

DRAFT
SALMONID CONSERVATION MEASURES
FOR ** FORESTRY ACTIVITIES
FOR A SHORT-TERM HCP
1999

The following information is provided by the National Marine Fisheries Service (NMFS) in response to a request by ** to provide a thorough example of conservation measures that would be necessary to obtain a short-term, 3-5 year, habitat conservation plan (HCP). The measures below are generic and presented for all of ** ownership within the range of anadromous salmonids. Measures may be tailored more site specifically depending on the availability of information. The measures are written in a basic style for inclusion directly into a HCP.

Aquatic Protection and Management Zones: Aquatic Protection Zones (APZs) will be designated for all Class I and Class II waters within watersheds containing salmonids. Aquatic Management Zones (AMZs) will be designated for all Class III waters within watersheds containing salmonids. APZs and AMZs will be mapped and marked on the ground on all waters before the preharvest inspection occurs. The size of APZs or AMZs, and the activities allowed within, vary with type of water.

Class I and II waters: The outer APZ boundary will be delineated and marked on the ground equal to one site-potential tree height, 180 feet, 50 feet beyond the break in slope at the top of the inner gorge, 50 feet beyond the upper extent of any unstable area that extends down to within 180 feet of a Class I or II water or 50 feet beyond the break in slope for all slopes 50% or greater adjacent to the APZ, whichever of these distances is greater. If this distance is greater than the distance from the water to the drainage divide specific to that watercourse, the outer APZ boundary at the drainage divide will be delineated and marked on the ground.

All distances are measured horizontally from the edge of the channel migration zone (CMZ), if one exists, or from the outer edge of the bankfull channel on each side of the waters.

Timber operations or other management activities will not be conducted, except road-related activities, as described below, within this APZ and within the adjacent bankfull channel.

The following restrictions apply within APZs:

- Equipment exclusion zone (EEZ).
- No salvage or sanitation logging, exemption harvest, emergency timber operations including within the bankfull channel.
- No burning or mechanical site preparation.
- Yarding across the APZ will be conducted only if it can be accomplished from full suspension and without falling or harvesting trees in yarding corridors within the APZ or

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without removal or damage to tree crowns. Achieving full suspension above the overstory tree canopy is preferable.

- Retain trees within the APZ damaged during timber operations.
- No chemical treatments, including herbicides, pesticides, rodenticides, dust abatements, and fire retardants (except in emergencies when deemed essential for the protection of life and property).
- In cases of emergencies that could result in the loss of life or property, removal of wood may be allowed in the APZ, after consultation and approval by NMFS. Loss of property is defined as a demonstrated high risk of loss of capital improvements such as bridges, roads, culverts, and houses, however it does not include the loss of vegetation.
- Directionally fall trees and yard away from Class I and II waters.
- Except in conjunction with construction of a new road that crosses a watercourse, leave any part of a tree that falls within the APZ during timber operations.
- If ground-based yarding will be used on slopes greater than 50% adjacent to the APZ, or if roads are within 100 feet of an APZ, the EEZ will be increased by 100 feet, measured horizontally from the outer edge of the APZ.

Class III waters: The outer AMZ boundary will be delineated and marked on the ground equal to 100 feet, up to the break in slope for slopes that exceed 50%, or 50 feet beyond the upper extent of any unstable area that extends down to within 100 feet of a Class III water, whichever of these three distances is greater. If this distance is greater than the distance from the watercourse to the drainage divide specific to that watercourse, the outer AMZ boundary at the drainage divide will be delineated and marked on the ground.

All distances are measured horizontally from the edge on each side of the channel. This AMZ may be partially entered for timber management purposes.

Within all Class III water AMZs, the first 30 feet closest to the channel, or 50 feet beyond the upper extent of any unstable area that extends down to within 30 feet of a Class III water, whichever distance is greater, will be delineated and marked on the ground. Timber harvest or other management activities will not be conducted, except road-related activities as described, within this inner buffer.

Between the inner 30 feet buffer closest to the channel and the outer AMZ boundary, the following management restrictions apply:

- The conifer basal area will not be reduced to less than 50% of the potential of a fully stocked stand, according to published empirical yield tables (referenced in the definition for “*Site-potential tree*, provided above), considering age and site class. Conifer tree size distributions will be left representative of the pre-harvest stand. No harvest within the AMZ will occur

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except concurrent with commercial thinning or single tree selection (CDF 1999) in adjacent stands and under the same timber harvest plan, immediately after which, at least 100 square feet basal area per acre will be retained in these adjacent stands.

