Section 6. Conservation Program

This Section identifies the biological goals and objectives of the Plan, sets forth the conservation program that Simpson will undertake in the Plan Area, and provides a detailed explanation of the rationale for the conservation program.

- Section 6.1 presents the goals and objectives.
- Section 6.2 sets forth the specific conservation measures that Simpson will undertake within the Plan Area during the term of the Permits. These measures are referred to as Simpson's "Operating Conservation Program." It includes measures to minimize and mitigate the impacts of incidental take, maintain and improve habitat conditions for the Covered Species, monitor implementation and effectiveness of the Plan, institute adaptive management, and respond to changed and unforeseen circumstances.
- Section 6.3 supplements the Operating Conservation Program with further discussion of the intent, rationale and analysis that underlie the specific measures and commitments outlined in Section 6.2. This section is provided to aid in the implementation of Simpson's Operating Conservation Program.

6.1 BIOLOGICAL GOALS AND OBJECTIVES

6.1.1 Introduction

To meet the statutory criteria for approval of an HCP/ITP, Simpson's conservation program must: (i) minimize and mitigate the impacts of authorized incidental take of Covered Species that may result from Covered Activities to the maximum extent practicable and (ii) ensure that any such taking will not appreciably reduce the likelihood of the survival and recovery of such species in the wild. While these statutory criteria themselves are biological in nature, NMFS and USFWS have issued an Addendum to the HCP Handbook (also known as the "Five Points Policy") calling for an HCP to identify specific biological goals and objectives based on the proposed action that necessitates incidental take permit issuance and the conservation needs of the Covered Species (Final Addendum; 65 FR 35251).

As the Services explained in proposing the Handbook Addendum, the "biological outcome of the operating conservation program for the Covered Species is the best measure of the success of an HCP" (64 FR 11585). Further, the Service stated:

> Explicit biological goals and objectives clarify the purpose and direction of an HCP's operating conservation program. They create parameters and benchmarks for developing conservation measures, provide the rationale behind the HCP's terms and conditions, promote an effective monitoring program, and, where appropriate, help determine the focus of an adaptive management strategy. . . .Biological goals provide broad, guiding principles for an HCP's operating conservation program and the biological goals are "the rationale behind the minimization and mitigation strategies (Final Addendum; 65 FR 35251).

Biological goals can be either habitat-based or species-based. Habitat-based goals are expressed in terms of the amount and or the quality of habitat. Species-based goals are expressed in terms specific to individuals or populations of that species. This Plan's biological goals and objectives are primarily habitat-based but include species-based objectives for the amphibian species. Biological objectives are more specific and include measurable parameters. Biological objectives are the different components needed to achieve the biological goals. Permittees are not required to achieve the HCP's biological goals and objectives to comply with their permits. Rather than being enforceable terms or conditions, the goals and objectives guide the development of the operating conservation measures.

Whether the HCP is based on prescriptions, results, or both, the permittee's obligation for meeting the biological goals and objectives is proper implementation of the operating conservation program of the HCP. In other words, to qualify for No Surprises assurances, a permittee is required only to implement the operating conservation program of the HCP; the IA, if used, and the terms and conditions of the permit. Implementation may include provisions for ongoing changes in actions in order to achieve results or due to results from an adaptive management strategy (65 FR 35251).

Accordingly, to minimize and mitigate the impacts of incidental take within the Plan Area as described in this AHCP and to ensure that such take does not jeopardize the Covered Species, Simpson intends to undertake management measures that will, during the term of the Permit protect, and, where needed allow development of the functional habitat conditions that are required for long-term survival to support well-distributed, viable populations of the Covered Species. These measures, set forth in the Operating Conservation Program in Section 6.2, are based on the biological goals and objectives set forth in this section.

The Biological Goals and Objectives cover not only the listed Covered Species but also the unlisted ITP Species under NMFS jurisdiction and the unlisted ESP Species under USFWS jurisdiction. According to the Handbook Addendum, each ITP Species "must be addressed as if it were listed and named on the permit" (65 FR 35251).

The HCP Handbook Addendum does not apply to CCAAs. Therefore, the Addendum does not directly guide the conservation planning for the ESP Species, and the establishment of biological goals and objectives is not required for ESP Species. Nevertheless, Simpson has established biological goals and objectives for the ESP Species consistent with the purposes of the CCAA policy. The CCAA policy is intended to facilitate the conservation of proposed and candidate species, and species likely to become candidates, by giving non-Federal property owners incentives to implement conservation measures for declining species (64 FR 32726). The CCAA portion of this

Plan will provide benefits to the ESP Species through Simpson's implementation of the voluntary conservation measures contained in the Operating Conservation Program (Section 6.2). These measures are designed to provide conservation benefits of removing threats to the Covered Species and maintaining and improving habitat conditions in the Plan Area so as to help preclude or remove any need to list them as threatened or endangered under the ESA.

6.1.2 Biological Goals and Objectives

The Covered Species in this Plan are six stream-dwelling species. The preferred area of freshwater habitat for these species ranges from the lowest portions of watersheds to the uppermost headwater areas, but they all share some common habitat needs. Although the specifics vary, they all have adapted to relatively cool water temperatures, and require streams with complex habitat both in terms of stream morphology and substrate composition. The six species exhibit life history variability, with the result that different portions of their life cycles depend on freshwater habitat. Of the fish species, chinook salmon spends the least time in freshwater where the spawning and estuarine rearing habitats are the most critical freshwater elements. In comparison, coho salmon and steelhead generally spend up to two years or more of their life in freshwater habitat so that spawning, and summer and winter rearing habitats are important. Most of the coastal cutthroat trout probably spend their entire lives in freshwater. This fish species is completely dependent on the freshwater habitat, although some individuals of certain populations may exhibit anadromy. The amphibian species spend their entire lives within relatively small areas in the upper reaches of watersheds, although the adults of both species are terrestrial and presumably capable of limited overland movements during certain times of year.

Based on these considerations, Simpson has established the five goals and five objectives to reflect in biological terms the intended result of the proposed conservation program.

6.1.2.1 Biological Goals

As a result of the shared habitat requirements of the Covered Species and in addition to the overall purpose of the Plan as stated in Section 1.2, the specific biological goals of this AHCP/CCAA are to:

- Maintain cool water temperature regimes that are consistent with the requirements of the individual species,
- Minimize and mitigate human-caused sediment inputs,
- Provide for the recruitment of LWD into streams so as to maintain and allow the development of functional stream habitat conditions,
- Allow for the maintenance or increase of populations of the amphibian Covered Species in the Plan Area through minimization of timber harvest-related impacts on the species, and

- Monitor and adapt the Plan as new information becomes available, to provide those habitat conditions needed to meet the general goals that benefit the Covered Species.

6.1.2.2 Biological Objectives

There are five biological objectives for the Plan. Three are habitat-based, one is population-based, and one is monitoring-based.

6.1.2.2.1 Summer Water Temperature Objective

For 4th order or smaller Class I and II watercourses with drainage areas less than approximately 10,000 acres, the biological objective for the highest 7DMAVG will be below the upper 95% PI as described by the following regression equation:

Water temperature = 14.35141 + 0.03066461 x square root watershed area

In addition, even when temperatures are below the values listed above, it is a biological objective of this Plan to have no significant increases (>2°C) in the 7DMAVG water temperature in Class I or II watercourses following timber harvest that are not attributable to annual climatic variation. A graphical representation of the temperature regression analysis is shown in Figure 6-1.

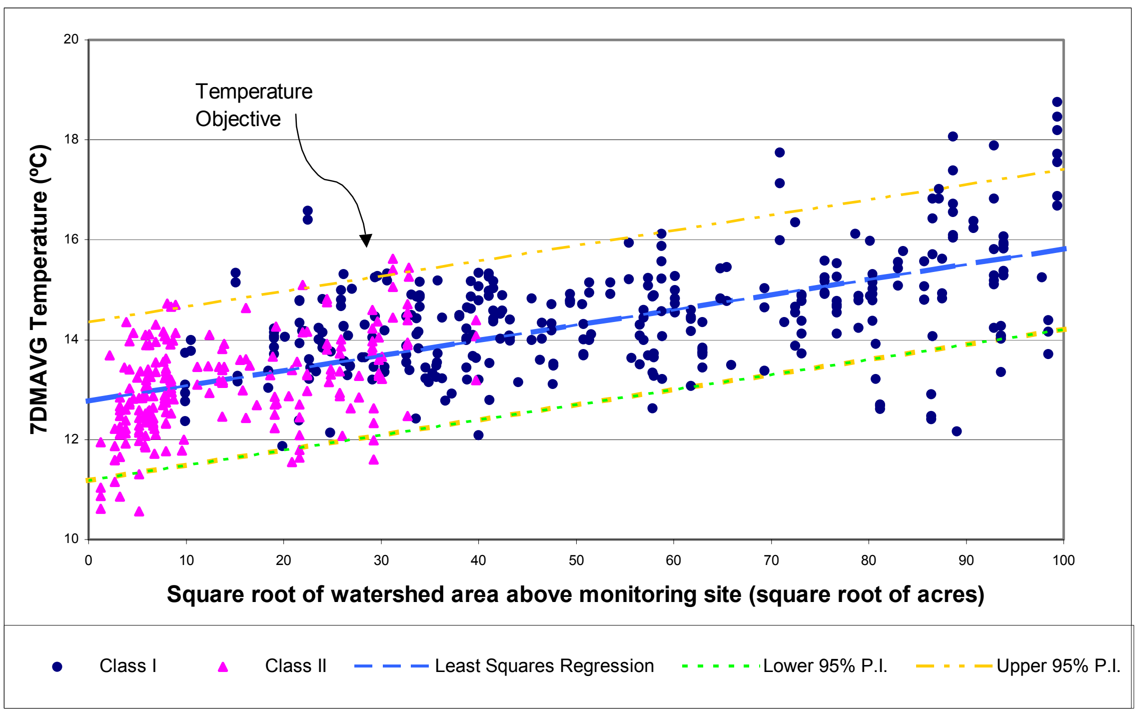


Figure 6-1. Representation of the temperature analysis underlying the summer water temperature objectives based on 7DMAVG water temperatures for all monitoring sites on the Original Assessed Ownership (1994-2000).

6.1.2.2.2 LWD Objective

The biological objective for LWD is to increase the abundance and size class of inchannel and potential LWD in watersheds in the Plan Area. Based on projections of future stand composition in riparian zones through the life of the Plan, the objective is that 99% of riparian zones will be stocked with mature stands greater than 60 years in age and over 70% will have stands greater than 80 years in age. In addition, the potential recruitment based on managed potential tree height will be greater than 80 and 70% attainment for Class I and II watercourses respectively.

6.1.2.2.3 Amphibian Population Objective

The biological objective for amphibian populations is based on two targets:

1. Results of paired sub-basin monitoring indicate that timber harvest activities have no measurable impact on populations of the covered amphibians.

2. Estimates of occurrence of tailed frogs and southern torrent salamanders in Plan Area Class II watercourses will be at least 75 and 80%, respectively.

6.1.2.2.4 Sediment Objective

The biological objective for reducing sediment delivery into watercourses is based on two targets:

1. Treat high or moderate priority sites (classified in terms of likelihood to deliver sediment to Plan Area watercourses), to reduce the amount of road-related sediment at such sites by more than 46% (change high and moderate potential delivery sites to low potential delivery sites) within the first 15 years of the Permits, and the remaining percentage over the last 35 years of the Permits.

2. Achieve a 70% reduction in sediment delivery from management-related landslides in harvested steep streamside slopes compared to delivery volumes from appropriate reference areas within clearcut stands.

6.1.2.2.5 Monitoring and Adaptive Management Objective

The biological objective for monitoring and adaptive management will be to measure detectable changes in baseline biological conditions so as to make appropriate adjustments to the Operating Conservation Program to meet the Plan's goals.

6.2 SIMPSON'S OPERATING CONSERVATION PROGRAM

Based upon the biological goals and objectives, Simpson has developed a comprehensive conservation program with a number of specific conservation measures. These measures are termed the “Operating Conservation Program” and reflect all the binding, enforceable commitments Simpson will make to satisfy the requirements of ESA Section 10(a). The Operating Conservation Program will be incorporated by reference in the section of the IA that describes all Simpson’s conservation planning commitments that must be made and carried out to qualify for and comply with the ITP and ESP that Simpson is seeking. Section 6.3, which follows, provides a supplement to the Operating

Conservation Program, with a detailed discussion of the background, rationale, and intent of the measures. Section 6.3 is not an express element of the Operating Conservation Program but is intended to guide its implementation.

Pursuant to the Operating Conservation Program, Simpson will undertake the following measures on its fee-owned lands and the 1,866 acres in which it owns perpetual harvesting rights granted by Simpson Timber Company on June 28, 2002 within the Plan Area during the term of the Plan and Permits.

In all areas where Simpson holds perpetual harvesting rights in the Initial Plan Area, with the exception of the above-referenced 1,866 acres granted on June 28, 2002, and any Harvesting Rights areas added to the Plan Area over time, all measures will be implemented except as follows: 1) the road assessment and implementation plan measures (6.2.3.1 and 6.2.3.2) will not apply, and 2) routine road maintenance and inspection plan measures (6.2.3.9) will apply only where Simpson has exclusive road-use rights. Furthermore, when Simpson acquires Harvesting Rights and plans to make an election to add such areas to the Plan Area pursuant to IA Paragraph 11.2, Simpson will use its best efforts to enter into an agreement with the fee owner to allow for the application of the road assessment and implementation plan measures (6.2.3.1 and 6.2.3.2) on such lands and, if successful, will apply these measures in such Harvesting Rights areas. Where Simpson does not have exclusive road-use rights in a Harvesting Rights area, Simpson will conduct road maintenance and inspection activities in accordance with existing FPRs and Simpson's management policies and practices. Harvesting Rights acreage added to or deleted from the Plan Area pursuant to the IA will be taken into account for purposes of the annual adjustments made pursuant to 6.2.3.2.1.4.

Regarding roads that are subject to Road Access Rights and included in the Plan Area pursuant to Section 1.3.2.1 and Implementation Agreement Paragraph 3.11.1, Simpson will conduct the assessment of road-related sediment sources for existing roads pursuant to 6.2.3.1.1-6.2.3.1.4 where the fee owner allows Simpson to do so, and Simpson will report the results of the assessment to the Services. Simpson will apply the routine road maintenance and inspection plan measures (6.2.3.9) on such roads only where Simpson has exclusive road-use rights. Where Simpson does not have exclusive road-use rights in a Harvesting Rights area, Simpson will conduct road maintenance and inspection activities in accordance with existing FPRs and Simpson's management policies and practices. Furthermore, Simpson will apply the following specified measures relating to time of year restrictions (6.2.3.4.1- 6.2.3.4.3), design flow (6.2.3.4.5 #1-3), washed out or replacement culverts (6.2.3.4.7), reshaping (6.2.3.4.8), new road construction standards (6.2.3.5), drainage structures (6.2.3.6), erosion control measures (6.2.3.8) and road and landing use limitations (6.2.3.11). Simpson will not apply the remainder of the measures of section 6.2 to these roads, and the acreage of such roads will not be taken into account for purposes of the accelerated road implementation plan and the annual adjustments made pursuant to 6.2.3.2.1.4 .

6.2.1 Riparian Management Measures

6.2.1.1 Class I RMZ Width

1. Simpson will apply a riparian management zone (RMZ) of at least 150 feet (slope distance) on each bank of all Class I watercourses. The width will be measured from the watercourse transition line or from the outer Channel Migration Zone (CMZ) edge where applicable.

2. Where the floodplain is wider than 150 feet on one side, the outer zone of the RMZ will extend to the outer edge of the floodplain. An additional buffer will be added to the RMZ immediately adjacent to a floodplain, as follows:

Side Slopes	Additional Floodplain Buffer
0-30%	30 feet
30-60%	40 feet
>60%	50 feet

6.2.1.1.1 Inner Zone RMZ Width

Simpson will establish an inner zone within the RMZ, the width of which will depend upon the streamside slope in accordance with the following:

Side Slopes	Inner Zone Width
0-30%	50 feet
30-60%	60 feet
>60%	70 feet

6.2.1.1.2 Outer Zone RMZ Width

Simpson will establish an outer zone of the RMZ within the RMZ, which will extend from the outside limit of the inner zone edge to at least 150 feet from the bankfull channel (or CMZ edge) with the additional floodplain buffer set forth above.

6.2.1.2 Conservation Measures within Class I RMZs

During the life of the Plan, Simpson will carry out only one harvest entry into Class I RMZs, which will coincide with the even-aged harvest of the adjacent stand. Simpson will apply the restrictions in this subsection during such entry.

6.2.1.2.1 Overstory Canopy Closure

1. Simpson will retain at least 85% overstory canopy closure within the inner zone.

2. At least 70% canopy overstory closure will be retained within the outer zone.

3. CDF protocol in effect as of the date of the Plan will be used for sampling overstory canopy cover to determine compliance with the overstory canopy closure requirements.

6.2.1.2.2 Retention Based on Bank Stability

1. Within the RMZ, Simpson will harvest no trees that contribute to maintaining bank stability.

2. Redwoods will be preferentially harvested over other conifers.

6.2.1.2.3 Conifer Density Requirements

1. If the inner zone is predominantly composed of hardwoods (it contains less than 15 conifer stems per acre that are greater than 16 inches dbh), Simpson will take no conifers from the inner zone.

2. No harvesting within the RMZ will be undertaken that would reduce the conifer stem density within the RMZ to less than 15 conifer stems per acre.

6.2.1.2.4 Retention Based on Likelihood to Recruit

Simpson will harvest no trees within the RMZ that are judged by Simpson to be "likely to recruit to the watercourse." Such judgment will be based on one or more of the factors listed in 6.2.1.2.5 and 6.2.1.2.6.

6.2.1.2.5 "Likely to Recruit" Factors

The following considerations will be used to determine which trees are "likely to recruit to the watercourse":

1. Tree is on the stream bank;

2. Tree has roots in the stream bank or stream;

3. Tree is leaning toward the stream;

4. Tree is tall enough to ensure it will reach the stream;

5. Tree is on a slope that is sufficiently steep such that gravity would likely carry the fallen tree into the stream; and

6. Tree is on an unstable area or immediately downslope of such an area.

6.2.1.2.6 "Unlikely to Recruit" Factors

Considerations used by Simpson to determine which trees are "not likely to recruit to the watercourse" will be:

1. Tree has an impeded "fall path" to the stream (outside family members of a clonal group); or

2. Tree is leaning away from stream.

6.2.1.2.7 Tree Falling for Safety Purposes

Trees may be felled within RMZs to create cable yarding corridors as needed to ensure worker safety, subject to the canopy closure requirements set forth above. Such trees will be part of the harvest unit.

6.2.1.2.8 Equipment Exclusion Measures

The RMZ will be an equipment exclusion zone (EEZ), except for existing roads and landings, construction of spur roads to extend outside the RMZ and watercourse crossings.

6.2.1.2.9 Management-related Ground Disturbance Treatment.

1. Any ground disturbance caused by management activities that is larger than 100 square feet within an RMZ will be mulched and seeded or otherwise treated to reduce the potential for sediment delivery from sheet and gully erosion.

2. Minimum standards for seeding and mulching operations are 30 pounds per acre of seed and a minimum mulching depth of two inches, covering at least 90% of the surface area.

3. Hand-constructed firelines (established by removing the duff and litter layers to expose, but not disturb, the mineral soil) will not be subject to the 100-square foot ground disturbance standard, but other measures will be applied as necessary to ensure that hand-constructed firelines within a Class I RMZ do not deliver sediment to Class I watercourses.

6.2.1.2.10 Snag Retention Measures

Simpson will retain all safe snags within the RMZ, and fall and leave unsafe snags on-site.

6.2.1.2.11 Inner Zone Salvage

Simpson will not carry out salvage within the inner zone of the Class I RMZ. If any part of the salvageable piece is in the inner zone, the entire piece will be left.

6.2.1.2.12 Floodplain or CMZ Salvage

Simpson will not carry out salvage within an identified floodplain or CMZ.

6.2.1.2.13 Outer Zone Salvage.

Within the outer zone of the Class I RMZ Simpson will conduct salvage operations only of downed trees and if one or more of the following criteria is met:

1. The wood is not currently, and is unlikely in the future to be, incorporated into the bankfull channel (including wood located below unstable areas);

2. The wood is not contributing to bank or slope stability; or

3. The wood is not positioned on a slope such that it can act to intercept sediment moving toward the stream.

6.2.1.3 Class II RMZ Width

1. Simpson will establish an RMZ of at least 70 or 100 feet on each bank of all Class II watercourses.

2. A 70-foot minimum buffer will be used on the first 1,000 feet of 1^{st} order Class II watercourses (Class II-1 watercourses).

3. A 100-foot minimum buffer will be used on all 2^{nd} order or larger Class II watercourses (Class II-2 watercourses).

6.2.1.3.1 Inner Zone RMZ Width

Simpson will establish an inner zone within the RMZ, the width of which will be 30 feet measured from the first line of perennial vegetation.

6.2.1.3.2 Outer Zone RMZ Width

Simpson will establish an outer zone of the RMZ within the RMZ, which will extend the remaining 40 feet or 70 feet (depending on whether it is a Class II-1 watercourse or a Class II-2 watercourse, respectively).

6.2.1.4 Conservation Measures within Class II RMZs

During the life of the Plan, Simpson will carry out only one harvest entry into Class II RMZs, which will coincide with the even-aged harvest of the adjacent stand. Simpson will apply the restrictions in this subsection during such entry.

6.2.1.4.1 Overstory Canopy Closure

1. Simpson will retain at least 85% overstory canopy closure within the inner zone.

2. At least 70% overstory canopy closure will be retained within the outer zone.

6.2.1.4.2 Retention Based on Bank Stability

Within the RMZ, Simpson will harvest no trees that contribute to maintaining bank stability. Redwoods will be preferentially harvested over other conifers.

6.2.1.4.3 Retention Based on Likelihood to Recruit

Simpson will harvest no trees within the first 200 feet of the Class II RMZ adjacent to the Class I RMZ that are judged by Simpson to be “likely to recruit to the watercourse.” Such judgment will be based on the same factors that are listed in 6.2.1.2.5 and 6.2.1.2.6.

6.2.1.4.4 Tree Falling for Safety Purposes

Trees may be felled within RMZs to create cable yarding corridors as needed to ensure worker safety, subject to the canopy closure requirements set forth above. Such trees will be part of the harvest unit.

6.2.1.4.5 Equipment Exclusion Measures

The RMZ will be an EEZ, except for existing roads and landings, construction of spur roads to extend outside the RMZ and watercourse crossings.

6.2.1.4.6 Management-related Ground Disturbance Treatment

1. Simpson will mulch and seed any area where ground disturbance caused by management activities is larger than 100 square feet within a Class II RMZ, or otherwise treat the area to reduce the potential for sediment delivery from sheet and gully erosion.

2. Minimum standards for seeding and mulching operations are 30 pounds per acre of seed and a minimum mulching depth of two inches, covering at least 90% of the surface area.

3. Hand-constructed firelines (established by removing the duff and litter layers to expose, but not disturb, the mineral soil) will not be subject to the 100-square foot ground disturbance standard, but other measures will be applied as necessary to ensure that hand-constructed firelines within a Class II RMZ do not deliver sediment to Class II watercourses.

6.2.1.4.7 Snag Retention

Simpson will retain all safe snags within the RMZ, and will fall unsafe snags and leave them onsite.

6.2.1.4.8 Inner Zone Salvage

Simpson will not conduct salvage on downed trees within the inner zone. If any part of the salvageable piece is in the inner zone, the entire piece will be left.

6.2.1.4.9 Outer Zone Salvage

Simpson will carry out salvage operations within the outer zone only of downed trees and if one or more of the criteria listed in 6.2.1.2.13 are met.

6.2.1.5 Class III Protections

Simpson will apply one of two tiers of protection measures within Class III watercourses in accordance with HPA Groups and slope gradient (as measured with a clinometer), as follows:

HPA Group	Slope Gradient
Smith River	<65%=Tier A >65%=Tier B
Coastal Klamath	<70%=Tier A >70%=Tier B
Korbel	<65%=Tier A >65%=Tier B
Humboldt Bay	<60%=Tier A >60%=Tier B

6.2.1.6 Class III Tier A Protection Measures

6.2.1.6.1 Equipment Exclusion Zone

Simpson will establish a 30-foot EEZ (exceptions for the EEZ include watercourse crossings and existing roads).

6.2.1.6.2 LWD Retention

Simpson will retain all LWD on the ground (not including felled trees) within the EEZ.

6.2.1.6.3 Site Preparation

Simpson will not ignite fire during site preparation within the EEZ.

6.2.1.7 Class III Tier B Protection Measures

6.2.1.7.1 Equipment Exclusion Zone

Simpson will establish a 50-foot EEZ (exceptions for the EEZ include watercourse crossings and existing roads).

6.2.1.7.2 Hardwood Retention

Simpson will retain all hardwoods and nonmerchantable trees within the EEZ except where necessary to create cable corridors or for the safe falling of merchantable trees.

6.2.1.7.3 Site Preparation

Simpson will not ignite fire during site preparation within the EEZ.

6.2.1.7.4 Conifer Retention

1. Simpson will retain conifers where they contribute to maintaining bank stability or if they are acting as a control point in the channel.

2. A minimum average of one conifer per 50 feet of stream length within the EEZ will be retained.

6.2.1.7.5 LWD Retention

Simpson will retain all LWD on the ground (not including felled trees) within the EEZ.

6.2.1.8 Mapping of Unique Geomorphic Features

6.2.1.8.1 Floodplains

1. Simpson will map all floodplains of Class I watercourses within the Plan Area within five years after the Permits' effective date. For any lands added to the Plan Area after the end of the third year, Simpson will complete mapping within two years of the addition.

2. Any sites that show the potential attributes of a floodplain based on geographic information system (GIS) analysis will be further analyzed using aerial photographs, maps, and historic field information.

3. The final determination of the boundaries of all floodplains within the Plan Area will be based on field verification with the oversight of a team of experts that may include a hydrologist, fluvial geomorphologist, geologist, and fisheries biologist representing the Simpson and the Services.

4. Following field verification, the floodplains (with any additional buffers as provided in 6.2.1.1) will be flagged in the field and mapped on Simpson's GIS.

6.2.1.8.2 CMZs

1. Simpson will map all CMZs of Class I watercourses within the Plan Area within five years after the Permits' effective date. For any lands added to the Plan Area after the end of the third year, Simpson will complete mapping within two years of the addition.

2. Any sites that show the potential attributes of a CMZ based on GIS analysis will be further analyzed using aerial photographs, maps, and historic field information.

3. The final determination of the boundaries of all CMZs within the Plan Area will be based on field verification with the oversight of a team of experts that may include a hydrologist, fluvial geomorphologist, geologist, and fisheries biologist representing the Simpson and the Services.

4. Following field verification, the CMZs will be flagged in the field and mapped on Simpson's GIS.

6.2.2 Slope Stability Measures

6.2.2.1 Steep Streamside Slopes

6.2.2.1.1 Identification

During THP layout, Simpson will identify all steep streamside slopes leading to Class I or II watercourses with the following characteristics within the proposed THP area:

HPA Group	HPAs	Initial Slope Gradient
Smith River	Smith River	Greater or equal to 65%
Coastal Klamath	Coastal Klamath Blue Creek	Greater or equal to 70%
Korbel	Mad River North Fork Mad River Little River Coastal Lagoons Redwood Creek Interior Klamath	Greater or equal to 65%
Humboldt Bay	Humboldt Bay Eel River	Greater or equal to 60%

6.2.2.1.2 Initial Maximum Slope Distance

Where steep streamside slopes have been identified within the THP area, Simpson will create a Steep Streamside Slope (SSS) zone with the following initial maximum widths:

	SSS Zone Slope Distance from Watercourse Transition Line (feet)		
HPA Group	Class I	Class II-2	Class II-1
Smith River	150	100	70
Coastal Klamath	475	200	100
Korbel	200	200	70
Humboldt Bay	200	200	70

6.2.2.1.3 SSS Outer and Inner Zone Distances

1. The SSS zone will be comprised of an inner zone (Riparian Slope Stability Management Zone [RSMZ]) and an outer zone (Slope Stability Management Zone [SMZ]).

2. The width of the RSMZ will be the same as the applicable RMZ set forth in 6.2.1.1, except where a qualifying slope break exists within that distance the RSMZ may only extend to the slope break. A “qualifying slope break” is an interruption of slope gradient of sufficient degree and scale to reasonably impede sediment delivery to watercourses from shallow landslides originating above the slope break.

3. The width of the SMZ will be either the remainder of the distance to a qualifying slope break or to the maximum SSS distance from the watercourse for that HPA group, whichever is shorter.

6.2.2.1.4 RSMZ Inner and Outer Zone Distances

1. The RSMZs will be comprised of an inner zone and an outer zone.

2. The inner zone of RSMZs on all Class I watercourses will be 70 feet, except where a qualifying slope break exists within that distance the RSMZ inner zone may only extend to the slope break, and the outer zone, if any, will be the remainder of the applicable RMZ distance except where a qualifying slope break exists within that distance.

3. The inner zone of RSMZs on all Class II watercourses will be 30 feet, except where a qualifying slope break exists within that distance then the RSMZ inner zone may only extend to the slope break, and the outer zone, if any, will be the remainder of the applicable RMZ distance except where a qualifying slope break exists within that distance.

6.2.2.1.5 Prescriptions for RSMZs in Coastal Klamath and Blue Creek HPAs

In the Coastal Klamath and Blue Creek HPAs, Simpson will not conduct harvesting in RSMZs.

6.2.2.1.6 Prescriptions for RSMZs in All HPAs except Coastal Klamath and Blue Creek

1. On Class I and Class II-2 watercourses, Simpson will not conduct harvesting on the inner zone of the RSMZ and there will be 85% overstory canopy retention in the outer zone of the RSMZ.

2. On Class II-1 watercourses, Simpson will retain 85% overstory canopy in the inner zone of the RSMZ and 75% overstory canopy in the outer zone of the RSMZ.

6.2.2.1.7 Default Prescriptions for SMZs

1. The initial silviculture prescription employed within SMZs will be single tree selection, as that term is defined in the Glossary of the Plan.

2. Even spacing of unharvested trees will be provided where the trees are available to allow it, and all hardwoods will be retained. All species and size classes represented in pretreatment stands will be represented post harvest where feasible.

3. There will be only one harvesting entry in the SMZ during the term of the Permits.

4. Where no SMZ is identified, the standard default prescriptions for RMZs will apply.

6.2.2.1.8 Tree Falling for Safety and Cable Yarding

Simpson may fall trees within RSMZs and SMZs for worker safety and to create cable yarding corridors of up to 25 feet in width.

6.2.2.1.9 Road Construction

Simpson's road construction will avoid RSMZs and SMZs where feasible. Where such zones cannot be avoided or where major road reconstruction is required, the road alignment within a RSMZ or SMZ will be evaluated by a registered geologist (RG) and a registered professional forester (RPF) with experience in road construction in steep forested terrain.

6.2.2.2 Headwall Swales

6.2.2.2.1 Identification

During THP layout, Simpson will identify all headwall swales within the proposed THP area based on a SHALSTAB computer model analysis (>1/4 ac) using at least a 10m DEM and a q/T less than or equal to –2.8) coupled with field observations and verification of characteristic slope attributes by an appropriately trained RPF or RG. The boundaries of a SHALSTAB-identified headwall swale may be adjusted according to field observations by an appropriately trained RPF or RG.

6.2.2.2.2 Default Prescription

The default prescription for headwall swales is uniform across the Plan Area and is not subject to adaptive management.

6.2.2.2.3 Silvicultural Prescription

1. The silviculture prescription employed on a field verified headwall swale will be single tree selection (as defined in the Glossary of the Plan).

2. Even spacing of unharvested trees will be provided where the trees are available to allow it, and all hardwoods will be retained.

3. All species and size classes represented in pretreatment stands will be represented post harvest where feasible.

4. There will be only one harvesting entry in headwall swales during the term of the Permits.

6.2.2.2.4 Tree Falling for Safety and Cable Yarding

Simpson may fall trees on a field verified headwall swale for worker safety and to create cable yarding corridors of up to 25 feet in width.

6.2.2.2.5 New Road Construction

Simpson's new road construction will avoid field verified headwall swales wherever feasible. Where such areas cannot be avoided or where road reconstruction is required, the terrain will be evaluated by a RG and RPF with experience in road construction in steep forested terrain.

6.2.2.3 Deep-Seated Landslides

6.2.2.3.1 Identification

During THP layout, an appropriately trained RPF or RG, will identify all active deep-seated landslides within the proposed THP area that meet one of the following two criteria by using published landslide maps, aerial photographs and field observation:

- First Criterion: A scarp or ground crack that exhibits at least three inches of horizontal displacement or at least six inches of vertical displacement that typically exposes bare mineral soil, but that may be partially revegetated, and where field observations clearly indicate that the movement occurred within approximately the past 50 to 100 years; or

- Second Criterion: A convex, lobate landslide toe that exhibits evidence of activity within approximately the past 50 to 100 years.

6.2.2.3.2 Default Prescription for Active Deep-seated Landslides

1. Where neither criterion in 6.2.2.3.1 is exhibited, other conservation measures in the Plan may apply and the California FPRs will apply, but no default prescription will be required. The California FPRs will also apply to all parts of deep-seated landslides.

2. The default prescription for deep-seated landslides is uniform across the Plan Area and is not subject to adaptive management.

6.2.2.3.3 Harvesting near Active Deep-seated Landslides Identified by the First Criterion

Where an active deep-seated landslide exhibits the first criterion stated in 6.2.2.3.1, Simpson will not harvest within 25 feet upslope from the identified scarp or ground crack.

6.2.2.3.4 Harvesting near Active Deep-seated Landslides Identified by the Second Criterion

Where an active deep-seated landslide exhibits the second criterion stated in 6.2.2.3.1, Simpson will not harvest on the toe or within 25 feet upslope from the inflection point of the convex, lobate landslide toe.

6.2.2.3.5 Tree Falling for Safety and Cable Yarding

Simpson may fall trees on active deep-seated landslides for worker safety and to create cable yarding corridors of up to 25 feet in width.

6.2.2.3.6 New Road Construction

Simpson will not construct new roads across active deep-seated landslide toes or scarps, or on steep (greater than 50% gradient) areas of dormant slides, without approval by a RG and a RPF with experience in road construction in steep forested terrain.

6.2.2.4 Shallow Rapid Landslides

This conservation measure will apply to only those shallow rapid landslides that are field verified to be active or which are likely to be reactivated by harvesting, and that have a reasonable potential to deliver sediment directly to a watercourse, and that are at least 200 square feet in plan view. This conservation measure will not apply to road related failures. Road related failures will be addressed by the road maintenance plan.

1. The default prescription for landslides that do meet the above listed criteria will be no cut within the landslide boundaries, and a minimum of 70% overstory canopy within 50 feet above a slide and 25 feet on the sides of a slide. Site-specific geologic review of this default prescription, pursuant to Sections 6.2.2 and 6.3.2, may result in an alternative prescription for shallow rapid landslides.

2. Simpson's new road construction will avoid landslides that meet the above listed criteria wherever feasible. Where such areas cannot be avoided or where major road reconstruction is required, the terrain will be evaluated by a RG and RPF with experience in road construction in steep forested terrain.

6.2.2.5 Training

1. RPFs writing timber harvesting plans for Simpson will be trained to address issues relating to the conservation measures set forth in 6.2.2.

2. The training will be administered by a California RG or a Certified Engineering Geologist (CEG) and will initially follow the guidelines of the 1998 and 1999 CLFA Geology and Mass Wasting workshops.

6.2.2.6 Application of Prescriptions and Alternatives

1. During THP development, Simpson's RPF will do one of the following when he or she determines that any portion of the THP meets the steep streamside slope, headwall swale, or deep-seated landslide definitions:

   a. Impose the default prescription applicable to that feature as set forth above, or

   b. Retain a California RG to:

      1) Evaluate the likelihood that timber harvest 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

      2) Work with the RPF to prepare a more cost-effective, site-specific alternative to the default prescription designed to minimize that likelihood, which will have the benefit of minimizing and mitigating potentially significant impacts on the Covered Species from sediment delivery resulting from landslides caused or exacerbated by timber harvest operations.

2. A qualified biologist will be involved in evaluating the potential biological consequences whenever a more cost-effective alternative to the default prescription is proposed.

3. The alternative to the default prescription may be applied to any SMZ (except an RSMZ), field verified headwall scarp, or deep-seated landslide.

4. THPs for which a geologic report was prepared and the conclusions of which allowed for alternatives to replace the default prescriptions will be flagged as such when submitted for review by CDF and other agencies. A THP map and letter of notice that describes the alternative to replace the default prescriptions will be sent to the Services when a THP with such an alternative is proposed.

6.2.3 Road Management Measures

6.2.3.1 Road Assessment Process and Priority for Repair

6.2.3.1.1 Road-related Sediment Source Identification

Simpson will identify road-related sediment sources in accordance with the sub-watershed road work unit (RWU) priority set forth in this subsection for the Lower Klamath River basin and the rest of the Plan Area.

6.2.3.1.2 Aerial Photo Analysis and Maps

1. Simpson will conduct an analysis of historical aerial photos to identify all the roads that were constructed in each watershed.

2. When possible, photographic coverage from a number of years will be selected to "bracket" major storms in the watershed.

3. From the information gained in the photo analysis, detailed land use and erosion history maps, including road location and road construction history, will be developed.

6.2.3.1.3 Field Inventories

1. Simpson will conduct field inventories to identify and quantify road-related sediment sources. During the field assessment, aerial photographs will be used to record the location of each road feature that exhibits potential to deliver sediment to a stream.

2. A data form will be completed for each potential sediment delivery site, and the data form will be stored in a database.

6.2.3.1.4 Documentation of Fish-passage Problems

Simpson will document any potential fish passage problems, including culverts that are impeding fish passage, during the field inventory.

6.2.3.1.5 Development of Prescriptions for Erosion Control and Prevention

Simpson will develop a prescription for erosion control and erosion prevention for each source of treatable erosion that is identified. The prescription for each site will involve temporary or permanent decommissioning, or road upgrading for the Simpson's Management Road system, and will include the following kinds of information:

Road Work Unit Prioritization for the Plan Area, excluding the Lower Klamath Basin

Sub-watershed Road Work Units		**Ranking**				**Total**	**Rank**
		Covered Species Occurrence	**Habitat Quality**	**Slope Risk**	**Watercourse Crossing Risk**		
	(area included)	High=6	High=6	High=6	High=6	High=24	
South Little River	(Upper S.F., Lower S.F., S.F, Bullwinkle, Mainstem Little River)	6	5	4.67	6.00	21.67	**1**
S. F. Winchuck	(S.F. Winchuck)	6	5	4.80	5.37	21.16	**2**
Rowdy	(Rowdy, S.F. Rowdy, Ravine, Savoy)	6	5	4.07	5.35	20.44	**3**
Wilson	(Wilson)	6	4	5.30	4.69	20.00	**4**
Long Prairie	(Canyon, Railroad, Mule, Long Prairie, Pollock, Bald Mtn., Jiggs, Hatchery, Sullivan, Watek)	6	5	3.87	4.47	19.34	**5**
Maple Creek	(Gray, Beach, M-Line, Clear)	6	4	3.90	5.16	19.06	**6**
North Little River	(Water, Freeman, Railroad)	6	3	4.36	5.00	18.36	**7**
Dominie	(Dominie, Ritmer, Lopez, Gilbert)	5	4	3.66	5.22	17.88	**8**
Jacoby Creek	(Jacoby Creek, Cloney, Washington, Rocky, Janes)	6	2	4.44	5.13	17.57	**9**
Lindsay Creek	(Powers, Mill, Hall, Lindsay, Essex, Mill, Widow White, Strawberry)	4	4	4.15	5.27	17.42	**10**
Dry Creek	(Devil, Dry, Blackdog, Boundary, Putter, Quarry)	4	3	5.47	4.91	17.38	**11**
Salmon Creek	(Salmon Creek)	5	3	4.58	4.70	17.28	**12**
Panther Creek	(Panther, Coyote)	5	4	3.98	3.98	16.96	**13**
Ryan Creek	(Ryan Creek et al.)	4	3	4.56	5.06	16.62	**14**
N.F. Maple Creek	(Diamond, Pitcher, N.F. Maple)	6	4	2.32	3.89	16.21	**15**
Canon Creek	(Maple, Simpson, Cañon, Vincent)	5	2	4.55	4.53	16.08	**16**
East Little River	(Mainstem above barrier)	4	4	3.54	4.49	16.03	**17**
Gossinta	(Krueger, Jackson, Denman, Gossinta, Poverty)	4	2	4.71	4.87	15.59	**18**
Basin	(Dolf, Tyson, East Fork North Fork)	4	3	3.47	4.48	14.95	**19**
Goose	(Goose)	4	3	4.04	3.74	14.78	**20**
Little Mill	(Peacock, Sultan, Little Mill, Hutsinpillar, Tryon, Camp Six, Fort Dick)	4	3	3.69	3.99	14.68	**21**
Eel/VanDuzen	(Eel/VanDuzen et al.)	3	1	4.78	4.62	13.39	**22**
Noisy Creek	(Noisy, Lake Prairie, Pardee, Snow Camp)	4	3	2.68	3.16	12.84	**23**
McDonald Creek	(McDonald)	4	2	2.95	3.85	12.80	**24**
Dolly Varden	(Dolly Varden, Toss-up, Lupton)	3	3	2.92	3.58	12.50	**25**
Joe Marine	(Aikens, Joe Marine, Cananaugh, Gist, Bens, Burrill, Pine, Devil, Cappell)	3	3	2.91	2.86	11.77	**26**
Coastal Tribs	(Burris, McNeil, Mill, McConnahas, Luffenholtz)	2	2	3.10	4.36	11.47	**27**
Boulder Creek	(Madrone, Graham, Goodman, Boulder)	3	1	2.96	3.27	10.22	**28**

Lower Klamath River Basin Road Work Unit Prioritization

Sub-Basin	Diversity (1-5)	Importance (1-5)	Condition (1-5)	Connectivity (1-5)	Density (1-5)	Density (1-5)	Total (1-30)	Rank (1-30)
Mainstem Blue Creek	5	5	5	5	2	2	24	1
Crescent City Fork	5	5	5	5	1	1	22	2
Terwer Creek	5	5	4	3	2	2	21	3
Tectah Creek	4	5	3	3	2	3	20	4
McGarvey Creek	4	4	3	4	3	2	20	5
Mettah Creek	4	4	3	4	2	2	19	6
South Fork Ah Pah	3	3	2	2	4	5	19	7
West Fork Blue Creek	3	3	3	4	2	3	18	8
Mainstem Ah Pah	3	3	2	2	5	3	18	9
Roaches Creek	3	3	3	3	2	3	17	10
Hunter Creek	5	4	2	2	2	2	17	11
Hoppaw Creek	4	3	2	1	3	3	16	12
Nickowitz Creek	2	3	4	4	1	1	15	13
North Fork Ah Pah	3	2	3	3	2	2	15	14
Bear Creek	3	2	2	2	3	3	15	15
Johnsons Creek	4	3	2	2	2	2	15	16
Pine Creek	3	3	3	3	1	1	14	17
Pecwan Creek	3	2	3	2	2	2	14	18
Tully Creek	1	3	3	3	2	2	14	19
Slide Creek	1	3	4	4	1	1	14	20
Surpur Creek	3	1	1	2	4	3	14	21
Tarup Creek	4	2	2	1	3	2	14	22
Cappell Creek	1	2	3	2	2	2	12	23
Waukell Creek	2	1	1	1	4	3	12	24
High Prairie Creek	2	1	3	1	2	2	11	25
Salt Creek	2	2	2	2	2	1	11	26
Morek Creek	1	1	3	2	2	2	11	27
Little Surpur Creek	1	1	1	2	3	3	11	28
Omagaar Creek	3	1	2	1	2	2	11	29
Saugep Creek	2	1	1	2	3	2	11	30

- types of equipment needed
- equipment hours
- hand labor for culvert installation
- downspouts
- seeding and mulching
- estimated costs for each work site
- estimate of expected sediment savings

6.2.3.1.6 Prioritization of Implementation of Treatment Prescriptions

Simpson will prioritize road-related sediment sources for treatment as “high,” “moderate” or “low” based on a balancing of the following factors: (1) volume of future sediment delivery; (2) treatment immediacy; and (3) treatment cost-effectiveness.

6.2.3.2 Implementation Plan

1. Simpson will memorialize the prescriptions to be applied and the priority of application in an implementation plan.

2. Implementation will be carried out consistent with the Road Decommissioning Standards (6.2.3.3) and the Management Road Upgrading Standards (6.2.3.4).

3. Implementation of road treatment sites identified as “high” or “moderate” priority of all sites will be carried out during the term of the Permits.

6.2.3.2.1 Acceleration of Implementation Plan

1. Simpson will provide for an average of $2.5 million per year (to be inflation adjusted in 2002 dollars for each year of the acceleration period) for the first 15 years of the Permits’ 50-year term (the “acceleration period”) to implement the treatment of high and moderate priority sediment sites identified in the implementation plan, for a total of $37.5 million (unless the acceleration period is adjusted as provided in 6.2.3.2.3).

2. All funds provided by Simpson to treat high and moderate sites during the acceleration period, including high and moderate sites on roads appurtenant to THPs, will be counted toward the $2.5 million per year commitment.

3. During any of the first three years of the acceleration period, Simpson may provide for substantially more or less than $2.5 million, as long as a total of $7.5 million (inflation adjusted in 2002 dollars for each year) has been provided by the end of the three-year period.

4. On an annual basis the $2.5 million per year will be adjusted proportionally to reflect the current acreage of the Plan Area in relation to the acreage of the Initial Plan Area.

6.2.3.2.2 Five-year Assessment of Future Sediment Yield

1. At the end of the first five year period of the Permits, Simpson will refine its estimate of the amount (in cubic yards) of future sediment yield from high and moderate priority sites on roads owned by Simpson within the Plan Area.

2. For RWUs that have not yet been totally inventoried at the time of the five-year assessment, a stratified random sampling approach will be utilized: 15 to 20% of the roads will be sampled in 0.5-mile segments.

3. If the refined estimate is within 5% of the original estimate (i.e., is from 6,118,000 cubic yards to 6,762,000 cubic yards), then Simpson will continue to provide for $2.5 million per year for the remaining ten-year term of the acceleration period.

6.2.3.2.3 Revisions to Acceleration Period Based on Five-year Assessment

1. If the refined estimate is greater than 5% more than the original estimate of future sediment yield from high and moderate priority road sites, then the commitment to provide for $2.5 million per year for the remaining term of the acceleration period will be proportionally increased in 1% increments to add up to an additional 1.5 years to the acceleration period (i.e., Simpson will provide for up to $3.75 million more over an additional 1.5 years).

2. If the refined estimate is greater than 5% less than the original estimate of future sediment yield from high and moderate priority road sites, then the commitment to provide for $2.5 million per year for the remaining term of the acceleration period will be proportionately reduced in 1% increments to subtract up to 1.5 years from the acceleration period (i.e., Simpson will provide for up to $3.75 million less and the remaining acceleration period will be reduced by up to 1.5 years).

6.2.3.3 Road Decommissioning Standards

6.2.3.3.1 Time of Year Restrictions

1. Simpson will not carry out road decommissioning during the winter operating period (October 16th through May 14th), except that road decommissioning may occur from October 15th through November 15th if “unseasonably dry fall” occurs (less than four inches of cumulative rainfall from September 1st through October 15th) and the following occurs:

   a. Each project site is completed that operational day with erosion control measures installed; or

   b. If a site requires multiple days for completion, a long-range forecast of no rain for the next five days has been issued.

2. Sites that require multiple weeks for completion will not be started during the winter period.

6.2.3.3.2 Watercourse Crossings

1. Simpson will remove fill from all watercourse crossings.

2. The excavation will extend down to the original channel bed, with the excavated channel at least as wide as the original channel.

3. The side slopes will be sloped back to the original or a stable angle and spoil material transported to a stable location.

4. Appropriate erosion control measures such as seeding and mulching will be utilized to facilitate revegetation of excavated crossings.

6.2.3.3.3 Unstable Areas

1. Simpson will pull back unstable or potentially unstable road or landing fill identified during the road assessment process and deposit spoil in a stable location.

2. Appropriate erosion control measures such as seeding and mulching will be utilized to facilitate revegetation of unstable areas.

6.2.3.3.4 Road Surface Runoff

1. Simpson will establish maintenance-free surface drainage for temporarily and permanently decommissioned roads.

2. Inside ditches and springs and seeps will be properly drained with deep cross-drain ditches.

3. Localized outsloping will be utilized as necessary to adequately drain the road surface.

4. Permanently decommissioned roads will be ripped and planted with commercial tree species where appropriate to reestablish timber production.

6.2.3.3.5 Erosion Control

Simpson will perform seeding, mulching and planting, and installation of energy dissipation (rock armor or woody debris) when determined necessary by qualified and trained personnel for additional control erosion on the decommissioned roads.

6.2.3.4 Management Road Upgrading Standards

6.2.3.4.1 Time of Year Restrictions

Simpson will not conduct road upgrading during the winter operating period, except as stated in 6.2.3.4.2 and 6.2.3.4.3.

6.2.3.4.2 Dry Fall

1. Road upgrading may occur from October 16th through November 15th if "unseasonably dry fall" occurs (less than four inches of cumulative rainfall from September 1st through October 15th), and the following restrictions are followed:

    a. Each project site is completed that operational day with erosion control structures installed; or

    b. If a site requires multiple days for completion, a long-range National Weather Service forecast of no rain for the next five days has been issued.

2. Sites that require multiple weeks for completion will not be started during the winter period unless there is an emergency situation.

6.2.3.4.3 Early Spring Drying

Simpson may conduct road upgrading from May 1st through May 14th when "early spring drying" has occurred (no measurable rainfall occurred within the last 5 days and no rain forecasted by the National Weather Service for the next 5 days) and the following restrictions are followed:

1. Watercourse crossings on Class I and larger Class II watercourses (watercourses where significant surface flows could prevent effective diversion of flow around the work site) will not be installed or replaced; and

2. Erosion control supplies are retained on-site and applied to each completed site by the end of that operational day.

6.2.3.4.4 Road Upgrading Methods

Where road upgrading is the recommended treatment in the implementation plan, Simpson will follow the applicable location, design, timing, and construction standards of 6.2.3, the methods stated in 6.2.3.4.5 through 6.2.3.4.9, and be generally governed by the techniques described in Weaver and Hagans (1994) unless and until a more "state of the art" manual is published and mutually agreed upon by Simpson and the Services for application.

6.2.3.4.5 Design Flow

1. All culverted watercourse crossing replacements will be designed to handle a 100-year return interval flow event.

2. The design flow will be calculated using the Waananen and Crippen (1977) method for areas greater than or equal to 80 acres. The Rational Method (Chow 1964) will be used when the drainage area for a crossing is less than 80 acres.

3. Culverts will be sized to pass the 100-year flow event without overtopping (HW/D = 1.0).

4. Culverts that are functioning properly but are undersized according to the standards will be upgraded if (a) the existing culvert's capacity is not within 15% of the design flow and (b) the headwater depth to culvert diameter ratio is less than 2.0.

