 feet of a 1st order Class II RSMZ inner zone subject to 85 percent canopy closure retention post-harvest. A minimum 75 percent canopy retention within the first 1,000 feet of a 1st order Class II RSMZ outer zone would also be required. (See Section 6.2.2.1 of the proposed AHCP/CCAA).

- Prohibit timber harvesting within the entire RSMZ for the Coastal Klamath and Blue Creek Hydrographic Regions.
- Use single-tree selection as the initial silvicultural prescription within SMZs and the only prescription within headwall swales. In addition, one harvesting entry would be allowed within SMZs and headwall swales for the term of the permit. All hardwoods within SMZs and headwall swales would be retained and, wherever possible, Simpson would provide for even spacing of unharvested conifers such that all species and size classes represented in pretreatment stands would generally be represented post harvest.
- Establish no-cut zones within the toe, and 25 feet upslope from the top of the toe of active deep-seated landslides, except for purposes of creating cable-yarding corridors when other options are impractical. Similarly establish no-cut zones upslope of the deep-seated landslide scarp so as to taper to the lateral margins of the scarp.
- Prohibit timber harvesting within the boundaries of shallow rapid landslides, and retain a minimum 70 percent overstory canopy within 50 feet above and 25 feet on the sides of shallow rapid landslides. This default prescription may be modified subsequent to a site-specific geologic review.

The development of additional acreage in mid- and late-seral stand types under the No Action Alternative would be accelerated as a result of implementing the additional conservation measures listed above for the Proposed Action. The accelerated development of these stand types is anticipated to be most pronounced within riparian areas.

4.5.3.2 Riparian Management Effects

Under the Proposed Action, only a small proportion of the trees within RMZs would be harvested; those that remain would continue to mature, following removal of adjacent upland stands. Trees in the RMZs would age throughout the term of the proposed AHCP/CCAA. By the end of the permit term, over one-third of the RMZ stands would be older than 100 years and the remainder would be between 51 and 100 years. At age 100, in a typical redwood zone, there will be approximately 120 trees per acre with around 12 percent of those trees larger than 36 inches dbh; a few trees would exceed 48 inches dbh; and the tallest trees in the stand would be approximately 170 feet (see Section 7.2.3 of the proposed AHCP/CCAA). Under the Proposed Action, therefore, riparian areas would comprise more mature trees by the end of the permit term, compared with either existing conditions or the improvements expected to occur over time under the No Action Alternative.

Vegetation management activities in riparian areas would result in a more desirable plant community composition over time. More conifers would be maintained compared to what would be anticipated under the No Action, where mostly hardwoods currently exist in riparian areas.

4.5.3.3 Listed Plant Species and Other Plant Species of Concern

The impacts described for Humboldt milk-vetch, kneeland prairie pennycress, McDonald's rock cress, and western lily would be the same as those described for the No Action Alternative. Although certain minimal habitat disturbances are anticipated to occur under the Proposed Action, no significant impacts to listed plant species are expected. This is comparable to the level of disturbance expected to occur over time under the No Action

Alternative. Take of federally listed plants is not prohibited under the ESA, unless take prohibitions under state law exists. Under the Proposed Action Simpson would continue to minimize significant adverse impacts to listed plants and plant species of concern, including continuing to adhere to measures contained in the CFPRs (special protections afforded to meadows and wetlands), Simpson's own Plant Protection Program, and other measures identified during the THP preparation and review process

4.5.4 Alternative A

Under Alternative A, operations within the Action Area would be subject to the provisions of an ITP only, meaning there would be no coverage for unlisted species and no application for an ESP. Impacts to vegetation and plant species of concern would be the same as those described for the No Action and Proposed Action.

4.5.5 Alternative B

Under Alternative B, fixed no-cut riparian buffer widths would apply to Class I and II watercourses on Simpson's fee-owned lands in the Action Area. Simpson would not implement an ownership-wide Road Management Plan or slope stability and ground disturbance measures, and would not provide protection for unique geomorphic features, such as CMZs and floodplains. Effectiveness and compliance monitoring would not be as extensive under this alternative as for the Proposed Action, and adaptive management with structured feedback loops would not be conducted. Under this alternative, impacts to vegetation and listed plants/plant species of concern would be comparable to the No Action Alternative and the Proposed Action.

4.5.5.1 General Effects

In general, under Alternative B, vegetation resources in the Primary Assessment Area and the 11 HPAs would be similar to the conditions described for the No Action Alternative, with the exception of riparian areas. In this Alternative, Simpson would not conduct timber-harvesting activities within no-cut riparian buffers for Class I and II streams that are wider than the RMZs described for the Proposed Action. No-cut riparian buffers could result in long-term beneficial effects to plant species associated with riparian areas. Beneficial effects on plant species dependent on these habitats are anticipated to be greater within these areas under Alternative B than under the No Action Alternative.

The slope stability measures, designed to prevent or reduce erosion and to reduce the potential for hillslope mass wasting under the Proposed Action, would not apply under Alternative B. Consequently, landslide risks are anticipated to be similar to those under the No Action Alternative with concomitant impacts to standing vegetation in these areas.

The composition of plant communities in the Primary Assessment Area and the 11 HPAs would be similar to the other alternatives. Compared to the No Action Alternative, Alternative B would likely result in a smaller increase in stand types with intermediate-sized trees, yet there would likely be more stands with large-sized trees.

4.5.5.2 Riparian Management Effects

Within riparian areas, the benefits of Alternative B would be greater than the No Action Alternative. Establishment of fixed riparian-buffer areas, within which no management

would occur, would provide for a greater number of large trees, at greater distances from the stream channels, than under any of the other alternatives. The absence of management within the riparian buffers areas, however, indicates that differences would only become evident either at the end or past the term of the ITP/ESP.

4.5.5.3 Listed Plant Species and Other Plant Species of Concern

Although certain minimal habitat disturbances are anticipated to occur under Alternative B, no effects to listed plant species are expected. This is the same as the No Action Alternative. Under Alternative B, Simpson 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, unless take prohibitions under state law exists. Simpson would continue to minimize significant adverse impacts to listed plants and other plant species of concern, including continuing to adhere to measures contained in the CFPRs (special protections afforded to meadows and wetlands), Simpson's own Plant Protection Program, and other measures identified during the THP preparation and review process.

4.5.6 Alternative C

Under Alternative C, Simpson would continue to conduct timber operations as described in the Proposed Action (see Section 2.2.2) and the No Action Alternative (see Section 2.2.1), with one exception. Alternative C adds 26,116 acres of rain-on-snow areas to be covered by the AHCP/CCAA.

4.5.6.1 General Effects

The impacts to vegetation resources from Alternative C would be the same as those described under the Proposed Action, except the measures described in the Proposed Action would be extended to Simpson ownership outside of the 11 HPAs in rain-on-snow areas. Also, prescriptions would be included for the marbled murrelet, bald eagle, and western pond turtle, which would be additional species covered under the ITP.

The conservation strategy described for the marbled murrelet under this alternative would allow phased harvesting of isolated, residual late-seral timber stands. Harvesting would occur first in stands with the lowest value for murrelets and there would be provisions for extended phasing of harvests in stands with the highest value for murrelets. Implementation of the species-specific measures for the murrelet under Alternative C would result in the loss of some late-seral stand types compared to the No Action.

4.5.6.2 Riparian Management Effects

Within riparian areas, the benefits of Alternative C would be greater than the No Action Alternative, and similar to the Proposed Action except that benefits would extend to the additional 26,116 acres of rain-on-snow areas to be covered by the AHCP/CCAA.

4.5.6.3 Listed Plant Species and Other Plant Species of Concern

The impacts to listed plant species under Alternative C would be the same as under the No Action. The only listed species recorded to occur within Simpson-owned rain-on-snow areas is McDonald's rock cress. There are no listed plant species known or likely to occur in, or adjacent to, murrelet or bald eagle stands that could be affected by the murrelet and bald

eagle prescriptions proposed under Alternative C. Although certain minimal habitat disturbances are anticipated to occur under Alternative C, no effects to listed plant species are expected. Under Alternative C, Simpson 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, unless take prohibitions under state law exists. Simpson would continue to minimize significant adverse impacts to listed plants, including continuing to adhere to measures contained in the CFPRs (special protections afforded to meadows and wetlands), Simpson's own Plant Protection Program, and other measures identified during the THP preparation and review process.

The impacts to other plant species of concern under Alternative C would be the same as the No Action. There are five species, with a historic record in the rain-on-snow areas, that have not been recorded in the Primary Assessment Area. Although Humboldt milk vetch has been recorded to occur in the vicinity of the rain-on-snow areas, this species is associated with broad-leaved upland forests, which are not typically harvested. Oregon lungwort and Siskiyou phacelia have been recorded in the vicinity of the rain-on-snow area. These species, however, are known to occur only in Siskiyou and Trinity counties, whereas the Primary Assessment Area is located in Del Norte and Humboldt counties. Under Alternative C, Simpson would continue to exercise the precautions necessary to minimize adverse impacts to Waldo daisy and Waldo rock cress by adhering to measures contained in the CFPRs, Simpson's own Plant Protection Program, and other measures identified during the THP preparation and review process. There are no plant species of concern, known or likely to occur in or adjacent to murrelet or bald eagle stands, that could be affected by the murrelet and bald eagle prescriptions proposed under Alternative C.

4.5.7 Cumulative Impacts

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*. The assessment area for cumulative impacts consists of the 11 HPAs that contain Action Area lands owned by Simpson and covered in its proposed AHCP/CCAA; and other lands that are predominantly either privately owned, administered by a federal resource management agency, or state or federal park lands. Resource management strategies that are being applied in these HPAs, combined with future management strategies that would be used by Simpson, have the potential to result in cumulative effects on vegetation and plant species of concern. The purpose of this cumulative impact assessment is to evaluate the potential effects of these varied resource management strategies, including the Proposed Action of this EIS, on vegetation in the 12-HPA assessment area.