- Equipment exclusion zone (EEZ).
- No salvage or sanitation logging, exemption harvest, or emergency timber operations including within the bankfull channel.
- No burning or mechanical site preparation.
- Yarding across the AMZ may be accomplished using full suspension only.
- Retain all trees in the AMZ that are damaged during logging activities, including yarding operations.
- No chemical treatments, including application of herbicides, pesticides, rodenticides, dust abatements, and fire retardants (except in emergencies when deemed essential for the protection of life and property).
- Directionally fall trees and yard away from Class III waters.
- Except in conjunction with construction of a new road that crosses a watercourse, any part of a tree that falls within the AMZ during timber operations will be retained on site.
- If ground-based yarding will be used on slopes greater than 50% adjacent to the AMZ, or if roads are within 100 feet of an AMZ, the EEZ will be increased by 100 feet, measured horizontally from the outer edge of the AMZ.

Measures to Minimize Surface Erosion in Riparian Areas

- Within APZs and AMZs, all sites of exposed mineral soils will be treated, that are caused by timber operations and other forestry activities. Soil cover will be restored with a combination of straw mulch (minimum 4 inches depth), or duff and surface vegetation, maintaining a minimum of 95 percent surface cover. Erosion prevention materials, such as straw mulch, hydromulchers, chipping machines, or seed will be located at THP sites during timber operations to treat exposed soils in a timely manner.
- Exposed mineral soil associated with water crossings will be treated to avoid or minimize sediment delivery, as described and specified above.
- Waterbreaks will be installed in cable corridors that divert or carry water away from the natural drainage network or channelize run-off that reaches waters at intervals as per skid trail prescriptions by Weaver and Hagans (1994).

Channel Migration Zones

All segments of Class I and II waters will be examined to identify the current boundaries of the Channel Migration Zones (CMZ). Timber harvest plan areas, including appurtenant roads, situated upslope of a Class I or II watercourse will be analyzed and the CMZ delineated with the assistance of a qualified fluvial geomorphologist. No timber operations or other management activities will occur within CMZs and within the adjacent bankfull channel, except road-related activities as described below. The following restrictions apply within CMZs:

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- Equipment exclusion zone.
- No salvage or sanitation logging, exemption harvest, or emergency timber operations.
- No burning or mechanical site preparation.
- Conduct full suspension yarding across the CMZ only if it can be accomplished without falling or harvesting trees in yarding corridors within the CMZ and without removal or damage to tree crowns. Achieving full suspension above the overstory tree canopy is preferable. Partial suspension will not be conducted.
- Trees within the CMZ damaged during timber operations will be retained.
- No chemical treatments, including herbicides, pesticides, rodenticides, dust abatements, and fire retardants (except in emergencies when deemed essential for the protection of life and property).
- In cases of emergencies that could result in the loss of life or property, harvest may be allowed in the CMZ after consultation and approval by NMFS. Loss of property is defined as a demonstrated high risk of loss of capital improvements such as bridges, roads, culverts, and houses, however it does not include the loss of vegetation.

Road construction, maintenance, and use: In order to protect salmonids, roads will be constructed, reconstructed, maintained, and operated such that:

- Roads do not initiate gully and landslide processes.
- Road-related sediment (both coarse and fine) does not reach watercourses.
- Salmonid movement is not restricted.
- The natural drainage network and hydrology are maintained.
- Forest chemicals do not come in contact with water.

A road management plan and long-term transportation plan will be developed at the ownership or watershed scale, in consultation and with approval by NMFS. This plan will identify a long-term road network that will result in low environmental impacts and low annual maintenance requirements and costs. The plan will also set forth specific measures for controlling winter and wet weather road use. The “*Handbook for forest and ranch roads: A guide for planning, designing, constructing, reconstructing, maintaining, and closing wildland roads*” will be used (Weaver and Hagans 1994) as a reference for all road-related activities. Additional information on road surfacing “*Reduction of soil on forest roads*” (Burroughs and King 1989) will be used.

