HEARST FORESTS
BEST MANAGEMENT PRACTICES

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General

The surfaces of roads, landings and skid trails (tractor roads) concentrate runoff because they tend to be highly impermeable, have relatively straight alignments, and (most particularly in the case of skid trails) can be steep. Unless properly designed or mitigated, runoff flows can occur down these surfaces, contributing to accelerated surface soil erosion and increased sedimentation of downslope streams and watercourses.

A major focus of the California Forest Practice Rules (FPRs) is to reduce the potential for increased erosion rates and related water quality impacts from road, landing and skid trail construction, reconstruction and maintenance. The following list of management practices should be considered as ownership-specific best management practices (BMPs), which incorporates and references many of the standard FPRs. Additional practices, not addressed in the FPRs but adopted by Hearst Forests, are also incorporated.

Planning Guidelines Specific to Logging Roads and Landings

1.1 All logging roads (roads) and landings shall be planned, located, constructed, reconstructed, used and maintained in a manner which: is consistent with long-term enhancement and maintenance of the forest resource; best accommodates appropriate yarding systems and economic feasibility; minimizes damage to soil resources and fish and wildlife habitat; and prevents degradation of the quality and beneficial uses of water. [14 CCR 943]

1.2 With the exception of the H-Line, which provides primary access to the Hearst property from State Highway 89, and roads linking building structures and other improvements, all roads on Hearst Forests are classified as seasonal. Seasonal roads are roads which are planned and constructed as part of a permanent transportation facility where: 1) commercial hauling may be discontinued during the winter period, or 2) the landowner desires continuation of access for fire control, forest management activities, Christmas tree growing, or for occasional or incidental use for harvesting of minor forest products, or similar activities. These roads have a surface adequate for hauling of forest products in the non-winter periods, and in the extended dry periods or hard frozen conditions occurring during the winter period; and have drainage structures, if any, at watercourse crossings which will accommodate a fifty-year flood flow. Some maintenance usually is required [14 CCR 895.1]. With the exception of the roads noted above which access and link structural improvements, all roads on Hearst Forests will be constructed, reconstructed and maintained to seasonal road standards.

1.3 The H-Line, which provides primary access to the Hearst property from State Highway 89, and roads linking building structures and other improvements, are classified

as permanent roads. Permanent roads are roads which are planned and constructed to be part of a permanent all-season transportation facility. These have a surface which is suitable for the hauling of forest products throughout the entire winter period and have drainage structures, if any, at watercourse crossings which will accommodate a fifty-year flood flow. Normally, these roads are maintained during the winter period [14 CCR 895.1]. These roads will continue to be maintained to permanent road standards.

1.4 In general, existing roads and landings will be used whenever feasible. New roads and landings will be planned to fit topography to minimize disturbances to the natural features of a site [14 CCR 943]. Where feasible, new roads and landings shall be located on natural benches, flatter slopes and areas of stable soils to minimize adverse effects on watercourses [14 CCR 943(f)]. New roads and landing construction will be minimized along or within narrow canyons, riparian zones, wetlands and other sensitive areas.

1.5 Roads and landings shall be planned, constructed, reconstructed and/or maintained so that an adequate number of drainage facilities and structures are installed to minimize erosion on roadbeds, landing surfaces, sidecast and fills. [14 CCR 943.1(f)]

1.6 Seasonal logging roads shall be planned to a single-lane width compatible with the largest type of equipment used for harvesting operations with turnouts at reasonable intervals. [14 CCR 943.1(g)(1)]

1.7 Roads shall be planned to achieve as close a balance between cut volume and fill volume as is feasible. [14 CCR 943.1(g)(2)]

1.8 All roads shall be planned to effect prism constructed which is either outsloped, insloped, crowned or turnpiked. Outsloped prisms shall be used wherever possible. Crowned prisms may be used on wider road segments or to minimize the number of waterbreaks that may otherwise be required. Roads with insloped or crowned prisms will have inside ditches with adequate cross drainage as necessary for purposes of intercepting and diverting surface drainage from backslopes and road surfaces [14 CCR 943.1(g)(3)]. Turnpike prisms, with or without ditches, can be constructed on flat ground where surface drainage cannot be diverted away from the roadway surface.

1.9 Existing, driveable road segments with insloped road prisms shall be inventoried and reconstructed to outslope specifications, or have adequate cross-drainage structures and facilities installed or constructed, by the year 2016.

1.10 Roads and landings shall be planned, constructed, reconstructed and/or maintained so as to minimize the use of outside (downslope) berms. Outside berms shall be used only when necessary in order to protect fill slopes or divert road surface runoff away from adjacent watercourses, unstable or other sensitive areas.

1.11 Logging roads and landings shall be planned and located, when feasible, to avoid unstable areas [14 CCR 943.1]. See "Landslides and Other Unstable Areas" (Section 14) for guidelines specific to situations where logging road and landing placement within or adjacent to unstable areas, as defined in 14 CCR 895.1, cannot be avoided.

1.12 Road and landing construction shall be planned to stay out of Watercourse and Lake Protection Zones (WLPZs) [14 CCR 895.1, 936.5 and 943.1(h)]. See "Watercourse and Lake Protection" (Section 18) for guidelines specific to situations where logging road and landing construction within WLPZs cannot be avoided.

1.13 Road construction shall be planned so as to minimize the number of watercourse crossings [14 CCR 943(e), 943.3(b)].

1.14 Abandonment of roads, watercourse crossings and landings shall be planned and conducted in a manner which provides for permanent maintenance-free drainage, minimizes concentration of runoff, soil erosion and slope instability, prevents unnecessary damage to soil resources, promotes regeneration, and protects the quality and beneficial uses of water [14 CCR 943.8]. See BMP 4.13 for procedures relating to general road abandonment.

Road Construction and Major Reconstruction

Reconstructed roads are those existing roads which are in need of substantial restoration, rehabilitation or improvement. "Reconstruction" does not include routine or annual maintenance or rehabilitation that does not require substantial change to the original prism of the road.

General

2.1 Road construction and reconstruction shall not occur during the winter period, November 15 to April 1, except for areas with low or moderate erosion hazard ratings (EHRs) as determined on a site-specific basis by a registered professional forester (RPF). Construction and reconstruction activities during the winter period shall be limited to: 1) areas outside the WLPZ; and 2) dry, rainless time intervals where soils are not saturated or where hard, frozen conditions exist, and the U.S. Weather Service forecast for locally significant rain (i.e., greater than 0.5 inches) within the subsequent 24 hours is less than 30%.

2.2 Road construction not completed before October 15 shall be drained by outsloping, waterbreaks and/or cross draining before the beginning of the winter period. If road construction does take place after October 15, roads shall be adequately drained concurrent with construction operations [14 CCR 943.2(s)]. During the winter period, all

erosion and sediment control work shall be completed prior to the weekend or other shutdown periods, or prior to the end of the day if the U.S. Weather Service forecast for locally significant rain (i.e., greater than 0.5 inches) within the subsequent 24 hours is equal to or greater than 30%.

2.3 No road construction shall occur under saturated soil conditions, except that construction may occur on isolated wet spots arising from localized ground water such as springs, provided measures are taken to prevent material from significantly damaging water quality [14 CCR 943.2(r)].

2.4 During all phases of road construction or reconstruction, precautions shall be taken to ensure that soil and sediment material will not reach a watercourse or lake.

2.5 Road construction and reconstruction are prohibited in Class I, II, III or IV watercourses [14 CCR 895.1, 936.2(b), 936.5], in marshes, wet meadows, and other wet areas, except as follows: [14 CCR 936.3(c), 943.2(v)]

- At crossings of Class III watercourses which are dry at the time of local operations;
- At existing road crossings;
- At new road crossings approved as part of the Fish and Game Code permit process (Fish and Game Code 1600 et seq.).

2.6 Road construction and reconstruction are prohibited in watercourse and lake protection zones (WLPZs), except as follows:

- At existing road crossings;
- At new road crossings approved as part of the Fish and Game Code permit process (Fish and Game Code 1600 et seq.);
- On existing roads within the WLPZ for which relocation outside the WLPZ would not provide equal or greater protection to the quality and beneficial uses of water relative to continued use of the road within the WLPZ, provided that existing road reconstruction and use within the WLPZ in coordination with other mitigations and best management practices noted herein would not significantly and adversely impact the quality and beneficial uses of water as validated by CDF in the course of preharvest inspections of the PTHP area;
- When new road construction outside the WLPZ is not practical and would not provide equal or greater protection to the quality and beneficial uses of water relative to new road construction within the WLPZ, provided that construction within the WLPZ in coordination with other mitigations and best management practices noted herein would not significantly and adversely impact the quality and beneficial uses of water as validated by CDF in the course of preharvest inspections of the PTHP area.

2.7 Reconstruction of existing roads located within watercourse flood plains which are outside of but tangential to a watercourse or WLPZ is permitted, provided that road relocation is impractical and reconstruction activities in coordination with other mitigations and best management practices noted herein would not significantly and adversely impact the quality and beneficial uses of water.

2.8 New logging roads shall not exceed a grade of 15% except that pitches of up to 20% shall be allowed not to exceed 500 continuous feet [14 CCR 943.1(e)].

2.9 Insloped or outsloped roads shall be uniformly sloped the entire width of the roadbed, including turnouts. Crowned surfaces should be sloped to each edge from centerline, with a slope gradient of between 2% and 6% depending on grade and subgrade strength. Shoulders may have a slightly greater slope.

2.10 Diversion of surface drainage flows from one road to another shall be avoided. The roadbeds of intersecting roads shall be graded for a reasonable distance to ensure proper drainage and blending of surfaces.

2.11 Use of imported rock for road surfacing should be carefully evaluated to ensure that the rock, like soft shale, is not more erodible than native soils.

Clearing and Grubbing

2.12 New road construction shall have the centerline identified on the ground prior to PTHP submission.

2.13 Clearing areas shall be minimized, especially at or near watercourses. Clearing limit widths are allowed to exceed roadway widths in order to extend the line-of-sight distance along inside curves for safety reasons.

2.14 Clearing and grubbing shall not be performed too far in advance of excavation and embankment in order to minimize the time loose and unstabilized soil is exposed.

2.15 Grubbing shall not occur on swampy ground or within springs or other wet areas [14 CCR 936.3(c)]. Grubbing shall not occur within the WLPZ of watercourses except as otherwise noted in Section 2.6 above.

2.16 Waste organic material, such as uprooted stumps, cull logs, substantial accumulations of limbs and branches, and unmerchantable trees, shall not be buried in road fills. Wood debris or cull logs or chunks may be placed and stabilized at the toe of fills to restrain excavated soil from moving downslope [14 CCR 943.2(j)].

2.17 Slash and other debris from road construction shall not be bunched against residual trees which are required for silvicultural and wildlife purposes, nor shall it be placed in locations where it could be discharged into watercourses [14 CCR 943.2(u)].

2.18 Continual and adequate drainage shall be provided during mechanical clearing and grubbing operations from October 15 to May 1 prior to weekends or other extended shutdown periods, or when the U.S. Weather Service forecast for locally significant rain (i.e., greater than 0.5 inches) within the subsequent 24 hours is 30% or more.

Excavation

2.19 Pioneer road excavation shall be confined to within roadway width limits.

2.20 Excess material from road construction and reconstruction shall be deposited and stabilized in a manner or in areas where downstream beneficial uses of water will not be significantly and adversely affected [14 CCR 943.2(g)].

2.21 Where new roads will be located across 100 feet or more of lineal distance on any slopes over 65%, or on slopes over 50% which are within 100 feet of the boundary of a WLPZ, measures to minimize movement of soil and the discharge of concentrated surface runoffs shall be implemented as necessary [14 CCR 943.1(d)]. These include, but are not necessarily limited to, use of one or more of the following: outside berms; inside ditches with strategically located cross-drainage; strategically located water intercepting dips (WIDs) and/or waterbreaks; soil surface stabilization through seeding, mulching or other means; end-hauling of material away from within 100 feet of WLPZ boundaries to stable locations. Wherever possible, slope depressions, drainage ways and other natural retention and detention features will be utilized

2.22 Where a road section which is greater than 100 feet in length crosses slopes greater than 65%, placement of fill is prohibited and placement of sidecast shall be minimized to the degree feasible [14 CCR 943.2(b)]. A bench shall be excavated before building up of embankments on all roads located on slopes greater than 65%.

2.23 On slopes greater than 50%, where the length of the road section is greater than 100 feet, and the road is more than 15 feet wide (as measured from the base of the cut slope to the outside of the berm or shoulder of the road) and the fill is more than 4 feet in vertical height at the road shoulder for the entire 100 feet, the road shall be constructed on a bench that is excavated at the proposed toe of the compacted fill and the fill shall be compacted [14 CCR 943.2(c)].

2.24 Excavated material shall not be sidecast at locations above a watercourse where a reasonable chance of material sloughing or eroding into the watercourse exists, and shall

otherwise be end hauled away from the site or stabilized in such a manner that excavated material shall not slough or erode into the watercourse.

2.25 Disturbance of subsurface drainage patterns shall be avoided during excavation activities.

2.26 During excavation, adequate drainage of potential runoff flows from roadway surfaces shall be provided during the course of operations. Natural drainage patterns shall be maintained wherever possible.

2.27 Roads shall be constructed without overhanging banks [14 CCR 943.2(k)].

2.28 Cut slopes should not exceed a stable angle, as based on soil texture and underlying bedrock. As a guide, the following minimum angles may be used:

Construction Material	Slope Angle
Common earth	> 0.75 : 1
Cohesive rock	> 0.50 : 1
Coarse textured or poorly cohesive soils	> 3.00 : 1

Embankment

2.29 Through fills shall be constructed in approximately one foot lifts [14 CCR 943.2(e)].

2.30 Roads shall be constructed so no break in grade, other than that needed to drain the fill, shall occur on or through the fill; breaks in grade shall be above or below the through fill, as appropriate. Where conditions do not allow the grade to break as required, through fills must be adequately protected by additional drainage structures or facilities [14 CCR 943.2(d)].

2.31 In general, embankments shall not be constructed upon slopes containing or covered with organic material. One exception to this general rule is embankment construction across swampy ground where removal of soils or subgrade treatment is not practical.

2.32 On slopes greater than 35%, the organic layer of the soil shall be substantially disturbed or removed prior to placement [14 CCR 943.2(f)]. The same exception across swampy ground applies as noted above.

2.33 Embankment construction across swampy ground, when necessary, shall occur in phases. During the first phase, the low part of the embankment shall be constructed in a

single lift to the minimum depth necessary to support construction equipment. Next, a geotextile fabric or other structural support product should be selected per manufacturer's specifications and placed according to manufacturer's recommendations over the initial lift. The embankment may then be built up in compacted lifts to final grade.

2.34 Excessively wet material that is otherwise suitable for embankment shall be field drained and dried before placement. Frozen material shall not be placed in embankments.

2.35 Rocks that are too large to be incorporated into the embankment shall be broken or maneuvered such that they will not interfere with the use and maintenance of the road surface.

2.36 Fill slopes should not exceed a stable angle, as based on soil texture and underlying bedrock. As a guide, the following minimum angles may be used. The flattest surface slope available shall be used near watercourses.

Construction Material	Slope Angle
Common earth	> 1.50 : 1
Cohesive rock	> 1.00 : 1
Coarse textured or poorly cohesive soils	> 3.00 : 1

2.37 All embankments shall be constructed using one of the methods described below. Method 2 may be used for compacting rock embankments that cannot be accomplished with Methods 1 or 3. Method 3 should be used on all embankments with a height greater than 10 feet at subgrade centerline.

- Method 1. Embankment material may be placed by side casting and end dumping. Where material containing a large amount of rock is used, the embankment shall be constructed by working smaller rocks and fines in with the larger rocks to minimize voids. Hauling and spreading equipment should then be operated uniformly over the entire roadway width to achieve compaction.

- Method 2. Embankment material should be placed in layers except over rock surfaces, in which case material may be placed by end dumping to the minimum depth needed for operation of spreading equipment. Each embankment layer should be leveled and smoothed before placement of subsequent layers. Hauling and spreading equipment should be operated uniformly over the entire width of each layer to effect compaction.

  Suitable material should be placed in layers no more than 12 inches thick, except when the material contains larger rock, in which case layers may be of

sufficient thickness to accommodate the material involved. No layer should exceed 24 inches before compaction.

Placing individual rocks or boulders greater than 24 inches is permitted provided the embankment will accommodate them. Such rocks and boulders should be carefully distributed and the voids filled with finer material to form a dense and compacted mass.

- Method 3 (Controlled compaction). Embankment material should be placed as specified in Method 2, with the exception that earthen embankments should be placed in layers not to exceed a thickness that compaction equipment can accommodate, or 24 inches, whichever is less. Material should be at a moisture content suitable for attaining the required compaction.

2.38 Excess or unsuitable material from road construction and reconstruction shall be deposited or stabilized in a manner or in areas where downstream beneficial uses of water will not be adversely affected [14 CCR 943.2(g)].

Drainage Structures and Facilities

Drainage structures include but are not limited to culverts, overside drains or flumes. Drainage facilities include but are not limited to water intercepting dips, waterbreaks and inside ditches.

2.39 Drainage structures and facilities shall be appropriate for the location and adequate in both size and number to accommodate runoff flows off roadbeds, landings and fill slopes. They shall be installed so as to minimize erosion, to ensure proper functioning, and to maintain or restore natural drainage patterns [14 CCR 943.2(h)].

2.40 Drainage structures and facilities on logging roads shall not discharge on erodible fill or other erodible material unless suitable energy dissipaters are used [14 CCR 943.2(o)]. Drainage structures and facilities shall be located to allow water to be discharged into some form of vegetative cover, duff, slash, rocks, or less erodible material wherever possible, and shall be constructed to allow unrestricted discharge at their lower end so that water will be discharged and spread in such a manner that erosion shall be minimized [14 CCR 934.6(f)].

2.41 Drainage facilities shall be in place and functional by October 15. An exception is that waterbreaks do not need to be constructed on roads in use after October 15 provided that all such waterbreaks are constructed prior to the start of rains that generate overland flows [14 CCR 943.2(q)].

2.42 Permanent drainage structures shall be installed no later than October 15. For construction and reconstruction of roads after October 15, drainage structures shall be installed concurrently with the activity [14 CCR 943.2(n)].

2.43 Water intercepting dips shall be constructed to drain seasonal road surfaces on grades less than or equal to 12% when the slope of the road prism and grade breaks alone are not adequate. Waterbreaks shall be constructed on seasonal roads with grades over 12% when the slope of the road prism, grade breaks and local cross-drainage structures are not adequate to handle surface flows.

2.44 Water intercepting dips and waterbreaks shall be constructed or reconstructed in accordance with Figures 1 and 2.

2.45 Waterbreaks shall be cut diagonally a minimum of 6 inches into the firm roadbed and shall have a continuous firm embankment at least 6 inches in height immediately adjacent to the lower edge of the waterbreak cut [14 CCR 934.6(g)]. The embankment shall be high enough to prevent a breach. Lead off ditches may be necessary to channel flows off the roadway. See Figure 2.

2.46 The appropriate water intercepting dip and waterbreak spacing shall be based upon the EHR and road gradient of the local site. Distances between water intercepting dips or waterbreaks shall not exceed the following standards, unless otherwise noted below:

EHR	Road Gradient (%)			
	< 11	11-25	26-50	> 50
	Feet	Feet	Feet	Feet
Extreme	100	75	50	50
High	150	100	75	50
Moderate	200	150	100	75
Low	300	200	150	100

2.47 Water intercepting dips and waterbreaks need not be constructed on flat ground (slopes less than or equal to 5%) where there is no potential for road drainage to enter streams and where road drainage can be accomplished through use of natural drainage patterns or lead out ditches.

2.48 Inside ditches, water intercepting dips or waterbreaks shall be constructed immediately upslope of all watercourse crossings and fills. All roads shall be drained to avoid accumulating water on fills.

2.49 Overside drains, flumes or engineered flow dissipaters shall be used to carry road surface flows over outside fill slopes which are particularly vulnerable to gully erosion. They shall be installed from the lowest point of a water intercepting dip or waterbreak, and shall discharge flows onto areas where adequate rock, slash or vegetation is available or can be introduced.

2.50 The berm inlet anchor of overside drains shall be firmly installed in an earthen berm of sufficient size to divert water into the drain. The road surface gradient entering an overside drain should be at least 2% to adequately divert flows to the structure but less than 6% to prevent downcutting of the road surface. The bottom of the drain shall also be level with the outside edge of the road surface.

2.51 Inside ditches, when used, should be excavated to a depth of 1 to 2 feet below roadbed grade, and should be large enough to accommodate flows from a fifty-year storm event. Ditch slopes shall be constructed to an approximate ratio of 3:1 from the bottom of the ditch to the edge of the roadbed without undercutting the backslope.

2.52 Inside ditches shall have drainage to adequately prevent volume and velocity of flows capable of exceeding ditch capacity. Spacing of drain structures or facilities shall be variable and adjusted to accommodate local soil erodibility, changes in road grade or alignment, and desired drain site locations. Ditch barriers may be necessary to adequately divert water into cross drain culverts.

2.53 Inside ditches shall provide an unobstructed flow to cross-drain culverts or lead out ditches. Energy dissipaters, such as rocks, shall be left or placed in ditches with steep grades or of highly erodible soils to minimize downcutting.

2.54 Culvert type and sizing shall consider the following: volume and velocity of average flows; volume and velocity of peak flows; fish passage needs; height of cover available; amount and size of channel debris available for transport; cost of resource and culvert replacement; future upstream activity which may contribute to additional future flows.

2.55 Determination of culvert size shall be based on accepted empirical methodologies (e.g. Hasty, Rational, Talbot), historical information or professional experience.

2.56 Culverts used for permanent stream crossings shall be large enough to accommodate a fifty-year storm event. A single large culvert will be used in place of several smaller culverts where practicable; the larger culvert is less likely to become plugged with channel debris and is capable of carrying water at lower velocities. Downstream culverts associated with permanent stream crossings shall be larger or equal in diameter to upstream culverts.

2.57 Culverts and accessories shall be made of corrugated and galvanized metal pipe (CMP) or high density polyethylene plastic pipe (HDPE).

2.58 "Failure points" shall be planned for drainage structures or facilities used in road embankments.

2.59 Excavation for culverts shall be of sufficient depth and width to allow for satisfactory jointing and thorough tamping of bedding material under and around the culvert.

2.60 Unsuitable foundation materials shall be excavated below the inlet of the culvert to an approximate depth of at least two feet and a width of at least the culvert diameter plus four feet. Unsuitable backfill material shall be replaced with suitable material and compacted.

2.61 Where rock, hardpan or other unyielding material is encountered in association with culvert excavation, it shall be removed below the foundation grade for a depth of at least 1 foot. The width of the excavation shall be at least culvert diameter plus 4 feet. The excavated material shall be replaced with suitable backfill material.

2.62 Culvert pipe sections shall be firmly joined together. End sections, risers or other accessories shall be attached to culvert sections with connecting bands or other means, as recommended by the manufacturer.

2.63 Culvert pipe shall be bedded to a depth of not less than 10% of its total height or 18 inches, whichever is greater. During bedding, the pipe shall be given a camber under its center to allow for settling. Minimum camber shall be 1% of total pipe length.

2.64 After bedding is prepared and culvert pipe is placed, selected material shall be placed in layers not exceeding 6 inches loose thickness and subsequently compacted under the haunches and sides of the pipe. The material shall have sufficient moisture content to allow for effective compaction. Backfill shall consist of readily available compactable material that is free of rocks larger than 3 inches in diameter within 1 foot of the culvert. On each side of the pipe, the area of compacted material shall be at least 2 feet wide. Backfill shall be compacted without damaging or displacing the pipe. Backfilling and compacting shall continue until the backfill over the pipe is 18 inches or 50% of the culvert diameter, whichever is greater. The culvert shall be protected by an adequate cover of embankment material before heavy equipment is permitted to cross over it.

2.65 Culverts or culvert accessories which are ruptured, broken or distorted to the point of making them non-functional shall be replaced.

2.66 Culvert installation in watercourses or channels with water present shall proceed as quickly as possible.

2.67 Where local site conditions allow, catch basins shall be constructed before the inlet of culverts which drain ditches. These basins serve as sediment traps for material eroded from roadways. Catch basins shall be constructed with stable banks which do not undercut ditch slopes.

2.68 Where there is evidence that soil and other debris is likely to significantly reduce culvert capacity below design flow, oversize culverts, trash racks, or similar devices shall be installed in a manner that minimizes culvert blockage [14 CCR 943.2(I)].

Slope Stabilization.

2.69 Slopes exposed as a result of new road construction or reconstruction activity, and which have the opportunity to transport sediment to watercourses or lakes in amounts deleterious to the quality and beneficial uses of water, shall be stabilized.

2.70 Areas previously damaged by erosion or other causes should be restored as nearly as possible to their previous condition before stabilizing materials are applied.

2.71 Materials used for slope stabilization shall be appropriate for the site. Degree of slope, amount and type of existing ground cover, uniformity of slope, aesthetic concerns and stabilization timelines shall be considered in the selection of stabilization materials.