5. Other flow design estimation methods developed in the future for the North Coast Region may be substituted if comparable.

6.2.3.4.6 Fish-bearing Watercourses

1. Simpson will install bridges on fish-bearing watercourses where feasible.

2. When a bridge installation is not feasible, a countersunk or bottomless culvert will be installed on grade that will provide upstream and downstream fish passage. Installed culverts will not restrict the active channel flow.

6.2.3.4.7 Washed Out or Replacement Culverts

1. Simpson will upgrade washed out culverts and those replaced on previously temporary decommissioned roads to the same installation standards as new roads.

2. Any buried logs or other large organic debris will be removed from the crossing fill.

6.2.3.4.8 Reshaping

1. Simpson will reshape the existing roadbed if necessary to improve surface drainage.

2. Reshaping is restricted to the time periods described for road upgrading except it will not be conducted during the early spring drying period (May 1st through May 14th).

6.2.3.4.9 Additional Ditch Relief Culverts

Simpson will install additional ditch relief culverts to meet the maximum spacing specifications of 6.2.3.6.12.

6.2.3.5 New Road Construction Standards

6.2.3.5.1 Single-use THP Roads

Simpson will classify new roads designed for a single-use in a THP as temporary, and decommission the roads upon completion of operations.

6.2.3.5.2 Seasonal Restrictions

Simpson will not construct new roads during the winter period (October 16th through May 14th).

6.2.3.5.3 Clearing Width

Simpson will provide a clearing with a width which is based on the slope of the ground (it must be able to adequately displace organic material so that organics are not incorporated in the fill) and the presence of green trees (to avoid having fill material butt up against green trees), and will normally range from 75 to 100 feet.

6.2.3.5.4 Tree Removal

1. Simpson will clear all trees over 12 inches dbh within five feet of the top of the cut slope.

2. Trees greater than 12 inches dbh within five feet of the top of the cut slope may be retained if they will not be susceptible to windthrow or of being undercut.

6.2.3.5.5 Slash and Debris

1. Simpson will not incorporate slash and other debris from road construction into the road prism, fills or sidecast material.

2. When feasible, slash and debris will be placed parallel to the toe of road fill slopes as a filter windrow.

3. Slash will not be bunched against residual trees or placed in locations where it may gain entry into Class I, II or III watercourses.

6.2.3.5.6 Organic Layer

On slopes greater than 35%, Simpson will substantially remove the organic layer of the soil prior to fill placement.

6.2.3.5.7 Location

1. Simpson will make every attempt to avoid locating roads on steep slopes, inner gorge or steep toe slopes, headwall swales or debris slide slopes, and deep-seated landslides, and will follow the slope stability measures when it is not possible to avoid these features.

2. Wherever feasible, roads will be located on or close to ridge tops or on benches where the road prism can be built with the least soil displacement.

3. New roads will be constructed so the road network will not drain directly into watercourses (i.e., will be hydrologically disconnected).

6.2.3.5.8 Road Width Specifications

1. Simpson will construct management roads to have a running surface width of 16 to 18 feet (mainline roads) and 14 to 16 feet (secondary roads).

2. Mainline and secondary roads will typically have a combination of outsloped and crowned road construction plus an inside ditch where appropriate and occasional turnouts.

3. Temporary roads will have a width of 14 to 16 feet, will typically be outsloped with rolling dips, will be planned and designed for a single harvest entry, and will be decommissioned upon completion of harvest operations.

4. Exceptions to the road width specifications will be made where necessary considering topographic constraints, landing locations, turnouts, engineered berms, and curve widening, as measured in 200 foot lineal segments. Greater widths will be allowed to satisfy requirements of alignment, safety, and equipment. Curves will be widened to an additional width based on the following:

Radius	Additional Width
100+ feet radius	+ three feet
75-100 feet radius	+ five feet
50-74 feet radius	+ eight feet

6.2.3.5.9 Road Construction within RMZs

1. Simpson will not construct new roads within RMZs with the exception of watercourse crossings or spur roads off of existing roads within RMZs which would be designed to extend outside the RMZ.

2. Simpson will not build new roads that parallel watercourses within RMZs.

6.2.3.5.10 Surfacing for Roads

1. Simpson will not use roads during the winter period for hauling (logs and rock) unless they have surfacing specifications of a minimum compacted depth of 12 inches of rock.

2. Only rock that is durable and does not break down with vehicle or heavy equipment use will be applied to road surfaces.

3. During the winter period, Simpson will not use vehicles on roads for administrative purposes unless the roads have rock applied as needed to prevent runoff of waterborne sediment in amounts sufficient to cause a visible increase in turbidity in any ditch or road surface which drains into a Class I, II, or III watercourse.

6.2.3.5.11 Final Grades

Simpson will ensure that final grades of new roads do not exceed 15% except to avoid unstable slopes, steep slopes, inner gorges, inner gorge crossings, or to access a suitable watercourse crossing location, as measured in minimum 100 feet increments.

6.2.3.5.12 Overhanging Cut Slopes

Simpson will remove all overhanging cut slopes.

6.2.3.5.13 Existing Road Bank Cuts

For new road construction in areas where existing road bank cuts have exhibited failures, Simpson will evaluate site specific situations and apply measures as appropriate such as seeding and mulching, buttressing, and erosion mats to ensure cut bank stability and to minimize erosion.

6.2.3.5.14 *Use of Through Cuts*

Simpson will avoid the use of through cuts wherever feasible. In areas where through cuts cannot be avoided (e.g. to avoid steep slopes, unstable slopes) permanent ditch-outs will be installed at the beginning and end of the through cut.

6.2.3.5.15 *Slope Cut Design*

Except for certain soil types or site conditions that require vertical cut slopes (e.g. Tonnini soils, rock outcrops), slope cuts will be designed and constructed to minimize the risk of slope failure, soil disturbance, and excessive excavation.

6.2.3.5.16 *Deposit of Excess Material*

1. For areas requiring "end-haul" or some degree of "waste management" Simpson will deposit excess material in a stable location where sediment will not deliver to any watercourses.

2. Waste material will be seeded and mulched prior to October 15th in the year it is produced.

6.2.3.5.17 *Bench Construction*

On side slopes greater than 50%, where the length of the road section is greater than 100 feet, Simpson will construct fills greater than four feet in vertical height at the outside shoulder of the road on a bench that is excavated at the proposed toe of the fill and is wide enough to compact the first lift and subsequent lifts in approximately one-foot intervals from the toe to the finished grade.

6.2.3.5.18 *Fill Construction*

Simpson will construct fills to minimize erosion using techniques such as insloping, berms, rock armoring (where appropriate), or other suitable methods.

6.2.3.5.19 *Rocked Roads*

Simpson will use a combination of outsloped and crowned roads with inboard ditches where appropriate on roads that are to be rocked.

6.2.3.5.20 *Roads Crossing Watercourses*

Where roads cross watercourses, Simpson will ensure that the road prism has a gradual transition to an insloped vertical curve as the road approaches and leaves the crossing.

6.2.3.5.21 *Native Surface Roads*

Simpson will generally use an outsloped road prism for native surface roads.

6.2.3.5.22 *Turnouts*

1. Simpson will place turnouts at reasonable intervals along the alignment and will be located where a minimum of excavation will be necessary to increase the road width.

2. Turnouts will not be constructed if fill is required on side slopes for their construction.

6.2.3.5.23 *Soil Moisture Conditions*

Simpson will not construct roads when soil moisture conditions would result in:

1. Reduced traction by equipment as indicated by spinning or churning of wheels or tracks in excess of normal performances;

2. Inadequate traction without blading wet soil; or

3. Soil displacement in amounts that cause a visible increase in turbidity in any ditch or road surface that drains into a Class I, II, III or IV watercourse; except that construction may occur on isolated wet spots arising from localized groundwater such as seeps or springs.

6.2.3.6 Drainage Structures for New Road Construction

6.2.3.6.1 *Fill Minimization*

Simpson will construct all new watercourse crossings to minimize fill over the culvert.

6.2.3.6.2 *Design Flow*

1. All new watercourse crossing culverts will be designed to handle a 100-year return internal flow event.

2. The design flow will be calculated using the Waananen and Crippen method (1977) for areas greater than or equal to 80 acres. The Rational Method (Chow 1964) will be used when the drainage area for a crossing is less than 80 acres.

3. Culverts will be sized to pass the 100-year flow event without overtopping (headwater depth to culvert diameter ratio =1.0).

4. Other flow design estimation methods developed in the future for the North Coast Region may be substituted if comparable.

6.2.3.6.3 *Temporary Road Watercourse Crossings Design*

1. Watercourse crossings on temporary roads designed for one time summer season use will be designed to carry the flow at the time of construction and will be removed prior to October 15th in the year it was installed.

2. A minimum six-inch pipe size will be used on small seeps and springs.

6.2.3.6.4 *Fish-bearing Watercourses*

1. Simpson will install bridges on fish-bearing watercourses where feasible.

2. When a bridge installation is not feasible, a countersunk or bottomless culvert (or other fish-friendly structure) will be installed on grade that will provide upstream and downstream fish passage. Installed culverts will not restrict the active channel flow.

6.2.3.6.5 Diversion Prevention

Simpson will construct permanent watercourse crossings, road approaches to crossings, and associated fills to prevent the potential diversion of stream overflows down the road and to minimize fill erosion should the drainage structure become obstructed.

6.2.3.6.6 Erosion Protection Measures

1. Simpson will install erosion protection measures such as inlet and outlet armoring of pipes and energy dissipaters as necessary to prevent erosion concurrently with the fill at all culverted watercourse crossings.

2. Armoring will extend at least one foot above the expected head and tail water elevations at the culvert.

3. All bare soil on fill slopes at the culvert crossing will be seeded and/or mulched prior to the first winter period following installation.

6.2.3.6.7 Alignment

Simpson will align all watercourse crossings with the natural grade and course of the stream to the fullest extent possible.

6.2.3.6.8 Compaction

Simpson will compact fill material over culvert installations in one-foot lifts and will compact fill faces during construction.

6.2.3.6.9 Minimum Culvert Sizes

Simpson will install a minimum culvert size of 24 inches in Class II watercourse crossings on management roads, except for springs and seeps where such size would be unnecessary or impractical.

6.2.3.6.10 Discharge

1. No culvert will be discharged onto erodible material or unstable slopes.

2. When downspouts are used, they will be adequately secured to the culvert and they will be supported at intervals along their entire length.

6.2.3.6.11 Ditches

1. Ditches will be V-shaped and will be approximately one-foot deep relative to the subgrade.

2. Simpson will excavate ditches into the road subgrade and will not undercut the road cut slope.

3. Where conditions warrant it, ditch alignment will be pulled away from the cut slope to provide storage room for hillslope ravel, and slumps, and to provide protection of ditch conveyance capability.

6.2.3.6.12 *Maximum Spacing of Ditch Relief Culverts and/or Rolling Dips*

Simpson will install ditch relief culverts and/or rolling dips at intervals based on the following maximum spacing:

	Maximum Spacing (feet) by Erosion Hazard Rating		
Road Grade	Extreme	High	Moderate/Low
2%	600	---	---
4%	530	600	---
6%	355	585	600
8%	265	425	525
10%	210	340	420
12%	180	285	350
14%	155	245	300
16%	135	215	270
18%	115	190	240

6.2.3.6.13 *Additional Culverts and Rolling Dips*

Simpson will install additional ditch relief culverts and rolling dips where appropriate to adequately disconnect the roads from the watercourses and to minimize ditch water accumulation on slide prone landforms such as inner gorges.

6.2.3.6.14 *Ditch Drains*

Ditch drains will consist of culverts with a minimum size of 18 inches except where circumstance warrant otherwise.

6.2.3.6.15 *Ditch Drain Discharge*

1. Ditch drains will be discharged 50 to 100 feet before water enters a Class I or II watercourse.

2. Drains will discharge onto stable landforms with adequate energy dissipation and sediment filtering capacity.

3. Outlets discharging onto areas prone to gullying, slumping or land sliding will be avoided or provided with erosion protection measures.

6.2.3.6.16 *Ditch Drain Grades*

Ditch drains will have a grade that is at least 2% greater than a contributing ditch.

6.2.3.7 New Landing Construction

6.2.3.7.1 *Landings in RMZs or EEZs*

Simpson will not construct new landings in an RMZ or EEZ.

6.2.3.7.2 *Limitation on New Landing Construction*

1. Simpson will make every reasonable effort to limit new landing construction and associated excavation by landing logs on existing roadways.

2. When it is necessary to construct landings, landings will be located on topographic flats and divergent slopes where possible.

3. New landing construction will not occur during the winter period (October 16 through May 14).

6.2.3.7.3 *Soil Moisture Conditions*

Simpson will not carry out landing construction when soil moisture conditions would result in (1) reduced traction by equipment as indicated by spinning or churning of wheels or tracks in excess of normal performance; (2) inadequate traction without blading wet soil; or (3) soil displacement in amounts that cause a visible increase in turbidity in any ditch or landing surface that drains into a Class I, II, III or IV watercourse.

6.2.3.7.4 *Steep Slopes*

For new landing construction, Simpson will not place fill, and will minimize sidecast, on slopes greater than 65%.

6.2.3.7.5 *Risk Assessment and Pull Back*

1. Simpson will assess all landings used as part of the current operations after completion of operations to determine whether or not overhanging or perched fill or organic material in such landings poses a risk of failure and sediment delivery to a watercourse.

2. If a risk of failure and sediment delivery to a watercourse exists, fill material will be pulled back to a stable condition and excavated material will be deposited in a stable location. The pull back will be accomplished prior to October 15th following the completion of operations. Waste material will be seeded and mulched prior to October 15^{th} in the year it is produced.

6.2.3.7.6 *Sidecast Treatment*

1. On side slopes less than 50%, Simpson will seed, plant, mulch, remove or treat sidecast or fill material extending more than 20 feet in slope distance from the outside edge of the landing and within 200 feet of a watercourse or lake to minimize soil erosion.

2. Excess material will be deposited in a stable location where downstream beneficial uses of water will not be adversely affected.

6.2.3.7.7 *Waste Organic Materials*

1. Simpson will not bury waste organic material such as uprooted stumps, cull logs, accumulations of limbs and branches, or unmerchantable trees in landing fills.

2. Slash and other organic debris may be placed and stabilized at the toe of landing fills to restrain fill soil from moving downslope.

6.2.3.7.8 *Drainage of Landings*

1. Upon completion of timber operations, Simpson will drain landings to prevent water from accumulating.

2. Concentrated flows will not be channeled over fills and will only be discharged onto stable areas.

3. Discharge points will be located on stable landforms and where stable discharge points are absent adequate erosion protection and energy dissipation will be employed.

6.2.3.7.9 *Surfacing for Landings*

Landings that will be used during the winter period will have surfacing specifications of minimum compacted depth of 12 inches of rock. Only rock that is durable and does not readily break down with vehicle or heavy equipment use will be applied to landing surfaces.

6.2.3.8 Erosion Control Measures for New Road and Landing Construction

6.2.3.8.1 *Erosion Control during Construction*

Simpson will use appropriate erosion control measures to minimize erosion and prevent sediment from entering watercourses during all road and landing construction activities. Such measures will include but are not limited to:

1. Road surfacing

2. Dispersing runoff into stable vegetated filter areas

3. Armoring with rock rip-rap

4. End hauling waste material to stable locations

5. Construction of rolling dips, critical dips, and waterbars

6. Mulching

7. Revegetating disturbed surfaces as soon as practical

6.2.3.8.2 *Construction in Close Proximity to Watercourses*

Where construction activities are conducted in close proximity to watercourses, Simpson will use additional erosion control protection measures to trap sediment and minimize its entry into the watercourse. Slash filter windrows, silt fences, mulching, and/or straw bale check dams will be used to control runoff over fill slopes and along concentrated runoff flow paths, on an as-needed basis.

6.2.3.8.3 Construction of Features

1. All watercourse crossings and cross drains will be installed and functional prior to October 15th.

2. All waterbars and rolling dips will be constructed, and projects associated with straw mulching and grass seeding will be completed, by October 15th.

6.2.3.8.4 Seeding and Mulching

Prior to the beginning of the first winter period following construction, Simpson will seed all new cut and fill slopes on roads constructed within an RMZ or EEZ of a Class I, II, or III watercourse at a rate of at least 30 pounds per acre and mulched to a depth of at least two inches (before settling) with 90% surface coverage.

6.2.3.8.5 Temporary Crossings

1. At temporary crossings, Simpson will pull back the fill slope to the natural side slopes and deposit the material in a stable location where sediment will not deliver to any watercourses.

2. All exposed areas associated with the crossing will be seeded at a rate of at least thirty pounds per acre and mulched to a depth of at least two inches (before settling) with 90% surface coverage.

6.2.3.9 Routine Road Maintenance and Inspection Plan

6.2.3.9.1 Distribution of Information

Simpson will distribute information about proper road use and reporting of maintenance problems to all of its woods personnel and woods contractors and to members of the public who have road access to the Plan Area.

6.2.3.9.2 Time of Year Restrictions

1. Simpson may carry out patch (spot) rocking, brushing, cleaning inlets and outlets of culverts, cleaning ditches where poor drainage is occurring, repairing or maintaining existing waterbars, replacement of a failed or imminently failing culvert along a needed access road, and site specific road surface grading for maintaining the integrity of the road surface year-round, including during the winter period.

2. Grading will not be used to blade off wet soil to provide conditions for extended periods of operation on a deteriorated road surface.

3. The installation of waterbars, rolling dips and critical dips, general project grading for shaping the road surface, road outsloping, road rocking, resurface rocking, cleaning ditch lines, and general culvert replacements may occur only during the period when road upgrading may occur (see 6.2.3.4.1, 6.2.3.4.2, and 6.2.3.4.3).

6.2.3.9.3 Road Maintenance Schedules for Mainline and Appurtenant Roads

1. Prior to September 15th of each year, Simpson will inspect all mainline roads for needed maintenance.

2. Other roads that are appurtenant to THPs will be inspected at least through the prescribed maintenance period for erosion controls specified in the THP.

3. The inspections of mainline and other roads will assess the effectiveness and condition of all erosion control and drainage structures.

6.2.3.9.4 Road Maintenance Schedules for All Secondary Management Roads or Roads Not Yet Decommissioned

1. Simpson will maintain all secondary management roads or roads yet to be decommissioned that are accessible to maintenance crews.

2. The maintenance schedule will be completed on a three-year rotating basis in accordance with the following:

Rotating Annual Schedule	Routine Maintenance Areas
1	Smith River HPA
1	Coastal Klamath HPA (on northern side of the Klamath River) minus the Bear Creek RWU
2	Coastal Klamath HPA (on southern side of the Klamath River)
2	Blue Creek HPA plus the Bear Creek RWU
3	Interior Klamath HPA
3	Redwood Creek HPA
2	Coastal Lagoons HPA
1	Little River HPA
1	Mad River HPA minus the Boulder Creek RWU
2	North Fork Mad River HPA
3	Humboldt Bay HPA plus the Boulder Creek RWU
3	Eel River HPA

6.2.3.9.5 Inspection Content

1. Simpson will conduct road inspections by driving accessible roads. Problems observed in connection with the drive-through will be documented, and a recommendation provided for the repair.

2. The inspections will assess the following:

   a. Adequate waterbar spacing, depth, interception of the ditch line, and complete diversion of water flow onto undisturbed soil.

   b. Areas having poorly drained low spots or inadequately breached outside berms.

   c. Ditches are open and properly functioning, that are free of debris that could plug the ditch or a culvert and cause a diversion of water onto the road surface.

d. Culverts are functioning properly.

3. Simpson will prioritize maintenance or repairs that are needed based on treatment immediacy (a subjective combination of event probability and potential sediment delivery evaluated as either low, moderate, or high). Simpson's goal will be to complete all the priority tasks prior to the winter period. If the priority workload exceeds that which can be accomplished in the current maintenance year, lower priority sites will be held over until the following maintenance year.

6.2.3.10 Emergency Inspections

6.2.3.10.1 Emergency Inspection Trigger

If a storm occurs that produces three inches of precipitation or more in a 24-hour period at a gauge location identified below, then Simpson's timberlands staff will conduct emergency inspections of all accessible rocked roads in the corresponding region, to the extent the roads can be traveled without causing road damage during or immediately after such event.

Gauge Location	Associated Inspection Area
Crescent City	Smith River HPA
Klamath River near Terwer Creek	Coastal Klamath and Blue Creek HPAs
Trinity River at Hoopa	Interior Klamath HPA
Redwood Creek at Orick	Redwood Creek HPA downstream of Dolly Varden and Coastal Lagoons HPA
O'Kane (Blue Lake)	Redwood Creek HPA upstream of Dolly Varden
Korbel	North Fork Mad River and Mad River HPAs
Eureka	Humboldt Bay, and Eel River HPAs

6.2.3.10.2 Emergency Inspection Repairs

1. Simpson will make repairs during the emergency inspections if hand labor can correct the problem.

2. Any major problems observed during emergency inspections that would require the use of heavy equipment for repair will be reported to a designated "storm response coordinator." The coordinator will prioritize and schedule repairs so that they are accomplished as soon as possible. If access is prohibited because of adverse conditions, these sites will receive priority for treatment during the following summer's road maintenance schedule.

6.2.3.10.3 Road Daylighting

1. Simpson will perform road daylighting where necessary and feasible to accelerate drying of roads and provide stable road surfaces for log hauling or other vehicular traffic. Within RMZs for Class I and II watercourses, no trees will be cut that could cause channel de-stabilization. No trees larger than 16 inches dbh will be cut from the downstream side of Class I watercourse crossings.

2. Simpson will evaluate daylighting within RMZs on a site-specific basis to determine where it will be necessary in order to accelerate drying of the road and provide a stable road surface.

6.2.3.11 Road and Landing Use Limitations

6.2.3.11.1 *Turbidity Restrictions*

1. Simpson will cease log hauling, road decommissioning, road upgrading, road construction, and use of landings when the use of any portion of a road or landing results in runoff of waterborne sediment in amounts sufficient to cause a visible increase in turbidity in any ditch or road surface that drains into a Class I, II or III watercourse.

2. Use of roads for log hauling, road decommissioning, road upgrading, road construction, and use of landings, will not resume until the road surface has dried sufficiently to allow use without resulting in runoff of waterborne sediment in amounts sufficient to cause a visible increase in turbidity in any ditch or road surface that drains into a Class I, II or III watercourse. This criterion will apply any time of year (including during summer storms).

6.2.3.11.2 *Seasonal Restrictions*

1. Simpson will carry out hauling or loading during the winter period only on rocked surfaces.

2. Hauling and loading will be allowed on unsurfaced roads from May 1st through May 14th if “early spring drying” occurs or from October 16th through November 15th if an “extended dry fall” occurs.

6.2.3.11.3 *Helicopter Landing Areas*

Helicopter service landing areas will be considered appurtenant to a THP and will be subject to the limitations described in 6.2.3.11.1 and 6.2.3.11.2.

6.2.3.11.4 *ATVs*

1. Simpson will use only ATVs on unsurfaced seasonal roads during the winter period.

2. Other vehicular use of seasonal roads will be allowed from May 1st through May 14th if “early spring drying” occurs, or from October 16th through November 15th if an “extended dry fall” occurs.

3. Any damage caused to drainage or erosion control structures by using ATVs on any road will be repaired immediately following damage.

4. Exceptions for seasonal road use during the winter period for management include fire control vehicles for site preparation burning, pickup access for transportation of monitoring supplies and equipment, and pickup trucks and vans for transportation of seedlings and reforestation crews. Upon completion of each specified activity all drainage facilities will be returned to the condition prior to road use or brought up to a condition where they are functioning properly.

6.2.3.11.5 *Landings on Roads within RMZs*

1. Simpson will not use landings on roads (including roadside decking) within RMZs from October 16th through May 14th.

2. Ditchlines and drainage facilities associated with existing roads within RMZs that are used for landings or roadside decking during the summer period will be repaired immediately following completion of operations and prior to October 16th.

3. Any proposed use of existing landings and roads within an RMZ will be discussed and mapped in THPs and also included on the THP map submitted to the Services. Alternatives to roadside decking in RMZs will be evaluated during the THP preparation. Simpson will select the most feasible alternative with the least amount of impact to the aquatic resource.

6.2.3.12 Emergency Road Repair

If there is an imminent threat to life, property, or public safety, or a potential for a massive sediment input with catastrophic environmental consequences, and the appropriate emergency response action is otherwise prohibited by this Section of this Plan, Simpson will notify the Services' designated contacts, but a formal notification will not be required prior to response actions being taken.

6.2.3.13 Water Drafting

Simpson will restrict its water drafting and use of gravity-fed water storage systems for timber operations as identified in this subsection. These restrictions will not apply to water drafting for fire suppression or wildfire. However, if a watercourse has larval tailed frogs, then the drafting requirements for the site will be modified to avoid temporary dewatering of the Class II watercourse or another drafting site will be used.

6.2.3.13.1 *Within Class I Watercourse Channels*

Water drafting for timber operations within the channels of Class I watercourses will conform with the following standards:

1. The pumping rate will not exceed 350 gallons per minute.

2. The pumping or gravity fed lines to storage tanks will not remove more than 10% of the daily above-surface flow.

3. Drafting will not occur in watercourses that have less than one cubic foot per second surface flow.

6.2.3.13.2 *Within Class I Watercourse Impoundments*

Water drafting for timber operations from impoundments within the channels of Class I watercourses that do not have surface outflow will conform with the following standards:

1. The pumping rate will not exceed 350 gallons per minute.

2. Drafting or pumping to storage tanks will not reduce maximum pool depth by more than 10%.

6.2.3.13.3 *Within Class II Watercourses or Impoundments*

Gravity fed lines to storage tanks from within Class II watercourses or impoundments will not divert more than 50% of the flow, and water drafting for timber operations from within Class II watercourses or impoundments will not reduce maximum pool depth by more than one-third and the pool will be fully recharged before any additional drafting occurs.

6.2.3.13.4 *Drafting Screen Specifications*

Simpson will screen intakes, including gravity fed lines, in Class I and II watercourses. Simpson will install intakes in pools to avoid entrainment of amphibian larval stages. The screens will be designed to prevent the entrainment of all life stages of Covered Species and will meet the minimum design criteria specified in Section 6.3.3.12 of the Plan.

6.2.3.13.5 *Herbicide Mix Trucks*

Simpson will not use herbicide mix trucks to directly draft water from any watercourse.

6.2.3.14 Rock Quarries

6.2.3.14.1 *Locations of New Rock Quarries*

Simpson will not establish new rock quarries and borrow pits within a Class I or II RMZ.

6.2.3.14.2 *Portions of Existing Quarries within RMZs*

Simpson will not use any portion of an existing rock quarry or borrow pit that is within 150 feet of a Class I watercourse, 100 feet of a Class II-2 watercourse, or 70 feet of a Class II-1 watercourse.

6.2.3.14.3 *Turbidity*

1. Simpson will carry out rock quarrying or rock extraction from borrow pits, or hauling operations associated therewith, so as not to cause a visible increase in turbidity in watercourses or hydrologically connected facilities which discharge into watercourses.

2. If an increase in turbidity does occur as the result of such operations, interim erosion control measures will be install and the operations causing the increase will be immediately ceased.

6.2.3.14.4 *Overburden*

Simpson will place overburden generated during development of rock quarries and borrow pits in a stable location away from watercourses and RMZs. The overburden disposal area will be grass-seeded and straw-mulched where necessary.

6.2.3.15 Training

1. Simpson will provide the training specified below for all equipment operators and supervisors involved with the road plans specified in this Plan, and all foresters, as provided for his or her position.

2. The training courses will be offered every year for new employees or contractors who will be involved in the road plan. Refresher courses will be provided every two years as appropriate to review concepts and introduce any new state-of-the-art techniques.

6.2.3.15.1 *Training Courses*

The following training courses will be offered:

1. Basic training in road decommissioning (foresters, supervisors and operators);

2. Basic training in road location and design (foresters) and road construction (foresters, supervisors and operators);

3. Basic training in road upgrading (foresters, supervisors and operators);

4. Basic training in road maintenance (foresters, supervisors and operators).

6.2.3.15.2 *Training Course Format*

Each of the above-listed courses will follow the following format:

1. Office and class-room—2-4 hours. Presentation of concepts and theory of road treatments; review of the difference between typical past practices and currently acceptable methods; slide presentation depicting road-related problems and appropriate treatments; comparison of effective and ineffective treatments; question and answer session.

2. Field workshop—6 hours. Viewing of sites depicting various untreated problems; review of road reaches which have been correctly and appropriately treated; review of road reaches or sites showing examples of partially or incorrectly applied treatments.

3. Practical field workshop—8 hours. Observation and participation in proper road treatments and demonstration projects actively underway; discussions with other operators on techniques and practices employed in designing, staging and applying proper road treatments.

4. On-the-job training for foresters and supervisors—variable. Training on road design and layout; problem identification; problem quantification; prioritization; and development of cost-effective treatments.

5. On-the-job training for operators—2 to 6 months. Application of road treatments with technical oversight and review of road treatment practices and operations (beginning with regular, repeated field review and terminating in intermittent checking of new or unusual operations, as needed).

6.2.4 Harvest-Related Ground Disturbance Measures

6.2.4.1 Field Trials with Mechanized Equipment

Simpson will not conduct field trials with mechanized equipment for silvicultural operations unless it has provided assurances to the Services that the equipment will not cause compaction or soil displacement that is measurably greater than the equipment or methods previously used. Such assurances will be supported by available documented evidence.

6.2.4.2 Site Preparation Standards

Simpson will plan and execute harvest operations so as to facilitate the purposes of the site preparation conservation measures described in this subsection.

6.2.4.2.1 Design

Simpson will design all site preparation operations to limit the amount of ground and forest floor disturbance to that which is required for fuel reduction and reforestation operations.

6.2.4.2.2 Priority for Treatment

Simpson will plan site preparation operations so that areas having the greatest need of treatment for fuel reduction and/or reforestation access are assigned the highest priority for treatment.

6.2.4.2.3 Mechanized Site Preparation Methods

1. Simpson will minimize use of machine piling with tractor-and-brushrake; other mechanized methods or equipment will be used preferentially.

2. Use of mechanized site preparation methods will be limited to the period beginning May 15th and ending October 15th.

6.2.4.2.4 Prescribed Fire Operations

Simpson will design prescribed fire operations to produce burns that have the following "low intensity" attributes:

1. The burning operation will consume only a limited portion of the fuelbed.

2. Non-targeted portions of the fuelbed, such as the duff layer and woody fuels greater than three inches in diameter, will be generally only lightly consumed.

3. The fires will tend to self-extinguish when they burn into a fireline or into an adjacent area with a continuous overstory canopy.

6.2.4.2.5 Desired Post-operation Fuelbed and Forest Floor Attributes

Simpson will use reasonable efforts to achieve the following attributes following site preparation:

1. Down woody material greater than 3.0 inches diameter to reflect the pre-disturbance condition throughout the prepared area.

2. The litter layer to be minimally displaced or consumed.

3. Bare mineral soil exposure that occurs through the displacement or consumption of logging slash and forest floor material to be less than 5% of the area of any harvest unit (skid trails and skyline roads are not included in the estimate of exposed area).

6.2.4.2.6 Fireline Drainage

All firelines that are not in an RMZ or EEZ will have drainage structures adequate to prevent the delivery of sediments to RMZs or EEZs.

6.2.4.2.7 Fireline Construction with Tractors

1. Simpson will limit fireline construction with tractors to the period beginning May 15th and ending October 15th.

2. If the proposed fireline location may cause hillslope sediment delivery to a RMZ or EEZ adjacent to a Class I, II or III watercourse, then equipment use will be limited to slopes less than 45%.

3. If the proposed fireline location is not likely to cause sediment delivery to a RMZ, and if slopes are greater than 50%, then the tractors will operate only on fireline segments less than 100 feet.

6.2.4.2.8 Fireline Construction, Reconstruction, and Use within RMZs and EEZs

Simpson will limit fireline construction, reconstruction, and use within RMZs and EEZs as follows:

1. Firelines will only be constructed or reconstructed with hand tools.

2. Existing skid roads or firelines within RMZs or EEZs will be reconstructed for fireline usage only if they are located advantageously for fire containment. Reconstruction will only be done with hand tools, and only to the minimum width required for fire containment. All prior drainage failures on the existing skid roads or firelines will be remedied during reconstruction.

3. All constructed or reconstructed firelines within RMZs or EEZs will have drainage structures that will minimize the movement of sediments from the exposed fireline surface but are not subject to the 100 square foot ground disturbance standard for seeding and mulching as described in Section 6.2.1.

6.2.4.3 Release, Pre-commercial Thinning, and Commercial Thinning

1. Simpson will use self-propelled, mechanized equipment for release and pre-commercial thinning operations only as specified in the seasonal limits on ground-based yarding.

2. The uses of logging equipment in commercial thinning operations are subject to all applicable limitations on felling, yarding and loading in 6.2.4.4 through 6.2.4.8 below.

6.2.4.4 Measures Common to All Felling, Yarding, and Loading Operations

1. Erosion control measures for the treatment of disturbed areas in RMZs or EEZs resulting from felling, bucking, and yarding activities will be implemented as provided in Section 6.2.1.

2. Any bare mineral soil exposure, greater than 100 square feet in RMZ's or EEZ's that is caused by logging activities, will be mulched and seeded or treated by other means prior the end of logging operations or prior to October 15, whichever comes first. Seeding will be at a rate of at least 30 pounds per acre and mulching to a depth of at least 2 inches (before settling) with 90% surface coverage.

6.2.4.5 Tractor, Skidder, and Forwarder Operations

6.2.4.5.1 Time of Year Restrictions

1. Simpson will limit the construction and reconstruction of skid trails to the period beginning May 15th and ending October 15th.

2. Ground-based yarding with tractors, skidders, and forwarders may occur from May 15th through October 15th on existing skid trails. This period for skid trail use (which excludes construction and reconstruction of skid trails) may be extended to include the periods May 1st to May 15th or October 16th to November 15th when the following procedures are followed:

   a. Skid trail use will be carried out during this period so as to not cause in a visible increase in turbidity in watercourses or hydrologically connected facilities which discharge into watercourses.

      1) If an increase in turbidity does occur as the result of such operations, interim erosion control measures will be installed and the operations causing the increase will be immediately ceased.

      2) Use of skid trails by ground-based logging equipment will not occur when soil moisture conditions would result in (a) reduced traction by equipment as indicated by spinning or churning of wheels or tracks in excess of normal performance; (b) inadequate traction without blading wet soil, or (c) soil displacement in amounts that cause movement of waterborne sediments off of a skid trail surface.

3) If any of the foregoing conditions is caused during skid trail use, interim erosion control measures will be installed and the operation causing the condition will be immediately ceased.

b. Ground-based yarding operations will use minimal ground disturbing equipment without bladed skid trail construction or reconstruction to the maximum extent feasible. Where this is not feasible, yarding operations during this period will be limited to existing skid trails for ground-based equipment that are hydrologically disconnected from Class I, II, or III watercourses or drainage facilities that discharge into Class I, II, or III watercourses.

c. Use of skid trails during the period will not occur within at last 100 feet, slope distance, of the upper extent of any designated Class II watercourse, and on slopes greater than 30% within at least 100 feet of Class III watercourses. Long-line yarding or lifting logs with a shovel from outside these zones may occur as long as the skid trails are hydrologically disconnected from Class I, II, or III watercourses or drainage facilities that discharge into Class I, II or III watercourses.

d. During the period, all bare mineral soils greater than 100 square feet created by ground-based yarding that are within an RMZ or EEZ will be treated with seed, mulch or slash by the end of the working day. Such treatment outside the zones will be performed at the discretion of the RPF or Simpson's supervisor based on an evaluation of the potential of the site to deliver sediment to a watercourse or hydrologically connected facility, taking into consideration the potential for large storm events to cause sediment delivery.

e. During the period, prior to commencement of yarding operations, sufficient erosion control materials, including but not limited to straw, seed (barley seed and/or the Simpson's seed mix), and application equipment will be retained on-site or otherwise accessible (so as to be able to procure and apply that working day, or, if infeasible, the following morning) in amounts sufficient to provide at least two inches depth of straw with minimum 90% coverage, and 30 pounds per acre of Simpson's seed mix. In lieu of the above listed materials, native slash may be substituted and applied if depth, texture, and ground contact are equivalent to at least two inches straw mulch.

f. If operations expose an area of bare mineral soil late in the day and it is not feasible to completely finish erosion control treatment that day, the erosion control treatment may be completed the following morning prior to start of yarding operations provided there is no greater than a 30% chance of rain forecasted by the National Weather Service within the next 24 hours.)

6.2.4.5.2 Use on Steep Slopes

Simpson will not use ground-based yarding systems that require constructed skid trails on slopes over 45% unless greater soil or riparian zone disturbance would be expected from cable yarding due to unfavorable terrain that reduces skyline deflection and payload capability, or additional haul road construction would be required to accommodate the use of cable logging systems.

6.2.4.5.3 RMZ and EEZ Exclusions

Simpson will not use ground-based yarding, or skidding, equipment in RMZs or EEZs adjacent to Class I, II and III watercourses, except as provided in Sections 6.2.1, 6.2.3, and 6.2.4 of the Plan.

6.2.4.6 Skid Trails

1. During THP preparation, Simpson will note existing skid trails within the proposed harvest area that are diverting a watercourse, have a potential to divert a watercourse, or are not properly draining and will have them evaluated for repair by a fisheries biologist, hydrologist, geologist, or other qualified personnel.

2. Necessary repairs will be performed by the completion of timber operations.

6.2.4.7 Feller-Buncher and Shovel Logging Operations

1. Where appurtenant haul roads are not surfaced for all weather conditions or do not have appropriate drainage facilities, or when the operation involves use of constructed skid trails for skidding and forwarding, Simpson will not carry out feller-buncher or shovel logging operations during the winter period.

2. Feller-buncher and shovel logging operations will cease during storm events where logging operations, combined with significant rainfall, are likely to cause delivery of sediments in RMZs or EEZs along Class I, II or III watercourses.

3. Forwarding over constructed skid trails, when used in conjunction with the feller-buncher or shovel operation, will be governed by 6.2.4.3.

6.2.4.8 Skyline Yarding Operations

6.2.4.8.1 Cable Logging Suspension

Simpson will fully suspend logs above the ground when cable yarding across Class I and II RMZs, and to the extent practicable when cable yarding across Class III EEZs.

6.2.4.8.2 Bare Soil Exposure Treatment

1. Simpson will mulch and seed or treat by other means areas of bare soil exposed in skyline roads within RMZs or EEZs that are greater than 100 square feet and are caused by logging activities prior to the end of logging operations or prior to October 15th, whichever occurs first.

2. Where sections of skyline road upslope of RMZs or EEZs have created furrowing of the ground which can channelize surface flow and result in gullying and possible delivery of sediments into or through the RMZ or EEZ, those affected areas will be treated with the installation of one hand-built waterbar per 50 lineal feet of affected skyline road, except in areas of known erodible soil types and on formations or slopes greater than 65%, where waterbars will be placed after a linear disturbance distance of 30 feet and the spacing between waterbars thereafter will be 20 feet.

6.2.4.9 Helicopter Yarding Operations

In harvest planning, Simpson will consider helicopter yarding as an alternative to ground-based or skyline logging methods where road construction to access harvest units would traverse overly steep and/or unstable terrain, and will justify the final choice of logging method in the THP.

6.2.4.10 Loading and Landing Operations

6.2.4.10.1 Landing Construction

Simpson will minimize the need for landing construction to the extent practicable, considering safe operation of equipment.

6.2.4.10.2 Landing Size

Simpson will minimize the size of new landings to the extent practicable, considering safe operation of equipment, by designing them for shovel, or heel-boom, loaders instead of front-end loaders.

6.2.4.10.3 Loading Surfaces and Operations

Simpson will not conduct loading on unrocked surfaces during the winter period except from May 1st through May 14th if early spring drying occurs, or October 16th through November 15th if extended dry fall occurs.

6.2.5 Effectiveness Monitoring Measures

Effectives monitoring measures include four categories of projects and programs: "Rapid Response Monitoring," "Response Monitoring," "Long-term Trend Monitoring/Research," and "Experimental Watersheds Program." The projects and programs in each category are as follows:

- Rapid Response Monitoring
  - Summer Water Temperature Monitoring
    - Property-wide Water Temperature Monitoring
    - Class II BACI Water Temperature Monitoring
  - Spawning Substrate Permeability Monitoring
  - Road-related Sediment Delivery (Turbidity) Monitoring
  - Headwaters Monitoring
    - Tailed Frog Monitoring
    - Southern Torrent Salamander Monitoring

- Response Monitoring
  - Class I Channel Monitoring
  - Class III Sediment Monitoring

- Long-term Trend Monitoring/Research
  - Road-related Mass Wasting Monitoring
  - Steep Streamside Slope Delineation Study
  - Steep Streamside Slope Assessment
  - Mass Wasting Assessment
  - Long-term Habitat Assessments
  - LWD Monitoring
  - Summer Juvenile Salmonid Population Estimates
  - Out-migrant Trapping

- Experimental Watersheds Program
  - Area-limited Effectiveness Monitoring Projects and Programs
  - BACI Studies of Harvest and Non-Harvest Areas under the Plan
  - BACI Studies of Conservation and Management Measures
  - New and Refined Monitoring and Research Protocols

The monitoring projects and programs described in 6.2.5.1 through 6.2.5.4 will be designed using the considerations identified in subsection 6.3.5. Rapid Response, Response Monitoring, and Long-term Trend Monitoring/Research will be implemented using the protocols identified or developed as described in Appendix D. The Experimental Watershed Program will be implemented using the protocols identified in Appendix D where appropriate and new or refined protocols developed in response to monitoring results.

6.2.5.1 Rapid Response Monitoring

6.2.5.1.1 Property-wide Summer Water Temperature Monitoring

Simpson will monitor summer water temperatures annually at sites in Class I and Class II watercourses across the Plan Area using the protocols identified in Appendix D.1.2. This monitoring will document the highest 7DMAVG, 7DMMX, and seasonal water temperature fluctuations for each monitoring site.

6.2.5.1.2 Class II BACI Water Temperature Monitoring

Simpson will conduct BACI studies of water temperatures before and timber harvesting in selected reaches of Class II watercourses using the protocol described in Appendix D.1.3. The goal is to assess potential effects of harvesting and the adequacy of riparian buffers by comparing maximum temperature differentials across fixed length of stream.

6.2.5.1.3 Spawning Substrate Permeability Monitoring

Simpson will monitor spawning gravel permeability in selected Class I watercourses throughout the Plan Area to determine if conditions are suitable for the fish Covered Species and to track trends in permeability. Several Plan Area sites in each HPA will be monitored using the protocol described in Appendix D.1.4.

6.2.5.1.4 *Road-related Sediment Delivery (Turbidity) Monitoring*

Simpson will monitor the road-related delivery of fine sediments into Plan Area streams (turbidity) and evaluate the effectiveness of the road upgrading measures in reducing those inputs. Turbidity will be measured immediately above and below Class II-1 and II-2 watercourse crossing using the protocol identified in Appendix D.1.5. There will be one permanent continuous monitoring station in each of the four drainages included in the Experimental Watersheds Program (see 6.2.5.4).

6.2.5.1.5 *Tailed Frog Monitoring*

Simpson will monitor changes in larval populations of tailed frogs in the Plan Area using a BACI experimental design as described in Appendix D.1.6. Treatment and control sites will be monitored to determine if timber harvesting under the Plan has a measurable effect on the larval populations in the Plan Area. Long-term changes in tailed frog populations across the Plan Area also will be monitored.

6.2.5.1.6 *Southern Torrent Salamander Monitoring*

Simpson will monitor changes in the persistence of sub-populations of southern torrent salamanders in the Plan Area using a BACI experimental design as described in Appendix D.1.6. Treatment and control sites will be monitored to determine if timber harvesting under the Plan has a measurable effect on the persistence on sub-populations in the Plan Area. Long-term changes in southern torrent salamander populations across the Plan Area also will be monitored.

6.2.5.2 Response Monitoring

6.2.5.2.1 *Class I Channel Monitoring*

Simpson will measure monitoring reaches in Class I watercourses in the Plan Area at least every other year for the duration of the Plan, using the protocol identified in Appendix D.2.2. The measurements will include cross-sectional and thalweg profiles, substrate size distributions, and bankfull and active channel widths.

6.2.5.2.2 *Class III Sediment Monitoring*

Simpson will monitor sediment delivery from Class III watercourses using a BACI design, as described in Appendix D.2.3. The collected data will be analyzed to determine the amount of sediment delivered from Class III watercourses following timber harvesting. This monitoring will occur in the drainages designated for the Experimental Watersheds Program (see 6.2.5.4).

6.2.5.3 Long-term Trend Monitoring/Research

6.2.5.3.1 *Road-related Mass Wasting Monitoring*

Simpson will monitor the effectiveness of the road upgrading and decommissioning measures in reducing the frequency and severity of sediment inputs from road-related mass wasting. Monitoring will follow the protocols discussed in Appendix D.3.2 and will entail before and after examination of sediment inputs from upgraded and decommissioned roads and comparison of sediment inputs from upgraded and non-upgraded roads. Implementation will occur within the four drainages of the Experimental Watershed Program (see subsection 6.2.5.4).

6.2.5.3.2 *Steep Streamside Slope Delineation Study*

Simpson will complete the SSS Delineation Study within seven years after the effective date of the Permits to modify the initial minimum slope gradient and maximum slope distances stated in 6.2.2.1 (Slope Stability Measures). The study will determine minimum slope gradient and maximum slope distance for Plan Area lands in each HPA based on a percentage of the measured cumulative sediment delivered to watercourses from shallow landslides originating from within the streamside slopes. The study will be conducted as described in Appendix D.3.3.

6.2.5.3.3 *Steep Streamside Slope Assessment*

Simpson will assess the effectiveness of the SSS prescriptions by collecting and analyzing data relevant to landslides in SSS zones. Data collection will occur over the first 15 years of the Permits' term. Data analysis will begin when data collection is complete. Data collection and analysis will occur as described in Appendix D.3.4.

6.2.5.3.4 *Mass Wasting Assessment*

Simpson will conduct a Mass Wasting Assessment (MWA) to examine the relationships between mass wasting processes and timber management practices. A preliminary MWA will be completed within the seven years after the Permits' effective date and at a minimum will include a landslide inventory and reporting of statistics collected to date. A final MWA will be completed within 20 years after the Permits' effective date and will include an updated landslide inventory and identification of patterns or trends in mass wasting processes as they relate to management practices. Both the preliminary and final MWA may be done incrementally across the Plan Area, with results presented as they become available or in a single report. The preliminary and final MWA will be conducted as described in Appendix D.3.5.

6.2.5.3.5 *Long-term Habitat Assessments*

Simpson will assess channel and habitat types of selected streams in the Plan Area every ten years during the Plan duration, beginning in 2004-2005. The assessments will be coordinated with LWD Monitoring (6.2.5.3.6) and will be conducted as described in Appendix D.3.6.

6.2.5.3.6 *LWD Monitoring*

Simpson will conduct LWD surveys on the stream reaches selected for the Long-term Habitat Assessments (see 6.2.5.3.5). Abundance and size of LWD will be inventoried. Monitoring will occur every ten years during Plan implementation, beginning in 2004-2005, and will be conducted as described in Appendix D.3.7.

6.2.5.3.7 Summer Juvenile Salmonid Population Estimates

Simpson will conduct sampling surveys each summer to estimate young of the year coho and age 1+ steelhead and coastal cutthroat trout. As described in Appendix D.3.8, the methodology developed by Dr. Scott Overton of Oregon State University (retired) and Dr. David Hankin of Humboldt State University, as previously refined by Simpson will be used.

6.2.5.3.8 Out-migrant Trapping

Simpson will conduct out-migrant trapping annually in the Little River HPA to monitor smolt abundance, size, and out-migration timing. The overwinter survival of juvenile coho also will be estimated based on a comparison of out-migrant trapping results and summer juvenile population estimates from 6.2.5.3.7. Trapping will occur as described in Appendix D.3.9. The Little River HPA is one of the four drainages designated for the Experimental Watersheds Program. Out-migrant trapping may be expanded to the other three experimental watersheds (see 6.2.5.4).

6.2.5.4 Experimental Watersheds Program

Simpson will designate the Little River in the Little River HPA, South Fork Winchuck River in the Smith River HPA, Ryan Creek in the Humboldt Bay HPA, and Ah Pah Creek in the Coastal Klamath HPA as experimental watersheds for additional monitoring and research on the interactions between forestry management and riparian and aquatic ecosystems may occur. The four watersheds were selected because they are representative of different geologic and physiographic provinces throughout the Plan Area.

Simpson will conduct the following types of monitoring and research in the four watersheds:

1. Effectiveness monitoring projects and programs that due to their complexity and expense of implementation can only be applied in limited regions (these include turbidity monitoring (6.2.5.1.4), Class III sediment monitoring (6.2.5.1.4), and road-related mass wasting monitoring (6.2.5.2.2);

2. BACI studies of harvest and non-harvest areas, allowing for more effective evaluation of conservation measures and increased understanding of the effects of forest management on the habitats and populations of the Covered Species.

3. BACI studies of conservation and management measures, allowing for a refinement of measures and an assessment of the relative benefits of different measures under the Plan; and

4. Development and implementation of new or refined monitoring and research protocols.

In addition, Simpson may expand Out-migrant Trapping in the Little River HPA to one or more of the other experimental watersheds.

No monitoring or research which involves the application of measures other than those prescribed in this Plan will occur without the concurrence of the Services.

6.2.5.5 Monitoring Thresholds for Rapid Response and Response Monitoring

Measurable thresholds that will trigger management responses when exceeded will be established for all Rapid Response and Response Monitoring projects and programs. Each project/program will have a "yellow light" and "red light" threshold that triggers different levels of review and response. Thresholds that have already been established and the process for establishing thresholds for the other projects/programs are described in this subsection.

6.2.5.5.1 Property-wide Temperature Monitoring

Yellow and red light thresholds have been established for Property-wide Temperature Monitoring and are as follows:

1. The yellow light threshold In Class I and II watercourses with drainage areas generally less than 10,000 acres is:

    a. A 7DMAVG water temperature above the upper 95% PI, as described by the regression equation: *Water Temperature = 14.35141 + 0.03066461x square root Watershed Area;* or

    b. Any statistically significant increase in the 7DMAVG water temperature of a Class I or II watercourse where recent timber harvest has occurred, which cannot be attributed to annual climatic effects.

2. The red light threshold in Class I and II watercourses with drainage areas generally less than 10,000 acres is:

    a. A 7DMAVG water temperature above the upper 95% P. plus one °C, as described by the regression equation: *Water Temperature =15.35141+ 0.03066461x square root Watershed Area*;

    b. An absolute water temperature of 17.4 °C (relevant for fish); or

    c. A 7DMAVG water temperature that triggers a yellow light for three successive years.

6.2.5.5.2 Class II BACI Water Temperature Monitoring

The yellow light threshold/trigger for Class II BACI Water temperature monitoring is the determination of one or more statistically significant effects from harvesting in at least one-third of the treatment sites. The red light threshold is the determination of one or more statistically significant effects from harvesting in three successive years in at least one-third the treatment sites.