For all roads within and near a harvest area, including appurtenant roads under the control of**, and legacy roads that could be treated with equipment in the harvest area, the following measures will be implemented:

- A. ***Fine sediment discharge*** from surface erosion of roads. To avoid or minimize fine sediment discharges, the following measures will be implemented during construction, maintenance, and

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operation of roads:

- Within APZs and AMZs, no new road construction or reconstruction or opening of legacy roads (except for upgrading or decommissioning), or new stream crossings, unless it can be demonstrated and agreed to by NMFS that such locations will be less impactful on aquatic habitat than alternative routes.
- Upgrade concurrently with timber operations, or close or decommission prior to completion of timber operations, all THP-related roads as per Weaver and Hagans (1994).
- In conjunction with each THP, road upgrading, closure or decommissioning will be completed to reduce in sufficient quantity actual ongoing or potential sediment discharge to at least offset the quantity of sediment discharged from the THP. Complete measures to offset additional predicted discharge from the THP operations to waters within the sub-basin in which the THP harvest units and any new road construction occur.
- Move soils for purposes of road construction, reconstruction and upgrading only when soil moisture is no wetter than is found during normal watering (dust abatement) treatments, and when roads are not rutting or pumping fines.
- During and after road construction, reconstruction, and upgrading there will be no visible increase in turbidity in any drainage facility, on any construction/reconstruction site or road surface, which discharges to a Class I, II or III water and within any of these waters (standing water on the road that does not drain to a Class I, II, or III, is not applicable).
- During road construction, reconstruction and upgrading, erosion control materials will be stockpiled of sufficient quantity on site and utilize to prevent a visible increase in turbidity within any drainage facility that leads to a Class I, II or III waters and within any of these waters.
- Construct or reconstruct roads as single-lane with periodic turnouts that are no more than 12 to 14 feet wide. Build turnouts only where landings and intersections are not available to provide safe transport of equipment. Periodic turnouts, combined with road width, will extend out to no more than a total of 18 feet.
- Surface all existing, new and reconstructed roads in APZs and AMZs with high quality, clean rock surfacing (minimum packed 6 in. depth) or paving, and maintain the road surfacing to avoid rutting or pumping fines during use.
- No road construction using through cuts.
- No skidding, road construction, road reconstruction, road upgrading, rocking, layout construction, or mechanical site preparation during the winter period.
- Do not haul during wet weather conditions.
- Outside of the winter period, no skidding, road construction, road reconstruction, road upgrading, rocking, layout construction, or mechanical site preparation during wet weather conditions. Commencement or resuming these activities will not occur for 48 hours after precipitation ends or until road surfaces and ditches are dry (road moisture is no higher than that found during normal watering - dust abatement - treatments) and when operations do not

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cause rutting or pumping of fines and do not cause a visible increase in turbidity within any drainage facility that leads to a Class I, II or III waters and within any of these waters.

- Road fill, watercourse crossings and actively eroding slopes that can be demonstrated as high risk of immediate failure which may deliver sediment to waters can be upgraded during the winter period and during wet weather conditions.
- Construct roads using the guidelines for outsloping, rolling dips, critical dips and water bars found in Weaver and Hagans (1994). Follow guidelines for road construction on unstable areas found under “E. *Gully and landslide erosion*” and “Unstable areas prone to landslides,” presented below.
- Promptly decommission temporary roads using the following methods according to the recommendations in Weaver and Hagans (1994) or Burroughs and King (1989): pull back all perched fill and sidecast, treat road surfaces and ditches to disperse runoff and prevent surface erosion, remove potentially unstable road material, mulch and seed exposed soil surfaces, remove all drainage structures and stream crossing fills, permanently drain using outsloping and rolling dips, remove outside road berms and eliminate inside ditches. Where stream crossings are removed, restore natural channel configurations to minimize channel adjustments.
- Inspect all THP roads, including drainage structures and facilities, at least twice annually during, and for at least five years after completion of timber operations. Inspect all roads at least once annually after May 31 and prior to October 1 to ensure that drainage structures and facilities are in proper condition. This includes all closed roads. Inspect all roads again annually during the winter period at least once following a two-year, six-hour storm or bankfull storm event as soon as conditions permit access to ensure and validate that drainage structures and facilities are properly functioning. Multiple inspections during the winter period are encouraged.
- Decommission roads that cannot be inspected during any one of the annual inspections according to guidelines provided by Weaver and Hagans (1994).
- Inspect roads that have been decommissioned, during the first winter period after decommissioning and again after the first five-year, six hour storm event or five years after completion of work, whichever comes first, to ensure that treatments to restore natural drainage and hillslope stability are functioning as intended. If treatments are found to be ineffective, treat further if the volume of sediment prevented from entering a channel by additional treatments is greater than that incurred by re-entering the site.
- During road inspection and maintenance, employ measures to ensure that waterbars capture runoff from road surfaces and discharge it so that sediment is not delivered to watercourses, culverts are not occluded by debris, inside ditches are not scouring, cut banks are not eroding and fines are not pumping from road surfaces such that they can be delivered directly or indirectly to watercourses.
- Immediately repair or maintain waterbars, inside ditches, and plugged culverts. Reconstruct or pull back failed landings, blown crossings, and road bench failures after the winter period