2.72 Soil surface stabilization materials shall include but not be limited to seed, straw mulch, slash, rock, geofabrics, silt fencing or other commercially available product.

2.73 In general, grass seed shall be applied concurrently with other materials. Seed used in hydromulch or hand spreaders should include erosion control mixtures tailored to local conditions. For best results, seeding shall occur during the fall months.

2.74 Use of willow, alder and similar plantings should be emphasized for stabilization work within riparian zones or corridors.

2.75 When straw mulch is used, it shall be applied to provide a minimum layer of at least three inches covering at least 80% of the soil surface area.

2.76 When slash is used, it shall be spread to provide a minimum layer of at least three inches covering at least 70% of the soil surface area.

2.77 Within the WLPZ adjacent to Class I and Class II waters, areas where mineral soil exceeding 800 continuous square feet in size, exposed by road construction or

reconstruction operations, shall be treated for reduction of soil loss. Treatment shall be done prior to October 15, except that such bare areas created after October 15 shall be so treated within 10 days. Stabilization measures shall be selected that will prevent significant movement of soil into Class I and II waters and may include, but not be limited to, mulching, rip-rapping, or grass seeding. These measures do not apply to the traveled surface of roads.

2.78 All erosion and sediment control work shall be completed by the beginning of the winter period, November 15, except for areas where road construction or reconstruction is permitted during the winter period (see Section 17, "Winter Period Operations"). During the winter period, drainage structures and facilities on all permanent and seasonal roads being used for log hauling purposes shall be in place and functional during operations. Additionally required erosion and sediment control work shall be completed prior to the weekend or other extended shutdown periods, or prior to the end of the day if the U.S. Weather Service forecast for locally significant rain (i.e., greater than 0.5 inches) within the subsequent 24 hours is equal to or greater than 30%.

Watercourse Crossings: Roads

General

3.1 Drainage structures on watercourses that support fish shall allow for unrestricted passage of fish [943.3(c)].

3.2 Instream activities shall be minimized during fish spawning seasons. Spawning seasons are as follows:

- Rainbow trout: February 1 through June 30
- Brown trout: October 15 through December 31
- Brook trout: October 15 through December 31
- Redband trout: April 1 through June 30

3.3 Unless agreed to by the California Department of Fish and Game (DFG), disturbance or removal of vegetation shall not exceed the minimum necessary to complete operations. The disturbed portions of any watercourse channel or lake margin within the high water mark of the watercourse or lake shall be restored to as near their original condition as possible. Rock, riprap or other erosion protection shall be placed in areas where vegetation cannot reasonably be expected to become reestablished.

3.4 Any temporary dam or artificial obstruction that is constructed within watercourses shall only be built from material such as clean gravel which will cause little or no siltation.

3.5 Temporary crossings shall be adequate to carry the highest anticipated flow during use; they shall be removed as per Section 3.7 below when completed.

3.6 Watercourse crossing facilities not constructed to permanent crossing standards shall be removed before the beginning of the winter period.

3.7 When watercourse crossings, other drainage structures, and associated fills are removed the following standards shall apply:

(a) Fills shall be excavated to form a channel which is as close as feasible to the natural watercourse grade and orientation and is wider than the original channel.
(b) The excavated material and any resulting cut bank shall be sloped back from the channel and stabilized to prevent slumping and to minimize soil erosion. Where needed, this material shall be stabilized by seeding, mulching, rock armoring, or other suitable treatment. [14 CCR 943.3(d)]

3.8 Permanent watercourse crossings and associated fills and approaches shall be constructed or maintained to prevent diversion of stream overflow down the road and to minimize fill erosion should the drainage structure become obstructed [14 CCR 943.3(e), 943.3(h)].

Culvert Placement Guidelines

3.9 Culverts shall be placed and aligned to protect the natural flow of streams, and to minimize erosion due to culvert entrance or discharge.

3.10 All culverts at watercourse crossings in which water is flowing at the time of installation shall be installed with their necessary protective structures concurrently with the fill, construction and reconstruction of logging roads [14 CCR 943.2(n)].

3.11 If culverts are to be used for watercourse crossings on fish bearing streams, they shall be installed below stream grade with as flat a slope as possible to allow for fish passage. Where feasible, slopes less than 3.0% shall be accommodated. Culvert slopes greater than this may require a baffle system. Water depths in culverts should be a minimum of six inches for resident trout. Water velocities should not exceed four fps.

3.12 Excavated material shall not be deposited in a watercourse nor be placed in a location or manner which could likely move into a watercourse.

3.13 Trash racks for culvert inlets shall be used only where necessary and shall not be used in fish bearing streams.

3.14 Potential scouring below culvert outlets shall be mitigated, where feasible, through installation of energy dissipaters below the outlet.

Bridges

3.15 Bridge lengths and abutment spacings shall be as long as possible to span a watercourse.

3.16 Bridges shall be capable of supporting an 80,000 pound vehicle. Engineered structures shall have a minimum rating of at least U80.

3.17 Wing walls shall be constructed or installed where necessary to avoid undermining of bridge structures. Rip-rap shall be placed to protect all abutment footings and adjacent embankments.

3.18 Where feasible, bridges shall have accompanying fords for purposes of providing a watercourse crossing for oversized equipment.

Fords

3.19 Wet fords receiving intermittent and periodic use shall be located where the watercourse channel is as rocky, wide and flat as possible. Approaches shall be designed and constructed so as to minimize erosion and sedimentation of adjacent waters. Where needed, additional structural support with native material or commercially available geotechnical materials shall be provided.

3.20 Existing wet fords on roads receiving regular and frequent traffic shall be replaced with culvert crossings or bridges by the year 2006. This section does not apply to wet fords designed for intermittent and periodic use by oversized equipment as noted in Section 3.18 above.

Road System Maintenance

Maintenance allows for upgrading of road surfaces and drainage that does not require a substantial change to the original prism of the road. Maintenance can be periodic or programmatic in application.

General

4.1 Logging roads and associated drainage structures shall be maintained in a manner which minimizes concentration of runoff, soil erosion, and slope instability and which

prevents degradation of the quality and beneficial uses of water during the prescribed maintenance period [14 CCR 943.4].

4.2 The prescribed maintenance period for erosion controls on permanent and seasonal roads and associated drainage structures and facilities shall be three years subsequent to use for timber harvesting purposes.

4.3 During the two years following certification of the PTEIR, reconnaissance surveys shall be conducted of all haul roads on the Hearst property to identify structural damage and related soil erosion and sedimentation hazards. Thereafter, similar reconnaissance surveys shall be conducted on an ongoing basis in the course of daily property administration and oversight of timber harvesting operations.

Particular attention shall be given to:

- gullying or surface erosion of road surfaces;
- unstable cut slopes and fills;
- watercourse crossings with high diversion potential;
- undersized or plugged drainage structures.
- roads with inboard ditches that should be outsloped;
- areas where waterbreaks should be replaced with rolling dips;
- WLPZ road segments that should be relocated outside the WLPZ;
- unneeded road segments that should be abandoned or replaced;
- culverts that should be replaced with bridges.

4.4 (BMP 4.4 deleted from draft PTEIR.)

4.5 Damaged structures and related erosion orsedimentation hazards that are identified on or along roads will be repaired or stabilized on an ongoing basis. Major maintenance of roads will be accomplished in conjunction with timber operations.

4.6 (BMP 4.6 deleted from draft PTEIR.)

4.7 Hearst road signage, as initiated by Hearst in 1993, shall be annually updated to facilitate management and emergency response.

4.8 Hearst shall maintain existing locked gates at points of public access to control vehicular traffic and to minimize road disturbance.

4.9 Seasonal roads shall be closed as necessary to minimize damage to road surfaces and loss of surface fines that may otherwise result from heavy traffic usage.

4.10 Except for emergencies and maintenance needed to protect water quality, use of heavy equipment for maintenance is prohibited during wet weather where roads or landings are within a WLPZ [14 CCR 943.4(o)].

4.11 Temporary roads shall be blocked or otherwise closed to normal vehicular traffic before the winter period [14 CCR 943.4(g)].

4.12 Bridges shall be inspected regularly for evidence of structural failure. Periodic maintenance, including washing of decks to remove accumulated soil, painting of steel surfaces and replacement of wooden deck planks, shall be performed as needed.

4.13 General road abandonment procedures shall be applied in a manner consistent with Section 1.14 above, and shall include the following:

- Blockage of roads so that standard production four wheel-drive highway vehicles cannot pass the point of closure at the time of abandonment [14 CCR 943.8(a)];
- Stabilization of exposed soil on cuts, fills, or sidecast where deleterious quantities of eroded surface soils may be transported in a watercourse [14 CCR 943.8(b)];
- Grading or shaping of road surfaces to provide dispersal of water flow [14 CCR 943.8(c)];
- Pulling or shaping of fills or sidecast where necessary to prevent discharge of materials into watercourses due to failure of cuts, fills or sidecast [14 CCR 943.8(d)];
- Removal of watercourse crossings, other drainage structures, and associated fills. Where it is not feasible to remove drainage structures and associated fills, the fill shall be excavated to provide an overflow channel which will minimize erosion of fill and prevent diversion of overflow along the road should the drainage structure become plugged [14 CCR 943.8(e)].

4.14 Where existing roads are located across 100 feet or more of lineal distance on any slopes over 65%, or within 100 feet of the boundary of a WLPZ on slopes over 50% that lead without flattening or a catch point, measures to minimize movement of soil and the discharge of concentrated surface runoffs shall be implemented as necessary. These include, but are not necessarily limited to, use of one or more of the following: outside berms; inside ditches with strategically located cross-drainage; strategically located water intercepting dips (WIDs) and/or waterbreaks; soil surface stabilization through seeding, mulching or other means; end-hauling of material away from within 100 feet of WLPZ boundaries to stable locations. Wherever possible, slope depressions, drainage ways and other natural retention and detention features will be utilized. [14 CCR 943.1(d)]

Road Surfaces

4.15 Running surface of roads actively being used in conjunction with timber operations, or otherwise receiving heavy use, shall be treated for stabilization (rocked,

watered, chemically treated, asphalted or oiled) where necessary to prevent excessive loss of road surface materials {14 CCR 943.4(h)].

4.16 Surface blading and shaping shall be performed, as necessary, to maintain the integrity of roadbed surfaces and provide for proper drainage. It should provide a compacted surface with a level of smoothness appropriate for the amount and kind of traffic served.

4.17 At the conclusion of shaping and blading operations, the road surface shall be smooth, compacted and dressed to produce a surface uniform in grade and cross section that is free of hollows, depressions and projections.

4.18 Where feasible, all ruts, chuckholes and washes shall be removed by scarifying or cutting to beneath such defects to provide for uniform compaction of roadbed material.

4.19 Blading of road surfaces shall be performed in such a manner that no base material is lost.

4.20 Existing aggregate surface material shall be bladed to conserve fines.

4.21 Cut slope slough shall be blended into the existing road surface or subgrade. Where feasible, large rocks shall be removed from the road surface and deposited outside the cut where it will not likely enter a watercourse or severely abrade fill slopes.

4.22 Undercutting of cut slopes shall be avoided.

4.23 Water shall be applied during scarifying or blading if sufficient soil moisture is not present to reduce segregation or enable compaction. Usable roadbed material shall be wetted, blended or otherwise treated so as to maintain adequate soil moisture content during blading operations.

Drainage Structures and Facilities

4.24 Unless partially blocked to create a temporary water source, watercourse crossing facilities and drainage structures, where feasible, shall be kept open to the unrestricted passage of water. Temporary blockages shall be removed by November 15 [14 CCR 943.4(d)].

4.25 Except where needed to facilitate erosion control, roadside berms on roads used in conjunction with active timber harvesting operations shall be removed or breached subsequent to use for timber harvesting purposes and before the beginning of the winter period [14 CCR 943.4(e)].

4.26 Existing outside berms, which do not protect fill slopes or divert road surface runoff from sensitive areas, shall be removed or breached to facilitate drainage on all roads and landings not currently requiring reconstruction by the year 2011.

4.27 Existing drainage structures on active logging roads used for timber harvesting purposes shall be adequate to carry water from fifty-year flood levels. If not adequate, they shall be removed by the first day of the winter period, before the flow of water exceeds their capacity if operations are conducted during the winter period, or by the end of timber operations, whichever occurs first [14 CCR 943.4(f)].

4.28 Existing drainage structures on all roads and landings not currently requiring reconstruction shall be assessed for adequacy to carry water from fifty-year flood levels by the year 2006. Drainage structures not adequate to carry fifty-year flood flows shall have overflow structures installed or be replaced and upgraded to fifty-year flood specifications by the year 2016.

4.29 Each drainage structure and any appurtenant trash rack shall be maintained and repaired as needed to prevent blockage and to provide adequate carrying capacity. Where not present, new trash racks shall be installed if there is evidence that woody debris is likely to significantly reduce flow through a drainage structure [14 CCR 943.4(l)].

4.30 Special care shall be taken to remove debris perched on banks immediately adjacent to inlet catch basins in order to minimize potential risk of blockage to drainage structures from these sources.

4.31 Permanent watercourse crossings and associated approaches shall be maintained to prevent diversion of stream overflow down the road should the drainage structure become plugged.

4.32 Inlet and outlet structures, additional drainage structures, and other features to provide adequate capacity and to minimize erosion of road and landing fill and sidecast to minimize soil erosion and to minimize slope instability shall be repaired, replaced or installed wherever such maintenance is needed to protect the quality and beneficial uses of water [14 CCR 943.4(m)].

4.33 Drainage ditches shall be maintained to allow free flow of water and minimize soil erosion [14 CCR 943.4(j)].

4.34 Ditch cleaning shall be performed to direct flows into drainage facilities and/or structures.

4.35 Slough material from drainage ditches, if suitable, may be blended into an existing native road surface or shoulder, or placed in a berm to be dealt with during surface blading.

4.36 Slough material from ditches that is not blended into existing roads shall be removed from the ditch and deposited at a disposal site where it will not likely enter a watercourse.

Incidental Slide Removal and Slump Repair

4.37 Suitable cushion material removed through slide repair activities may be integrated with native road surfaces or used in slump repair. It shall not be incorporated with an aggregate road surface or be wasted over road fills where it has potential to slough or erode into a watercourse .

4.38 Unsuitable cushion material removed from slides shall be deposited at predesignated locations. Said material shall be placed or treated in such a manner as to minimize erosion. It shall not be deposited where it has potential to slough or erode into a watercourse.

4.39 Material used for slump repair shall be placed in layers and compacted. It shall not be deposited where it has potential to slough or erode into a watercourse The compaction density of the new embankment should equal that of the surrounding soil.

Roadside Vegetation Management

4.40 Trees and brush that encroach upon the roadway to restrict proper sight distance, traffic clearance, or road drainage shall be removed, lopped in place or chipped, and if necessary stabilized.

4.41 Debris from roadside vegetation removal shall not be placed or disposed of in locations which could result in blockage of drainage structures or facilities, or could likely wash into watercourse channels.

Snow Removal

4.42 Every effort shall be made to avoid removal and loss of road surface and subgrade materials during periods of high traffic usage and/or adverse weather conditions.

4.43 Special care shall be taken to keep inlets and outlets of all drainage structures free of snow during snow removal operations.

4.44 Where feasible, water intercepting dip and waterbreak leadouts shall be opened concurrent with snow removal operations. Snow berms deposited on outsloped roads shall be breached at regular intervals to allow for adequate surface drainage during snow melt and water runoff periods.

Landing Construction and Major Reconstruction

General

5.1 Landing construction and reconstruction shall not occur during the winter period, November 15 to April 1, except for areas with low or moderate EHRs as determined on a site-specific basis by a registered professional forester (RPF). Construction and reconstruction activities during the winter period shall be limited to: 1) areas outside the WLPZ; and 2) dry, rainless time intervals where soils are not saturated or where hard, frozen conditions exist, and the U.S. Weather Service forecast for locally significant rain (i.e., greater than 0.5 inches) within the subsequent 24 hours is less than 30%.

5.2 All erosion and sediment control work shall be completed by the beginning of the winter period, November 15, except for areas where landing construction or reconstruction is permitted during the winter period (see Section 17, "Winter Period Operations"). During the winter period, all erosion and sediment control work shall be completed prior to the weekend or other extended shutdown period, and prior to the end of the day if the U.S. Weather Service forecast for locally significant rain (i.e., greater than 0.5 inches) within the subsequent 24 hours is equal to or greater than 30%.

5.3 No landing construction shall occur under saturated soil conditions [14 CCR 943.5(e)].

5.4 During all phases of landing construction or reconstruction, precautions shall be taken to ensure that soil and sediment material will not reach a watercourse or lake.

5.5 In general, landing construction and reconstruction is prohibited in Class I, II, III or IV watercourses [14 CCR 895.1, 936.2(b), 936.5], in marshes, wet meadows, and other wet areas [14 CCR 936.3(c), 943.2(v)]. Reconstruction of existing landings in Class III watercourses is permitted, however, in instances where landing relocation is infeasible, provided that reconstruction activities in coordination with other mitigations and best management practices noted herein will not result in significant, adverse impacts to the quality and beneficial uses of water. Reconstructed landing locations in Class III watercourses and related additional mitigations not identified in the PTEIR shall be identified in the PTHP.

5.6 Constructed landings shall be the minimum in width, size and number consistent with the yarding and loading system to be used. In general, landings shall be no larger than one-half acre [14 CCR 943.5(d)]. Larger landings are acceptable for purposes of accommodating helicopter and cable operations, where landings greater than one-half acre are usually required. Larger landings used in conjunction with helicopter or cable operations shall be:

- the minimum size necessary to provide for safe operations;
- located so as to minimize soil excavation and landing fill;
- located in less sensitive areas away from watercourses where potential impacts to watercourses are less than significant;
- approved and preflagged by an RPF prior to use; and
- identified in the PTHP.

5.7 On slopes greater than 35%, the organic layer of the soil shall be substantially removed prior to fill placement [14 CCR 943.5(g)].

5.8 Landing construction and reconstruction is prohibited in WLPZs, except as follows:

- On existing landings within the WLPZ for which relocation outside the WLPZ is impractical or would not provide equal or greater protection to the quality and beneficial uses of water relative to continued use of the landing within the WLPZ, provided that existing landing reconstruction and use within the WLPZ in coordination with other mitigations and best management practices noted herein would not significantly and adversely impact the quality and beneficial uses of water ;
- When new landing construction outside the WLPZ is not practical or would not provide equal or greater protection to the quality and beneficial uses of water relative to new landing construction within the WLPZ, provided that construction within the WLPZ in coordination with other mitigations and best management practices noted herein would not significantly and adversely impact the quality and beneficial uses of water.

Existing and new landings within the WLPZ and related additional mitigations not identified in the PTEIR shall be identified in the PTHP.

5.9 On slopes greater than 65%, fill or sidecast shall be minimized and placed in locations where the quality and beneficial uses of water will not be significantly and adversely affected.

5.10 On slopes greater than 50%, fills greater than 4 feet in vertical height at the outside shoulder of the landing shall be: a) constructed on a bench that is excavated at

the proposed toe of the fill and is wide enough to compact the first lift, and b) compacted in approximately one foot lifts from the toe to the finished grade [14 CCR 943.5(b)].

5.11 Waste organic material, such as uprooted stumps, cull logs, accumulations of limbs and branches, or unmerchantable trees, shall not be buried in landing fills. Wood debris or cull logs or chunks may be placed and stabilized at the toe of landing fills to restrain excavated soil from moving downslope [14 CCR 943.5(c)].

5.12 The following specifications shall be met upon completion of timber operations for the year or prior to October 15, whichever occurs first, unless otherwise provided for herein:

- Overhanging or unstable concentrations of slash or woody debris and soil along the downslope edge or face of the landings shall be removed or stabilized when they are located on slopes over 65% or on slopes over 50% within 100 feet of a WLPZ [14 CCR 943.5(f)(1)].
- Any obstructed ditches and culverts shall be cleaned (14 CCR 943.5(f)(2)].
- Landings shall be sloped or ditched to prevent water from accumulating on the landings. Discharge points shall be located and designed to reduce erosion. [14 CCR 943.5(f)(3)]
- Sidecast or fill material extending more than 20 feet in slope distance from the outside edge of the landing and which has access to a watercourse or lake shall be seeded, planted, mulched, removed or treated to adequately reduce soil erosion [14 CCR 943.5(f)(4)].
- Sidecast or fill material extending across a watercourse shall be removed.

5.13 Landing construction not completed before October 15 shall be drained by outsloping, waterbreaks and/or cross draining before the beginning of the winter period. If landing construction does take place after October 15, landings shall be adequately drained concurrent with construction operations [14 CCR 943.5(h)].

5.14 Within the WLPZ adjacent to Class I and Class II waters, areas where mineral soil exceeding 800 continuous square feet in size, exposed by landing construction or reconstruction operations, shall be treated for reduction of soil loss. Treatment shall be done prior to October 15, except that such bare areas created after October 15 shall be so treated within 10 days. Stabilization measures shall be selected that will prevent significant movement of soil into Class I and II waters and may include, but not be limited to, mulching, rip-rapping, or grass seeding. These measures do not apply to the traveled surface of roads through landings.

Landing Maintenance

6.1 Landings and associated drainage structures shall be maintained in a manner which minimizes concentration of runoff, soil erosion, and slope instability and which prevents degradation of the quality and beneficial uses of water during the prescribed maintenance period [14 CCR 943.4].

6.2 The prescribed maintenance period for erosion controls on landings and associated drainage structures shall be three years subsequent to use for timber harvesting purposes.

6.3 General landing abandonment procedures shall be applied in a manner consistent with Section 1.14 above, and shall include the following:

- Blockage of access roads so that standard production four wheel-drive highway vehicles cannot pass the point of closure at the time of abandonment [14 CCR 943.8(a)];
- Stabilization of exposed soil on cuts, fills, or sidecast where deleterious quantities of eroded surface soils may be transported in a watercourse [14 CCR 943.8(b)];
- Grading or shaping of landing surfaces to provide dispersal of water flow [14 CCR 943.8(c)];
- Pulling or shaping of fills or sidecast where necessary to prevent discharge of materials into watercourses due to failure of cuts, fills or sidecast [14 CCR 943.8(d)];
- Removal of watercourse crossings, other drainage structures, and associated fills. Where it is not feasible to remove drainage structures and associated fills, the fill shall be excavated to provide an overflow channel which will minimize erosion of fill and prevent diversion of overflow along the road should the drainage structure become plugged [14 CCR 943.8(e)].

Operational Guidelines on Roads and Landings

7.1 Routine use and maintenance of roads and landings shall not take place when, due to general wet conditions, equipment cannot operate under its own power. Operations may take place when roads and landings are generally firm and easily passable or during hard frozen conditions. Isolated wet spots on these roads or landings shall be rocked or otherwise treated to permit passage. However, operations and maintenance shall not occur when sediment discharged from landings or roads will reach watercourses or lakes in amounts deleterious to the quality and beneficial uses of water. [14 CCR 943.6]

7.2 Road and landing use in conjunction with timber harvesting operations is prohibited in Class I, II, III or IV watercourses, within WLPZs, in marshes, wet meadows, and other wet areas, except as follows:

- At crossings of Class III watercourses which are dry at the time of local operations;
- At existing road crossings;
- At new road crossings approved as part of the Fish and Game Code process (Fish and Game Code 1600 et seq.);

- On existing roads and landings within the WLPZ for which relocation outside the WLPZ is impractical or would not provide equal or greater protection to the quality and beneficial uses of water relative to continued use of the road and landing within the WLPZ, provided that existing road and landing use within the WLPZ in coordination with other mitigations and best management practices noted herein would not significantly and adversely impact the quality and beneficial uses of water.

Planning and Construction Guidelines Specific to Skid Trails (Tractor Roads)

8.1 Skid trails shall be limited in number and width to the minimum necessary for removal of logs. When less damage to forest resources will result, existing skid trails shall be used instead of constructing new skid trails. [14 CCR 934.2(c)]

8.2 Where feasible, new skid trails shall be located on natural benches, flatter slopes and areas of stable soils to minimize adverse effects on watercourses. New skid trail construction will be minimized along or within narrow canyons, riparian zones, wetlands and other sensitive areas.

8.3 Skid trails shall be planned and located, when feasible, to avoid unstable areas. See "Landslides and Other Unstable Areas" (Section 14) for guidelines specific to situations where skid trail placement within or adjacent to unstable areas, as defined in 14 CCR 895.1, cannot be avoided.

8.4 Skid trail construction and reconstruction are prohibited in Class I, II, III or IV watercourses, within WLPZs, in marshes, wet meadows, and other wet areas, except as follows:

- At crossings of Class III watercourses which are dry at the time of local operations;
- At prepared skid trail crossings as described in Section 9 below;On existing skid trails within the WLPZ identified on the ground by a RPF or his designee for which relocation outside the WLPZ is impractical or would not provide equal or greater protection to the quality and beneficial uses of water relative to continued use of the skid trail within the WLPZ, provided that existing skid trail reconstruction and use within the WLPZ in coordination with other mitigations and best management practices noted herein would not significantly and adversely impact the quality and

beneficial uses of water, as validated by CDF in the course of preharvest inspections of the PTHP area;

- When new skid trail construction outside the WLPZ is not practical or would not provide equal or greater protection to the quality and beneficial uses of water relative to new skid trail construction within the WLPZ, provided that construction within the WLPZ in coordination with other mitigations and best management practices noted herein would not significantly and adversely impact the quality and beneficial uses of water, as validated by CDF in the course of preharvest inspections of the PTHP area.