6.2.5.5.3 Tailed Frog Monitoring

Yellow and red light thresholds have been established for Tailed Frog Monitoring and are as follows:

1. The yellow light threshold is:

    a. Any statistically significant decrease in the larval populations of treatment streams relative to control streams, or

    b. A statistically significant downward trend in both treatment and control streams.

2. The red light threshold is:

    a. A statistically significant decline in larval populations in treatment streams relative to control streams in >50% of the monitored sub-basins in a single year;

    b. A statistically significant decline in treatment vs. control sites continuing over a three year period within a single sub-basin or;

    c. A statistically significant downward trend in both treatment and control streams that continues for three years or more.

6.2.5.5.4 Southern Torrent Salamander Monitoring

Yellow and red light thresholds have been established for Southern Torrent Salamander Monitoring and are as follows:

1. The yellow light threshold is:

    a. Any extinction of a sub-population, or

    b. An apparent decline in the average index of sub-population size in treatment sites compared to control sites.

2. The red light threshold is:

    a. A statistically significant increase in the extinction of treatment sub-populations relative to control streams, or

    b. A significant increase in the net rate of extinctions over the landscapes.

6.2.5.5.5 Other Rapid Response and Response Monitoring Projects and Programs

Yellow and red light thresholds will be established for Spawning Substrate Permeability Monitoring, Road-related Sediment Delivery (Turbidity) Monitoring, Class I Channel Monitoring, and Class III Sediment Monitoring as follows.

1. The thresholds will be established based on data collected from reference sites, either within stream reaches within the Plan Area that have been demonstrated to support stable populations of the Covered Species of interest, or reaches in which the habitat conditions have been shown to be within the range of good conditions based on studies done outside the Plan Area.

2. If the list of potential reference sites is greater than 12, a spatially distributed randomized sample of sites will be chosen for monitoring; if the list of reference sites is 12 or less, then all reference sites will be monitored.

3. While the reference site data are being collected, Simpson will collect data on a variety of potentially explanatory covariates that may reduce the natural variation observed in the response variable.

4. Prior to setting the thresholds for a program, an appropriate statistical analysis will be conducted to remove the effects of any relevant environmental covariates, and the 95% confidence or prediction interval will be calculated. Depending on the response variable of interest, either the lower or upper 95% confidence or prediction interval endpoint in any given year will be used to trigger the yellow light threshold. Depending on the temporal correlation of the response variable, three to five years of a yellow light condition will trigger a red light threshold, or one year exceedence of the 99% confidence interval endpoint.

5. Thresholds for Spawning Substrate Permeability Monitoring and Road-related Sediment Delivery will be established within five years of the date that each is fully operational; thresholds for Class I Channel Monitoring and Class III Sediment Delivery Monitoring will be established within ten years of the date that each is fully operational.

6.2.5.6 Phase-in Period for Effectiveness Monitoring

Except as noted herein, the monitoring projects and programs are continuations and expansions of the studies described in Section 4.3 of this Plan. The exceptions are 6.2.5.1.3, 6.2.5.1.4, 6.2.5.3.1, 6.2.5.3.8, and those portions of 6.2.5.4 not tied to other Effectiveness Monitoring studies. Continuations and expansions of existing projects and programs will be implemented in their identified time lines as of the effective date of the Permits. Design and implementation of the other projects and programs (6.2.5.1.3, 6.2.5.1.4, 6.2.5.3.1, 6.2.5.3.8, and portions of 6.2.5.4) will occur in phases during Plan implementation. Excluding those aspects of the Experimental Watersheds Program that will be developed in response to monitoring results, all Effectiveness Monitoring projects and programs will be ready for implementation by the end of the third year following the effective date of the Permits.

6.2.6 Adaptive Management Measures

Simpson will initiate reviews and implement adaptive management measures in response to the triggers and within the range of changes identified within this subsection. Simpson also will establish an Adaptive Management Reserve Account (AMRA) to fund adjustments over the term of the Plan and Permits. No adaptive management change will be made unless there is a sufficient balance in the AMRA to make the change.

6.2.6.1 Adaptive Management Triggers

Simpson will institute the adaptive management process in the event of a yellow light threshold trigger, a red light threshold trigger, SSS trigger, or results from the experimental watersheds monitoring program that identify an appropriate change in the conservation measures.

6.2.6.1.1 Yellow Light Threshold Trigger

When a yellow light threshold for Rapid Response or Response Monitoring is exceeded, the following will occur:

1. Exceedence of a yellow light threshold will trigger an internal assessment to determine the cause of the exceedence.

2. Simpson will design the internal assessment to identify the cause behind the yellow light condition, its relationship to management activities, and what, if any, changes to management are appropriate. Simpson will use all available information to make this determination, including results from other monitoring sites throughout the Plan Area, and results from other monitoring projects where applicable.

3. Simpson will notify NMFS and USFWS within 30 days after the analysis indicates that any yellow light threshold has been exceeded. Simpson will request the technical assistance of NMFS and USFWS in determining the cause of the exceedence. All available information will be used to make this determination.

4. Any and all management changes resulting from the yellow light threshold must be made with the concurrence of the Services and a management change will only be made to the extent of the availability of a balance in the AMRA.

5. The procedures followed, conclusions reached, and any changes in management undertaken to address a yellow light condition will be documented in a report to the Services.

6.2.6.1.2 Red Light Threshold Trigger

When a red light threshold for Rapid Response or Response Monitoring is exceeded, the following will occur:

1. In the event that a red light threshold is exceeded, Simpson will notify the Services within 30 days of that determination.

2. Simpson will endeavor to obtain input from the Services regarding identification of any feasible interim changes in the Operating Conservation Program in the area in which the red light threshold is exceeded that could be made by Simpson to avoid management-caused exacerbation of the red light condition pending a full assessment of the causes of the exceedence.

3. An in-depth assessment with the full participation of the Services will be conducted to determine the likely causes of the red light threshold condition, and appropriate management changes to address the issue.

4. A scientific review panel which consists of independent experts on the subject at hand will be assembled at the request of either party if Simpson and the Services cannot agree on the course of action to address the red light condition.,

    a. The role of the panel will be to provide technical analysis of the data and any other available information to the extent it is relevant to the conservation of the Covered Species in the Plan Area.

    b. The panel will attempt to reach conclusions on whether the exceedence of the red light threshold was management induced.

    c. The panel will have three members, one appointed by the Services, one by the Simpson, and a third selected by the first two panel members.

    d. Adaptive management changes will not be made unless the analysis is conclusive in the opinion of a majority of the scientific review panel; if the results are not conclusive, the monitoring will be extended for another five years and the monitoring protocol will be evaluated to insure that appropriate methodologies are being applied.

5. Just as the biological goals and objectives set forth in Section 6.1 guided the development of the prescriptions set forth in the Plan, Simpson will look to the applicable goals and objectives to guide the development of any changes to the prescriptions pursuant to a red light trigger, using the information gained from the monitoring and adaptive management processes.

6.2.6.1.3 SSS Triggers

If monitoring determines that the SSS default widths and slope gradients set by the SSS Delineation study need to be changed, the following will occur:.

1. A scientific review panel will be convened to analyze the data gathered during the 15-year SSS Assessment.

    a. The panel will have three members, one appointed by the Services, one by the Simpson, and a third selected by the first two panel members.

    b. If the SMZ prescriptions are determined to be less than 70% effective at reducing management-related sediment delivery (by volume) from shallow landslides to the stream network compared to landslides in appropriate historical clearcut reference stands in the opinion of two of the three experts, then the default SSS prescriptions will be changed based on the data analysis to make these defaults 70% effective.

6.2.6.1.4 Experimental Watersheds Program Triggers

The results of one or more designed experiments under the experimental watersheds program may indicate that a conservation measure could or should be modified. If Simpson believes that is the case, it will convene the scientific review panel to analyze the findings and recommend whether a change is warranted. An adaptive management change will not be made as the result of one or more experimental watershed program experiments unless the results conclusively suggest that a conservation measure should be changed.

6.2.6.2 Range of Adaptive Management Changes

Adaptive management changes that may be made in response to the triggering events identified in 6.2.6.1 are as follows.

1. RMZ widths and prescriptions may be changed to fall anywhere within the following range of options (up to the balance of the account): state forestry regulations applicable at the time the change is made (lower bound) to interim Northwest Forest Plan riparian measures (upper bound).

2. SSS default widths and slope gradients may be changed as a result of the SSS delineation study (6.2.5.3.2). Changes to the SSS default widths and slope gradients as a result of the initial mass wasting assessments are not subject to the AMRA.

3. SMZ default prescriptions may be changed after the 15-year SMZ assessment.

4. The following road management prescriptions may be changed:

   a. The rate of accelerated high and moderate priority sites within the first 15 years may be increased;

   b. Drainage structure prescriptions set forth in 6.2.3.6 may be changed; and

   c. Erosion control prescriptions set forth in 6.2.3.8 may be changed.

6.2.6.3 Adaptive Management Reserve Account

Simpson will establish the AMRA to fund the adjustments that may be made during the life of the Plan.

1. The AMRA will be charged with an opening balance of 1,550 Fully Stocked Acres (FSA), and the AMRA account balance will be factored in FSA throughout the term of the Plan and Permits. If the balance falls to zero through the debit process described below, then no more debits will be made until the account is credited.

2. FSAs will be comprised of a stand with 42,000 board feet per acre (50-year stand with an index of 350 square feet of basal area) and a species composition of 50% redwood, 34% Douglas-fir, 10% white woods, and 6% hardwoods. The current California State Board of Equalization (SBE) Harvest Value Schedule will be used to translate FSA to equivalent specific road management plan prescriptions. The percentage of SBE harvest categories will be 60% cable yarding, 35% tractor, and 5% helicopter.

3. The AMRA will be used to accommodate changes in riparian protection measures from conclusive results of the monitoring program.

4. Any modification of the current riparian measures described in Section 6.3.1, areas included in SMZs, or specific road management plan prescriptions will be credited to or debited from the AMRA. Debits and credits will be reflected in the account on an on-going basis as the account acres are retained or harvested, and the account will be summarized biennially. The balance within the account will fluctuate proportionately to the addition and deletion of properties.

5. Depletion of the AMRA balance by translating FSA to funds for road prescriptions is limited to 2% per year of the opening balance (i.e., the equivalent of 31 FSA). There is no limit on the annual use of the AMRA for RMZ or SMZ modifications.

6.2.7 Implementation Monitoring Measures

6.2.7.1 Internal Plan Compliance Team

1. Simpson will form and maintain an internal compliance team consisting of a Plan Coordinator working in conjunction with Simpson's internal forestry, fisheries, wildlife, and geologic staff.

2. Simpson will staff the Plan Coordinator position with a person who is academically trained and experienced as a fisheries biologist/hydrologist or a fluvial geomorphologist.

3. Simpson will ensure that the Plan Coordinator reviews each proposed THP during its development, and informs the RPF preparing the THP on the appropriate status of watercourses in the THP area and the occurrence of any special restrictions and/or mitigations in the area (e.g., unstable slopes, inner gorges or CMZs). Simpson also will ensure that the RPF completes a pre-harvest checklist during THP development that covers all necessary compliance elements.

4. During THP development, if there is any uncertainty about the appropriate status of streams or the existence of special restriction/mitigation areas, Simpson will ensure that the Plan Coordinator directs the appropriate field personnel to do the appropriate field assessment/survey. When additional field expertise is called upon by the Plan Coordinator or RPF to delineate some special restriction/mitigation area, Simpson will ensure that the designated expert flag or otherwise designate the appropriate areas that will require special treatment/mitigation. When additional field expertise is not required, Simpson will ensure that the RFP preparing the THP or his/her designee flag the appropriate RMZs or other special mitigation areas in the field.

5. Following completion of a first draft of the THP, Simpson will assure that the Plan Coordinator reviews the THP for accuracy and completeness. For every THP within the Plan Area, the Plan Coordinator or compliance team members will prepare for internal use and maintain on file documentation indicating compliance with the Plan.

6. Following state review and approval of the THP, Simpson will direct the RPF to insure that the THP is actually implemented as written, and to fill out a THP post-harvest completion form documenting compliance of the THP with the provisions of the Plan, and to submit the form to the Plan Coordinator. Simpson will direct the Plan Coordinator to review the form to insure compliance.

6.2.7.2 THP Notice of Filing and THP Area Map

At the time of submitting any proposed THP within the Plan Area to CDF, Simpson will provide an informational copy of the THP notice of filing and a map of the THP area to the Services.

6.2.7.3 Biennial Reports

Simpson will prepare and submit a biennial report to the Services on March 1 following the first full year after the effective date of the Plan and every two years thereafter during the term of the Plan. These reports will summarize compliance with the Operating Conservation Program, the results of the Effectiveness Monitoring Measures set forth in 6.2.5, and any scheduled field reviews (as provided in 6.2.7.4) conducted in the period since the last report. The post-harvest completion forms described in 6.2.7.1 will be part of the biennial report to the Services.

6.2.7.4 Scheduled Reviews

Simpson will schedule annual meetings with the Services for the first five years of the Plan as described in the IA. In the second and fourth years, the annual meeting will be followed with a field review of implemented conservation measures to allow technical evaluation of conservation measure implementation. In the event that the Services determine as the result of a field review that the conservation measures are not being implemented in accordance with this Operating Conservation Program, then recommendations will be developed with the Services regarding implementation and additional field reviews may be scheduled.

6.2.7.5 Dispute Resolution

Simpson and the Services recognize that reasonable differences of opinion may arise from time to time regarding implementation of various elements of the Operating Conservation Program. Should a dispute arise at the technical level, either of the Services or Simpson will have the option of calling a meeting to discuss and attempt to resolve the issues at that level. If the Services call a meeting under this provision, Simpson would arrange to meet within one month of receiving such notice. Should it be necessary to resolve the issues at a policy level following an initial meeting at the technical level, Simpson would arrange to meet at the policy level within one month of receiving a request. Simpson would have the right to request meetings for the same purpose and the Services' commitment to engage in this process will be incorporated in the dispute resolution provisions in the IA. The Service's participation in this process would be in the nature of providing technical assistance. Simpson's and the Services' rights and obligations regarding informal dispute resolution and matters that could be addressed in such a process would remain as provided in the IA.

6.2.8 Special Project

6.2.8.1 Transport of Anadromous Salmonids around Barriers

Simpson will undertake one project in the Plan Area involving the trapping and transportation of coho salmon that are native to the stream system around a barrier during spawning season for a ten-year period. Prior to undertaking the project, Simpson will evaluate the selected stream to determine that salmonids residing in the basin above the barrier will not be adversely affected by the project. The translocation project will include monitoring of subsequent spawning, utilization of the summer rearing habitat by the juvenile fish, and out-migrant trapping to document the number of smolts leaving the system. At the end of the ten-year period Simpson will review the effectiveness of the project. Additional projects in other areas, involving either coho salmon or other covered fish species, will be carried out as part of the Plan's conservation measures in Simpson's sole discretion after evaluating the initial project's success, subject to additional pre-project stream evaluations.

6.2.9 Measures for Changed Circumstances

Five types of changes are identified in the Plan as potential "changed circumstances" as defined in applicable federal regulations and policies:

1. Fire covering more than 1,000 acres within the Plan Area or more than 500 acres within a single watershed within the Plan Area, but covering 10,000 acres or less;

2. Complete blow-down of more than 150 feet of previously standing timber within an RMZ, measured along the length of the stream; but less than 900 feet of trees within an RMZ, due to a windstorm;

3. Loss of 51% or more of the total basal area within any SSS, headwall swale, or Tier B Class III watercourses as a result of Sudden Oak Death or stand treatment to control Sudden Oak Death;

4. Landslides that deliver more than 20,000 cubic yards and less than 100,000 cubic yards of sediment to a channel; and

5. Listing of a species that is not a Covered Species but is affected by the Covered Activities.

As described in this subsection, Simpson also has considered the potential for floods and earthquakes to have effects that would constitute "changed circumstances."

If changed circumstances occur, Simpson will implement supplemental prescriptions set forth in this subsection. In some cases, the conservation measures set forth in other parts of Section 6.2 are adequate to address changed circumstances. No supplemental prescriptions are included for those changed circumstances.

6.2.9.1 Fire

If during the term of the Permits, a fire covering less than 10,000 acres occurs in the Plan Area, Simpson may take all measures reasonably necessary to extinguish the fire, including measures that deviate from the other Section 6.2 measures. The strategy for responding to and suppressing forest fires is generally established by CDF, and Simpson may have little ability to influence such strategy. However, to the extent reasonably possible and where consistent with the primary goal of containing and extinguishing the fire, Simpson will encourage the development of a fire-response strategy that is consistent with the other Section 6.2 measures and that furthers rather than diminishes the functions that such measures have been designed to provide.

If the fire involves more than 1,000 acres within the Plan Area, or involves more than 500 acres within a single watershed within the Plan Area, Simpson will provide both Services with information regarding the fire within 30 days. Once such a fire is extinguished, unless such fire is an “unforeseen circumstance” (i.e., exceeds 10,000 acres in the Plan Area), Simpson will apply the following supplemental prescriptions on its fee-owned lands within the Plan Area:

1. Trees damaged or killed outright by fire, including those in riparian and stream side management zones, will be considered by Simpson for salvage. Removal of standing dead or damaged trees and downed trees will be conditioned by the application of the conservation standards in Section 6.2 regarding likely to recruit and salvage within RMZs.

2. Salvage of trees downed or dead by fire must comply with state law. In addition, the conduct of any salvage operations within an RMZ or SMZ will be done with reasonable care to minimize soil erosion, to retain structural features that contribute to bank or slope stability, and to retain standing dead trees that will contribute to the recruitment of LWD to watercourses within the area affected by the fire.

3. Reforestation of any RMZ or SMZ affected by the fire will be implemented as soon as reasonably possible.

6.2.9.2 Wind

Small-scale windthrow is not expected to have a long-term significant adverse impact on stream shading or water temperatures and will have the beneficial effect of introducing large woody debris into streams that currently lack this habitat-forming element. Thus, small-scale windthrow does not pose so substantial an impact as to threaten an adverse change in the status of any Covered Species, and may actually benefit aquatic species through natural modifications to stream habitat. Based on historical experience within the HPAs, a windstorm that results in a complete blow-down of 900 feet or more, measured along the length of the stream, of trees within an RMZ, is not reasonably foreseeable, and would be considered an unforeseen circumstance.

If a windstorm results in a complete blow-down of more than 150 feet of previously standing timber within an RMZ, measured along the length of the stream, Simpson will provide both Services with information regarding such windthrow within 30 days of its discovery. With respect to such windthrow, unless the windstorm constitutes an “unforeseen circumstance” as defined above, Simpson will apply the following supplemental prescriptions within the Plan Area:

1. Other than trees that are downed or dead due to the wind, Simpson will not be allowed to remove more timber than it would have been allowed to remove under the other portions of Section 6.2 had no windthrow occurred in the stand, unless the Services determine that the removal of such additional timber would not materially reduce the functional benefit of such habitat for any Covered Species.

2. Salvage of trees downed or dead by wind must comply with state law. In addition, the conduct of any salvage operations within an RMZ or SMZ will be done with reasonable care to minimize soil erosion, to retain structural features that contribute to bank or slope stability, and to retain standing dead trees that will contribute to the recruitment of LWD to watercourses within the area affected by the windstorm.

3. Reforestation of any RMZ or SMZ affected by the windstorm will be implemented as soon as reasonably possible.

6.2.9.3 Earthquakes

The Plan Area is located in an area that is well known for frequent, but generally small, earthquakes. Earthquakes are quite common and are generally of a relatively insignificant magnitude, typically magnitude 2 to 3 on the Richter scale. Occasionally, greater magnitude events occur, but they are impossible to predict. In the forest environment, earthquakes of magnitude 6 or less on the Richter scale produce little, if any, visible change, and apparently no significant impact to wildlife or fishery habitat. It is possible that some trees have fallen as a result of earthquake activity, however fallen trees in the forest are generally attributed to wind or landslide effects. Regardless of cause, fallen trees in the forest are not of so significant a number as to require additional mitigations and/or changes in the management scenario or restrictions outlined in this Plan. While it may be speculated that localized landslides or other earth movements resulted from these earthquakes, there are no data to document that this occurred within the Plan Area. Landslides caused by earthquakes are addressed separately in this "Changed Circumstances" subsection. Earthquakes of such magnitude (greater than magnitude 6 on the Richter scale) that may substantially alter habitat status or require additional conservation or mitigation measures in excess of those already included in the Plan, are not reasonably foreseeable during the life of the Plan, and would be considered "unforeseen circumstances."

6.2.9.4 Floods

Floods are a natural and necessary component of aquatic and riparian ecosystems but also can cause damage to forest transportation systems (e.g. watercourse crossings, bridges, roads) and forest stands. The frequency with which floods occur and their relative magnitude are inversely related. Large floods are infrequent while smaller floods can go unnoticed and may recur as often as once every year. Severe floods may occur once in 15 or even 100 years. A flood that is of lesser magnitude than a 100-year recurrence interval event (i.e., less than a 100-year flood) is part of the expected normal ecology of the forest. The conservation measures in the other portions of Section 6.2 are adequate mitigation for such an event. Based on historical evidence in the Plan Area, a flood that is equal or greater in magnitude than a 100-year recurrence interval event is not reasonably foreseeable during the term of this Plan, and thus it would be considered an "unforeseen circumstance."

6.2.9.5 Pest or Pathogen Infestation

Insects and diseases can usually be kept under control through careful forest management and proper treatments. Site quality and nutrient availability play a key role in forest health and vigor. Because much of the Plan Area is of high site quality, infestations are less likely to occur within the healthy forests that occupy these sites.

Infestations by generally recognized types of forest pests or pathogens are not be expected to have significant adverse effects on the Covered Species within the Plan Area, will be adequately addressed by the other measures in Section 6.2, and are not considered changed circumstances. A possible exception is the recently identified sudden oak death disease caused by *Phytophthora ramorum*. If 51% or more of the total basal area within any SSS, headwall swale, or Tier B Class III watercourses is lost as a result of sudden oak death or stand treatment to control sudden oak death, on site review will be made by an RF and RPF to develop additional prescriptions to compensate for the loss of hardwood root strength through retention of additional conifers. An infestation of sudden oak death that crosses to redwood or other conifers or infestation by other pests that has significant effect on the forest ecosystem within the Plan Area are not reasonably foreseeable and would be considered an “unforeseen circumstance.”

6.2.9.6 Landslides

Landslide rates and processes differ in the various geologic settings across the Plan Area. In the Coastal Klamath and Blue Creek HPAs, shallow rapid landslides are the most common kinds of landslides, whereas the upstream portions of the Mad River HPA are pervasively underlain by deep seated landslides and earthflows. Still other HPAs are subject to both deep seated landslides and shallow landslides. These different landscapes with their particular mass wasting processes present varying sensitivities to management activities. Conservation measures within this Plan were designed to address sediment and other habitat effects from past landslides, to take advantage of future naturally-occurring landslides, and through a combination of stream buffer prescriptions, land management restrictions, slope stability analyses, and stream monitoring, to avoid significant adverse impacts from management related landslides and mass wasting events in the future.

Based on historic experience within the Plan Area, a landslide that results in the delivery of more than 100,000 cubic yards of sediment is not reasonably foreseeable and is considered an unforeseen circumstance. If a landslide results in the delivery of more than 20,000 cubic yards of sediment to a channel (either from a source area or from combined source area and propagated volumes), Simpson will provide both Services with information regarding such landslide within 30 days of its discovery. With respect to such a landslide, and unless this landslide constitutes an "unforeseen circumstance", i.e. delivery of more than 100,000 cubic yards, Simpson and the Services will confer to determine if it is reasonably possible that management activities on or adjacent to the area of the landslide could have materially contributed to causing such landslide. If either Service or Simpson concludes that it is reasonably possible that management activities materially contributed to the occurrence of such a landslide, Simpson, at its own expense, will retain a qualified geo-technical expert to analyze the slide and develop a written report. The report will include, at a minimum, an assessment of the factors likely to have caused the slide and any changes to management activities which had they been implemented on or adjacent to the area of the slide would have likely prevented the slide from occurring. Upon receipt of such a report, Simpson will forward the report to the Services. Where appropriate, the recommendations set forth in the report may form the basis for adaptive management changes to the SSS measures.

6.2.9.7 New Listing of Species that are Not Covered Species

The preamble to the No Surprises rule states that the listing of a species as endangered or threatened could constitute a changed circumstance. Therefore, if a species is listed under the federal ESA subsequent to the effective date of the Permits, and that species (i) is not a Covered Species, and (ii) is affected by the Covered Activities, such listing will constitute a changed circumstance. Where a new listing that constitutes a changed circumstance occurs, Simpson will follow the procedures set forth in the IA.

6.2.10 Measures for Unforeseen Circumstances

All other changes in circumstances affecting a Covered Species or its habitat in the Plan Area that are not designated changed circumstances in Section 6.2.9.1 are considered not reasonably foreseeable in the context of this Plan. For purposes of this Plan such changes, including those described in Section 6.2.9.1 as such, are Unforeseen Circumstances. In the event that Unforeseen Circumstances occur, modifications to the Plan will be made only in accordance with the procedures set forth in the IA.

6.3 RATIONALE AND ANALYSIS UNDERLYING SIMPSON'S OPERATING CONSERVATION PROGRAM

This Section provides a detailed description of the components and rationale of the conservation programs. The measures identified in the Operating Conservation Program, Section 6.2, are presented in the context of the biological goals and objectives, presented in Section 6.1 with a more detailed summary of the purpose and intent of the measures. Although this section is not part of the Operating Conservation Program itself, it is included to provide the basis for and intent of the specific measures included in the Operating Conservation Program, so as to assist in guiding its implementation.

6.3.1 Riparian Management Measures

As described in Section 3, the riparian zone adjacent to streams is a vital component of salmonid and amphibian habitat, providing temperature control, nutrient inputs, channel stability, sediment control, and LWD recruitment. Following the distinctions used in California's FPRs, riparian management measures will vary among three broad classes of watercourses, Class I, Class II, and Class III watercourses. Further divisions within some watercourse classes are based on their size (Class II watercourses) and side slopes/terrains (Class III watercourses) and are represented in Table 6-1. Class I watercourses include all current or historical fish-bearing watercourses. Class II watercourses contain no fish, but support or provides habitat for aquatic vertebrates. Seeps and springs that support or provide habitat for aquatic vertebrates will also be considered Class II watercourses with respect to the conservation measures. Class III watercourses are small seasonal channels which do not support aquatic species, but have the potential to transport sediment to Class I or II watercourses.

The classification of streams, springs, and seeps occurs on the ground through a physical inspection of the watercourses. The initial inspection may be the result of fish or amphibian surveys by a trained biologist, or by a RPF during the initial layout of the THP. The documentation of fish or other aquatic vertebrate species permanently designates the watercourse to an appropriate class such that it is never "downgraded" to a lesser class. In the classification process a Class I designation is given to any watercourse even if fish can only use the watercourse seasonally. In watercourses which are clearly not fish bearing, the presence of habitat for other aquatic vertebrate species is sufficient to give a Class II designation to a watercourse even if no animals are observed. If the initial inspection of watercourses is being made by a RPF (something that typically only happens in Class II and III watercourses), any uncertainty regarding the appropriate watercourse classification is resolved by a trained biologist. Watercourses and wet areas that have been inadvertently created by harvesting and road building activities (e.g. interception of an aquifer that creates a continuously flowing inboard ditch) range in function from providing essential habitat for fish and non-fish aquatic species, to sites that have the potential to have a significant negative impact on aquatic resources (e.g., water diverted onto a landing that could result in saturation and ultimate failure of the fill). As a result, protection associated with these sites will be determined on a case-by-case basis. If the feature has no potential to have a negative impact and provides habitat for fish or non-fish aquatic species, it should be evaluated for protection. For flowing inboard ditches, the appropriate protection may include eliminating periodic ditch cleaning with some canopy retention depending on topographic shading. Wet areas may be protected with a 25-foot EEZ, but overstory canopy retention would normally not be required, unless the site is known to provide critical habitat for a cold-water adapted species. Manmade watercourses and wet areas that have the potential to harm aquatic resources will be redirected or drained as part of adjacent timber operations or as part of the road implementation plan. Conservation measures designed to maintain and enhance the key riparian functions in each of these watercourse types are described below. Conservation measures associated with unique channel types such as CMZs and floodplains are addressed in Section 6.3.1.4.

6.3.1.1 Maintenance of Riparian Function in Class I Watercourses

All Class I watercourses will have a RMZ of at least 150 feet (slope distance) on each bank (Table 6-1). The RMZ width will be measured from the first line of perennial vegetation (the watercourse transition line as defined in the Glossary), or from the outer CMZ edge, where applicable. The outer zone of the RMZ will be extended, where necessary, to cover the entire floodplain and an additional 30-50 foot beyond the outer edge of the floodplain. The additional buffer outside the floodplain will depend on the slope immediately adjacent to the floodplain as follows: 30 feet for slopes of 0-30%; 40 feet for slopes of 30-60% and 50 feet for slopes >60%. RMZs and CMZs are defined in Section 6.3.1.

Table 6-1. Watercourse classes and minimum buffer widths.

Watercourse Class	Further Subdivisions	Total Width[2]	Inner Zone Width	Outer Zone Width
Class I	None	150 ft RMZ	50-70 ft	80-100 ft
Class II	2nd order or larger	100 ft RMZ	30 ft	70 ft
	1st order[1]	70 ft RMZ	30 ft	40 ft
Class IIIA	Dependent on Terrains[3]	30 ft EEZ	NA	NA
Class IIIB	Dependent on Terrains[3]	50 ft EEZ plus tree retention	NA	NA

Notes
1 Some Class II-1 watercourses will receive the protections of Class II-2 watercourses. See Figure 6-2 and Section 6.3.1.2 for details.
2 one side.
3 For Class III watercourses see Section 6.3.1.3.1.3 for details of slope and terrain criteria

The RMZ for Class I watercourses will be divided into an inner zone and an outer zone. The width of the inner zone will be adjusted for slope according to Table 6-2. The outer zone will extend from the outside limit of the inner zone edge to at least 150 feet from the bankfull channel (or CMZ edge) respectively.

Table 6-2. Adjustments to the inner zone width for side slopes.

Side Slopes	Inner Zone Width
0-30%	50 feet
30°-60%	60 feet
>60%	70 feet

6.3.1.1.1 Conservation Measures within All Class I RMZs

During the life of the Permits, there will only be a single harvest entry into Class I RMZs, which will coincide with the even-aged harvest of the adjacent stand. The minimum conservation measures within all Class I RMZs are described below. Where features of instability (as defined in Section 6.3.2 and Appendix B) are identified within or immediately adjacent to the RMZ, additional site-specific conservation measures for the identified area will be applied as well.

1. At least 85% overstory canopy closure will be retained on the inner zone.

2. If the inner zone is predominately composed of hardwoods (based on stand surveys defined as <15 conifer stems per acre >16 inches dbh), no conifers will be taken from in the inner zone. In addition, harvest within RMZs would not reduce the conifer stem density to less that 15 conifer stems > 16 inches dbh per acre.

3. At least 70% overstory canopy closure will be retained in the outer zone.

4. Overstory canopy closure is the overhead shade provided by the crowns of intermediate, co-dominant, and dominant trees in the stand (for canopy definitions see Berbach et al. 1999). Compliance with overstory canopy standards will be measured using the current CDF protocol for canopy cover sampling (Robards 1999).

5. In addition to the canopy requirements, no trees within the RMZ will be harvested which are judged likely to recruit to the watercourse.

   a. Considerations that will be used to determine which trees would likely recruit to a stream include:

      1) Whether they are on the stream bank,

      2) Have roots in the stream bank or stream,

      3) Are leaning towards the stream,

      4) Are tall enough to ensure that they will reach the stream,

      5) Trees that are on slopes that are sufficiently steep such that gravity would likely carry the fallen tree into the watercourse, and

6) Trees associated with unstable areas on the feature or directly downslope of the feature.

b. Considerations that will be used to determine which trees are not likely to recruit include:

1) Have an impeded "fall-path" to the stream (outside family members of a clonal group)

2) Leaning away from the stream

6. In addition to the canopy requirements, no trees will be harvested which contribute to maintaining bank stability. The distinction in retention levels between inner and outer zones of the RMZ will be reduced on increasingly steeper slopes (generally >50%), because of the increased potential for trees to recruit at greater distances from the stream. Redwoods will be preferentially harvested over other conifers, because of their ability to sprout from the remaining root system.

7. The RMZ will be an EEZ, with the exception of existing roads and landings, construction of spur roads off of existing roads within RMZs and watercourse crossings. Also see Section 6.3.3 and 6.3.4 for road and landing use limitations. The intent is to minimize the effects of disturbances to RMZs that would result in degradation of stream habitat.

8. Any ground disturbance larger than 100 square feet caused by management activities will be mulched and seeded or otherwise treated to reduce the potential for sediment delivery. Seed will be spread at a rate of at least 30 pounds per acre, and mulched to a depth of at least 2 inches (before settling) with 90% surface coverage. The intent is to minimize sediment delivery from sheet and gully erosion. Hand constructed firelines are not subject to the 100 square foot ground disturbance standard. Hand constructed firelines are established by removing the duff and litter layers to expose mineral soil but does not disturb the mineral soil. Other measures will be applied as necessary to ensure that hand constructed firelines do not deliver sediment to watercourses.

9. Trees may be felled within RMZs to create cable yarding corridors as needed to ensure worker safety. These trees will be part of the harvest unit and their removal will be subject to the canopy requirements described above.

10. All safe snags will be retained (unsafe snags will be felled and left onsite).

11. No salvage will occur in the inner zone. If any part of the salvageable piece is in the inner zone, the entire piece will be left.

12. Salvage will be limited to downed trees in the outer zone and will occur only if any of the following criteria are met:

a. The wood is not currently or unlikely in the future to be incorporated into the bankfull channel; including wood located below unstable areas,

b. The wood is not contributing to bank or slope stability, or

c. The wood is not positioned on a slope such that it can act to intercept sediment moving towards the stream

13. Salvage will be prohibited on the floodplain or CMZ.

6.3.1.2 Maintenance of Riparian Function in Class II Watercourses

All Class II watercourses will have a RMZ of at least 70 or 100 feet on each bank. The 70-foot minimum buffer will be used on the first 1,000 feet portions of the smallest (1st order) Class II watercourses, and the 100-foot minimum buffer used on all 2nd order or greater Class II watercourses. The specific applications of these buffers are depicted in Figure 6-2 and explained in the examples provided below. All Class II RMZs will be divided into an inner zone and an outer zone. The inner zone will be the first 30 feet, as measured from the first line of perennial vegetation (the watercourse transition line as defined in the Glossary). The outer zone will be the remaining 40 feet or 70 feet (depending on stream order).

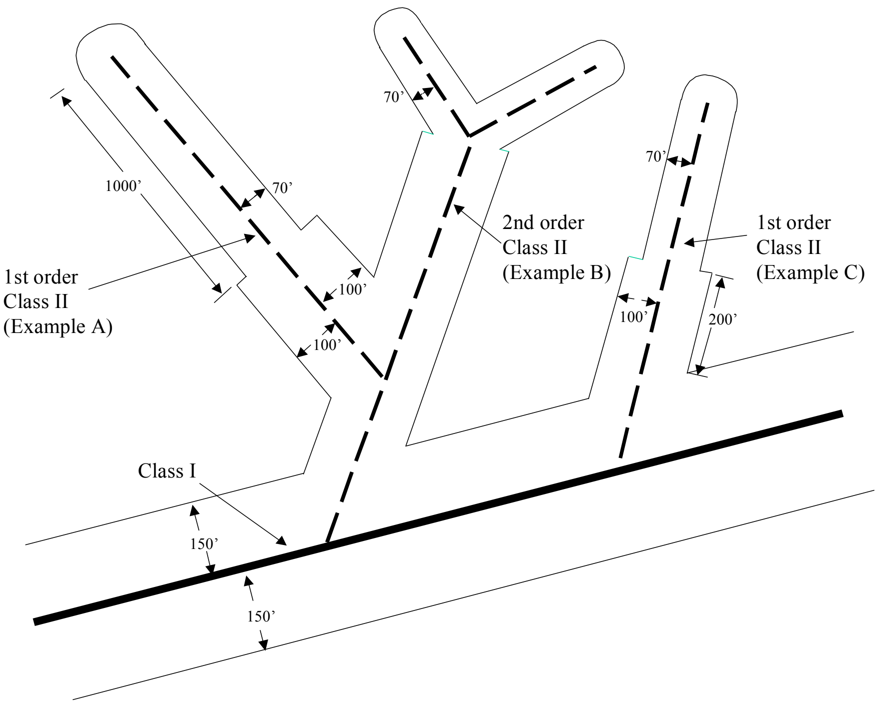
The current information in Simpson's GIS database was used to calculate the proportions of total Class II watercourse lengths with 70 and 100 feet RMZ widths respectively in three randomly selected watersheds on Simpson's ownership in the HPAs. The results are presented in Table 6-3. This preliminary assessment indicates that 100-foot RMZs would apply on approximately 61% of the assessed Class II watercourse lengths and 70-foot RMZs would apply on the remaining 39%.

Table 6-3. Application of the Class II RMZ widths in three previously assessed watersheds.

Watershed (HPA)	Total Class II watercourse length (miles)	Percent of total length with a 100' RMZ	Percent of total length with a 70' RMZ
Carlotta (Eel River HPA)	7.7	69.4%	30.6%
Dominie Creek (Smith River HPA)	21.0	45.1%	54.9%
NF Mad River (NF Mad River HPA)	33.8	67.9%	32.1%
Total	62.5	60.8%	39.2%

6.3.1.2.1 General Class II RMZ Conservation Measures

1. During the life of the Permits, there will only be a single harvest entry into Class II RMZs, which will coincide with the even-aged harvest of the adjacent stand. The minimum conservation measures in Class II RMZs during such an entry are described below. Where features of instability (defined in Section 6.3.2. and Appendix B) are identified within the RMZ, additional site-specific conservation measures for the identified area may be applied. At least 85% overstory canopy closure will be retained on the inner zone (0-30 feet). (Overstory canopy closure is defined and measured as with Class I watercourses above).



Example A
The RMZ on the first 1000 feet of a 1st order channel, (a small, typically intermittent, headwater stream with no tributaries), will be at least 70 feet. Downstream of this first 1000-foot section, the RMZ will expand to at least 100 feet.

Example B
All 2nd order or greater Class II watercourses will have a minimum 100-foot RMZ. Example B shows two first order channels, with 70-foot RMZs, joining to form a 2nd order channel, which has a 100-foot RMZ.

Example C
Where a 1st order Class II watercourse flows directly into a Class I watercourse, the Class II RMZ will be at least 100 feet on each bank for the first 200 feet Of channel upstream of the Class I RMZ boundary, after which the Class II RMZ will be dictated by the length of the stream, as per example A.

Figure 6-2. Class II riparian management zones.

2. At least 70% overstory canopy closure will be retained on the outer zone (30-70 or 30-100 feet).

3. In addition to the canopy requirements, in the first 200 feet of the Class II RMZ adjacent to a Class I RMZ, no trees within the RMZ will be harvested which are judged likely to recruit to the watercourse (see Figure 6-2).

    a. Considerations that will be used to determine which trees would likely recruit to a stream include:

        1) Whether they are on the stream bank,

        2) Have roots in the stream bank or stream,

        3) Are leaning towards the stream,

        4) Are tall enough to ensure that they will reach the stream,

        5) Trees that are on slopes that are sufficiently steep such that gravity would likely carry the fallen tree into the watercourse, and

        6) Trees associated with unstable areas on the feature or directly downslope of the feature.

    b. Considerations that will be used to determine which trees are not likely to recruit include:

        1) Have an impeded “fall-path” to the stream (outside family members of a clonal group)

        2) Leaning away from the stream

4. In addition to the canopy requirements, no trees will be harvested which contribute to maintaining bank stability. The distinction in retention levels between inner and outer zones of the RMZ will be reduced on increasingly steeper slopes (generally >50%), because of increased needs to retain trees to maintain bank stability. Redwoods will be preferentially harvested over other conifers because of their ability to sprout from the remaining root system.

5. The RMZ will be an EEZ, with the exception of existing roads and landings, construction of spur roads off of existing roads within RMZs and watercourse crossings. Also see Section 6.3.3 and 6.3.4 for road and landing use limitations. The intent is to minimize the effects of disturbances to Class II watercourse RMZs that would result in degradation of stream habitat.

6. Any ground disturbance larger than 100 square feet caused by management activities that is likely to result in sediment delivery to a watercourse will be mulched and seeded or otherwise treated to reduce the potential for such delivery. Seed will be spread at a rate of at least 30 pounds per acre, and mulched to a depth of at least 2 inches (before settling) with 90% surface coverage. The intent is to minimize sediment delivery from sheet and gully erosion. Hand constructed firelines are not subject the 100 square foot ground disturbance standard. Hand constructed firelines are established by removing the duff and litter layers to expose mineral soil but does not disturb the mineral soil. Other measures will be applied as necessary to ensure that hand constructed firelines do not deliver sediment to watercourses.

7. Trees may be felled within RMZs to create cable-yarding corridors as needed to ensure worker safety. These trees will be part of the harvest unit and their removal will be subject to the canopy requirements described above.

8. All safe snags will be retained (unsafe snags will be felled and left on site).

9. No salvage of downed trees will occur in the inner zone (0-30 feet). If any part of the salvageable piece is in the inner zone, the entire piece will be left.

10. Salvage of downed trees in the outer zone (30 to either 70 or 100 feet) will only occur if the following criteria are met:

    a. The wood is not currently or unlikely in the future to be incorporated into the bankfull channel, including wood located below unstable areas;

    b. The wood is not contributing to bank stability, and

    c. The wood is not positioned on a slope such that it can act to intercept sediment moving towards the stream.

6.3.1.3 Maintenance of Riparian Function in Class III Watercourses

Protection of Class III watercourses will occur in a two-tiered system, where the tiers correspond to two slope classes. Where features of instability (defined in Section 6.3.211.2. and Appendix B) are identified, additional site-specific conservation measures for the identified area will be applied.

6.3.1.3.1 <u>Tier A Protection Measures</u>

Tier A protections will be applied to Class IIIA watercourses using the adjacent streamside slope gradient (as measured with a clinometer), for the appropriate HPA Groups, as shown in Table 6-4 below. For example, within the Smith River HPA Group, Tier A protections would be applied if streamside slopes were less than 65%.

Table 6-4. Criteria for applying Class III Tier A and B protection measures.

HPA Group	Slope Gradient
Smith River	<65% = Tier A >65% =Tier B
Coastal Klamath	<70% = Tier A >70% = Tier B
Korbel	<65% = Tier A >65% = Tier B
Humboldt Bay	<60% = Tier A >60% = Tier B

The conservation measures for Tier A Class III watercourses will include:

1. A 30-foot EEZ (exceptions for the EEZ include watercourse crossings and existing roads).

2. All LWD on the ground (not including felled trees) will be retained within the 30-foot EEZ.

3. No ignition of fire during site preparation within the EEZ.

6.3.1.3.2 Tier B Protection Measures

Tier B protections will be applied to all Class IIIB watercourses using the adjacent streamside slope gradient (as measured with a clinometer), for the appropriate HPA Group, as shown in Table 6-4 above. For example, within the Smith River HPA Group, Tier B protections would be applied if streamside slopes were greater than 65%. Conservation measures for Tier B Class III watercourses will include:

1. A 50-foot EEZ (exceptions for EEZ include watercourse crossings and existing roads).

2. All hardwoods and nonmerchantable trees within the 50-foot EEZ will be retained except where necessary to create cable corridors, or for the safe falling of merchantable trees.

3. No ignition of fire during site preparation within the EEZ

4. Conifers will be retained where they contribute to maintaining bank stability or if they are acting as a control point in the channel. A minimum average of one conifer per 50 feet of stream length within the 50-foot EEZ will be retained.

5. All LWD on the ground (not including felled trees) will be retained within the 50-foot EEZ.

6.3.1.4 Measures to Address Unique Geomorphic Features

Unique geomorphic features which may warrant separate or additional conservation measures include CMZs and floodplains. CMZs are important in determining where RMZs should be measured from, while the occurrence of floodplains may require the

RMZ width to be expanded to ensure the entire floodplain and a 30- to 50-foot buffer are protected. The definitions, specific issues, and conservation measures designed to address each are described below.

6.3.1.4.1 Mapping Channel Migration Zones and Floodplains

Simpson will map all floodplains and CMZs of Class I watercourses throughout the Plan Area within the first five years of the Permits' effective date. For any lands added to the Plan Area after the end of the third year, Simpson will complete mapping within two years of the addition. Potential floodplains and CMZs will be screened initially using GIS. Any sites that show the potential attributes of a floodplain or CMZ based on the GIS analysis will be further analyzed using aerial photographs, maps and historic field information. The final determination of the boundaries of all floodplains and CMZs will be based on field verification with the oversight of a team of experts that may include a hydrologist, fluvial geomorphologist, geologist and fisheries biologist representing Simpson and the Services. Following field verification, the floodplains and CMZs with any additional buffers, where appropriate, will be flagged in the field and mapped in Simpson's GIS.

Floodplains

The floodplain is defined as the area adjacent to the stream constructed by the river in the present climate and inundated during periods of high flow (NMFS 1999). A stream's floodplain will be specified as two times its maximum bank full depth as a starting point, but will be modified if necessary by field verification at a later date. The floodplain typically acts as a depositional zone during floods. While high velocity flow is occurring in the main channel, the velocity breaks created by live and down trees and other vegetation, combined with the distribution of water across a broad, typically low gradient floodplain result in generally low velocity flow across the floodplain.

Maintaining and promoting development of functioning riparian habitat is a biological goal of this Plan. This includes allowing that the floodplain is well stocked with trees and vegetation of sufficient size to act as velocity breaks during floods and with their root systems minimizing erosive scour from flooding. The conservation measures are expected to provide adequate riparian stands for this purpose in most smaller streams (3^{rd} order), but additional protections will be applied in the lower depositional reaches of larger Class I watercourses in cases where the floodplain with a 30- to 50-foot buffer may extend beyond the proposed RMZ boundary.

The normal conservation measures (Section 6.3.1) of the RMZ Class I outer zone will be extended, where necessary, to cover the entire floodplain and an additional 30- to 50-foot beyond the outer edge of the floodplain. The additional buffer outside the floodplain will depend on the slope immediately adjacent to the floodplain as follows: 30 feet for slopes of 0-30%; 40 feet for slopes of 30-60% and 50 feet for slopes >60%.

Channel Migration Zones

Channel migration is a natural process in which streams shift position laterally on their floodplain or valley floor. Channel migration can occur either by gradual bank erosion processes or by sudden channel avulsion where high flows and/or reduced channel conveyance capacity result in the formation of alternate channels on the floodplain or valley floor (Leopold and Dunne 1978). Morphological features such as stream gradient, side slopes, bed material, and floodplain width influence the likelihood and rate of channel migration, and analyzing such features can allow for identification of areas where channel migration is likely to occur.. Channel migration zones (CMZs) are areas that generally correspond to the modern floodplain, but can also include river terraces subject to significant bank erosion (NMFS 2000). CMZs identified on the Original Assessed Ownership tend to occur along the lower depositional reaches of larger (3rd order or greater) Class I watercourses and seem to be associated with channel aggradation.

Identifying potential CMZs in the Plan Area is necessary to ensure that the riparian conservation measures can achieve their desired effects of maintaining functional riparian and aquatic conditions. The RMZs described above are intended to extend a specific distance (e.g. 150 feet for Class I watercourse RMZ) from the permanent vegetation line adjacent to the channel in order to achieve their desired protective benefits. RMZs created without regard for channel migration zones could leave at least one bank of the stream entirely without or with a substantially reduced riparian buffer as a result of channel migration. To avoid this possibility, the RMZ will be measured from the outer edge of the CMZ.

6.3.2 Slope Stability Measures

6.3.2.1 Introduction

The goal of the slope stability measures is to reduce management-related sediment delivery to the aquatic system from landslides and landslide-related erosion that might occur in specific portions of the landscape.

The potential effects of forest management on factors that may contribute to slope failure are discussed in Section 5 and 7. These effects can be partially mitigated through prescriptions that limit changes in root strength and hillslope hydrology that can result from timber harvesting, and by improving construction standards associated with road or skid trails. Such prescriptions will be applied to reduce management-related slope failure and associated sedimentation in specified landscape areas that were found to have a relatively high potential for sediment delivery.

The measures focus on silvicultural prescriptions and also consider road construction. Slope stability and erosion problems associated with the existing road network are addressed through conservation measures pertaining to road maintenance (Section 6.3.3).

A summary of landslide processes and landslide prone terrain is provided in Appendix B.

6.3.2.2 Overview of the Approach

6.3.2.2.1 Assumptions

The following assumptions form the foundation of the analytical approaches used to identify slope stability hazards in the Plan Area and contributed to the development of management rules to mitigate potential hazards:

1. The majority of landslides occur in discrete areas of the landscape (e.g. inner gorges and steep streamside slopes, headwall swales, and existing deep-seated landslide areas).

2. The location of existing mass wasting features can be used to predict likely locations of future instability. Areas prone to these processes can be mapped based on physical characteristics (such as topography, geology, and soils), as interpreted from aerial photographs, topographic maps, geologic and soils maps, and field observations.

3. Effects of past land use activities on landslides can be inferred and sediment delivery estimated from historical aerial photographs and field reconnaissance. It is acknowledged that small landslides may not be detectable in aerial photographs because of variability in forest canopy, timing, quality and scale of photography, and because revegetation of some landslide may occur rapidly.

4. Historical management activities on the landscape provide a valid empirical example of the likely effects of forest management on future landslide activity. It is acknowledged that all parts of the landscape may not have been fully "tested", that is, subjected to high magnitude storm events following harvest when the potential for landslides is greatest. Nevertheless, the vast majority of Simpson's forestland property has been logged, and significant storm events occur frequently enough to reasonably assume that most portions of the landscape prone to mass wasting will be identifiable.

6.3.2.2.2 Mass Wasting Prescription Zones (Summary)

The slope stability measures address discrete parts of the landscape with grossly similar physical characteristics that have been established both in the literature (Best et al. 1995; Best 1997; Kelsey et al. 1995; PWA 1999a; Raines and Kelsey 1991) (PWA 1998) and from unpublished Simpson data from pilot watersheds as having relatively high landslide-related sediment delivery rates, and which are assumed to be sensitive to management activities. The areas are referred to as Mass Wasting Prescription Zones (MWPZs). The three MWPZs are:

- Steep Streamside Slopes
- Headwall Swales
- Deep-Seated Landslides

The three MWPZs the associated conservation measures are discussed in Section 6.3.2.

A default slope stability conservation measure will also be applied to some shallow rapid landslides. Shallow rapid landslides are not considered a MWPZ, but rather they may be found within any of the MWPZs or outside of a MWPZ. Shallow rapid landslides and the associated conservation measure are discussed in Section 6.3.2.