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and prior to October 1. If blown crossings are pulled, limiting access to inspect and maintain the road, decommission the remaining road crossings beyond the failed site.

- Maintain the road surface and excavate or “blade” inboard ditches only when surface flowpaths are disrupted, inboard ditches are blocked or lack adequate hydraulic capacity, or driver safety is a concern.
- Maintain proper surface drainage configuration of the road (e.g., outsloping or rolling dips) while excavating inboard ditches.
- Perform routine corrective work that will prevent diversion of water from a watercourse or ditch (e.g., repair to inside ditches, cross drains, water bars, road surface, unblocking of culverts, etc.) as soon as conditions permit, consistent with federal and state law, regardless of the time of year.
- Perform maintenance needs, other than stated in the previous item, identified between May 31 and prior to October 1. Perform maintenance, other than stated in the previous item, identified after October 1 and up to May 31, after May 31.

B. *Impacts to fish passage*, primarily due to culverts. Existing culverts and other stream crossings within the THP boundaries and on appurtenant roads under ownership will be inventoried and, if necessary, reconstructed to comply with the following:

- Construct or reconstruct watercourse crossings only during low flow periods, between June 15 and October 1, and following emergence of juvenile salmonids from downstream spawning gravels.
- Construct or reconstruct watercourse crossings such that they do not change the channel bed elevation or block sediment transport downstream. Maintain channel cross-sectional area at least to the bankfull stage.
- For all new roads and reconstructed water crossings, design structures over fish-bearing and restorable fish-bearing waters to provide for fish passage of both juveniles and adults so that historic distribution patterns are restored. As a first choice, construct or reconstruct crossings with bridges. Alternatives include bottomless or baffled culverts. Where culverts are used, install them at an appropriate gradient, and select sizes to permit passage of a 100-year recurrence interval flood without overtopping the culvert, and maintain the stream bed through the culvert to provide fish passage, and to prevent culvert “perching.” Fish passage will be ensured by adhering to standards for culvert installation developed by NMFS, or by NMFS review and approval of alternate installation measures.

C. *Impacts to water temperature and volume* due to drafting of water for dust abatement and wildfire suppression. In order to prevent impacts from water drafting, the following will be implemented:

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- No drafting of water for dust abatement or wildfire suppression in Class I waters, unless the intake meets NMFS screening criteria for screen mesh size and approach and sweeping velocity, and is managed to prevent adverse effects on instream flows, sediment levels, and water quality. Water withdrawal sites in Class II waters will be located and managed to prevent adverse effects on instream flows, sediment levels, and water quality.

D. *Gully and landslide erosion* from roads, landings, and watercourse crossings. To avoid or minimize the potential for gully and landslide erosion caused by roads, landings, and watercourse crossings, the following will be implemented :

- Construct or reconstruct roads by outsloping, maintained with rolling dips. Maintain ditched roads with a well-spaced ditch relief system.
- Construct road drainage structures and facilities at appropriate intervals such that surface flow originating from the road surface and ditch does not create a gully or sediment plume that connects with the channel network.
- Space ditch relief culverts on roads which utilize an inside ditch at intervals no greater than that specified in Weaver and Hagans (1994).
- Inventory and assess the existing road network and associated road drainage facilities to:
a) locate the installed system, including legacy roads, b) identify the erosion hazard presented by the road network, c) determine the potential impacts to aquatic resources, and d) prioritize sites for upgrade or decommissioning. Conduct the inventories and assessments concurrently with individual THPs and encompass the entire sub-basin that supports salmonids.
- Size culverts to prevent submergence of inlet at design flow.
- Construct or reconstruct new, or upgraded road-water crossings such that they do not have the potential to divert flows down the road or inside ditch and minimize the potential for fill failures. Reconstruct crossings in such a way as to minimize sediment input to streams if they do fail. Use permanent, broad rolling dips or grade breaks to prevent stream diversions. Construct these so that they are driveable by standard logging equipment, are permanent features of the road, and require little or no maintenance.
- Do not construct roads and landings on unstable areas, on steep slopes (>50%) without benches between the activity and the waters, in headwalls of defined channels, or on narrow ridges between defined channels unless using full bench construction methods limiting the amount of fill. Decommission existing roads and landings built in these areas within 5 years or at the completion of timber harvest activities, whichever comes first.
- Do not allow road-related drainage to discharge onto unstable slopes.