8.4a The location of new skid trails or use of heavy equipment on skid trails within a WLPZ, HEEZ or HELZ (as defined in Sections 18.31 and 18.32 below) shall be described in the PTHP and identified on the ground 1) prior to PTHP submission for Class I WLPZs, or 2) at the option of the RPF or as required by CDF on a site-specific basis for a Class II WLPZ, HEEZ and HELZ as defined herein.

8.5 Skid trails shall be planned, constructed, reconstructed and/or maintained so that an adequate number of drainage facilities and structures are installed to minimize gullying and erosion.

8.6 Skid trail construction and reconstruction shall not occur during the winter period, November 15 to April 1, except for areas with low or moderate EHRs as determined on a site-specific basis by a RPF. Construction and reconstruction activities during the winter period shall be limited to: 1) areas outside the WLPZ; and 2) dry, rainless time intervals where soils are not saturated or where hard, frozen conditions exist, and the U.S. Weather Service forecast for locally significant rain (i.e., greater than 0.5 inches) within the subsequent 24 hours is less than 30%.

8.7 Skid trail construction not completed before October 15 shall be drained by waterbreaks before the beginning of the winter period. If skid trail construction does take place after October 15, skid trails shall be adequately drained concurrent with construction operations. All erosion and sediment control work shall be completed by the beginning of the winter period, November 15, except for areas where road construction or reconstruction is permitted during the winter period (see Section 17, "Winter Period Operations"). During the winter period, all erosion and sediment control work shall be completed prior to the weekend or other extended shutdown period, or prior to the end of the day if the U.S. Weather Service forecast for locally significant rain (i.e., greater than 0.5 inches) within the subsequent 24 hours is equal to or greater than 30%.

8.8 Skid trail construction, reconstruction or use shall not occur under saturated soil conditions.

8.9 During all phases of skid trail construction or reconstruction, precautions shall be taken to ensure that soil and sediment material will not reach a watercourse or lake.

8.10 Skid trails shall be planned so as to minimize the number of watercourse crossings [14 CCR 934.8(a)].

Watercourse Crossings: Skid Trails

9.1 A prepared watercourse crossing using a structure such as a bridge, culvert, or temporary log culvert shall be used to protect the watercourse from siltation where skid trails cross a watercourse in which water may be present during the life of the crossing [14 CCR 934.8(b)].

9.2 Crossing facilities on watercourses that support fish shall allow for unrestricted passage and water [14 CCR 934.8(c)].

9.3 Watercourse crossings shall be at right angles to the watercourse whenever possible.

9.4 Disturbance or removal of vegetation shall not exceed the minimum necessary to complete operations. Rock, riprap or other erosion protection shall be placed in areas where vegetation cannot reasonably be expected to become reestablished.

9.5 Any temporary dam or artificial obstruction that is constructed within watercourses shall only be built from material such as clean gravel which will cause little or no siltation.

9.6 Watercourse crossing facilities not constructed to permanent crossing standards on skid trails shall be removed before the beginning of the winter period. When watercourse crossings, other drainage structures, and associated fills are removed the following standards shall apply:

(a) Fills shall be excavated to form a channel which is as close as feasible to the natural watercourse grade and orientation and is wider than the original channel.

(b) The excavated material and any resulting cut bank shall be sloped back from the channel and stabilized to prevent slumping and to minimize soil erosion. Where needed, this material shall be stabilized by seeding, mulching, rock armoring, or other suitable treatment. [14 CCR 934.8(d)]

9.7 If the watercourse crossing involves a culvert, the culvert shall be of a sufficient length to extend beyond the fill material [14 CCR 934.8(e)].

Skid Trail Drainage Facilities

10.1 Drainage facilities on skid trails shall not discharge on erodible fill or other erodible material unless suitable energy dissipaters are used. Drainage facilities shall be located to allow water to be discharged into some form of vegetative cover, duff, slash, rocks, or less erodible material wherever possible, and shall be constructed to allow unrestricted discharge at their lower end so that water will be discharged and spread in such a manner that erosion shall be minimized [14 CCR 934.6(f)].

10.2 Skid trail drainage facilities (waterbreaks) shall be in place and functional by October 15, with the following exceptions:

- For construction and reconstruction of skid trails occurring after October 15, waterbreaks shall be constructed prior to the weekend or other extended shutdown period, or prior to the end of the day if the U.S. Weather Service forecast for locally significant rain (i.e., greater than 0.5 inches) within the subsequent 24 hours is equal to or greater than 30%.
- For skid trails in use after October 15, waterbreaks shall be constructed prior to the weekend or other extended shutdown period, or prior to the end of the day if the U.S. Weather Service forecast for locally significant rain (i.e., greater than 0.5 inches) within the subsequent 24 hours is equal to or greater than 30%.

10.3 Waterbreaks shall be cut diagonally a minimum of six inches into the skid trail and shall have a continuous firm embankment at least six inches in height immediately adjacent to the lower edge of the waterbreak cut [14 CCR 934.6(g)]. The embankment shall be high enough to prevent a breach. Lead off ditches may be necessary to channel flows off the skid trail.

10.4 The appropriate waterbreak spacing shall be based upon the EHR and skid trail gradient of the local site. Distances between waterbreaks shall not exceed the following standards, unless otherwise noted below:

EHR	Trail Gradient (%)			
	< 11	11-25	26-50	> 50
	Feet	Feet	Feet	Feet
Extreme	100	75	50	50
High	150	100	75	50
Moderate	200	150	100	75
Low	300	200	150	100

10.5 Waterbreaks need not be constructed on flat ground (slopes less than 5%), where skid trail drainage can be accomplished through use of natural drainage patterns or lead out ditches.

10.6 Waterbreaks shall be installed at all natural watercourses on skid trails regardless of the maximum distances specified above [14 CCR 934.6(e)].

10.7 Where waterbreaks cannot effectively disperse surface runoff, other erosion controls shall be installed as needed.

Skid Trail Maintenance

11.1 The prescribed maintenance period for erosion controls on skid trails and associated drainage facilities shall be three years subsequent to use for timber harvesting purposes.

Operational Guidelines on Skid Trails

12.1 Tractor, or other heavy equipment which is equipped with a blade, shall not operate on skid trails or slopes that are so steep as to require the use of the blade for breaking [14 CCR 934.2(b)].

12.2 Heavy equipment shall not operate on unstable areas, except as otherwise noted below under "Landslides and Other Unstable Areas" (Section 14).

12.3 Heavy equipment shall not operate where any of the following are present: a) slopes steeper than 65%, b) slopes steeper than 50% where the EHR as determined by a RPF on a site-specific basis is high or extreme, or c) slopes over 50% which lead without flattening to sufficiently dissipate water flow and trap sediment before it reaches a watercourse or lake [14 CCR 934.2(f)(1)]. These measures do not apply to use of existing skid trails that do not require reconstruction and that have weathered and stabilized well, for which continued use will not significantly and adversely impact the quality and beneficial uses of water. Slope percentages are for average slope steepness based on sample areas that are a maximum of 20 acres.

12.4 On slopes between 50% and 65% where the EHR as determined by a RPF on a site-specific basis is moderate, and all slope percentages are for average slope steepness based on sample areas that are 20 acres, heavy equipment shall be limited to: a) existing skid trails that do not require reconstruction, or b) new skid trails that have been flagged by or under the supervision of a RPF prior to use. [14 CCR 934.2(f)(2)]

12.5 Skid trail use is prohibited in Class I, II, III and IV watercourses, within WLPZs, in marshes, wet meadows, and other wet areas, except as follows:

- At crossings of Class III watercourses which are dry at the time of local operations;
- At prepared skid trail crossings as described in Section 9 above;
- On skid trails within the WLPZ identified on the ground by a RPF or his designee provided that use within the WLPZ in coordination with other mitigations and best management practices noted herein would not significantly and adversely impact the quality and beneficial uses of water;

12.6 Where skid trails are constructed, timber operators shall use skid trails only, both for skidding logs to landings and on return trips [14 CCR 934.2(g)].

Operational Guidelines for Areas with a High or Extreme Erosion Hazard Rating

13.1 For areas that are identified as having a high or extreme EHRs, the following operational restrictions apply:

- Tractor operations are permitted on: 1) slopes less than or equal to 50%; and 2) slopes greater than 50% but less than or equal to 65% provided operations are restricted to existing, stable trails.
- Cable and/or helicopter yarding is permitted for areas where tractor operations are prohibited;
- Clearcutting is prohibited;
- Slash resulting from tractor operations, straw mulch and/or other erosion control materials shall be distributed onto skid trails immediately adjacent to landings in order to reduce compaction and accelerated erosion;
- Operations will not take place during the winter period, November 15 to April 1;
- Broadcast burning is prohibited in order to retain ground cover; slash treatment is limited to lopping and scattering only.

Landslides and Other Unstable Areas

General

14.1 Logging roads, landings and skid trails shall be planned and located, when feasible, to avoid existing and potential landslides and other unstable areas. During planning of timber harvesting operations, a certified engineering geologist or suitably trained RPF shall evaluate all undisturbed hillslopes that would be disturbed by proposed operations for purposes of assessing geologic condition and associated stability and landslide potential.

14.2 (BMP 14.2 deleted from draft PTEIR.)

14.3 For landslides that are categorized as "active", the following general operational restrictions apply:

- Clearcutting is prohibited;
- Use of heavy equipment is prohibited except for end-lining of logs to adjacent, stable areasor the use of existing roads;
- Operations will not take place during the winter period, November 15 to April 1;
- Uphill drainage facilities will be constructed so as to drain surface runoff away from the active landslide area; and
- New construction and major realignment of roads and landings on active landslides shall be subject to review and approval of a certified engineering geologist.

14.4 A certified engineering geologist (CEG) shall be utilized for purposes of conducting field reviews and making recommendations under the following conditions:

- Where construction of roads and landings on static or dormant landslides, other than earthflows, is proposed on slopes exceeding 65%;
- Where construction of roads and landings on static or dormant earthflows is proposed on slopes exceeding 50%;
- Where maintenance of existing roads previously damaged by landslides may result in high potential for movement of material into a watercourse, as needed based on the judgement of an RPF;
- Where roads segments associated with potentially unstable cuts and fills are proposed for abandonment, as needed based on the judgement of an RPF;
- Where, in the judgment of an RPF, significant uncertainty exists regarding the suitability of proposed management practices relative to local geologic conditions.

Rotational and Translational Landslides

14.5 New roads and landings shall be located to avoid loading the head of rotational and translational landslides. Wherever feasible, new roads shall be aligned along benches to minimize the need for excavation. Drainage facilities shall be installed to divert surface water from scarps, slide masses, and lateral margins.

14.6 During timber harvesting, ground disturbance to rotational and translational slide areas shall be minimized. Vegetation removal shall be minimized along slide margin edges and logs shall be removed by end-lining from adjacent stable areas.

14.7 Where watercourses adjacent to large slides form inner gorges, timber harvesting shall be minimized in the inner gorge.

Earthflows

14.8 Construction of roads and landings shall be avoided on earthflows wherever possible. Where construction of roads across earthflows is unavoidable, the road shall wherever possible be 1) a single lane aligned on benches and along contours, 2) located so as to avoid wet areas, and 3) arched and outsloped to facilitate drainage and avoid concentration of runoff.

14.9 Any disturbance that may undercut the toe of an earthflow shall be avoided wherever possible.

14.10 Major roads across earthflows shall be continuously maintained. Artificial slopes shall be reseeded as quickly as is appropriate.

14.11 During timber harvesting operations, the following shall apply to areas within earthflow boundaries:

- Ground disturbance and use of heavy equipment shall be minimized;
- Within WLPZs and ELZs, logs shall be removed by end-lining from adjacent areas wherever possible.

14.12 On earthflows on slopes from 35% to 50%, the following additional mitigation measures shall be implemented:

- Cut slopes shall not exceed five (5) feet in height;
- Fills shall not exceed five (5) feet in height, except where reviewed and approved by a CEG;
- Fills shall be keyed into underlying earth materials;
- Roads shall consist of a single lane with turnouts; and
- Road surfaces shall either be outsloped or arched to direct runoff to natural drainages.

Debris Avalanches

14.13 Construction of roads and landings across or adjacent to debris avalanche scars shall be avoided wherever possible. Where construction of roads across or adjacent to debris avalanche scars is unavoidable, they shall be located so as not to load the slide scar or adjacent slopes. Cuts and fills on debris avalanche scars shall be kept to an absolute minimum. Wherever possible, new roads shall be arched to drain water away from the slide scar area.

14.14 A 50-foot buffer zone shall be established adjacent to all debris avalanches, within which the following shall be adhered to:

- Heavy timber harvesting equipment shall be prohibited, except on existing stable roads and skid trails;
- Only light selective harvesting shall be conducted; and
- Minimal surface litter and other vegetation shall be removed.

Debris Flows and Torrents

14.15 Landings shall not be constructed on debris flows, in debris torrent tracks, or areas where such failures are likely.

14.16 Rock-fill, low-water crossings, or other suitable crossings approved by DFG shall be used at stream crossings where debris flows or torrent hazards exist.

14.17 A 50-foot buffer zone shall be established adjacent to all debris flows and torrents, within which the following shall be adhered to:

- Heavy timber harvesting equipment shall be prohibited, except on existing stable roads and skid trails; and
- Yarding methods and silvicultural systems shall be selected and used that will maximize channel slope stability and avoid additional erosion.

Undisturbed Slopes with High Landslide Potential

14.18 Consideration shall be given to implementation of the following in the treatment of areas with high landslide potential:

- Careful location of roads to avoid steeper slopes;
- Use of full-bench road construction whenever possible;
- Minimizing cuts;
- Keying fills into underlying stable earth materials;
- Outsloping roads;
- Installing drainage facilities to avoid concentration of runoff;
- Designing stream crossings to fit the gradient and other local site conditions; and
- Retaining maximum vegetation and litter layer cover.

Site Preparation

15.1 Site preparation shall be planned and conducted in a manner which encourages maximum timber productivity, minimizes fire hazards, prevents substantial adverse effects to soil resources and to fish and to wildlife habitat, and prevents degradation of the quality and beneficial uses of water [14 CCR 935].

15.2 Use of heavy equipment for site preparation shall comply with limitations noted above under "Operational Guidelines on Skid Trails" (Section 12).

15.3 Heavy equipment shall not be used for site preparation under saturated soil conditions or when it cannot operate under its own power due to wet conditions [14 CCR 935.1(b)].

15.4 Watercourse crossings for heavy equipment shall be planned, constructed, maintained and removed in accordance with requirements and limitations noted above for skid trails (Sections 8 and 9). [14 CCR 935.1(c)]

15.5 Undisturbed areas or energy dissipaters shall be used to control and disperse concentrated runoff from roads, landings, skid trails, firebreaks and erosion control facilities where it flows into site preparation areas [14 CCR 935.1(d)].

15.6 Broadcast burning shall not fully consume the larger organic debris which retains soil on slope and stabilizes watercourse banks.

15.7 Site preparation activities shall comply with the watercourse and lake protection requirements stated below (Section 18).

Rock Quarries, Gravel Pits, Borrow Pits and Spoil Disposal Areas

16.1 All new quarries, pits and spoil disposal areas shall not be located within 100 feet of a Class I watercourse or 75 feet of a Class II watercourse. In addition, spoil disposal areas shall be located where risk of erosion and ponding is minimal.

16.2 Quarries, gravel pits, and borrow pits from which road surfacing materials are excavated shall be managed in conformance with applicable regulations of the Surface Mining and Reclamation Act of 1975. Subsequent to closure of these sites, as well as spoil disposal areas, revegetation measures and post-closure uses of these areas, shall be developed in consultation with CDF.

Winter Period Operations

17.1 Road, landing and skid trail construction or reconstruction shall not occur during the winter period, November 15 to April 1, except for areas with low or moderate EHRs as determined on a site-specific basis by a RPF. Construction and reconstruction activities during the winter period shall be limited to: 1) areas outside the WLPZ; and 2) dry, rainless time intervals where soils are not saturated or where hard, frozen conditions

exist, and the U.S. Weather Service forecast for locally significant rain (i.e., greater than or equal to 0.5 inches) within the subsequent 24 hours is less than 30%.

17.2 Mechanical site preparation shall not occur during the winter period, November 15 to April 1, except for areas with low or moderate EHRs as determined on a site-specific basis by a RPF. Mechanical site preparation activities during the winter period shall be limited to: 1) areas outside the WLPZ; and 2) dry, rainless time intervals where soils are not saturated or where hard, frozen conditions exist, and the U.S. Weather Service forecast for locally significant rain (i.e., greater than or equal to 0.5 inches) within the subsequent 24 hours is less than 30%.

17.3 Tractor yarding and log hauling during the winter period, November 15 to April 1, shall be limited to: 1) areas with low or moderate EHRs as determined on a site-specific basis by a RPF; and 2) dry, rainless time intervals where soils are not saturated, or during time intervals where hard, frozen conditions exist.

17.4 During the winter period, erosion control structures and facilities shall be installed on all constructed or used skid trails and landings prior to weekends or other extended shutdown periods, or prior to the end of the day if the U.S. Weather Service forecast for locally significant rain (i.e., greater than or equal to 0.5 inches) within the subsequent 24 hours is 30% or more.

17.5 During the winter period, drainage structures and facilities on all permanent and seasonal roads being used for log hauling purposes shall be in place and functional during operations. Additionally required erosion and sediment control work shall be completed prior to weekends or other extended shutdown periods, or prior to the end of the day if the U.S. Weather Service forecast for locally significant rain (i.e., greater than or equal to 0.5 inches) within the subsequent 24 hours is equal to or greater than 30%.

17.6 During the winter period, heavy equipment shall not be used within the WLPZ, except as noted in Section 17.3 above, or for emergencies and maintenance needed to protect water quality.

17.7 During the winter period, log hauling within the WLPZ will be permitted only on surfaced roads, or roads with firm surfaces that do not have potential for sediment transport to watercourses or lakes.

17.8 Accidental deposition of soil and other debris into watercourses during the winter period shall be immediately removed or stabilized.

17.9 Winter operations shall not take place on known active unstable areas.

Watercourse and Lake Protection

General Limitations and Protection Measures

18.1 The quality and beneficial uses of water shall not be unreasonably degraded by timber harvesting or other forest management operations. During said operations, the timber operator, road contractor, or any other person employed by or under the direct supervision of Hearst staff shall not place, discharge, or dispose of or deposit in such a manner as to permit to pass into the water, quantities of substances or materials deleterious to fish, wildlife or the quality and beneficial uses of water. These substances and materials include, but are not limited to, soil, silt, bark, slash, sawdust or petroleum.

18.2 When there is reasonable expectation that slash, debris, soil or other material resulting from timber harvesting or other forest management operations will be deposited in Class I and Class II waters below the watercourse or lake transition line or in watercourses which contain or conduct Class IV waters, those activities shall be deferred until equipment is available for its removal. [14 CCR 936.3(a)]

18.3 Accidental depositions of soil or other debris in lakes or below the watercourse or lake transition line in Class I, II and IV watercourses shall be removed immediately after the deposition. [14 CCR 936.3(b)]

18.4 With the exception of temporary crossings soil deposited in a Class III watercourse during timber harvesting or forest management operations with potential for movement into the waters of Class I, II or IV watercourses shall be removed no later than October 15, or concurrent with operations if they occur after October 15. Other debris deposited in a Class III watercourse during timber harvesting or forest management operations, except at temporary crossings, shall be removed or stabilized no later than October 15, or concurrent with operations if they occur after October 15. Temporary crossings shall be removed before the winter period.

18.5 Within the WLPZ adjacent to Class I and Class II waters, areas where mineral soil exceeding 800 continuous square feet in size, exposed by timber harvesting and forest management operations, shall be treated for reduction of soil loss. Treatment shall be done prior to October 15 except that such bare areas created after October 15 shall be so treated within 10 days. Stabilization measures shall be selected that will prevent significant movement of soil into Class I and II waters and may include, but not be limited to, mulching, rip-rapping, or grass seeding. These measures do not apply to the traveled surface of roads. [14 CCR 936.7]

18.6 Road and landing construction and reconstruction are prohibited in Class I, II, III or IV watercourses [14 CCR 895.1, 936.2(b), 936.5], in marshes, wet meadows, and other wet areas, except as follows: [14 CCR 936.3(c), 943.2(v)]

- At crossings of Class III watercourses which are dry at the time of local operations;
- At existing road crossings;
- At new road crossings approved as part of the Fish and Game Code process (Fish and Game Code 1600 et seq.).
- On existing roads or landings within the WLPZ identified on the ground by a RPF or his designee for which relocation outside the WLPZ is impractical and would not provide equal or greater protection to the quality and beneficial uses of water relative to continued use of the existing road or landing within the WLPZ, provided that existing road and landing reconstruction and use within the WLPZ in coordination with other mitigations and best management practices noted herein would not significantly and adversely impact the quality and beneficial uses of water;

18.7 Road and landing construction and reconstruction are prohibited in WLPZs, except as follows:

- At existing road crossings;
- At new road crossings approved as part of the Fish and Game Code process (Fish and Game Code 1600 et seq.);
- On existing roads or landings within the WLPZ identified on the ground by a RPF or his designee for which relocation outside the WLPZ is impractical or would not provide equal or greater protection to the quality and beneficial uses of water relative to continued use of the existing road or landing within the WLPZ, provided that existing road and landing reconstruction and use within the WLPZ in coordination with other mitigations and best management practices noted herein would not significantly and adversely impact the quality and beneficial uses of water;
- When new road or landing construction outside the WLPZ is not practical or would not provide equal or greater protection to the quality and beneficial uses of water relative to new road or landing construction within the WLPZ, provided that construction within the WLPZ in coordination with other mitigations and best management practices noted herein would not significantly and adversely impact the quality and beneficial uses of water.

18.8 During the winter period, heavy equipment shall not be used within the WLPZ, except as noted in Section 17.3 above, or for emergencies and maintenance needed to protect water quality.

18.9 Except for emergencies and maintenance needed to protect water quality, use of heavy equipment for maintenance is prohibited during wet weather where roads or landings are within a WLPZ [14 CCR 943.4(o)].

18.10 Where use of roads, landings and skid trails within the WLPZ shall occur in conjunction with timber harvesting operations, exclusive of biomass operations noted in Section 18.32 below, the following additional mitigations shall be adhered to:

- Flagging for purposes of indicating heavy equipment exclusion shall be hung on all edges of roads and landings that are located within the WLPZ;
- Use of heavy equipment on roads, landings and skid trails within the WLPZ is limited to the running surface of affected road, landing and skid trail segments only;
- Road and landing maintenance within a WLPZ shall be performed with minimum removal of roadside vegetation;
- Landings and skid trails to be used within WLPZs shall be identified on the ground by an RPF or his designee.

Additional mitigations to address unique situations shall be determined by Hearst and CDF as necessary on a site-specific basis in the course of PTHP preharvest inspections.

18.11 Where use of existing landings within HELZs (see Section 18.31 below) or within or immediately adjacent to Class III watercourses shall occur in conjunction with timber harvesting operations, the following additional mitigations shall be adhered to:

- Flagging for purposes of indicating heavy equipment exclusion shall be hung on all edges of landings;
- Use of heavy equipment is limited to the running surface of landings and appurtenant skid trails only;
- Landing maintenance shall be performed with minimum removal of side vegetation;
- Landings and skid trail access shall be preapproved and identified on the ground by an RPF or his designee;
- Landing use shall not occur during the winter period;
- Appurtenant Class III watercourses shall be dry during timber operating periods or have erosion control structures in place for purposes of diverting or protecting Class III water;
- Subsequent to operations, a bermed dip shall be constructed through affected landings for purposes of diverting surface drainage away from the watercourse while allowing for unrestricted passage of water through the watercourse itself;
- All areas within 10 feet of the reconstructed watercourse channel shall be straw mulched subsequent to operations but prior to beginning of the winter period;
- Unmerchantable landing slash shall be spread over the surface of affected landings subsequent to operations but prior to beginning of the winter period;
- A "heel boom" type loader shall be used if affected landings are also located within the WLPZ of a Class I or Class II watercourse, in which case logs shall be decked only on existing brush vegetation immediately adjacent to the landings.