Steep Streamside Slopes

As indicated in Section 6.2.2.1.3, SSS zones will be identified based on field measurements of cumulative sediment delivery from landslides, slope gradients, and landslide crown distances from Class I and II watercourses. A maximum slope distance and a minimum slope gradient for SSS zones will be based on a percentage of the measured cumulative sediment delivered to watercourses from shallow landslides wholly originating from within streamside slopes. The initial default maximum slope distance and minimum slope gradient for the SSS zones are different for the various HPA Groups.

Two slope stability monitoring programs are designed to refine the default prescriptions for SSS zones: the SSS Delineation Study and the SSS Assessment. The SSS Delineation Study can modify the initial default maximum distance and minimum slope gradient for SSS for the 11 individual HPAs. The SSS Assessment can modify the initial HPA Groups' initial default maximum distance and minimum slope gradient and prescriptions for SSS in the 11 individual HPAs. Both of these slope stability monitoring programs are further described in Section 6.3.5 and Appendix D.

Headwall Swales

Headwall swales will be identified from a GIS-based analyses of shallow hillslope stability (SHALSTAB) coupled with field verification of characteristic landforms described in Section 6.3.2. The default prescription is uniform across the Plan Area and is not subject to adaptive management.

Deep-Seated Landslides

Deep-seated landslides will be identified from published landslide maps, review of aerial photographs and field observations, coupled with verification of the criteria described in Section 6.3.2. The default prescription for deep-seated landslides is uniform across the Plan Area and is not subject to adaptive management changes.

6.3.2.2.3 Implementation

All RPFs who write THPs for Simpson will participate in training that addresses issues related to timber harvesting, slope stability, and the Slope Stability Measures. The training will be administered by a California RG or CEG, and initially the training will follow the guidelines from the CLFA Geology and Mass Wasting workshops of 1998 and 1999. In addition, Simpson will employ or retain a California RG or CEG with substantial experience in forest management to provide professional review of MWPZs and unstable areas on a project-by-project basis at the RPFs' discretion.

The purpose of the training is to help Simpson RPFs identify and more fully understand the slope stability measures as well as the possible implications of various timber management scenarios for landslide and other unstable areas. The training program is not intended to supplant the need for input from a licensed geologist in THP development when geological concerns exceed the experience and scope of license of the project RPF. Training will be offered biennially or as necessary to accommodate contractors and new employees and as necessary to present new relevant scientific or regulatory information.

During the period of initial THP layout and data collection, all site-specific knowledge or concerns regarding aquatic biota or habitat known to Simpson's resources staff will be made known to the project forester in order that the THP may be voluntarily designed to further reduce risk to resources.

During the development stage of a THP, the RPF will determine if any portion of the potential THP meets the HCP definition of an MWPZ. If a MWPZ is identified, the following protocol will apply:

1. Impose the default prescription for that MWPZ, or

2. Retain a California RG to

   a. Evaluate the likelihood that timber harvest 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

   b. Work with the RPF to prepare a more cost-effective, site-specific alternative to the default prescription designed to minimize that likelihood, which will have the benefit of minimizing and mitigating 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.

THPs for which a geologic report was prepared and the conclusions of which allowed for alternatives to replace the default prescriptions will be flagged as such when submitted for review by CDF and other agencies. Also, a THP map and a letter of notice that describes the alternative to replace the default prescriptions will be sent to the Services when a THP with such an alternative is proposed. The intent of this procedure is to encourage professional geologic review by agency staff to ensure that the intent of the conservation measures is fulfilled.

The internal compliance monitoring procedure, described in Section 6.3.7, will assure that the measures are properly administered.

6.3.2.2.4 Slope Stability Monitoring and Assessments

The slope stability measures are subject to adaptive management changes identified as a result of the SSS Delineation Study and SSS Assessment. The SSS Delineation Study will determine the minimum slope gradient and maximum slope distance for SSS zones in each HPA. The SSS Assessment will evaluate the effectiveness of the SSS prescriptions (including minimum slope gradient and maximum slope distance).

Simpson will also complete a preliminary Mass Wasting Assessment (MWA) within seven years after Plan approval and an update along with a final report within 20 years of Plan approval. The purpose of the MWA is to examine any relationships between mass wasting processes and timber management practices. The MWA is further described in Section 6.3.5 and Appendix D.3.5.

6.3.2.3 Steep Streamside Slopes

Steep streamside slopes are generally characterized by steep slopes that descend directly to Class I and Class II watercourses without intervening topographic benches. An inner gorge is a subset of steep streamside slopes where a more-or-less distinct break-in-slope separates steeper inner gorge slopes below the break-in-slope from lesser-gradient slopes above the break. The SSS zone classification includes inner gorge slopes as well as those steep slopes without a distinct break-in-slope.

Sediment budget and landslide inventories conducted in northcoast California have documented that streamside landslides constitute the bulk (50% to 90%) of landslide-derived sediment delivered to streams (Best 1997; Forest Soil & Water 1998; Harden et al. 1995; Kelsey et al. 1981; PWA 1998, 1999a, b; Raines and Kelsey 1991). This is consistent with preliminary landslide data collected on the Plan Area through the studies identified in Section 4.3. Moreover, preliminary landslide data collected on Simpson property reveals the bulk of sediment appears to be derived from landslides originating on the larger watercourses (Class I and Class II-2).

The goal of the default prescriptions for SSS zones is to achieve a 70% reduction in management-related sediment delivery from landslides compared to delivery volumes from landslides in appropriate historical clearcut reference areas. A maximum of a 30% relative increase in landslide-related sediment delivery compared to merchantable-sized second growth uncut SSS zones may be used as another comparative standard to determine the effectiveness of the conservation measures. The objectives of the prescriptions for SSS zones are to maintain a sufficient live root network and overstory canopy which limits the loss of root strength and provides for rainfall interception and evapotranspiration. These objectives are designed to reduce landslide occurrences that result in sediment delivery, and thereby achieve the goal.

6.3.2.3.1 <u>Steep Streamside Slopes: Identification</u>

Steep streamside slopes in the various HPAs are defined by: 1) a minimum slope gradient leading to a Class I or Class II watercourse, 2) a maximum distance from a Class I or Class II watercourse, and 3) a reasonable ability for slope failures to deliver sediment to a watercourse. Whether or not slope failures have a reasonable ability to deliver sediment to a watercourse will be determined based on the presence or absence of a qualifying slope break. A qualifying slope break is a break-in-slope of sufficient degree (below the minimum for an HPA) and distance that it would likely impede sediment delivery to watercourses from shallow landslides originating above the slope-break. Qualifying slope breaks will be identified on a site-specific basis through the THP process.

Landslide data for steep streamside slopes were grouped into four HPA Groups, as shown on Table 6-5, for purposes of developing and implementing initial default prescriptions for SSS zones. The initial default minimum slope gradients and maximum slope distances are summarized in Table 6-6. The initial minimum slope gradients and maximum slope distances and default prescriptions for SSS zones can be modified through the SSS Delineation and SSS Assessment programs as described in Section 6.3.5 and Appendix D.3.3 and D.3.4.

Table 6-5. HPA Groups for initial SSS default prescriptions.

HPA Group	HPA
Smith River	Smith River
Coastal Klamath	Coastal Klamath Blue Creek
Korbel	Mad River North Fork Mad River Little River Coastal Lagoons Redwood Creek Interior Klamath
Humboldt Bay	Humboldt Bay Eel River

Table 6-6. Initial default maximum slope distances and minimum slope gradient for SSS zones in each HPA Group.

HPA Group	Slope Gradient	Slope Distance from Watercourse Transition Line (feet)		
		Class I	Class II-2	Class II-1
Smith River	65%	150[1]	100[1,2]	70[1]
Coastal Klamath	70%	475	200	100
Korbel	65%	200	200	70[1]
Humboldt Bay	60%	200	200	70[1]

Notes
1 Maximum SSS zone is equal to the RMZ width; but the RSMZ prescriptions will apply.
2 There are no data available for Class II-2 watercourses in the Smith River HPA Group; values presented here are based on Class I watercourses which is assumed to be more restrictive.

The physical characteristics of streamside slopes that deliver sediment from landslides to Class-I and Class-II watercourses were used to develop the criteria for defining steep streamside slopes. A field inventory of 471 non-road related shallow streamside landslides on Simpson's ownership in the HPAs formed the basis for determining the physical characteristics of SSS zones. A more complex method of identifying slopes prone to shallow landslides based on current GIS topographic data (i.e. SHALSTAB or SINMAP) was not employed since available digital terrain models (DEMs) often underestimates slope gradients along slopes leading into watercourses and therefore would underestimate the landslide risk.

For logistical reasons, the initial field inventory was directed to those areas where aerial photographs revealed a relatively high concentration of recent failures. Data collected in the field inventory included landslide type, slope gradient, distance of the landslide headscarp from watercourse transition line and volume of sediment delivery. Landslides were classified according to a simplified version of Cruden and Varnes (1996). Slope gradients were measured using hand-held clinometers. Headscarp distances were measured from the watercourse transition line to the crowns of landslides using a range finder. Volume of sediment delivery was estimated from direct field observation.

A relatively simple relationship between slope gradient, headscarp distance from watercourse, and cumulative landslide delivery volumes form the basis for determining minimum SSS slope gradients and maximum slope distances. Because management goals are focused on reducing the amount of sediment delivered to stream systems, distance and slope gradient relationships were based on landslide delivery volumes instead of landslide frequency. The distance and slope gradient relationships with cumulative landslide delivery volume are illustrated as graphs in Figures 6-3 and 6-4). Criteria used to develop minimum steep streamside slope gradients were developed separately from that used for maximum slope distance.

Going forward, the SSS Delineation Study will be continued using a statistically valid sampling method as described in Section 6.3.5. The initial default minimum gradients and maximum distances for SSS zones can be modified pursuant to the results of this work, as discussed in Section 6.3.2, 6.3.5, and Appendix D.

6.3.2.3.2 *Steep Streamside Slopes: Slope Gradient*

With the exception of the Smith River and Coastal Klamath HPA Groups, a cumulative sediment delivery volume of 80% was used to determine minimum SSS gradients (Figure 6-3 and Table 6-6). In the Smith River and Coastal Klamath HPA Groups, the relatively strong and competent bedrock coupled with the deeply incised nature of the larger watercourses results in steeper streamside slopes in comparison to the other regions. In the Smith River HPA Group, 80% of the delivered sediment volume came from slopes that were 70% gradient or steeper. In the Coastal Klamath HPA Group, 80% of the delivered sediment volume came from slopes that were 85% gradient or steeper. Because the data may be biased towards steeper slopes and may not accurately assess the slope gradient on which the overburden soils are prone to failure, the minimum SSS gradient for the Smith River HPA Group was reduced to 65% and the Coastal Klamath HPA Group was reduced to 70%, both pending additional analysis. This slope gradient reduction provides a more conservative value whereby SSS prescriptions would be applied.

The critical slope gradients found in Table 6-6 and Figure 6-3 may increase or decrease for each watershed pending the analysis of additional streamside landslide data collected in the SSS Delineation Study. For a slope break to truncate an SSS zone before its maximum distance, the slope break must be of a sufficient decline in slope gradient (below the minimum slope gradient for the given HPA) and of sufficient distance that it may be reasonably expected to impede sediment delivery to watercourses from shallow landslides originating above the slope break.

6.3.2.3.3 *Steep Streamside Slopes: Slope Distance*

With the exception of the Coastal Klamath HPA Group, a cumulative sediment delivery volume of 60% was used to determine maximum SSS distances (Figure 6-4 and Table 6-6). In Coastal Klamath HPA Group, the relatively strong and competent bedrock coupled with the deeply incised nature of the larger watercourses results in substantially longer streamside slopes in comparison to the other regions. In this area, the maximum slope length of the default SSS zone was based on 80% of measured sediment delivered to streams by shallow landslides that initiated on streamside slopes (i.e. the headscarp of measured slides are located at or below this distance).

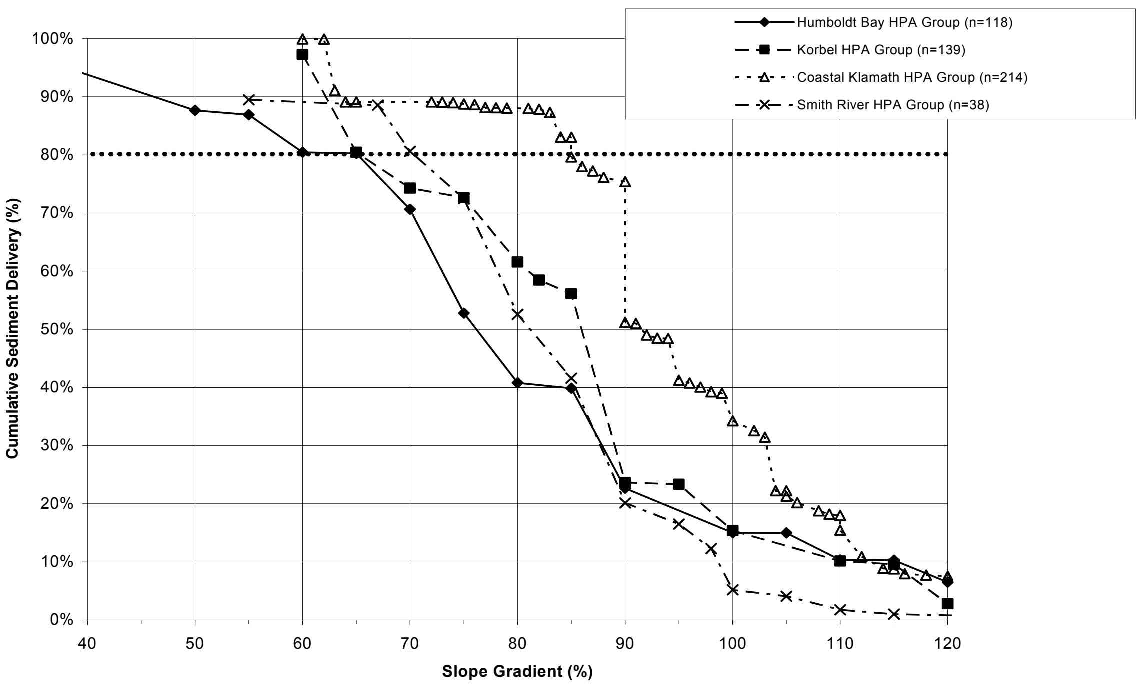


Figure 6-3. Cumulative landslide delivery vs. slope gradient.

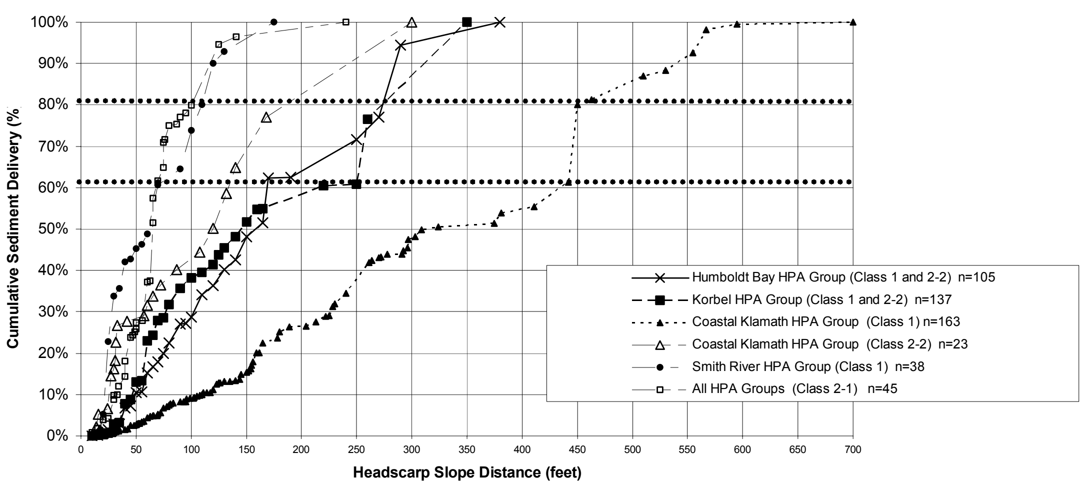


Figure 6-4. Cumulative landslide delivery volume vs. headscarp slope distance.

Total sediment volumes were plotted at the maximum headscarp distance rather than averaging the landslide volume over the slide length or attempting to determine the location of initiation of slope failure. It is important to keep in mind that the use of headscarp distance is a conservative approach since the initiation point of a slope failure is typically located some distance downslope from the headscarp. Therefore, the upslope delineation of the MWPZ as a function of headscarp distance is likely to provide an additional increment of risk reduction by protecting a portion of the hillslope above the probable initiation point.

In the Humboldt Bay and Korbel HPA Groups, Class I and Class II-2 watercourses are grouped together since the geomorphic characteristics of these two classes of watercourses are substantially similar. In the Coastal Klamath HPA Group, however, Class I and Class II-2 watercourses are grouped separately since the geomorphic characteristics of these two classes of watercourses are apparently different. In the Smith River HPA Group, Class II-2 data were unavailable and therefore results are based on Class I measurements. In general, Class I watercourses tend to be more deeply incised and have longer SSS zones compared to Class II-2 watercourses. This is illustrated by the landslide data (Figure 6-4).

As indicated in Section 6.2.2.1.3, SSS zones will be divided into an inner zone (RSMZ) and an outer zone (SMZ). A RSMZ is a subset of a RMZ but where slopes exceed the minimum SSS gradients. The maximum slope distance of a RSMZ is equal to that of a RMZ. The width of the SMZ will be either the remainder of the distance to a qualifying slope break or to the maximum SSS distance from the watercourse for that HPA Group, whichever is shorter.

The RSMZs will be comprised of an inner zone and an outer zone. The inner zone of RSMZs on all Class I watercourses will be 70 feet, except where a qualifying slope break exists within that distance the RSMZ inner zone may only extend to the slope break, and the outer zone, if any, will be the remainder of the applicable RMZ distance except where a qualifying slope break exists within that distance. The inner zone of RSMZs on all Class II watercourses will be 30 feet, except where a qualifying slope break exists within that distance then the RSMZ inner zone may only extend to the slope break, and the outer zone, if any, will be the remainder of the applicable RMZ distance except where a qualifying slope break exists within that distance. A conceptual illustration of an RMZ and an opposing SSS with an SMZ and inner and outer RSMZ zones is shown on Figure 6-5.

The maximum SSS slope distances found in Table 6-6 and Figures 6-4 and 6-5 may increase or decrease pending the analysis of additional streamside landslide data collected during the SSS Delineation Study for each HPA.

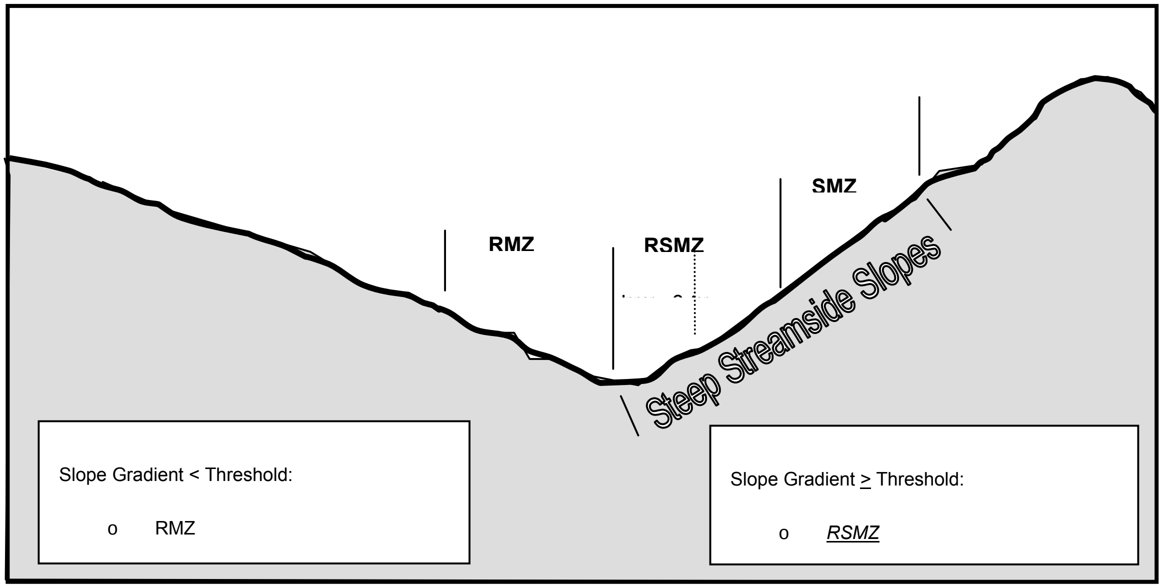


Figure 6-5. Conceptual RMZ and an opposing SSS with an SMZ and inner and outer RSMZ.

6.3.2.3.4 Steep Streamside Slopes' Prescriptions: Silviculture and Roads

Tree retention will be greatest along the lower slope positions in RSMZs, where slope failures are expected to have an immediate effect on the aquatic system. Tree retention will decrease up-slope in SMZs. The higher level of retention along the lower slope positions will also limit the degree of ground disturbance that might otherwise result in greater amounts of surface erosion. In addition, tree retention will be greatest in RSMZs on Class I and Class II-2 watercourses where landslides tend to be larger and where LWD delivered to the stream channel from streamside landslides is expected to be most beneficial to fish habitat.

Only one harvesting entry will be allowed in SSS zones during the term of the permit.

RSMZ silviculture prescriptions are:

- In Coastal Klamath and Blue Creek HPAs, no harvesting in RSMZs.
- In all other HPAs on Class I and Class II-2 watercourses, no harvesting on the inner RSMZ band and 85% overstory canopy retention on the outer RSMZ band.
- In all other HPAs on Class II-1 watercourses, 85% overstory canopy retention on the inner RSMZ band and 75% overstory canopy retention on the outer RSMZ band.
- Where no SMZ is identified, the standard default prescriptions for RMZs will apply.

Initial default SMZ silviculture prescriptions are single tree selection, as defined in the Glossary, with a target for even spacing of residual conifers where the trees are available to allow it; and Retention of all hardwood. All species and size classes represented in pretreatment stands will be represented post harvest where feasible.

The intent of these prescriptions is to maintain a viable root network and some overstory canopy within the swale and steep side slopes. Single tree selection will limit the loss of root strength and provide canopy for rainfall interception and evapotranspiration.

Trees may be felled within RSMZs and SMZs (as well as RMZs) where necessary to create cable-yarding corridors or for safe falling of merchantable trees. Cable corridors will be no greater than 25 feet wide. The intent of this exemption is to provide for operational worker safety consideration when other options are deemed impractical and while still imparting the intended mitigation described in this document. Most sediment budget studies and erosion inventories for watersheds in northern California have documented that the frequency of shallow landslides from forest road systems (including skid trails and landings) is high compared to landslide rates in unmanaged forests or from the harvesting of timber alone. Most past road-related problems occur on slopes steeper than 65% and are generally attributable to loose, sidecast road fill perched on steep slopes or to road runoff concentrated and discharged onto such sidecast fill. Road-related impacts to the aquatic system can be managed by regulating where and how roads are constructed.

Where feasible, road construction will avoid RSMZs and SMZs. Where such zones cannot be avoided or where major road reconstruction is required, the road alignment will be evaluated by an RG and an RPF with experience in road construction in steep forested terrain. Upgrading and storm proofing of existing roads, where major reconstruction is not required, will be undertaken under the Road Management Plan.

The default prescriptions for SSS zones are summarized in Table 6-7.

6.3.2.4 Headwall Swales

Headwall swales are generally characterized by steep (typically greater than 70% gradient) convergent topography within steep valleys upstream of Class III watercourses, where accumulation of thick soils and shallow subsurface runoff tend to be concentrated. Many shallow debris slides and debris flows initiate in headwall swales (Dietrich et al. 1982). Headwall swales are also sometimes referred to as colluvial filled hollows.

The rate of landslides in headwall swales on northern California forestlands tends to be much less in comparison to failures originating along steep streamside slopes. For example, recent landslide inventories conducted in Bear River, Jordan Creek, and Freshwater Creek by Pacific Watershed Associates, report that landslides from steep swales comprised 9% to 22% of the total number of slides inventoried (PWA 1998, 1999a, b). This is consistent with the preliminary landslide data collected in Little River and Salmon Creek. In some watersheds, headwall swale areas may be quite numerous across the landscape. The intent of this measure is to identify those relatively high-risk swales where management activities are likely to result in failure during a stressing storm and apply the default prescriptions, or an alternative prescription pursuant to Section 6.3.2.

Table 6-7. Summary of default prescriptions for steep streamside slopes.

Watercourse	Inside RSMZ and within Steep Streamside Slope Zone		Outside RMZ but within Steep Streamside Slope Zone Maximum slope distance or to qualifying break-in-slope (whichever is shorter)			
	Inner Zone[1]	**Outer Zone**[1]	**Humboldt Bay HPA Group**	**Korbel HPA Group**	**Coastal Klamath HPA Group**	**Smith River HPA Group**
	(see HPA for minimum slope gradient)	*(see HPA for minimum slope gradient)*	*(≥60% slopes)*	*(≥65% slopes)*	*(≥70% slopes)*	*(≥65% slopes)*
Class I	*(0-70 feet)*	*(70-150 feet)*	*(150 – 200 feet)*	*(150 – 200 feet)*	*(150-475 feet)*	
	• No cut • No new roads or major road reconstruction without approved review	• 85% overstory canopy retention. • Harvest biased to redwood and only if unlikely to recruit. • No new roads or major road reconstruction without approved review	• Single tree selection with even spacing of residual conifers • Hardwood retention • No new roads or major road reconstruction without approved review	• Single tree selection with even spacing of residual conifers • Hardwood retention • No new roads or major road reconstruction without approved review	• Single tree selection with even spacing of residual conifers • Hardwood retention • No new roads or major road reconstruction without approved review	See footnote 2
Class II-2	*(0-30 feet)*	*(30-100 feet)*	*(100-200 feet)*	*(100-200 feet)*	*(100-200 feet)*	
	• No cut • No new roads or major road reconstruction without approved review	• 85% overstory canopy retention. • Harvest biased to redwood and only if unlikely to recruit. • No new roads or major road reconstruction without approved review	• Single tree selection with even spacing of residual conifers • Hardwood retention • No new roads or major road reconstruction without approved review	• Single tree selection with even spacing of residual conifers • Hardwood retention • No new roads or major road reconstruction without approved review	• Single tree selection with even spacing of residual conifers • Hardwood retention • No new roads or major road reconstruction without approved review	• See footnote 2
Class II-1	*(0-30 feet)*	*(30-70 feet)*			*(70-100 feet)*	
	• 85% overstory canopy retention. • Harvest biased to redwood and only if unlikely to recruit. • No new roads or major road reconstruction without approved review	• 75% overstory canopy retention. • No new roads or major road reconstruction without approved review	• See footnote 2	• See footnote 2	• Single tree selection with even spacing of residual conifers • Hardwood retention • No new roads or major road reconstruction without approved review	See footnote 2

1 Listed default prescriptions apply to the Smith River, Korbel, and Humboldt Bay HPA Groups. The Coastal Klamath HPA Group default prescriptions for RSMZs are no harvest and no new roads or major road reconstruction without approved review . The slope distance for RSMZs in the Coastal Klamath HPA Group is the same as described for the other HPA Groups. Trees may be felled for cable corridors or as needed for worker safety).

2 The maximum SSS distance is equal to the total RSMZ width; but the RSMZ prescriptions will apply.

6.3.2.4.1 Headwall Swale: Identification

Headwall swales and other areas where shallow landslide processes are most likely to occur will be identified using the SHALSTAB computer model (described below) coupled with field verification by an appropriately trained RPF or RG. Also, RPFs will receive field training that will allow them to identify headwall swale areas that may not be identified by the SHALSTAB model. The boundaries of a SHALSTAB-identified headwall swale can be adjusted according to field observations by appropriately trained field personnel.

SHALSTAB is a GIS-based slope stability model that uses topographically driven, steady-state shallow subsurface flow theory. The model assumes cohesionless soils and uses an infinite-slope representation of the balance of forces on soil masses to delineate the relative potential for shallow landslides across the landscape (Dietrich et al. 2000 (in press); Dietrich et al. 1992; Dietrich et al. 1993; Montgomery and Dietrich 1994). SHALSTAB identifies potential unstable areas based on both slope steepness and contributing upslope drainage area.

SHALSTAB calculates a dimensionless ratio (log q/T) that reflects soil hydrologic conditions and the relative likelihood of soil saturation that is associated with shallow landslide initiation. Validation studies conducted in 7 watersheds in northern California conclude that for topography defined by 10 meter resolution digital elevation model (DEM), a log (q/T) threshold of less than –2.8 delineates a portion of the landscape within which about 60% of the shallow landslides mapped from aerial photographs are found (Dietrich et al. 2000 (in press); Dietrich et al. 1998).

Field review of headwall swale areas will focus on slope characteristics that are considered at present to be most important to landslide processes in such areas. These characteristics include the steepness (typically greater than 70%) of the slopes, the relative degree of slope convergence, the appearance of a concave or inverted teardrop- or spoon-shaped slope, the presence of a build-up of colluvium, various vegetative indicators, and the apparent landslide history of the site and similar sites in the area.

6.3.2.4.2 Headwall Swale Prescriptions: Silviculture and Roads

The default silviculture prescriptions for headwall swales are:

- Single tree selection (as defined in the Glossary) with a target for even spacing of residual conifers where the trees are available to allow it; and retention of all hardwood. All species and size classes represented in pretreatment stands will be represented post harvest where feasible.

- Trees may be felled within these zones where necessary to create cable-yarding corridors or for the safe falling of merchantable trees. Yarding corridors will not be greater than 25 feet wide. The intent of this exemption is to provide for operational and worker safety considerations when other options are impractical while still imparting the intended mitigation described in this document.

- Only one harvesting entry will be allowed in headwall swales per the term of the permit.

Default silviculture prescriptions will apply to all headwall swales identified by the SHALSTAB computer model (>1/4 acre) using at least a 10 meter DEM and a q/T less than or equal to –2.8 which are field verified to exhibit characteristic slope qualities, unless an approved geologic review indicates that a particular landscape feature is not a high-risk site.

The intent of these prescriptions is to maintain a viable root network and some overstory canopy within the swale and steep side slopes. Single tree selection will limit the loss of root strength and provide canopy for rainfall interception and evapotranspiration. Typically, tree retention should be greatest along the axis of the headwall swales and decrease up-slope.

The impact of roads on headwall swales can be managed by regulating where and how roads are constructed. New road construction will avoid field verified headwall swales wherever feasible. Where such features cannot be avoided, or where road reconstruction is required, the terrain will be evaluated by a RG and RPF with experience in road construction in steep forested terrain. New or reconstructed roads in this terrain should be built to a high standard as prescribed by a RG and RPF. Upgrading and storm proofing of existing roads, where major reconstruction is not required, and road decommissioning in these areas will be undertaken under the Road Management Plan (Section 6.3.3).

The default prescriptions for headwall swales are summarized in Table 6-8.

Table 6-8. Default prescriptions for headwall swales.

Silviculture Prescriptions	• Single tree selection (as defined in the Glossary) with a target for even spacing of residual conifers where the trees are available to allow it; and retention of all hardwood. • All species and size classes represented in pretreatment stands will be represented on site after harvest where feasible. • Trees may be felled within these zones where necessary to create cable-yarding corridors or for the safe falling of merchantable trees. Yarding corridors will not be greater than 25 feet wide. The intent of this exemption is to provide for operational and worker safety considerations when other options are impractical while still imparting the intended mitigation described in this document.
Road Prescriptions	• Headwall Swales will be avoided where feasible. • Where such slopes cannot be avoided or where major road reconstruction is required, the road alignment will be evaluated by a California RG and California RPF with experience in road construction in steep forested terrain. • Upgrading and storm proofing of existing roads, where major reconstruction is not required, will be undertaken under the Road Management Plan

6.3.2.5 Deep-Seated Landslides

For purposes of this Plan, deep-seated landslides include translational/rotational rockslides and earth flows. These are typically relatively large-scale landslides with a relatively deep failure plane, particularly in comparison to shallow debris slides and channelized debris flows.

Translational/rotational rockslides are characterized by the relatively slow movement of a largely intact slide mass above a comparatively deep failure plane. The slide plane typically extends below the colluvial layer into the underlying and more competent bedrock. The landslide toe is typically found at the base of the hillside and is typically adjacent to a stream channel. Some "perched" landslides, however, may be located higher on the slope, and their toes may not impinge upon stream channels.

Commonly, larger landslides consist of several smaller slide blocks that coalesced to form the larger landslide complex. Differential movement between individual slide blocks is common. Most slides move incrementally in response to climatic or seismic events. Catastrophic failure of the slope is rare.

Sediment from deep-seated landslides is delivered to the stream system by stream bank erosion and shallow slope failures (debris slides and debris flows) occurring along the toe of the slide and the watercourses draining the interior of the slide mass.

Earthflows are characterized by slow progressive deformation or creep of the slide mass in a semi-viscous, plastic state. Most earthflows are comprised of a heterogeneous mixture of fine-grained soils and rock (most commonly found in areas underlain by Franciscan mélange bedrock). The degree of activity varies among earthflows. Most lie dormant or exhibit very slow rates of movement while some move somewhat faster. Rapid movement and catastrophic failure of earthflows is relatively uncommon and unlikely. The materials in earthflows typically erode easily, often resulting in gullying and irregular drainage patterns.

In general, large-scale deep-seated landslides are considered less sensitive to most forest management activities compared to shallow landslides. The principal effects of forest management on deep-seated slope stability from the geotechnical perspective include: increased soil moisture from reduced rainfall interception and reduced evapotranspiration, undercutting or overloading of the slide by roads or skid trails, and delivery of concentrated surface runoff from roads or skid trails from areas outside the natural contributing area to the area of the landslide. The potential impact of harvest activities on the stability of deep-seated landslides may be partially mitigated by retaining a component of the timber stand on and upslope of active or historically active landslides and constructing or reconstructing roads across such slides under the guidance of an experienced geologist or geotechnical engineer.

Unlike shallow-seated landslides, nearly all deep-seated landslides are reactivations of existing slides with comparatively few initiating in new locations. Therefore, management objectives are focused on existing slides. Because it is assumed that the impact of harvest activities is greater on active slides than on dormant slides with respect to sediment production, conservation measures for deep-seated landslides will apply only to deep-seated landslides that meet the criteria described in 6.3.2.5.1.

6.3.2.5.1 Deep-Seated Landslides: Identification

Deep-seated landslides can be identified in aerial photographs or in the field based on various criteria described in the FPRs, California Department of Conservation Division of Mines and Geology publications, and many other publications. For purposes of this Plan, a deep-seated landslide must exhibit either of the following two criteria for this measure to apply:

1. A scarp or ground crack that exhibits at least 3 inches of horizontal displacement or at least 6 inches of vertical displacement that typically exposes bare mineral soil, but that may be partially revegetated, and where field observations clearly indicate that the movement occurred within approximately the past 50 to 100 years, or

2. A convex, lobate landslide toe that exhibits evidence of activity within approximately the past 50 to 100 years.

6.3.2.5.2 Deep-Seated Landslide Prescriptions: Silviculture and Roads

Where the first criterion is exhibited, there will be no harvesting within 25 feet upslope from the identified active scarp or active ground crack. Where the second criterion is exhibited, there will be no harvesting on the toe and no harvesting within 25 feet upslope from the inflection point of the active convex, lobate landslide toe. Where neither criterion is exhibited, other Plan conservation measures may apply and the California FPRs will apply, but no default prescription will be required. The California FPRs also will apply to all parts of deep-seated landslides.

The intent of these prescriptions is to provide tree retention that maintains a viable root network to mitigate possible headward regression of the headscarp and shallow landslides that might occur on the toe and result in sediment delivery to a watercourse. A possible benefit of these conservation measures on some landslides will be some measure of rainfall interception and evapotranspiration to reduce the migration of water from the crown area into the slide mass, although this may not be related to sediment delivery in all cases. The conservation measures for deep-seated landslides are subject to alternative prescriptions, as described in Section 6.3.2.

Trees may be felled within these no cut zones where necessary for worker safety or to create cable-yarding corridors. Such yarding corridors will not be greater than 25 feet wide. The intent of this exemption is to provide for operational and worker safety considerations when other options are impractical while still imparting the intended mitigation described in this document.

The impact of roads on deep-seated landslides can be managed by regulating where and how roads are constructed. No new roads will be constructed across deep-seated landslide toes or scarps that meet the criteria for this measure, or on steep (>50% gradient) areas of dormant slides, without approval by a RG and RPF with experience in road construction in steep forested terrain. Upgrading and storm proofing of existing roads, where major reconstruction is not required, will be undertaken under the Road Management Plan.

The default prescriptions for deep-seated landslides are summarized below in Table 6-9.

Table 6-9. Default prescriptions for deep-seated landslides

Historically Active	**Landslide Toe** • A historically active deep-seated landslide toe is defined as the area below the inflection point of the convex, lobate landform at the downslope end of the landslide that exhibits evidence of activity within approximately the past 50 to 100 years. In these areas the following default prescriptions will apply: • No cut zone within the toe and no-cut 25 feet upslope from the inflection point of a historically active toe. • Where a historical active toe is not present, standard RMZ, RSMZ, and SMZ prescriptions will apply. • No new roads will be constructed across historically active landslide toes without an approved field review. • Pre-existing roads within these areas will be evaluated and prioritized for decommissioning according the road management plan **Landslide Scarp** • A historically active deep-seated landslide scarp will be defined as any ground crack or scarp on a deep seated landslide that exhibits at least 3 inches of horizontal displacement or at least 6 inches of vertical displacement that typically exposes bare, mineral soil, but that may be partially revegetated, and were active within approximately the past 50 to 100 years. In these areas the following default prescriptions will apply: • No cut zone within 25 feet upslope from the historically active scarp, • Where there are no discernable historically active ground cracks or scarps that exhibit at least 3 inches of horizontal displacement or at least 6 inches of vertical displacement, standard RMZ, RSMZ, SMZ and Headwall Swale Protection will apply. • No new roads will be constructed across historically active scarps without an approved field review. • Pre-existing roads crossing scarps these areas will be evaluated and prioritized for decommissioning according the road management plan.
All Activity Classes	• Standard RMZ, RSMZ, SMZ and Headwall Swale Protection will apply. • No new roads or major road reconstruction across toe slopes steeper than 50% without geologic input from a California licensed Geologist. • No new skid trails or major skid reconstruction across toe slopes steeper than 50% without geologic input from a California licensed Geologist.
Other	• Trees may be felled within no cut zones where necessary to create cable-yarding corridors for the safe falling of merchantable trees. Yarding corridors will not be greater than 25 feet wide. The intent of this exemption is to provide for operational and worker safety considerations when other options are impractical while still imparting the intended mitigation described in this document.

6.3.2.6 Shallow Rapid Landslides

Shallow rapid landslides are typically characterized by an arcuate headscarp and somewhat distinct sidescarps that can be approximately 1 foot to 10 feet deep, a partly or fully depleted source area and transport reach (commonly a bare scar), and a deposition zone, which may be subdued or eroded away. These landslides are commonly vegetated with brush, pioneering hardwood trees, and sometimes conifers, or they may be relatively devoid of vegetation. Older slides may support varying amounts and types of vegetation. Small groundwater seeps are sometimes found within landslide boundaries.

This conservation measure will apply to only those shallow rapid landslides that are field verified to be active or which are likely to be reactivated by harvesting, and that have a reasonable potential to deliver sediment directly to a watercourse, and that are at least 200 square feet in plan view. It is expected that in some cases, an RPF will be able to determine if a landslide meets these criteria, and in other cases, an RG may be necessary to make this determination. This conservation measure will not apply to road related failures. Road related failures will be addressed by the road maintenance plan.

The default prescription for landslides that do meet the above listed criteria will be no cut within the landslide boundaries, and a minimum of 70% overstory canopy within 50 feet above a slide and 25 feet on the sides of a slide. The intent of this conservation measure is to minimize any backwasting of landslide scarps or erosion of the scarps, scar, or deposit that might result in ongoing sediment delivery. Site specific geologic review of this default prescription, pursuant to Section 6.3.2, may result in an alternative prescription for shallow rapid landslides. Simpson's new road construction will avoid landslides that meet the above listed criteria wherever feasible. Where such areas cannot be avoided or where major road reconstruction is required, the terrain will be evaluated by a RG and RPF with experience in road construction in steep forested terrain.

6.3.3 Road Management Measures

6.3.3.1 Introduction

Road related risk assessment is focused on identifying potential sediment delivery sources from areas such as the road surfaces, in-board ditches, side-cast from the road prism or at watercourse crossings. The amount of road-related sediment entering watercourses is highly variable, but in some watersheds, may comprise a large percentage of management related sediment delivery. The definition of "risk" for roads is strictly related to sediment delivery into watercourses and does not include events such as fill slope and cut bank failures that will not deliver sediment to a stream. Any potential fish passage problems also will be documented during the road related sediment risk assessment. Culverts that are impeding fish passage will be prioritized for replacement with a bridge or other "fish friendly" structure.

6.3.3.1.1 Road-related Sediment Sources

Three geomorphic processes are responsible for sediment delivery from roads: 1) surface erosion; 2) road related landslides (mostly from the fill slope, but also including some cut-bank failures); and 3) watercourse crossing failures (washouts and diversions).

In general, chronic surface erosion delivers sediment every winter, whether or not there are any large storms. Sediment delivery from chronic road erosion is generally greatest on roads that are used during the winter, and where ditches are connected to watercourses. Newly constructed roads also exhibit increased risk of surface erosion for the first several years following construction. Roads that are abandoned and overgrown typically contribute far less sediment from chronic surface erosion. Although chronic surface erosion represents a threat or risk to the aquatic system, it is not one that results in catastrophic sediment inputs.

Sediment delivery from road-related landslides and watercourse crossing failures are more episodic in nature, and are linked to large storm events. The more extreme the hydrologic event, the more frequent and larger are the failures from these two sediment sources. These episodic sediment sources deliver relatively large quantities of sediment (including both fine and coarse grain sizes) to watercourse channels. The risk is typically greatest on old or abandoned roads with undersized culverts that are not properly maintained.

6.3.3.2 Risk Assessment

6.3.3.2.1 Transportation Plan

Simpson has developed a preliminary transportation plan for its road network that categorized truck roads into three classes:

- management roads,
- temporarily decommissioned roads, and
- permanently decommissioned roads.

Management roads are defined as roads that are needed to either support long term management activities on the property or provide access to timber that will be harvested within the next 20 years. There are two sub-classifications of management roads 1) mainline roads and 2) secondary roads. Mainline roads support significant amounts of traffic annually from major tracts of timber or provide the main access into a tract for non-harvest management activities. Secondary roads support periodic traffic into portions of tracts with the level of use dependent upon location of harvest units. Management roads will be maintained for seasonal or year-round use (depending on their surface). Some management roads will change to a decommission category as timber harvesting operations along them are completed.

Temporarily decommissioned roads are those roads that may be used again in the future (typically unused for 20 years). A schedule will be developed for decommissioning these roads throughout the Plan Area. Decommissioning is described in Section 6.3.3. and will include pulling all watercourse crossings, backsloping of fills at crossings to the approximate natural slope contours, waterbarring road surfaces (including interception of the ditch line), pulling back excess overburden where there is a significant risk of fill failure that would deliver sediment to a watercourse, and grass seeding and mulching of cut and fill surfaces exposed during decommissioning operations. Assessment may show that some roads or road segments are completely revegetated, and no longer pose a threat to aquatic systems. These roads are in a condition that would render the disturbance, inherent in decommissioning, counter-productive.

Permanently decommissioned roads are roads that will not be needed for future management activities. Most of the roads that will be permanently decommissioned are those that were constructed on unstable slopes, or within or adjacent to riparian zones. Treatment of permanent decommission roads are essentially the same as the treatment for temporarily decommissioned roads. The storage location of waste material could be different between permanent and temporary decommissioning, but the distinct difference is the intent of future use. Permanently decommissioned roads are not intended to be used again at any point in time in the future. Assessment may show that some roads or road segments have been abandoned for such a long time that they are completely revegetated, no longer pose a significant threat to aquatic systems. These roads are in a condition that would render the disturbance inherent in decommissioning counter-productive.

Table 6-10 is a current projection of road miles that fits into each road classification. Presently, the majority of the roads are in a management status, however, the table shows the course the road plan will lead as the plan is implemented over time. Throughout the life of the plan, the mileage of management roads is anticipated to decrease and the mileage of decommissioned roads is expected to increase (both temporary and permanent). See Section 6.3.3 for a description of the road plan implementation schedule. The intent is to decrease the mileage of management roads over time. Every five years the entire classification system will be reviewed to ensure that management roads are no longer needed for log transportation or administrative access are changed to the appropriate decommission status. Roads newly constructed pursuant to THPs will be classified using this system, but will not contribute toward the treatment implementation total. The newly constructed roads will be built to the higher standards and will not require treatment.

Table 6-10. Miles of road in road class as projected from current GIS classification.

Road Classification	Miles
Management roads	2195
Temporary decommissioning	1397
Permanent decommissioning	103

6.3.3.2.2 Prioritization of Sub-Watershed RWUs

The Plan Area will be divided into two areas from which sub-watershed RWUs will be established and prioritized: 1) Lower Klamath River and 2) remaining portion of Simpson's ownership in the HPAs.

Basins within Simpson's ownership outside of the Lower Klamath River were divided into 28 sub-watershed RWUs that range in size from 2,000 to 21,500 acres. To facilitate watershed prioritization for assessment, the units were delineated by: 1) individual hydrologic watersheds; 2) grouping small individual hydrologic watersheds; or 3) separating larger watersheds into two or more smaller watersheds. These sub-watershed work units were prioritized for assessment based on biological, geomorphic, and road-related management criteria (Table 6-11). Biological factors used in the prioritization included species occurrence and habitat quality. A work unit received a point for each Covered Species known or suspected to be present (range 0-6). In addition, biologists qualitatively ranked each unit from low (1) to high (6) based on habitat quality. A rating of 6 represented very high habitat quality for the Covered Species present, 5 (high), 4 (high-moderate), 3 (moderate), 2 (low-moderate), 1 (low).

Geomorphic and road-related management criteria used in the screening level risk assessment include stream density (mi/mi^2) and road density (mi/mi^2). Road related erosion that results in sediment delivery typically occurs at a few relatively predictable geomorphic locations. Generally, the more frequently these "susceptible" locations occur along a road, the greater will be the chance for accelerated erosion and sediment delivery. These "weak points" or "susceptible locations" include watercourse crossings, locations where roads have been constructed across steep inner gorge hillslopes, and locations where roads have been built across the steep approaches to incised tributary stream channels. High stream and road densities were used as a surrogate for more "susceptible" sites which established the watercourse crossing risk. Sub-watersheds that had higher stream and road densities received a higher priority. Road densities for the sub-watershed RWUs range from 2.8 to 8 mi/mi^2 and the stream densities range from 4.6 to 8.9 mi/mi^2. The road density and stream density for each work unit was averaged and multiplied by 0.7177 to construct the watercourse crossing risk scale with a range from 2.86 to 6. A slope risk was also established for each work unit which incorporated slope steepness and road density. A GIS analysis calculated the proportion of area in each work unit by slope classes that ranged from 0-30%, 31-50%, and >50%. A weighting procedure was applied to each slope class. The proportion of the work unit in the >50% slope class was multiplied by 5, the proportion of the work unit in the 31-50% slope class was multiplied by 2, and the proportion of the work unit in the 0-30% received no weighting. Next, each work unit received a road density rank of 1 if the road density ranged from 2.8 to 4.5, a 2 if the road density ranged from 4.6 to 6.2, or a 3 if the road density ranged from 6.3 to 8.0. To determine the slope risk value for each work unit, the sum of the weighted slope classes was added to the road density rank. Sub-watersheds that had steeper slopes and higher road densities received a higher priority. This process standardized the slope classes and the road and stream densities so the biological, geomorphic, management criteria had equal weight when determining the overall priority rank of the sub-watershed work units. The maximum total score possible for any work unit was 24.

Table 6-11. Road work unit prioritization criteria for Simpson's ownership, excluding the Lower Klamath Road Work Unit.

Sub-watershed Road Work Units		Ranking				Total	Rank
		Covered Species Occurrence	**Habitat Quality**	**Slope Risk**	**Watercourse Crossing Risk**		
	(area included)	High=6	High=6	High=6	High=6	High=24	
South Little River	(Upper S.F., Lower S.F., S.F, Bullwinkle, Mainstem Little River)	6	5	4.67	6.00	21.67	**1**
S. F. Winchuck	(S.F. Winchuck)	6	5	4.80	5.37	21.16	**2**
Rowdy	(Rowdy, S.F. Rowdy, Ravine, Savoy)	6	5	4.07	5.35	20.44	**3**
Wilson	(Wilson)	6	4	5.30	4.69	20.00	**4**
Long Prairie	(Canyon, Railroad, Mule, Long Prairie, Pollock,	6	5	3.87	4.47	19.34	**5**
	Bald Mtn., Jiggs, Hatchery, Sullivan, Watek)						
Maple Creek	(Gray, Beach, M-Line, Clear)	6	4	3.90	5.16	19.06	**6**
North Little River	(Water, Freeman, Railroad)	6	3	4.36	5.00	18.36	**7**
Dominie	(Dominie, Ritmer, Lopez, Gilbert)	5	4	3.66	5.22	17.88	**8**
Jacoby Creek	(Jacoby Creek, Cloney, Washington, Rocky, Janes)	6	2	4.44	5.13	17.57	**9**
Lindsay Creek	(Powers, Mill, Hall, Lindsay, Essex, Mill, Widow White, Strawberry)	4	4	4.15	5.27	17.42	**10**
Dry Creek	(Devil, Dry, Blackdog, Boundary, Putter, Quarry)	4	3	5.47	4.91	17.38	**11**
Salmon Creek	(Salmon Creek)	5	3	4.58	4.70	17.28	**12**
Panther Creek	(Panther, Coyote)	5	4	3.98	3.98	16.96	**13**
Ryan Creek	(Ryan Creek et al.)	4	3	4.56	5.06	16.62	**14**
N.F. Maple Creek	(Diamond, Pitcher, N.F. Maple)	6	4	2.32	3.89	16.21	**15**
Canon Creek	(Maple, Simpson, Cañon, Vincent)	5	2	4.55	4.53	16.08	**16**
East Little River	(Mainstem above barrier)	4	4	3.54	4.49	16.03	**17**
Gossinta	(Krueger, Jackson, Denman, Gossinta, Poverty)	4	2	4.71	4.87	15.59	**18**
Basin	(Dolf, Tyson, East Fork North Fork)	4	3	3.47	4.48	14.95	**19**
Goose	(Goose)	4	3	4.04	3.74	14.78	**20**
Little Mill	(Peacock, Sultan, Little Mill, Hutsinpillar,	4	3	3.69	3.99	14.68	**21**
	Tryon, Camp Six, Fort Dick)						
Eel/VanDuzen	(Eel/VanDuzen et al.)	3	1	4.78	4.62	13.39	**22**
Noisy Creek	(Noisy, Lake Prairie, Pardee, Snow Camp)	4	3	2.68	3.16	12.84	**23**
McDonald Creek	(McDonald)	4	2	2.95	3.85	12.80	**24**
Dolly Varden	(Dolly Varden, Toss-up, Lupton)	3	3	2.92	3.58	12.50	**25**
Joe Marine	(Aikens, Joe Marine, Cananaugh, Gist,	3	3	2.91	2.86	11.77	**26**
	Bens, Burrill, Pine, Devil, Cappell)						
Coastal Tribs	(Burris, McNeil, Mill, McConnahas, Luffenholtz)	2	2	3.10	4.36	11.47	**27**
Boulder Creek	(Madrone, Graham, Goodman, Boulder)	3	1	2.96	3.27	10.22	**28**

In 1995, the Lower Klamath Restoration Partnership (LKRP), developed a "Watershed Restoration and Enhancement Plan" for the Lower Klamath River. To facilitate and enhance existing partnership established between Simpson and the Yurok Tribe, the prioritization plan already established for the Lower Klamath Basin was utilized. That plan identified 30 sub-watershed RWUs within the Lower Klamath River for prioritizing assessment work. These 30 sub-watershed work units were similarly prioritized for assessment based on biological, in-stream, and upslope parameter (Table 6-12). Two categories were established for each parameter, resulting in 6 scoring criteria. Each criteria was scored on a scale from 1-5, with a maximum total score possible of 30. Stream drainage area was used as a tiebreaker for any streams that received equal scores, with larger watersheds receiving priority. This was based on the assumption that all other things being equal, a larger watershed has a greater biological production potential.