As noted in the previous impact discussions in this section, growth projections indicate that under the current management regime, forest trends in the Simpson ownership will lead to increased age class and size, as well as increased total acreage with dense canopy closure. These trends are expected to accelerate under the Proposed Action and other action alternatives over the duration of the term of the permits. 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 the No Action and Proposed Action, Simpson 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, unless take prohibitions under state law exists. Simpson would continue to minimize potential significant adverse impacts to listed plants. This cumulative impact assessment considers four other predominant conservation or management strategies, besides Simpson's, that are being used in the 11 HPAs. (See Section 4.1.2, *Cumulative Impacts*, for a description of these strategies.)

Continued implementation of the CFPRs on commercial timberlands within the 11 HPAs would result in a more varied vegetation mosaic over the landscape, compared to existing conditions, trending toward development of a greater number of mid- and late-seral forest types in riparian areas. These trends would also be generally consistent for the Proposed Action and other alternatives. 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 Primary Assessment 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-Simpson 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.

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. The beneficial effects of the PALCO HCP on vegetation and plant species would have a primary and positive influence within three HPAs (Eel River, Humboldt Bay, and Mad River) where PALCO has ownership.

The USFS and/or BLM also manage federal lands in the Blue Creek and Smith River HPAs. Less than 7 percent of lands in the other HPAs is managed by either of these agencies. 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. 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.

Potential impacts to vegetation and plant species of concern associated with resource management on lands administered by the State of California and the National Park Service are most important in the Redwood Creek and Smith River HPAs, where state and federal park lands together comprise 41.5 percent and 15.8 percent of the total land ownership, respectively. Resource management strategies in park lands generally allow no commercial timber harvesting; although thinning of some timber stands may occur occasionally for stand improvement purposes. In addition, streamside and upslope activities that would

affect riparian resources are extremely limited. 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 12-HPA assessment area, beyond currently existing levels and levels that would be expected under the No Action Alternative. Impacts to plant species of concern would be insignificant.

4.6 Terrestrial Habitat/Wildlife Species of Concern

The purpose of this section is to evaluate the potential impacts to terrestrial habitat and wildlife species of concern as a result of implementing the Proposed Action (the conservation measures in the proposed AHCP/CCAA) and the alternatives, including the No Action Alternative. As discussed in Section 4.5, *Vegetation/Plant Species of Concern*, under the current management regime, forest trends in the Simpson ownership will lead to increased age class and size, as well as increased total acreage with dense canopy closure. These trends are expected to accelerate under the Proposed Action and other action alternatives over the duration of the term of the permits. The accelerated development of mid- and late-seral stand types as a result of implementation of the conservation measures under the Proposed Action and other action alternatives is anticipated to be most pronounced within riparian areas. These trends would be expected to result in some long-term beneficial effects to wildlife species that use these habitats relative to the No Action.

4.6.1 Methodology

The assessment for terrestrial habitat and wildlife species of concern relies on information made available in Simpson's proposed AHCP/CCAA and information collected and documented in Section 3.6, *Terrestrial Habitat/Wildlife Species of Concern*, 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 in Section 4.5.1, *Methodology*, and in the affected environment discussion in Sections 3.5, *Vegetation/Plant Species of Concern*, and 3.6, *Terrestrial Habitat/Wildlife Species of Concern*, 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 non-riparian lands under all the alternatives would generally be managed in accordance with the CFPRs, other applicable laws, Simpson's NSOHCP, and Simpson operational policies and guidelines (i.e., the No Action Alternative [see Section 2.1]). The Proposed Action and the other action alternatives would also apply all or portions of the conservation measures of the proposed AHCP/CCAA.

The analysis of the action alternatives is a qualitative assessment that focuses on the impacts associated with potential changes to habitat within the riparian zones. The greatest potential for vegetation changes to occur, as a result of implementation of the Proposed Action and other action alternatives, exists in these areas. 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 3.6 of this EIS. This qualitative analysis further focuses on the potential changes to wildlife within forested areas in the riparian zone. Most of the non-forested natural habitat types described in Section 3.5 are either protected under existing regulations or do not have practical use to Simpson, other than as incidental access areas. Since the effects from implementation of the Proposed Action and other alternatives on these non-forested habitats would be negligible compared to current conditions, the wildlife assessment presented below focuses on forested habitats.

4.6.2 No Action Alternative

4.6.2.1 General Effects

Under the No Action Alternative, existing state regulations are augmented by additional measures identified in the Simpson NSOHCP, that provide for retention of a variety of tree sizes (height and diameter) and species within WLPZs, with priority given to wildlife habitat trees. Over the term of the permit, vegetation structure in riparian stands in the Primary Assessment Area is expected to remain about the same or slowly improve, over time, as the No Action riparian management prescriptions are implemented over greater portions of the Simpson ownership. Implementation of the No Action Alternative is, therefore, expected to result in static or improved wildlife habitat conditions within both the Primary Assessment Area and the 11 HPAs 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 Primary Assessment 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.

Under the No Action Alternative, the number and acreage of stands with saplings and small-diameter trees would decrease during the permit period. 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 should be insignificant. Lands within the Primary Assessment Area have been managed for timber production for decades and the species that thrive there today have adapted to the disturbances associated with timber management.

4.6.2.2 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 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 feeding.

4.6.2.3 Listed Wildlife Species and Other Wildlife Species of Concern

Under the No Action Alternative, Simpson would remain subject to state regulatory requirements to avoid or mitigate significant adverse impacts 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 Simpson's NSOHCP 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 Primary Assessment Area, that breed or forage in older trees or late-seral stands. These species include the bald eagle, marbled murrelet, and northern spotted owl. The trend is also beneficial to other wildlife species of concern presumed or known to occur in the Primary Assessment Area that are associated with late-seral conditions (e.g., osprey, Vaux's swift, Humboldt marten, red tree vole, and tailed frog).

Table 4.6-1 presents: (1) a list of all the wildlife species of concern (listed and unlisted) known or likely to occur within the Primary Assessment Area; and (2) 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 minor and, in general, beneficial. No impacts would occur to species that are primarily associated with habitats that are not intensely managed; minor beneficial impacts are anticipated to occur to those species that occur in riparian and/or late seral forest habitats.

4.6.3 Proposed Action

Under the Proposed Action, Simpson would continue to manage its lands and conduct timber harvesting in the Primary Assessment Area, the same as under the No Action Alternative. In addition, the existing measures used by Simpson to protect Class I, II, and III streams would be supplemented by Simpson's AHCP/CCAA Conservation Strategy, which includes enhanced RMZ widths for Class I and II streams, establishment of EEZs for Class III streams, and limited activities within the RMZs and EEZs. Simpson also would implement ownership-wide mitigation, management, and monitoring measures.

4.6.3.1 General Effects

In general, the potential impacts associated with implementation of the Proposed Action on terrestrial wildlife species would be relatively similar to those described for the No Action Alternative. Differences between the two alternatives would be realized, primarily in RMZs and other areas directly affected by conservation measures described under the Proposed Action that are not included in the No Action Alternative. These other areas include landslide-hazard areas, areas near existing or future haul roads, and fireline areas.

TABLE 4.6-1
Wildlife Species of Special Concern: Habitat Associations and Potential Impacts

Species	Habitat Associations	Potential Impacts		
		No Action	Proposed Action, Alts A and B	Alternative C
Birds				
American peregrine falcon <i>Falco peregrinus</i>	Breeds on high cliffs near wetlands, lakes and rivers	No Effect. Although beneficial effects to associated habitats are anticipated to occur, changes in populations are anticipated to be negligible over time due to low species occurrence.	Same as the No Action Alternative.	Same as the No Action Alternative.
Bald eagle <i>Haliaeetus leucocephalus</i>	Nests in large old growth trees near ocean shore, lakes, and rivers	Minor Beneficial Effect. Implementation of existing regulations and Simpson's NSOHCP is anticipated to lead to improved habitat conditions over time under the No Action. Long-term beneficial effects, however, would likely accrue to the species as a result of implementation of enhanced riparian protection measures and other species-specific conservation measures, such as timber stand retention adjacent to high value murrelet habitat on public land and thinning of overstocked stands in neighboring Redwood National Park (RNP).	Enhanced riparian and late seral forest conditions resulting from implementation of conservation measures described under the Proposed Action, Alternative A, and Alternative B would likely provide greater benefits to this species as compared to the No Action Alternative.	Implementation of species-specific conservation measures under Alternative C would likely result in short-term adverse impacts to the species compared to the No Action Alternative as a result of phased harvesting of residual old-growth stands.
Bank swallow <i>Riparia riparia</i>	Colonial nester in riparian area with vertical sandy banks composed of fine soils	No Effect. Changes in associated habitats and populations are anticipated to be negligible over time.	Same as the No Action Alternative.	Same as the No Action Alternative.

TABLE 4.6-1
Wildlife Species of Special Concern: Habitat Associations and Potential Impacts

Species	Habitat Associations	Potential Impacts		
		No Action	Proposed Action, Alts A and B	Alternative C
Black swift <i>Cypseloides niger</i>	Breeds in small colonies adjacent to waterfalls in deep canyons and coastal bluffs, forages widely	No Effect. Changes in associated habitats and populations are anticipated to be negligible over time.	Same as the No Action Alternative.	Same as the No Action Alternative.
Black-crowned night heron <i>Nycticorax nycticorax</i>	Margins of lacustrine, large riverine, and fresh and saline emergent habitats	No Effect. Changes in associated habitats and populations are anticipated to be negligible over time.	Same as the No Action Alternative.	Same as the No Action Alternative.
Coopers hawk <i>Accipiter cooperi</i>	Open woodlands, nests in riparian areas	Minor Beneficial Effect. Implementation of existing regulations and Simpson's NSOHCP is anticipated to lead to improved habitat conditions over time.	Enhanced riparian conditions resulting from implementation of proposed conservation measures described under the Proposed Action and other action alternatives would likely provide greater benefits to this species as compared to the No Action Alternative.	Same as the Proposed Action.
Golden eagle <i>Aquila chrysaetos</i>	Rolling foothills and open mountain terrain in oak woodlands and most major forested habitats.	No Effect. Changes in associated habitats and populations are anticipated to be negligible over time.	Same as the No Action Alternative.	Same as the No Action Alternative.
Great blue heron <i>Ardea herodias</i>	Wet meadows, marshes, lake margins, rivers and streams, and tidal flats	No Effect. Changes in associated habitats and populations are anticipated to be negligible over time.	Same as the No Action Alternative.	Same as the No Action Alternative.