18.12 Trees cut within the WLPZ shall be felled away from the watercourse by pulling or other mechanical methods if necessary, in order to protect the residual vegetation in the WLPZ [14 CCR 936.3(e)]. Trees may be felled across the watercourse in order to minimize excessive log breakage or where less damage to residual vegetation in the WLPZ would occur provided the following additional mitigations are adhered to:

- Affected trees shall be felled as close as is practicable to right angles across watercourses;
- When there is reasonable expectation that slash, debris, soil, or other material resulting from timber operations, falling or associated activities, will be deposited in Class I and Class II waters below the watercourse or lake transition line or in watercourses which contain or conduct Class IV water, those harvest activities shall be deferred until equipment is available for its removal [14 CCR 936.3(a)];
- Log bucking of tree segments located within or over the immediate watercourse channel shall occur subsequent to log or tree removal operations and shall not occur in the watercourse itself;
- Lopping and scattering of limbs shall occur subsequent to log or tree removal operations;
- Residual wood chunks, limbs and other debris shall be removed from watercourse channels immediately subsequent to log or tree removal operations;
- Removal of adjacent vegetation shall be limited to that necessary for safe felling and removal of affected trees.

18.13 Vegetation, other than commercial species [14 CCR 932], bordering and covering meadows and wet areas shall be retained and protected during timber harvesting, as well as road, landing and skid trail construction, reconstruction and maintenance operations. Soil within meadows and wet areas shall be protected to the maximum extent possible. [14 CCR 936.3(d)]

18.14 All WLPZs as defined in Section 18.30 below, shall be clearly identified on the ground by an RPF, or his designee, with paint, flagging, or other suitable means prior to the start of local timber operations.

18.15 To ensure retention of shade canopy filter strip properties, as well as maintenance of soil stability and wildlife values, all trees to be harvested within the WLPZ will be marked. Tree marking shall include placement of a base mark below the cut line, and shall be done by a RPF or his designee in advance of timber falling operations.

18.16 Within the WLPZ of Class I watercourses, at least 50% of the overstory and 50% of the understory canopy [14 CCR 895.1] covering the ground and adjacent waters shall be left in a well distributed multi-storied stand composed of a diversity of species similar to that found before the start of operations. The residual overstory canopy shall be composed of at least 25% of the existing overstory conifers. [14 CCR 936.5]

18.17 Within the WLPZ of Class II watercourses or the HELZ of Class IV watercourses (see Section 18.31 below), at least 50% of the total canopy covering the ground shall be left in a well distributed multi-storied stand configuration composed of a diversity of species similar to that found before the start of operations. The residual overstory canopy shall be composed of at least 25% of the existing overstory conifers. [14 CCR 936.5]

18.18 Where less than 50% canopy exists in the WLPZs of Class I and II waters before timber operations, only sanitation salvage [14 CCR 933.3(b)] shall be allowed [14 CCR 936.3(f)].

18.19 Within the HELZ of Class III watercourses (see Section 18.31 below), at least 50% of the understory vegetation present before operations shall be left living and well distributed. This shall not be construed to prohibit broadcast burning with a project type burning permit for site preparation.

18.20 Within the WLPZ, at least 75% surface cover and undisturbed area shall be retained to act as a filter strip for raindrop energy dissipation and for wildlife habitat [14 CCR 936.4(b)(6)].

18.21 Use of the broadcast burning prescription in the WLPZ for Class I and II watercourses is prohibited [14 CCR 937.3(c)]. Exceptions may occur provided a project-type burning permit is obtained prior to burning and the terms of the permit are adhered to while burning [14 CCR 937.3(d)]. Mitigation measures to protect Class III watercourses shall be identified and implemented as necessary.

18.22 Recruitment of large woody debris for instream habitat shall be provided by retaining at least two living conifers per acre at least 16 inches diameter breast height and 50 feet tall within 50 feet of all Class I and II watercourses [14 CCR 936.3(g)].

18.23 All snags that have been so for one or more years, plus all unmerchantable cull trees, that do not protrude above the general canopy level shall be retained except as follows:

- within 100 feet of all roads and landings [14 CCR 939.1(a)(2)];
- within 100 feet of structures maintained for human habitation [14 CCR 939.1(c)];
- where federal and state safety laws and regulations require the felling of snags [14 CCR 939.1(b)];
- where personal safety hazards exist.

18.24 Unmerchantable dead and down material greater than 23 inches in diameter and 10 feet in length will be retained.

18.25 Within the WLPZ, except in areas where fire activity, windthrow, and insect and disease epidemics necessitate a focused, intense salvaging effort, timber harvesting operations shall not result in a general downgrading of the WHR "size class" or "canopy closure" classifications of timber stands.

18.26 A RPF or his designee shall conduct a field examination of all lakes and watercourses within a proposed timber harvesting area and shall map all lakes and watercourses which contain or conduct Class I, II, III or IV waters. As part of this field evaluation, the RPF shall evaluate areas near watercourses and lakes for sensitive conditions including, but not limited to, use of existing roads within the standard WLPZ width, unstable and erodible watercourse banks, debris jam potential, flow capacity and changeable channels, overflow channels, and flood prone areas. [14 CCR 936.4(a)]

18.27 The RPF or his designee shall identify conditions which may interact with proposed timber operations to significantly and adversely affect the beneficial uses of water, and shall note these in his written instructions to the licensed timber operator. The written instructions shall reference applicable best management practices listed herein to minimize the potential for adverse impacts. The written instructions shall also indicate other site-specific mitigations, as appropriate.

WLPZ and Special Management Zone Widths

18.28 WLPZ widths for Class I and II waters shall be determined by a RPF or his designee from on-site inspection of all watercourses and lakes, as well as the upslope areas immediately adjacent to watercourses and lakes.

18.29 Class II springs shall be treated similarly to Class II watercourse and lakes, and shall have WLPZs established around them with width determinations based on the table in Section 18.30 below.

18.30 Standard watercourse WLPZ widths shall be based on the following table:

Water Class	Class I		Class II	
	Width in Feet		Width in Feet	
Slope Class	Tractor	Cable	Tractor	Cable
<5	50	50	50	50
5-30	75	75	50	50
30-50	100	100	75	75
>50	150	100	100	75

18.31 Class III and IV watercourses do not require WLPZ protection, but shall have heavy equipment limitation zones (HELZs) established around them. Standard

watercourse HELZ widths for Class III and IV watercourses shall be based on the following table:

Water Class	Class III		Class IV	
	Width in Feet		Width in Feet	
Slope Class	Tractor	Cable	Tractor	Cable
<5	25	25	25	25
5-30	25	25	25	25
30-50	50	505	N/A	N/A
>50	50	50	N/A	N/A

18.32 Feller-bunchers used in conjunction with biomass thinning operations are permitted on slopes less than or equal to 5% within the WLPZ of Class I and Class II watercourses in areas where soil movement into Class I or Class II watercourses or waters resulting from biomass operations cannot be reasonably expected. In all such cases, the following shall apply:

- use of feller-bunchers within the WLPZ of Class I or Class II watercourses shall be noted in the PTHP and be subject to CDF approval; and
- a minimum 35-foot heavy equipment exclusion zone (HEEZ) shall be established within the WLPZ, within which feller-bunchers shall not operate.

18.33 A RPF shall consider site-specific sensitive conditions listed in Sections 18.26 above in determining whether increases to the standard widths are necessary.

18.34 The width of the WLPZ, HELZ or HEEZ shall be measured along the surface of the ground from the watercourse or lake transition line or, in the absence of riparian vegetation, from the top edge of the watercourse bank.

18.35 Slopes adjacent to watercourses shall be measured in percent for the proposed WLPZ, HELZ or HEEZ. If the topography within the proposed WLPZ, HELZ or HEEZ is variable, segments of the proposed WLPZ, HELZ or HEEZ shall be segregated by slope class as indicated in Section 18.30 and Section 18.31 above. Side slope classes for the individual class of waters to be protected, where the side slope is measured from the watercourse or lake transition line to a point 100 feet upslope from the watercourse or lake transition line, or, in the absence of riparian vegetation, from the top of the watercourse bank where slope configurations are variable, a weighted average method shall be used to determine sideslope percent.

18.36 Where soil surfaced roads exist within the standard WLPZ, WLPZ widths shall not be reduced [14 CCR 936.4(b)(5)].

18.37 The centerline of Class III watercourses will be flagged for easier field identification during operations. Class III centerline flagging shall be performed prior to the start of local operations.

Late Seral Management Zones

Hearst Forests has instituted a network of Late Seral Management Zones (LSMZs) designed to facilitate development and connectivity of late seral stage habitats. These areas will be managed for development of late seral attributes. They shall also serve to enhance near-stream shade canopy, upslope stability, bank and channel stabilization, vegetation structure diversity for fish and wildlife, and filtration of organic and inorganic material plus streambed and water flow modifications through future contribution of large woody debris.

19.1 Within the LSMZ, except in areas where fire activity, windthrow, and insect and disease epidemics necessitate a focused, intense salvaging effort, timber harvesting operations shall not result in a general downgrading of the WHR "size class" or "canopy closure" classifications of timber stands.

19.2 All unmerchantable cull trees, plus all snags that have been so for one or more years that do not protrude above the general canopy level, shall be retained except as follows:

- within 100 feet of all roads and landings [14 CCR 939.1(a)(2)];
- within 100 feet of structures maintained for human habitation [14 CCR 939.1(c)];
- where federal and state safety laws and regulations require the felling of snags [14 CCR 939.1(b)];
- where personal safety hazards exist.

19.3 Unmerchantable dead and down material greater than 23 inches in diameter and 10 feet in length will be retained.

19.4 As part of the LSMZ network, non-variable 200-foot late seral management zones shall be established immediately upslope of Class I and selected Class II watercourses for purposes of promoting late seral attributes through management.

Hazard Reduction and Fuels Management

21.1 Limbs and tops greater than or equal to four inches in diameter shall be chipped, piled and burned, or lopped and scattered throughout the entire harvest area where timber

felling occurs. Lopping shall be done in such a way as so as to permit tree stem and limb contact with the ground.

21.2 Within 100 feet of the edge of the traveled surface of public roads, slash created and trees knocked down by road construction or timber operations shall be treated by lopping for fire hazard reduction, piling and burning, chipping, burying or removal from the zone [14 CCR 937.2(b)].

21.3 All woody debris created by timber operations greater than one inch but less than eight inches in diameter within 100 feet of permanently located structures maintained for human habitation shall be removed or piled and burned; all slash created between 100-200 feet of permanently located structures maintained for human habitation shall be lopped for fire hazard reduction, removed, chipped or piled and burned [14 CCR 937.2(c)].

21.4 Slash shall not be bunched immediately adjacent to residual trees.

21.5 Slash to be treated by piling and burning shall be treated no later than April 1 of the year following its creation, or within 30 days of climatic access [14 CCR 937.2(a)].

21.6 Broadcast burning may be prescribed for slash treatment subject to the following conditions:

- Such burning shall be done only after the first heavy fall rains and shall be completed before April 1 [14 CCR 937.3(a)];
- Broadcast burning may occur within cleared firebreaks of not less than 10 feet in width [14 CCR 937.3(b)];
- Use of the broadcast burning prescription in the WLPZ for Class I and II watercourses is prohibited [14 CCR 937.3(c)];
- Exceptions to the above listed conditions may occur provided a project-type burning permit is obtained prior to burning and the terms of the permit are adhered to while burning [14 CCR 937.3(d)].

21.7 When the option of burning piles or concentrations of slash is chosen to meet slash treatment requirements, such burning shall be done as follows:

- Piles and concentrations shall be sufficiently free of soil and other noncombustible material for effective burning [14 CCR 937.5(a)];
- The piles and concentrations shall be burned at a safe time during the first wet fall or winter weather or other safe period following piling and according to laws and regulations [14 CCR 937.5(b)];
- Piles and concentrations that fail to burn sufficiently to remove the fire hazard shall be further treated to eliminate the hazard [14 CCR 937.5(b)];

- All necessary precautions shall be taken to confine such burning to the piled slash [14 CCR 937.5(b)].

21.8 Slash burning operations and fire hazard abatement operations shall be conducted in a manner which will not damage residual trees and reproduction to the extent that they will not qualify to meet the silvicultural and stocking requirements of the FPRs [14 CCR 937.7].

Appendix D. Natural Sensitivity Index and Equivalent Roaded Area Calculations

CWE Natural Sensitivity Index

Table 1

Watershed: Wyntoon PW # 17

CalState ID #######

		%
Total Acreage:	17533	100.00%
Hearst Acres	9643	55.00%
Other Private Acres	7890	45.00%
USFS Acres	0	0.00%

Date: 8/17/96
Prep by: sjd
Update:

NSI Attributes:	Total Acres	x	Index Factor	=	Index Total
I. Attributes Affecting Runoff Processes					
A. Horton Overland Flow					
1. Rock Outcrop	5.7		1.0		6
2. Hydrologic Soil Group D	917		0.8		734
3. Hydrologic Soil Group C	1036		0.4		414
B. Saturation Overland Flow					
1. Wet Meadows	0		1.0		0
2. Ponds	0		1.0		0
3. Streamside Management Zones	501		1.0		501
a. Class I (mi.) 12.67 c. Class III (mi.)	8.68				
b. Class II (mi.) 2.20 d. Class IV (mi.)	5.15				
II. Attributes Affecting Sediment Delivery					
A. Erosion From Highly Erosive Soils					
1. Soils Prone to Gully Erosion	0		1.0		0
2. Soils With a Very High EHR (includes altered/eroded phases)	390		0.5		195
B. Erosion From mass wasting					
1. All Active forms of mass wasting	2		8.0		19
2. Inner Gorge	178		2.0		356
Subtotal for Natural Sensitivity Attributes:					2225

Drainage Basin and Channel Morphology Affecting Sediment Routing Processes		Calculated Value	Index Factor Low 0.9	Mod 1.0	High 1.1	Extr 1.2	
A. Relief Ratio (ft/ft)		0.030	<.070	.070-.100	>.100-.130	>.130	0.9
1. Basin High Point	3360						
2. Basin Low Point	2880						
3. Main Stem Length (ft)	15847						
III. B. Drainage Density (FOT/Ac)		0.003	<.020	.020-.030	>.030-.040	>.040	0.9
1. # of First Order Tnbs	53						
2. USGS Stream Mi	28.7						
3. Stream Mi / Sq. Mi.	1.0						
C. Rosgen Channel Classification			(Refer to process paper for ratings)				1.1
% Length by Sensitivity			3%	0%	83%	14%	
Index Value			0.03	0.00	0.91	0.17	
			0.8	1.0	1.2		
D. Precipitation Regime			snow	rain	rain/snow		1.1
Product for Channel Morphology Attributes:							1.0

Weighted Percentage of Watershed Classified Sensitive: 2225 / 17533 = 12.69

Natural Sensitivity Index:	1.0	x	12.69	=	13
Empirically Derived Threshold of Concern (TOC):				=	18 to 20

Rain-on-Snow Calculations

ELEVATION		ACRES	COEF	CONTR
0	2500	0	1.00	0
2501	4500	17165	1.10	1.076512
4501	6200	368	1.20	0.025153
6200+		0	0.80	0
		17533		**1.102065**

Table 2.1

Hearst Corporation: Wyntoon Operation
Land Disturbance History
Timber Removal

Watershed: Wyntoon
WS #: 17
Prepared By: sjd
Date: 10/4/96

	Acres	1996 ERA	1997 ERA	2000 ERA
Subtotals for Timber Removal:	6207	678.1	656.0	612.5

Timber Removal	Year	Act. Code	Acres	1996	1997	2000
	1985	11	5.0	0.48	0.47	0.45
	1985	13	68.0	6.50	6.41	6.17
	1986	3	23.0	3.48	3.38	3.11
	1986	11	499.0	48.49	47.73	45.80
	1986	11	24.0	2.33	2.30	2.20
	1986	13	161.0	15.64	15.40	14.78
	1987	11	814.0	80.47	79.10	75.67
	1987	11	1.0	0.10	0.10	0.09
	1987	13	169.0	16.71	16.42	15.71
	1988	11	130.0	13.10	12.85	12.25
	1988	11	26.0	2.62	2.57	2.45
	1988	13	186.0	18.74	18.39	17.53
	1988	13	55.0	5.54	5.44	5.18
	1989	13	1.0	0.10	0.10	0.10
	1990	11	2.0	0.21	0.21	0.19
	1991	14	6.0	0.52	0.49	0.43
	1991	11	1576.0	170.64	166.04	155.80
	1991	13	43.0	4.66	4.53	4.25
	1992	11	125.0	13.98	13.53	12.59
	1992	11	462.0	51.68	50.02	46.54
	1993	11	1139.0	132.65	127.40	117.19
	1993	13	4.0	0.47	0.45	0.41
	1994	11	296.0	36.40	34.47	31.19
	1995	11	392	52.55	48.20	42.44
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00

Table 2.3

Hearst Corporation: Wyntoon Operation
Land Disturbance History
Landings

Watershed: Wyntoon
WS #: 17
Prepared By: sjd
Date: 10/4/96

	Acres		ERA	ERA	ERA
Subtotal for Landings	9.6	23.0	28.1	28.1	28.1

Ownership	Landings	Size	# of Landings	Acres	Coeff	1996	1997	2000
	T/Recent	0.30	32	9.6	1.0	9.6	9.6	9.6
	C/Recent	0.30	0	0.0	1.0	0.0	0.0	0.0
	H/Recent	0.62	0	0.0	1.0	0.0	0.0	0.0
	T/Aband	0.30	77	23.0	0.8	18.4	18.4	18.4
	C/Aband	0.30	0	0.0	0.8	0.0	0.0	0.0
	H/Aband	0.62	0	0.0	0.8	0.0	0.0	0.0

Table 2.5

Hearst Corporation: Wyntoon Operation
Land Disturbance History
Transportation

Watershed: Wyntoon
WS #: 17
Prepared By: sjd
Date: 10/4/96

	Acres	ERA
Subtotal ERA for Roads	208.3	174.0

Road #	Surface	Width Ft	Length Mi	Acres	ERA Coeff	Total ERA
Arterial/W		16	2.5	4.8	1.20	5.8
Collector/W		12	9.3	13.5	1.20	16.2
Arterial/O		16	23.6	45.8	0.80	36.6
Collector/O		12	99.1	144.1	0.80	115.3
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0

No-Project Alternative

ERA PROJECTIONS

PW: Wyntoon

TOTACRE 17533

YEAR	BASE HARVST ERA	ROADS	LNDGS	1-Jan 1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	678.1	160.6	77.6	916.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	656	160.6	77.6		894.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	573.5	160.6	77.6			811.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	638.9	160.6	77.6				877.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	624.7	160.6	77.6					862.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	612.5	160.6	77.6						850.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	601.8	160.6	77.6							840	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	592.1	160.6	77.6								830.3	0	0	0	0	0	0	0	0	0	0	0	0
2004	583.3	160.6	77.6									821.5	0	0	0	0	0	0	0	0	0	0	0
2005	575.3	160.6	77.6										813.5	0	0	0	0	0	0	0	0	0	0
2006	567.9	160.6	77.6											806.1	0	0	0	0	0	0	0	0	0
2007	561.1	160.6	77.6												799.3	0	0	0	0	0	0	0	0
2008	554.6	160.6	77.6													792.8	0	0	0	0	0	0	0
2009	548.6	160.6	77.6														786.8	0	0	0	0	0	0
2010	543	160.6	77.6															781.2	0	0	0	0	0
2011	537.6	160.6	77.6																775.8	0	0	0	0
2012	532.5	160.6	77.6																	770.7	0	0	0
2013	527.7	160.6	77.6																		765.9	0	0
2014	516.7	160.6	77.6																			756.9	0
2015	514.5	160.6	77.8																				752.7
2016	510.5	160.6	77.6																				
	PERCENT ACRE_TOC			27.5%	26.8%	24.4%	26.3%	25.9%	25.5%	25.2%	24.9%	24.7%	24.4%	24.2%	24.0%	23.8%	23.6%	23.5%	23.3%	23.1%	23.0%	22.7%	22.6%
	DELTA				-2.4%	-9.2%	8.1%	-1.6%	-1.4%	-1.3%	-1.2%	-1.1%	-1.0%	-0.9%	-0.8%	-0.8%	-0.8%	-0.7%	-0.7%	-0.7%	-0.6%	-1.2%	-0.6%

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3331.27

TOC Ln

ACRE_TOC

MATH MOD

Proposed Project

ERA PROJECTIONS

PW: Wyntoon

TOTACRE 17533

YEAR	BASE HARVST ERA	ROADS	LNDGS
1996	678.1	163.5	77.6
1997	656	163.5	77.6
1998	573.5	163.5	77.6
1999	638.9	163.5	77.6
2000	624.7	163.5	77.6
2001	612.5	163.5	77.6
2002	601.8	163.5	77.6
2003	592.1	163.5	77.6
2004	583.3	163.5	77.6
2005	575.3	163.5	77.6
2006	567.9	163.5	77.6
2007	561.1	163.5	77.6
2008	554.6	163.5	77.6
2009	548.6	163.5	77.6
2010	543	163.5	77.6
2011	537.6	163.5	77.6
2012	532.5	163.5	77.6
2013	527.7	163.5	77.6
2014	516.7	163.5	77.6
2015	514.5	163.5	77.6
2016	510.5	163.5	77.6

	1-Jan 1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5
	987.7	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5
		1034.1	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5
			1020.1	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5
				1154	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5
					1208.3	104.3	95.7	90.6	87	84.2	82	80	78.4	76.9	75.6	74.4	73.3	72.3	71.4	70.5
						1300.4	104.3	95.7	90.8	87	84.2	82	80	78.4	76.9	75.6	74.4	73.3	72.3	71.4
							1385.4	104.3	95.7	90.8	87	84.2	82	80	78.4	76.9	75.6	74.4	73.3	72.3
								1466.3	104.3	95.7	90.6	87	84.2	82	80	78.4	76.9	75.6	74.4	73.3
									1544.5	104.3	95.7	90.6	87	84.2	82	80	78.4	76.9	75.6	74.4
										1620.7	38.7	35.5	33.7	32.3	31.3	30.4	29.7	29.1	28.6	28.1
											1629.7	38.7	35.5	33.7	32.3	31.3	30.4	29.1	28.6	28.1
												1642.7	38.7	35.5	33.7	32.3	31.3	30.4	29.7	29.1
													1657.7	38.7	35.5	33.7	32.3	31.3	30.4	29.7
														1673.9	38.7	35.5	33.7	32.3	31.3	30.4
															1691	74.6	68.4	64.8	62.2	60.2
																1744.3	74.6	68.4	64.8	62.2
																	1795.1	74.6	68.4	64.8
																		1844.4	74.6	68.4
																			1888.4	74.6
																				1936.1
PERCENT ACRE_TOC	29.6%	31.0%	30.6%	34.6%	36.3%	39.0%	41.6%	44.0%	46.4%	48.7%	48.9%	49.3%	49.8%	50.2%	50.8%	52.4%	53.9%	55.4%	56.7%	58.1%
DELTA		4.7%	-1.4%	13.1%	4.7%	7.6%	6.5%	5.6%	5.3%	4.9%	0.6%	0.8%	0.9%	1.0%	1.0%	3.2%	2.9%	2.7%	2.4%	2.5%

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TOC Ln

ACRE_TOC

MATH MOD

Intensive Management Alternative

ERA PROJECTIONS

PW: Wymtoon
TOTACRE 17533

YEAR	BASE HARVST ERA	ROADS	LNDGS	1-Jan 1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
1996	676.1	163.5	77.6	156.5	138.7	128.2	120.8	115.1	110.4	106.5	103	100	97.3	94.8	92.6	90.5	88.6	86.9	85.2	83.6	82.2	80.8	79.5
1997	656	163.5	77.6	1075.7	156.5	136.7	128.2	120.8	115.1	110.4	106.5	103	100	97.3	94.8	92.6	90.5	88.6	86.9	85.2	83.6	82.2	80.8
1998	573.5	163.5	77.6		1192.3	156.5	156.5	138.7	128.2	120.8	115.1	110.4	106.5	103	100	97.3	94.8	92.6	90.5	88.6	86.9	85.2	83.6
1999	636.9	163.5	77.6			1238	156.5	138.7	128.2	120.8	115.1	110.4	106.5	103	100	97.3	94.6	92.6	90.5	88.6	86.9	85.2	83.6
2000	624.7	163.5	77.6				1442	156.5	138.7	128.2	120.6	115.1	110.4	106.5	103	100	97.3	94.6	92.6	90.5	88.6	86.9	85.2
2001	612.5	163.5	77.8					1535.6	93.6	84.6	79.7	76.3	73.8	71.4	69.5	67.5	66.5	65.3	64.1	63.1	62.1	61.2	60.4
2002	601.8	163.5	77.6						1568	93.6	84.6	79.7	76.3	73.6	71.4	69.5	67.5	66.5	65.3	64.1	63.1	62.1	61.2
2003	592.1	163.5	77.6							1608	93.6	84.6	79.7	76.3	73.6	71.4	69.5	67.5	66.5	65.3	64.1	63.1	62.1
2004	583.3	163.5	77.6								1651.6	93.6	84.6	79.7	76.3	73.6	71.4	69.5	67.5	66.5	65.3	64.1	63.1
2005	575.3	163.5	77.6									1697.7	93.6	84.6	79.7	76.3	73.6	71.4	69.5	67.5	66.5	65.3	64.1
2006	567.9	163.5	77.6										1745.1	136.2	122.2	114.1	108.3	103.8	100.2	97.1	94.4	92	89.9
2007	561.1	163.5	77.6											1635.4	136.2	122.2	114.1	108.3	103.8	100.2	97.1	94.4	92
2008	554.6	163.5	77.6												1921.5	136.2	122.2	114.1	108.3	103.8	100.2	97.1	94.4
2009	548.6	163.5	77.6													2004.2	136.2	122.2	114.1	108.3	103.8	100.2	97.1
2010	543	163.5	77.6														2085	136.2	122.2	114.1	108.3	103.8	100.2
2011	537.6	163.5	77.6															2164.4	279.9	247.9	229.2	216	205.7
2012	532.5	163.5	77.6																2385.8	279.9	247.9	229.2	216
2013	527.7	163.5	77.6																	2587.9	279.9	247.9	229.2
2014	516.7	163.5	77.6																		2778.9	279.9	247.9
2015	514.5	163.5	77.6																			2956.4	279.9
2016	510.5	163.5	77.8																				3131.5
	PERCENT ACRE_TOC			32.3%	35.8%	37.2%	43.3%	46.1%	47.1%	48.3%	49.6%	51.0%	52.4%	55.1%	57.7%	60.2%	62.6%	65.0%	71.6%	77.7%	83.4%	88.7%	94.0%
	DELTA				10.8%	3.8%	16.5%	6.5%	2.1%	2.6%	2.7%	2.8%	2.8%	5.2%	4.7%	4.3%	4.0%	3.6%	10.2%	8.5%	7.4%	6.4%	5.9%