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E. *Impacts of chemicals* (fire retardant, toxic dust abatement, oil and fuel, etc.) on juvenile fish growth. The transport and application of chemicals will comply with the following parameters:

- No chemical applications, in particular toxic dust abatement, and fire retardants on or along roads located in APZs and AMZs or areas along roads that are drained by inside ditches leading to a watercourse.
- No fuel facilities, equipment storage, fueling, changing fluids, cleaning of equipment, or parking of equipment on roads located within APZs and AMZs.
- A spill plan will be developed before fuel, oils, or other chemicals are transported along roads for accidental spills.

F. *Impacts of fire suppression* from control burns and site preparation.

- No construction of fire lines in APZs and AMZs. Conduct minimal hand clearing for fuel breaks in the zone to prevent and control escaped fires. Exceptions to this standard apply where the fire line intersects the APZ or AMZ for a short distance and is environmentally less damaging to a long fire line parallel to the APZ or AMZ.
- Do not ignite fire in the APZs and AMZs. Ignite fire so that fire will back its way toward the APZs and AMZs.
- Ignite fire on one side of the APZ or AMZ at a time, if due to topographic features and/or fuel patterns, a fire on both sides likely would result in intrusion into the zone.
- Conduct burning in the spring or in the fall when fuel moisture conditions, relative humidity, fuel loading and atmospheric conditions, such as wind, are conducive to controlled, light burning.
- Do not remove overstory in the APZ or AMZ.
- If areas of bare soil are exposed from fuel breaks or fire that could result in fine sediment inputs into a Class I, II, or III waters, treat such areas as described under “*Measures to Minimize Surface Erosion in Riparian Areas*”, above.
- When available and feasible, a helitorch will be used to ignite fires for better directional and speed control of the fire.

Unstable areas prone to landslides: To protect salmonids, the potential for *increasing* mass failure, i.e., landslides, above natural levels will be minimized. Furthermore, if mass movement does occur as a result of timber management, the likelihood for soil and debris to enter streams will be minimized. This will be accomplished through carefully delineating and marking potentially unstable areas and limiting or avoiding timber management activities on the identified areas that

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could potentially deliver sediment to a stream.

A. *Identify unstable areas:* All unstable areas will be delineated, mapped, and marked on the ground before the pre-harvest inspection. For each unstable area, the likelihood of failure occurring will be determined; the probability of failure as low, medium, or high will be ranked. There are numerous methods for identifying landslides and areas prone to sliding. “*A Guide for Management of Landslide-prone Terrain in the Pacific Northwest*” may be used in addition to other methods (Chatwin et al. 1994). Whichever procedure is used, it will be based on the best available science, and be done by or with the assistance of a geomorphological or geotechnical expert and will contain the following components: (1) an office evaluation of existing data - a review of available maps (topographic, soil, landslide inventory, slope stability, forest cover, bedrock, etc.), reports, and current and historical aerial photographs; (2) a field evaluation of the site (including, the THP and adjacent areas within the planning watershed) - note landform and slope configuration and gradient, overburden, evidence of past landslides or other features that indicate instability, bedrock characteristics, evidence of wet soil, evidence of hydrophytes, and indicators of movement from vegetation (curved trees, leaning trees, etc.); (3) a field and aerial photo evaluation of landsliding rates on similar sites that have undergone earlier management and stressing storm events; and, (4) a quantitative assessment of unstable or potentially unstable slopes, based on the data gathered in the office and on the field visit.

A process for assigning the likelihood of failure is based upon comparison of landslide rates on similar landforms with and without management to assess loss of root strength on slope stability after a stressing storm event. The probability of failure is defined based on the following:

Low: Unstable areas where landslide rates under management are equal to rates in unstable areas without management.

Medium: Unstable areas where landslide rates under management are less than 2 times the rate in unstable areas without management.

High: Unstable areas where landslide rates under management are greater than or equal to 2 times the rate in unstable areas without management.