TABLE 4.6-1
Wildlife Species of Special Concern: Habitat Associations and Potential Impacts

Species	Habitat Associations	Potential Impacts		
		No Action	Proposed Action, Alts A and B	Alternative C
Great egret <i>Ardea alba</i>	Colonial nester in large trees near marshes, tidal flats, rivers, and lakes	Minor Beneficial Effect. Implementation of existing regulations and Simpson's NSOHCP is anticipated to lead to improved habitat conditions over time.	Enhanced riparian and late-seral forest conditions resulting from implementation of proposed conservation measures described under the Proposed Action and other action alternatives would likely provide greater benefits to this species compared to the No Action Alternative.	Same as the Proposed Action.
Little willow flycatcher <i>Empidonax traillii brewsteri</i>	Riparian areas with extensive willow vegetation	No Effect. Changes in associated habitats and populations are anticipated to be negligible over time.	Same as the No Action Alternative.	Same as the No Action Alternative.
Marbled murrelet <i>Brachyramphys marmoratus</i>	Late-seral conifer forest and marine waters	Minor Beneficial Effect. Implementation of existing regulations and Simpson's NSOHCP is anticipated to lead to improved habitat conditions over time. Long-term beneficial effects, however, would likely accrue to the species as a result of implementation of enhanced riparian protection measures and other species-specific conservation measures, such as timber stand retention adjacent to high value murrelet habitat on public land and thinning of overstocked stands in neighboring Redwood National Park (RNP).	Enhanced riparian and late-seral forest conditions resulting from implementation of proposed conservation measures described under the Proposed Action, Alternative A, and Alternative B would likely provide greater benefits to this species compared to the No Action Alternative.	Implementation of species-specific conservation measures under Alternative C would likely result in short-term adverse impacts to the species compared to the No Action Alternative as a result of phased harvesting of residual old-growth stands.

TABLE 4.6-1
Wildlife Species of Special Concern: Habitat Associations and Potential Impacts

Species	Habitat Associations	Potential Impacts		
		No Action	Proposed Action, Alts A and B	Alternative C
Merlin <i>Falco columbarius</i>	Frequents coastlines, open grassland, woodlands, lakes, wetlands, edges, and early successional forest stages	No Effect. Changes in associated habitats and populations are anticipated to be negligible over time.	Same as the No Action Alternative.	Same as the No Action Alternative.
Northern harrier <i>Circus cyaneus</i>	Open habitats including grasslands, scrublands, and wetlands	No Effect. Changes in associated habitats and populations are anticipated to be negligible over time.	Same as the No Action Alternative.	Same as the No Action Alternative.
Northern goshawk <i>Accipiter gentilis</i>	Nests on northern slopes in coniferous forests	No Effect. Changes in associated habitats and populations are anticipated to be negligible over time.	Same as the No Action Alternative.	Same as the No Action Alternative.
Northern spotted owl <i>Strix occidentalis caurina</i>	Old growth or mixed mature-old growth forests	No effect. Implementation of the No Action is anticipated to lead to impacts commensurate with the NSOHCP.	Minor Beneficial Effect. Enhanced riparian and late seral-forest conditions resulting from implementation of proposed conservation measures described under the Proposed Action and other action alternatives would likely provide additional benefits to this species compared to the No Action Alternative.	Phased harvesting of old-growth stands under Alternative C pursuant to species-specific measures for the marbled murrelet would likely not adversely impact spotted owls; other Alternative C measures would provide similar benefits to this species as the Proposed Action.
Olive-sided flycatcher <i>Contopus borealis</i>	Forest and woodland riparian zones	Minor Beneficial Effect. Implementation of existing regulations and Simpson's NSOHCP is anticipated to lead to improved habitat conditions over time.	Enhanced riparian conditions resulting from implementation of proposed conservation measures described under the Proposed Action and other action alternatives would likely provide additional benefits to this species compared to the No Action Alternative.	Same as the Proposed Action.

TABLE 4.6-1
Wildlife Species of Special Concern: Habitat Associations and Potential Impacts

Species	Habitat Associations	Potential Impacts		
		No Action	Proposed Action, Alts A and B	Alternative C
Osprey <i>Pandion haliaetus</i>	Freshwater lakes, bays, ocean shore, large streams	Minor Beneficial Effect. Implementation of existing regulations and Simpson's NSOHCP is anticipated to lead to improved habitat conditions over time.	Enhanced riparian and late-seral forest conditions resulting from implementation of proposed conservation measures described under the Proposed Action and other action alternatives would likely provide greater benefits to this species compared to the No Action Alternative.	Same as the Proposed Action.
Purple martin <i>Progne subis</i>	Forest and woodland with cavity trees, and riparian zones	Minor Beneficial Effect. Implementation of existing regulations and Simpson's NSOHCP is anticipated to lead to improved habitat conditions over time.	Enhanced riparian and late-seral forest conditions resulting from implementation of proposed conservation measures described under the Proposed Action and other action alternatives would likely provide greater benefits to this species compared to the No Action Alternative.	Same as the Proposed Action.
Sharp-shinned hawk <i>Accipiter striatus</i>	Early- to mid-seral forest and riparian zones	Minor Beneficial Effect. Implementation of existing regulations and Simpson's NSOHCP is anticipated to lead to improved habitat conditions over time.	Enhanced riparian conditions resulting from implementation of proposed conservation measures described under the Proposed Action and other action alternatives would likely provide additional benefits to this species compared to the No Action Alternative.	Same as the Proposed Action.

TABLE 4.6-1
Wildlife Species of Special Concern: Habitat Associations and Potential Impacts

Species	Habitat Associations	Potential Impacts		
		No Action	Proposed Action, Alts A and B	Alternative C
Short-eared owl <i>Asio flammeus</i>	Marshlands, grasslands, and forest clearings	No Effect. Changes in associated habitats and populations are anticipated to be negligible over time.	Same as the No Action Alternative.	Same as the No Action Alternative.
Snowy egret <i>Egretta thula</i>	Riverine, emergent wetland, lacustrine, and estuarine habitats. Nests in large trees in the vicinity of foraging areas.	No Effect. Changes in associated habitats and populations are anticipated to be negligible over time.	Same as the No Action Alternative.	Same as the No Action Alternative.
Tricolored blackbird <i>Agelaius tricolor</i>	Highly colonial species, largely endemic to California; requires open water with protected areas for nesting	No Effect. Changes in associated habitats and populations are anticipated to be negligible over time.	Same as the No Action Alternative.	Same as the No Action Alternative.
Vaux's swift <i>Chaetura vauxi</i>	Conifer forest with large snags	Minor Beneficial Effect. Implementation of existing regulations and Simpson's NSOHCP is anticipated to lead to improved habitat conditions over time.	Enhanced riparian and late-seral forest conditions resulting from implementation of proposed conservation measures described under the Proposed Action, Alternative A, and Alternative B would likely provide greater benefits to this species compared to the No Action Alternative.	Some loss of snags would be anticipated under Alternative C as a result of phased harvesting of isolated timber stands of suitable marbled murrelet habitat over the term of the permits resulting in some short-term adverse impacts to this species.
Western burrowing owl <i>Athene cunicularia</i>	Grasslands and shrublands	No Effect. Changes in associated habitats and populations are anticipated to be negligible over time.	Same as the No Action Alternative.	Same as the No Action Alternative.
Western snowy plover <i>Charadrius alexandrinus nivosus</i>	Sandy beaches, salt ponds and levees, gravel bars along coastal rivers	No Effect. Changes in associated habitats and populations are anticipated to be negligible over time.	Same as the No Action Alternative.	Same as the No Action Alternative.

TABLE 4.6-1
Wildlife Species of Special Concern: Habitat Associations and Potential Impacts

Species	Habitat Associations	Potential Impacts		
		No Action	Proposed Action, Alts A and B	Alternative C
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	No Effect. Changes in associated habitats and populations are anticipated to be negligible over time.	Same as the No Action Alternative.	Same as the No Action Alternative.
Yellow warbler <i>Dendroica petechia brewsteri</i>	Riparian woodland	No Effect. Changes in associated habitats and populations are anticipated to be negligible over time.	Same as the No Action Alternative.	Same as the No Action Alternative.
Yellow-breasted chat <i>Icteria virens</i>	Riparian thickets and early-seral forest	No Effect. Changes in associated habitats and populations are anticipated to be negligible over time.	Same as the No Action Alternative.	Same as the No Action Alternative.
Mammals				
Fringed myotis <i>Myotis thysanodes</i>	Roosts in mines, caves, trees, and buildings; feeds along forest edges and over forest canopy	Minor beneficial effect. Implementation of existing regulations and Simpson's NSOHCP is anticipated to lead to improved habitat conditions over time.	Enhanced riparian and late-seral forest conditions resulting from implementation of proposed conservation measures described under the Proposed Action, Alternative A, and Alternative B would likely provide greater benefits to this species compared to the No Action Alternative.	Some short-term loss of snags would be anticipated under Alternative C as a result of phased harvesting of isolated timber stands of suitable marbled murrelet habitat over the term of the permits resulting in some short-term adverse impacts to this species.

TABLE 4.6-1
Wildlife Species of Special Concern: Habitat Associations and Potential Impacts

Species	Habitat Associations	Potential Impacts		
		No Action	Proposed Action, Alts A and B	Alternative C
Humboldt marten <i>Martes americana humboldtensis</i>	Late-seral conifer forest	Minor Beneficial Effect. Implementation of existing regulations and Simpson's NSOHCP is anticipated to lead to improved habitat conditions over time. Long-term beneficial effects, however, would likely accrue to the species as a result of implementation of enhanced riparian protection measures and other species-specific conservation measures, such as timber stand retention adjacent to high value murrelet habitat on public land and thinning of overstocked stands in neighboring Redwood National Park (RNP).	Enhanced riparian and late-seral forest conditions resulting from implementation of proposed conservation measures described under the Proposed Action, Alternative A, and Alternative B would likely provide additional benefits to this species compared to the No Action Alternative.	Implementation of species-specific conservation measures under Alternative C would likely result in short-term adverse impacts to this species compared to the No Action Alternative as a result of phased harvesting of residual old-growth stands.
Long-legged myotis <i>Myotis volans</i>	Roosts in hollow trees, crevices, mines, and buildings; feeds in open habitats	Minor beneficial effect. Implementation of existing regulations and Simpson's NSOHCP is anticipated to lead to improved habitat conditions over time.	Enhanced riparian and late-seral forest conditions resulting from implementation of proposed conservation measures described under the Proposed Action, Alternative A, and Alternative B would likely provide greater benefits to this species compared to the No Action Alternative.	Some short-term loss of snags would be anticipated under Alternative C as a result of phased harvesting of isolated timber stands of suitable marbled murrelet habitat over the term of the permits resulting in some short-term adverse impacts to this species.