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3331.27
TOC Ln
ACRE_TOC
MATH MOD

CWE Natural Sensitivity Index

Table 1

Watershed: McCloud Reservoir PW # 9

CalState ID ########

		%
Total Acreage:	9118	100.07%
Hearst Acres	8744	95.90%
Other Private Acres	223	2.45%
USFS Acres	161	1.73%

Date: #####
Prep. by: sjd
Update:

NSI Attributes:

	Total Acres	x	Index Factor	=	Index Total
I. Attributes Affecting Runoff Processes					
A. Horton Overland Flow					
1. Rock Outcrop	51.8		1.0		52
2. Hydrologic Soil Group D	755.6		0.8		604
3. Hydrologic Soil Group C	776		0.4		310
B. Saturation Overland Flow					
1. Wet Meadows	0		1.0		0
2. Ponds	0		1.0		0
3. Streamside Management Zones	453		1.0		453
a. Class I (mi.) 1.54 c. Class III (mi.) 29.97					
b. Class II (mi.) 21.84 d. Class IV (mi.) 0.00					
II. Attributes Affecting Sediment Delivery					
A. Erosion From Highly Erosive Soils					
1. Soils Prone to Gully Erosion	0		1.0		0
2. Soils With a Very High EHR (includes altered/eroded phases)	3746		0.5		1873
B. Erosion From mass wasting					
1. All Active forms of mass wasting	0		8.0		0
2. Inner Gorge	1684.4		2.0		3369
Subtotal for Natural Sensitivity Attributes:					6662

Drainage Basin and Channel Morphology Affecting Sediment Routing Processes		Calculated Value	Index Factor Low 0.9	Mod 1.0	High 1.1	Extr 1.2	
A. Relief Ratio (ft/ft)		0.126	≤.070	>.070-.100	>.100-.130	>.130	1.1
1. Basin High Point	4328						
2. Basin Low Point	2680						
3. Main Stem Length (ft)	13100						
III. B. Drainage Density (FOT/Ac)		0.046	≤.020	>.020-.030	>.030-.040	>.040	1.2
1. # of First Order Tribs	413						
2. USGS Stream Mi	53.4						
3. Stream Mi. / Sq. Mi	3.7						
C. Rosgen Channel Classification			(Refer to process paper for ratings)				0.9
% Length by Sensitivity			83%	2%	14%	1%	
Index Value			0.75	0.02	0.15	0.01	
			0.8	1.0	1.2		
D. Precipitation Regime			snow	rain	rain/snow		1.1
Product for Channel Morphology Attributes:							1.4

Weighted Percentage of Watershed Classified Sensitive:	6662	/	9118	=	73.06
Natural Sensitivity Index:	1.4	x	73.06	=	99
Empirically Derived Threshold of Concern (TOC):				=	12 to 14

Rain-on-Snow Calculations

ELEVATION		ACRES	COEF	CONTR
0	3000	3	1.00	0.000329
3001	5000	8603	1.10	1.03787
5001	7200	512	1.20	0.067383
7200+		0	0.30	0
		9118		1.105582

Table 2.1

Hearst Corporation: Wyntoon Operation
Land Disturbance History
Timber Removal

Watershed: McCloud Res
WS #: 9
Prepared By: sjd
Date: 10/4/96

	Acres	1996 ERA	1997 ERA	2000 ERA
Subtotals for Timber Removal:	2637	272.2	262.9	244.1

Timber Removal	Year	Act. Code	Acres	1996	1997	2000
	1987	14	368.0	26.08	25.05	22.47
	1987	13	230.0	22.74	22.35	21.38
	1989	14	94.0	7.29	6.96	6.16
	1989	11	31.0	3.19	3.12	2.96
	1989	13	233.0	23.97	23.47	22.28
	1990	14	1.0	0.08	0.08	0.07
	1990	11	438.0	46.15	45.06	42.56
	1990	13	218.0	22.97	22.43	21.18
	1991	11	276.0	29.88	29.08	27.28
	1991	13	18.0	1.95	1.90	1.78
	1993	11	569.0	66.27	63.64	58.54
	1995	11	161.0	21.58	19.80	17.43
	0	0	0.0	0.00	0.00	0.00
	0	0	0.0	0.00	0.00	0.00
	0	0	0.0	0.00	0.00	0.00
	0	0	0.0	0.00	0.00	0.00
	0	0	0.0	0.00	0.00	0.00
	0	0	0.0	0.00	0.00	0.00
	0	0	0.0	0.00	0.00	0.00
	0	0	0.0	0.00	0.00	0.00
	0	0	0.0	0.00	0.00	0.00
	0	0	0.0	0.00	0.00	0.00
	0	0	0.0	0.00	0.00	0.00
			0	0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00

Table 2.2

Hearst Corporation: Wyntoon Operation

Land Disturbance History

Site Preparation

Watershed: McCloud Res
WS #: 9
Prepared By: sjd
Date: 10/4/96

	Acres	1996 ERA	1997 ERA	2000 ERA
Subtotals For Site Preparation	77	0.00	0.00	0.00

Ownership	Site Prep M	Year	Act. Code	Acres	1996	1997	2000
Hearst	scarif	1990	88	53.5	0.00	0.00	0.00
Hearst	scarif	1995	88	23.2	0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00

Table 2.3

Hearst Corporation: Wyntoon Operation
Land Disturbance History
Landings

Watershed: McCloud Res
WS #: 9
Prepared By: sjd
Date: 10/4/96

	Acres		ERA	ERA	ERA
Subtotal for Landings	3.8	10.0	11.9	11.9	11.9

Ownership	Landings	Size	# of Landings	Acres	Coeff	1996	1997	2000
	T/Recent	0.30	13	3.8	1.0	3.8	3.8	3.8
	C/Recent	0.30	0	0.0	1.0	0.0	0.0	0.0
	H/Recent	0.62	0	0.0	1.0	0.0	0.0	0.0
	T/Aband	0.30	33	10.0	0.8	8.0	8.0	8.0
	C/Aband	0.30	0	0.0	0.8	0.0	0.0	0.0
	H/Aband	0.62	0	0.0	0.8	0.0	0.0	0.0

Table 2.5

Hearst Corporation: Wyntoon Operation
Land Disturbance History
Transportation

Watershed: McCloud Res
WS #: 9
Prepared By: sjd
Date: 10/4/96

	Acres	ERA
Subtotal ERA for Roads	138.3	170.4

Road #	Surface	Width Ft	Length Mi	Acres	ERA Coeff	Total ERA
Arterial/W		16	7.6	14.7	3.00	44.2
Collector/W		12	17.7	25.7	3.00	77.2
Arterial/O		16	21.7	42.1	0.50	21.0
Collector/O		12	38.3	55.7	0.50	27.9
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0

No-Project Alternative

ERA PROJECTIONS

PW: McCloud
TOTACRE 10521

YEAR	BASE HARVST ERA	ROADS	LNDGS
1996	272.2	126.6	33
1997	262.9	126.6	33
1998	255.6	126.6	33
1999	249.5	126.6	33
2000	244.1	126.6	33
2001	239.3	126.6	33
2002	235	126.6	33
2003	231.1	126.6	33
2004	227.5	126.6	33
2005	224.1	126.6	33
2006	221	126.6	33
2007	218.1	126.6	33
2008	215.3	126.6	33
2009	212.7	126.6	33
2010	210.3	126.6	33
2011	207.9	126.6	33
2012	205.7	126.6	33
2013	203.6	126.6	33
2014	201.6	126.6	33
2015	199.6	126.6	33
2016	197.8	126.6	33

	1-Jan 1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0	0	0
	431.8	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0	0
		422.5	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0
			415.2	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0
				409.1	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0
					403.7	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0
						398.9	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0
							394.6	0	0	0	0	0	0	0	0	0	0.0	0	0	0
								390.7	0	0	0	0	0	0	0	0	0	0.0	0	0
									387.1	0	0	0	0	0	0	0	0	0	0.0	0
										383.7	0	0	0	0	0	0	0	0	0	0.0
											380.6	0	0	0	0	0	0	0	0	0
												377.7	0	0	0	0	0	0	0	0
													374.8	0	0	0	0	0	0	0
														372.3	0	0	0	0	0	0
															369.9	0	0	0	0	0
																367.5	0	0	0	0
																	365.3	0	0	0
																		363.2	0	0
																			361.2	0
																				359.2
PERCENT ACRE_TOC	31.6%	30.9%	30.4%	29.9%	29.5%	29.2%	28.9%	28.6%	28.3%	28.1%	27.8%	27.6%	27.4%	27.2%	27.0%	26.9%	26.7%	26.6%	26.4%	26.3%
DELTA		-2.2%	-1.7%	-1.5%	-1.3%	-1.2%	-1.1%	-1.0%	-0.9%	-0.9%	-0.8%	-0.8%	-0.7%	-0.7%	-0.6%	-0.6%	-0.6%	-0.6%	-0.6%	-0.6%

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TOC Ln
ACRE_TOC
MATH MOD

Proposed Project

ERA PROJECTIONS

PW: McCloud
TOTACRE 10521

YEAR	BASE HARVST ERA	ROADS	LNDGS
1996	272.2	129.5	33
1997	262.9	129.5	33
1998	255.6	129.5	33
1999	249.5	129.5	33
2000	244.1	129.5	33
2001	239.3	129.5	33
2002	235	129.5	33
2003	231.1	129.5	33
2004	227.5	129.5	33
2005	224.1	129.5	33
2006	221	129.5	33
2007	218.1	129.5	33
2008	215.3	129.5	33
2009	212.7	129.5	33
2010	210.3	129.5	33
2011	207.9	129.5	33
2012	205.7	129.5	33
2013	203.6	129.5	33
2014	201.6	129.5	33
2015	199.6	129.5	33
2016	197.8	129.5	33

	1-Jan 1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
	84.5	76.7	72.1	68.8	66.3	64.2	62.5	60.9	59.6	58.4	57.3	56.3	55.4	54.6	53.8	53.1	52.4	51.7	51.1	50.5
	519.2	84.5	76.7	72.1	68.8	66.3	64.2	62.5	60.9	59.6	58.4	57.3	56.3	55.4	54.6	53.8	53.1	52.4	51.7	51.1
		586.6	84.5	76.7	72.1	68.8	66.3	64.2	62.5	60.9	59.6	58.4	57.3	56.3	55.4	54.6	53.8	53.1	52.4	51.7
			651.4	84.5	76.7	72.1	68.8	66.3	64.2	62.5	60.9	59.6	58.4	57.3	56.3	55.4	54.6	53.8	53.1	52.4
				714.1	84.5	76.7	72.1	68.8	66.3	64.2	62.5	60.9	59.6	58.4	57.3	56.3	55.4	54.6	53.8	53.1
					775	28.2	25.6	24	23	22.1	21.4	20.9	20.4	19.9	19.5	19.2	18.8	18.5	18.2	18
						778.1	28.2	25.6	24	23	22.1	21.4	20.9	20.4	19.9	19.5	19.2	18.8	18.5	18.2
							785.2	28.2	25.6	24	23	22.1	21.4	20.9	20.4	19.9	19.5	19.2	18.8	18.5
								794.1	28.2	25.6	24	23	22.1	21.4	20.9	20.4	19.9	19.5	19.2	18.8
									804.3	28.2	25.6	24	23	22.1	21.4	20.9	20.4	19.9	19.5	19.2
										816.1	22.8	20.7	19.4	18.5	17.9	17.3	16.8	16.4	16.1	15.7
											821.1	22.8	20.7	19.4	18.5	17.9	17.3	16.8	16.4	16.1
												828	22.8	20.7	19.4	18.5	17.9	17.3	16.8	16.4
													835.6	22.8	20.7	19.4	18.5	17.9	17.3	16.8
														843.3	22.8	20.7	19.4	18.5	17.9	17.3
															851.6	19.8	17.9	16.8	16.1	15.5
																857.1	19.8	17.9	16.8	16.1
																	862.9	19.8	17.9	16.8
																		869	19.8	17.9
																			875.5	19.8
																				882
PERCENT ACRE_TOC	38.0%	42.9%	47.6%	52.2%	56.7%	56.9%	57.4%	58.1%	58.8%	59.6%	60.0%	60.5%	61.1%	61.7%	62.3%	62.7%	63.1%	63.5%	64.0%	64.5%
DELTA		13.0%	11.0%	9.6%	8.5%	0.4%	0.9%	1.1%	1.3%	1.3%	0.7%	0.8%	0.9%	0.9%	1.0%	0.6%	0.7%	0.7%	0.7%	0.7%

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TOC Ln
ACRE_TOC
MATH MOD

Intensive Management Alternative

ERA PROJECTIONS

PW: McCloud
TOTACRE 10521

YEAR	BASE HARVST ERA	ROADS	LNDGS
1996	272.2	129.5	33
1997	262.9	129.5	33
1998	255.6	129.5	33
1999	249.5	129.5	33
2000	244.1	129.5	33
2001	239.3	129.5	33
2002	235	129.5	33
2003	231.1	129.5	33
2004	227.5	129.5	33
2005	224.1	129.5	33
2006	221	129.5	33
2007	218.1	129.5	33
2008	215.3	129.5	33
2009	212.7	129.5	33
2010	210.3	129.5	33
2011	207.9	129.5	33
2012	205.7	129.5	33
2013	203.6	129.5	33
2014	201.6	129.5	33
2015	199.6	129.5	33
2016	197.8	129.5	33

	1-Jan 1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
	122.8	106.1	96.3	89.5	84	79.6	75.9	72.7	69.8	67.3	65	62.9	60.9	59.2	57.5	55.9	54.5	53.1	51.8	50.6
	657.6	122.8	106.1	96.3	89.5	84	79.6	75.9	72.7	69.8	67.3	65	62.9	60.9	59.2	57.5	55.9	54.5	53.1	51.8
		654.3	122.8	106.1	96.3	89.5	84	79.6	75.9	72.7	69.8	67.3	65	62.9	60.9	59.2	57.5	55.9	54.5	53.1
			743.3	122.8	106.1	96.3	89.5	84	79.6	75.9	72.7	69.8	67.3	65	62.9	60.9	59.2	57.5	55.9	54.5
				826.7	122.8	106.1	96.3	89.5	84	79.6	75.9	72.7	69.8	67.3	65	62.9	60.9	59.2	57.5	55.9
					905.3	48.7	42.3	38.5	35.9	33.8	32.1	30.6	29.4	28.3	27.3	26.4	25.6	24.9	24.2	23.6
						908	48.7	42.3	38.5	35.9	33.8	32.1	30.6	29.4	28.3	27.3	26.4	25.6	24.9	24.2
							913.8	48.7	42.3	38.5	35.9	33.8	32.1	30.6	29.4	28.3	27.3	26.4	25.6	24.9
								924.8	48.7	42.3	38.5	35.9	33.8	32.1	30.6	29.4	28.3	27.3	26.4	25.6
									937.4	48.7	42.3	38.5	35.9	33.8	32.1	30.6	29.4	28.3	27.3	26.4
										951.1	32.4	28.6	26.4	24.8	23.6	22.6	21.7	21	20.4	19.8
											949.2	32.4	28.6	26.4	24.8	23.6	22.6	21.7	21	20.4
												950.2	32.4	28.6	26.4	24.8	23.6	22.6	21.7	21
													952.9	32.4	28.6	26.4	24.8	23.6	22.6	21.7
														956.9	32.4	28.6	26.4	24.8	23.6	22.6
															961.8	38.9	35.3	33.2	31.7	30.5
																973.7	38.9	35.3	33.2	31.7
																	988.5	38.9	35.3	33.2
																		999.9	38.9	35.3
																			1013.7	38.9
																				1027.8
PERCENT ACRE_TOC	40.8%	47.8%	54.3%	60.4%	66.2%	66.2%	66.8%	67.6%	68.5%	69.5%	69.4%	69.5%	69.7%	70.0%	70.3%	71.2%	72.1%	73.1%	74.1%	75.1%
DELTA		17.4%	13.6%	11.2%	9.5%	0.1%	0.9%	1.2%	1.4%	1.5%	-0.2%	0.1%	0.3%	0.4%	0.5%	1.2%	1.3%	1.4%	1.4%	1.4%

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TOC Ln
ACRE_TOC
MATH MOD

CWE Natural Sensitivity Index

Table 1

Watershed: Angel Creek PW # 1

CalState ID 505 241

		%
Total Acreage:	10641	100.00%
Hearst Acres	10036	94.31%
Other Private Acres	605	5.69%
USFS Acres	0	0.00%
Unknown Acres	0	0.00%

Date: 8/28/98
Prep by: sjd
Update

NSI Attributes:

	Total Acres	x	Index Factor	=	Index Total
I. Attributes Affecting Runoff Processes					
A. Horton Overland Flow					
1. Rock Outcrop	82.9		1.0		83
2. Hydrologic Soil Group D	1817		0.8		1454
3. Hydrologic Soil Group C	134		0.4		53
B. Saturation Overland Flow					
1. Wet Meadows	0		1.0		0
2. Ponds	0		1.0		0
3. Streamside Management Zones	683		1.0		683
a. Class I (mi.) 8.04 c. Class III (mi.)	43.60				
b. Class II (mi.) 21.46 d. Class IV (mi.)	0.00				
II. Attributes Affecting Sediment Delivery					
A. Erosion From Highly Erosive Soils					
1. Soils Prone to Gully Erosion	0		1.0		0
2. Soils With a Very High EHR (includes altered/eroded phases)	3344		0.5		1672
B. Erosion From mass wasting					
1. All Active forms of mass wasting	154		8.0		1228
2. Inner Gorge	340		2.0		679
Subtotal for Natural Sensitivity Attributes:					5351

Drainage Basin and Channel Morphology Affecting Sediment Routing Processes

		Calculated Value	Index Factor Low 0.9	Mod 1.0	High 1.1	Extr 1.2	
A. Relief Ratio (ft/ft)		0.051	<.070	>.070-.100	>.100-.130	>.130	0.900
1. Basin High Point	5575						
2. Basin Low Point	2760						
3. Main Stem Length (ft)	54910						
III. B. Drainage Density (FDT/Ac)		0.020	<.020	>.020-.030	>.030-.040	>.040	1.000
1. # of First Order Tribs	214						
2. USGS Stream Mi.	73.1						
3. Stream Mi. / Sq. Mi.	4.4						
C. Rosgen Channel Classification			(Refer to process paper for ratings)				0.952
% Length by Sensitivity			66%	16%	18%	0%	
Index Value			0.59	0.16	0.20	0.00	
			0.8	1.0	1.2		
D. Precipitation Regime			snow	rain	rain/snow		1.136
Product for Channel Morphology Attributes:							0.973

Weighted Percentage of Watershed Classified Sensitive: 5351 / 10641 = 54.99

Natural Sensitivity Index:	0.973	x	54.99	=	54
Empirically Derived Threshold of Concern (TOC):				=	14 to 16

Rain-on-Snow Calculations

ELEVATION		ACRES	COEF	CONTR
0	2500	0	1.00	0
2501	4500	6822	1.10	0.705216
4501	6200	3818	1.20	0.430551
6200+		0	0.80	0
		10640		1.135777

NSI 001 9/11/96 22:40

Table 2.1

Hearst Corporation: Wyntoon Operation
Land Disturbance History
Timber Removal

Watershed: Angel Creek
WS #: 1
Prepared By: sjd
Date: 10/6/96

	Acres	1996 ERA	1997 ERA	2000 ERA
Subtotals for Timber Removal:	5496	609.9	589.7	547.9

Timber Removal	Year	Act. Code	Acres	1996	1997	2000
	1988	14	74.0	5.48	5.25	4.68
	1988	11	484.0	48.76	47.85	45.62
	1988	13	347.0	34.96	34.30	32.70
	1989	14	78.0	6.05	5.77	5.11
	1989	11	506.0	52.06	50.98	48.39
	1989	13	813.0	83.65	81.91	77.76
	1990	11	348.0	36.66	35.80	33.81
	1990	14	39.0	3.19	3.03	2.65
	1990	11	579.0	61.00	59.57	56.26
	1990	13	491.0	51.73	50.52	47.71
	1991	11	162.0	17.54	17.07	16.01
	1991	13	1.0	0.11	0.11	0.10
	1992	14	48.0	4.44	4.16	3.55
	1992	11	14.0	1.57	1.52	1.41
	1992	8	332.0	53.87	51.00	44.97
	1993	11	5.0	0.58	0.56	0.51
	1993	11	3.0	0.35	0.34	0.31
	1994	11	5.0	0.61	0.58	0.53
	1994	11	1037.0	127.51	120.77	109.25
	1994	13	28.0	3.44	3.26	2.95
	1995	11	49	6.57	6.03	5.31
	1991	3	53	9.80	9.34	8.30
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00

Table 2.2

Hearst Corporation: Wyntoon Operation
Land Disturbance History
Site Preparation

Watershed: Angel Creek
WS #: 1
Prepared By: sjd
Date: 10/6/96

	Acres	1996 ERA	1997 ERA	2000 ERA
Subtotals For Site Preparation	47	0.00	0.00	0.00

Ownership	Site Prep Method	Year	Act. Code	Acres	1996	1997	2000
Hearst	scarificatn	1990	88	43.6	0.00	0.00	0.00
Hearst	scarificatn	1995	88	3.8	0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00
					0.00	0.00	0.00

Table 2.3

Hearst Corporation: Wyntoon Operation
Land Disturbance History
Landings

Watershed: Angel Creek
WS #: 1
Prepared By: sjd
Date: 10/6/96

	Acres		ERA	ERA	ERA
Subtotal for Landings	5.9	23.0	24.3	24.3	24.3

Ownership	Landings	Size	No. of Landings	Acres	Coeff	1996	1997	2000
	T/Recent	0.30	20	5.9	1.0	5.9	5.9	5.9
	C/Recent	0.30	0	0.0	1.0	0.0	0.0	0.0
	H/Recent	0.62	0	0.0	1.0	0.0	0.0	0.0
	T/Aband	0.30	77	23.0	0.8	18.4	18.4	18.4
	C/Aband	0.30	0	0.0	0.8	0.0	0.0	0.0
	H/Aband	0.62	0	0.0	0.8	0.0	0.0	0.0

Table 2.5

Hearst Corporation: Wyntoon Operation
Land Disturbance History
Transportation

Watershed: Angel Creek
WS #: 1
Prepared By: sjd
Date: 10/6/96

	Acres	ERA
Subtotal ERA for Roads	124.2	184.6

Road #	Surface	Width Ft	Length Mi	Acres	ERA Coeff	Total ERA
Arterial/W		16	10.8	20.9	3.00	62.8
Collector/W		12	19.3	28.1	3.00	84.2
Arterial/O		16	8.9	17.3	0.50	8.6
Collector/O		12	39.8	57.9	0.50	28.9
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0

No-Project Alternative

ERA PROJECTIONS

PW: Angel Creek

TOTACRE 10641

YEAR	BASE HARVST ERA	ROADS	LNDGS	1-Jan 1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
1996	609.9	114.6	68.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	589.7	114.6	68.7	793.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	573.5	114.6	68.7		773	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	559.8	114.6	68.7			756.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	547.9	114.6	68.7				743.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	537.4	114.6	68.7					731.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	527.9	114.6	68.7						720.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	519.2	114.6	68.7							711.2	0	0	0	0	0	0	0	0	0	0	0	0	0
2004	511.3	114.6	68.7								702.6	0	0	0	0	0	0	0	0	0	0	0	0
2005	504	114.6	68.7									694.6	0	0	0	0	0	0	0	0	0	0	0
2006	497.2	114.6	68.7										687.3	0	0	0	0	0	0	0	0	0	0
2007	490.6	114.6	68.7											680.6	0	0	0	0	0	0	0	0	0
2008	484.8	114.6	68.7												674.1	0	0	0	0	0	0	0	0
2009	479.2	114.6	68.7													668.1	0	0	0	0	0	0	0
2010	473.8	114.6	68.7														662.6	0	0	0	0	0	0
2011	468.8	114.6	68.7															657.1	0	0	0	0	0
2012	464	114.6	68.7																652.1	0	0	0	0
2013	459.4	114.6	68.7																	647.3	0	0	0
2014	455	114.6	68.7																		642.7	0	0
2015	450.8	114.6	68.7																			638.3	0
2016	446.8	114.6	68.7																				634.1