The first two parameters were developed with the intent of ranking work units based on the diversity and significance of fish populations and the overall condition and accessibility of in-stream habitat. Unlike the other prioritization criteria, these criteria do not include the amphibian Covered Species, however, both amphibian species are ubiquitous throughout the Lower Klamath region and would not affect the overall ranking of any given sub-watershed work unit.

The upslope parameter factors in road and watercourse crossing densities, which like the prioritization criteria established for the ownership outside the Lower Klamath River, were used as a surrogate for more "susceptible" sites. Sub-watersheds in the best biological and physical condition and with the largest number of potential erosion sites received a higher priority rank. See Gale and Randolph (2000) for a detailed description of the ranking criteria that was used in the prioritization Table 6-12 from the Lower Klamath River sub-basin watershed restoration plan.

6.3.3.2.3 Assessment of Road Network

Simpson will coordinate assessment activities using both prioritization tables beginning in the highest priority RWUs. Road-related sediment sources from truck roads will be identified through a two-step process of air photo analysis and field inventories. An analysis of the available historical aerial photos will be conducted to identify all the roads that were constructed in the watershed, whether they are currently maintained and driveable, or are now abandoned and overgrown with vegetation. When possible, photographic coverage from a number of years will be selected to "bracket" major storms in the watershed. This analysis will lead to the construction of detailed land use and erosion history maps for the watershed, including road location and road construction history. Finally, field inventories and site analyses will be conducted to identify and quantify road-related sediment sources and to develop plans for erosion reduction or prevention. Culverts that are identified on fish bearing watercourses during the assessment will be documented for high priority replacement with a "fish friendly" crossing. The field inventories of the RWUs should precede implementation no more than a few years. The time period is dependant on the weather conditions since the data were collected.

Table 6-12. Lower Klamath River road work unit prioritization criteria.

Sub-Basin	Anadromous Salmonid Diversity (1-5)	Relative Biological Importance (1-5)	Channel & Riparian Condition (1-5)	Habitat Connectivity (1-5)	Road Density (1-5)	Stream Crossing Density (1-5)	Total (1-30)	Rank (1-30)
Mainstem Blue Creek	5	5	5	5	2	2	24	1
Crescent City Fork	5	5	5	5	1	1	22	2
Terwer Creek	5	5	4	3	2	2	21	3
Tectah Creek	4	5	3	3	2	3	20	4
McGarvey Creek	4	4	3	4	3	2	20	5
Mettah Creek	4	4	3	4	2	2	19	6
South Fork Ah Pah	3	3	2	2	4	5	19	7
West Fork Blue Creek	3	3	3	4	2	3	18	8
Mainstem Ah Pah	3	3	2	2	5	3	18	9
Roaches Creek	3	3	3	3	2	3	17	10
Hunter Creek	5	4	2	2	2	2	17	11
Hoppaw Creek	4	3	2	1	3	3	16	12
Nickowitz Creek	2	3	4	4	1	1	15	13
North Fork Ah Pah	3	2	3	3	2	2	15	14
Bear Creek	3	2	2	2	3	3	15	15
Johnsons Creek	4	3	2	2	2	2	15	16
Pine Creek	3	3	3	3	1	1	14	17
Pecwan Creek	3	2	3	2	2	2	14	18
Tully Creek	1	3	3	3	2	2	14	19
Slide Creek	1	3	4	4	1	1	14	20
Surpur Creek	3	1	1	2	4	3	14	21
Tarup Creek	4	2	2	1	3	2	14	22
Cappell Creek	1	2	3	2	2	2	12	23
Waukell Creek	2	1	1	1	4	3	12	24
High Prairie Creek	2	1	3	1	2	2	11	25
Salt Creek	2	2	2	2	2	1	11	26
Morek Creek	1	1	3	2	2	2	11	27
Little Surpur Creek	1	1	1	2	3	3	11	28
Omagaar Creek	3	1	2	1	2	2	11	29
Saugep Creek	2	1	1	2	3	2	11	30

The two most important factors that will be used to evaluate the risk of road-related sediment delivery include: 1) an assessment of the probability of erosion or failure at all "susceptible" points along the alignment ("erosion potential") and 2) an estimation of the volume of potential sediment delivery to a stream (if no preventive work were done). These two factors will form the basis of the road assessment, and the data collected will be used to develop a cost-effective plan for mitigating or preventing road-related sediment delivery.

The most common sediment source sites include watercourse crossings, potentially unstable road and landing fills, and "hydrologically connected" road segments which exhibit surface erosion and sediment delivery. For the detailed field assessment, aerial photographs will be used to record site locations. A data form will be completed for each potential sediment delivery site identified in the field which will be stored in a database. Road failures or erosion features with no potential to deliver sediment to a stream will not be included in the inventory.

Once sites are identified and quantified, prescriptions for erosion control and erosion prevention will be developed for each source of treatable erosion. Prescriptions developed during the field inventory include types of equipment needed, equipment hours, hand labor for culvert installation, downspouts, seeding and mulching, estimated costs for each work site and quantitative estimates of expected sediment savings.

6.3.3.2.4 Implementation Prioritization

Following development of treatment prescriptions, roads will be prioritized for treatment based on: 1) future sediment delivery (yds^3/site or yds^3/mile); 2) treatment immediacy (a subjective combination of event probability and sediment delivery which is evaluated as High, Moderate or Low); and 3) treatment cost-effectiveness. The estimated cost-effectiveness of treating a work site is defined as the amount of money that would be spent to prevent one cubic yard of sediment from entering or being delivered to the stream system, expressed as $/$yd^3$ (dollars spent per cubic yard of sediment "saved"). The estimated cost effectiveness will be calculated for each individual site recommended for treatment or for groups of sites along a single road.

By using this quantitative methodology, a variety of different techniques and proposed projects can be using the same criteria, and a prioritized list of proposed erosion prevention treatments can be developed for each road or for individual road segments and spur roads.

Some sites that have a low cost-effectiveness may be critically important to treat because of a large volume of potential sediment delivery and a high likelihood of occurrence of a triggering event. These sites will receive priority for treatment, even if the road on which they occur does not otherwise rank high on the list of treatment candidates.

Generally, individual sites will be given priority for upgrading or decommissioning treatment if they exhibit: 1) potential for substantial (>25 yds^3) sediment delivery to a Class I or II channel, 2) a high or moderate treatment immediacy, and 3) a predicted cost-effectiveness value averaging no more than about $15/$yd^3$. Roads or road segments will be prioritized for treatment if they contain an unusually large number of sites with a high treatment immediacy (#H/mile), or if they display a comparatively large unit future sediment delivery volume (yds^3/mile).

6.3.3.2.5 Implementation Plan and Accelerated Schedule

The final product from road assessment and treatment prioritization will be an implementation plan that involves one of three outcomes: 1) temporary road decommissioning, 2) permanent road decommissioning, and 3) road upgrading.

Simpson will treat all high and moderate sites by the end of the Permit period. Simpson will front load the treatment implementation by providing for an average of $2.5 million per year for the first 15 years (for a total of $37.5 million unless adjusted as provided below) on implementing the treatment of high and moderate priority sites beginning in the high priority RWUs. The preliminary estimate of future sediment yield from high and moderate sites on roads within the Plan Area is 6,440,000 yds^3. A refined estimate of the future sediment yield (yds^3) from high and moderate sites will be made by the end of the first five years of Plan implementation. A stratified random sampling approach will be used in RWUs that have not been 100% inventoried. Fifteen to twenty percent of the roads within each RWU will be randomly sampled in 0.5-mile segments.

The estimated future sediment from each RWU will be added to the estimates from the 100% inventories. If the refined estimate is within ±5% of the original estimate (6,118,000 to 6,762,000 yds^3) there will be no change in the level of mitigation. If the refined estimate is within ±5-10% of the original estimate, the level of mitigation will adjust according to the sediment yield percentage difference in 1% increments (± $375,000 per 1% sediment yield difference) by increasing or decreasing the initial 15-year period by up to 1.5 years. If the refined estimate is more than ±10% of the original estimate (<5,796,000 or >7,084,000 yds^3), the level of mitigation will adjust to no more than ±$3.75 million for ±1.5 years of the first 15 years. The maximum extent of the accelerated commitment will be $2.5 million per year for 16.5 years and the minimum extent of the accelerated commitment will be 13.5 years. The $2.5 million commitment will be inflation adjusted in 2002 dollars each year of the accelerated term. All high and moderate sites, including those fixed on roads appurtenant to THPs, will count towards the $2.5 million. In general this will not dramatically shift the proposed prioritization schedule because a large proportion of Simpson's current harvest activities are in high priority RWUs. There will likely be a three-year implementation phase in period. A short-term time lag may occur between identifying specific road projects, acquiring necessary 1603 permits, locating capacity for the actual implementation, and completing required training courses. Simpson is expected to be at a full implementation level by the end of th[e] 3rd year (i.e. $7.5 million spent (inflation adjusted in 2002 dollars for each year)). On an annual basis the $2.5 million per year will be adjusted proportionally to reflect the acreage of the current Plan Area in relation to the acreage of the Initial Plan Area.

Examples of possible commitment level adjustments:

Example #1.

Original estimate:	6,440,000 yds^3
Refined estimate:	6,311,200 (2% less than the original estimate)
Commitment:	$2.5 million per year for 15 years

Example #2.

Original estimate:	6,440,000 yds^3
Refined estimate:	6,955,200 (8% more than the original estimate)
Commitment:	$2.5 million per year for 16 years plus $0.5 million the following year.

6.3.3.3 Training Courses

All equipment operators and supervisors involved with the implementation plan will complete training to ensure proper implementation of treatments. In addition foresters will complete a training course to ensure proper road layout and design. The training courses will be offered every year as necessary for new employees or contractors who will be involved with implementing the road plan. Refresher courses will be provided every two years as appropriate to review concepts and to introduce any new state-of-the-art techniques.

6.3.3.3.1 Purpose of Training

- To present technical training on the topics of proper road construction, road upgrading, road maintenance and road decommissioning practices with a dual emphasis on practicality as well as effective erosion and sediment control
- To build a company-wide understanding of state-of-the-art, cost-effective road treatments
- To make road treatment procedures uniform, consistent and up-to-date across the ownership
- To introduce new procedures and techniques to field personnel as they are developed or refined
- To bring Simpson operators and contractors up-to-speed on tasks and methods for proper road treatments
- To introduce new operators to the concepts and techniques for proper road treatments
- To work with supervisors to develop an understanding of the theory and proper application of the standards and practices for modern forest road treatments
- To work with foresters on identifying common road-related problems and developing effective and cost-effective treatment prescriptions for erosion prevention and sediment control

6.3.3.3.2 Training Format

Training for forest road activities and practices will consist of a four-phase procedure.

1. Office and classroom presentation of concepts and theory of road treatments; review of the difference between typical past practices and currently acceptable methods; slide presentation depicting road-related problems and appropriate treatments; comparison of effective and ineffective treatments; question and answer session.

2. Field workshop to view sites depicting various untreated problems, review of road reaches which have been correctly and appropriately treated; review of road reaches or sites showing examples of partially or incorrectly applied treatments.

3. Practical field workshop to observe and participate in proper road treatments and demonstration projects actively underway; discussions with other operators on techniques and practices employed in designing, staging and applying proper road treatments

4a. On-the-job training for foresters and supervisors on road design and layout, problem identification, problem quantification, prioritization and development of cost-effective treatments

4b. On-the-job application of road treatments with technical oversight and review of road treatment practices and operations (beginning with regular, repeated field review and terminating in intermittent checking of new or unusual operations, as needed)

6.3.3.3.3 Duration of Road Treatment Workshops and Training

- Phase 1 Office and class room — 2 - 4 hours
- Phase 2 Field workshop — 6 hours
- Phase 3 Practical field workshop — 8 hours
- Phase 4a On-the-job training for foresters and supervisors — Variable
- Phase 4b On-the-job training for operators — 2 - 6 months

6.3.3.3.4 Training Courses

1. Basic training in Road Decommissioning (foresters, supervisors and operators)

2. Basic training in Road Location and Design (foresters) and Road Construction (foresters, supervisors and operators)

3. Basic training in Road Upgrading (foresters, supervisors and operators)

4. Basic training in Road Maintenance (foresters, supervisors and operators)

6.3.3.4 Summary of Time Periods When Road Work May/May Not Occur

Table 6-13 summarizes the time periods when road decommissioning, upgrading, and new construction may occur in the Plan Area.

Table 6-13. Time periods when road work may/may not occur within the Plan Area.

Activity	Nov. 16 –April 30	May 1-May 14	May 15-Oct. 15	Oct. 16-Nov. 15
Road Decommissioning	None	None	Yes	Yes if (1, 3)
Road Upgrades	None	Yes if (2)	Yes	Yes if (1, 3)
New Road Construction	None	None	Yes	None
New Landing Construction	None	None	Yes	None

Notes
1. Cumulative rainfall from September 1st through October 15th is less than 4” and activity will cease when cumulative rainfall reaches 4”.
2. No measurable rainfall has occurred within the last 5 days and no rain is forecast by the National Weather Service for the next 5 days.
3. A project can be completed in one day and erosion control structures can be installed. If a site requires multiple days for completion, a long-range National Weather Service forecast of no rain for the next 5 days is required.

6.3.3.5 Road Decommissioning

The treatments listed below briefly describe some techniques for decommissioning roads and landings. Techniques described in Weaver and Hagans (1994) will generally be followed when decommissioning roads.

6.3.3.5.1 Time of Year Restrictions

Road decommissioning will not occur during the winter operating period (October 16th through May 14th) unless unseasonably dry weather persists in the fall at the beginning of the winter period (see Table 6-13). Unseasonably dry fall is defined as less than 4 inches cumulative rainfall from September 1st through October 15th. Road decommissioning will cease when 4 inches cumulative rainfall is reached or a National Weather Service forecasted rainfall amount will reach or exceed the 4 inch cumulative total. No road decommissioning will occur prior to May 15th or after November 15th.

Average weekly rainfall from the Fieldbrook 4D Ranch rain gauge from October 1956 through May 1986 was examined with respect to the average weekly discharge for Little River stream gage near Trinidad for the same period. The relationship between rainfall and stream flow response was examined to determine the amount of rainfall that was required to generate elevated and sustained stream flow above a summer base flow (Figure 6-6). From that examination, the week of October 9th through October 15th is the period where the stream flow begins to increase above a summer base flow. This week was then selected as the period where the average cumulative rainfall would indicate saturated soil conditions. For purposes of this evaluation, the beginning point for the cumulative rainfall was set on September 1st. Rainfall occurs prior to this date during the summer; however the amount is generally not sufficient to contribute to soil moisture storage. From inspection of the historical data, the average cumulative rainfall between September 1st and October 15th is 4 inches. October 15th also corresponds to the last day of the summer period. Therefore the 4 inch cumulative rainfall can be considered an indicator of when the soil first becomes saturated on average (as indicated by the increased stream flow response).

Based on this evaluation, road decommissioning can occur outside the summer period (after October 15th) during an unusually dry fall up through November 15th or when 4 inches of cumulative rainfall is reached (which ever occurs first). An unusually dry fall is defined as less than 4 inches of cumulative rainfall from September 1st through October 15th. The above analysis was based upon data from the Little River area but it will be applied to the entire Plan Area. This was the only area where there were data with sufficient record length or gauges in close proximity to perform the analysis. As more data become available (e.g. from project work from the Experimental Watersheds within Plan Area) the relationship between rainfall and stream flow response estimates may be refined.

Between October 15th and November 15th, each project site (i.e. watercourse crossing fill removal) will be completed that operational day with erosion control structures installed. If a site requires multiple days for completion (i.e. 2-3 days), a long-range forecast of no rain for the next 5 days is required. The intent is to have at least one operational day prior to a rain event to ensure erosion control structures are installed. Sites that require multiple weeks for completion will not be started during the winter period.

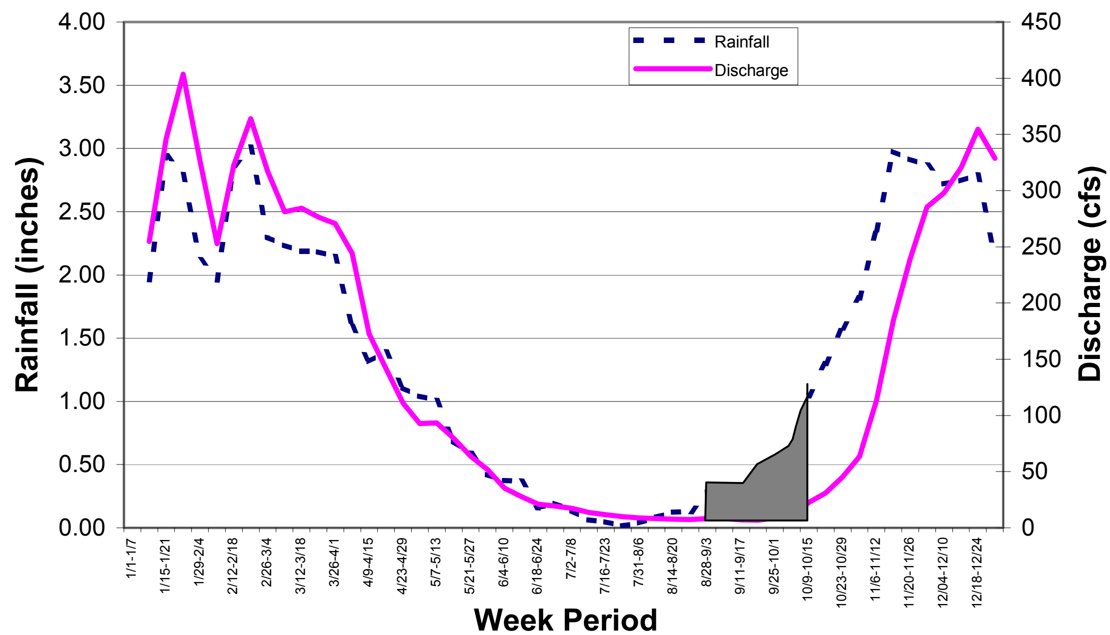


Figure 6-6. **Average rainfall for Fieldbrook 4D Ranch, CA, and average discharge for Little River near Trinidad, CA, by week from 10/1956 through 5/1986. Shaded area represents 4 inches of cumulative rainfall from September 1st through October 15th.**

6.3.3.5.2 Permanent and Temporary Decommissioning

Some roads have been abandoned and are in a condition where no treatment would be required because they are completely revegetated, no longer pose a threat to aquatic systems, and are in a condition that would render the disturbance inherent in decommissioning counter-productive. The road assessment process will determine whether treating certain roads or road segments would be counter-productive.

6.3.3.5.3 Watercourse Crossings

On all watercourse crossings, fill will be removed from the stream channel. The excavation will extend down to the original channel bed, with the excavated channel at least as wide as the original channel. The side slopes will be sloped back to the original or a stable angle and spoil material transported to a stable location. Appropriate erosion control measures such as seeding and mulching will be utilized to facilitate revegetation of excavated crossings.

6.3.3.5.4 Unstable Areas

Any unstable or potentially unstable road or landing fill identified during the assessment process will be pulled back and spoil deposited in a stable location to ensure that perched fill or organic material does not pose a risk of failure and sediment delivery to a watercourse. Appropriate erosion control measures such as seeding and mulching will be utilized to facilitate revegetation of unstable areas.

6.3.3.5.5 Road Surface Runoff

Both temporarily and permanently decommissioned roads will have maintenance free surface drainage. Inside ditches and springs and seeps will be properly drained with deep cross-drain ditches. Localized outsloping may be necessary to adequately drain the road surface. Permanently decommissioned roads will be ripped and planted with commercial tree species where appropriate to reestablish timber production.

6.3.3.5.6 Erosion Control

The majority of erosion control work will be accomplished by excavating the watercourse crossings and unstable areas, and by ensuring proper road surface drainage. Other erosion control measures will include seeding, mulching, and planting and installing energy dissipation (rock armor or woody debris) when determined necessary by qualified/trained personnel.

6.3.3.6 New Roads – Location, Design, Timing, and Construction Standards

Minimization of both the length of road construction and the number of watercourse crossings are basic Simpson engineering principles. However, because of topographic limits and climatic conditions found on the north coast the lineal feet of watercourse per square mile is much higher than for interior forests. This situation requires that foresters assess larger portions of watersheds or their sub-basins to obtain the topographic and hydrologic information necessary to insure the best overall road design for an area. Because Simpson has a wide variety of modern road construction and harvesting equipment available, more options are available to allow for application of low impact road designs and construction techniques.

6.3.3.6.1 *Location*

As part of THP preparation, Simpson foresters perform a detailed field reconnaissance to identify and locate the best access between topographic control points that are critical to a harvesting operation. Wherever feasible, roads are located on or close to ridge tops or on benches where the road prism can be built with the least soil displacement. New roads will be constructed so the road network will not drain directly into watercourses (hydrologically disconnected). New roads designed for a single-use in a THP will be classified as temporary and decommissioned upon completion of operations. This minimizes the risk of sedimentation from unused roads and reduces the amount of future maintenance liability. The construction standards for new temporary roads or new management roads are the same except where specifically noted below.

6.3.3.6.2 *Time of Year Restrictions*

New road construction will not occur during the winter period (October 16 through May 14). (Also see Table 6-13.)

6.3.3.6.3 *Right-of-way and Pioneering*

1. Clearing limits will normally range from 75 to 100 feet. The width of the clearing limits depends on the slope of the ground to adequately displace organic material so the organics are not incorporated in the fill. In addition the width needs to be sufficient to avoid having fill material butt up against green trees.

2. All trees over 12 inches dbh within 5 feet of the top of the cut slope will be cleared. Trees greater than 12 inches dbh within 5 feet of the top of the cut slope may be retained if they will not be susceptible to windthrow or of being undercut.

3. Slash and other debris from road construction will not be incorporated into the road prism, fills or sidecast material. When feasible, slash and debris will be placed parallel to the toe of road fill slopes as a filter windrow. Slash will not be bunched against residual trees or placed in locations where it may gain entry into Class I, II, or III watercourses.

4. On side slopes greater than 35%, the organic layer of the soil will be substantially removed prior to fill placement.

5. Every attempt will be made to avoid locating roads on steep slopes, inner gorge or steep toe slopes, headwall swales or debris slide slopes, and deep-seated landslides as identified in Section 6.3.2 and Appendix B. The Slope Stability Measures outlined in Section 6.3.2 will be followed when it is not possible to avoid these features.

6.3.3.6.4 Excavation and Construction

1. Road Width Specifications

   a. Management Roads

      1) Mainline Road – 16 to 18 feet wide running surface, with combination of outsloped and crowned roads plus inside ditches where appropriate and occasional turnouts (see c below for exceptions).

      2) Secondary Road - 14 to 16 feet wide running surface, with combination of outsloped and crowned roads plus inside ditches where appropriate and occasional turnouts (see c below for exceptions).

   b. Temporary Road – 14 to 16 feet wide running surface, typically outsloped with rolling dips. Planned and designed for a single harvest entry and will be decommissioned upon completion of harvesting operation (see c below for exceptions).

   c. Exceptions for increasing widths include topographic constraints, landing locations, turnouts, engineered berms, and curve widening (see #4 below), as measured in 200-foot lineal segments.

2. New road construction will not occur in RMZs with the exception of watercourse crossings or spur roads off of existing roads within RMZs which would be designed to extend outside the RMZ. New roads will not be built that parallel watercourses within RMZs. The intent is to minimize the amount of road within the RMZ when crossing watercourses and to use spur roads outside the RMZ when appropriate to avoid paralleling watercourses. The alternative with the least impact to cross watercourses and construct spur roads will be selected.

3. Roads that will be used during the winter period for hauling (logs and rock) will have surfacing specifications of a minimum compacted depth of 12" of rock. Only rock that is durable and does not readily break down (e.g. sandstones, graphitic schist, etc) with vehicle or heavy equipment use will be applied to road surfaces. Vehicular access on roads used for administrative purposes during the winter period will have rock applied as needed to prevent runoff of waterborne sediment in amounts sufficient to cause a visible increase in turbidity in any ditch or road surface which drains into a Class I, II, or III watercourse.

4. Greater road widths will be allowed to satisfy requirements of alignment, safety and equipment. Curves will be widened to an additional width based on the following table:

100 feet + radius	+ 3 feet
75 – 100 feet radius	+ 5 feet
50 – 74 feet radius	+ 8 feet

5. Final grades will not exceed 15% except to avoid unstable slopes, steep slopes, inner gorges, inner gorge crossings, or to access a suitable watercourse crossing location, as measured in minimum 100-foot increments. The intent is to minimize steeper road grades to have a lower risk road; but have the flexibility to run steeper grades where appropriate to reach strategic control points and avoid higher risk topography.

6. All overhanging cut slopes will be removed.

7. For new road construction in areas where existing road bank cuts have exhibited failures, Simpson will evaluate site specific situations and apply measures as appropriate such as seeding and mulching, buttressing, and erosion mats to ensure cut bank stability and to minimize erosion.

8. Simpson will avoid the use of through cuts wherever feasible. In areas where through cuts cannot be avoided (e.g., to avoid steep slopes, unstable slopes) permanent ditch-outs will be installed at the beginning and end of the through cut.

9. Except for certain soil types or site conditions that require vertical cut slopes (e.g. Tonnini soils, rock outcrops) slope cuts will be designed and constructed to minimizing the risk of slope failure, soil disturbance and excessive excavation.

10. For areas requiring “end-haul” or some degree of “waste management” (hill slopes greater than 60%, or locations where sidecast could directly enter stream channels) excess material will be deposited in a stable location where sediment will not deliver to any watercourses. Waste material will be seeded and mulched prior to October 15th of the same year.

11. On side slopes greater than 50%, where the length of the road section is greater than 100 feet, fills greater than 4 feet in vertical height at the outside shoulder of the road will be constructed on a bench that is excavated at the proposed toe of the fill and is wide enough to compact the first lift and subsequent lifts compacted in approximately 1-foot intervals from the toe to the finished grade.

12. Fills, including fills across watercourses, will be constructed to minimize erosion using techniques such as insloping, berms, rock armoring where appropriate, or other suitable methods.

13. A combination of outsloped and crowned roads with inboard ditches will be used where appropriate on roads that are to be rocked.

14. Where roads cross watercourses, the road prism will have a gradual transition to an insloped vertical curve as the road approaches and leaves the crossing (critical dip).

15. An out-sloped road prism will generally be used for native surface roads.

16. Turnouts will be placed at reasonable intervals along the alignment and will be located where a minimum of excavation will be necessary to increase the road width. Turnouts will not be constructed if fill is required on side slopes for their construction.

17. No road construction will occur when soil moisture conditions would result in: a) reduced traction by equipment as indicated by spinning or churning of wheels or tracks in excess of normal performance, b) inadequate traction without blading wet soil, or c) soil displacement in amounts that cause a visible increase in turbidity in any ditch or road surface that drains into a Class I, II, III, or IV waters, except that construction may occur on isolated wet spots arising from localized groundwater such as seeps or springs.

6.3.3.6.5 Drainage Structures

1. All new watercourse crossings will be constructed to minimize fill over the culvert.

2. All new watercourse crossing culverts will be designed to handle a 100-year return interval flow event. The design flow will be calculated using the Waananen and Crippen (1977) method for areas greater than or equal to 80 acres. The Rational Method (Chow 1964) will be used when the drainage area for a crossing is less than 80 acres. Culverts will be sized to pass the 100-year flow event without overtopping (headwater depth to culvert diameter ratio = 1.0). Other comparable flow design estimators that are developed for the North Coast Region may also be used.

3. Watercourse crossings on temporary roads designed for one time summer season use will be designed to carry the flow at the time of construction and will be removed prior to October 15th of the same year. A minimum 6 inch pipe size will be used on small seeps and springs to ensure a dry and stable road surface.

4. Bridges will be installed on fish bearing watercourses where feasible. When a bridge installation is not feasible, a countersunk or bottomless culvert or other “fish-friendly” structure will be installed that will provide upstream and downstream fish passage. Installed culverts will not restrict the active channel flow.

5. Permanent watercourse crossings, road approaches to crossings, and associated fills will be constructed to prevent the potential diversion of stream overflows down the road and to minimize fill erosion should the drainage structure become obstructed (critical dip).

6. Necessary erosion protection measures such as inlet and outlet armoring of pipes and energy dissipaters (e.g., down spouts, rocks, or logs) will be installed concurrently with the fill at all culverted watercourse crossings. Armoring will extend at least 1 foot above the expected head and tail water elevations at the culvert. All bare soil on fill slopes at the culvert crossing will be seeded and/or mulched prior to the first winter period following installation to prevent erosion and promote revegetation.

7. All watercourse crossings will be aligned with the natural grade and course of the stream to the fullest extent possible.

8. Fill material over culvert installations will be compacted in 1-foot lifts and fill faces will be compacted during construction.

9. In nearly all cases a minimum culvert size of 24 inches will be installed in Class II watercourse crossings on management roads. Exceptions would include small springs and seeps where it would not be necessary or practical to install a 24-inch culvert.

10. No culvert will be allowed to discharge onto erodible material or unstable slopes. When downspouts are used, they will be adequately secured to the culvert and they will be supported at intervals along their entire length.

11. Ditches will be V-shaped and be approximately 1 foot deep relative to the subgrade. Ditches will be excavated into the road subgrade and not undercut the road cut slope. Where conditions warrant it, ditch alignment will be pulled away from the cut slope to provide storage room for hillslope ravel, and slumps, and to provide protection of ditch conveyance capability.

12. Ditch relief culverts and/or rolling dips will be installed at intervals based on the maximum spacing in Table 6-14. Additional ditch relief culverts and rolling dips will be installed where appropriate to adequately disconnect the roads from the watercourses and to minimize ditch water accumulation on slide prone landforms such as inner gorges.

13. Ditch drains will normally consist of culverts with a minimum size of 18 inches.

14. Ditch drains will be discharged 50 to 100 feet before water enters a Class I or II watercourse to hydrologically disconnect the roads from the watercourse. Drains will discharge onto stable landforms with adequate energy dissipation and sediment filtering capacity. Outlets discharging onto areas prone to gullying, slumping or land sliding will be avoided or provided with erosion protection as in #6 above.

Table 6-14. Maximum spacing (feet) for ditch relief culverts and/or rolling dip installations.[1]

Road Grade	Maximum Spacing (Feet) per Erosion Hazard Rating[2]		
	Extreme	High	Moderate and Low
2%	600		
4%	530	600	
6%	355	585	600
8%	265	425	525
10%	210	340	420
12%	180	285	350
14%	155	245	300
16%	135	215	270
18%	115	190	240

Notes
1 Modified from Weaver and Hagans (1994)
2 EHR from California FPRs, 14CCR 912.5

15. Ditch drains will have a grade that is at least 2% greater than a contributing ditch to prevent ponding and to ensure that they are self-cleaning.

16. In general, steeper road grades (>8%) will utilize cross drains, and more moderate grades will utilize rolling dips and/or outsloping.

6.3.3.6.6 *New Landing Construction*

1. New landing construction will not occur during the winter period (October 16 through May 14).

2. Landings will be constructed to the minimum width, size and number consistent with the yarding and loading systems to be used.

3. New landings will not be constructed in RMZs or EEZs.

4. Every reasonable effort will be made to limit new landing construction and associated excavation by landing logs on existing roadways. When it is necessary to construct landings, an emphasis will be placed on avoiding locating landings on steep or convergent slopes (topographic flats and divergent slopes will be used where possible).

5. No landing construction will occur when soil moisture conditions would result in: a) reduced traction by equipment as indicated by spinning or churning of wheels or tracks in excess of normal performance, b) inadequate traction without blading wet soil, or c) soil displacement in amounts that cause a visible increase in turbidity in any ditch or landing surface which drains into a Class I, II, III, or IV waters.

6. No fill will be placed and sidecast will be minimized on slopes greater than 65%.

7. All landings used as part of current operations will be assessed after completion of operations to determine whether or not overhanging or perched fill or organic material poses a risk of failure and sediment delivery to a watercourse. If such a risk exists, fill material will be pulled back to a stable condition and excavated material will be deposited in a stable location. The pullback will be accomplished prior to October 15th following the completion of operations. Waste material will be seeded and mulched prior to October 15th.

8. On side slopes less than 50%, sidecast or fill material extending more than 20 feet in slope distance from the outside edge of the landing and within 200 feet of a watercourse or lake will be seeded, planted, mulched, removed, or treated to minimize soil erosion. The intent is to minimize the amount of side cast particularly in locations where sidecast could directly enter a stream channel. Excess material will be deposited in a stable location where sediment will not deliver to any watercourses.

9. Waste organic material such as uprooted stumps, cull logs, accumulations of limbs and branches, or unmerchantable trees will not be buried in landing fills. Slash and other organic debris may be placed and stabilized at the toe of landing fills to restrain fill soil from moving downslope.

10. Upon completion of timber operations, landings will be drained to prevent water from accumulating. Concentrated flows will not be channeled over fills and will only be discharged onto stable areas. Discharge points will be located on stable landforms and where stable discharge points are absent, adequate erosion protection and energy dissipation will be employed.

11. Landings that will be used during the winter period will have surfacing specifications of minimum compacted depth of 12 inches of rock. Only rock that is durable and does not break down with vehicle or heavy equipment use will be applied to road surfaces.

6.3.3.6.7 *Erosion Control*

1 Appropriate erosion control measures will be utilized to minimize erosion and prevent sediment from entering watercourses during all road and landing construction activities. Erosion control measures to be utilized will include, but not be limited to, road surfacing, dispersing runoff into stable vegetated filter areas, armoring with rock rip-rap, end hauling waste material to stable locations, construction of rolling dips, critical dips and waterbars, mulching, and revegetating disturbed surfaces as soon as practical.

2 Where construction activities are conducted in close proximity to watercourses, additional erosion control protection measures will be utilized to trap sediment and minimize its entry into the watercourse. As required, slash filter windrows, silt fences, mulching and/or straw bale check dams will be used to control runoff over fill slopes and along concentrated runoff flow paths.

3 All watercourse crossings and cross drains will be installed and functional prior to October 15th. All waterbars and rolling dips will be constructed, and projects associated with straw mulching and grass seeding will be completed by October 15th.

4 Prior to the beginning of the first winter period (October 15th) following construction, all new cut and fill slopes on road construction within the RMZ or EEZ of a Class I, II, or III watercourses will be seeded at a rate of at least 30 pounds per acre and mulched to a depth of at least 2 inches (before settling) with 90% surface coverage.

5 At temporary crossings, the fill slope will be pulled back to the natural side slopes and deposited in a stable location where sediment will not deliver to any watercourses. All exposed areas associated with the crossing will be seeded at a rate of at least 30 pounds per acre and mulched to a depth of at least 2 inches (before settling) with 90% surface coverage.

6.3.3.7 Upgrading of Management Roads

6.3.3.7.1 *Time of Year Restrictions*

Road upgrading will not occur during the winter operating period (October 16th through May 14th) unless unseasonably dry weather persists in the fall at the beginning of the winter period or early spring drying has occurred at the end of the winter period. An unseasonably dry fall is defined as less than 4 inches cumulative rainfall from September 1st through October 15th. Road upgrading will cease when 4 inches cumulative rainfall is reached or a forecasted rainfall amount will reach or exceed the 4 inch cumulative total. See Road Decommissioning Section 6.3.3 for a rationale of the 4 inch cumulative rainfall.

Road upgrading can take place from May 1st to May 15th when early spring drying has occurred. Early spring drying is defined as 1) no measurable rainfall within the last 5 days, 2) no rain forecast by the National Weather Service for the next 5 days. The use of any portion of the road should not result in runoff of waterborne sediment in amounts sufficient to cause a visible increase in turbidity in any ditch or road surface which drains into a Class I, II, or III watercourse. The intent of the early spring drying from May 1st to May 15th is to ensure that a drying trend during this period has occurred and will continue to occur for an extended period with favorable conditions to upgrade roads.

No road upgrading will occur prior to May 1st or after November 15th. Restrictions for road upgrading from May 1st through May 14th include watercourse crossing installations on Class I and larger Class II watercourses. The intent is to avoid replacing or installing watercourse crossings on larger watercourses during late spring when there may be significant surface flow that would prevent diversion of flow around the work site effectively. Erosion control supplies will be retained on site from May 1st through May 14th and applied to each completed site by the end of that operational day.

After October 15th, each project site (i.e. replacing a watercourse crossing) will be completed in one operational day with erosion control structures installed if feasible. If a site requires multiple days for completion (i.e., 2-3 days), a long-range National Weather Service forecast of no rain for the next 5 days is required. The intent is to have at least one operational day prior to a rain event to ensure erosion control structures are installed. Specific sites that require more than one week for completion will not be started during the winter period unless it is an emergency situation.

6.3.3.7.2 *Methods*

Techniques described in Weaver and Hagans (1994) will generally be followed when upgrading roads. The Weaver and Hagans (1994) manual will be used unless and until a more “state of the art” manual is published and mutually agreed upon by Simpson and the Services for application. The following is a description of road upgrading techniques.

1. All culverted watercourse crossing replacements will be designed to handle a 100-year return interval flow event. The design flow will be calculated using the Waananen and Crippen (1977) method for drainage areas greater than or equal to 80 acres. The Rational Method (Chow 1964) will be used when the drainage area for a crossing is less than 80 acres. Culverts will be sized to pass the 100-year flow event without overtopping (headwater depth to culvert diameter ratio (HW/D) = 1.0). Other comparable flow design estimators that are developed for the North Coast Region may also be use.

2. Culverts that are functioning properly but are undersized according to the “new installation” standard will be upgraded if 1) the existing culvert’s capacity is not within 15% of the design flow and 2) the HW/D is less than 2.0.

3. Bridges will be installed on fish-bearing watercourses where feasible. When a bridge installation is not feasible, a countersunk or bottomless culvert or other "fish-friendly" structure will be installed that will provide upstream and downstream fish passage. Installed culverts will not restrict the active channel flow.

4. Washed out culverts and those replaced on previously temporary decommissioned roads will be upgraded to the same installation standards as new roads. Any buried logs or other large organic debris will be removed from the crossing fill.

5. The existing roadbed will be reshaped if necessary to improve surface drainage. Reshaping is restricted to the time periods described for road upgrading except it will not be conducted during the early spring drying period (May 1st through May 14th).

6. Additional ditch relief culverts will be installed to meet the specifications listed in Table 6-14.

7. Upgrading of roads will follow the New Roads – Location, Design, Timing and Construction Standards discussed in Section 6.3.3.

6.3.3.8 Routine Road Maintenance / Inspection Plan

6.3.3.8.1 Type and Timing of Maintenance Activities

Road maintenance activities that will be conducted include but are not limited to brushing, waterbarring, constructing rolling dips, culvert replacement, grading (including berm removal or maintenance where appropriate), installation of critical dips at watercourse crossings to reduce diversion potential, outsloping roads, patch rocking, dust abatement, resurface rocking, cleaning ditches, and cleaning inlets and outlets of culverts. Patch (spot) rocking, brushing, cleaning inlets and outlets of culverts, cleaning ditches where poor drainage is occurring (e.g., cleaning a ditch line along a sloughed cut-bank), repairing or maintaining existing waterbars, replacement of a failed or imminently failing culvert along a needed access road, and site specific road surface grading for maintaining the integrity of the road surface (i.e. redistribution of existing rock, filling pot holes, and distributing new patch rock) will be allowed year round including during the winter period. The intent is to allow winter grading to fix localized bad spots on the road surface before the deterioration of longer road segments. Grading will not be used to blade off wet soil to provide conditions for extended periods of operation on a deteriorated road surface. The installation of waterbars, rolling dips and critical dips, general project grading for shaping the road surface, road outsloping, road rocking, resurface rocking, cleaning ditch lines, and general culvert replacements will be allowed only during the period when road upgrading can occur (Section 6.3.3).

6.3.3.8.2 Distribution of Information

Information about proper road use and reporting of maintenance problems will also be distributed to all Simpson woods personnel and woods contractors and will be made available to the public who have road access to Simpson property.

6.3.3.8.3 *Inspection and Maintenance Schedules*

Prior to September 15 of each year, all mainline roads will be inspected for needed maintenance (Figure 6-7 [A-C]). Other roads that are appurtenant to THPs will also be inspected at least through the duration of the prescribed maintenance period for erosion controls specified for each THP. This inspection will assess the effectiveness and condition of all erosion control and drainage structures.

All other management roads (secondary roads) or roads yet to be decommissioned that are accessible to maintenance crews will be maintained. The maintenance schedule will be based on the HPAswith a slight modification that incorporates additional RWUs from another HPAto create regions of the ownership that are more uniform in size. The maintenance schedule will be completed on a 3-year rotating basis (Table 6-15)

All the maintenance areas listed with “1” under the rotating annual schedule column will be maintained during the first year, fourth year, seventh year, etc. The regions were selected combined based on blocks of the ownership that contained approximately equal miles of road and would allow efficient implementation of the maintenance schedule. Approximately 45% of all of Simpson’s roads will be maintained annually following this routine maintenance schedule. The actual percentage of roads that are maintained will increase over time because a portion of the current road network is planned for decommissioning. In addition, as the road management plan is implemented and more roads are decommissioned, the overall miles of roads that require maintenance will decrease.

Table 6-15. Routine maintenance schedule.

Routine Maintenance Areas	Acres in Simpson Ownership	Miles of Road	Rotating Annual Schedule
Smith River HPA	41,163	381	1
Coastal Klamath HPA (on the northern side of the Klamath River) minus the Bear Creek RWU	38,412	350	1
Coastal Klamath HPA (on the southern side of the Klamath River)	42,506	406	2
Blue Creek HPA plus the Bear Creek RWU	21,554	206	2
Interior Klamath HPA	66,127	515	3
Redwood Creek HPA	33,223	249	3
Coastal Lagoons HPA	39,999	327	2
Little River HPA	26,041	290	1
Mad River HPA minus the Boulder Creek RWU	33,684	352	1
North Fork Mad River HPA	28,219	268	2
Humboldt Bay HPA plus the Boulder Creek RWU	33,278	261	3
Eel River HPA	7,940	89	3
TOTAL	412,146	3,695	

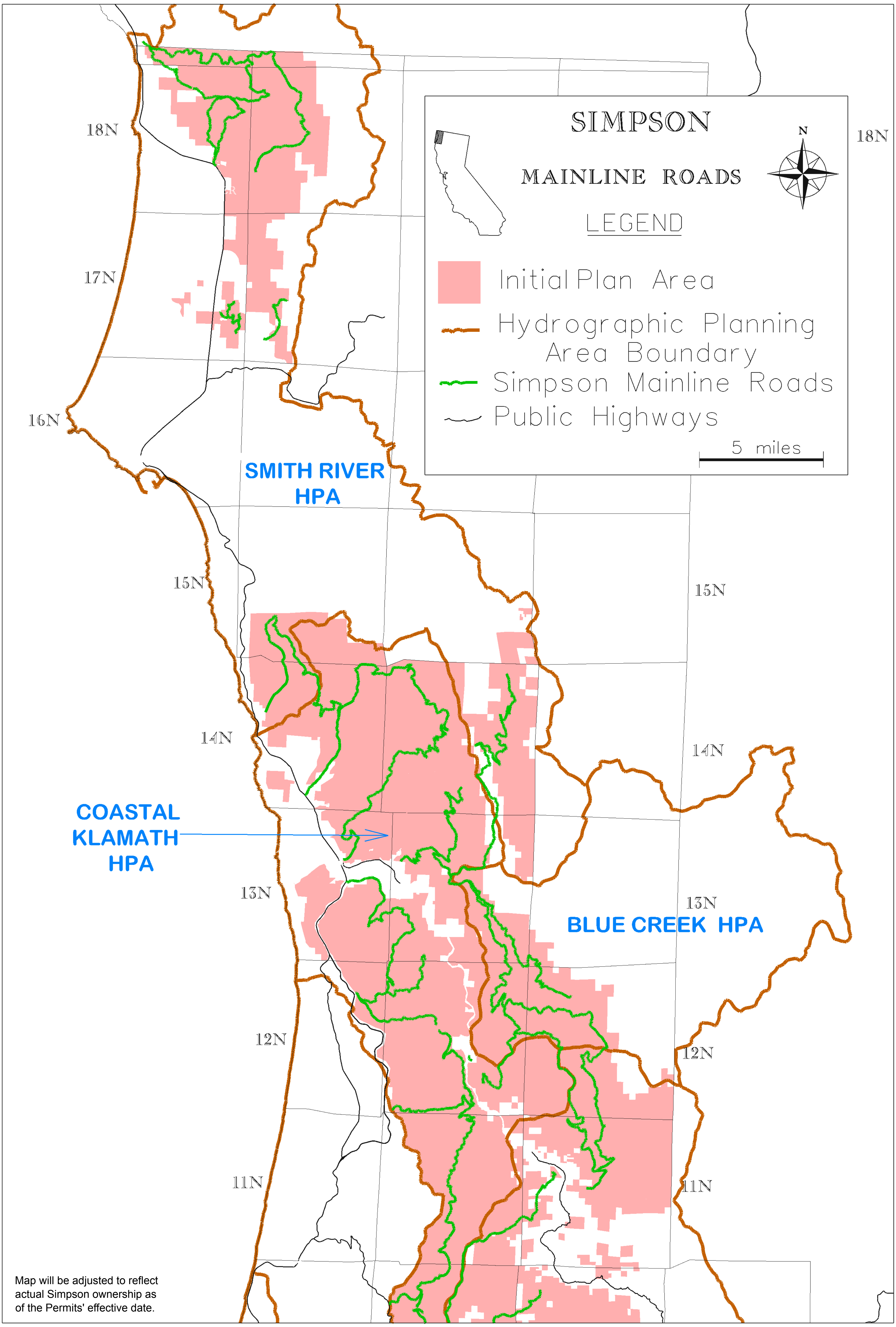


Figure 6-7 (A). Mainline roads in the Plan Area.

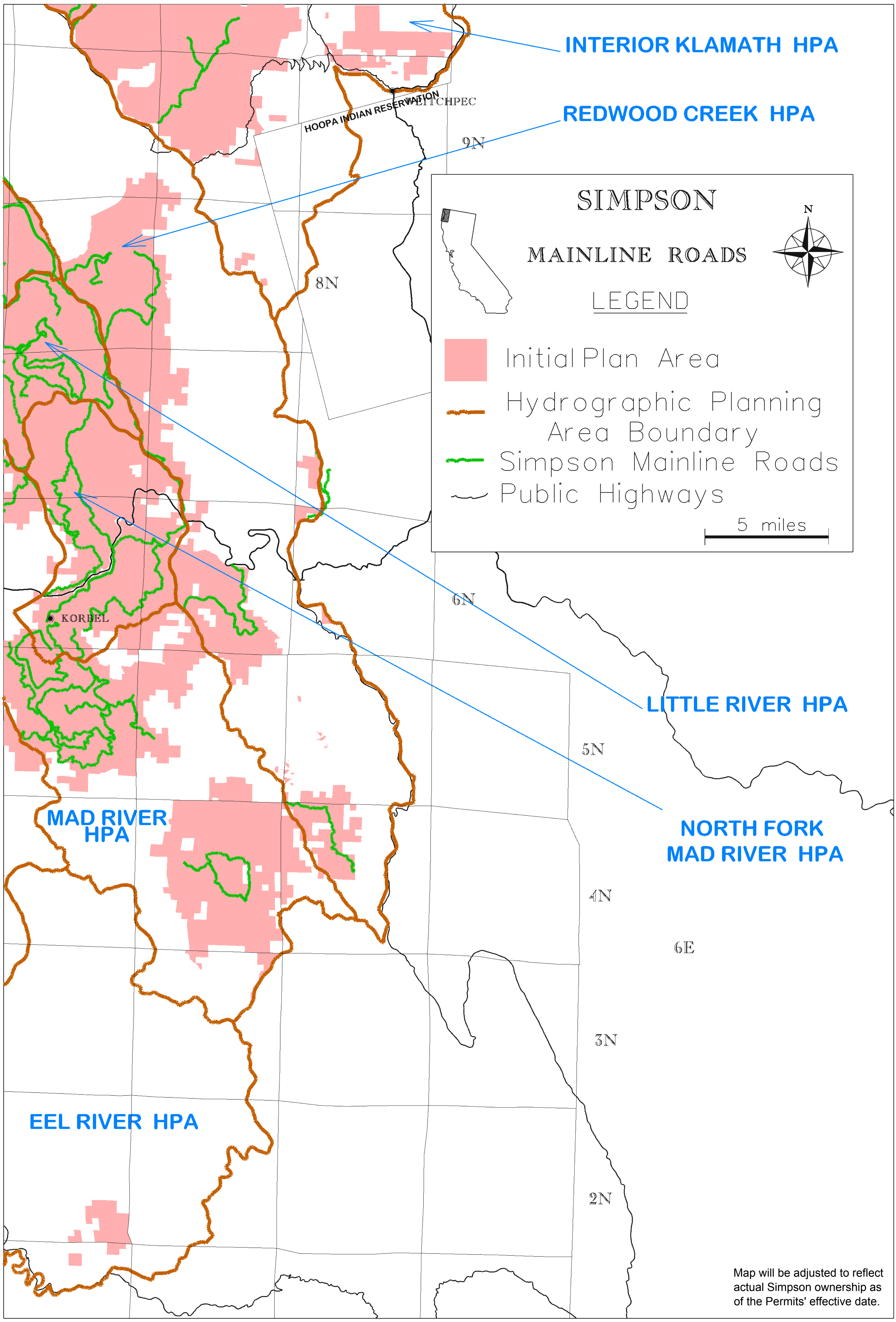


Figure 6-7 (B). Mainline roads in the Plan Area.