TABLE 4.6-1
Wildlife Species of Special Concern: Habitat Associations and Potential Impacts

Species	Habitat Associations	Potential Impacts		
		No Action	Proposed Action, Alts A and B	Alternative C
Long-eared myotis <i>Myotis evotis</i>	Roosts in trees, crevices, mines, caves, and buildings; feeds within forest and over water	Minor beneficial effect. Implementation of existing regulations and Simpson's NSOHCP is anticipated to lead to improved habitat conditions over time.	Enhanced riparian and late-seral forest conditions resulting from implementation of proposed conservation measures described under the Proposed Action, Alternative A, and Alternative B would likely provide greater benefits to this species compared to the No Action Alternative.	Some short-term loss of snags would be anticipated under Alternative C as a result of phased harvesting of isolated timber stands of suitable marbled murrelet habitat over the term of the permits resulting in some short-term adverse impacts to this species.
Pacific fisher <i>Martes pennanti pacifica</i>	Coniferous forests and shaded riparian areas	Minor Beneficial Effect. Implementation of existing regulations and Simpson's NSOHCP is anticipated to lead to improved habitat conditions over time under the No Action. Long-term beneficial effects, however, would likely accrue to the species as a result of implementation of enhanced riparian protection measures and other species-specific conservation measures, such as timber stand retention adjacent to high value murrelet habitat on public land and thinning of overstocked stands in neighboring Redwood National Park (RNP).	Enhanced riparian conditions resulting from implementation of proposed conservation measures described under the Proposed Action, Alternative A, and Alternative B would likely provide greater benefits to this species compared to the No Action Alternative.	Implementation of species-specific conservation measures under Alternative C would likely result in short-term adverse impacts to this species compared to the No Action Alternative as a result of phased harvesting of residual old-growth stands.

TABLE 4.6-1
Wildlife Species of Special Concern: Habitat Associations and Potential Impacts

Species	Habitat Associations	Potential Impacts		
		No Action	Proposed Action, Alts A and B	Alternative C
Pallid bat <i>Antrozous pallidus</i>	Roosts in trees, caves, crevices, and buildings; feeds in a variety of open habitats	No Effect. Changes in associated habitats and populations are anticipated to be negligible over time.	Same as the No Action Alternative.	Same as the No Action Alternative.
Red tree vole <i>Arborimus pomo</i>	Douglas fir, redwood, and montane conifer-hardwood forests	Minor Beneficial Effect. Implementation of existing regulations and Simpson's NSOHCP is anticipated to lead to improved habitat conditions over time under the No Action. Long-term beneficial effects, however, would likely accrue to the species as a result of implementation of enhanced riparian protection measures and other species-specific conservation measures, such as timber stand retention adjacent to high value murrelet habitat on public land and thinning of overstocked stands in neighboring Redwood National Park (RNP).	Enhanced riparian conditions resulting from implementation of proposed conservation measures described under the Proposed Action, Alternative A, and Alternative B would provide additional benefits to this species compared to the No Action Alternative.	Implementation of species-specific conservation measures under Alternative C would likely result in short-term adverse impacts to the species compared to the No Action Alternative as a result of phased harvesting of residual old-growth stands.
Townsend's western big-eared bat <i>Corynorhinus townsendii</i>	Humid coastal regions of central and northern California, and southern Oregon	No Effect. Changes in associated habitats and populations are anticipated to be negligible over time.	Same as the No Action Alternative.	Same as the No Action Alternative.

TABLE 4.6-1
Wildlife Species of Special Concern: Habitat Associations and Potential Impacts

Species	Habitat Associations	Potential Impacts		
		No Action	Proposed Action, Alts A and B	Alternative C
White footed vole <i>Arborimus albipes</i>	Mature conifer forests, small streams with dense alder and shrub cover	Minor Beneficial Effect. Implementation of existing regulations and Simpson's NSOHCP is anticipated to lead to improved habitat conditions over time under the No Action. Long-term beneficial effects, however, would likely accrue to the species as a result of implementation of enhanced riparian protection measures and other species-specific conservation measures, such as timber stand retention adjacent to high value murrelet habitat on public land and thinning of overstocked stands in neighboring Redwood National Park (RNP).	Enhanced riparian and late-seral forest conditions resulting from implementation of the proposed conservation measures described under the Proposed Action, Alternative A, and Alternative B would provide greater benefits to this species compared to the No Action Alternative.	Implementation of species-specific conservation measures under Alternative C would likely result in short-term adverse impacts to the species compared to the No Action Alternative as a result of phased harvesting of residual old-growth stands.
Yuma myotis <i>Myotis evotis</i>	Roosts in buildings, trees, mines, caves, crevices, and bridges; feeds over water	No Effect. Changes in associated habitats and populations are anticipated to be negligible over time.	Same as the No Action Alternative.	Same as the No Action Alternative.

TABLE 4.6-1
Wildlife Species of Special Concern: Habitat Associations and Potential Impacts

Species	Habitat Associations	Potential Impacts		
		No Action	Proposed Action, Alts A and B	Alternative C
Reptiles and Amphibians				
Del Norte Salamander <i>Plethodon elongatus</i>	Old-growth mixed conifer-hardwood forests	Minor Beneficial Effect. Implementation of existing regulations and Simpson's NSOHCP is anticipated to lead to improved habitat conditions over time under the No Action. Long-term beneficial effects, however, would likely accrue to the species as a result of implementation of enhanced riparian protection measures and other species-specific conservation measures, such as timber stand retention adjacent to high value habitat on public land and thinning of overstocked stands in neighboring Redwood National Park (RNP).	Enhanced riparian and late-seral forest conditions resulting from implementation of the proposed conservation measures described under the Proposed Action, Alternative A, and Alternative B would likely provide greater benefits to this species compared to the No Action Alternative.	Implementation of species-specific conservation measures under Alternative C would likely result in short-term adverse impacts to the species compared to the No Action Alternative as a result of phased harvesting of residual old-growth stands.
Tailed frog <i>Ascaphus truei</i>	Permanent streams in montane-conifer hardwood, redwood, Douglas fir, and ponderosa pine forests	Minor Beneficial Effect. Implementation of existing regulations and Simpson's NSOHCP is anticipated to lead to improved habitat conditions over time.	Enhanced aquatic and riparian conditions resulting from implementation of the proposed conservation measures described under the Proposed Action and other action alternatives would provide greater benefits to this species compared to the No Action Alternative.	Same as the Proposed Action.

TABLE 4.6-1
Wildlife Species of Special Concern: Habitat Associations and Potential Impacts

Species	Habitat Associations	Potential Impacts		
		No Action	Proposed Action, Alts A and B	Alternative C
Southern torrent salamander <i>Rhyacotriton variegatus</i>	Permanent streams in coastal redwood, Douglas fir, mixed conifer, montane hardwood, and montane-riparian forests	Minor Beneficial Effect. Implementation of existing regulations and Simpson's NSOHCP is anticipated to lead to improved habitat conditions over time.	Enhanced aquatic and riparian conditions resulting from implementation of the proposed conservation measures described under the Proposed Action and other action alternatives would provide greater benefits to this species compared to the No Action Alternative.	Same as the Proposed Action.
Northern red-legged frog <i>Rana aurora aurora</i>	Humid forests with intermixed hardwoods and grasslands, streamsides	Minor Beneficial Effect. Implementation of existing regulations and Simpson's NSOHCP is anticipated to lead to improved habitat conditions over time.	Enhanced aquatic and riparian conditions resulting from implementation of the proposed conservation measures described under the Proposed Action and other action alternatives would provide greater benefits to this species compared to the No Action Alternative.	Same as the Proposed Action.
Foothill yellow legged frog <i>Rana boylei</i>	Partly shaded shallow streams with rocky substrate, in a variety of habitats	Minor Beneficial Effect. Implementation of existing regulations and Simpson's NSOHCP is anticipated to lead to improved habitat conditions over time.	Enhanced aquatic and riparian conditions resulting from implementation of the proposed conservation measures described under the Proposed Action and other action alternatives would provide greater benefits to this species compared to the No Action Alternative.	Same as the Proposed Action.

TABLE 4.6-1
Wildlife Species of Special Concern: Habitat Associations and Potential Impacts

Species	Habitat Associations	Potential Impacts		
		No Action	Proposed Action, Alts A and B	Alternative C
Northwestern pond turtle <i>Clemmys marmorata marmorata</i>	Ponds and swamps in grasslands, and mixed conifer-hardwood forests	No Effect. Changes in associated habitats and populations are anticipated to be negligible over time.	Same as the No Action Alternative.	Potential benefits to the western pond turtle may occur under Alternative C through implementation of conservation measures specific to the species.
Invertebrates				
Ground beetle <i>Scaphinotus behrensi</i>	Wooded areas with moist microhabitats, including logs and tree trunks	No Effect. Changes in associated habitats and populations are anticipated to be negligible over time.	Same as the No Action Alternative.	Same as the No Action Alternative.
Pomo bronze shoulderband snail <i>Helminthoglypta arrosa pomoensis</i>	Dense redwood forest	Minor Beneficial Effect. Implementation of existing regulations and Simpson's NSOHCP is anticipated to lead to improved habitat conditions over time.	Enhanced riparian conditions resulting from implementation of proposed conservation measures described for the Proposed Action and other action alternatives would likely provide greater benefits to this species compared to the No Action Alternative.	Same as the Proposed Action.
Oregon silverspot butterfly <i>Speyeria zerene hippolyta</i>	Coastal meadows in Del Norte County; larvae feed only on the foliage of the western dog violet (<i>Viola adunca</i>)	No Effect. Changes in associated habitats and populations are anticipated to be negligible over time.	Same as the No Action Alternative.	Same as the No Action Alternative.
Karok Indian Snail <i>Vespericola karokorum</i>	Under leaf litter and woody debris in riparian areas with alder and maple	No Effect. Changes in associated habitats and populations are anticipated to be negligible over time.	Same as the No Action Alternative.	Same as the No Action Alternative.