PERCENT ACRE_TOC	43.8%	42.7%	41.8%	41.1%	40.4%	39.8%	39.3%	38.8%	38.4%	38.0%	37.6%	37.3%	36.9%	36.6%	36.3%	36.0%	35.8%	35.5%	35.3%	35.1%
DELTA		-2.5%	-2.1%	-1.8%	-1.6%	-1.4%	-1.3%	-1.2%	-1.1%	-1.1%	-1.0%	-0.9%	-0.9%	-0.8%	-0.8%	-0.8%	-0.7%	-0.7%	-0.7%	-0.7%

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TOC Ln

ACRE_TOC

MATH MOD

Proposed Project

ERA PROJECTIONS

PW: Angel Creek
TOTACRE 10641

YEAR	BASE HARVST ERA	ROADS	LNDGS	1-Jan 1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
1996	609.9	117.5	68.7	64.7	59.3	56.1	53.8	52.1	50.6	49.4	48.4	47.4	46.6	45.8	45.2	44.5	43.9	43.4	42.9	42.4	42	41.5	41.1
1997	589.7	117.5	68.7	860.8	64.7	59.3	56.1	53.8	52.1	50.6	49.4	48.4	47.4	46.6	45.8	45.2	44.5	43.9	43.4	42.9	42.4	42	41.5
1998	573.5	117.5	68.7		899.9	64.7	59.3	56.1	53.8	52.1	50.6	49.4	48.4	47.4	46.6	45.8	45.2	44.5	43.9	43.4	42.9	42.4	42
1999	559.8	117.5	68.7			939.8	64.7	59.3	56.1	53.8	52.1	50.6	49.4	48.4	47.4	46.6	45.8	45.2	44.5	43.9	43.4	42.9	42.4
2000	547.9	117.5	68.7				979.9	64.7	59.3	56.1	53.8	52.1	50.6	49.4	48.4	47.4	46.6	45.8	45.2	44.5	43.9	43.4	42.9
2001	537.4	117.5	68.7					1020.1	79.2	72.5	68.6	65.8	63.6	61.9	60.4	59.1	58	57	56	55.2	54.4	53.7	53
2002	527.9	117.5	68.7						1074.7	79.2	72.5	68.6	65.8	63.6	61.9	60.4	59.1	58	57	56	55.2	54.4	53.7
2003	519.2	117.5	68.7							1127.9	79.2	72.5	68.6	65.8	63.6	61.9	60.4	59.1	58	57	56	55.2	54.4
2004	511.3	117.5	68.7								1180	79.2	72.5	68.6	65.8	63.6	61.9	60.4	59.1	58	57	56	55.2
2005	504	117.5	68.7									1231.6	79.2	72.5	68.6	65.8	63.6	61.9	60.4	59.1	58	57	56
2006	497.2	117.5	68.7										1282.3	39.7	36.4	34.4	33	31.9	31	30.3	29.7	29.1	28.6
2007	490.8	117.5	68.7											1293.1	39.7	36.4	34.4	33	31.9	31	30.3	29.7	29.1
2008	484.8	117.5	68.7												1306.9	39.7	36.4	34.4	33	31.9	31	30.3	29.7
2009	479.2	117.5	68.7													1321.8	39.7	36.4	34.4	33	31.9	31	30.3
2010	473.8	117.5	68.7														1337.9	39.7	36.4	34.4	33	31.9	31
2011	468.8	117.5	68.7															1354.6	22.9	21	19.8	19	18.4
2012	464	117.5	68.7																1356	22.9	21	19.8	19
2013	459.4	117.5	68.7																	1357.1	22.9	21	19.8
2014	455	117.5	68.7																		1360.4	22.9	21
2015	450.8	117.5	68.7																			1364.4	22.9
2016	446.8	117.5	68.7																				1369

PERCENT ACRE_TOC	47.6%	49.7%	52.0%	54.2%	56.4%	59.4%	62.3%	65.2%	68.1%	70.9%	71.5%	72.2%	73.1%	74.0%	74.9%	74.9%	75.0%	75.2%	75.4%	75.7%
DELTA		4.5%	4.4%	4.3%	4.1%	5.4%	4.9%	4.6%	4.4%	4.1%	0.8%	1.1%	1.1%	1.2%	1.2%	0.0%	0.2%	0.2%	0.3%	0.3%

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TOC Ln
ACRE_TOC
MATH MOD

Intensive Management Alternative

ERA PROJECTIONS

PW: Angel Creek

TOTACRE 10641

YEAR	BASE HARVST ERA	ROADS	LNDGS	1-Jan 1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
1996	609.9	117.5	68.7	100.6	88.2	80.9	75.7	71.7	68.4	65.6	63.2	61.1	59.2	57.5	55.9	54.5	53.2	51.9	50.7	49.7	48.6	47.7	46.7
1997	589.7	117.5	68.7	896.7	100.6	88.2	80.9	75.7	71.7	68.4	65.6	63.2	61.1	59.2	57.5	55.9	54.5	53.2	51.9	50.7	49.7	48.6	47.7
1998	573.5	117.5	68.7		964.7	100.6	88.2	80.9	75.7	71.7	68.4	65.6	63.2	61.1	59.2	57.5	55.9	54.5	53.2	51.9	50.7	49.7	48.6
1999	559.8	117.5	68.7			1029.4	100.6	88.2	80.9	75.7	71.7	68.4	65.6	63.2	61.1	59.2	57.5	55.9	54.5	53.2	51.9	50.7	49.7
2000	547.9	117.5	68.7				1091.4	100.6	88.2	80.9	75.7	71.7	68.4	65.6	63.2	61.1	59.2	57.5	55.9	54.5	53.2	51.9	50.7
2001	537.4	117.5	68.7					1151.2	28.7	26.3	24.9	23.9	23.1	22.4	21.9	21.4	21	20.7	20.3	20	19.7	19.5	19.2
2002	527.9	117.5	68.7						1137.2	28.7	26.3	24.9	23.9	23.1	22.4	21.9	21.4	21	20.7	20.3	20	19.7	19.5
2003	519.2	117.5	68.7							1131.4	28.7	26.3	24.9	23.9	23.1	22.4	21.9	21.4	21	20.7	20.3	20	19.7
2004	511.3	117.5	68.7								1129.9	28.7	26.3	24.9	23.9	23.1	22.4	21.9	21.4	21	20.7	20.3	20
2005	504	117.5	68.7									1131.3	28.7	26.3	24.9	23.9	23.1	22.4	21.9	21.4	21	20.7	20.3
2006	497.2	117.5	68.7										1134.6	35.4	32.3	30.5	29.2	28.2	27.4	26.7	26.1	25.6	25.1
2007	490.8	117.5	68.7											1146.0	35.4	32.3	30.5	29.2	28.2	27.4	26.7	26.1	25.6
2008	484.8	117.5	68.7												1167.6	35.4	32.3	30.5	29.2	28.2	27.4	26.7	26.1
2009	479.2	117.5	68.7													1170.1	35.4	32.3	30.5	29.2	28.2	27.4	26.7
2010	473.8	117.5	68.7														1182.9	35.4	32.3	30.5	29.2	28.2	27.4
2011	468.8	117.5	68.7															1198	96	87.8	83	79.6	77
2012	464	117.5	68.7																1270.1	96	87.8	83	79.6
2013	459.4	117.5	68.7																	1339.4	96	87.8	83
2014	455	117.5	68.7																		1405.8	96	87.8
2015	450.8	117.5	68.7																			1470.4	96
2016	446.8	117.5	68.7																				1533.4
	PERCENT ACRE_TOC			49.6%	53.3%	56.9%	60.3%	63.6%	62.9%	62.5%	62.5%	62.5%	62.7%	63.4%	64.0%	64.7%	65.4%	66.1%	70.2%	74.0%	77.7%	81.3%	84.8%
	DELTA				7.6%	6.7%	6.0%	5.5%	-1.2%	-0.5%	-0.1%	0.1%	0.3%	1.0%	1.0%	1.1%	1.1%	1.1%	6.2%	5.5%	5.0%	4.6%	4.3%

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TOC Ln

ACRE_TOC

MATH MOD

CWE Natural Sensitivity Index

Table 1

Watershed: Star City Creek PW # 14

CalState ID #######

		%
Total Acreage:	8112	100.00%
Hearst Acres	7979	98.36%
Other Private Acres	133	1.64%
USFS Acres	0	0.00%

Date: #####
Prep. by: sjd
Update:

NSI Attributes:

	Total Acres	x	Index Factor	=	Index Total
I. Attributes Affecting Runoff Processes					
A. Horton Overland Flow					
1. Rock Outcrop	120		1.0		120
2. Hydrologic Soil Group D	1922		0.8		1538
3. Hydrologic Soil Group C	284		0.4		114
B. Saturation Overland Flow					
1. Wet Meadows	0		1.0		0
2. Ponds	0		1.0		0
3. Streamside Management Zones	638		1.0		638
a. Class I (mi.) 8.50 c. Class III (mi.)	33.69				
b. Class II (mi.) 18.07 d. Class IV (mi.)	0.00				
II. Attributes Affecting Sediment Delivery					
A. Erosion From Highly Erosive Soils					
1. Soils Prone to Gully Erosion	0		1.0		0
2. Soils With a Very High EHR (includes altered/eroded phases)	3576		0.5		1788
B. Erosion From mass wasting					
1. All Active forms of mass wasting	42		8.0		336
2. Inner Gorge	1313		2.0		2626
Subtotal for Natural Sensitivity Attributes:					7159

Drainage Basin and Channel Morphology Affecting Sediment Routing Processes		Calculated Value	Index Factor Low 0.9	Mod 1.0	High 1.1	Extr 1.2	
A. Relief Ratio (ft/ft)		0.065	≤.070	>.070-.100	>.100-.130	>.130	0.9
1. Basin High Point	6252						
2. Basin Low Point	2720						
3. Main Stem Length (ft)	54683						
III. B. Drainage Density (FOT/Ac)		0.030	≤.020	>.020-.030	>.030-.040	>.040	1.1
1. # of First Order Tnbs	245						
2 USGS Stream Mi.	60.3						
3. Stream Mi. / Sq. Mi.	4.9						
C. Rosgen Channel Classification			(Refer to process paper for ratings)				0.9
% Length by Sensitivity			79%	6%	15%	0%	
Index Value			0.71	0.06	0.17	0.00	
			0.8	1.0	1.2		
D. Precipitation Regime			snow	rain	rain/snow		1.1
Product for Channel Morphology Attributes:							1.1

Weighted Percentage of Watershed Classified Sensitive:	7159	/	8112	=	88.26
Natural Sensitivity Index:	1.1	x	88.26	=	94
Empirically Derived Threshold of Concern (TOC):				=	12 to 14

Rain-on-Snow Calculations

ELEVATION		ACRES	COEF	CONTR
0	3000	0	1.00	0
3001	5000	2887	1.10	0.391482
5001	7200	5096	1.20	0.753846
7200+		0	0.80	0
		7983		1.145328

Table 2.3

Hearst Corporation: Wyntoon Operation
Land Disturbance History
Landings

Watershed: Star City Creek
WS #: 14
Prepared By: sjd
Date: 10/4/96

	Acres		ERA	ERA	ERA
Subtotal for Landings	2.3	10.0	10.3	10.3	10.3

Ownership	Landings	Size	# of Landings	Acres	Coeff	1996	1997	2000
	T/Recent	0.30	8	2.3	1.0	2.3	2.3	2.3
	C/Recent	0.30	0	0.0	1.0	0.0	0.0	0.0
	H/Recent	0.62	0	0.0	1.0	0.0	0.0	0.0
	T/Aband	0.30	33	10.0	0.8	8.0	8.0	8.0
	C/Aband	0.30	0	0.0	0.8	0.0	0.0	0.0
	H/Aband	0.62	0	0.0	0.8	0.0	0.0	0.0

Table 2.5

Hearst Corporation: Wyntoon Operation
Land Disturbance History
Transportation

Watershed: Star City Creek
WS #: 14
Prepared By: sjd
Date: 10/4/96

	Acres	ERA
Subtotal ERA for Roads	101.7	126.6

Road #	Surface	Width Ft	Length Mi	Acres	ERA Coeff	Total ERA
Arterial/W		16	5.8	11.2	3.00	33.7
Collector/W		12	13.1	19.1	3.00	57.2
Arterial/O		16	14.4	27.9	0.50	14.0
Collector/O		12	29.9	43.5	0.50	21.7
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0

No-Project Alternative

ERA PROJECTIONS

PW Star City
TOTACRE 8113

YEAR	BASE HARVST ERA	ROADS	LNDGS	1-Jan 1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
1996	275 9	101 7	10 3	387.9																			
1997	250 2	101 7	10 3		362.2																		
1998	243 7	101 7	10 3			355.7																	
1999	238 1	101 7	10 3				350.1																
2000	233 2	101 7	10 3					345.2															
2001	228 7	101.7	10 3						340.7														
2002	224 7	101 7	10 3							336.7													
2003	221	101 7	10 3								333												
2004	217 6	101 7	10 3									329.6											
2005	214 5	101 7	10 3										326.5										
2006	211 5	101 7	10 3											323.5									
2007	208 8	101 7	10 3												320.8								
2008	206 2	101 7	10 3													318.2							
2009	203 7	101 7	10 3														315.7						
2010	201 4	101 7	10 3															313.4					
2011	199 2	101 7	10 3																311.2				
2012	197 1	101 7	10 3																	309.1			
2013	195	101 7	10 3																		307		
2014	193 1	101 7	10 3																			305.1	
2015	191 3	101 7	10 3																				303 3
2016	189 5	101 7	10 3																				
	PERCENT ACRE_TOC			36 8%	34 3%	33 7%	33 2%	32 7%	32 3%	31 9%	31 6%	31 3%	31 0%	30 7%	30 4%	30 2%	29 9%	29 7%	29 5%	29 3%	29 1%	28 9%	28 8%
	DELTA				-6 6%	1 8%	-1 6%	-1 4%	-1 3%	-1 2%	-1 1%	-1 0%	-0 9%	-0 9%	-0 8%	-0 8%	-0 8%	-0 7%	-0 7%	0 7%	-0 7%	-0 6%	0 6%

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TOC Ln
ACRE_TOC
MATH MOD

Proposed Project

ERA PROJECTIONS

PW: Star City

TOTACRE 6113

YEAR	BASE HARVST ERA	ROADS	LNDGS
1996	275.9	104.6	10.3
1997	250.2	104.6	10.3
1998	243.7	104.6	10.3
1999	238.1	104.6	10.3
2000	233.2	104.6	10.3
2001	228.7	104.6	10.3
2002	224.7	104.6	10.3
2003	221	104.6	10.3
2004	217.6	104.6	10.3
2005	214.5	104.6	10.3
2006	211.5	104.6	10.3
2007	208.6	104.6	10.3
2008	206.2	104.6	10.3
2009	203.7	104.6	10.3
2010	201.4	104.6	10.3
2011	199.2	104.6	10.3
2012	197.1	104.6	10.3
2013	195	104.6	10.3
2014	193.1	104.6	10.3
2015	191.3	104.6	10.3
2016	189.5	104.6	10.3

	1-Jan 1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
	23.3	21.2	20	19.1	18.5	17.9	17.5	17.1	16.7	16.4	16.1	15.9	15.6	15.4	15.2	15	14.8	14.6	14.5	14.3
	414.1	23.3	21.2	20	19.1	18.5	17.9	17.5	17.1	16.7	16.4	16.1	15.9	15.6	15.4	15.2	15	14.8	14.6	14.5
		409.6	23.3	21.2	20	19.1	18.5	17.9	17.5	17.1	16.7	16.4	16.1	15.9	15.6	15.4	15.2	15	14.8	14.6
			423.1	23.3	21.2	20	19.1	18.5	17.9	17.5	17.1	16.7	16.4	16.1	15.9	15.6	15.4	15.2	15	14.6
				436.6	23.3	21.2	20	19.1	18.5	17.9	17.5	17.1	16.7	16.4	16.1	15.9	15.6	15.4	15.2	15
					450.2	21.2	20	19.1	16.5	17.9	17.5	17.1	16.7	16.4	16.1	15.9	15.6	15.4	15.2	15
						466.7	24	22.7	21.7	20.9	20.3	19.6	19.3	18.9	18.6	18.2	18	17.7	17.4	17.2
							483	24	22.7	21.7	20.9	20.3	19.8	19.3	18.9	18.6	18.2	18	17.7	17.4
								499.1	24	22.7	21.7	20.9	20.3	19.8	19.3	18.9	18.6	18.2	18	17.7
									515.0	24	22.7	21.7	20.9	20.3	19.8	19.3	18.9	18.6	18.2	18
										530.7	24	22.7	21.7	20.9	20.3	19.8	19.3	18.9	18.6	18.2
											551.1	31.3	28.5	25.7	24.8	24	23.4	22.9	22.4	22
												571.1	31.3	28.8	25.7	24.8	24	23.4	22.9	22.4
													590.4	28.5	26.8	25.7	24.8	24	23.4	22.9
														609.5	28.8	26.8	25.7	24.8	24	23.4
															628.5	28.5	26.8	25.7	24.8	24
																644.4	26	24.4	23.4	22.5
																	660.3	26.6	24.4	23.4
																		676.1	26	24.4
																			691.9	26
																				707.5

PERCENT ACRE_TOC	39.3%	38.8%	40.1%	41.4%	42.7%	44.2%	45.8%	47.3%	48.6%	50.3%	52.3%	54.1%	56.0%	57.8%	59.6%	61.1%	62.6%	64.1%	65.6%	67.1%
DELTA		-1.1%	3.3%	3.2%	3.1%	3.7%	3.5%	3.3%	3.2%	3.0%	3.6%	3.6%	3.4%	3.2%	3.1%	2.5%	2.5%	2.4%	2.3%	2.3%

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1054.69

TOC Ln

ACRE_TOC

MATH MOD

ERA PROJECTIONS

Intensive Management Alternative

PW: Star City
TOTACRE 8113

YEAR	BASE HARVST ERA	ROADS	LNDGS	1-Jan 1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2009	2009	2010	2011	2012	2013	2014	2015	2016
1996	275.9	104.6	10.3	27	23.9	22.1	20.8	19.6	19	18.3	17.7	17.2	16.7	16.3	15.9	15.6	15.2	14.9	14.7	14.4	14.1	13.9	13.7
1997	250.2	104.6	10.3	417.8	27	23.9	22.1	20.8	19.6	19	18.3	17.7	17.2	16.7	16.3	15.9	15.6	15.2	14.9	14.7	14.4	14.1	13.9
1998	243.7	104.6	10.3		416	27	23.9	22.1	20.8	19.8	19	18.3	17.7	17.2	16.7	16.3	15.9	15.6	15.2	14.9	14.7	14.4	14.1
1999	236.1	104.6	10.3			431.6	27	23.9	22.1	20.6	19.8	19	18.3	17.7	17.2	16.7	16.3	15.9	15.6	15.2	14.9	14.7	14.4
2000	233.2	104.6	10.3				446.8	27	23.9	22.1	20.8	19.8	19	18.3	17.7	17.2	16.7	16.3	15.9	15.6	15.2	14.9	14.7
2001	228.7	104.6	10.3					461.7	20.7	18.6	17.4	16.5	15.8	15.3	14.6	14.4	14.1	13.8	13.5	13.2	13	12.8	12.6
2002	224.7	104.6	10.3						469.9	20.7	16.6	17.4	16.5	15.8	15.3	14.8	14.4	14.1	13.8	13.5	13.2	13	12.8
2003	221	104.6	10.3							478.9	20.7	16.6	17.4	16.5	15.8	15.3	14.8	14.4	14.1	13.8	13.5	13.2	13
2004	217.6	104.6	10.3								488.2	20.7	18.6	17.4	16.5	15.8	15.3	14.8	14.4	14.1	13.8	13.5	13.2
2005	214.5	104.6	10.3									497.7	20.7	18.6	17.4	16.5	15.8	15.3	14.8	14.4	14.1	13.8	13.5
2006	211.5	104.6	10.3										507.3	14.3	12.7	11.7	11.1	10.5	10.1	9.6	9.4	9.2	8.9
2007	208.6	104.6	10.3											510.5	14.3	12.7	11.7	11.1	10.5	10.1	9.8	9.4	9.2
2008	206.2	104.6	10.3												514.3	14.3	12.7	11.7	11.1	10.5	10.1	9.6	9.4
2009	203.7	104.6	10.3													518.3	14.3	12.7	11.7	11.1	10.5	10.1	9.6
2010	201.4	104.6	10.3														522.5	14.3	12.7	11.7	11.1	10.5	10.1
2011	199.2	104.6	10.3															526.9	48.7	44.3	41.7	39.9	38.5
2012	197.1	104.6	10.3																565.9	48.7	44.3	41.7	39.9
2013	195	104.6	10.3																	602	48.7	44.3	41.7
2014	193.1	104.6	10.3																		636.4	48.7	44.3
2015	191.3	104.6	10.3																			669.9	48.7
2016	189.5	104.6	10.3																				702.6

PERCENT ACRE_TOC	39.6%	39.4%	40.9%	42.4%	43.8%	44.6%	45.4%	46.3%	47.2%	48.1%	48.4%	48.8%	49.1%	49.5%	50.0%	53.6%	57.1%	60.3%	63.5%	66.6%
DELTA		-0.4%	3.8%	3.5%	3.3%	1.8%	1.9%	1.9%	1.9%	1.9%	0.6%	0.7%	0.8%	0.8%	0.8%	7.4%	6.4%	5.7%	5.3%	4.9%

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TOC Ln
ACRE_TOC
MATH MOD

CWE Natural Sensitivity Index

Table 1

Watershed Curtis Creek/Devils Canyon PW # 3 and 4

CalState ID 526.16010 and 526.16011

		%
Total Acreage:	28674	100.00%
Hearst Acres	18168	63.36%
Other Private Acres	10506	36.64%
USFS Acres	0	0.00%

Date. #####
Prep. by: sjd
Update.