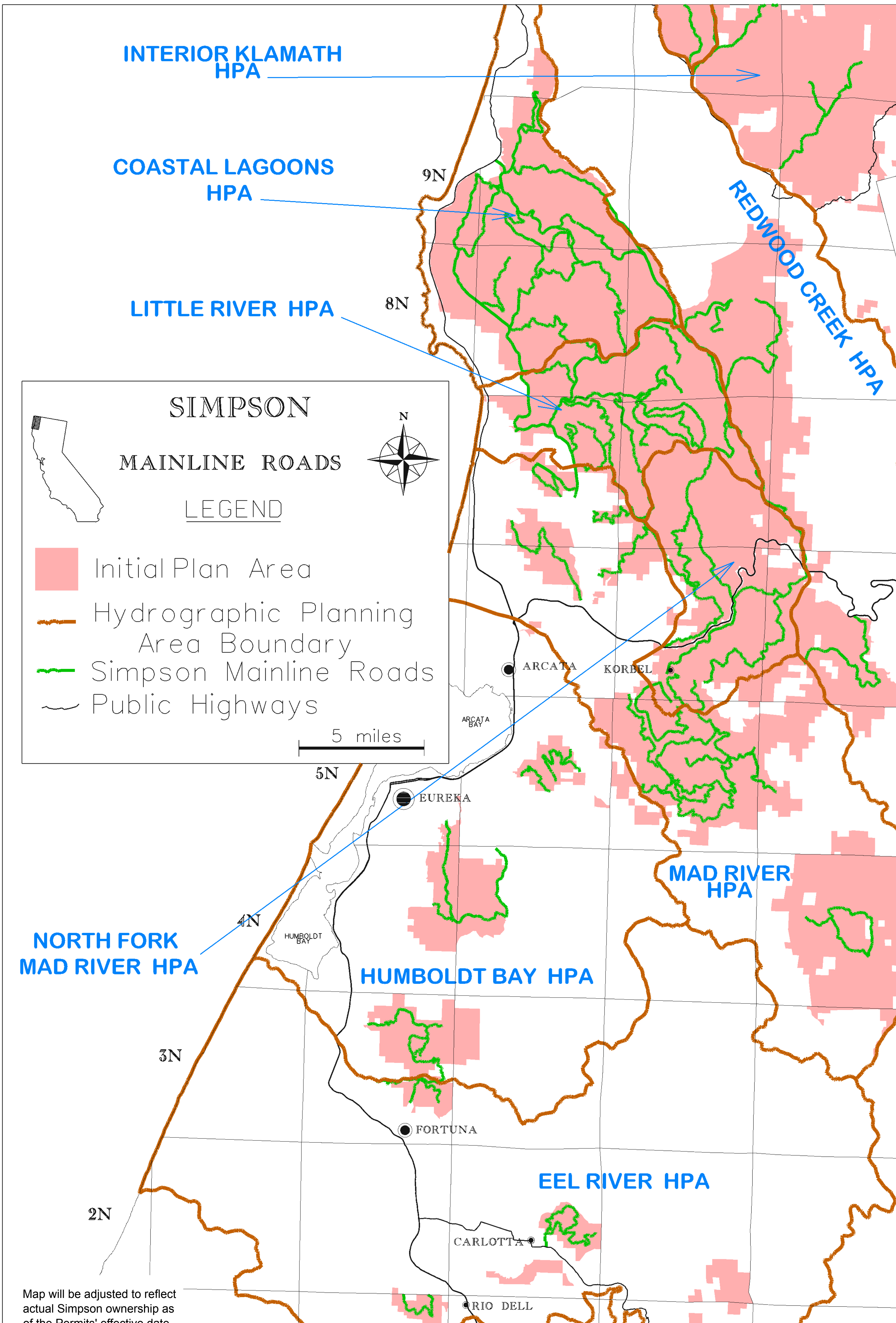


Figure 6-7 (C). Mainline roads in the Plan Area.

Road inspections will be conducted by driving accessible roads. Observed problems will be documented and a recommendation provided for the repair. The inspections will assess the following:

- Adequate waterbar spacing, depth, interception of the ditch line, and complete diversion of water flow onto undisturbed soil.
- Areas having poorly drained low spots or inadequately breached outside berms.
- Ditches are open and properly functioning and are free of debris that could plug the ditch or a culvert and cause a diversion of water onto the road surface.
- Cuverts are functioning properly.

6.3.3.8.4 Prioritization of Maintenance and Repairs

Maintenance or repairs that are needed will be prioritized based on treatment immediacy (a subjective combination of event probability and potential sediment delivery evaluated as either low, moderate, or high). The goal will be to complete all the priority tasks prior to the winter period. If the priority workload exceeds that which can be accomplished in the current maintenance year, lower priority sites may be held over until the following maintenance year.

6.3.3.8.5 Emergency Inspections

If a storm occurs that produces 3 inches of precipitation or more in a 24-hour period, as measured at Crescent City, Klamath River near Terwer Creek, Trinity River at Hoopa, Redwood Creek at Orick, Redwood Creek at O'Kane, Korbel, and Eureka (Table 6-16). Simpson's Timberlands staff will conduct emergency inspections of all accessible rocked roads that can be traveled without causing road damage, during or immediately after such an event. Repairs will be made during these inspections (e.g., fix damaged waterbars, unplug culvert inlets) if hand labor can correct the problem. Any major problems observed during these inspections that would require the use of heavy equipment for repair will be reported to a designated "storm response coordinator". This coordinator will prioritize and schedule repairs so that they are accomplished as soon as possible. If access is prohibited because of adverse conditions, these sites will receive priority for treatment during the following summer's road maintenance schedule.

Table 6-16. Rain gauge stations and associated inspection areas for storm period inspections.

Gauge Location	Applied Area
Crescent City	Smith River HPA
Klamath River near Terwer Cr.	Coastal Klamath HPA
Trinity River at Hoopa	Interior Klamath HPA
Redwood Creek at Orick	Redwood Creek HPA downstream of Dolly Varden and Coastal Lagoons HPA
O'Kane (Blue Lake)	Redwood Creek HPA upstream of Dolly Varden
Korbel	North Fork Mad River and Mad River HPAs
Eureka	Humboldt Bay, and Eel River HPAs

6.3.3.8.6 Road Daylighting

Road daylighting (removal of trees within 25 feet slope distance of the shoulder or cut bank of a road) will be done where necessary and feasible to accelerate drying of roads and provide stable road surfaces for log hauling or other vehicular traffic. Within RMZs for Class I and II watercourses, no trees will be cut that could cause channel de-stabilization. All trees greater than 16 inches dbh will not be cut from the downstream side of Class I watercourse crossings. Daylighting within RMZs where it is necessary to accelerate drying of the road and provide a stable road surface will be evaluated on a site specific basis.

6.3.3.9 Road and Landing Use Limitations

1. Log hauling, road decommissioning, road upgrading, road construction and use of landings will cease when the use of any portion of a road or landing results in runoff of waterborne sediment in amounts sufficient to cause a visible increase in turbidity in any ditch or road surface which drains into a Class I, II, or III watercourse.

2. Use of roads for log hauling, road decommissioning, road upgrading, road construction and landing use will not resume until the road surface has dried sufficiently to allow use without resulting in runoff of waterborne sediment in amounts sufficient to cause a visible increase in turbidity in any ditch or road surface which drains into a Class I, II, or III watercourse. This criterion applies to any time of the year (e.g., summer storms).

3. Hauling and loading during the winter period (October 16th through May 14th) will only occur on rocked surfaces. Hauling and loading will be allowed on unsurfaced roads from May 1st through May 14th if early spring drying occurs as defined in Section 6.2. or from October 16th through November 15th if an extended dry fall occurs as defined in Section 6.2. 4

4. Helicopter service landing areas will be considered appurtenant to a THP and will be subject to the road use limitations described above.

5. Only ATVs will be used on unsurfaced seasonal roads during the winter period. Other vehicular use of seasonal roads will be allowed from May 1st through May 14th if early spring drying occurs as defined in Section 6.3.4 or from October 16th through November 15th if an extended dry fall occurs as defined in Section 6.2. Any damage caused to drainage or erosion control structures by using ATVs on any road will be repaired immediately following damage. Exceptions for seasonal road use during the winter period for management include fire control vehicles for site preparation burning, pickup access for transportation of monitoring supplies and equipment, and pickup trucks and vans for transportation of seedlings and reforestation crews. Upon completion of each specified activity all drainage facilities will be returned to the condition prior to road use or brought up to a condition where they are functioning properly.

6. Landings on roads (including roadside decking) within RMZs will not be used from October 16th through May 14th. Ditchlines and drainage facilities associated with existing roads within RMZs that are used for landings or roadside decking during the summer period (May 15th through October 15th) will be repaired immediately following completion of operations and prior to October 16th. Any proposed use of existing landings and roads will be discussed and mapped in THPs and also included on the THP map submitted to the Services. The intent of utilizing existing roadways and landings within RMZ's and restricting the expansion of existing roads or landings is to minimize potential aquatic impacts and new road or landing construction near watercourses. Alternatives to roadside decking in RMZ (such as building new spur roads that extend out of the RMZ and constructing a designated landing, building a new road system into the THP, or using alternative yarding systems) will be evaluated during the THP preparation. The intent is to use the most feasible alternative that will have the least amount of impact to the aquatic resource.

6.3.3.10 Emergency Road Repair

If there is an imminent threat to life, property, or public safety, or a potential for a massive sediment input with catastrophic environmental consequences, Simpson will notify the Services of the emergency and the proposed action, but will not be required to submit a formal notification in order to perform a quick response to the situation. An individual contact from both of the Services will be designated. The Services will notify Simpson of any changes in their personnel contacts.

6.3.3.11 Water Drafting

The potential impacts of drafting water from watercourses during summer are dramatically different between fish and amphibians in the Plan Area. Juvenile salmonids are vulnerable to rapid changes in flow that could leave them stranded in a de-watered or very restricted portion of the wetted channel. In addition, reduction in the flow may reduce dissolved oxygen and/or increase water temperature that would put these fishes at risk. In contrast, studies done in the Plan Area indicate that many of the Class II watercourses have very minimal flows or even sub-surface flows during late summer. In spite of these, these amphibians are well distributed throughout the Plan Area indicating that they are well adapted for streams with low flow regimes during summer. When flows are reduced to the point of having no surface flow, these amphibians can survive by retreating to interstices within the substrate that retain subsurface flow. As a result, the potential impacts of reduced flows from drafting should not have a significant impact on these amphibian species. If a watercourse has larval tailed frogs, then the drafting requirements for the site will be modified to avoid temporary dewatering the Class II watercourse or another drafting site will be used.) The following restrictions for water drafting are intended to avoid dewatering any portion of Class I watercourses and only localized temporary dewatering on Class II watercourses.

Most water trucks hold approximately 3500 gallons of water. With the proposed drafting standards, the maximum fill up time per truck is 10 minutes. Depending on the distance from the source of water and the level of operating activities, 4-6 loads per day is a typical drafting frequency from a site. Some drafting sites with flows well above the minimum flow (i.e. >5 cfs) or larger impoundments may be drafted from more than 6 times per day depending upon the level of operating activities.

6.3.3.11.1 Restrictions

To protect Covered Species from water drafting or from gravity fed water storage systems the following restrictions will apply

1. Water drafting for timber operations from within the channels of Class I watercourses will conform to the following standards:

    - pumping rate will not exceed 350 gallons per minute (0.78 cfs),

    - pumping or gravity fed lines to storage tanks will not remove more than 10% of the daily above-surface flow, drafting will not occur in watercourses that have less than 1 cfs surface flow.

2. Water drafting for timber operations from impoundments within the channels of Class I watercourses that do not have surface outflow will conform with the following standards:

    - pumping rate will not exceed 350 gallons per minute (0.78 cfs),

    - drafting or pumping to storage tanks will not reduce maximum pool depth by more than 10%.

3. Gravity fed lines to storage tanks from Class II watercourses will not divert more than 50% of the flow.

4. Water drafting for timber operations from within Class II watercourse or impoundment:

    - will not reduce maximum pool depth by more than 1/3, and

    - the pool will be fully recharged before any additional drafting will occur

5. Intakes will be screened in Class I and Class II watercourses (including gravity fed lines). Screens will be designed to prevent the entrainment of all life stages of Covered Species. The intakes will be installed in pools to avoid the entrainment of amphibian larval stages. See Section 6.3.3.12 for drafting screen specifications.

6. Herbicide mix trucks will not be used to directly draft water from any watercourse.

These drafting criteria do not apply for fire suppression or wildfire.

6.3.3.12 Drafting Screen Specifications

In 1997, Simpson designed a drafting screen for use on all pumping site locations in Class I watercourses. This screen was design to meet or exceed the Fish Screening Criteria published by CDFG) on April 14, 1997. The CDFG criteria were modified from Fish Screening Criteria for Anadromous Salmonids published by NMFS in January 1997. The CDFG guidelines are more restrictive that the NMFS guidelines. The specific modification applies to “Not Self-Cleaning” screens such as Simpson’s design. The following specifications were designed for Class I watercourses, however the design and specifications also will be applied to Class II watercourses.

The screen is an open top box constructed from a framework of 1-inch angle iron with 1/16-inch mesh screen attached to the four vertical sides. Each side is 3 feet long by 2 feet high. The bottom of the box is a 3 feet x 3 feet piece of plywood inserted within the framework. The drafting hose is placed in the middle of the box. Future modifications to the drafting screen may occur, however any new designs will at least meet the current design criteria.

6.3.3.12.1 Approach Velocity

Approach velocity is defined as the local velocity component perpendicular to the screen face. For non self-cleaning screens, the CDFG criteria requires an approach velocity of no more than 25% of the velocity allowed on a self-cleaning screen, or 25% of 0.40 feet per second (fps). An instantaneous velocity of 0.10 fps is beyond the accuracy of our flow meter (0.50 fps); however, the flow meter will measure 0.10 fps in an averaging mode. Simpson's drafting screen is designed to have no measurable flow, in the averaging mode, at the screen's surface while pumping. This velocity is slow enough that you should barely be able to detect water movement when holding your hand against the drafting box screen while drafting.

6.3.3.12.2 Screen Area

"The required wetted screen area (square feet), excluding the area affected by structural components, is calculated by dividing the maximum diverted flow (cubic feet per second) by the allowable approach velocity (feet per second)" (CDFG, Fish Screening Criteria, 1997). The maximum pump rate will be 350 gallons per minute (gpm), or 0.78 cfs.

0.78 cfs / 0.10 fps = 7.8 square feet

Simpson's drafting box design provides 24 square feet of screened area when submerged to the level of the top angle iron rail. When submerged to a depth of 8 inches, or a maximum of 16 inches sideboard exposed, the screen provides 8 square feet of screen area. As a safety buffer the drafting box should always be submerged at least one foot deep.

6.3.3.12.3 Sweeping Velocity

Sweeping velocity is the velocity component parallel to the screen face. This is essentially the stream flow outside of the box that helps prevent debris buildup on the screen surface. The CDFG Fish Screening Criteria, Section 3a, requires that the sweeping velocity should be at least two times the allowable approach velocity. In this case a sweeping velocity of 0.20 fps should be met if there is any measurable flow past the face of the screen.

6.3.3.12.4 Screen Openings

Square screen openings, such as is used in Simpson's drafting screen, will not exceed 3.96 mm (5/32 inches), or when steelhead fry are present, 2.38 mm (3/32 inches) measured diagonally. Simpson assumes that any Class I watercourse where drafting occurs will potentially have steelhead fry and thus has designed the screen with the more restrictive criteria. The 1/16 inch mesh provides for diagonal openings of 3/32 inches.

6.3.3.13 Rock Quarries and Borrow Pits

1. New rock quarries and borrow pits will not be established within Class I or II RMZs.

2. No portion of an existing rock quarry or borrow pit that is within 150 feet of a Class I watercourse or 100 feet of a Class II-2 watercourse or 70 feet of a Class II-1 watercourse will be used.

3. Rock quarrying, rock extraction from borrow pits, or hauling will not result in a visible increase in turbidity in watercourses or hydrologically connected facilities which discharge into watercourses. If an increase in turbidity does occur as a result of such operations, then the operator will install interim erosion control measures and cease operations at once.

4. During development of rock quarries and borrow pits, overburden will be placed in a stable location away from watercourses and associated RMZs. The overburden disposal area will be grass seeded and straw mulched where necessary.

6.3.4 Harvest-Related Ground Disturbance Measures

6.3.4.1 Summary of Time Period when Harvest-related Ground Disturbances May/May Not Occur

Table 6-17 summarizes the time of year restrictions on harvest-related ground disturbances (also see Table 6-7 for time of year restrictions for road work).

6.3.4.2 Field Trials with Mechanized Equipment

Simpson may wish to conduct field trials with mechanized equipment for silvicultural operations (e.g., site preparation, release or pre-commercial thinning, logging). Successful trials may lead the company to adopt the tested equipment for future operational use. However, before field trials proceed, the Services must receive some assurance that the equipment will not cause ground disturbance, in the form of compaction or soil displacement that is measurably greater than the equipment or methods previously used for the same purposes. Assurances will be supported by available documented evidence including, but not limited to, manufacturers specification sheets (with attention to parameters such as ground pressure or traction characteristics), published or unpublished field trials by independent (university) researchers, by researchers for government land management agencies, or by the manufacturer or its customers.

Table 6-17. Time periods when harvest-related ground disturbances may/may not occur within the Plan Area.

Activity	Nov 16 –April 30	May 1-May 14	May 15-Oct. 15	Oct. 16-Nov. 15
Ground-Based Yarding – Tractor, Skidder, and Forwarder	None	Yes if (1)	Yes	Yes if (1)
Ground-Based Yarding – Feller-Buncher and Shovel Logging	Yes if (2)	Yes	Yes	Yes
Skyline and Helicopter Yarding	Yes	Yes	Yes	Yes
Mechanized Site Preparation	None	None	Yes	None
Skid Trail Construction and Reconstruction	None	None	Yes	None

Notes
1 See Section 6.3.4.6 for operating measures
2 See Section 6.3.4.8 for operating measures

6.3.4.3 Site Preparation Standards

Harvest operations will be planned and executed so as to facilitate the purposes of the conservation measures for site preparation as specified in below.

1. The purpose of the conservation measures in this Section is to minimize surface erosion from site preparation operations. The practices outlined in this Section address this purpose in four ways:
    a. Minimization of bare soil exposure within harvest units,
    b. Minimization of the need for fireline construction,
    c. Maintenance of a nearly continuous forest floor layer of duff and woody material to intercept and limit the channelization of surface water, and
    d. Prevention of drainage failures and sediment delivery from firelines.
2. All site preparation operations will be designed to limit the amount of ground and forest floor disturbance to that which is required for fuel reduction and reforestation operations. For example, reforestation personnel may arrange with logging operators to remove a portion of the logging debris to landings. This practice can reduce fuel levels in the treatment area, facilitate greater control of prescribed burns, and minimize the chance of excessive forest floor consumption in the burning operation.

3. Operations will be planned so that areas having the greatest need of treatment for fuel reduction and/or reforestation access are assigned the highest priority for treatment. High priority areas are treated earliest in an operating season. Low priority areas are either treated later in the operating season, deferred to a subsequent season or not treated.

4. Use of machine piling with tractor-and-brushrake will be minimized. Other mechanized methods such as grapple piling with shovel loaders, or use of mechanized choppers or cutters, are preferred. All types of mechanized site preparation methods are subject to the seasonal operating limitations for ground-based yarding in Section 6.3.4

5. Prescribed fire operations will be designed to produce burns of “low-intensity”. For the purposes of this Section, a low-intensity prescribed burn has the following desired attributes:

   a. The burning operation is designed to consume only a limited portion of the fuelbed; for example, woody fuels 0.25 inch to 3.0 inches in diameter,

   b. Non-targeted portions of the fuelbed, such as the duff layer and woody fuels > 3.0 inches in diameter are generally only lightly consumed,

   c. Low-intensity prescribed fires will tend to self-extinguish when they burn into a fireline, or into an adjacent area with a continuous overstory canopy, such as an RMZ or other unharvested stand, thus minimizing the need for firelines.

6. Following site preparation, by machine or prescribed fire, the desired post-operation fuelbed and forest floor attributes are as follows:

   a. Down woody material greater than 3.0 inches diameter to reflect the pre-disturbance condition throughout the prepared area,

   b. The litter layer is minimally displaced or consumed,

   c. Bare mineral soil exposure that occurs through the displacement or consumption of logging slash and forest floor material to be less than 5% of the area of any harvest unit. Skid trails and skyline roads are not included in the estimate of exposed area.

7. All firelines that are not in an RMZ or EEZ will have drainage structures adequate to prevent the delivery of sediments to RMZs, EEZs.

8. Fireline construction with tractors is subject to the same seasonal limitations as skid trail construction in Section 6.3.4, plus the following limitations:

   a. If the proposed fireline location may cause hillslope sediment delivery to a riparian management zone or equipment exclusion zone adjacent to Class I, II or III watercourses, then equipment use is limited to slopes less than or equal to 45%.

   b. If the proposed fireline location is not likely to cause sediment delivery to an RMZ, and if slopes are greater than 50% then tractors may operate only on fireline segments less than 100 feet. (Note: slope limitations on fireline construction are less than for skid road construction; the rationale is that fireline construction involves substantially less excavation).

7. Fireline construction, reconstruction and use within RMZs and EEZs are subject to the following limitations:

   a. Firelines will only be constructed or reconstructed with hand tools.

   b. Existing skid roads or firelines within RMZs or EEZs may be reconstructed for fireline usage if they are located advantageously for fire containment. Reconstruction must only be done with hand tools, and only to the minimum width required for fire containment. All prior drainage failures on the existing skid roads or firelines must be remedied during reconstruction.

   c. All constructed or reconstructed firelines within RMZs or EEZs must have drainage structures that will minimize the movement of sediments from the exposed fireline surface but are not subject to the 100 square foot ground disturbance standard for seeding and mulching as described in Section 6.3.1.

6.3.4.4 Release, Pre-Commercial Thinning, and Commercial Thinning

1. The uses of self-propelled, mechanized equipment for release and pre-commercial thinning operations (e.g., boom-mounted cutters) are subject to the seasonal limitations on ground-based yarding in Section 6.3.4 below.

2. The uses of logging equipment in commercial thinning operations are subject to all applicable limitations on felling, yarding and loading in Section 6.3.4 below.

6.3.4.5 Measures Common to All Felling, Yarding, and Loading Operations

1. Erosion control measures for the treatment of disturbed areas in RMZs or EEZs resulting from felling, bucking and yarding activities will be implemented as provided in Section 6.3.1. Any bare mineral soil exposure, greater than 100 square feet in RMZ's or EEZ's that is caused by logging activities, will be mulched and seeded or treated by other means prior the end of logging operations or prior to October 15, whichever comes first. The purpose of treatment of exposed soil is to reduce the potential for the delivery of sediment to streams in the first three to five years following harvest and site preparation. The purpose of mulching and seeding is to provide temporary vegetative cover on the exposed site until native vegetation can re-colonize the site.

2. Seeding will be at a rate of at least 30 pounds per acre and mulching to a depth of at least 2 inches (before settling) with 90% surface coverage.

6.3.4.6 Ground-Based Yarding - Tractor, Skidder, and Forwarder Operations

In field usage, the terms '*skid trail*', '*skid road',* and '*tractor road'* are common synonyms. The measures below use the term 'skid trail'.

1. The construction and reconstruction of skid trails is limited to the period beginning May 15th, and ending October 15th (see Table 6-17).

2. Ground-based yarding with tractors, skidders, and forwarders may occur from May 15th through October 15th on existing skid trails. Skid trail use (excluding construction and reconstruction of skid trails) may be extended to include the periods May 1st through May 14th, and October 16th through November 15th, when the following procedures are followed:

a. Skid trail use will not result in a visible increase in turbidity in watercourses or hydrologically connected facilities (e.g. ditches, landings, roads) which discharge into watercourses. If an increase in turbidity occurs while operations are underway, then the operator will install interim erosion control measures and cease operations at once. Use of skid trails by ground-based logging equipment will not occur when soil moisture conditions would result in: 1) reduced traction by equipment as indicated by spinning or churning of wheels or tracks in excess of normal performance, 2) inadequate traction without blading wet soil, or 3) soil displacement in amounts that cause movement of waterborne sediments off a skid trail surface. If any of the preceding events occur while operations are underway, then the operator will install interim erosion control measures and cease operations at once.

b. Ground based yarding operations will use minimal ground disturbing equipment (e.g. tracked shovel loaders) without bladed skid trail construction or reconstruction to the maximum extent feasible. Where this is not feasible, yarding operations from May 1st through May 14 and October 16 through November 15th will be limited to existing skid trails for ground-based equipment which are hydrologically disconnected from Class I, II, or III watercourses or drainage facilities that discharge into Class I, II, or III watercourses. The intent is to have no or minimal skid trail construction or reconstruction near any watercourse, and no channelized flow resulting from timber operations or facilities reaching Class I, II, or III watercourses or hydrologically connected ditches. Operations can occur on hydrologically connected skid trails from May 15th through October 15 provided Procedure (a) is met.

c. Use of skid trails from May 1st through May 14th and October 16th through November 15 will not occur within at least 100 feet, slope distance, of the upper extent (e.g. top or head) of any designated Class II watercourse, and on slopes greater than 30% within at least 100 feet of Class III watercourses. (Note: Long-line yarding or lifting logs with a shovel loader from outside this zone is permitted as long as the skid trails are hydrologically disconnected, as in Procedure (b). The intent is to minimize the amount of ground disturbance created by tractor operations near watercourses during May 1 through May ^{1}4th and October 16th through November 15th. Operations may occur in these zones from May 15th through October 15th provided Procedure (a) is met.

d. From May 1 through May [1]4th and October 16th through November 15th Simpson will treat with seed, mulch, or slash (see Procedure (e) below), all areas of bare mineral soils greater than 100 square feet created by ground based yarding (e.g. long lining, use of approved watercourse crossings) within an RMZ, or EEZ by the end of the working day. Application of erosion control materials beyond 100 feet slope distance of Class I watercourses, Class II RMZ widths, or beyond EEZs will be discretionary, based on the potential of the site to deliver sediment to a watercourse or hydrologically connected facility. This will be subject to the RPF's (or designated Simpson Supervisor's) evaluation of the site, taking into consideration the potential for large storm events to cause sediment delivery.

e. From May 1 through May [1]4th and October 16th through November 15th prior to commencement of ground based yarding operations, sufficient erosion control materials, including but not limited to straw, seed (barley seed and/or Simpson seed mix), and application equipment will be retained on-site or otherwise accessible (so as to be able to procure and apply that working day**) in amounts sufficient to provide at least 2 inches depth of straw with minimum 90% coverage, and 30 pounds per acre Simpson seed mix. In lieu of the above listed erosion control materials, native slash may be substituted and applied if depth, texture, and ground contact are equivalent to at least 2 inches straw mulch. If an area of exposed bare mineral soil is caused by operations late in the day and it is not feasible to completely finish erosion control treatment, the erosion control treatment may be completed the following morning prior to start of yarding operations provided there is no greater than a 30% chance of rain forecasted by the National Weather Service within the next 24 hours.)

3. The use of ground-based yarding systems that require constructed skid trails is prohibited on slopes over 45%. Two exceptions are permitted as follows:

a. Where greater soil or riparian zone disturbance would be expected from cable yarding, due to unfavorable terrain that reduces skyline deflection and payload capability and,

b. Where additional haul road construction would be required to accommodate the use of cable logging systems. Regardless of the site-specific situation, the company is expected to use every practicable means to minimize soil disturbance within ground-based yarding units through the use of proper unit layout, appropriate equipment, operator education and training (see Section 6.3.3 Road Management Plan). (Note: slope limitations in this paragraph are more restrictive than for fireline construction; the rationale is that skid road construction often involves excavation.)

4. Ground-based yarding, or skidding, equipment is prohibited from operating in riparian management zones and equipment exclusion zones adjacent to Class I, II and III watercourses (for exceptions see Sections 6.3.1, 6.3.3, and 6.3.4).

6.3.4.7 Existing Skid Trails

Existing skid trails (roads used for skidding logs and not associated with hauling), including legacy skid trails, that are diverting a watercourse, have a potential to divert or are not properly draining will be noted and evaluated for repair by a RPF, fisheries biologist, hydrologist, geologist or other qualified personnel during THP preparation within the proposed harvest area. Any needed repairs will be made by the completion of timber operations.

6.3.4.8 Ground-Based Yarding - Feller-Buncher and Shovel Logging Operations

1. With one exception, feller-buncher and shovel logging operations may continue throughout the winter period when appurtenant haul roads are surfaced for all weather conditions and have appropriate drainage facilities, and when the operation does not involve the use of constructed skid trails for skidding or forwarding (see Table 6-17). The exception is during storm events where logging operations, combined with rainfall that is likely to deliver sediments into the RMZs or EEZs along Class I, II or III watercourses.

2. Measure 1 above applies solely to feller-buncher and shovel operations. Forwarding over constructed skid trails, when used in conjunction with the feller-buncher or shovel operation, is governed by Ground-Based Yarding – Tractor, Skidder, Forwarder Operations described above). Loading and landing operations are governed by the Loading and Landing Operations below. Hauling operations are also governed by Road and Landing Use Limitations.

6.3.4.9 Skyline Yarding Operations

1. When cable yarding across Class I and II riparian management zones, logs will be fully suspended above the ground.

2. When cable yarding across Class III equipment exclusion zones, logs will be fully suspended to the extent practicable.

3. Sections of skyline roads upslope of RMZs or EEZs may have bare mineral soil (i.e. no duff layer). Where sections of skyline roads have created furrowing of the ground which can channelize surface flow and result in gullying and possible delivery of sediments into or through the RMZ or EEZ, those affected areas will be treated as follows: one hand-built waterbar per 50 linear feet of affected skyline road. An exception to this standard would be in areas of known erodible soil types (e.g. Tonnini's) and formations (e.g. Wildcat) or slopes are over 65%. In these site specific instances, waterbars will be placed after a linear disturbance distance of 30 feet (minimum) and then 20-foot spacing between water bars after 30 feet.

6.3.4.10 Helicopter Yarding Operations

In harvest planning, helicopter yarding will be considered as an alternative to ground-based or skyline logging methods where road construction to access harvest unit(s) would traverse overly steep and/or unstable terrain. The final choice of logging method must be justified in the THP.

6.3.4.11 Loading and Landing Operations

1. To the extent practicable, (considering safe operation of equipment) minimize the need for landing construction. This can be accomplished through roadside decking, or by loading trucks at the roadside at approximately the same rate they are arriving to the roadside from yarding operations (see “hot-logging” or “hot-loading” in Glossary).

2. To the extent practicable, (considering safe operation of equipment) minimize the size of new landings by designing them for shovel, or heel-boom loaders in preference to front-end loaders.

3. Loading may occur only on rocked surfaces, subject to limitations in Road and Landing Use Limitations). Loading will be allowed on unsurfaced roads from May 1st through May 14th if early spring drying occurs as defined in the Road Management Measures or from October 16th through November 15th if an extended dry fall occurs also as defined in Road Management Measures.

6.3.5 Effectiveness Monitoring Measures

Monitoring and adaptive management form a key component of Simpson’s science-based approach to management. A wide variety of monitoring projects will be used to evaluate the implementation and the overall effectiveness of the Operating Conservation Program and to allow for changes to the Plan as necessary. Extensive assessment and monitoring of the Covered Species and their habitats has been conducted throughout Simpson’s ownership in the HPAs (see Appendix C and Section 4), and this Plan is predicated on the results of these studies. Severalof the monitoring projects presented here are a continuation of ongoing projects, and significant new monitoring projects are also proposed.

Monitoring can only be a useful component of the Operating Conservation Program when it is designed to address specific questions and objectives. The two main types of monitoring projects proposed under the Plan, implementation monitoring and effectiveness monitoring, are separated by their respective objectives. Implementation monitoring projects will focus on evaluating and documenting Simpson’s implementation of and compliance with this Plan and is described in Section 6.3.7. Effectiveness monitoring will focus on measuring the success of both individual and collective conservation measures in achieving the biological goals and objectives of the Plan and is described in this subsection (6.3.5) and Appendix D.

The proposed conservation measures in Section 6.2 are science-based using site-specific data, and Simpson fully expects that they will successfully achieve the biological goals and objectives of this Plan. The monitoring and adaptive management program provide the framework needed to ensure these expectations are met, and if necessary, to fine-tune specific measures through adaptive management. 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). The monitoring and adaptive management program described below incorporates both of these features. First, there are measurable thresholds associated with specific monitoring projects, which if exceeded, trigger corrective action to provide the direct link between science and management. Second, the implementation of specific management measures in selected watersheds will be designed to work in concert with monitoring projects as a scientific experiment.

A brief summary of each monitoring project, including the background, monitoring objective(s), biological objectives and measurable thresholds (where applicable), and the spatial and temporal scales of each project, is provided below. Monitoring protocols for the projects and programs, excluding those to be developed in response to monitoring results and those for new and refined approaches developed through the Experimental Watersheds Program, are described in Appendix D.

6.3.5.1 Overview of Effectiveness Monitoring Measures

Effectiveness Monitoring projects and programs will measure the success of the Operating Conservation Program in relation to the Plan's biological goals and objectives. Effectiveness monitoring will 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 between specific aquatic habitat elements and the long-term persistence of the Covered Species.

6.3.5.1.1 Program Flexibility and Temporal Scale

Each Effectiveness Monitoring project and program is based on current monitoring technology and methodologies and on current understanding of the limiting habitat conditions required by the Covered Species (i.e., LWD, sediment, and water temperature). It is reasonable to expect that monitoring techniques and related technology will change significantly through the fifty-year life of this Plan, and that understanding of riparian function will also change. Therefore, it is essential to build flexibility into the monitoring program to respond to these changes. Some monitoring approaches may be retired or replaced by more efficient and/or accurate techniques to address the same issues, and entirely new approaches may be implemented to address currently unforeseen issues. Changes to the monitoring program will be evaluated to insure that they do not reduce the ability of the program to achieve its objectives: to evaluate the effectiveness of the conservation measures and provide feedback for adaptive management. Periodic reviews, at least every ten years or following changed circumstances, will provide the assessment needed to justify changes. Changes to the monitoring program will be subject to the concurrence of the Services.

As indicated in Table 6-18, the projects and programs fall into four categories: Rapid Response Monitoring, Response Monitoring, Long-term Trend Monitoring and Research, and Experimental Watersheds Program. The first three categories are based on the minimum time frame over which feedback for adaptive management is likely to occur. The time scales are a product of the specific variables or processes being measured as well as the available monitoring protocols.

- Rapid Response Monitoring projects have the potential to provide feedback to adaptive management on a time scale of months up to two years.

- Response Monitoring projects will generally require a minimum of three years to provide feedback to adaptive management.

Table 6-18. Effectiveness monitoring projects and programs.

Rapid Response Monitoring	Response Monitoring	Long-term Trend Monitoring/Research	Experimental Watersheds Program
• Summer Water Temperature Monitoring – Property-wide Water Temperature Monitoring – Class II BACI Water Temperature Monitoring • Spawning Substrate Permeability Monitoring • Road-related Sediment Delivery (Turbidity) Monitoring • Headwaters Monitoring – Tailed Frog Monitoring – Southern Torrent Salamander Monitoring	• Class I Channel Monitoring • Class III Sediment Monitoring	• Road-Related Mass Wasting Monitoring • Steep Streamside Slope Delineation Study • Steep Streamside Slope Assessment • Mass Wasting Assessment • Long Term Habitat Assessments • LWD Monitoring • Summer Juvenile Salmonid Population Estimates • Outmigrant Trapping	• Area-limited Effectiveness Monitoring Projects • BACI Studies of Harvest and Non-Harvest Areas under the Plan • BACI Studies of Conservation and Management Measures • New and Refined Monitoring and Research Protocols

- Long-term Trend Monitoring/Research projects are designed to monitor long-term trends and/or provide an understanding of the relationship between management and riparian function. They do not have set thresholds for adaptive management.

The Experimental Watersheds Program provides a unique spatial scale for individual projects and for the development of new and refined approaches.

6.3.5.1.2 Monitoring Thresholds and Feedback to Adaptive Management

The Rapid Response and Response Monitoring projects form the backbone of the adaptive management process. Each project has measurable thresholds which, when exceeded, initiate a series of steps for identifying appropriate management responses. To provide the ability to respond rapidly to early signs of potential problems while providing assurances that negative monitoring results will be adequately addressed, a two-stage “yellow light, red light” process will be employed. The yellow light threshold will serve as an early warning system to identify and rapidly address a potential problem. As such, the yellow light thresholds can typically be exceeded by a single negative monitoring result (i.e., summer water temperatures). The red light threshold is usually triggered by multiple negative monitoring responses (a series of yellow light triggers) and indicates a more serious condition than the yellow light threshold (i.e., headwaters population monitoring for tailed frogs).

There have not yet been thresholds established for some of the monitoring projects, either due to the scarcity of available scientific literature, site-specific baseline data or both. For these monitoring projects, a process has been created that will allow establishment of yellow and red light thresholds in the future. The process to establish thresholds to trigger yellow and red light evaluations will be based on data collected from “reference sites”. Reference sites will either be stream reaches within the Plan Area that have been demonstrated to support stable populations of the Covered Species of interest, or reaches in which the habitat conditions have been shown to be within the range of good conditions based on studies done outside the Plan Area. If the list of potential reference sites within the Plan Area is large (greater than 12-15), a spatially distributed randomized sample of sites will be chosen for monitoring. Otherwise, if the list of reference sites is small (less than 12-15), all reference sites within the Plan Area will be monitored. The first phase of setting the thresholds will be collecting baseline data to establish the average condition and range of natural variability for the response variable of interest. During the time that baseline data are being collected, Simpson will also collect data on a variety of potentially explanatory covariates that may reduce the natural variation observed in the response variable. The length of time that baseline data will need to be collected will depend on annual temporal correlation of the selected response variable (e.g. annual mean maximum water temperature probably is not temporally correlated, but the depth of sediment stored in a given stream reach probably is), natural range of variability and the degree to which climatic conditions during the monitoring period are representative of “normal” conditions. There should be sufficient data available to set these thresholds within five years for the Rapid Response Monitoring projects, but it will take at least ten years for the Response Monitoring projects.

Once sufficient data have been collected, the appropriate statistical analysis (e.g. simple linear regression, analysis of covariance, randomization or a bootstrap technique) will be conducted to remove the effects of any relevant environmental covariates and calculate the 95% confidence interval. Depending on the response variable of interest, either the lower or upper 95% confidence interval endpoint in any given year will be used to trigger the yellow light threshold. Depending on the temporal correlation of the response variable, two to five years of a yellow light condition will trigger a red light threshold, or one year exceedence of the 99% confidence interval endpoint.

The results of the Long-Term Trend Monitoring/Research will be evaluated within at least 15 years to determine if the data suggest trends that may trigger adaptive management actions. However, assessment of trend monitoring data will be more of a qualitative evaluation and not conducive to the establishment of rigorous thresholds.

Monitoring data may be collected year-round, as with some instream temperature recorders, or seasonally, as with the Class I channel dimensions monitoring. The data collected through each monitoring project will be analyzed on an annual basis for every monitoring project (see Appendix D), and that analysis will determine if any yellow or red light thresholds were exceeded over the previous monitoring period. The intent is to provide a timely review of monitoring data to allow for corrective actions to occur, if necessary, prior to the next season. The procedures followed if a yellow or red light threshold is exceeded are described below.

The yellow light threshold will trigger an internal assessment to determine the source of the problem, and NMFS and USFWS will be notified within 30 days after the analysis indicates that any yellow light threshold has been exceeded. Their technical assistance will be requested in addressing the problem, and any and all management changes resulting from the yellow light threshold must be made with the concurrence of the Services. Changes in management will also be consistent with the AMRA described in Section 6.3.6. The procedures followed, conclusions reached, and any changes in management undertaken to address a yellow light condition will be documented and included in a report to the Services.

The internal assessment will be designed to identify the cause behind the yellow light condition, its relationship to management activities, and what, if any, changes to management are appropriate. All available information will be used to make this determination, including results from other monitoring sites throughout the Plan Area, and results from other monitoring projects where applicable. For example, if the yellow light threshold for water temperature was exceeded, air and water temperature profiles from across the entire Plan Area would be examined to determine if high temperatures were found everywhere. This would indicate that an unusually hot summer caused water temperatures to rise significantly throughout the Plan Area irrespective of management activities in any particular basin. In this case, the internal assessment might conclude that the condition is due to weather, and no changes in management would be taken. However, if temperatures in basins which had been recently harvested were to rise, while those in undisturbed areas did not, then further assessment in the affected basins would follow. The assessment would include measures such as on the ground inspections of RMZs and creation of a basin thermal profile to isolate specific problem areas. Should management activities be implicated as the likely cause of temperature increases, corrective measures would likely include adjustments to RMZ widths or canopy retention standards. For a discussion of the RMZ buffer widths and canopy cover conservation measures see Section 6.3.1.

The red light trigger is typically a result of multiple negative monitoring responses (a series of yellow light triggers). The Services will be notified within 30 days after the analysis of monitoring results indicates that any red light threshold has been exceeded. Simpson will endeavor to obtain input from the Services regarding identification of any feasible interim changes in the Operating Conservation Program (in the area in which the red light threshold is exceeded) that could be made by Simpson to avoid management-caused exacerbation of the red light condition pending a full assessment of the causes of the exceedence.

An in-depth assessment with the full participation of the Services will be conducted to determine the likely causes of the red light threshold condition, and appropriate management changes to address the issue. A scientific review panel which consists of independent experts on the subject at hand may be assembled at the request of either party if Simpson and the Services cannot agree on a course of action to address the red light condition. The panel will have three members, one appointed by the Services, one by Simpson, and a third selected by the first two panel members. The role of the scientific review panel is to provide technical analysis of the data and any other available information to the extent it is relevant to the conservation of the Covered Species in the Plan Area and attempt to reach conclusions on whether the exceedence of a red light threshold was management induced. Modifications will not be made to the default prescriptions unless the analysis is conclusive in the opinion of a majority of the scientific review panel. If the results are not conclusive, the monitoring will be extended for another five years and the monitoring protocol will be evaluated to insure that appropriate methodologies are being applied. A similarly constructed scientific panel will provide technical analysis of the SMZ data, after a 15 year data collection period, and attempt to reach conclusions on the effectiveness of the SMZ prescriptions relative to the goal of the SMZ conservation measures. Modifications will not be made to the default SMZ prescriptions unless the analysis is conclusive in the opinion of a majority of the scientific review panel. If the results are not conclusive, the monitoring protocol will be evaluated to ensure that appropriate methodologies are being applied and the monitoring will be extended for another five years.

Just as the biological goals and objectives set forth in Section 6.1 guided development of the prescriptions set forth in the Plan, Simpson will look to the applicable goals and objectives to guide development of any changes to the prescriptions pursuant to a red light trigger, using the information gained from the monitoring and adaptive management processes. Any adjustments to the Plan will be in keeping with the AMRA and responses to changed circumstances. The two-stage yellow light-red light threshold process for adaptive management is outlined in the Figure 6-8.

6.3.5.1.3 Monitoring Sites

The Effective Monitoring projects and programs will be implemented in the Plan Area.

Figure 6-8. Two-stage threshold process for adaptive management.

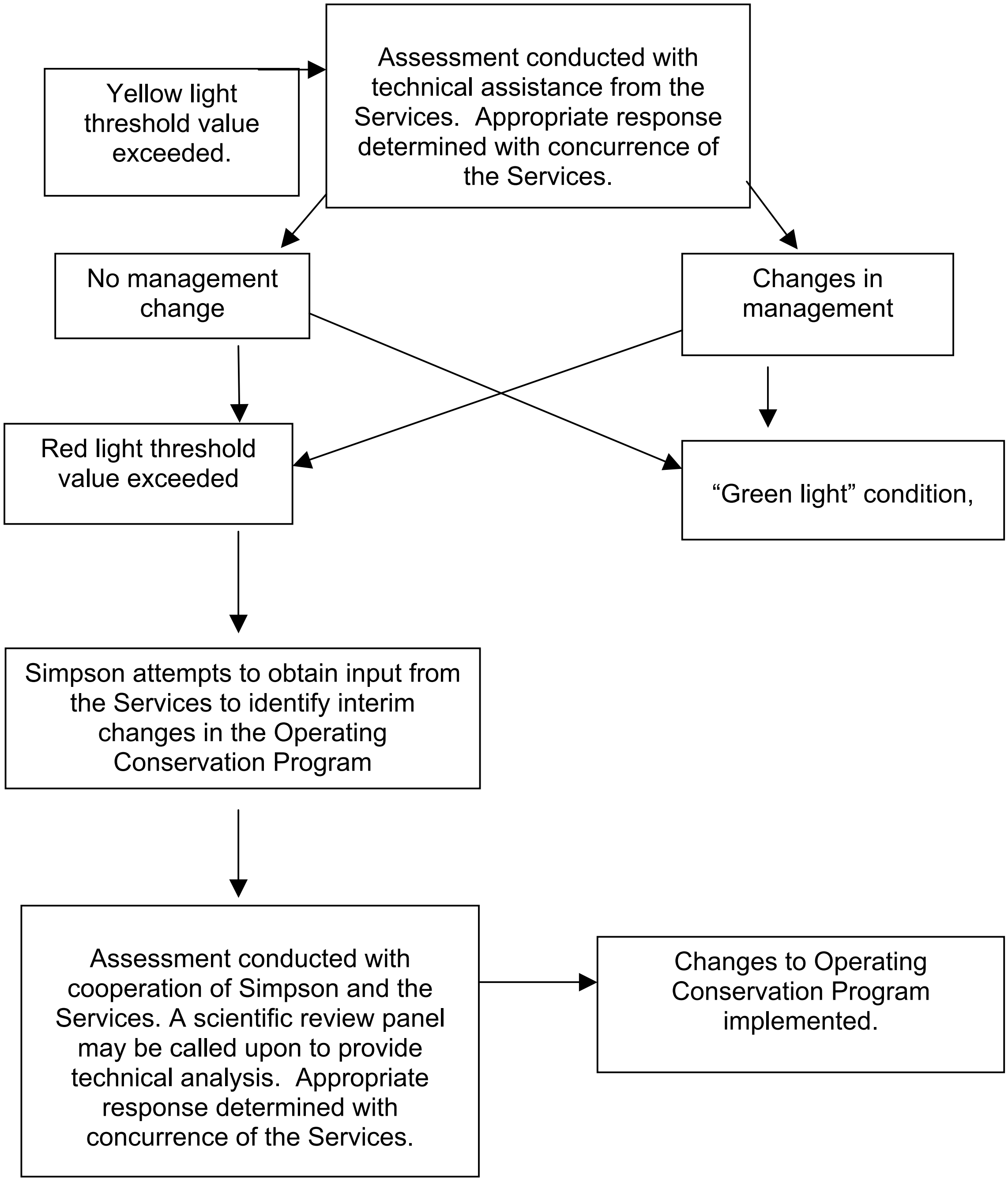


Figure 6-9 identifies the location of many of the existing monitoring sites. Some monitoring sites have not yet been established or cannot be shown effectively on a map of this scale and consequently are not included on the figure. The figure also does not show existing water temperature monitoring sites because of the high density of sites across the Plan Area would obscure the other depicted sites.

6.3.5.1.4 Phase-in Period

There will be a phase-in period for some of the monitoring measures (e.g., within the Experimental Watersheds). By the end of the third year of Plan implementation, all of projects and programs identified below will be up and running. The first biennial report will include information from the projects and programs that are operational and a progress statement on the remaining measures. The second biennial report will include information from all of the projects and programs.

6.3.5.2 Rapid Response Monitoring

The Rapid Response Monitoring projects and programs will provide the early warning signals necessary to ensure that the biological goals and objectives of the Plan will be met. While trends which occur over longer time scales will also be monitored through these projects, they are distinguished from the response and trend monitoring projects by their potential to provide rapid feedback for adaptive management. The yellow light threshold for these projects can typically be triggered in less than one year, although the annual analysis of results will be necessary to identify the yellow light condition. The red light threshold will generally take two to three years to be triggered. A brief summary of each Rapid Response Monitoring project is provided below.

6.3.5.2.1 Property-wide Water Temperature Monitoring

Background

Cool water temperatures are essential to all six Covered Species. Timber harvest has the potential to cause increased water temperatures through a reduction in stream canopy cover or through channel widening and shallowing as a result of increased sediment inputs. As a result, maintaining cool water temperatures is one of the primary biological goals of this Plan.

Water temperature monitoring on Simpson's ownership began in 1994 and is ongoing today. Between 1994 and 2000, 400 summer water temperature profiles were recorded at 156 locations in 109 Class 1 watercourses, and 209 summer temperature profiles were recorded at 87 locations in 66headwater (Class II) watercourses. Water temperature monitoring will continue on an annual basis throughout the Plan Area.

Using one or several set water temperature values to establish biological objectives or thresholds was problematic because of the relationship between water temperature at a site and the drainage area above that site (Figure 6-10). Water temperatures were positively associated with drainage area and relatively predictable up to a size of approximately 10,000 acres. In drainages with greater watershed area, water temperatures tended to have increasingly greater variation probably in response to a variety of complex interacting physical factors (Beschta et al. 1987)

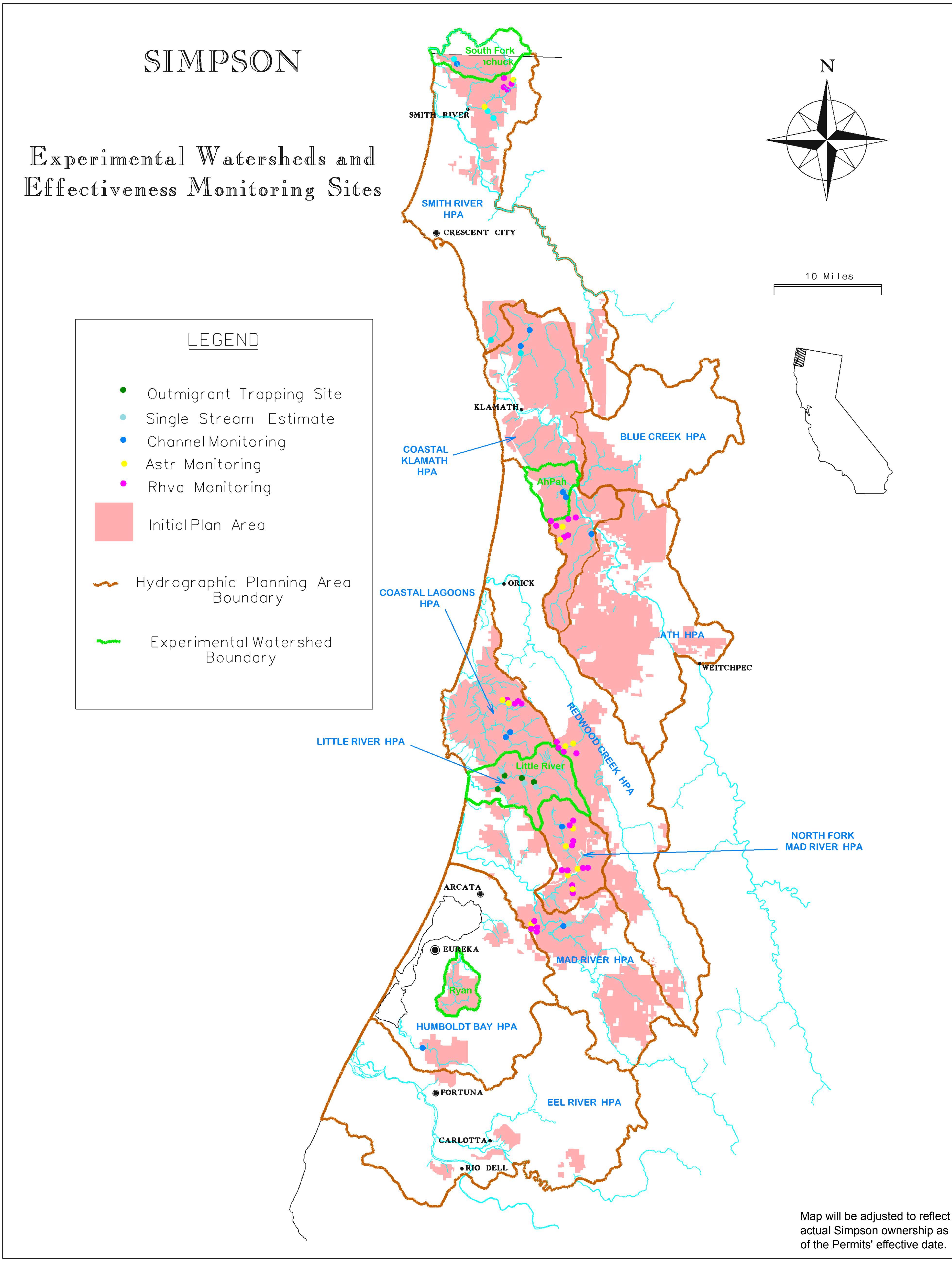


Figure 6-9. Location of existing monitoring sites (water temperature monitoring sites not included).