Measures described under the Proposed Action to prevent or reduce erosion, for the purpose of providing cleaner water for aquatic species, would also benefit terrestrial species. Implementation of measures to reduce the potential for landslides would preserve more wildlife habitat and minimize the mortality or injury of wildlife during a landslide event. Measures designed with the long-term objective of decommissioning roads would also restore wildlife habitat; measures that reduce soil compaction would also provide more vigorous plant life that serves to support wildlife species. Therefore, the non-riparian management measures presented in the Proposed Action would generally improve wildlife habitat quality, or minimize adverse effects to habitat quality, within portions of the Primary Assessment Area, relative to the No Action Alternative.

4.6.3.2 Riparian Management Effects

Under the Proposed Action, only a small proportion of the trees within RMZs will be harvested, and those that remain will continue to mature, following removal of the adjacent upland stands. Trees in the RMZs will be increasing in age throughout the term of the AHCP/CCAA. By the end of the term, over one-third of the RMZ stands will be older than 100 years and the remainder will be between 51 and 100 years. At age 100 in a typical redwood zone, there will be approximately 120 trees per acre, with around 12 percent of the trees larger than 36 inches dbh. A few trees will exceed 48 inches dbh and the tallest trees in the stand will be about 170 feet. (See Section 7.2.3 of the proposed AHCP/CCAA.) Under the Proposed Action, therefore, riparian areas would be comprised of a greater number of mature trees by the end of the permit term, compared with either existing conditions or the improvements expected to occur over time under the No Action Alternative (See Section 4.5.3.2.) These trees would provide greater benefits to wildlife species dependent on late-seral-forest conditions, including frogs, salamanders, bats, owls, marbled murrelets, eagles, herons, and owls.

4.6.3.3 Listed Wildlife Species and Other Wildlife Species of Concern

Potential benefits to listed species under the Proposed Action would generally be greater than under the No Action Alternative, primarily because of increased overstory-canopy requirements within Class II RMZs, retention of all LWD within Class III Tier A EEZs, and retention of evenly distributed conifer trees within SMZs. Also, slightly more land would likely be left undisturbed in riparian areas relative to the No Action Alternative. These differences would amplify benefits described under the No Action Alternative for listed species that breed or forage in older trees and late-seral-forest stands, such as bald eagles, marbled murrelets, and northern spotted owls (Table 4.6-1). Implementation of the proposed conservation measures noted above would also amplify benefits, relative to the No Action Alternative, for other wildlife species of concern (unlisted species) presumed or known to occur in the Primary Assessment Area. These would include species that breed or forage in older trees or late-seral stands (e.g., osprey, Vaux's swift, Humboldt marten, red tree vole, and tailed frog).

4.6.4 Alternative A

The only difference between this alternative and the Proposed Action is that no monitoring would be conducted for the southern torrent salamander or tailed frog, and the adaptive management provisions of the AHCP would not apply to these species. This means that

these species would not have the benefit of possible adjustments to the AHCP that would otherwise occur with the implementation of the monitoring and adaptive management provisions together. Impacts to terrestrial habitat and wildlife species of concern under Alternative A would generally be the same as those described for the Proposed Action.

4.6.5 Alternative B

Under Alternative B, fixed no-cut riparian buffer widths would apply to Class I and II watercourses on Simpson's fee-owned lands in the Action Area. Simpson would not implement an ownership-wide Road Management Plan or slope stability and ground disturbance measures, and would not provide protection for unique geomorphic features, such as CMZs and floodplains. Effectiveness and compliance monitoring would not be as extensive under this alternative as the Proposed Action, and adaptive management with structured-feedback loops would not be conducted. Under this alternative, impacts would be comparable to both the No Action Alternative and the Proposed Action.

4.6.5.1 General Effects

In general, vegetation resources in the Primary Assessment Area and the 11 HPAs would be similar to the conditions described for the No Action Alternative, with the exception of riparian areas. The conservation measures, specific to landslide-hazard areas, road construction and operation sites, and firelines outside the riparian zone, afforded by the Proposed Action would not be provided under Alternative B. Measures described under the Proposed Action to prevent or reduce the potential for landslides would not be present under Alternative B. Consequently the potential for loss of wildlife habitat and direct mortality or injury of terrestrial wildlife species during a landslide event would be similar to the No Action Alternative. Impacts in non-riparian areas would, therefore, be the same as under the No Action Alternative.

As under the No Action Alternative, the abundance of stands with saplings and small-diameter trees would decrease during the permit period under Alternative B. A slight increase in high-density mature forest stands would also be expected. Wildlife species most adversely affected by these forest trends would be those that feed and breed in early successional riparian habitats, such as thrushes, warblers, and sparrows. However, because these species also use adjacent upland forests, impacts on these species should be insignificant. Lands in the Primary Assessment Area have been managed for timber production for decades and the species that thrive there today have adapted to the disturbances associated with timber management.

4.6.5.2 Riparian Management Effects

Alternative B would prohibit timber harvesting and other forest management activities within all riparian buffers along Class I and II streams. Riparian conservation measures, as described for the Proposed Action, would not be conducted under Alternative B. Vegetation and wildlife habitat within riparian areas would develop naturally over time. The absence of management within the riparian buffers areas, however, indicates that differences would only become evident either at the end or past the term of the ITP/ESP. Benefits would eventually accrue to species dependent on these riparian and late-seral forest habitats, such as frogs, salamanders, bats, owls, herons, eagles, and marbled murrelets.

4.6.5.3 Listed Wildlife Species and Other Wildlife Species of Concern

Potential benefits to listed species under Alternative B would generally be greater than under the No Action Alternative, primarily because slightly more land would likely be left undisturbed in riparian areas relative to the No Action Alternative. Establishment of fixed riparian buffer areas, within which no management would occur, would also provide a greater number of larger trees at greater distances from stream channels than would be provided under any of the other alternatives. The absence of management within the riparian buffers areas, however, indicates that differences would only become evident either at the end or past the term of the ITP/ESP. These differences would amplify benefits described under the No Action Alternative for listed species that breed or forage in older trees and late-seral-forest stands, such as bald eagles, marbled murrelets, and northern spotted owls (Table 4.6-1). These differences would also amplify benefits (relative to the No Action Alternative or existing conditions) to other wildlife species of concern, presumed or known to occur in the Primary Assessment Area. This includes species that breed or forage in older trees or late-seral stands (e.g., osprey, Vaux's swifts, Humboldt martens, red tree voles, and tailed frogs).

4.6.6 Alternative C

Under Alternative C, Simpson would continue to conduct timber operations as described in the Proposed Action (see Section 2.2.2) and the No Action Alternative (see Section 2.2.1), with the exception of adding 26,116 acres of rain-on-snow areas to be covered by the AHCP/CCAA. This alternative would also expand the list of covered species. Because this alternative is an expansion of the Proposed Action the mitigation and monitoring measures described for the species covered under the Proposed Action, would also be applied under Alternative C, where applicable and practicable. Because there is a potential for unique impacts in the rain-on-snow areas, the AHCP/CCAA would include an additional element in the monitoring program. This element would be designed to evaluate whether the measures proposed for the Action Area described in the Proposed Action are adequate for the covered species in the expanded portion of this alternative's coverage area (i.e., the rain-on-snow areas). The adaptive management program noted for the Proposed Action, would also be included under Alternative C. Species-specific measures to allow incidental take of bald eagles, marbled murrelets, and western pond turtles would also be implemented under this alternative.

4.6.6.1 General Effects

Impacts to terrestrial habitat and wildlife species of concern under Alternative C would be the same as those described for the Proposed Action, with two exceptions: (1) the measures described in the Proposed Action would be extended to Simpson ownership outside of the 11 HPAs in rain-on-snow areas; and (2) conservation measures specific to the marbled murrelet, bald eagle, and western pond turtle would be included. Because the adaptive management "account" for the Proposed Action would apply to a larger area under Alternative C, potential benefits may be diluted relative to what would be expected to occur under the Proposed Action. Implementation of Alternative C, therefore, would result in terrestrial wildlife habitat conditions comparable to or slightly less improved relative to conditions that would result from implementing the Proposed Action.

4.6.6.2 Riparian Management Effects

Under Alternative C, conservation measures described for the Proposed Action would extend to an additional 26,116 acres of rain-on-snow area currently owned by Simpson. General benefits to terrestrial habitat and wildlife species described for the Proposed Action relative to the No Action Alternative would also apply to the additional areas covered under Alternative C. As noted above, because the adaptive management “account” for the Proposed Action would apply to a larger area under Alternative C, potential benefits may be diluted relative to what would be expected to occur under the Proposed Action. Implementation of Alternative C, therefore, would result in terrestrial wildlife habitat conditions comparable to or slightly less improved relative to conditions that would result from implementing the Proposed Action.

4.6.6.3 Effects from Harvesting of Marbled Murrelet Stands

Under Alternative C, Simpson would implement mitigation and management measures designed to minimize and mitigate the impact of incidental take on marbled murrelets. Specific measures, contained in the CFPRs or developed pursuant to the THP process, would be superseded by species-specific measures (contained in the AHCP/CCAA under this alternative) designed to minimize and mitigate the impacts of take and comply with other ESA requirements. Insofar as the murrelet, however, is also a state-listed species under CESA, Simpson would not undertake any HCP measures that are likely to take this species unless it also receives incidental take authorization under state law.

Table 4.6-2 shows the anticipated conservation benefits or impact minimization and mitigation functions for each of the measures proposed in Alternative C to conserve marbled murrelets.