NSI Attributes:	Total Acres	x	Index Factor	=	Index Total
I. Attributes Affecting Runoff Processes					
A. Horton Overland Flow					
1. Rock Outcrop	1257		1.0		1257
2. Hydrologic Soil Group D	4961		0.8		3969
3. Hydrologic Soil Group C	1346		0.4		538
B. Saturation Overland Flow					
1. Wet Meadows	0		1.0		0
2. Ponds	0		1.0		0
3. Streamside Management Zones	1380		1.0		1380
a. Class I (mi.) 8.55 c. Class III (mi.)	56.50				
b. Class II (mi.) 58.81 d. Class IV (mi.)	0.00				
II. Attributes Affecting Sediment Delivery					
A. Erosion From Highly Erosive Soils					
1. Soils Prone to Gully Erosion	0		1.0		0
2. Soils With a Very High EHR (Includes altered/eroded phases)	8140.1		0.5		4070
B. Erosion From mass wasting					
1. All Active forms of mass wasting	101		8.0		810
2. Inner Gorge	1988		2.0		3976
Subtotal for Natural Sensitivity Attributes:					15900

Drainage Basin and Channel Morphology Affecting Sediment Routing Process		Calculated Value	Index Factor Low 0.9	Mod 1.0	High 1.1	Extr 1.2	
A. Relief Ratio (ft/ft)		0.102	<.070	>.070-.100	>.100-.130	>.130	1.10
1. Basin High Point	5733						
2. Basin Low Point	3000						
3. Main Stem Length (ft)	26817						
III. B. Drainage Density (FOT/Ac)		0.037	<.020	>.020-.030	>.030-.040	>.040	1.10
1. # of First Order Tnbs	1055						
2. USGS Stream Mi	123.9						
3. Stream Mi. / Sq. Mi.	2.8						
C. Rosgen Channel Classification			(Refer to process paper for ratings)				0.93
% Length by Sensitivity			83%	2%	15%	0%	
Index Value			0.75	0.02	0.17	0.00	
			0.8	1.0	1.2		
D. Precipitation Regime			snow	rain	rain/snow		1.14
Product for Channel Morphology Attributes:							1.29

Weighted Percentage of Watershed Classified Sensitive:		15900	/	28674	=	55.46
Natural Sensitivity Index:	1.29	x	55.46		=	71
Empirically Derived Threshold of Concern (TOC):					=	14 to 16

Rain-on-Snow Calculations

ELEVATION		ACRES	COEF	CONTR
0	3000	687.5	1.30	0.023976
3001	5000	15273.2	1.10	0.585915
5001	7200	12713.8	1.20	0.532069
7200+		0	0.80	0
		28674.5		1.141961

Table 2.1

Hearst Corporation: Wyntoon Operation
Land Disturbance History
Timber Removal

Watershed: Curtis/Devils
WS #: 3 and 4
Prepared By: sjd
Date: 10/4/96

	Acres	1996 ERA	1997 ERA	2000 ERA
Subtotals for Timber Removal:	1729	221.5	204.7	181.4

Timber Removal	Year	Act. Code	Acres	1996	1997	2000
	1987	14	100.0	7.09	6.81	6.10
	1987	14	1.0	0.07	0.07	0.06
	1987	13	2.0	0.20	0.19	0.19
	1992	11	1.0	0.11	0.11	0.10
	1994	14	1.0	0.11	0.10	0.08
	1994	11	131.0	16.11	15.26	13.80
	1994	13	210.0	25.82	24.46	22.12
	1995	11	110.0	14.75	13.53	11.91
	1995	11	682.0	91.43	83.86	73.84
	1995	13	491.0	65.83	60.37	53.16
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00
				0.00	0.00	0.00

Table 2.3

Hearst Corporation: Wyntoon Operation
Land Disturbance History
Landings

Watershed: Curtis/Devils
W/S #: 3 and 4
Prepared By: sjd
Date: 10/4/96

	Acres		ERA	ERA	ERA
Subtotal for Landings	8.6	0.5	9.0	9.0	9.0

Ownership	Landings	Size	# of Landings	Acres	Coeff	1996	1997	2000
	T/Recent	0.30	29	8.6	1.0	8.6	8.6	8.6
	C/Recent	0.30	0	0.0	1.0	0.0	0.0	0.0
	H/Recent	0.62	0	0.0	1.0	0.0	0.0	0.0
	T/Aband	0.30	2	0.5	0.8	0.4	0.4	0.4
	C/Aband	0.30	0	0.0	0.8	0.0	0.0	0.0
	H/Aband	0.62	0	0.0	0.8	0.0	0.0	0.0

Table 2.5 Hearst Corporation: Wyntoon Operation

Land Disturbance History

Transportation

Watershed: Curtis/Devils
WS #: 3 and 4
Prepared By: sjd
Date: 10/4/96

	Acres	ERA
Subtotal ERA for Roads	167.6	197.9

Road #	Surface	Width Ft	Length Mi	Acres	ERA Coeff	Total ERA
Arterial/W		16	8.9	17.3	3.00	51.8
Collector/W		12	19.5	28.4	3.00	85.1
Arterial/D		16	20	38.8	0.50	19.4
Collector/D		12	57.2	83.2	0.50	41.6
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0
				0.0	1.00	0.0

No-Project Alternative

ERA PROJECTIONS

PW Devils-Curtis
TOTACRE 28674

YEAR	BASE HARVST ERA	ROADS	LNOGS	1-Jan 1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	221 5	150	21 6	393.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	204 7	150	21 6		376.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	194 6	150	21 6			366.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	187 2	150	21 6				358.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	181 4	150	21 6					353	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	176 6	150	21 6						348.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	172 5	150	21 6							344.1	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	168 9	150	21 6								340.5	0	0	0	0	0	0	0	0	0	0	0	0
2004	165 7	150	21 6									337.3	0	0	0	0	0	0	0	0	0	0	0
2005	162 9	150	21 6										334.5	0	0	0	0	0	0	0	0	0	0
2006	160 3	150	21 6											331.9	0	0	0	0	0	0	0	0	0
2007	157 9	150	21 6												329.5	0	0	0	0	0	0	0	0
2008	155 8	150	21 6													327.4	0	0	0	0	0	0	0
2009	153 7	150	21 6														325.3	0	0	0	0	0	0
2010	151 8	150	21 6															323.4	0	0	0	0	0
2011	150 1	150	21 6																321.7	0	0	0	0
2012	148 4	150	21 6																	320	0	0	0
2013	146 8	150	21 6																		318.4	0	0
2014	145 3	150	21 6																			316.9	0
2015	143 9	150	21 6																				315.5
2016	142 5	150	21 6																				

PERCENT ACRE_TOC				9 1%	8 7%	8 5%	8 3%	8 2%	8 1%	8 0%	7 9%	7 8%	7 8%	7 7%	7 7%	7 6%	7 6%	7 5%	7 5%	7 4%	7 4%	7 4%	7 3%
DELTA					-4 3%	-2 7%	-2 0%	-1 6%	-1 4%	-1 2%	-1 0%	-0 9%	-0 8%	-0 8%	-0 7%	-0 6%	-0 6%	-0 6%	-0 5%	-0 5%	-0 5%	-0 5%	-0 4%

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4301 1
TOC Ln
ACRE_TOC
MATH MOD

Proposed Project

RA PROJECTIONS

/N	Devils Curtis																						
DTACRE	28674																						
	BASE			1-Jan																			
EAR	HARVST			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
	ERA	ROADS	LNDGS	20 6	18 7	17 6	18 9	18 3	15.8	15 4	15	14.7	14 4	14.2	13 9	13 7	13 5	13 3	13 2	13	12 9	12 7	12 6
1996	221 5	152 9	21 6	416.6	20 6	18 7	17 6	16 9	16 3	15 8	15 4	15	14 7	14 4	14 2	13 9	13 7	13 5	13 3	13 2	13	12 9	12 7
1997	204 7	152 9	21 6		418 5	20 6	18 7	17 6	16 9	16 3	15 8	15 4	15	14 7	14 4	14 2	13 9	13 7	13 5	13 3	13 2	13	12 9
1998	194 6	152 9	21 6			426	20 6	18 7	17 6	16 9	16.3	15 8	15 4	15	14 7	14.4	14 2	13 9	13 7	13 5	13 3	13 2	13
1999	187 2	152 9	21 6				435.5	20 6	16 7	17 6	16 9	16.3	15 8	15 4	15	14 7	14 4	14 2	13 9	13 7	13 5	13 3	13 2
2000	181 4	152 9	21 6					446	216 7	197 4	186	178	171 8	166 7	162 4	158 6	155 4	152.4	149 7	147.3	145 1	143	141
2001	176 6	152 9	21 6						653.1	216 7	197 4	186	178	171 8	166 7	162 4	158 6	155 4	152 4	149 7	147 3	145 1	143
2002	172 5	152 9	21 6							843.1	216 7	197 4	186	178	171 8	166 7	162 4	158 6	155 4	152 4	149 7	147 3	145 1
2003	168 9	152 9	21 6								1022.9	216 7	197 4	186	178	171 8	166 7	162 4	158 6	155 4	152 4	149 7	147 3
2004	165 7	152 9	21 6									1195.5	216 7	197 4	186	178	171 8	166 7	162 4	158 6	155 4	152 4	149 7
2005	162 9	152 9	21 6										1362.6	6 3	7 3	6 7	6 3	5 7	5 5	5 3	5 1	4 9	102 3
2006	160 3	152 9	21 6											1316.7	6 3	7 3	6 7	6 3	5 7	5 5	5 3	5 1	4 9
2007	157 9	152 9	21 6												1285.1	6 3	7 3	6 7	6 3	5 7	5 5	5 3	5 1
2008	155 8	152 9	21 6													1261	6 3	7 3	6 7	6 3	5 7	5 5	5 3
2009	153 7	152 9	21 6														1241.4	6 3	7 3	6 7	6 3	5 7	5 5
2010	151 8	152 9	21 6															1224.7	75 9	69	65	62 2	60
2011	150 1	152 9	21 6																1278.1	75 9	69	65	62 2
2012	148 4	152 9	21 6																	1327.4	75 9	69	65
2013	146 8	152 9	21 6																		1374.9	75 9	69
2014	145 3	152 9	21 6																			1421	75 9
2015	143 9	152 9	21 6																				1564.1
2016	142 5	152 9	21 6																				
	PERCENT ACRE_TOC			9 7%	9 7%	9 9%	10 1%	10 4%	15 2%	19 6%	23 8%	27 8%	31 7%	30 6%	29 9%	29 3%	28 9%	28 5%	29 7%	30 9%	32 0%	33 0%	38 4%
	DELTA				0 5%	1 8%	2 2%	2 4%	46 4%	29 1%	21 3%	16 0%	14 0%	3 4%	2 4%	-1 9%	-1 6%	1 3%	4 4%	3 0%	3 6%	3 4%	10 1%
	15																						
	4301 1																						
OC	Ln																						
ACRE_TOC																							
MATH MOD																							

Intensive Management Alternative

ERA PROJECTIONS
PW Devils-Curtis
TOTACRE 28674

YEAR	BASE HARVST ERA	ROADS	LNDGS	1-Jan 1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
1996	221 5	152 9	21 6	110 3	100 5	94 7	90 6	87 4	84 8	82 7	80 8	79.1	77 6	76 2	75	73 8	72 8	71 8	70 9	70	69 2	68 4	67 7
1997	204 7	152 9	21 6	506 3	110 3	100 5	94 7	90 6	87 4	84 8	82 7	80 8	79 1	77 6	76 2	75	73 8	72 8	71 8	70 9	70	69 2	68 4
1998	194 6	152 9	21 6		590	110 3	100 5	94 7	90 6	87 4	84 8	82 7	80 8	79 1	77 6	76 2	75	73 8	72 8	71 8	70 9	70	69 2
1999	187 2	152 9	21 6			674.6	110 3	100 5	94 7	90 6	87 4	84 8	82.7	80 8	79 1	77 6	76 2	75	73 8	72 8	71 8	70 9	70
2000	181 4	152 9	21 6				757.6	110 3	100 5	94 7	90 6	87 4	84 8	82 7	80 8	79 1	77 6	76 2	75	73 8	72 8	71 8	70 9
2001	176 6	152 9	21 6					839.4	149 7	136 3	128 5	122 9	118 6	115 1	112 1	109 6	107 3	105 3	103 4	101 7	100 2	98 8	97 4
2002	172 5	152 9	21 6						958.8	149 7	136 3	128 5	122 9	116 6	115 1	112 1	109 6	107 3	105 3	103 4	101 7	100 2	98 8
2003	168 9	152 9	21 6							1073 2	149 7	136 3	128 5	122 9	118 6	115 1	112 1	109 6	107 3	105 3	103 4	101 7	100 2
2004	165 7	152 9	21 6								1184.2	149 7	136 3	128 5	122 9	118 6	115 1	112 1	109 6	107 3	105 3	103 4	101 7
2005	162 9	152 9	21 6									1292.4	149 7	136 3	128 5	122 9	118 6	115 1	112 1	109 6	107 3	105 3	103 4
2006	160 3	152 9	21 6										1398.4	145 4	132 5	124 9	119 5	115 3	111 9	109	106 5	104 3	102 3
2007	157 9	152 9	21 6											1498.0	145 4	132 5	124 9	119 5	115 3	111 9	109	106 5	104 3
2008	155 8	152 9	21 6												1596.2	145 4	132 5	124 9	119 5	115 3	111 9	109	106 5
2009	153 7	152 9	21 6													1693.1	145 4	132 5	124 9	119 5	115 3	111 9	109
2010	151 6	152 9	21 6														1788.6	145 4	132 5	124 9	119 5	115 3	111 9
2011	150 1	152 9	21 6															1882.9	67.5	61 5	58	55 4	53 5
2012	148 4	152 9	21 6																1898.2	67 5	61 5	58	55 4
2013	148 8	152 9	21 6																	1919.1	67 5	61 5	58
2014	145 3	152 9	21 6																		1943.1	67 5	61 5
2015	143 9	152 9	21 6																			1968 9	67 5
2016	142 5	152 9	21 6																				1996
	PERCENT ACRE_TOC			11 8%	13 7%	15 7%	17 6%	19 5%	22 3%	25 0%	27 5%	30 0%	32 5%	34 8%	37 1%	39 4%	41 6%	43 8%	44 1%	44 6%	45 2%	45 8%	46 4%
	DELTA				18 5%	14 3%	12 3%	10 8%	14 2%	11 0%	10 3%	9 1%	8 2%	7 1%	6 6%	6 1%	5 6%	5 3%	0 8%	1 1%	1 3%	1 3%	1 4%

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Appendix E. Special-Status Plant and Wildlife Species

Table E-1. Special-Status Plant Species Known to Occur in the Vicinity of Hearst Forests

Common and Scientific Name	Listing Status* Federal/State/CNPS	Distribution	Preferred Habitat
Long-haired star tulip *Calochortus longebarbatus*	--/--/1B	Shasta, Siskiyou, and Modoc counties; Oregon, Washington	Mesic sites in lower montane coniferous forest, including meadows, seeps, openings and drainages; clay soils; 3,266 to 6,175 feet.
Bellinger's meadowfoam *Limnanthes floccosa* ssp. *bellingeriana*	--/--/1B	Shasta County; Oregon	Vernally wet sites, including wet edges of meadows, and damp, stony flats in pine forest; 1,000 to 3,100 feet.
Shasta snow-wreath *Neviusia cliftonii*	--/--/1B	Shasta County	Shaded, north-facing, limestone slopes in lower montane coniferous forest; 975 to 1,625 feet.
Scott Mountain phacelia *Phacelia dalesiana*	--/--/1B	Shasta, Trinty, and Siskiyou counties	Dry meadows or openings in montane coniferous forest, on ultramafic soil; 4,950 to 6,600 feet.
Columbia yellowcress *Rorippa columbiae*	--/--/1B	Eastern Siskiyou County, northwest Modoc County; Oregon, Washington	River banks, lake margins in yellow pine forest and juniper woodland; 500 to 4,500 feet.

* Status explanations (see Chapter 5 for citations):

Federal

-- = no listing status.

State

-- = no listing status.

CNPS

1B = List 1B species: rare, threatened, or endangered in California and elsewhere.

Table E-2. Special-Status Wildlife Species with the Potential to Occur on Hearst Forests

Species	Status* Federal/State	California Distribution	Habitats	Reason for Decline or Concern
Northern spotted owl *Strix occidentalis caurina*	T/SSC	A permanent resident throughout its range; found in the north Coast, Klamath, and western Cascade Range from Del Norte County to Marin County	Dense old-growth or mature forests dominated by conifers with topped trees or oaks available for nesting crevices	Loss of nesting habitat
Bald eagle *Haliaeetus leucocephalus*	T/E	Nests in Siskiyou, Modoc, Trinity, Shasta, Lassen, Plumas, Butte, Tehama, Lake, and Mendocino Counties and in the Lake Tahoe Basin; reintroduced into central coast; winter range includes the rest of California, except the southeastern deserts, very high altitudes in the Sierras, and east of the Sierra Nevada south of Mono County; range expanding	In western North America, nests and roosts in coniferous forests within 1 mile of a lake, a reservoir, a stream, or the ocean	Nest sites vulnerable to human disturbance, pesticide contamination
American peregrine falcon *Falco peregrinus anatum*	E/E	Permanent resident on the north and south Coast Ranges; may summer on the Cascade and Klamath Ranges south through the Sierra Nevada to Madera County; winters in the Central Valley south through the Transverse and Peninsular Ranges and the plains east of the Cascade Range	Nests and roosts on protected ledges of high cliffs, usually adjacent to lakes, rivers, or marshes that support large populations of other bird species	Pesticide contamination; population recovering
Osprey *Pandion haliaetus*	--/SSC	Nests along the north coast from Marin County to Del Norte County, east through the Klamath and Cascade Ranges, and the upper Sacramento Valley; important inland breeding populations at Shasta Lake, Eagle Lake, and Lake Almanor and small numbers elsewhere south through the Sierra Nevada; winters along the coast from San Mateo County to San Diego County	Nests in snags or cliffs or other high, protected sites near the ocean, large lakes, or rivers with abundant fish populations	Vulnerable to human disturbance at nest sites, pesticide contamination, breeding range and populations increasing in many areas
Northern goshawk (North American pop.) *Accipiter gentilis*	--/SSC	Permanent resident on the Klamath and Cascade Ranges, on the north Coast Ranges from Del Norte County to Mendocino County, and in the Sierra Nevada south to Kern County; winters in Modoc, Lassen, Mono, and northern Inyo Counties; rare in southern California	Nests and roosts in older stands of red fir, Jeffrey pine, and lodgepole pine forests; hunts in forests and in forest clearings and meadows	Loss of nesting habitat and disturbance of nest sites
Cooper's hawk *Accipiter cooperii*	--/SSC	Throughout California except high altitudes in the Sierra Nevada; winters in the Central Valley, southeastern desert regions, and plains east of the Cascade Range; permanent residents occupy the rest of the state	Nests primarily in riparian forests dominated by deciduous species; also nests in densely canopied forests from digger pine-oak woodland up to ponderosa pine; forages in open woodlands	Human disturbance at nest sites, loss of riparian habitats, especially in the Central Valley; pesticide contamination

Table E-2. Continued

Species	Status* Federal/State	California Distribution	Habitats	Reason for Decline or Concern
Sharp-shinned hawk *Accipiter striatus*	--/SSC	Permanent resident on the Sierra Nevada, Cascade, Klamath, and north Coast Ranges at midelevations and along the coast in Marin, San Francisco, San Mateo, Santa Cruz, and Monterey Counties; winters over the rest of the state except very high elevations	Dense canopy ponderosa pine or mixed-conifer forest and riparian habitats	Human disturbance at nest sites, pesticide contamination, timber harvesting near nesting sites
Great gray owl *Strix nebulosa*	--/E	Permanent resident of the Sierra Nevada in small portions of Tuolumne, Mariposa, Madera, and Fresno Counties	Late successional coniferous forests bordering meadows; red fir, Jeffrey pine, and lodgepole pine dominate	Loss of nesting habitat, degradation of foraging habitat in meadows
California yellow warbler *Dendroica petechia brewsteri*	--/SSC	Nests over all of California except the Central Valley, the Mojave Desert region, and high altitudes in the Sierra Nevada; winters along the Colorado River and in parts of Imperial and Riverside Counties; two small permanent populations in San Diego and Santa Barbara Counties	Nests in riparian areas dominated by willows, cottonwoods, sycamores, or alders or in mature chaparral; may also use oaks, conifers, and urban areas near streamcourses	Loss of riparian breeding habitats, nest parasitism by brown-headed cowbirds
Greater sandhill crane *Grus canadensis tabida*	--/T	Breeds on the plains east of the Cascade Range and south to Sierra County; winters in the Central Valley, southern Imperial County, Lake Havasu National Wildlife Refuge, and the Colorado River Indian Reserve	Summers in open terrain near shallow lakes or freshwater marshes; winters in plains and valleys near bodies of fresh water	Loss of freshwater marsh nesting habitat, disturbance by cattle during nesting, illegal hunting
Little willow flycatcher *Empidonax traillii brewsteri*	--/E	Summer range includes a narrow strip along the eastern Sierra Nevada from Shasta County to Kern County, another strip along the western Sierra Nevada from El Dorado County to Madera County; widespread in migration	Riparian areas and large, wet meadows with abundant willows for breeding; usually found in riparian habitats during migration	Loss of riparian breeding habitat, nest parasitism by brown-headed cowbirds
Vaux's swift *Chaetura vauxi*	--/SSC	Coastal belt from Del Norte County south to Santa Cruz County; less commonly in midelevation forests of the Sierra Nevada and Cascade Range	Nests in hollow, burned-out tree trunks in large conifers; most other activities are conducted in the air	Reduction in the number of suitable nest sites from logging and fire suppression
Purple martin *Progne subis*	--/SSC	Nests in Sacramento; uncommon or absent elsewhere in the Central Valley; breeds locally in coastal areas from Del Norte County south to Santa Barbara County; rare in southern California	Abandoned woodpecker holes in valley oak and cottonwood forests for nesting; also nests in vertical drainage holes under elevated freeways and highway bridges; open areas required for feeding	Competition from European starlings for nest sites, loss of riparian habitat, loss of nesting habitat
Yellow-breasted chat *Icteria virens*	--/SSC	Uncommon migrant in California; nests in a few locations with appropriate habitat, such as Sweetwater and Weber Creeks, El Dorado County; Pit River, Shasta County; Russian River, Sonoma County; Little Lake Valley, Mendocino County; and upper Putah Creek, Yolo County	Nests in dense riparian habitats dominated by willows, alders, Oregon ash, tall weeds, blackberry vines, and grapevines	Loss of riparian breeding habitat

Table E-2. Continued

Species	Status* Federal/State	California Distribution	Habitats	Reason for Decline or Concern
California wolverine *Gulo gulo luteus*	--/T	Klamath and Cascade Ranges south through the Sierra Nevada to Tulare County	Sighted in a variety of habitats from 1,600 to 14,200 feet; most common in open terrain above timberline and subalpine forests	Reason for decline unclear; altered habitat from logging and recreation activities
Pacific fisher *Martes pennanti pacifica*	--/SSC	Coastal mountains from Del Norte County to Sonoma Counties, through Cascades to Lassen County; south in Sierra Nevada to Kern County	Mixed conifer habitats with high overstory cover; preference for riparian areas and other ecotonal habitats	Altered habitat from logging, historic trapping
Shasta salamander *Hydromantes shastae*	--/T	Restricted to several tributaries of the McCloud River, Pit River, and Squaw Creek, Shasta County	Limestone caves at elevations from 1,000 to 3,000 feet	Limited range and restricted habitat, potential habitat loss from proposed construction of Shasta Dam
Foothill yellow-legged frog *Rana boylii*	--/SSC	Occurs in the Klamath, Cascade, north Coast, south Coast, and Transverse Ranges; through the Sierra Nevada foothills up to approximately 6,000 feet south to Kern County	Creeks or rivers in woodlands or forests with rock and gravel substrate and low overhanging vegetation along the edge; usually found near riffles with rocks and sunny banks nearby	Reduced habitat quality from alteration of stream hydrology, predation by non-native aquatic fauna, loss of habitat from urban development
Tailed frog *Ascaphus truei*	--/SSC	Occurs in northwestern California from Del Norte County south to central Sonoma County and east as far as southwest Shasta County	Cool, perennial, swiftly flowing streams in redwood, Douglas-fir, and yellow pine forests	Altered microclimate conditions from timber harvesting in riparian areas
Northwestern pond turtle *Clemmys marmorata marmorata*	--/SSC	In California, range extends from Oregon border of Del Norte and Siskiyou Counties south along coast to San Francisco Bay, inland through Sacramento Valley, and on the western slope of Sierra Nevada; range overlaps with that of southwestern pond turtle through the Delta and Central Valley to Tulare County	Woodlands, grasslands, and open forests; occupies ponds, marshes, rivers, streams, and irrigation canals with muddy or rocky bottoms and with watercress, cattails, water lilies, or other aquatic vegetation	Loss and alteration of aquatic and wetland habitats, habitat fragmentation

* Status explanations (see Chapter 6 for citations):

Federal

E	=	listed as endangered under the federal Endangered Species Act.
T	=	listed as threatened under the federal Endangered Species Act.
--	=	no listing status.

State

E	=	listed as endangered under the California Endangered Species Act.
T	=	listed as threatened under the California Endangered Species Act.
SSC	=	species of special concern in California.
--	=	no listing status.

Appendix F. Biological Opinion

State of California

Memorandum

To Mr. Allen Robertson, Environmental Coordinator
California Department of Forestry and Fire Protection
Post Office Box 9442246
Sacramento, California 94244-2460

Date : March 24, 1998

From : Department of Fish and Game - Region 1
601 Locust Street, Redding, California 96001

Subject : Biological Opinion, Hearst Programmatic Timberlands Environmental Impact Report (PTEIR)

The Department of Fish and Game (DFG) has previously commented on the draft PTEIR in letters dated December 15, 1997, and more recently on February 18, 1998. Recent meetings between the DFG and Messrs. Lloyd Bradshaw, Rick Swift and Nick Dennis representing Hearst Forests have been productive in developing management strategies which will minimize the probability of taking or adversely affecting any State listed rare, threatened or endangered species. The following biological opinion is intended to provide the California Department of Forestry and Fire Protection (CDF) with necessary findings pursuant to §2090 and §2091 of the California Endangered Species Act (CESA) and specify measures necessary to minimize and fully mitigate the adverse impacts of any incidental taking. This opinion supercedes previous measures specified for compliance with CESA.

Pursuant to CESA §2090, each State lead agency shall consult with the DFG to ensure that any action authorized, funded or carried out by the State lead agency is in conformance with the CESA. Pursuant to CESA there are several listed wildlife species which inhabit or may inhabit the Hearst Forests. These species include the bald eagle, willow flycatcher, great gray owl, greater sandhill crane, wolverine and Shasta salamander. Certification of the Hearst Forest PTEIR by CDF would constitute an action authorized by a State lead agency.

In April of 1997, the Hearst Corporation and DFG entered into a memorandum of understanding (MOU) establishing procedures to avoid incidental "take" of State-listed species which may result from timber harvesting activities on lands managed by Hearst. This agreement primarily addressed "flag and avoid" mitigation measures associated with individual timber harvest plans proposed by the Hearst Corporation. The agreement did not specifically address potential cumulative impact issues associated with activities proposed in the Hearst Forest draft PTEIR. The MOU did address many pertinent issues related to threatened or endangered species management on Hearst Forests. The following findings and mitigation measures are based upon and supercede the MOU.