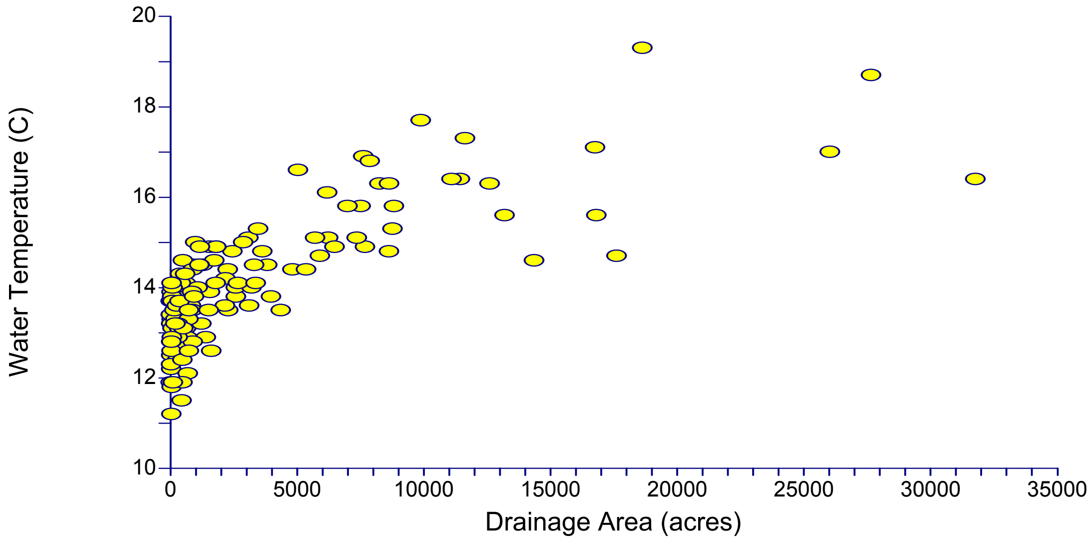


Figure 6-10. Relationship between the 7-day highest mean water temperature and drainage area above the monitoring site for 139 locations.

To account for the relationship between water temperature and drainage area, Simpson regressed temperature on the square root of drainage area at locations known to support populations of southern torrent salamanders, tailed frogs or coho salmon (Figure 6-11). The square root transformation was used to create a linear relationship between the two variables. As described in more detail in Section 4.3.1 and Appendix C5, the upper 95% PI (of individual sample sites as the yellow light threshold for drainages up to approximately 10,000 (100 square root) acres. One degree above the upper 95% PI was set as the red light threshold until a maximum of 17.4 °C was reached. It should be noted that using the regression of water temperature versus drainage area to establish biological objectives and threshold values was only intended to apply to 4th order or smaller streams that generally occur in drainages less than 10,000 acres. As noted above, this is because the relationship gets weaker for increasingly larger watersheds. In addition, the Covered Species in this Plan generally rear in smaller watersheds during the summer months.

Monitoring Objectives

The monitoring objectives are to:

- Document the highest 7DMAVG, 7DMMX, and seasonal water temperature fluctuations for each site.
- Identify stream reaches with water temperatures which may exceed the thresholds relative to the drainage area above the monitoring site.

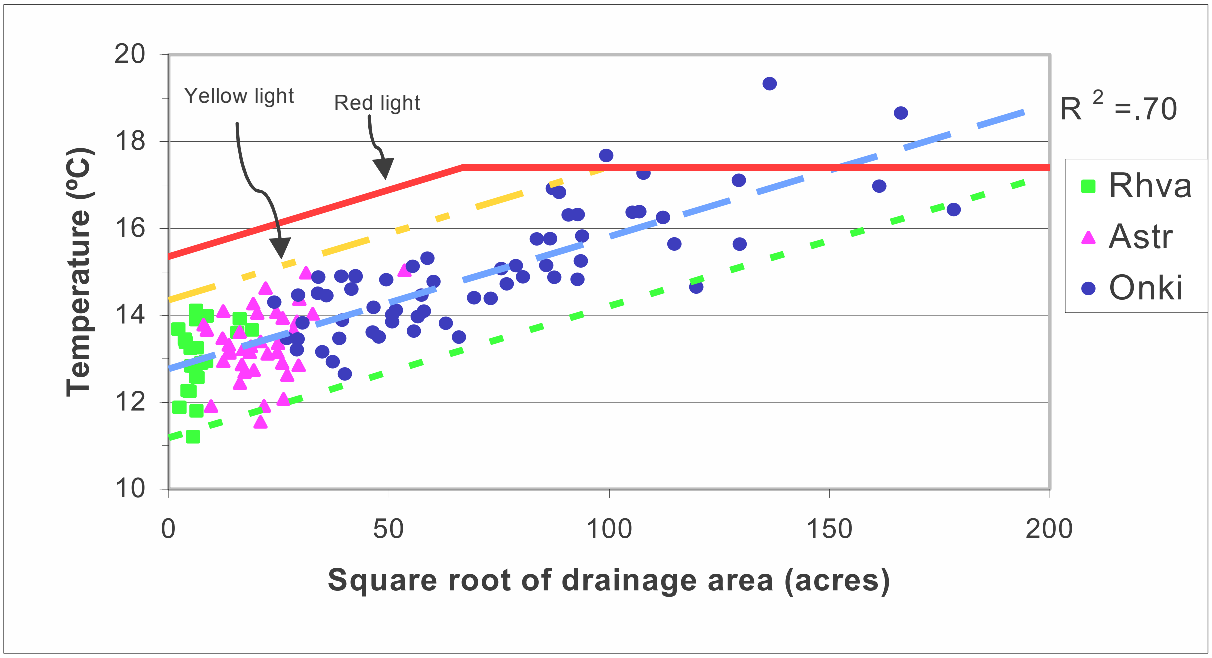


Figure 6-11. **Regression of the 7-day highest mean water temperature versus the square root of drainage area for 139 locations. (Rhva = streams with southern torrent salamanders, Astr = streams with tailed frogs and Onki = streams with coho salmon).**

<u>Biological Objectives</u>

Summer water temperatures in 4th order or smaller Class I and II watercourses with drainage areas less than approximately 10,000 acres will have a 7DMAVG below the upper 95% PI described by the following regression equation:

Water temperature = 14.35141 + 0.03066461x square root Watershed Area.

In addition, even when temperatures are below the values listed above, it is a biological objective of this Plan to have no significant increases (>2°C) in the 7DMAVG water temperature in Class I or II watercourses following timber harvest that are not attributable to annual climatic variation.

<u>Thresholds/triggers</u>

In Class I and II watercourses with drainage areas generally less than 10,000 acres the yellow light thresholds will be:

- A 7DMAVG above the upper 95% PI described by the regression equation: *Water Temperature = 14.35141 + 0.03066461x square root Watershed Area* <u>or</u>,

- Any statistically significant increase in the 7DMAVG of a stream where recent timber harvest has occurred, which cannot be attributed to annual climatic effects.

The red light thresholds will be:

- A 7DMAVG above the upper 95% P.I. plus one °C as described by the regression equation: *Water Temperature =15.35141+ 0.03066461x square root Watershed Area*,

- An absolute value of 17.4 °C (relevant for fish) or,

- A 7DMAVG value that triggers a yellow light for three successive years.

Temporal Scale

The response variable for water temperature monitoring is direct measurements of water temperature in Class I and II watercourses. Temperature increases due to timber harvest would likely appear in the first measurement (one summer) following harvest. The thresholds for adaptive management can likewise be triggered by one summer's results, so the time from impact to management response could be as little as one year. It is possible that unusually cool weather could mask a management-related increase, so that it might not be evident until a normal or hot summer occurs.

Spatial Scales

The results of individual temperature recorders reflect an integration of physical and biological conditions upstream of the monitoring site in a specific basin or sub-basin. The specific upstream area that influences the water temperature at the recorder (thermal reach) cannot be readily estimated, because it varies with stream depth, discharge, water temperature, canopy closure and a variety of other physical and biological parameters. However, the high numbers and wide distribution of water temperature monitoring sites across the Plan Area should permit identification potential management related increases, and allow for comparisons to Plan Area-wide trends which are related to larger climatic variations.

If a yellow or red-light threshold is surpassed, the assessment and potential management adjustments will be applied to the zone of monitoring influence associated with each site. Due to variations among thermal reaches and the inability to precisely define them, the zone of monitoring influence for each temperature monitoring site will be estimated on a site specific basis. However, if the water temperatures cannot be attributed to a specific thermal reach, the zone of monitoring influence will be applied to the entire sub-basin area above the monitoring reach, and any adjacent sub-basins that do not have temperature monitoring sites.

6.3.5.2.2 Class II BACI Water Temperature Monitoring

Background

In addition to the general property-wide water temperature monitoring project, experiments were initiated beginning in 1996 to compare water temperatures in Class II watercourses in eight paired sub-basins. These were designed as BACI experiments in which water temperatures were monitored before and after timber harvesting in both treatment and adjacent control streams. (See Appendix C5 for the full description of the study design and the results to date.)

In summer 1996, Simpson initiated water temperature monitoring in nonfish bearing (Class II) watercourses to assess potential impacts of harvesting and adequacy of the riparian buffers. The goal of this effort was to examine changes in stream temperature after timber harvest by comparing maximum temperature differentials across fixed lengths of stream. These temperature differentials were measured on pairs of similar streams, one member of which ran through a harvest unit, the other of which was undisturbed. Measurements were initiated in both streams of a pair prior to harvesting timber surrounding one member of the pair. Monitoring of the stream pair will continue until the stream pair returns to pretreatment conditions. These data represent a BACI (Green 1979; Stewart-Oaten et al. 1986; Skalski and Robson 1992) observational study. While observational studies cannot infer cause and effect relationships, BACI studies represent the best available setup for detecting changes after disturbance. Five paired sites were selected in 1996; three additional pairs were identified in 1999.

<u>Monitoring Objective</u>

The monitoring objective of the Class II BACI Studies is to directly assess the effects of timber harvest on water temperatures in Class II watercourses.

<u>Biological Objective</u>

The biological objective of the Class II BACI Studies is to examine the effectiveness of riparian buffers in mitigating the potential impacts on Covered Species from increased water temperatures following harvest adjacent to a Class II watercourse.

<u>Thresholds/triggers</u>

The yellow light threshold will be a statistically significant effects from harvesting in at least one-third of the sites. The red light threshold will be statistically significant effects from harvesting continuing for three successive years following treatment in at least one-third of the sites.

<u>Temporal Scale</u>

The impacts of timber harvest on water temperature in small Class II watercourses will be assessed at the warmest time of day during the warmest time of the year. This will be done to ensure the maximum test of the effectiveness of riparian buffers in mitigating the potential impacts of increased water temperatures following harvest adjacent to a watercourse. In addition, the assessment will focused on the warmest time of the year, since it is believed that the Covered Species are most likely to be impacted by increases in water temperature that may cause water temperature to exceed some biological threshold.

Monitoring of existing pairs where harvesting has been completed at the treatment site will continue for at least three years after harvest or until the temperature profile of the pair returns to the pre-treatment pattern. Monitoring of pairs where harvesting has not yet occurred will begin at least one-year prior to harvest of the treatment site and will continue for at least three years after harvest or until the temperature profile of the pair returns to the pre-treatment pattern.

Spatial Scale

Monitoring will continue at the eight existing paired sites, and additional sites will be established across the Plan Area as opportunities exist. (New BACI sites cannot be initiated unless there is going to be harvesting in the area to create the treatment reach.) The goal is to have a minimum of 12 to 15 paired sites that are well distributed across the Plan Area to represent different physiographic regions. If there is little variance among sites in the response of water temperature to the treatment effect, this minimum number will be adequate to reach a definitive conclusion on the impact of harvesting on Class II water temperature. However, if there is substantial variation in the treatment response, it will be necessary to add additional sites. The actual maximum number is a statistical question that cannot be answered until the data are collected and analyzed.

6.3.5.2.3 Spawning Substrate Permeability

Background

Reducing management-related sediment inputs to Plan Area streams is a biological goal of this Plan. Maintaining adequate spawning substrate permeability is one of the measurable biological objectives associated with this goal. Salmon and trout spawn in gravel and cobble substrates, and subsurface flow through redds is essential in providing dissolved oxygen to embryos and carrying away metabolic wastes. Sedimentation can reduce the survival to emergence of the covered embryos by reducing subsurface flow (Reiser and White 1988). Permeability monitoring is a way to measure subsurface flow, and permeability has been correlated with survival to emergence of salmonids (McCuddin 1977; Tagart 1976; Tappel and Bjorn 1993).

Monitoring Objective

Spawning gravel permeability will be monitored in selected Class I watercourses throughout the Plan Area to determine if conditions are currently suitable for the covered fish species and to track trends in permeability.

Biological Objective

Appropriate biological objective and threshold values for spawning substrate permeability in the Plan Area are not known at this time. Field measurements in streams across the Plan Area will be combined with the available literature and field data from additional streams, including pristine portions of the Prairie Creek watershed, to determine appropriate threshold and biological objective values. Approximately five years of initial trend monitoring is expected to be necessary for this process. A complete description of the spawning substrate permeability monitoring project, including the process for determining appropriate threshold values, is presented in Appendix D.

Thresholds

As described above, approximately five years of initial trend monitoring is expected to be necessary to determine appropriate threshold values. At the end of five years a review and evaluation of trend monitoring results will be conducted. In addition, at other times agreed upon with the consensus of the Services, periodic reviews will be conducted to evaluate progress in determining substrate permeability thresholds.

Temporal Scale

The response variable for permeability monitoring is inflow rate in likely salmonid spawning substrates of Class I watercourses. Changes in inflow rates should respond within hours or days to sediment inputs, but the interval between monitoring periods will likely be one to two years. The time period needed to distinguish between natural process variation and management-related trends may be at least five to ten years, but once threshold values are established, adaptive management response may occur over a time frame of one to two years.

Spatial Scale

The permeability recorded at a monitoring site will reflect the total sediment inputs upstream of the monitoring site, along with sediment stored in-channel which is mobilized due to high flows. The selection of all the monitoring sites has not yet occurred, but permeability will be monitored at all the long term channel sites, along with additional sites selected to insure that there will be at least several sites monitored in each HPA. The zone of monitoring influence will generally apply to the entire sub-basin above the monitoring site, but may be extrapolated to other drainages with similar conditions (i.e., geology, slope classes, etc) that lack monitoring sites.

6.3.5.2.4 Road Related Surface Erosion (Turbidity Monitoring)

Background

Surface erosion from roads is recognized as a potentially significant source of management related fine sediment inputs to Plan Area streams. Road upgrading measures and winter use limitations are expected to reduce road related surface erosion under this Plan. Inboard ditches collect surface runoff from roads, and in many cases, channel this runoff directly into streams. Part of the road upgrading process is to hydrologically disconnect the roads from the streams, eliminating these pathways for road runoff to directly enter streams.

Turbidity monitoring will be focused on the four watersheds which make up the Experimental Watershed Program. Turbidity monitoring will be used to measure the road-related fine sediment inputs to Plan Area streams, and evaluate the effectiveness of the road upgrading measures in reducing these inputs. Turbidity will be measured immediately above and below watercourse crossings in Class II-1 and II-2 watercourses, with the difference in turbidity between the two assumed to be due to surface runoff from the road. The road related surface erosion monitoring will also compare this change in turbidity on individual road segments before and after road upgrading, and between roads which have been upgraded and those which have not. The implementation of the road upgrading will be designed to allow for these experiments. Permanent turbidity monitoring stations will also be employed in the four drainages which make up the Experimental Watersheds Program. Permanent turbidity monitoring stations will be monitoring all changes in the experimental watersheds (i.e. all effects). Therefore these data can be used for comparing changes within each of the Experimental Watersheds.

Monitoring Objective

Turbidity monitoring will be used to determine the extent to which management roads are chronic contributors of fine sediment to Plan Area streams. Turbidity will also be monitored in a BACI experimental design to determine the effectiveness of road upgrading in reducing the hydrologic connections between the road network and Plan Area streams. The first objective will be used as a threshold for adaptive management, while the latter objective will be used to fine-tune road upgrading work. Both will contribute to the biological objective described below.

Biological Objective

Road upgrading (primarily measures to reduce or eliminate the hydrologic connections between the road network and Plan Area streams) and winter use limitations will reduce the amount of road related fine sediments entering Plan Area streams.

Thresholds

Appropriate threshold values for turbidity monitoring cannot be determined at this time. Approximately five years of initial trend monitoring are expected to be necessary to set the appropriate biological objectives and threshold values. At the end of five years a review and evaluation of trend monitoring results will be conducted. In addition, at other times agreed upon with the consensus of the Services, periodic reviews will be conducted to evaluate progress in determining turbidity thresholds.

Temporal Scale

The response variable for the road-related surface erosion monitoring will be the change in turbidity of a stream above and below a watercourse crossing. Turbidity responds almost instantly to changes in fine sediment inputs. Monitoring will occur continuously throughout each winter, so it will be possible to detect average changes within each sub-basin after each appropriate storm event. As a result, a yellow light condition could be reached in as little as three consecutive days of rain.

Spatial Scale

Turbidity monitoring will occur in the four drainages which make up the Experimental Watershed Program. The results from the permanent turbidity monitoring stations will integrate the effects of all upstream sources of turbidity in the watershed. The results from each watercourse crossing will directly reflect the fine sediment inputs from the particular road segment adjacent to that crossing. The extrapolation of results and potential adaptive management measures across the Plan Area will depend on the specific findings. For instance, if the monitoring results indicate that additional measures are needed to effectively disconnect roads from the stream network in certain geologic formations or soil types, that work would be done everywhere those formations or soil types exist. Alternatively, monitoring results could indicate that winter use limitations need to be expanded in particular geologic formations or soil types.

6.3.5.2.5 *Headwaters (Tailed Frog and Southern Torrent Salamander) Monitoring*

Background

Most of the research and protocols developed for monitoring forest aquatic systems in the Pacific Northwest have focused on anadromous fish populations and their habitat conditions within third order or larger streams. Using the fish populations as indicators of watershed health is problematic, as factors outside the freshwater system have a major impact on population levels. As a result, much of our monitoring program is focused on the habitat conditions within the fish-bearing reaches of streams. However, it is possible that habitat conditions will be shown to improve throughout the life of the Plan, but fish populations will continue to decline. Simpson believes it is critical to the monitoring program to provide a definitive biological link to freshwater habitat conditions.

The headwaters monitoring project will provide this biological link by focusing on the populations of the two obligate headwater species (tailed frog and southern torrent salamander) that are the most sensitive to the potential impacts of timber harvest. These species are unique relative to anadromous fish species in lower stream reaches in that they have relatively limited vagility and typically live out their entire lives in or immediately adjacent to a relatively short reach of stream. Therefore, the population levels of obligate headwater species are influenced by the conditions that exist within or immediately adjacent to the stream course. Although there are many demonstrated risks associated with the use of biological indicator species, the population levels of the headwater amphibian species covered in this Plan should provide a good biological indicator of the general effectiveness of the Plan in achieving the biological goals of maintaining cold water temperatures and reducing excessive sediment inputs into streams.

In addition to the need to provide a biological indicator, the focus of the headwaters monitoring will be on populations because there are no well defined protocols that can be directly applied to monitor the habitat conditions within headwater streams. Research in smaller headwater streams has typically focused on the populations and habitat associations of the species that live in these streams. In comparison to numerous studies designed to monitor the impact of watershed processes on stream morphology in fish bearing watercourses, little has been done to monitor the impact of those same processes on headwater streams. It is known that headwater streams typically have higher gradients and more confined channels than lower stream reaches, and as a result are primarily sediment transport reaches. There are no readily implemented techniques to monitor how sediment movement through these systems impacts the quality of the habitat in the stream. Although Simpsonwill monitor some elements of habitat conditions in headwater streams, the headwaters monitoring program will be primarily focused on populations of the two obligate headwater species covered under this Plan, the tailed frog and southern torrent salamander. Populations of tailed frogs and southern torrent salamanders should provide the best indicator of overall habitat conditions in headwater streams.

Differences in our ability to effectively sample populations of tailed frogs and southern torrent salamanders affect the temporal scales required for effective feedback to adaptive management. Tailed frog monitoring can trigger both yellow and red light thresholds in one and three years respectively. Southern torrent salamander monitoring has the potential to trigger a yellow light threshold in less than one year, but is expected to require at least five years before statistically significant results can be determined to trigger a red light threshold. These differences are described in more detail below.

6.3.5.2.5.1 Tailed Frog Monitoring

Tailed frogs occur primarily in larger first order and second order streams, and may be influenced by direct impacts of timber management. Direct impacts could include activities such as excessive canopy removal at the site leading to elevated water temperature, or destabilizing soil leading to direct sediment inputs at the site. However, they are also vulnerable to cumulative impacts in the upper reaches of watersheds that could result in elevated water temperatures or excessive sediment loads. In this regard they are similar to the salmonid species, except that such cumulative impacts could effect tailed frog populations before the impacts were manifest in the lower fish-bearing reaches of a watershed.

The primary focus of the tailed frog monitoring will be on the larval population. While the adults can move between the stream and adjacent riparian vegetation, the larvae respire with gills and are tied to the stream environment. They require a minimum of one year to reach metamorphosis, which necessitates over-wintering in the streams. They feed on diatoms while clinging to the substrate with sucker-like mouth parts and have limited swimming ability. This makes them potentially vulnerable to excessive bed movement of the stream during high flows, which Simpsonpreviously documented to drastically reduce the larval cohort that is in the stream during the high flow event. As a result of their life history requirements, the larvae provide the most immediate and direct response to changes in stream conditions. In addition, larval tailed frogs can be captured with ease while causing minimal disturbance to the site. Ongoing studies have allowed us to develop a protocol that has been shown to be highly effective in estimating larval populations. Methodologies for estimating larval tailed frog populations are shown in Appendix C11. Adults can also be captured with minimal disturbance to the site, but in contrast to the larvae, their population size cannot be readily estimated. As a result of all the factors discussed above, the primary response variable for the tailed frog monitoring will be the size of the larval population.

A decline in tailed frog populations could be caused by a number of factors including elevated water temperatures, change in the algal community due to an increase in insolation or increases in sediment inputs. However, our previous research and monitoring of tailed frogs indicated that they were most likely to be impacted by increases in sediment inputs. Given that Simpson will be monitoring water temperature, canopy closure and substrate composition along with the larval populations, Simpson believes that the likely cause of some future decline will be determined.

Monitoring Objectives

The primary monitoring approach will employ a paired sub-basin design. Changes in larval populations of tailed frogs will be compared in randomly selected streams in watersheds with (treatment) and without (control) timber harvest. In some cases, control sub-basins will not be available in which case changes in larval populations will be compared to the amount of timber harvest. In either case, the monitoring objective will be to determine if timber harvest activities have a measurable impact on larval populations.

A secondary monitoring objective will be to document long-term changes in tailed frog populations across Simpson's ownership. As indicated in Section 4.3, studies of the Original Assessed Ownership determined that 75% of the assessed streams (80% excluding geologically unsuitable areas) had tailed frog populations (Diller and Wallace 1999). Given that this occurrence rate is near the highest reported for the species even in pristine conditions (Corn and Bury 1989; Welsh 1990), a secondary objective is to sustain the occupancy of tailed frog populations in Class II watercourses in the Plan Area at a minimum of 75% through time. To determine if this objective is being met, the landscape study previously completed (Diller and Wallace 1999) will be repeated at 10-year intervals.

Biological Objective

No significant impact from timber harvest on the larval populations of tailed frogs.

Thresholds/triggers

Changes in larval tailed frog populations can be used as both yellow and red light thresholds to trigger adaptive management.

The yellow light thresholds are:

- Any statistically significant decrease in the larval populations of treatment streams relative to control streams, or

- A statistically significant downward trend in both treatment and control streams.

The red light thresholds are:

- A statistically significant decline in larval populations in treatment streams relative to control streams in >50% of the monitored sub-basins in a single year;

- A statistically significant decline in treatment vs. control sites continuing over a three year period within a single sub-basin or;

- A statistically significant downward trend in both treatment and control streams that continues for three years or more.

The change in the occurrence of tailed frog populations across the ownership would not be suitable to use as a trigger to initiate management review due to the extended time-lag between successive data points. However, the occurrence of tailed frogs in Class II watercourses across the Plan Area would serve as corroborative evidence to support the findings of the larval population monitoring, and a significant decrease in the occurrence rate would initiate a review of the probable cause of the decline.

Temporal Scale

If a significant change occurs in the larval populations of treatment streams relative to controls, it will most likely occur during winter high flow events. This change would then be detected during the summer survey season immediately following the winter event. Therefore, the yellow light threshold for adaptive management could be initiated in a single year. The red light threshold would require three years to be initiated.

Spatial Scale

The spatial scale over which results from an individual monitoring site should apply, (the zone of monitoring influence), will be analyzed on a case-by-case basis. The inherent variability associated with monitoring of a biological indicator necessitates this approach. If a yellow or red light condition is detected, results from all sites across the Plan Area will be examined carefully to determine if the observed population decline(s) appear to be associated with management activity, if they are localized or area wide, and if they appear to be correlated with other factors such as underlying geology or annual climate variation. Field inspection of the problem site(s) will also attempt to identify potential causes of the decline. Because populations in both treatment and control streams could decline for reasons beyond our control that may not be related to habitat (e.g. stochastic disease outbreaks), it is essential to examine the results from all monitoring sites to look for patterns in the observed decline. The spatial scale of any resulting adaptive management changes will depend on the particular results. Potential management changes could occur within a HPA, across the Plan Area, or in all areas with similar geology, for example, depending on the nature of the monitoring results.

6.3.5.2.5.2 *Southern Torrent Salamander Monitoring*

Torrent salamanders are generally found in springs, seeps and the most extreme headwater reaches of streams. They are a small salamander that appears to spend most of its time within the interstices of the stream's substrate, which make them difficult to locate and capture without disturbing their habitat. The larvae have gills and are restricted to flowing water while adults also appear to spend most of their time in the water, but are capable of movements out of the water. They are thought to have very limited vagility (Nussbaum and Tait 1977), and given the highly disjunct nature of their habitat, individuals at a given site (sub-population) are likely to be isolated from other adjacent sub-populations. The degree of isolation of these sub-populations probably varies depending on the distance and habitat that separates them, so that torrent salamanders could be best described as existing as a meta-population.

Although there is some evidence for cumulative effects of sediment input in certain sites, torrent salamanders are primarily vulnerable only to potential direct impacts from timber harvest (Diller and Wallace 1996). Direct impacts could include activities such as excessive canopy removal at the site leading to elevated water temperature, operating heavy equipment in the site, or destabilizing soil leading to excessive sediment deposits at the site. Past observations have indicated that these direct impacts can lead to extinction of the sub-population at the site. Due to the survey difficulties noted above, an attempt to get a statistically rigorous estimate of the number of individuals at monitored sites would be impractical. Despite this, an index of the number of individuals at each site will be obtained and the life history stage of each individual will be recorded.

However, given the unreliability of the index of sub-population size, the persistence of individual sub-populations will be used as the primary response variable for the torrent salamander monitoring.

Concerns could be raised that there are too few sub-populations in the meta-population of torrent salamanders to expect to see significant changes over time, or that any loss in sub-populations would threaten the long-term persistence of torrent salamanders within the Plan Area. However, over 550 torrent salamander sites (sub-populations) already have been located in what is estimated to be no more than 25-30% of the total potential habitat in the Original Assessed Ownership. In addition, without a formal monitoring protocol, Simpsonalready documented both the apparent extinction and re-colonization of several torrent salamander sites. This would indicate that the meta-population concept does appear to apply to torrent salamanders in this region.

Monitoring Objectives

The primary monitoring approach for southern torrent salamanders will employ a paired sub-basin design. Changes in the persistence of sub-populations will be compared in randomly selected sites in watersheds with (treatment) and without (control) timber harvest. In some cases, control sub-basins will not be available in which case changes in sub-populations will be compared to the amount of timber harvest. In either case, the objective will be to determine if timber harvest activities have a measurable impact on the persistence of sub-populations. Therefore, the monitoring will determine if there is a difference in the persistence rate for treatment and control sub-populations, and document any apparent changes in the habitat conditions or index of sub-population size at each site.

A secondary monitoring objective will be to document long-term changes in torrent salamander populations across Simpson's ownership. As indicated in Section 4.3, studies of the Original Assessed Ownership estimated that 80% of the assessed streams (almost 90% excluding geologically unsuitable areas) had torrent salamander populations (Diller and Wallace 1996). Given that this occurrence rate is near the highest reported for the species even in pristine conditions (Carey 1989; Corn and Bury 1989; Welsh et al. 1992), an additional objective is to sustain the occupancy of torrent salamander populations in Class II watercourses in the Plan Area at a minimum of 80% through time. To determine if this objective is being met, the landscape study previously completed (Diller and Wallace 1996) will be repeated at 10-year intervals. Results and methodology of these investigations are shown in Appendix C11.

The change in the occurrence of torrent salamander populations across the ownership would not be suitable to use as a trigger to initiate management review due to the extended time-lag between successive data points. However, the occurrence of torrent salamanders in Class II watercourses across the Plan Area would serve as corroborative evidence to support the findings of the meta-population monitoring, and a significant decrease in the occurrence rate would initiate a review of the probable cause of the decline.

Biological Objective

No significant impact of timber harvest on the persistence rate of southern torrent salamander sub-populations. Specifically, no significant difference in the persistence rate of southern torrent salamander sub-populations between treatment (harvest) and control (no harvest) sub-populations.

Thresholds

The yellow light thresholds will be:

- Any extinction of a sub-population, or
- An apparent decline in the average index of sub-population size in treatment sites compared to control sites.

The red light thresholds will be:

- A statistically significant increase in the extinction of treatment sub-populations relative to control streams, or
- A significant increase in the net rate of extinctions over the landscapes.

The extinction of a sub-population of torrent salamanders is a stochastic event that will not be likely to occur on a regular basis, and therefore will not provide a responsive trigger to incremental changes in habitat conditions for torrent salamanders. It is likely that Simpson would only be able to document a red light condition after many years of monitoring. This means that torrent salamander monitoring may be effective in the short term for detecting extinctions of localized sub-populations, but on a Plan Area wide scale, it will be more useful in establishing long term population trends than in providing triggers for adaptive management.

Temporal Scale

Based on previous monitoring of torrent salamander sites, the extinction of a site will likely be due to a catastrophic event (natural or anthropogenic). This will be detected during the first survey season following the event. Therefore, yellow light conditions will trigger an evaluation in a single year. As noted above, the torrent salamander monitoring is not well suited for a red light threshold, because the temporal scale would likely be too long for effective use in adaptive management.

Spatial Scale

The zone of monitoring influence for a specific site will be determined on a case-by-case basis. Given that torrent salamanders are most likely to be impacted by direct site impacts, assessment of yellow conditions will include a field inspection of the affected site to determine likely causes. Results from all sites will be examined to determine if extirpations or declines are localized, area-wide, or associated with specific management activities, geologies, climatic variations, or other variables. Potential adaptive management changes could occur within a HPA, across the Plan Area, or in all areas with similar geology, for example, depending on the nature of the monitoring results.

6.3.5.3 Response Monitoring

The Response Monitoring projects, like the Rapid Response projects described above, monitor the effectiveness of the conservation measures in achieving specific biological goals and objectives of the Plan. These monitoring projects are distinguished from the Rapid Response projects by the greater lag time required for feedback to the adaptive management process. The Response Monitoring projects are focused on the effects of cumulative sediment inputs on stream channels. Natural variation in stream channel dimensions, combined with the potential time lag between sediment inputs and changes in the response variables of these projects, make it difficult to determine appropriate thresholds for adaptive management at this time. When yellow and/or red light thresholds are determined, they are expected to require more than three years of results to be triggered in most cases.

6.3.5.3.1 Class I Channel Monitoring

Background

Timber management has the potential to increase sediment inputs to streams through both surface erosion and mass wasting. Increased sediment inputs are in turn associated with a decline in the quality of aquatic habitat for all six of the Covered Species. As a result, reducing anthropogenic sediment inputs to Plan Area streams is one of the primary biological goals of the Plan. The long term channel monitoring project is one of four monitoring projects designed to measure the effectiveness of the conservation measures in reducing management related sediment inputs to area streams. This technique is generally best suited for establishing long term trends due to the potential lag times between sediment inputs and the measured response in the monitoring reach.

Simpson initiated the long term channel monitoring project with the goal of improving management within the Plan Area and determining the effectiveness of current management standards in minimizing sediment inputs to Plan Area streams. Pilot projects in 1993 and 1994 provided valuable information regarding effective methods and response variables, and the difficulties of analyzing the resulting data. Using the information gathered in these pilot studies, a revised methodology was developed and first implemented in Cañon Creek in 1995.

Nine monitoring reaches are currently established in eight streams across the Plan Area. Two additional reaches are established with a reduced protocol (thalweg profile only), because the sites do not meet the criteria necessary for doing the full protocol. These eleven reaches will be measured at least every other year for the duration of the Plan. The channel dimensions measured in each reach include cross-sectional and thalweg profiles, substrate size distributions (pebble counts), and bankfull and active channel widths. A complete description of the long term channel monitoring protocol, reach locations, and results to date is presented in Appendix C3.

Monitoring Objectives

The monitoring objectives of the channel monitoring project are to track long term trends in the sediment budget of Class I watercourses as evidenced by changes in channel dimensions. Within most stream systems there are both transport and depositional reaches where sediment either moves through the system or tends to accumulate. When sediment inputs overwhelm the ability of a stream to transport sediment, aggradation of the stream channel occurs within depositional reaches. Conversely, a decrease in sediment input to levels below the transport capability of a stream can result in degradation of the stream channel in these same reaches. Both of these channel responses can be observed and quantified through the monitored channel dimensions in depositional reaches, allowing for identification of, and responses to, changes in sediment inputs to a watershed. The long term channel monitoring project is not designed to identify the potential sources or causes of changes in the sediment budget, only to document that they are occurring.

Biological Objective

Sediment inputs to Plan Area streams will not cause a significant negative change in channel dimensions in Class I depositional reaches. Negative changes in channel dimensions will be those changes associated with aggradation of the channel due to increased sediment inputs.

Thresholds

Appropriate biological objectives and threshold values for the Class I channel monitoring project cannot be determined at this time. Approximately five years of initial trend monitoring are expected to be necessary to set the appropriate objective values. At the end of five years, a review and evaluation of trend monitoring results will be conducted. In addition, at other times agreed upon with the consensus of the Services, periodic reviews will be conducted to evaluate progress in determining channel monitoring thresholds. Determining appropriate thresholds for adaptive management may require as much as 15 years due to the long time scales involved in the dynamics of channel morphology.

Temporal Scale

The response variables of the long-term channel monitoring project include thalweg elevation and variance, substrate size distributions (pebble counts), and bankfull and active channel widths. Monitoring of these channel features is generally most useful in observing long term (>10 years) trends in channel characteristics, because of the potential lag time between a hillslope event and a resultant change in the depositional reach. However, under ideal conditions the monitoring site is the first depositional reach immediately below a continuous transport reach. Under this scenario, previous monitoring has demonstrated that mass wasting associated with major storm events can create significant changes in channel dimensions over a period of hours or days. The interval between measurement periods will be one or two years at each site, so that the yellow light threshold can be triggered by a mass wasting event in as few as one to two years under ideal conditions. Monitoring sites that are separated from transport reaches by some distance of transitional reaches, which temporarily store sediments, would respond to hillslope sediment inputs with increasing lag times depending on the length of the transitional reaches. Simpson believes that our current monitoring sites have a range of response times but will not likely have lag times of greater than one to two years following greater than five-year storm events. This will be confirmed through additional monitoring.

The red light threshold requires a minimum of three years to be triggered following three successive winters with major storm events and minimal lag time for sediments to impact the monitoring reach. Simpson estimates that it will likely take a minimum of four to six years to trigger a red light in most of our monitoring reaches.

Spatial Scale

The long term channel monitoring project responds to the total sediment inputs in the watershed above the monitoring reach. The current 11 (9 complete and 2 partial) monitoring reaches are distributed throughout the Plan Area, so that even though there will be additional monitoring reaches added in the future, some HPAs have no monitoring reaches while others will have more than one. The results at each monitoring site, including any indicated adaptive management changes, will therefore be extrapolated throughout the Plan Area to other basins with similar conditions (i.e. geology, drainage size, slope classes, etc.) which lack monitoring reaches.

6.3.5.3.2 Class III Sediment Monitoring

Background

Under Simpson's Plan, Class III watercourses (do not support aquatic species) are protected under a 2-tiered system.

Under tier A, the watercourse has a delineated equipment exclusion zone and ground disturbance will be minimized, but there will be little or no retention of existing forest canopy. There are existing concerns that complete removal of trees from Class IIIs will result in destabilizing these headwater areas resulting in an upslope extension of the channel and increased risk of shallow rapid landslides. The net effect is that there may be significant increases in sediment production even though Class I and II watercourses may have ample buffer retention. Because the majority of a channel network is made up of the 1st order channels, the overall impact of destabilized Class IIIs may be quite large even though the increased sediment delivery in any given Class III might be small.

Using a BACI (before, after, control, impact) experimental design, Simpson has initiated a monitoring program to determine the amount of sediment delivered from Class III watercourses following timber harvest. The objectives will be to monitor Class III watercourses to quantify the amount of sediment delivered from treatment channels following timber harvest relative to control channels. Quantification of sediment delivery will be estimated utilizing four basic approaches: 1) documentation of changes in channel morphology, 2) monitoring of turbidity during storm events; 3) placement of sediment traps at potential sediment delivery sites, and 4) placement of silt fences at the lower extent of watercourse below the harvest unit. Each of these techniques will quantify sediment delivery in different ways, and measure a different component of the total sediment budget in Class III watercourses for a comprehensive evaluation of sediment delivery.

Monitoring Objective

The objectives are to monitor Class III watercourses to quantify the amount of sediment delivered from treatment channels following timber harvest relative to control channels.

Threshold/trigger

Appropriate biological objectives and threshold values for Class III sediment delivery cannot be determined at this time. Approximately five years of initial trend monitoring are expected to be necessary to set the appropriate biological objectives and threshold values. At the end of five years a review and evaluation of trend monitoring results will be conduced. In addition, at other times agreed upon with the consensus of the Services, periodic reviews will be conducted to evaluate progress in determining thresholds.

Temporal Scale

Class III Sediment Monitoring is a medium to long term project that will occur during approximately the first ten years of this Plan. Sediment inputs to streams are episodic in nature and are triggered by rainfall events. At the end of five years of monitoring a review and evaluation of the results obtained will be conduced to determine turbidity and sediment thresholds. Following that review and the establishment of these thresholds, the time scale required to accurately assess sediment delivery into Class III watercourses may require monitoring for up to five years or more following timber harvest in Class III watercourses within the Experimental Watersheds.

Spatial Scale

This monitoring program will only be employed in the four basins that make up the Experimental Watersheds Program.

6.3.5.4 Long-term Trend Monitoring/Research

The Long-term Trend Monitoring/Research projects are those monitoring projects for which no thresholds for adaptive management are set. For some projects, this reflects the multitude of factors which affect the response variables, in others, the long time scales required to distinguish the ‘noise’ from the underlying relationships. Research projects designed to reveal relationships between habitat conditions and long-term persistence of the Covered Species are also included in this Section. Each of these projects has the potential to provide feedback for adaptive management, but in some circumstances, decades may be required before that can occur.

6.3.5.4.1 Road-related Mass Wasting Monitoring

Background

Roads can lead to increases in the frequency and severity of all types of mass soil movement. Increased sediment inputs to streams can in turn negatively impact all six of the Covered Species. The road upgrading and decommissioning process described in Section 6.3.3 is expected to significantly reduce the frequency and/or severity of road related mass wasting sediment inputs. As such, it is an integral component of the suite of conservation measures designed to achieve the biological goal of reducing management-related sediment inputs to Plan Area streams.

Monitoring Objectives

The road-related mass wasting monitoring project will monitor the effectiveness of the road upgrading and decommissioning measures in reducing the frequency and severity of road-related course sediment inputs. This will involve before and after monitoring of particular road segments, comparisons within basins or sub-basins of upgraded and non-upgraded roads, and Plan Area wide comparisons of upgraded and non-upgraded roads. If no significant effect (i.e. reduced frequency and severity of road-related mass wasting inputs) can be attributed to the road upgrading and decommissioning measures, the monitoring results will be used to adjust and revise the road upgrading and decommissioning measures to improve their effectiveness.

Temporal Scale

Road upgrading and decommissioning are long term projects that will occur throughout the life of this Plan. In addition, road-related mass wasting sediment inputs to streams are episodic in nature and typically triggered by intense rainfall events. As a result, the time scale required to accurately assess the effectiveness of road upgrading and decommissioning may be on the order of decades.

Spatial Scale

The road related mass wasting monitoring project will be employed in the four basins which make up the Experimental Watershed Program. Any changes to the road decommissioning and upgrading measures and process which occurs will be applied according to the specific monitoring results. Such changes could apply to the entire Plan Area, or results could indicate that additional work is required only in specific areas defined by geology, soil type, or slope class, for example.

6.3.5.4.2 Steep Streamside Slope Delineation Study

Monitoring Objectives

The monitoring objective of the Steep Streamside Slope (SSS) Delineation Study is to determine the minimum slope gradient and maximum slope distance of SSS zones for each HPA. The initial default minimum slope gradients and maximum slope distances for the HPA Groups will be adjusted for each HPA based on the results of this study.

Temporal Scale

The SSS Delineation Studies for each of the 11 HPAs are scheduled to be conducted within seven years after the effective date of the Permits. The results for the SSS delineation study for each HPA will be subject to modification throughout the term of the permit following the completion of the initial delineation study. Such modification will be based on additional SSS data collected in each HPA. Additional SSS data for each HPA will be collected depending on climatic cycles across the region during the term of the permit. It is expected that the SSS distances and slope gradients for any given HPA may be subject to review and modification approximately every 10 to 20 years.

Spatial Scale

The objective of the SSS Delineation Study will be to develop HPA -specific default measures for minimum slope gradients and maximum slope distance. In order to collect data that will allow statistical inferences to be made that will apply to the entire HPA, it will be necessary to sample study sites across the HPA using a probability based sampling design that is spatially distributed. The specific sampling design has not been determined yet, because Simpson has not set the sampling frame or acceptable levels of variance in the estimates. Once this has been done, there are a variety of possible sampling schemes that will achieve the objective of obtaining a statistically valid sample from which to draw inferences to the entire HPA, and the specific sampling scheme selected will be based on minimizing variance and while maximizing efficiency of data collection.

6.3.5.4.3 Steep Streamside Slope Assessment

Monitoring Objectives

The goal of the SSS Assessment is to determine the effectiveness of SSS prescriptions and to recommend appropriate changes to the SSS conservation measures, if any such change is necessary, that will more closely achieve the effectiveness goal of the SSS conservation measures. The SSS conservation measures are designed to be at least 70% effective at preventing management-related sediment delivery from landslides compared to that from appropriate historical clear-cut reference areas. A maximum of a 30% relative increase in landslide-related sediment delivery compared to similar, modern, but uncut (advanced second-growth) SSS areas may be used as another comparative standard to determine the effectiveness of the conservation measures.

The objectives of the SSS Assessment are to collect data relevant to landslides in SSS zones and to determine the effectiveness of the SSS conservation measures by comparative analysis of cumulative sediment delivery volumes and associated data. The procedure will be based on the assumptions described in Section 6.3.2 and it will utilize similar methods as were employed in the three pilot watershed areas to determine the initial default SSS slope gradients and distances. For each HPA, this will include conducting an office-based Steep Streamside Slope inventory and a landslide inventory using aerial photographs and field surveys, designing a statistically valid field-based data collection program (as described for the SSS Delineation Study), field verifying the office-based SSS and landslide inventory, collecting field data, data analysis, reporting and implementation of adaptive SSS slope gradients and distances.

Temporal Scale

Data collection for the SSS Assessments for the 11 HPAs is scheduled to be completed after 15 winters following the signing of the HCP. Data analysis by a scientific review panel will begin after the 15 years of data is collected. If at least two of the panel members agree that the data analysis results are conclusive, then the panel will make recommendations regarding SSS prescriptions based on those results. If two panel members agree that the data interpretation is not conclusive, the data collection procedure may be modified and the study will be continued for an additional five years before another panel is convened for data analysis.

Spatial Scale

Landslide data will be collected across the landscape and on many different landscape elements in order to provide a meaningful data set for analytical purposes. The SSS Assessments for individual HPAs may result in a uniform prescription for an entire HPA, or it may result in several prescriptions within an HPA. Different HPAs or areas from different HPAs that are found to be substantively similar may receive similar prescriptions as a result of the SSS Assessment.

6.3.5.4.4 Mass Wasting Assessment

Monitoring Objectives

Simpson will conduct a property-wide Mass Wasting Assessment (MWA) within 20 years. The goal of the MWA is to examine relationships between mass wasting processes and timber management practices. The objectives of the Mass Wasting Assessment are to collect a thorough data set that represents a wide range of mass wasting processes and management practices, to analyze the data, and to present the results in a report or in several reports. The results of the MWA will not be subject to the adaptive management mechanisms provided by the plan.

The landslide inventory and analysis will generally follow the procedures outlined in the Washington State Department of Natural Resources (WDNR) methodology for mass wasting analysis, with some modifications. Modifications to the WDNR method may be implemented based on data or at the professional discretion of the supervising geologist. A California RG will oversee the MWA. All data will be stored in a database and appropriately represented on maps in order to facilitate data analysis.

Simpson and the Services will jointly review the final MWA results to determine if slope stability monitoring should continue. If the Services and Simpson cannot reach agreement on the finality of the study, a scientific panel will be convened to determine if continued MWA is necessary. If a scientific panel is required, the panel will be convened in the same manner and generally follow the same procedure as the panel for the SSS Assessment.

Temporal Scale

A preliminary MWA will be completed within the 7th anniversary of the Services' approval of the Permits. The final MWA will be completed within the 20th anniversary of the Services' approval of the Permits. The preliminary MWA will at least include a landslide inventory and some statistical reporting with limited comments and discussion. The final MWA will include updating the preliminary data and it will attempt to identify patterns or trends in mass wasting processes as they relate to management practices. The final MWA will be presented in a report or in several reports. The MWA may be done incrementally across the property and the results for the study may be presented as results become available. The results of the study may apply to entire HPAs, or any combination of smaller or larger areas.

Spatial Scale

The SSS Assessments will be conducted for each of the 11 HPAs. Although the initial default prescriptions are uniform across the entire Plan Area, the SSS assessment could modify the prescriptions on a per-HPA basis.

6.3.5.4.5 Long-term Habitat Assessment

Background

Channel and habitat typing assessment was conducted by Simpson fisheries personnel in 1994 and 1995 following the CDFG methods described by Flosi and Reynolds (1994) and Hopelain (1994). As indicated in Section 4.3, Simpson fisheries personnel assessed sixteen streams in 1994 and 1995, identifying 75 reaches by channel type for a total of nearly 104 miles of stream channel assessed. The sixteen streams assessed were selected based on their biological significance as producers of salmonids, and the size of Simpson's ownership in the watershed's anadromous reaches.

Channel and habitat typing assessments also were conducted on the Original Assessed Ownership by the YTFP, CCC, LP, and CDFG. They assessed 40 streams, covering 140 reaches for a total of 131.0 miles of channel.

The data collected in this process are intended to provide information about the health of the stream, especially with respect to salmonid habitat, including:

- Percent canopy cover
- Percent LWD as structural shelter
- Habitat types as a percent of length
- Dominant substrate composition
- Pool embeddedness
- Pool depths
- Shelter rating in pools

Monitoring Objectives

The monitoring objective of the Habitat Assessment Monitoring Project is to document long term trends in habitat quality and quantity under the Plan. The trends observed through this long term, comprehensive assessment will be valuable for comparison with the results of the other more specific monitoring projects to ensure that the individual biological objectives described above, i.e., permeability, channel dimensions, water temperature, etc., are accurately capturing the larger picture of overall aquatic stream health and function.

For example, if the individual biological objectives were being achieved, but a negative long term trend in habitat quality was observed through the habitat assessment process, a detailed assessment would be conducted to evaluate this apparent contradiction. The assessment would examine the specific habitat conditions of concern and determine why the other biological objectives monitoring projects were failing to detect an overall decline in habitat quality. Possible results of such an assessment include changes to specific management and conservation measures which correspond to the specific aspects of habitat quality determined to be a source of concern. Additional changes could include adding new biological objectives with associated monitoring projects, or adjusting the threshold values of other monitoring projects.

Temporal Scale

The channel and habitat assessment process will be repeated on the original 46 surveyed streams every ten years for the life of the Plan. As the first assessments were completed in 1994-1995, the next assessment will be in 2004 and 2005. Detection of significant trends will probably require at least a third assessment.

Spatial Scale

The channel and habitat typing reaches are and will be distributed throughout the Plan Area. Each assessment identifies the channel types and habitat features in the particular stream assessed. Significant differences between streams based on unique features, including management history and underlying geology, reduce the value of applying the long term trends documented through this monitoring to streams which are not assessed. However, consistent trends observed in assessed streams would be assumed to accurately reflect conditions in Plan Area streams which were not assessed.

6.3.5.4.6 LWD Monitoring

Background

In-channel LWD is recognized as a vital component of salmonid habitat. The physical and biological processes associated with LWD have been described in this document. Current levels of the large size class of in-channel and potential LWD are estimated to be low throughout the Plan Area. As a result, providing for the recruitment of large size class LWD into Plan Area streams is a biological goal of this Plan, and aspects of the riparian conservation measures and the road management plan described above were designed with this goal in mind. The conservation measures, including providing adequate buffer strips, may result in an increase in the long-term rate of inchannel LWD recruitment (and conversely decrease the rate of long-term of loss of LWD), over the life of the Plan. This long-term monitoring project will document whether these expectations are met.