Because phased harvesting of isolated stands of late-seral-forest habitat that would not be provided for under the other alternatives, implementation of Alternative C could result in a short-term reduction of late-seral habitat within the Primary Assessment Area. This could also reduce suitable habitat for other wildlife species, such as eagles, owls, and bats. These effects would be mitigated by implementation of other conservation measures that would occur primarily outside the Primary Assessment Area, but within the 11 HPAs.

TABLE 4.6-2

Conservation Benefits and Impact Minimization and Mitigation Measures for Marbled Murrelet in Alternative C

Measure	Conservation Benefits/Impact Minimization and Mitigation Functions
(1) Retention and protection, over a 50-year period, of timber stands, identified as suitable for murrelet nesting, located adjacent to large blocks of high-value murrelet habitat on public lands.	This measure minimizes adverse impacts to nesting murrelets and retains nesting and breeding opportunities in those stands that have the highest potential as nest stands. It is also designed to avoid direct injury to nesting murrelets, to the maximum extent practicable.

TABLE 4.6-2

Conservation Benefits and Impact Minimization and Mitigation Measures for Marbled Murrelet in Alternative C

Measure	Conservation Benefits/Impact Minimization and Mitigation Functions
(2) Phased harvest of isolated timber stands, with harvesting occurring first in stands with the lowest potential value for murrelets and provisions for extended phasing of harvests in stands with the highest potential value for murrelets.	This measure would reduce the potential effects of the harvesting of Simpson's murrelet stands on individual murrelets and the local population, by phasing the amount and location of the habitat removed. It temporarily retains nesting opportunities in those stands that have the highest value as nest stands.
(3) Thinning of overstocked stands in neighboring Redwood National Park (RNP) to accelerate development of buffer habitat and potential murrelet nesting habitat on public lands.	This measure would contribute to the survival and recovery of the species by providing for the accelerated development of buffer and potential nesting habitat for the local murrelet population. Over the long term, it would reduce cumulative effects on the local murrelet population from the harvesting of Simpson's small, isolated "murrelet" stands, by enhancing nesting opportunities in large tracts of protected habitat in the same region.
(4) Development of a corvid management program to reduce predation pressure on nesting murrelets in RNP and Redwood State Park.	This measure is designed to reduce predation pressure on nesting murrelets in RNP and Redwood State Park.
(5) Funding for murrelet research.	This measure supplements the other measures by providing for data collection and scientific studies that will improve the efficacy of conservation programs for the murrelet. To the degree that the funded research will provide population estimates and document the status of the local murrelet population, the measure also indirectly provides mitigation in the form of monitoring.

4.6.6.4 Effects from Bald Eagle Measures

Under Alternative C, Simpson would survey for bald eagle nests within proposed THP harvesting units and establish 30- to 40-acre nest site management zones within which management prescriptions would be jointly developed by Simpson and USFWS representatives on a site-specific basis. Implementation of this additional mitigation/management measure could provide greater protections to the bald eagle relative to the No Action. Under the No Action, Simpson would not harvest timber or conduct other tree removal, construct new roads, reactivate closed roads, or extract gravel within the best 10 to 40 acres of suitable nest-site habitat around active, occupied nests of the bald eagle. Because general habitat conditions are not expected to change as a result of implementation of this additional measure, adverse impacts to other species relative to the No Action would not likely occur from implementation of this measure either.

4.6.6.5 Effects from Western Pond Turtle Measures

Under Alternative C, Simpson would avoid road construction in meadows and open areas in upland habitats that are located near suitable aquatic habitat for pond turtles.

Under the No Action Alternative, Simpson would not build roads in meadow areas, but could construct roads in open areas outside of the WLPZ. Implementation of this additional mitigation/management measure would likely provide greater protections to the western pond turtle relative to the No Action. Because general habitat conditions are not expected to change as a result of implementation of this additional measure, adverse impacts to other species relative to the No Action would not likely occur from implementation of this measure either, but would likely provide additional benefits to species that utilize open areas, such as the northern harrier, short-eared owl, and western burrowing owl.

4.6.6.6 Listed Wildlife Species and Other Wildlife Species of Concern

For the most part, the impacts to listed wildlife species would be similar to those described for the Proposed Action, with the exception of short-term adverse impacts to some species from the phased harvesting of isolated marbled murrelet stands noted above. Phased harvesting of isolated stands of late-seral-forest habitat would not be provided for under the other alternatives but would be implemented under Alternative C. The associated short-term reduction of late-seral habitat within the Primary Assessment Area under this alternative would result in short-term impacts to the bald eagle, marbled murrelet, northern spotted owl, Vaux's swift, Humboldt marten, Pacific fisher, red tree vole, white-footed vole, Del Norte salamander, and some bat species. Species that would benefit from the phased removal of late-seral habitat include: Cooper's hawk, sharp-shinned hawk, and yellow-breasted chat.

These short-term impacts would be mitigated by other measures included under this alternative that are designed to improve and expand large blocks of late-seral habitat identified as suitable for murrelet nesting on or immediately adjacent to public lands over a 50-year period. These measures would provide long-term benefits to all of the species noted above compared to the No Action, although these benefits may not be realized until after the permit period. Other wildlife species of concern that would benefit from improvement and expansion of late-seral habitat would include: foothill yellow-legged frog, northern red-legged frog, southern torrent salamander, and tailed frog.

4.6.7 Cumulative Impacts

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*. The assessment area for cumulative impacts consists of the 11 HPAs that contain Action Area lands owned by Simpson and covered in its proposed AHCP/CCAA; 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 Simpson, have the potential to result in cumulative effects on terrestrial-wildlife habitat and wildlife species of concern. The purpose of this cumulative impact assessment is to evaluate the potential effects of these varied resource management strategies, including the Proposed Action of this EIS, on terrestrial habitat and wildlife species of concern in the 11-HPA assessment area.

As discussed in Section 4.5, *Vegetation/Plant Species of Concern*, under the current management regime, forest trends in the Simpson ownership will lead to increased age class and size, as well as increased total acreage with dense canopy closure. These trends are expected to accelerate under the Proposed Action and other action alternatives over the duration of the term of the permits. The accelerated development of mid- and late-seral stand types as a result of implementation of the conservation measures under the Proposed Action and other action alternatives is anticipated to be most pronounced within riparian areas. These trends would be expected to result in some long-term beneficial effects to wildlife species that use these habitats relative to the No Action.

Although certain minimal habitat disturbances are anticipated to occur, no significant effects to listed terrestrial wildlife species or other wildlife species of concern are expected. Under all alternatives, including the No Action and Proposed Action, Simpson would either: (1) implement specific measures contained in existing regulations, or developed pursuant to the THP process; or (2) implement measures contained in the AHCP/CCAA and accompanying ITP and/or ESP to minimize and mitigate environmental impacts of incidental take and comply with other requirements of the ESA. 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 four other predominant conservation or management strategies, besides Simpson's, that are being used in the 11 HPAs. (See Section 4.1.2, *Cumulative Impacts*, for a description of these strategies.)

As discussed under the No Action Alternative, continued implementation of existing regulations on commercial timberlands within the 11 HPAs would result in a more varied vegetation mosaic over the landscape, compared to existing conditions, trending toward development of a greater number of mid- and late-seral forest types. These trends would also be generally consistent for the Proposed Action and other alternatives. Continued implementation of the CFPR measures designed to protect riparian vegetation and minimize potential impacts to 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 in the Primary Assessment 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-Simpson 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 significant adverse impacts to listed wildlife species and minimize potential adverse impacts to other wildlife species of concern to a level of insignificance.

Conservation measures associated with the PALCO HCP, like those being proposed by Simpson in their AHCP/CCAA, are also designed to: (1) promote riparian and upland wildlife habitat quality; (2) minimize and mitigate the impacts of incidental take of covered species (including the marbled murrelet); (3) minimize potential significant 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 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 over the next 48 years; 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 have a primary and positive influence within the Eel River and Humboldt Bay HPAs, where PALCO has ownership.

The USFS and/or BLM also manage federal lands in the Blue Creek and the Smith River HPAs. Less than 7 percent of lands in the other HPAs are managed by either of these agencies. 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-risk in nature; do not allow timber harvesting or 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.

Potential impacts to terrestrial habitat and wildlife species of concern associated with resource management on lands administered by the State of California and the National Park Service are most important in the Redwood Creek and Smith River HPAs, where state and federal park lands together comprise 41.5 percent and 15.8 percent of the total land ownership, respectively. Resource management strategies in park lands essentially allow no commercial timber harvesting; although precommercial 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 (but well beyond the term of the permit), 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 may actually decrease over time, as these habitats decline on park lands.

Overall, the combined cumulative effect of these resource management programs would be a trend toward development of more mid- to late-seral forest stands within the 12-HPA assessment area, beyond currently existing levels and levels that would be expected under the No Action Alternative. This trend would favor species with late-seral habitat

associations. Impacts to wildlife species of concern, however, would be relatively insignificant.

4.7 Air Quality

The purpose of this section is to evaluate the potential for air quality impacts from implementing the Proposed Action (the conservation measures in the proposed AHCP/CCAA) and the alternatives, including the No Action Alternative.

4.7.1 Methodology

As discussed in Section 3.7, Simpson-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 the conservation measures in the proposed AHCP/CCAA (Proposed Action) or the other alternatives would result in degradation of existing air quality.

4.7.2 No Action Alternative

Under the No Action Alternative, Simpson would continue to conduct timber harvesting and related operations in the Primary Assessment Area in accordance with the measures described in Section 2.1 of this EIS. NMFS and USFWS would not issue Simpson an ITP or an ESP, and Simpson would not implement an AHCP/CCAA.

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 timber landowners in the Primary Assessment Area and the 11 HPAs (including Simpson) are also contributors to particulate emissions (see Section 3.7). Incidence of PM₁₀ from Simpson's timber management is typically attributable to slash burning and roadway dust entrainment.

Under the No Action Alternative, Simpson's management activities would continue similar to current practices, with some possible changes in harvest levels (and subsequently slash burning and road travel), depending on future changes to riparian buffer widths specified in the CFPRs. For the purposes of this analysis, however, harvest levels are assumed to remain the same under the No Action Alternative, and therefore, Simpson's contribution to air quality conditions would not change. In addition, Simpson would continue to follow AQMD burning restrictions and any new restrictions that could be adopted.