B. *Identify potential for sediment delivery:* Determining the potential for sediment to be delivered to a stream from a mass failure will be based on the following:

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Low: Unstable area is above APZ or AMZ, slope flattens (0-30%) for at least 300 feet before reaching APZ or AMZ.

Medium: Unstable area is within or above APZ or AMZ, slope ranges from 30 to 50% and leads to APZ or AMZ without flattening.

High: Unstable area is within or above APZ or AMZ, slope >50%, leads to APZ or AMZ without flattening.

C. Allowable activities:

The prescriptions for timber operations involving unstable areas in the APZs and AMZs will not be less restrictive than the general prescriptions that apply to these areas presented in the sections above.

Road decommissioning of existing roads is acceptable and encouraged on unstable areas.

Depending on the rating of a particular unstable area, either standard practices, limited practices, or no practices will be used, as presented in the following matrix:

**LIKELIHOOD OF FAILURE
POTENTIAL TO DELIVER SEDIMENT TO STREAM**

	LOW	MEDIUM	HIGH
LOW	Std. Practices*	Std. Practices	Ltd. Practices
MEDIUM	Ltd. Practices**	Ltd. Practices	No Practices
HIGH	No Practices***	No Practices	No Practices

**Standard Practices:* No special restrictions on timber operations and road construction as long as action is in compliance with the other sections of these guidelines and any other applicable regulations.

***Limited Practices:* Some land management practices may occur under review and guidance of a

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professional geomorphological or geotechnical expert, based on NMFS-approved review criteria and an assessment of the risk to the aquatic environment. Limited practices may include uneven age management, extended cutting cycles, and no ground-based logging.

The following applies to areas rated as “*Limited Practices*”:

- a) Timber operations on unstable areas will occur only if the following is provided for agency and public review as part of the timber harvest plan review process: 1) a map of all unstable areas within the planning watershed overlaid by all existing roads and timber harvest plan areas that have been subjected to at least one 10-year, six-hour or larger storm event and 2) a geologic analysis of the risk of hillslope failure by the proposed timber operations.

- b) Qualified professional geologist(s), including, but not limited to, certified engineering geologist(s) licensed by the State of California, will evaluate at the time of THP preparation the proposed roads, road specifications, silvicultural prescriptions and yarding methods to determine whether the proposed timber operations in these unstable areas are appropriate. The geologist(s) should make a determination that the proposed timber operations and mitigations are not likely to trigger or exacerbate mass wasting. Taking into consideration this geologic review, including, the information listed in the previous paragraph, the Public Trust Agencies (i.e. NMFS, U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, California Department of Fish and Game, and the Regional Water Quality Control Board) will make the final determination if all, some or none of the proposed timber operations should occur across an unstable area. This determination will be based on an assessment of risk to the aquatic environment by qualified Public Trust Agency aquatic biologist(s). It will also be based on consideration of the proposed road locations, road specifications, silvicultural prescriptions and yarding methods and the likelihood of avoidance of significant adverse impacts to aquatic species and their habitats and other beneficial uses of water. If any of the Public Trust Agencies determines that the proposed timber operations should not go forth, the Public Trust Agencies and ** may attempt to develop, if available, feasible alternatives that will avoid significant impacts to salmonids and their habitats.

- c) The NMFS, in consultation with state and other federal agencies, will provide a set of criteria for determining whether risk of mass wasting activity are to be considered “significant” for aquatic resources.

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****No Practices*: These areas will be closed to all timber operations except use of upgraded and stabilized existing roads. Existing roads across unstable areas will be stabilized under the guidance of a geotechnical expert or decommissioned.

Definitions:

Aquatic Management Zone (AMZ): A strip of land on either side of a Class III water where management practices are limited or excluded for the protection of aquatic resources.

Aquatic Protection Zone (APZ): A strip of land on either side of a Class I or II water where management practices are excluded for the protection of aquatic resources.

Bankfull stage: The point on a streambank at which overflow into the active floodplain begins. The active floodplain is a flat area adjacent to the channel constructed by the stream and overflowed by the stream at a recurrence interval of about 1.5 to 2 years (Dunne and Leopold 1978). If the active floodplain is absent or poorly defined, other indicators may identify bankfull. These include the height of depositional features, a change in vegetation, slope or topographic breaks along the bank, a change in the particle size of bank material, undercuts in the bank, and stain lines or the lower extent of lichens on boulders. Deposits of organic debris are seldom good indicators of bankfull. Harrelson et al. (1994) provides a field guide for determining bankfull. Field determination of bankfull will be calibrated to known stream flows to avoid errors.