As indicated in Section 4.3, an in-channel and recruitment zone LWD inventory was conducted on fifteen streams in 1994 and 1995 using CDFG's LWD inventory protocol (Flosi and Reynolds 1994). Information regarding the presence of LWD was also obtained in the channel and habitat typing assessment process, but the importance of LWD to biological and physical processes in the stream channel justified the need for a more thorough assessment of this critical habitat component. The information collected in the inventory includes:

- Total abundance of both inchannel LWD and potential LWD (all live and dead trees within 50 feet of the bankfull channel margin).
- Size distribution of inchannel and potential LWD.

Monitoring Objectives

The monitoring objectives of the LWD assessment project are to document long term trends in the abundance and size class of inchannel and potential LWD under this Plan.

The development of potential LWD in riparian areas throughout the Plan Area is relatively predictable. In contrast, the recruitment of potential LWD into the stream (in-channel LWD) is a highly stochastic process which occurs over long time scales. For this reason, the LWD assessment project does not lend itself to be used as measurable thresholds for adaptive management. The conservation measures as a whole are expected to increase potential LWD, and may increase inchannel LWD, over the life of the Plan, and this monitoring project will document whether this expectation is met.

Temporal Scale

The LWD assessments will occur concurrently with the habitat assessment every ten years for the life of the Plan. The next assessment will be in 2004 and 2005. The recruitment of potential LWD into the stream (inchannel LWD) is a highly stochastic process which occurs over long time scales. Detecting increasing trends in potential LWD may require at least 10 to 20 years, and trends in inchannel LWD may become evident in 30-40 years

Spatial Scale

LWD assessments will be conducted throughout the Plan Area. Each assessment reflects the LWD conditions in the particular stream assessed. The stochastic nature and long time scales involved in LWD development and recruitment make it difficult to apply the results from a particular stream to other areas. However, consistent trends observed in assessed streams across the Plan Area would be assumed to reflect conditions in streams which were not assessed.

6.3.5.4.7 Summer Juvenile Salmonid Population Estimates

In 1995 Simpson initiated a study designed to estimate summer populations of young-of-the-year coho and age 1+ and older steelhead and cutthroat trout, and to track trends in these populations over time. The number of streams sampled has expanded from three in 1995 to eight in 1999. The population estimate project has served as a pilot study to test and refine a sampling methodology developed by Dr. Scott Overton (Oregon State University, retired) and Dr. David Hankin (Humboldt State University) in conjunction with funding from the Fish, Forests, and Farm Communities (FFFC).

The results to date are summarized in Section 4 and Appendix C. The summer juvenile population monitoring project will continue under the Plan. The sampling methodology has been refined and should require little change in the future, allowing for better comparisons between estimates.

Monitoring Objectives

The objectives of the summer population estimates are to estimate summer populations of young-of-the-year coho and age 1+ and older steelhead and cutthroat trout, and to track trends in these populations over time.

The sampling and process variance associated with the population estimates and the uncertainty related to the possible causes of observed long term trends preclude the use of summer population estimates as measurable thresholds for adaptive management purposes. While changes (positive or negative) in summer population estimates will clearly be a source of interest, it remains unclear what, if any, changes can be related to management. The summer population data, in combination with other monitoring efforts, may provide valuable information about the relationships between coho populations in different streams throughout the Plan Area, and the climatic and/or habitat conditions which affect summer population size. In addition, trends in summer population estimates will be valuable in determining the recovery status of the coho populations within the Plan Area.

In the Little River HPA, the population estimate information will be combined with out-migrant trapping data and spawning surveys in an attempt to understand the mortality associated with specific life-history stages.

Temporal Scale

The summer population estimates are conducted annually, and significant changes in summer population estimates have already been observed on a year-to-year basis within individual streams.

Spatial Scale

Summer population estimates are currently conducted in eight streams, located within 5 of the 11 HPAs. Judging from the results to date, applying the results of these estimates to streams which have not been surveyed may be possible for general trends within a single basin, but is not advisable beyond that. For example, a significantly larger than normal estimate in a tributary of Little River may reasonably be assumed to reflect a larger than average summer population in other tributaries of the Little River as well, but may have no relationship with populations in other Plan Area streams.

6.3.5.4.8 Out-migrant Trapping

Background

The out-migrant trapping project is designed to monitor the abundance, size, and timing of out-migrating smolts, and to look for long term trends in any or all of these variables. The results of the outmigrant trapping will be used in conjunction with the summer population monitoring to estimate overwinter survival in the Little River HPA. Eventually this information will be further analyzed to correlate specific habitat conditions with overwinter survival of coho salmon.

The out-migrant trapping of juvenile salmonids was initiated on three tributaries to the Little River watershed in 1999: Upper South Fork Little River, Lower South Fork Little River, and Railroad Creek, using a pipe trap (Figure C8-1 in Appendix C8.) An additional trap site was established on Carson Creek in 2000 within this same watershed. Each trapped fish was identified by species and year class, and fork length was measured on all fish except 0+ trout. The summarized results are presented in Section 4 and detailed methods and results to date are presented in Appendix C8.

Monitoring Objectives

The objectives of the out-migrant trapping project are to estimate overwinter survival of juvenile coho by comparing out-migrant abundance to the summer population estimates, and to monitor the abundance, size, and timing of out-migrating smolts and look for long term trends in any or all of these variables.

The use of measurable thresholds for adaptive management is not appropriate for this monitoring project, but significant feedback for adaptive management is expected to result from the combined results of the out-migrant trapping, summer population estimates, and information on habitat conditions in the Little River HPA. If and when correlations between overwinter survival or total fish production and specific habitat features or conditions can be made, appropriate management measures to encourage or create those conditions will be implemented throughout the Plan Area. Similar out-migrant trapping projects have been conducted on Mill Creek in Del Norte County (Stimson Timber Co.) and are ongoing in pristine portions of the Prairie Creek watershed in Redwood National Park. The results of these studies will aid in evaluating the suitability of habitat conditions in the Little River.

Temporal Scale

Smolt abundance, size, and timing will be monitored annually. The time required to correlate these results with habitat information and summer population estimates is truly unknown, but will probably require a minimum of ten years due to the high variability observed in both summer population estimates and smolt abundance.

Spatial Scale

Out-migrant trapping is currently being conducted in four tributaries of the Little River. The immediate results will reflect only the smolt production of these four tributaries, which is thought to be the majority of smolt production in the Little River as a whole. In the event that correlations between habitat conditions and smolt production can be made through these studies, the results will be applied throughout the Plan Area to increase smolt production wherever possible.

6.3.5.5 Experimental Watersheds Program

While the majority of the Plan's monitoring projects will be conducted throughout the Plan Area, four experimental watersheds judged to be representative of the different geologic and physiographic provinces across the Plan Area have been designated for additional monitoring and research on the interactions between forestry management and riparian and aquatic ecosystems. Those watersheds are the Little River (Little River

HPA), South Fork Winchuck River (Smith River HPA), Ryan Creek (Humboldt Bay HPA), and Ah Pah Creek (Coastal Klamath HPA) (see Figure 6-9).

In general, the program will entail:

- Effectiveness monitoring projects and programs that due to their complexity and expense of implementation can only be applied in limited regions (these include turbidity monitoring, Class III sediment monitoring, and road-related mass wasting monitoring;

- BACI studies of harvest and non-harvest areas, allowing for more effective evaluation of conservation measures and increased understanding of the effects of forest management on the habitats and populations of the Covered Species.

- BACI studies of conservation and management measures, allowing for a refinement of measures and an assessment of the relative benefits of different measures under the Plan; and

- Development and implementation of new or refined monitoring and research protocols.

In addition, Simpson may expand Out-migrant Trapping in the Little River HPA to one or more of the other experimental watersheds.

In the program, management will be implemented as a large scale experiment where possible, allowing for more effective evaluation of conservation measures and increased understanding of the effects of forest management on the habitats and populations of the Covered Species. Where possible, harvest with a variety of different conservation measures will be the "treatments" in a BACI experimental design, with an adjacent unharvested area as the control. Specific effectiveness monitoring projects will compare the treatment and control before and after harvest to determine the effectiveness of the conservation measures.

Road-related turbidity and mass wasting monitoring are designed in part to measure the effectiveness of the road management plan's upgrading and decommissioning measures in reducing road-related sediment inputs. For these road-related monitoring projects, the experimental design occurs as monitoring is implemented both spatially and temporally to allow comparisons of road-related sediment inputs before and after road upgrading and decommissioning.

Upgrading and decommissioning the roads as effectively and efficiently as possible is the first priority, therefore monitoring will essentially be conducted "around" the road work schedule. The prioritization process (see Section 6.3.3.) used to schedule the road work will provide the information needed to design an effective monitoring program without slowing the implementation of the road upgrading and decommissioning process. For example, the prioritization table may dictate that, within a specific sub-basin, one road work unit will be upgraded before another. Monitoring could begin in both units before any work is done, and continues while first one, and then the other work unit is upgraded. This experiment would not be conducted in a true BACI design, because Simpson will not leave any sub-basins as "controls" in the untreated condition. However, over time it will be possible to make a cumulative comparison of treated versus untreated roads and sub-basins to determine if the road management plan is effective in reducing road-related mass wasting inputs and road-related increases in turbidity.

Simpson and CDFG are already implementing an experimental management program in the Little River HPA to assess the relative benefits of two different mitigation measures to protect aquatic resources following timber harvest. A randomized BACI experiment will be conducted in blocks of three streams, wherein the two sets of mitigation measures are viewed as two different treatments with the third stream as a control. During the course of the experiment, both mitigation measures will be applied to an approximately equal number and linear distance of streams. The primary objectives of the study will be to:

- Determine if there are any detectable changes in environmental and biological variables measured on watercourses following timber harvest, and if there are,

- Which mitigation strategy is more effective in reducing negative impacts.

The response variables will be monitored pre and post harvest and will include water temperature, shallow landslide activity, Class III sediment delivery, and potential LWD. Air temperature, relative humidity, wind speed, turbidity, and stream amphibian populations will also be monitored in selected sites.

The development and implementation of new research and monitoring protocol will provide an opportunity for Simpson to refine existing conservation measure to make them more effective and efficient. This will include state-of-the-art existing study designs along with original research approaches that will require the input from academic, agency, and private scientists.

No experiment which involves the application of conservation measures other than those prescribed in this Plan will occur without the concurrence of the Services.

6.3.6 Adaptive Management Measures

Adaptive management is an important tool for natural resource management when significant scientific uncertainty regarding appropriate management and conservation strategies is present (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 increasing our understanding of watershed processes and the effects of management activities on the habitats and populations of the Covered Species over the life of the plan, and adapting the Plan's conservation measures in response to this new information.

6.3.6.1 Triggering and Application of Adaptive Management Measures

The Plan is designed to minimize and mitigate all identified impacts of taking the Covered Species to the maximum extent practicable, based on current knowledge. However, specific conservation measures may change over time as the result of the adaptive management provisions and geologic evaluations of the Plan. Because this is a long-term Plan, and it incorporates a strong monitoring program to confirm the effectiveness of the certain Plan measures, mechanisms to alter certain conservation measures are proposed. Those mechanisms include the adaptive management process working in conjunction with the monitoring program. The adaptive management measures become applicable through the triggering of a “Yellow or Red Light” condition determined through on-going monitoring, the slope stability monitoring, or through the outcome of a designed experiment in one or more of the Experimental Watersheds. Results from on-going monitoring and experiments from the Experimental Watersheds must be conclusive before adaptive management measures become applicable. If Simpson believes that is the case, it will convene a Scientific Review Panel to analyze the findings and any other available information to the extent it is relevant to the conservation of the Covered Species in the Plan Area and recommend whether a change is warranted. If the results are not conclusive, further monitoring is required before changes can be made. Adaptive management changes will be subject to the availability of a balance in the AMRA, as described below. Adaptive management changes will be limited to the Plan’s RMZs, SMZs, and specific road management plan prescriptions described below. The widths and prescriptions within RMZs can be modified. In addition, the account will apply to the SMZ default widths and slope gradients after they have been set following the 5-year mass wasting analysis. Prescriptions in SMZs will be evaluated after 15 years of monitoring (see Section 6.3.2 and 6.3.5 and Appendix D for more details), and any subsequent changes will be subject to the AMRA. The upper bound of modifications to RMZs will be limited to the interim measures outlined in the Northwest Forest Plan (up to the balance of the AMRA) and the lower bound will be limited to the State forestry regulations applicable at the time the adaptive management change is made. SMZ prescriptions can range from no cut to even-age management. Specific road management plan prescriptions that can be modified are: increased rate of accelerated road implementation, drainage structure prescriptions and erosion control prescriptions. Just as the biological goals and objectives set forth in Section 6.1 guided the development of the prescriptions set forth in the Plan, Simpson will look to the applicable goals and objectives to guide the development of any changes to the prescriptions pursuant to a red light trigger, using the information gained from the monitoring and adaptive management processes.

6.3.6.2 Adaptive Management Reserve Account

As part of the conservation program, the Plan establishes the AMRA to fund the adjustments that may be made during the life of the Plan.

The AMRA will be “charged” with an “opening balance” of 1,550 FSA (FSA), and the AMRA account balance will be factored in FSAs throughout the term of the Plan. If the balance falls to zero through the debit process described below, then no more debits will be made until the account is credited. FSA will be defined as a stand with 42,000 BF/acre (50 year stand with an index of 350 square feet of basal area) and a species composition of 50% redwood, 34% Douglas fir, 10% white woods, and 6% hardwoods. The current California SBE Harvest Value Schedule will be used to translate FSA to equivalent specific road management plan prescriptions. The percentage of SBE harvest categories will be 60% cable yarding, 35% tractor, and 5% helicopter. The AMRA will be used to accommodate changes in riparian protection measures from conclusive results of the monitoring program and experimental watersheds.

Depletion of the AMRA balance by translating FSA to funds for road prescriptions is limited to 2% per year of the opening balance (i.e., the equivalent of 31 FSA). There is no limit to the annual use of the AMRA for RMZ or SMZ modifications. The balance within the adaptive management reserve account will fluctuate proportionately to the addition and deletion of properties.

The current set of riparian measures will be set as the standard for all future comparisons. The areas to be included in SMZs will be determined at the end of the 5-year property-wide geologic review. Any modification of the standard riparian measures, areas included in SMZs or specific road management plan prescriptions (obtained via monitoring, paired watershed analysis or subsequent geologic review) will be credited or debited from the AMRA. For instance, an increase in the width of a zone will debit the balance, and a decrease in a zone width will credit the balance. Debits and credits will be reflected in the account on an on-going basis as the account acres are retained or harvested, and the account will be summarized biennially.

The opening balance of the AMRA (1,150 FSA) was determined based on the amount needed to address risks associated with management prescriptions for SMZs, which Simpson estimates will include approximately 8,850 acres. These SMZ acres will be managed using uneven-aged silviculture, which is defined in the Glossary of this Plan as single tree selection. By applying single tree selection, Simpson will harvest approximately 65% of the conifer volume on the 8,850 acres. Thus, approximately 35% of the volume will be retained within the SMZs to produce conservation benefits as the Plan is implemented over time. As proposed the prescriptions will represent approximately 3,100 acres (or 0.35 x 8,850 acres) of fully stocked timberland. To reduce the risk of potentially underestimating the protection needs of SMZs, Simpson will allow up to a 50% increase in the retained volume in SMZs. In terms of fully stocked acres, this will equate to 1,550 acres (0.50 x 3,100 acres = 1,550 acres) that can be applied to these zones. As mentioned above, the opening AMRA balance of 1,550 FSA may increase or decrease in response to findings through the monitoring programs or through the results from projects in the Experimental Watersheds.

<u>Example of the AMRA fluctuating over time:</u>

1. Facts

    - The opening balance is set at 1,550 acres.

    - A red light consideration in 3 HPAs requires 50' extra width on class II watercourses. In 2002, this will result in an additional 120 acres being retained, and in 2003 this will result in an additional 160 acres being retained.

    - Paired watershed studies show that Class I watercourses require 25' less width on all HPAs. In 2002, this will result in an additional 350 acres being harvested; and in 2003, this will result in an additional 400 acres being harvested.

2. At the end of each year, the effect of the adaptive management will be reflected in the AMRA balance, as follows:

    - Opening Balance 2002 1,550 acres
    - Class II debit 2002 (120) acres
    - Class I credit 2002 350 acres
    - Closing Balance 2002 1,780 acres

    - Opening Balance 2003 1,780 acres
    - Class II debit 2003 (160) acres
    - Class I credit 2003 400 acres
    - Closing Balance 2,020 acres

6.3.7 Implementation Monitoring Measures

Implementation monitoring will be composed of the following elements:

- An internal compliance team consisting of a Simpson Plan Coordinator with assistance from internal forestry, fisheries, wildlife and geologic staff. Documentation indicating compliance with the Plan will be prepared for internal Simpson use on every THP and will be kept on file by Simpson.

- At the time of submission of a proposed THP, the Simpson Plan Coordinator will provide the Services an informational copy of the THP Notice of Filing and will attach a map of the THP area.

- As appropriate, the Services may provide technical assistance, including during pre-approval THP preparation and review, before Simpson carries out covered activities that are subject to evaluation of compliance.

- Pursuant to applicable regulations, the Services may conduct inspections of completed covered activities, including post-harvest THP areas, to evaluate compliance with conservation measures set forth in Section 6.2.

- Biennial reports will be prepared and submitted to the Services. These reports will summarize compliance and the results of effectiveness monitoring. The first Biennial Report will be due on March 1 following the first full year after the effective date of the Plan and every two years thereafter during the term of the Plan.

- Scheduled reviews. There will be annual meetings conducted jointly by representatives of Simpson, NMFS, and USFWS for the first five years of the Plan as described in the IA. In the second and fourth years, the annual meeting will be followed up with a field review of implemented conservation measures to allow technical evaluation of conservation measure implementation.

The roles and responsibilities of Simpson personnel for compliance with the Plan as part of the timber harvesting process are shown in Figure 6-12.

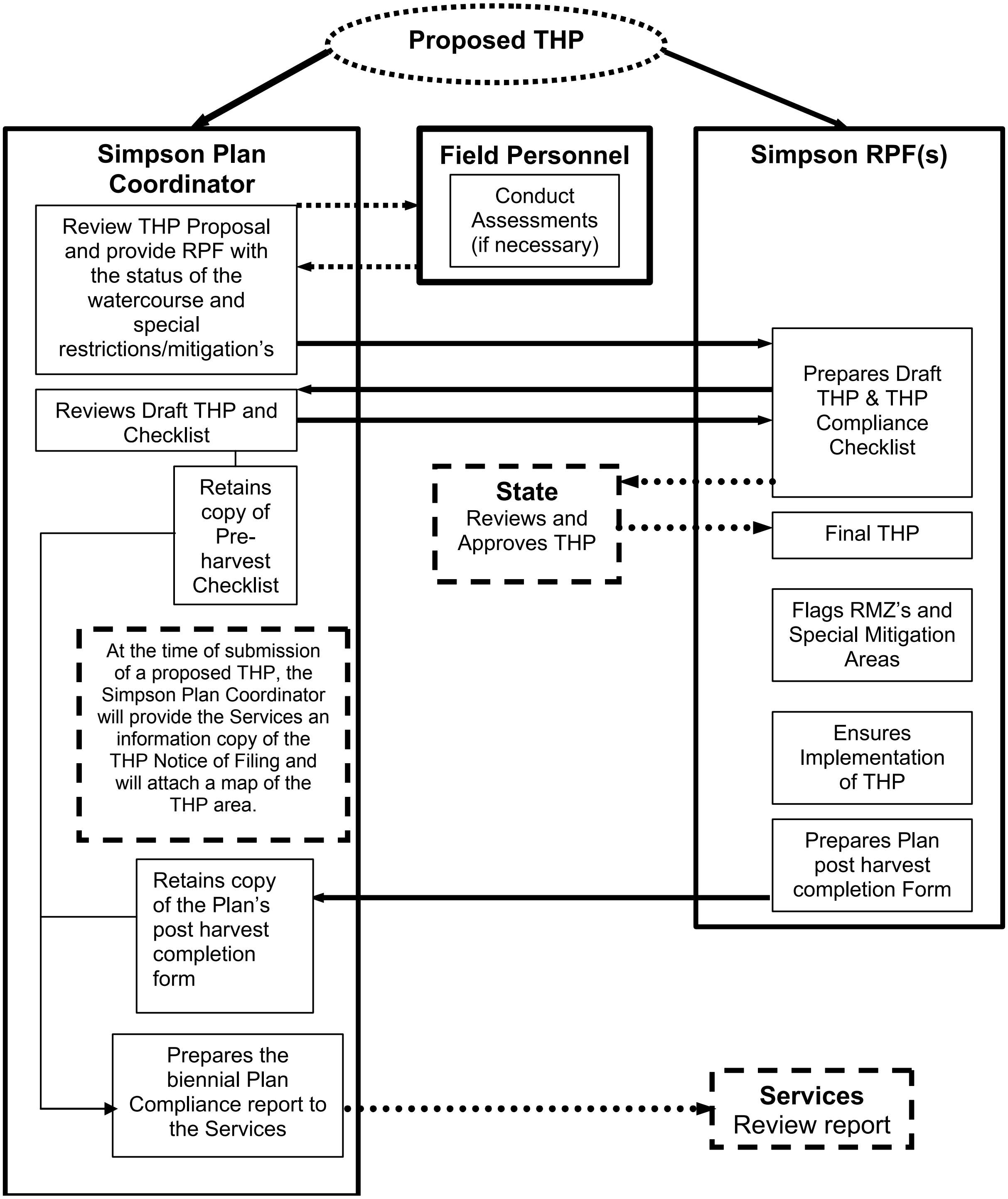


Figure 6-12. Schematic diagram of the internal compliance process for Plan implementation.

Internal compliance with the Plan will be primarily the responsibility of Simpson's Plan Coordinator. (A position similar to the HCP Coordinator who maintains compliance for Simpson's current successfully operating NSO HCP.) This position will be filled by an academically trained and experienced fisheries biologist/hydrologist or fluvial geomorphologist. The Plan Coordinator will review each proposed THP prior to its development, and inform the registered professional forester (RPF) preparing the THP on the appropriate status of watercourses in the THP area and the occurrence of any special restrictions and/or mitigations in the area (e.g. unstable slopes, inner gorges or channel migration zones). If there is any uncertainty about the appropriate status of streams or the existence of special restriction/mitigation areas, the Plan Coordinator will direct the appropriate field personnel (e.g. fisheries biologist, geologist or other trained personnel) to do the appropriate field assessment/survey. The RPF preparing the THP or his/her designee will be responsible to flag the appropriate RMZs or other special mitigation areas in the field when additional field expertise is not required. When additional field expertise is called upon by the Plan Coordinator or RPF to delineate some special restriction/mitigation area, the designated expert will be responsible to flag or otherwise designate the appropriate areas that will require special treatment/mitigation.

During development of the THP, the RPF will complete a pre-harvest checklist that will cover all necessary compliance elements for the THP. Following completion of a first draft of the THP, the Plan Coordinator will review the THP for compliance including a review of the checklist for accuracy and completeness. Following state review and approval of the THP, the responsible RPF will insure that the THP is actually implemented as written.

Following completion of the THP, the responsible RPF will fill out a Plan post-harvest completion form documenting compliance of the THP with the provisions of the Plan. The post-harvest completion form will be submitted to the Plan Coordinator who will also review it to insure compliance. The pre-harvest checklists and post-harvest completion forms will be kept as a record of compliance by the Plan Coordinator, and they will be part of the biennial report to the Services.

Scheduled field reviews of implemented conservation measures will be conducted jointly by Simpson and the Services biennially for the first four years of the Plan. The purpose of the field reviews will be to evaluate implementation of the Operating Conservation Program. If the Services determine that the Operating Conservation Program is not being implemented in accordance with its terms, then Simpson and the Services will attempt to resolve the issue in accordance with Section 6.3.7.1. A summary of the field review and any recommendations that are developed will be included in the biennial report to the Services.

6.3.7.1 Dispute Resolution

Simpson and the Services recognize that reasonable differences of opinion may arise from time to time regarding implementation of various elements of the Operating Conservation Program. Should a dispute arise at the technical level, either of the Services or Simpson will have the option of calling a meeting to discuss and attempt to resolve the issues at that level. If the Services call a meeting under this provision, Simpson would arrange to meet within one month of receiving such notice. Should it be necessary to resolve the issues at a policy level following an initial meeting at the technical level, Simpson would arrange to meet at the policy level within one month of receiving a request. Simpson would have the right to request meetings for the same purpose and the Services' commitment to engage in this process will be incorporated in the dispute resolution provisions in the IA. The Service's participation in this process would be in the nature of providing technical assistance. Simpson's and the Services' rights and obligations regarding informal dispute resolution and matters that could be addressed in such a process would remain as provided in the IA. .

6.3.8 Special Project

6.3.8.1 Increased Habitat for Anadromous Salmonids above Nature Barriers

Across the Plan 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. Current surveys or anecdotal observations indicate that some of these stream reaches appear to be currently under utilized, or inaccessible by some or all salmonids. Of all the fish Covered Species, coho appear to be generally the lowest in numbers and pose the greatest challenge for enhancement of future habitat conditions. Given the uncertainty and extended time associated with improvements of habitat for coho salmon, Simpson will undertake a special project which it anticipates will "jump start" the conservation of this species by increasing the available habitat for spawning and rearing. It is recognized that permanent removal of natural barriers may be logistically infeasible as well as having undesirable and/or unanticipated consequences. It is also recognized that artificial propagation of the species in these stream reaches has the potential to produce undesirable consequences on the genetics and overall biological fitness of local runs. Therefore, Simpson will undertake one project to trap and transport coho that are native to the respective stream system around a barrier and allow them to spawn unassisted in the previously unutilized habitat. The project period will be ten years. The goal would be to provide a rapid (within a few years) increase in smolt production of these selected streams while habitat conditions are continuing to improve across the Plan Area. At the end of the ten-year period Simpson will review the effectiveness of the project.

It is possible that this same augmentation of available habitat could also be applied to chinook salmon or steelhead, but Simpson is committing to only one project. Additional projects will be carried out at Simpson's sole discretion, after evaluation of the initial project and the impacts evaluation described below.

Before the initial coho project, or any additional project, is initiated on any stream, the stream will be evaluated in terms of the current use by other salmonids and the potential for negative impacts to any of the other Covered Species. In particular, the area will be assessed for all salmonids to insure that the introduction of coho will not harm or displace a unique population of fish. The project area will also be evaluated in terms of the potential quality and quantity of habitat (spawning, summer and winter rearing) for coho. If the evaluation suggests a high probability of success, the translocation of fish will only involve a small number of adults (probably a maximum of 10-15). These fish will be monitored to insure that they do spawn in the new habitat, and if they spawn, surveys will be conducted to assess the utilization of summer rearing habitat by the juvenile fish. These summer surveys will also allow an assessment of the potential interaction between the translocated population of fish and any resident salmonids.

Finally, out-migrant traps will be operated the following winter/spring to document the number of smolts that leave the system.

Potential sites for the initial project have already been identified, with the upper North Fork Mad River being one of the top candidates. There is a barrier low in the sub-basin created by a high gradient reach of step pools and small falls that prevent all access to salmonid anadromy except for a few of the most tenacious and athletic steelhead. The upper North Fork Mad River sub-basin also has resident cutthroat trout, but they appear to occur in relatively low population densities. Above the barrier is approximately 15 miles of suitable habitat of which a portion appears to be high quality coho habitat. The prime coho habitat appears to be very similar to Carson Creek in the Little River system that has been documented to be able to produce more than 1000 coho smolts per mile of stream. Carson Creek also has resident and probably anadromous cutthroat trout, which coexist with coho in high numbers. Given the propensity for cutthroat trout to feed on coho or any other salmonid, Simpson believes this translocation of coho would also benefit the resident cutthroat population.

All of the other potential sites that have been identified to date have shorter reaches of suitable habitat above the barrier, but collectively they could represent a substantial increase in habitat for coho across the Plan Area. Some of these other sites also have the added advantage that they do not have resident salmonids that may be impacted by the translocation of coho.

For a more detailed analysis of the special project for increasing habitat for anadromous salmonids above natural barriers see Appendix G.

6.3.9 Measures for Changed Circumstances

The conservation measures in this Plan were designed within the context of the forestland ecosystems in the Plan Area. These ecosystems are dynamic rather than static; they are regularly impacted by various natural physical processes that shape and reshape the habitat for the affected species that occupy those areas. Indeed, the aquatic and riparian species for whose conservation this Plan is crafted evolved in close association with this ever-changing mosaic of natural physical elements.

The natural physical processes that affect the biodiversity and landscape ecology are usually of moderate intensity and relatively confined in geographic extent and magnitude of impact. Nonetheless, natural physical processes have on occasion been of catastrophic intensity, particularly from the standpoint of impact to individual plants and animals. That these natural physical processes can significantly alter aquatic and riparian habitat has been a substantive consideration in the development of this Plan, and the Plan is designed to minimize and mitigate management-related disturbances and create conditions that enable natural disturbances to create productive habitat.

Simpson recognizes that the temporal and spatial configurations of future natural disturbances (and their specific related effects on the aquatic and wildlife species covered under the Plan) are inherently unpredictable. The fact that certain types of natural disturbances will occur at some time during the term of this Plan and at some location in the Plan Area is, however, reasonably foreseeable. The conservation measures set forth in the other portions of Section 6 of the Plan were designed, in large part, to be responsive to historic disturbance patterns. Indeed, many of the prescriptions are intended to develop a landscape capable of delivering valuable functions in response to such natural disturbances. Therefore, the occurrence of most natural disturbances will not create conditions that should require the implementation of revised prescriptions.

Certain reasonably foreseeable disturbances, however, may be of such magnitude, occur with such frequency or impact particular portions of the Plan Area as to require the application of supplemental prescriptions for the protection of the Covered Species. These supplemental prescriptions are set forth below.

"Changed Circumstances" will mean the changes in circumstances substantially affecting a Covered Species that are described in this Section 6.3.9. Except as specifically provided in this Section 6.3.9, any other changed circumstances will be adequately addressed by the application of the conservation measures set forth in the other portions of Section 6.2 of the Plan.

Five types of changes are identified in the Plan as potential "changed circumstances" as defined in applicable federal regulations and policies:

1. Fire covering more than 1,000 acres within the Plan Area or more than 500 acres within a single watershed within the Plan Area, but covering 10,000 acres or less;

2. Complete blow-down of more than 150 feet of previously standing timber within an RMZ, measured along the length of the stream; but less than 900 feet of trees within an RMZ, due to a windstorm;

3. Loss of 51% or more of the total basal area within any SSS, headwall swale, or Tier B Class III watercourses as a result of Sudden Oak Death or stand treatment to control Sudden Oak Death;

4. Landslides that deliver more than 20,000 cubic yards and less than 100,000 cubic yards of sediment to a channel; and

5. Listing of a species that is not a Covered Species but is affected by the Covered Activities.

As described in this subsection, Simpson also has considered the potential for floods and earthquakes to have effects that would constitute "changed circumstances."

6.3.9.1 Fire

6.3.9.1.1 <u>The Role of Fire in Coastal Northern California</u>

Fire is a significant agent in determining forest structure in the coastal Northern California region, but its effects, intensity, and frequency vary considerably. Although it is possible to generalize that fire is an important element of forest ecology in the region, it is not possible to specify the temporal or spatial effects of fire for any given area, since fires are not distributed uniformly through time, the areas affected often differ markedly, and the intensity and scale vary considerably.

The fire history of Coastal Northern California is reasonably well-documented for the last 1,000 years (from tree ring counts) but prior to that only inferences can be made based on charcoal in core samples from bogs and lakes and other paleoecological evidence. Fritz (1931) describes ring counts between fire scars on over 100 redwood stumps in a 31 acre area of Humboldt County. His counts include 45 or more fires during an 1100 year period. He reports major fires in 1147, 1595, 1789, 1806, and 1820. Various other studies estimating fire history within the region have not been able to agree on actual dates of occurrence. The most common dates reported for large fires have been 1640, 1700, 1745, 1894, and 1974 (Abbott, 1987). Differences in conclusions can be attributed to the various ways fire occurrences are estimated as well as differences within areas examined for fire history, although all agree that redwood forests are not burning nearly as often today as they were in the pre-settlement era. Many smaller fires have burned in the region since settlement but none have been of the magnitude represented by these large fires which appear to have been driven primarily by climatic variation.

Research by Veirs (1980, 1982) using tree age distribution in old growth redwood forest suggests that fires which significantly influenced stand composition and age distribution occurred at 250 to 500 year intervals in moist, coastal sites. Intervals for intermediately moist sites were reported as 100 to 250 year intervals while summer dry, interior sites at higher elevation were in the range of 33 to 50 year intervals. These fires were most commonly reported as surface fires burning under story fuels with little canopy involvement. Fires in redwood dominated forests will generally kill the thin barked trees and shrubs, however larger redwood and Douglas-fir survive due to the insulating effect of their thick bark. Similar research since these studies found low intensity ground fires to be common in Douglas-fir forests, with maximum fire free intervals of 35 to 90 years (Wills 1991).

In addition, other studies have examined the correlation of fire intensity to fire size, as well as the typical size of fires in coastal northern California and the Klamath Mountains. Stuart (1987) found that fire size was not correlated with fire frequency while using basal sprouts to determine fire frequency and estimate the area burned by fires just south of the Plan Area. One estimate for mean fire size in this study was reported as 4,319 acres (+/- 299 ac. SE) for the post European settlement period. CDF fire records reviewed by Stuart and Fox (1993) for the same area of Humboldt County from 1940 to 1993 report 30 fires ranging in size from 247 acres to 4,416 acres. These averages are less than the fire that occurred within the Plan Area in 1988, which burned over 6,000 acres of the Klamath property. Another report on fires in the Klamath Mountains (Taylor and Skinner 1998) documents lightning strikes in 1987 and 1994 that burned a total of 240,838 and 27,181 acres, respectively. Approximately 25% of the Plan Area is representative of a more inland, dryer vegetation type which is subject to these larger burn estimates.

In light of this analysis, it is not reasonably foreseeable that large-scale, stand-replacing fires (i.e., a fire covering more than 10,000 acres) will occur in the Plan Area during the life of this Plan. Thus, such fires are unforeseen circumstances and it is unnecessary to provide for new, different, or additional conservation measures based on the possibility that such events could occur. Certain supplemental procedural prescriptions, however, will be applicable in the event of smaller fires.

6.3.9.1.2 *Fire – Supplemental Prescriptions*

If during the term of the Plan, a fire less than 10,000 acres occurs in the Plan Area, Simpson may take all measures reasonably necessary to extinguish the fire, including measures that deviate from the Section 6.2 conservation measures. The strategy for responding to and suppressing forest fires is generally established by CDF and Simpson may have little ability to influence such strategy. However, to the extent reasonably possible and where consistent with the primary goal of containing and extinguishing the fire, Simpson will encourage the development of a fire-response strategy that is consistent with the Section 6.2 conservation measures and that furthers rather than diminishes the functions that such measures have been designed to provide.

If the fire involves more than 1,000 acres within the Plan Area, or involves more than 500 acres within a single watershed within the Plan Area, Simpson will provide both Services with information regarding the fire within 30 days. Once such a fire is extinguished, unless such fire is an "unforeseen circumstance" as defined above, Simpson will apply the following supplemental prescriptions on its fee-owned lands within the Plan Area:

- Trees damaged or killed outright by fire, including those in riparian and stream side management zones, will be considered by Simpson for salvage. Removal of standing dead or damaged trees and downed trees will be conditioned by the application of the conservation standards in Section 6.2 regarding likely to recruit and salvage within RMZs.
- Salvage of trees downed or dead by fire must comply with state law. In addition, the conduct of any salvage operations within an RMZ or SMZ will be done with reasonable care to minimize soil erosion, to retain structural features that contribute to bank or slope stability, and to retain standing dead trees that will contribute to the recruitment of LWD to watercourses within the area affected by the fire.
- Reforestation of any RMZ or SMZ affected by the fire will be implemented as soon as reasonably possible.

6.3.9.2 Wind

6.3.9.2.1 *The Role of Wind in Coastal Northern California*

Topography determines where the strongest winds within a region are found, such as ridge tops or orientation of slope to wind direction. Forest stands that are most endangered by wind are those growing on slopes exposed to winds that blow unobstructed across broad expanses of water or flat terrain. When wind passes up over a ridge or mountain range, its passageway is constricted from below and speed is accelerated. Wind damage associated with topography can be common on windward slopes. However, as the slopes increase in steepness, damage is often worst just leeward of the ridge crest due to gusty downbursts of air that take place in a turbulent zone on the lee sides of the crests. Wind can cause damage to trees by breakage or the uprooting of stems, which is due to compression failure of stems or roots on the leeward sides of trees. Different soil types provide limitations to rooting, and therefore can influence the amount of wind throw. The greater the mass of soil adhering to the root system the more wind firm the tree becomes. Another resistive force to wind throw can be attributed to support given by adjacent crowns. Contact between tree crowns is common in maturing even aged stands of conifers, and reduces the vulnerability to intense gusts, which cause sway and oscillation leading to blow down or mechanical damage.

Stem damage, canopy damage, volume losses, and mortality are categories of damage that can occur and are generally classified by severity. They can have an effect on the structure of the stand, influence future growth and yield, or reduce lumber value. Understory trees may be susceptible to indirect damage from other trees falling on them while larger trees are more likely to sustain direct damage, such as a broken top. Previous mechanical damage to trees may increase subsequent wind damage, while continued exposure may prevent any healing or recovery from damage. Leaning, or trees bent more than 40° from vertical, as well as pinned trees that are bent by other stems, are effectively damaged and will reduce the volume obtained from the stand at rotation.

Average wind speeds are light over much of the Plan Area, although strong winds are occasionally experienced in connection with migrant storms that move across the area during the winter. Since the major river valleys generally extend in a northwest to southeast direction, the prevailing wind direction for much of the Plan Area is dominated by this feature. Southwest or northeast winds only occur where local valleys run in this direction or along the coast where the mountain influence is less pronounced. A study of Eureka data over a 3-1/2 year period indicated that wind was from a northwest or north direction 29% of the time and from a southeast or south direction 19% of the time. Winds from the southeast prevail from November through March and from the north or northwest from April through October. Wind speeds of 40 to 50 mph can be expected once every two years, on average, while speeds of 80 to 90 mph occur about once in 100 years. The most damaging winds are from the southerly quarter and are associated with the approach of cyclonic storms. Historic winds accompanied major storms in 1955, 1962, and 1964.

Small-scale windthrow is not expected to have a long-term significant adverse impact on stream shading or water temperatures and will have the beneficial effect of introducing large woody debris into streams that currently lack this habitat-forming element. Thus, small-scale windthrow does not pose so substantial an impact as to threaten an adverse change in the status of any Covered Species, and may actually benefit aquatic species through natural modifications to stream habitat. Based on historical experience within the HPAs, a windstorm that results in a complete blow-down of 900 feet or more, measured along the length of the stream, of trees within an RMZ, however, is not reasonably foreseeable, and would be considered an unforeseen circumstance.

6.3.9.2.2 Windthrow – Supplemental Prescriptions

If a windstorm results in a complete blow-down of more than 150 feet of previously standing timber within an RMZ, measured along the length of the stream, Simpson will provide both Services with information regarding such windthrow within 30 days of its discovery. With respect to such windthrow, unless the windstorm constitutes an “unforeseen circumstance” as defined above, Simpson will apply the following supplemental prescriptions within the Plan Area:

- Other than trees that are downed or dead due to the wind, Simpson will not be allowed to remove more timber than it would have been allowed to remove under the other portions of Section 6.2 had no windthrow occurred in the stand, unless the Services determine that the removal of such additional timber would not materially reduce the functional benefit of such habitat for any Covered Species.

- Salvage of trees downed or dead by wind must comply with state law. In addition, the conduct of any salvage operations within an RMZ or SMZ will be done with reasonable care to minimize soil erosion, to retain structural features that contribute to bank or slope stability, and to retain standing dead trees that will contribute to the recruitment of LWD to watercourses within the area affected by the windstorm.

- Reforestation of any RMZ or SMZ affected by the windstorm will be implemented as soon as reasonably possible.

6.3.9.3 Earthquakes

The Plan Area is located in an area that is well known for frequent, but generally small, earthquakes. The surface trace of the Cascadia Subduction Zone San Andreas fault is offshore within 25 miles of most of the Plan Area and numerous smaller, less-significant faults are found throughout the region. Because earthquakes are quite common, they are generally of a relatively insignificant magnitude, typically magnitude 2 to 3 on the Richter scale. Occasionally, greater magnitude events occur, but they are impossible to predict.

In April of 1992, three earthquakes of magnitude 6 or greater on the Richter scale occurred in relatively short succession. These earthquakes produced ground shaking to cause incidental damage to some structures in the region. However, in the forest environment, earthquakes of magnitude 6 or less on the Richter scale produce little, if any, visible change, and apparently no significant impact to wildlife or fishery habitat.

It is possible that some trees have fallen as a result of earthquake activity, however fallen trees in the forest are generally attributed to wind or landslide effects. Regardless of cause, fallen trees in the forest are not of so significant a number as to require additional mitigations and/or changes in the management scenario or restrictions outlined in this Plan.

While it may be speculated that localized landslides or other earth movements resulted from these earthquakes, there are no data to document that this occurred within the Plan Area. Landslides caused by earthquakes will be addressed pursuant to the "Landslide" subsection of this Changed Circumstances Section.

Thus, earthquakes of such magnitude (greater than magnitude 6 on the Richter scale) that may substantially alter habitat status or require additional conservation or mitigation measures in excess of those already included in the Plan, are not reasonably foreseeable during the life of the Plan, and would be considered “unforeseen circumstances.” Landslides caused by earthquakes and other natural phenomena are addressed below.

6.3.9.4 Flood

Floods are a natural and necessary component of aquatic and riparian ecosystems. For example, floods transport and sort sediment, deposit fine sediments, organic materials and chemical nutrients onto flood surfaces, recruit large woody debris, and scour pools and create other beneficial aquatic habitats. Changing river courses also periodically provide opportunities for the establishment of new riparian stands. Alluvial terraces along river valleys provide ideal growing conditions for hardwood and conifer stands and are one of the most dynamic vegetative mosaics in the forested landscape. The Plan recognizes the dynamic nature of channel networks and accounts for the effects of floods by, among other things, prohibiting salvage in flood plains or channel migration zones in Class I RMZs.

The Plan Area is a region of moderate temperatures and considerable precipitation. Rainfall can be experienced each month of the year, although amounts are very light during the summer. Most of the precipitation occurs associated with winter storms that move inland from the Pacific. Total seasonal precipitation can exceed 100 inches at some points in the northern part of the area and decrease to less than 40 inches near Eureka. The Plan Area is traversed by a number of streams that generally flow northwest as they traverse Del Norte and Humboldt Counties. Major drainages include the Smith River, Klamath River, Trinity River, Redwood Creek, Mad River, Little River, and Eel River.

Floods can cause damage to forest transportation systems (e.g. watercourse crossings, bridges, roads). Floods can also cause damage to forest stands by undermining trees, washing out soil from around the roots, or softening the soil and causing trees to fall. Likewise, floods also suffocate roots by reducing available oxygen in the rooting zone.

The frequency with which floods occur and their relative magnitude are inversely related. Large floods are infrequent while smaller floods can go unnoticed and may recur as often as once every year. Severe floods may occur once in 15 or even 100 years. Existing gauging station records provide evidence of historic floods in 1861 and 1955 that were equal in magnitude but less damaging than that of December 1964, which is noted as the most severe flood ever recorded in California history. Two other floods, possibly similar in magnitude to that of 1964, occurred around 1600 and 1750. The latest intense flood occurred in 1997, and was the result of a large rainstorm preceded by a month of heavy rainfall.

A flood that is of lesser magnitude than a 100-year recurrence interval event (i.e., less than a 100-year flood) is part of the expected normal ecology of the forest. The conservation measures in the other portions of this Section 6 are adequate mitigation for such an event. Based on historical evidence in the Plan Area, a flood that is equal or greater in magnitude than a 100-year recurrence interval event is not reasonably foreseeable during the term of this Plan, and thus it would be considered “unforeseen circumstance.”

6.3.9.5 Pest Infestation

6.3.9.5.1 Insects and Disease

Insects and diseases can usually be kept under control through careful forest management and proper treatments. Natural control of insects can take place through climatic conditions, parasites, or predators via biological control. Integrated pest management (IPM) uses ecological principles to be effective, practical, economical, and protective of human health and environment while controlling pest infestation. By definition, IPM employs known practices, new ideas, policy considerations, treatment techniques, prediction, monitoring, and decision making to work together with the least amount of impact on the environment while providing silvicultural, biological, and chemical control. Defoliators, borers, bark beetles, and various terminal and root feeders, along with sucking insects are common types of insects in California forests. However, large outbreaks are uncommon to the redwood forest type since redwood has no known pests that cause damage or reduce growth and survival. Many problems with pests result from growing trees in habitats to which they are not adapted, or are off-site.

Site quality and nutrient availability play a key role in forest health and vigor. Since much of the Plan Area is of high site quality, infestations are less likely to occur within the healthy forests that occupy these sites. Likewise, many infestation problems can be linked to introducing exotic species, which become new hosts for pests. Tree species introduced outside their natural range may flourish for a time and then suffer serious attack as they encounter difficulties with pests native to the new habitat. Similarly, introduced pathogens can lead to the decline of native tree species. One example is Port-Orford-cedar (POC) root rot caused by *Phytophthora* spp. This pathogen is at chronic levels within portions of the four northern-most HPAs and its effect is to diminish the presence of live POC in the riparian areas. Under a worse case circumstance, as infected trees die the niche they occupied becomes colonized by other forest tree species. As a consequence of natural replacement of POC by other species the disease is not expected to have a measurable adverse effect on the Covered Species or on the functional attributes of the Plan.

Infestation by generally recognized types of forest pests or pathogens would not be expected to have significant adverse effects on the Covered Species within the Plan Area and are not considered changed circumstances. A possible exception is the recently identified sudden oak death disease caused by *Phytophthora ramorum*. Supplemental prescriptions were developed for this pathogen and will be applied if this disease becomes prevalent within the Plan Area (see supplemental prescriptions below). The conservation measures in other portions of Section 6 provide adequate mitigation for other pest invasions, but a pest invasion that results in a significant impact on the Covered Species would be considered to be an “unforeseen circumstance.” An infestation of sudden oak death that crosses to redwood or other conifers could have a significant effect on the forest ecosystem within the Plan Area; however, such an event that could actually have a significant impact on the Covered Species is not reasonably foreseeable, and thus it would be considered an “unforeseen circumstance.”

6.3.9.5.2 Pest Infestation – Supplemental Prescriptions

On SSSs, headwall swales and along Tier B Class III watercourses, if 51% or more of the total basal area is lost as a result of Sudden Oak Death or through stand treatment to control the disease then prior to any harvesting of such areas, on site review will be made by a Registered Geologist and Registered Professional Forester to develop additional prescriptions to compensate for the loss of hardwood root strength through retention of additional conifers.

6.3.9.6 Landslides

6.3.9.6.1 The Role of Landslides in Coastal Northern California

Landslides are known to have local and often significant impacts on the physical character of stream habitat and their biological communities. However, landslides and earthflows of many dimensions and driving processes are a natural part of the forested landscape in the Pacific Northwest, replenishing channels with gravel and wood derived from valley slopes and tributary systems (Bench 1990). Without the catastrophic transfer and replenishment of these materials, the habitat of streams in this region ultimately simplifies, supporting fewer species and a less diverse fish community (Reeves et. al. 1995). Thus while the short term effects of landslides can devastate local populations of aquatic vertebrates, landslides and their legacies can actually serve to preserve and perpetuate the habitat that they require and support long term persistence of metapopulations. This Plan is expected to reduce management related landslides and develop forest conditions that enable natural landslides to deliver sufficient quantities and quality of wood for the creation of productive stream habitat.

Landslide rates and processes differ in the various geologic settings across the Plan Area. In the Coastal Klamath and Blue Creek HPAs, shallow rapid landslides are the most common kinds of landslides, whereas the upstream portions of the Mad River HPA is pervasively underlain by deep seated landslides and earthflows. Still other HPAs are subject to both deep seated landslides and shallow landslides. These different landscapes with their particular mass wasting processes present varying sensitivities to management activities. Conservation and mitigation measures within this Plan were designed to address sediment and other habitat effects from past landslides, to take advantage of future naturally-occurring landslides, and through a combination of stream buffer prescriptions, land management restrictions, slope stability analyses, and stream monitoring, to avoid significant adverse impacts from management related landslides and mass wasting events in the future.

Generally, landslides that cause alteration of the instream habitat condition in any watershed are part of the ordinary ecology of the forested landscape and are adequately addressed by the existing conservation and mitigation measures. Based on historic experience within the Plan Area, a landslide that results in the delivery of more than 100,000 cubic yards of sediment is not reasonably foreseeable, i.e. an unforeseen circumstance.

6.3.9.6.2 Landslides –Supplemental Prescriptions

If a landslide results in the delivery of more than 20,000 cubic yards of sediment to a channel (either from a source area or from combined source area and propagated volumes), Simpson will provide both Services with information regarding such landslide within 30 days of its discovery. With respect to such a landslide, and unless this landslide constitutes an "unforeseen circumstance", i.e. delivery of more than 100,000 cubic yards, Simpson and the Services will confer to determine if it is reasonably possible that management activities on or adjacent to the area of the landslide could have materially contributed to causing such landslide. If either Service or Simpson concludes that it is reasonably possible that management activities materially contributed to the occurrence of such a landslide, Simpson, at its own expense, will retain a qualified geo-technical expert to analyze the slide and develop a written report. The report will include, at a minimum, an assessment of the factors likely to have caused the slide and any changes to management activities which had they been implemented on or adjacent to the area of the slide would have likely prevented the slide from occurring. Upon receipt of such a report, Simpson will forward the report to the Services. Where appropriate, the recommendations set forth in the report may form the basis for adaptive management changes to the SSS conservation measures under Sections 6.2.2 of this Plan.

6.3.9.7 New Listing of Species that are Not Covered Species

6.3.9.7.1 Changed Circumstance.

The preamble to the No Surprises rule states that the listing of a species as endangered or threatened could constitute a changed circumstance. Therefore, if a species is listed under the federal ESA subsequent to the effective date of the Permits, and that species (i) is not a Covered Species, and (ii) is affected by the Covered Activities, such listing will constitute a changed circumstance herein.

6.3.9.7.2 Supplemental Prescriptions

Where a new listing that constitutes a changed circumstance occurs, Simpson will follow the procedures set forth in the IA.

6.3.10 Measures for Unforeseen Circumstances

Unforeseen Circumstances will include those changes in circumstance identified as “unforeseen circumstances” in Section 6.3.9 but will not include any other changes in circumstances described in Section 6.3.9. In the event that Unforeseen Circumstances occur, modifications to the Plan will be made only in accordance with the procedures set forth in the IA.