4.7.3 Proposed Action

Under the Proposed Action, Simpson would continue to conduct timber harvesting in the Primary Assessment Area in accordance with existing regulations and guidelines discussed in Section 2.1 of this EIS. In addition, these existing measures used by Simpson to protect Class I, Class II, and Class III streams would be supplemented by Simpson's AHCP/CCAA Conservation Strategy, which includes enhanced RMZ widths for Class I and II streams, establishment of EEZs for Class III streams, and limited activities within the RMZs and EEZs. Simpson also would implement ownership-wide mitigation, management, and monitoring measures.

Conservation measures (e.g., restrictions on areas in which timber can be harvested, exclusion of heavy equipment in RMZs) could reduce Simpson'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 the No Action Alternative. On this basis, the impacts to air quality under the Proposed Action would be the same as those anticipated to occur over time under the No Action Alternative (i.e., no change from current conditions).

4.7.4 Alternative A

Under Alternative A, take coverage would not be extended to unlisted species. This would not affect air quality differently than the impacts described for the Proposed Action and Simpson would continue to conduct timber operations as described for the Proposed Action (see Section 2.2) and the No Action Alternative (see Section 2.1). On this basis, no change to air quality would occur under Alternative A compared with what would occur under either the Proposed Action or the No Action Alternative.

4.7.5 Alternative B

Under Alternative B, fixed no-cut riparian buffer widths would apply to Class I and II watercourses on Simpson's fee-owned lands in the Action Area. Application of these buffer areas and the no-cut provisions would potentially reduce PM₁₀ emissions relative to the Proposed Action, but the reduction would be negligible. Overall timber operations would be comparable to those described for the Proposed Action (see Section 2.2) and the No Action Alternative (see Section 2.1) and, therefore, no change to air quality would occur under Alternative B compared with what would occur under either the Proposed Action or the No Action Alternative.

4.7.6 Alternative C

Under Alternative C, Simpson would continue to conduct timber operations as described for the Proposed Action (see Section 2.2) and the No Action Alternative (see Section 2.1) with the exception of adding 26,116 acres of rain-on-snow areas as areas to be covered by an AHCP. The potential impacts to air quality are anticipated to be the same as for the Proposed Action and, therefore, would be less than significant.

4.7.7 Cumulative Impacts

Other commercial timberland owners in the Primary Assessment Area, plus state and federal land managers in the 11 HPAs, 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 Simpson's timber operations with the potential to affect air quality would not change under the Proposed Action or any of the alternatives), potential cumulative impacts are not expected to be significant.

4.8 Visual Resources

This section evaluates the potential for impacts to visual resources from implementing the Proposed Action (the conservation measures in the proposed AHCP/CCAA) and the alternatives, including the No Action Alternative.

4.8.1 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 AHCP/CCAA conservation measures that pertain to Simpson's existing timber harvest operations.

4.8.2 No Action Alternative

Under the No Action Alternative, Simpson would continue to conduct timber harvesting and related operations in the Primary Assessment Area in accordance with the measures described in Section 2.1 of this EIS. NMFS and USFWS would not issue Simpson an ITP or an ESP, and Simpson would not implement an AHCP/CCAA.

Simpson'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. Under the No Action Alternative, timber harvest levels would be similar to current conditions and, therefore, such actions would be consistent with historical use patterns, including aesthetic effects. 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 40 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 can undergo even-aged harvesting after a specified amount of time has passed, or the clearcut has regenerated to an approved age- or size-class composition.
- Clearcuts should 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.

4.8.3 Proposed Action

Under the Proposed Action, Simpson would continue to conduct timber harvesting in the Primary Assessment Area in accordance with existing regulations and guidelines discussed in Section 2.1 of this EIS. In addition, the existing measures used by Simpson to protect Class I, II, and III streams would be supplemented by Simpson's AHCP/CCAA Conservation Strategy, which includes enhanced RMZ widths for Class I and II streams, establishment of EEZs for Class III streams, and limited activities within the RMZs and EEZs. Simpson also would implement ownership-wide mitigation, management, and monitoring measures. Accordingly, the potential for impacts to visual resources is expected to be comparable to the conditions described above for the No Action Alternative (i.e., no impacts).

4.8.4 Alternative A

Under Alternative A, take coverage would not be extended to unlisted species. Under Alternative A, the potential for impacts to visual resources would be comparable to the Proposed Action conditions because the application of take coverage only for listed species would not affect visual resources.

4.8.5 Alternative B

Under Alternative B, fixed no-cut riparian buffer widths would apply to Class I and II watercourses on Simpson's fee-owned lands in the Action Area. Fixed no-cut riparian buffers under Alternative B would result in reduced timber harvesting within riparian areas and, therefore, potential visual benefits would occur where riparian areas are visible from adjacent highways or public recreation areas.

4.8.6 Alternative C

Under Alternative C, the potential for impacts to visual resources would be comparable to the Proposed Action conditions because the proposed AHCP/CCAA conservation measures affecting visual resources are the same under Alternative C as they are under the Proposed Action. The only difference between Alternative C and the Proposed Action for visual resources is that the conservation measures described under the Proposed Action would apply to the additional rain-on-snow acreage.

4.8.7 Cumulative Impacts

Similar minor visual differences could also occur in other private forestlands in the Primary Assessment Area, but state and federal lands within the 11 HPAs would continue to be managed to meet visual quality objectives. Accordingly, potential individual and cumulative impacts would be less than significant.

4.9 Recreation

This section evaluates the potential for impacts to recreational resources from implementing the Proposed Action (the conservation measures in the proposed AHCP/CCAA) and the alternatives, including the No Action Alternative.

4.9.1 Methodology

As discussed in Section 3.9, *Recreational Resources*, Simpson offers limited access to its forestlands to groups and individuals for recreational activities of hunting, fishing, camping, picnicking, hiking, motorcycle use, and shooting. A recreation impact would occur when the recreational experiences enjoyed by the public are diminished by activities conducted within the Primary Assessment Area. This assessment is based on the potential for the proposed AHCP/CCAA conservation measures 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.

4.9.2 No Action Alternative

Timber harvesting in the Primary Assessment 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. Under the No Action Alternative, timber harvest levels throughout the Primary Assessment Area are expected to be similar to current conditions and, therefore, such actions would be consistent with historical patterns of use, including the aesthetic impacts of such use. Simpson and other private forest landowners within the Primary Assessment Area would continue to follow existing regulations designed to minimize visual and associated recreational effects (see Section 4.8, *Visual Resources*).

4.9.3 Proposed Action

Under the Proposed Action, Simpson would continue to conduct timber harvesting in the Primary Assessment Area in accordance with existing regulations and guidelines discussed in Section 2.1 of this EIS. In addition, these existing measures used by Simpson to protect Class I, Class II, and Class III streams would be supplemented by Simpson's AHCP/CCAA Conservation Strategy, which includes enhanced RMZ widths, establishment of EEZs, and limited activities within the RMZs. Simpson also would implement ownership-wide mitigation, management, and monitoring measures. Accordingly, the potential for impacts to recreational resources is expected to be comparable to the conditions described above for the No Action Alternative (i.e., no impacts).

4.9.4 Alternative A

Under Alternative A, authorized incidental take coverage would not be extended to unlisted species. Under Alternative A, the potential for impacts recreational resources would be comparable to the Proposed Action conditions because the limitation of take coverage to listed species has no effect on recreational resources. Impacts under Alternative A would be the same as they are under the Proposed Action.

4.9.5 Alternative B

Under Alternative B, fixed no-cut riparian buffer widths would apply to Class I and II watercourses on Simpson's fee-owned lands in the Action Area. Fixed riparian buffers under Alternative B would result in reduced timber harvesting within riparian areas and,

consequently, some associated recreational benefits. On the basis of the case-by-case determination of access to Simpson's lands for recreational purposes, however, it is not known whether these fixed buffer areas would be the sites on which recreational activities were allowed or could occur. It is unlikely, therefore, that improvements to recreational resources in these areas would result in a noticeable change in recreational experiences of users compared with either the No Action Alternative or the Proposed Action.

4.9.6 Alternative C

Under Alternative C, the potential for impacts to recreational resources would be comparable to the Proposed Action conditions because the proposed AHCP/CCAA conservation measures affecting visual and associated recreational resources are the same under Alternative A as they are under the Proposed Action. The only difference between Alternative C and the Proposed Action for visual resources is that the conservation measures would apply to the additional rain-on-snow acreage.

4.9.7 Cumulative Impacts

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 Primary Assessment Area. In addition, state and federal lands within the 11 HPAs 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 the proposed AHCP/CCAA conservation measures and from timber harvesting conducted under the No Action would also be consistent with historical practices. Based on the analysis in Section 4.4 (*Aquatic Resources*) and Section 4.6 (*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. Anglers could experience potential benefits from improved fishery conditions. 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, potential adverse individual and cumulative impacts to recreational resources would be less than significant.

4.10 Cultural Resources

This section evaluates the potential for impacts to cultural resources from implementing the Proposed Action (the conservation measures in the proposed AHCP/CCAA) and the alternatives, including the No Action Alternative.

4.10.1 Methodology

Timber harvesting and other management operations can result in impacts to both 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.

4.10.2 No Action Alternative

Under the No Action Alternative, Simpson would continue to conduct timber harvesting and related operations in the Primary Assessment Area in accordance with the measures described in Section 2.1 of this EIS. NMFS and USFWS would not issue Simpson an ITP or an ESP, and Simpson would not implement an AHCP/CCAA.

Under the No Action Alternative, Simpson will continue to comply with the CFPRs in the preparation of THPs. Pursuant to the CFPRs, the following steps must be taken in preparation of THPs.

- Conduct an archaeological record search at the Northwest Information Center (Sonoma State University).
- 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 significant 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.

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.