Break in slope: the location on a hillslope above a water where a reduction in slope begins to be less than 50% (see definition for *Inner gorge*) for a distance of more than 100 feet. In cases where inner gorges have slopes that average less than 50%, the break in slope is defined as the location where a reduction in slope begins to be less than the average slope of the inner gorge for a distance of more than 100 feet.

Basal area: The total cross-sectional area expressed in square feet, measured at breast height, of tree stems per acre (CDF 1999). Measured for living trees over 4.5 inches diameter breast height.

Channel Migration Zone: Spatially, this area generally corresponds to the modern floodplain, but can also include river terraces subject to significant bank erosion. For delineation, see definition for *floodplain*.

Debris torrent tracks: Swales, gullies or watercourse channels susceptible to debris torrents.

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Channels may show recent evidence of debris flow(s) and have the potential to deliver future debris torrents. Characteristics of channels prone to debris torrents is described by Benda (1985).

Drainage facilities: facilities constructed to control road-related runoff, including, but not limited to, fords, inside ditches, waterbreaks (waterbars), outsloping and rolling dips.

Drainage structure: a structure installed to control, divert, or to cross over water, including, but not limited to, culverts, bridges and ditch drains.

Equipment Exclusion Zone: Areas where heavy equipment is completely excluded, except on designated roads (CDF 1999).

Floodplain: The area adjacent to the stream constructed by the river in the present climate and inundated during periods of high flow. Delineate the floodplain either by the flood-prone area or the approximate 100-year floodplain, whichever is greater. For larger streams, the 100-year floodplain may already be indicated on U.S. Army Corps of Engineers or county flood hazard maps.

Headwall: Steep (generally greater than 50%), planar or concave slopes at or near the heads of steep swales, gullies and Class II and Class III waters. Headwalls may be less steep and/or show little or no evidence of past failures where vegetation maintains slope stability.

Headwall swale: A concave depression, with convergent slopes generally greater than 50% that is connected to a water via a continuous linear depression. Linear depression interrupted by a landslide deposit is considered continuous for this definition.

Inner gorge: Physiographic features that occur along valley sideslopes adjacent to stream channels. In an inner gorge, slopes that are adjacent to the stream channel are steeper than those further upslope. Typically, inner gorges slopes are generally greater than 65% (33°), but Kelsey (1988) notes that in Redwood Creek, inner gorge slopes average 27° (51%) in the upper valley and 21° (38%) in the lower basin. In most cases, a clearly defined break-in-slope separates the steeper inner gorge slopes from the more moderate, higher hillslopes. In all cases, a recognizable break-in-slope occurs at the upper limit of the inner gorge. Inner gorges occur therefore within segmented hillslopes that have a valley-within-valley cross section (Kelsey 1988).

Roads: For purposes of these guidelines, *roads* include all sites of intentional surface disturbance for the purpose of vehicular traffic and equipment use, including all surfaced and unsurfaced roads,

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temporary roads, closed and inoperable roads, legacy roads, skid trails, tractor roads, layouts, landings, turnouts, seasonal roads, fire lines, staging areas and base camps. This definition also includes all associated sites such as quarries, borrow pits, and spoil or waste areas.

Types of roads include the following:

Closed roads: Roads that have drainage structures designed to accommodate 100-year flood events, using appropriate drainage facilities (rolling dips, water bars), with exposed soils (including running surfaces) adequately treated (straw-mulched or seeded, or both), and physically closed to all vehicles during the winter period and during wet weather conditions outside of the winter period except for the purposes of road monitoring and maintenance.

Decommissioned road: A road where elements that reroute hillslope drainage (e.g., inside ditches and culverts), restrict or confine stream flow, and/or present slope stability hazards have been removed. Decommissioning a road reestablishes natural drainage patterns on hillslopes and at stream crossings, and reduces the potential for erosion. Decommissioning treatments are self-maintaining, requiring no long-term maintenance.

Legacy roads: Roads that are not maintained, are overgrown, and/or in disrepair.

Temporary road: A road that is used until the timber operations for which they were constructed or reconstructed for a timber harvest plan have been completed. Upon completion of timber operations in the harvest unit(s) to which the road affords access, the temporary roads must be decommissioned as soon as possible between May 31 and October 1.