4.10.3 Proposed Action

Under the Proposed Action, Simpson would continue to conduct timber harvesting in the Primary Assessment Area in accordance with existing regulations and guidelines discussed in Section 2.1 of this EIS. In addition, these existing measures used by Simpson to protect Class I, II, and III streams would be supplemented by Simpson's AHCP/CCAA Conservation Strategy, which includes enhanced RMZ widths, establishment of EEZs, and limited activities within the RMZs. These measures would not change the way in which cultural resources regulations are applied. Simpson also would implement ownership-wide mitigation, management, and monitoring measures, and would continue to comply with the cultural resources protections discussed above for the No Action Alternative. Accordingly, the potential for impacts to cultural resources is expected to be comparable to the conditions described above for the No Action Alternative (i.e., no impacts).

4.10.4 Alternative A

Under Alternative A, take coverage would not be extended to unlisted species. Under Alternative A, the potential for impacts to cultural resources would be comparable to the Proposed Action conditions because the limitation of coverage to listed species would not affect cultural resources. Impacts would be the same under Alternative A as they are under the Proposed Action and the No Action Alternative.

4.10.5 Alternative B

Under Alternative B, fixed no-cut riparian buffer widths would apply to Class I and II watercourses on Simpson's fee-owned lands in the Action Area. The implementation of fixed riparian buffers under Alternative B would not change the ways in which existing cultural resources regulations are addressed. The impacts under Alternative B are the same as under the Proposed Action (i.e., no impacts) or the No Action Alternative.

4.10.6 Alternative C

Alternative C impacts would be the same as those of the Proposed Action (i.e., no impacts). The only difference between Alternative C and the Proposed Action for cultural resources is that the proposed conservation measures would apply to the additional rain-on-snow acreage. This does not result in a change to application of existing regulations for cultural resources protection.

4.10.7 Cumulative Impacts

As noted above, Simpson would adhere to the CFPR requirements for the protection of cultural resources under all alternatives, and the requirements would also apply to other commercial timberlands in the Primary Assessment Area. Management objectives on state and federal lands within the 11 HPAs also provide for the protection of cultural resources;

cultural resource surveys are performed on the Six Rivers National Forest similar to CFPR requirements. Accordingly, potential adverse individual and cumulative impacts to cultural resources would be less than significant.

4.11 Land Use

This section evaluates the potential for impacts to land use from implementing the Proposed Action (the conservation measures in the proposed AHCP/CCAA) and the alternatives, including the No Action Alternative.

4.11.1 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 3.11, Land Use, the Simpson forestlands and other private forestlands in the Primary Assessment 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.

4.11.2 No Action Alternative

The General Plans of both Del Norte and Humboldt counties designate the Simpson forestlands and other private forestlands in the Primary Assessment Area as suitable for timber production. This designation is consistent with past and intended future use of the Primary Assessment 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 Simpson forestlands and other private forestlands in the Primary Assessment 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 Simpson forestlands, it is consistent with the intent of the TPZ district.

4.11.3 Proposed Action

Under the Proposed Action, Simpson would continue to conduct timber harvesting in the Primary Assessment Area in accordance with existing regulations and guidelines discussed in Section 2.1 of this EIS. In addition, these existing measures used by Simpson to protect Class I, II, and III streams would be supplemented by Simpson's AHCP/CCAA Conservation Strategy, which includes enhanced RMZ widths, establishment of EEZs, and

limited activities within the RMZs. Simpson also would implement ownership-wide mitigation, management, and monitoring measures. The proposed AHCP/CCAA conservation measures would conform with existing approved land use, as defined above. No impacts would occur.

4.11.4 Alternative A

Under Alternative A, take coverage would not be extended to unlisted species. Under Alternative A, the land use impacts would be comparable to the Proposed Action and the No Action Alternative because limiting coverage to listed species would not affect land use conformity.

4.11.5 Alternative B

Under Alternative B, fixed no-cut riparian buffer widths would apply to Class I and II watercourses on Simpson's fee-owned lands in the Action Area. The implementation of fixed riparian buffers under Alternative B would not result in inconsistency with existing land use plans or policies. The impacts under Alternative B are the same as under the Proposed Action (i.e., no impacts).

4.11.6 Alternative C

Alternative C impacts would be the same as those of the Proposed Action (i.e., no impacts). The only difference between Alternative C and the Proposed Action for land use is that the proposed conservation measures would apply to the additional rain-on-snow acreage. Inclusion of this additional acreage would not be inconsistent with existing land use plans or policies.

4.11.7 Cumulative Impacts

Timber management activities on the Simpson 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 Simpson 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 other alternatives would occur in a similar manner as under the No Action Alternative. Accordingly, no cumulative land use conflicts would occur.

4.12 Socioeconomic Conditions

This section evaluates the potential for socioeconomic impacts to occur from implementing the Proposed Action (the conservation measures in the proposed AHCP/CCAA) and the alternatives, including the No Action Alternative.

4.12.1 Methodology

Over the term of the ITP/ESP, key socioeconomic indicators (e.g., Simpson employment) are likely to be affected by several internal (e.g., continued implementation of the NSOHCP) and external influences (e.g., market forces in the lumber and wood products sector) that are unrelated to the proposed AHCP/CCAA. 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).

4.12.2 No Action Alternative

As discussed above, key socioeconomic indicators are likely to be affected by several internal (i.e., Simpson-related) and external influences that are unrelated to the proposed AHCP/CCAA. In addition, regulatory requirements will continue to affect management activities in the Primary Assessment 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 habitat conservation plan (e.g., the proposed AHCP/CCAA). 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 conditions and, therefore, changes in socioeconomic conditions are assumed to be minor.

4.12.3 Proposed Action

Under the Proposed Action, Simpson would continue to conduct timber harvesting on the Primary Assessment Area in accordance with existing regulations and guidelines discussed in Section 2.1 of this EIS. In addition, these existing measures used by Simpson to protect Class I, II, and III streams would be supplemented by Simpson's AHCP/CCAA Conservation Strategy, which includes enhanced RMZ widths, establishment of EEZs, and limited activities within the RMZs. Timber harvesting is projected to remain approximately the same as current levels.

Commercial timber harvesting would not occur within 150 feet and 50 to 100 feet of Class I and II watercourses, respectively. The potential reduction in timber harvesting in these areas, however, is expected to be minor and could be balanced out by increased harvesting in other areas. Overall, the average volume of timber harvested from the Primary Assessment Area would be about the same under the Proposed Action 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 Simpson forestlands and, therefore, the need would still exist for Simpson to employ timber management and support staff. In addition, the implementation of measures contained in the proposed AHCP/CCAA (e.g., road management and decommissioning actions), that augment existing practices described under the No Action Alternative, could generate additional employment needs. Accordingly, Simpson's employment levels (as of July 1, 2002)

are expected to remain similar to current levels and similar to expected future employment under the No Action Alternative. In addition, minor changes in timber harvesting would have a negligible effect on local businesses supported by the indirect effects of Simpson employment, and yield taxes paid to Del Norte and Humboldt counties would not change by a substantial amount. Native Americans dependent on subsistence and commercial fishing in the region could benefit from implementation of measures contained in the proposed AHCP/CCAA to the extent that the covered species benefit; however, resulting incremental 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 Primary Assessment Area are not expected to be substantial for the reasons described above. Management activities on state and federal lands within the 11 HPAs are expected to remain similar to current conditions. For these reasons, potential individual impacts on socioeconomic conditions would be less than significant.

4.12.4 Alternative A

Under Alternative A, take coverage would not be extended to unlisted species. Under Alternative A, socioeconomic impacts would be comparable to the Proposed Action and the No Action Alternative because limiting coverage to listed species would not affect the local and regional economy.

4.12.5 Alternative B

Under Alternative B, fixed no-cut riparian buffer widths would apply to Class I and II watercourses on Simpson's fee-owned lands in the Action Area. This could result in the loss of some additional timber volume relative to the No Action Alternative. The loss in timber yields, however, is not expected to be substantial and, therefore, the employment impacts of decreased timber harvesting levels would be less than significant. Accordingly, Simpson's employment levels (as of July 1, 2002) are expected to remain similar to current levels, and similar to expected future employment under the No Action Alternative and the Proposed Action. In addition, minor decreases in timber harvesting would have a negligible effect on local businesses supported by the indirect effects of Simpson employment, and yield taxes paid to Del Norte and Humboldt counties would not change by a substantial amount. Under Alternative B, Native Americans dependent on subsistence and commercial fishing in the region could benefit from implementation of fixed, no-cut riparian buffers to the extent that the covered species benefit from this measure; however, resulting incremental improvements in Native American socioeconomic conditions would be relatively minor and less than significant when compared to the No Action Alternative.

4.12.6 Alternative C

Alternative C impacts would be the same as those of the Proposed Action (i.e., no impacts). The only difference between Alternative C and the Proposed Action for land use is that the proposed conservation measures would apply to the additional rain-on-snow acreage. Inclusion of this additional acreage could result in a benefit (e.g., additional local employment) that could occur from increased timber harvesting in the additional rain-on-snow acreage included in this alternative.

4.12.7 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 Primary Assessment Area include the Yurok Nation and Hoopa Tribe. The close proximity of Yurok and Hoopa lands to Simpson lands has resulted in close coordination between Simpson and the tribes regarding issues of shared concern, such as road use, timber harvesting, and wildlife. Informational meetings with the tribes are described in Section 1.7.1 of this EIS in relation to the NEPA scoping process.

As presented in Sections 4.2 through 4.12, the potential impacts of the Proposed Action and alternatives would be either less than significant or result in benefits to the environment. In addition, under all alternatives, timber harvesting levels are expected to remain similar to current levels. On this basis, the Simpson workforce (as of July 1, 2002) 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 alternatives.

In addition, salmon are an important resource of concern to the Yurok, Hoopa, and other local tribes. As described in Section 4.4, *Aquatic Resources*, key factors affecting aquatic habitat (e.g., suspended sediment, LWD, stream shading) are expected to improve as a result of implementing conservation measures under the proposed AHCP/CCAA. Because all impacts would be less than significant, there would be no environmental justice impacts.

4.12.8 Cumulative Impacts

Timber management activities on the Simpson forestlands are also consistent with activities occurring on other commercial forestlands in the areas. Implementation of the Proposed Action and other action alternatives would not substantively change the socioeconomic conditions compared with the No Action Alternative and existing conditions and, therefore, would not result in cumulative impacts.