Upgraded road: A road that is well drained and shows no signs of failure (e.g., as evidenced by slumping scarps or cracks in the road fill) which would deliver sediment to a water, having drainage structures designed to accommodate 100-year flood events and having drainage facilities designed and in place as per Weaver and Hagans (1994) that are hydrologically disconnected from waters. Actions necessary to upgrade a road include the installation of ditch relief culverts and/or rolling dips where downcutting of the ditch is noted and removal or stabilization of unstable fill material at sites showing signs of failure which could impact waters.

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Salvage: Removal of trees and their parts, including, 1) insect-attacked and/or diseased trees (“sanitation”) and 2) dead, dying, or deteriorating trees or downed woody debris (“salvage”) and trees that have fallen through bank cutting, landslides or wind throw. Snags that are felled to reduce fire hazard and for reasons of safety are included.

Site-potential tree: A tree that has attained the average maximum height of dominant trees at the site index age of 200 years, given site conditions where it occurs. To determine site-potential tree, the appropriate following document will be used - “*Empirical yield tables for young-growth redwood*” (Lindquist and Palley 1963), “*The yield of Douglas-fir in the Pacific Northwest*” (McArdle and Meyer 1961), or “*A site classification for the mixed-conifer selection forests of the Sierra Nevada*” (Dunning 1942). These citations provide 100 year site index tree height values. To estimate the 200-year site-potential tree for redwoods, multiply the 100-year site index value presented in Lindquist and Palley (1963) by 1.3¹.

Swale: An unchanneled hillslope where subsurface flow is concentrated. Swales are often sites of accumulation of colluvium. Combination of concentrated flow and unconsolidated colluvium can lead to hillslope failure.

Timber operations: The cutting or removal of timber or other solid wood forest products, including, Christmas trees, from timberlands for commercial purposes, together with all the work incidental thereto, including, but not limited to, construction and maintenance of roads, fuel breaks, fire breaks, stream crossings, landings, skid trails, beds for the falling of trees, and fire hazard abatement, but excluding preparatory work such as tree marking, surveying, or road flagging (Z’berg-Nejedly Forest Practice Act of 1973).

Unstable areas: In addition to the definitions contained in 14 CCR 895.1 (CDF 1999) for unstable areas, slide areas, and unstable soils, unstable areas include headwalls, steep swales, debris torrent tracks, inner gorges, debris torrents and streamside areas that have been undermined by stream bank erosion. Unstable areas include past and current mass movement features as well as geomorphic features indicating landslide prone terrain (Chatwin and others 1994) where the potential for mass movement exists.

¹Based upon an extrapolation of redwood growth curves from Lindquist and Palley (1963). The height of 200 year-old redwood was calculated for various site classes. The ratio between 200- and 100-year heights was then determined for each site class. The average of these ratios is 1.34 (L. Reid, pers. comm, 1998).

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Water(s): Includes streams, watercourses, side channels, seeps, springs, lakes, ponds, and wetlands.

Definitions for types of waters:

Class I waters: Fish bearing waters; including watercourses, streams, rivers, estuaries, lagoons, lakes and ponds that are currently accessible, or were historically accessible and are restorable below dams, potentially accessible for fish continuously or seasonally, including the habitat to sustain fish migration, spawning, and/or rearing.

Class II waters: Non-fish bearing waters; including where aquatic habitat is present for non-fish aquatic species, including invertebrates. These include non-fish bearing watercourses, wetlands, seeps, and springs. Also included are dewatered, aggraded, or tormented streams that have not recovered from past impacts, but would be classified as Class II waters under pre-impact conditions.

Class III waters: No aquatic life or aquatic habitat present. Class III waters include any definable channel, gully or swale, that is capable of transporting sediment, water, or woody debris to Class I or II waters under normal high water flow conditions before or after completion of timber operations.

Wet weather conditions: Occur when any of the following conditions exist: one-quarter inch of precipitation has accumulated within a 24-hour period or less; water is flowing in inside ditches; fines are displaced that can cause a visible increase in turbidity in any drainage facility that leads to a Class I, II or III water or in a Class I, II, or III water; soil moisture conditions are wetter than is found during normal watering (dust abatement) or precipitation can generate overland flow from roads or landings.

Winter period: Occurs from October 1 through May 31. The NMFS can modify this definition for a locale based on an analysis of monthly precipitation data.

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