CESA §2090 directs DFG to issue a written finding whenever it consults with a State lead agency which includes three basic determinations: 1) whether the proposed project will jeopardize the continued existence of any endangered or threatened species, 2) whether the

proposed project will result in destruction or adverse modification of habitat essential to the continued existence of any endangered or threatened species, or 3) whether the proposed project will result in any taking of an endangered or threatened species incidental to the proposed project.

WRITTEN FINDINGS PURSUANT TO CESA §2090

Pursuant to CESA §2090, DFG finds and determines as follows:

1. Forest management activities specifically proposed in the Hearst Forest's draft PTEIR dated April 8, 1997, are not likely to jeopardize the continued existence of the bald eagle, willow flycatcher, great gray owl, greater sandhill crane, wolverine or Shasta salamander.

2. Forest management activities proposed in the Hearst Forest's draft PTEIR dated April 8, 1997, are unlikely to result in the destruction or adverse modification of habitat essential to the continued existence of bald eagle, willow flycatcher, great gray owl, greater sandhill crane, wolverine or Shasta salamander.

3. Forest management activities proposed in the Hearst Forest's draft PTEIR dated April 8, 1997, may result in the incidental take of individual bald eagles, willow flycatchers, great gray owls, greater sandhill cranes, wolverine or Shasta salamander. The adverse effect of any such take incidental to the proposed activities will be minimized if the mitigation measures identified in the following species accounts are fully implemented and adhered to.

SPECIES ACCOUNTS

Bald Eagle

Status and Distribution. The bald eagle is State listed as endangered and federally listed as threatened. Historically, bald eagles occurred throughout much of California nesting along the coastal zone, inland in the Cascade Mountains, on the Modoc Plateau, in the Central Valley, and along the western slope of the Sierra Nevada (Detrich 1986). The number of breeding pairs in California prior to European settlement is unknown, however, it appears to have been substantially larger than the current population (Jurek 1990). The bald eagle now breeds primarily in Butte, Lake, Lassen, Modoc, Plumas, Shasta, Siskiyou and Trinity counties. About half of the wintering population is in the Klamath Basin.

Loss of habitat, man-caused mortality, and disturbance have contributed to the decline of bald eagles nesting in the State. Concern regarding their survival led to governmental programs for locating nest sites, protecting the birds, managing habitat, and monitoring breeding success (Jurek 1990). Federal (1967) and State (1971) endangered species laws provided additional protection for the species.

In California, the status of the bald eagle has been improving (Jurek 1990). Statewide, the productivity of bald eagles has been good, averaging one young fledged per occupied territory in recent years (Jurek 1990). Habitat loss continues to be the most significant long-term threat to the bald eagle population in California. Most nesting territories, feeding perches, night roosting areas, and foraging sites are located in areas subject to logging, mining, recreational use, and development. Uncontrolled, these factors can seriously disrupt eagle breeding behavior (Jurek 1990). Impacts can occur through the loss of nesting habitat or through disturbance.

Disturbance during the nesting season can cause desertion of breeding territories, failure of eggs to be laid, or the death of embryos if nests are left unattended (Jurek 1988). Bald eagles are most sensitive to disturbance during courtship, nest building, egg laying, and incubation. Later in the breeding season, disturbance which keeps adults away from their nest can cause the death of eaglets from exposure, predation, or inadequate nutrition. Disturbance to older eaglets can cause them to fledge prematurely.

Biology. In California, most eggs laid by bald eagles are produced in March or April. However, some pairs have laid eggs as early as February and as late as May (Jurek 1988). Courtship and nest construction can occur in January. On the average, 33% of the bald eagle pairs that attempt to nest each year fail to produce young (Jurek 1988). Average clutch size is two; the incubation period is usually 34-36 days.

Habitat. The bald eagle requires large bodies of water or free flowing rivers with abundant fish and adjacent snags or other perches. Open, easily approached hunting perches immediately adjacent to large bodies of water or free-flowing rivers are used most frequently. It may roost communally in winter in dense, sheltered, remote conifer stands. It nests primarily in large, old-growth, or dominant live trees with open branchwork, especially ponderosa pines. It nests most frequently in stands with less than 40% canopy closure but in trees with some foliage shading the nest. The bald eagle often chooses the largest tree in a stand on which to build a stick platform nest usually below the live tree crown. Nests are usually located near a permanent water source.

Occurrence on Hearst Forests. Bald eagles are regularly sighted around the McCloud Reservoir and along the main channel of the McCloud River. They have also been spotted in the vicinity of Huckleberry and Stouts Meadow. The only known nest site on Hearst lands is located along the east shore of the McCloud Reservoir and has been active on a regular basis over the past few years.

Mitigations. Timber harvesting activities conducted in the vicinity of bald eagle nest sites could disrupt birds attempting to use them. Other adverse effects could occur through the modification of habitat which renders such sites unsuitable to the eagles.

In order to protect active nest sites and provide future opportunities for nest establishment Hearst will implement the following measures:

1. A habitat retention zone within a 500-foot radius of the nest will be established within which selection, sanitation-salvage and commercial thinning shall be permitted provided trees within the protection zone are marked prior to operations. Within the habitat retention zone only trees which do not show evidence of use by bald eagles shall be considered for removal. The removal of these trees shall not decrease the California Wildlife Habitat Relationship System (CWHR) type and stage of the habitat retention zone area. The DFG will be given the opportunity to review the mark within the habitat retention zone but must do so within twenty-one calendar days of notification by Hearst.

2. Trees to be harvested within the habitat retention zone will be directionally felled away from nest trees if any danger exists of hitting a nest tree.

3. Consistent with the Hearst management plan for the northern spotted owl, as approved by the US Fish and Wildlife Service in 1993, all snags that have been so for one or more years, plus all nonmerchantable cull trees, that do not protrude above the general canopy will be retained within all timber harvest areas. Snags that pose a hazard to timber operators may be removed consistent with the California Forest Practice Rules and guidelines of the California Occupational Safety and Health Administration.

4. A 500-foot radius no-fly helicopter buffer shall be established around nest trees during the term of timber harvesting operations.

5. Annually during the term of local timber harvesting operations, a 0.5-mile radius no-fly helicopter buffer zone shall be established around nest trees between January 1 and August 15 or for four weeks after fledging, whichever is later. In any year, this buffer zone may be discontinued if Hearst documents to the satisfaction of the DFG that breeding activity at the nest site has not taken place or has failed.

6. Annually during the term of local timber harvesting operations, a 0.25-mile radius buffer around nest trees shall be established where ground operations shall be prohibited between January 1 and August 15 or four weeks after fledging, whichever is later. In any year, this buffer zone may be discontinued if Hearst documents to the satisfaction of the DFG that breeding activity has not taken place or has failed. Hauling on existing roads within the 0.25-mile buffer is permitted.

7. Hearst shall allow the DFG access, upon request, to monitor the status of known bald eagle nest sites.

8. Hearst shall notify the DFG by December 31 each year of any new bald eagle nests discovered on its ownership.

9. To provide for alternative nest sites in the event that the current site is damaged or lost through timber operations, Hearst shall consult with DFG in 1998 to permanently mark and retain two appropriately sized trees near the current nest location at McCloud Reservoir.

Willow Flycatcher

Status and Distribution. The willow flycatcher is State listed as endangered. The willow flycatcher breeds over much of North America and winters in Central America and South America. In California, however, it has been extirpated as a breeding bird from most of its former range (Serena 1982). Remaining breeding populations occur within wet meadow and montane riparian habitats in the Sierra Nevada and Cascade Range (Zeiner et al. 1990).

Cattle grazing, parasitism by brown-headed cowbirds, water diversion, meadow erosion, and reservoir development have been indicated as factors contributing to the decline of willow flycatchers in California (Serena 1982, Valentine et al. 1988). Willow flycatcher nests are susceptible to disturbance by cattle due to their low height within shrubs, the weakness of supporting limbs, their proximity to water, the low branch density near nests, and their proximity to shrub edges (Valentine et al. 1988). Logging activities which disturb nesting habitat could also adversely affect this species.

Biology. Willow flycatchers are found on the breeding grounds for only a brief period each year. Migrants arrive from wintering areas during May and June and depart during August (Zeiner et al. 1990). In Sierra County, willow flycatchers pair and establish territories in June, young fledge during July and August, and birds begin migration by the last week of August (Sanders and Flett 1989).

Habitat. The willow flycatcher most often occurs in broad, open river valleys or large mountain meadows with lush growth of shrubby willows (Serena 1982). Dense willow thickets are required for nesting and roosting. Low, exposed branches are used for singing posts and hunting perches, from which the flycatcher will make short sallies for flying insects. It will occasionally eat berries and seeds. Nesting sites usually occur near languid streams, standing water or seeps.

Occurrence on Hearst Forests. Willow flycatchers have heretofore not been observed on the Hearst ownership. Flycatcher nests are known to exist just off the property near Bigelow Meadows where expansive areas of willow growth exist. Although not presently known to be occupied on Hearst, suitable flycatcher habitat may occur along portions of Huckleberry Creek and upper Star City Creek (Stouts Meadow).

Mitigations. Insofar as flycatcher habitat is confined to nonforested areas along meadows, where logging activity is generally prohibited by the California Forest Practice Rules and Hearst internal management policy, it is unlikely that timber harvesting activity will directly affect this species. However, to minimize the potential for timber operations to adversely affect the willow flycatcher or its habitat, Hearst, in consultation with DFG will use remote sensing techniques to map potential habitat. Hearst will then use either of the following alternatives:

Alternative 1. Surveys for the willow flycatcher shall be conducted in areas of suitable habitat (thick willow growth in wet meadows) within proposed timber harvesting units using a protocol and individuals whose qualifications are acceptable to the DFG. Surveyors may include Hearst Forest staff who are trained in proper identification of this species and the protocol. In the event surveys indicate willow flycatcher presence, project activities (excluding truck traffic on existing haul roads) shall be prohibited from May 1 through August 10 within 300 feet of the occupied willow complex. Willows within areas of suitable habitat shall not be damaged by the felling of trees or the operation of heavy equipment.

Alternative 2. If surveys are not conducted, project activities (excluding truck traffic on existing haul roads) shall be prohibited from May 1 through August 10 within 300 feet of suitable habitat (thick willow growth in wet meadows) unless agreed to on a site-specific basis by the local DFG biologist. Willows within areas of suitable habitat shall not be damaged by the felling of trees or the operation of heavy equipment.

Field investigations conducted by the DFG in the McCloud Flats area in 1997 indicated that territorial willow flycatchers will inhabit patches of dense riparian habitat greater than one meter in height and containing a significant component of deciduous shrubs adjacent to rivers and streams as well as "thick willow growth in wet meadows". Consequently, the definition of suitable willow flycatcher habitat which must be surveyed or avoided pursuant to Alternatives 1 and 2 includes dense riparian deciduous brush along Class I and II streams with a gradient <5% and a riparian zone >30 meters in width. The definition of suitable willow flycatcher habitat may require further revision as more is learned about the habits and habitat of the species.

Great Gray Owl

Status and Distribution. The great gray owl is State listed as an endangered species. It is the largest, in terms of body length and wingspan (five feet), of any owl in North America (Gould 1991). In California, these birds are rarely observed. Most recent sightings have occurred in the Sierra Nevada from Yosemite to Huntington Lake (Winter 1980). Scattered observations of great gray owls have also been reported from Del Norte, Siskiyou, Shasta, Plumas, Sierra, and Alpine counties (Winter 1980). However, few intensive efforts to locate this species have been undertaken in California.

Although there is no information on the historic abundance of great gray owls in California, they appear to have been more numerous in the past based on the broader distribution of sighting and specimen records (Gould 1991). Only ten different pairs of great gray owls have been found nesting in California in recent years. All of these observations occurred in the vicinity of Yosemite National Park and adjacent national forests (Gould 1991). The statewide population estimate is about 60 individuals (Gould 1991).

Biology. Little information is available regarding the nesting chronology of the great gray owl in California. Winter (1980) reported that young birds at Yosemite National Park fledged during the first or second week of July. Bull and Henjum (1990) reported that in northeastern Oregon great gray owls initiated courtship in late February or March, laid eggs from about mid-March to mid-April, and owlets left the nest in June. Factors such as snow depth, prey abundance, and weather can affect nesting chronology (Winter 1980).

Young great gray owls leave the nest before they are able to fly and generally perch within 0.5 meters of the ground (Bull and Henjum 1990). During this period, the owlets are relatively immobile and are vulnerable to harvest activities such as the felling of trees or the operation of heavy equipment which could crush them. However, adult female great gray owls will readily defend their owlets after they have left the nest (Bull and Henjum 1990). This behavior would likely reduce the probability that persons working near recently fledged young would be unaware of their presence.

Habitat. Preferred habitat for the great gray owl appears to be mixed conifer forest characterized by ponderosa pine, sugar pine, white fir, Douglas fir, incense cedar, and black oak. At higher elevations, these birds have been found in red fir forests consisting of red fir, lodgepole pine, Jeffrey pine, and white pine (Winter 1980). Great gray owls are typically associated with timber stands adjacent to meadows (Winter 1980, Bryan and Forsman 1987). In Oregon, this species has been found primarily in mature or old-growth forests (Bryan and Forsman 1987, Bull and Henjum 1990).

Great gray owls appear to nest opportunistically with snags, abandoned raptor nests, and dwarf-mistletoe brooms being commonly used. Bull and Henjum (1990) reported that 68% of the stick nests used by this species during their study were originally constructed by northern goshawks. They also found that great gray owls may use the same nest repeatedly. In California, these birds have only been found nesting in the tops of large, broken-off snags (Winter 1980).

Occurrence on Hearst Forests. There are no recorded observations of great gray owls on Hearst lands in Shasta and Siskiyou counties, and the expectation for future occurrence on the property is low. However, timber stands immediately adjacent to the two large meadow complexes on the property, Huckleberry Meadow and Stouts Meadow, should be considered good habitat for this species. In particular, pine stands of relatively high canopy closure immediately adjacent to Huckleberry Meadow, which show a preponderance of broken-topped snags and trees with previously constructed raptor nests, are prime habitat areas. Additional sites warranting further investigation include Amos Meadow and McBride Field.

Mitigations. Logging and the overgrazing of montane meadow habitats have been attributed to a decline in suitable habitat for the great gray owl (Gould 1991). Timber harvest activities can adversely affect great gray owls through changes in vegetation structure which can render sites unsuitable for this species. Adults tending their young or females incubating eggs may be reluctant to leave an area where timber operations are occurring and could be killed by the felling of trees. If a female is disturbed and flushed from the nest, the risk of predation of the unattended eggs or young is increased.

To minimize the potential for timber operations on Hearst Forests to adversely affect the great gray owl or its habitat, the following mitigations will be implemented in areas where timber operations will occur:

1. An initial survey for great gray owls shall be conducted during 1998 by a qualified person according to protocols acceptable to the DFG in Amos Meadow, McBride Field, Huckleberry Meadow and Stouts Meadow. Surveyors may include Hearst Forest staff who are trained in proper identification of this species and the protocol. Additional surveys will be performed in the future if additional detections of great gray owls are confirmed in the vicinity of Hearst Forests.

2. Hearst will continue its practice of marking timber in advance of harvest activity within areas of preferred habitat as noted above.

3. In the event a great gray owl is detected in the vicinity of local operations, DFG will be immediately notified. Owl activity will subsequently be monitored to determine reproductive status.

4. Buffer zones shall be established around all trees containing active great gray owl nests. Buffer zones will be a minimum of 30 acres in size and will be designed to best protect the nest site and nesting birds from the effects of timber operations. Only selection, commercial thinning and the sanitation-salvage silvicultural treatments will be allowed within the buffer zone. The DFG will be given the opportunity to review the mark within buffer zones but must do so within twenty-one days of notification by Hearst.

5. Within the buffer zone, timber operations will be limited to the period of August 15 through March 1 to further reduce the potential for harvest activities to disrupt breeding birds. Truck hauling will be limited to roads outside of the buffer zone during the March 1 through August 15 period. Proposed exceptions to truck hauling restrictions shall be based on DFG concurrence.

6. Canopy closure levels within the buffer zone will be maintained at 60% or higher.

7. Consistent with the Hearst management plan for the northern spotted owl, as approved by the US Fish and Wildlife Service in 1993, all snags that have been so for one or more years, plus all nonmerchantable cull trees, that do not protrude above the general canopy will be retained within all timber harvest areas. Snags that pose a hazard to timber operators may be removed consistent with the California Forest Practice Rules and guidelines of the California Occupational Safety and Health Administration.

8. Special effort will be made to retain unmerchantable deformed trees with flattened or broken tops within 400 feet of the meadow's edge for Huckleberry Meadow and Stouts Meadow.

Greater Sandhill Crane

Status and Distribution. The greater sandhill crane is State listed as threatened. In California, greater sandhill cranes breed primarily in the northeastern portion of the State. During the 1988 breeding season, Littlefield (1989) recorded 164 breeding pairs in Modoc County, 75 breeding pairs in Lassen County, and 29 breeding pairs in Siskiyou County. During the summer months greater sandhill cranes occur near wet meadow, shallow lacustrine, and fresh emergent wetland habitats (Zeiner et al. 1990). This species winters primarily in the Sacramento and San Joaquin valleys.

Biology. Courtship begins in April with peak breeding occurring from May through July (Zeiner et al. 1990). Clutch size, based on a sample of 42 nests in California, averaged 1.91 and ranged from 1 to 3 (Littlefield 1989). Incubation lasts for approximately 30 days and the young

cranes are able to fly at about 70 days of age. Young cranes may remain with the adults for up to a year. Total nesting success based on a survey of 56 nests in northeastern California was approximately 38% (Littlefield 1989). Total nesting success was defined as the ratio of nests in which at least one egg hatched to all known nests. Coyotes, ravens, and raccoons prey upon greater sandhill crane eggs and cattle have been known to trample young cranes (Littlefield 1989).

Habitat Requirements. Greater sandhill cranes typically construct nests in secluded sites within extensive marshlands or occasionally in short grass prairies (Cogswell 1977, cited by Zeiner et al. 1990). However, pairs have been observed during the breeding season within relatively small, isolated wet meadows and marshes. Nests in dry habitats often consist of depressions lined with grasses. In more typical habitat, nests form large mounds of marsh plants, grasses, and reeds in shallow water. Breeding pairs may defend the same territory in successive years and may use the same nest site repeatedly (Johnsgard 1975, cited by Zeiner et al. 1990).

Occurrence on Hearst Forests. Nesting pairs of greater sandhill cranes have not been observed on Hearst Forests. However, Amos Meadow, Huckleberry Meadow and small, isolated patches of wet meadow within and immediately adjacent to lower Huckleberry Creek may provide habitat for this species. The suitability of these sites for the greater sandhill crane may vary annually in response to snow melt, precipitation and livestock grazing pressure. In recent years, livestock grazing has not occurred on Hearst lands and precipitation has been greater than normal. Under these conditions, good nesting habitat for cranes has existed.

Mitigations. It is unlikely that timber operations will directly affect habitat for greater sandhill cranes. However, timber harvest activities occurring during the breeding season could significantly disrupt these birds. Greater sandhill cranes are most sensitive to disturbance during courtship, incubation, and when their colts are young. Disturbance during the courtship period may cause abandonment of nest territories. Activities which flush an adult from the nest during incubation may result in nest abandonment or the death of embryos. Activities which separate young cranes from adults can increase their risk of mortality due to predation or exposure. Cranes less than two weeks of age may exhibit a hiding behavior when threatened and can be crushed by heavy equipment (Schlorff, pers. comm.).

The following mitigations will therefore be implemented by Hearst:

1. Potential habitat areas, such as wet meadows and marshes, located within or immediately adjacent to timber harvesting plan units, shall be checked for greater sandhill crane presence prior to start of operations within the plan area by individuals whose qualifications are acceptable to the DFG.

2. If nesting cranes are observed, no timber operations will occur within 0.5 miles in a line of sight to crane nests March 1 through August 1 or until the colts have fledged unless otherwise agreed to by the local DFG biologist on a site-specific basis.

3. Operations may be conducted up to 0.25 miles of nesting cranes provided "line of sight" screening between operations and nesting cranes is available and the behavior of the birds is monitored by individuals whose qualifications are acceptable to the DFG. Operations within 0.5 miles in a line of sight to the birds will cease immediately if they appear to disrupt reproductive activity.

Wolverine

Status and Distribution. The wolverine is State listed as a threatened species. Wolverines are one of the largest members of the family *Mustelidae* which includes badgers, weasels, otters and skunks. They are somewhat similar to the badger in shape. However, their comparatively large size and coarse, shaggy dark brown fur with a contrasting lateral stripe is distinctive (Wilson 1982). These stripes are reddish or pale brown in color and extend from the shoulder to the rump on each side of their body. Wolverines may weigh between 30 and 60 pounds and their total body length ranges from three to four feet.

In California, little is known regarding the distribution, density, habitat preferences or population trends of the wolverine. Grinnell (1913), as cited in Schempf and White (1977), described the wolverine's range in California as extending from Monache Meadows in Tulare County north to the vicinity of Mount Shasta in Siskiyou County. More recent sightings have expanded their range to include Del Norte and Trinity counties (Department of Fish and Game 1991).

Biology. Wolverines are wide ranging, territorial carnivores. Males may have territories as large as 2,000 square kilometers (769 square miles) and females may occupy territories from 400-500 square kilometers (154-192 square miles) in size (Wilson 1982). However, no data indicating home range or territory sizes for the wolverine in California are available. Krott (1959) suggested that food supply and the availability of den sites were important factors affecting territory size. Wolverines subsist on a variety of foods which include small and medium sized mammals, birds, fish, amphibians, insects, berries and fungi. Carrion, particularly large ungulates, is believed to be an important component of their diet in winter (Department of Fish and Game 1991).

The wolverine, like many other mustelids, exhibits delayed implantation. After fertilization, eggs do not implant in the uterus. Implantation does not occur for approximately 200 days postfertilization. After implantation, the period of active gestation is only 30-40 days (Wilson 1982). Breeding occurs in the summer and females do not give birth until the following spring.

Habitat. These animals have often been associated with high elevation montane habitats. However, observations in California indicate that wolverines use a wide variety of habitats ranging from 1,300 feet (Forks of Salmon) to 14,200 feet (White Mountain Peak) in elevation. In California, they have been found in Douglas fir, mixed conifer and lodgepole forest types (Schempf and White 1977).

Occurrence on Hearst Forests. A review of the California Natural Diversity Database records indicates the possible historical presence of a wolverine in T38N, R1E, on Hearst lands based on a 1976 visual sighting of tracks in snow. No other observations have been made.

Mitigations. The probability that timber harvesting operations on Hearst lands will adversely affect wolverines is low. This is due, in part, to the variety of habitats in which they are known to occur, their large territory size and rarity, and the emphasis on uneven-aged silvicultural methods on the property. However, impacts to wolverines from timber harvesting operations could occur if a den containing a female and/or her young was disturbed or damaged. Rocky crevices, large diameter logs or snags, or piles of down woody material are the most likely locations for dens on Hearst forests. Although the reproductive chronology of wolverines in California is unknown, January through May is the period when females would most likely reside in dens with their young. Less direct impacts may occur if management activities do not provide for the long-term recruitment of large diameter snags and down woody material.

The following mitigation measures will therefore be implemented on Hearst forests:

1. In the event an active den site is discovered on Hearst lands and the den is occupied, a 0.25-mile "no harvest" buffer will be established around the den site if timber operations occur during the January through May period.

2. Consistent with the Hearst management plan for the northern spotted owl, as approved by the US Fish and Wildlife Service in 1993, all snags that have been so for one or more years, plus all nonmerchantable cull trees, that do not protrude above the general canopy will be retained within all timber harvest areas. Snags that pose a hazard to timber operators may be removed consistent with the California Forest Practice Rules and guidelines of the California Occupational Safety and Health Administration.

3. As also discussed in the Hearst owl management plan referenced above, all non-merchantable dead and down woody material greater than 23 inches in diameter and a minimum of 10 feet in length will be retained within all timber harvest areas.

Shasta Salamander

Status and Distribution. The Shasta salamander is State listed as threatened. It has a disjunct distribution in limestone areas in the vicinity of Shasta Lake and the river systems which feed it in northern Shasta County, namely the Sacramento and the McCloud. Most of the known localities occur within a 27-kilometer radius of the town of O'Brien (Lewendal 1995).

Biology. Dorsal coloring of adult Shasta salamanders are gray-green, beige, tan, to red, and usually with yellow on the tail. They have silver flecking on the sides, lower limbs, and especially the feet (Stebbins 1985, Gorman and Camp 1953). Tails are blunt ended with tail lengths approximately one-third total body length. Shasta salamanders retreat into subterranean cavities, usually associated with limestone outcroppings, during the late spring with the onset of dry weather conditions. Reproduction is thought to take place during the summer and early fall. Young emerge to the surface to forage with the first fall rains (Pappenfuss and Carufel 1977).

Habitat Requirements. Gorman and Camp (1953) reported Shasta salamander year-round occurrence in limestone caves, fissures and crevices, plus under rocks and leaf litter on limey soils and humus in the immediate vicinity of rock refugia when damp conditions exist. Typical vegetation is somewhat variable, ranging from dense Douglas fir forest with California black oak, wild currant, thimbleberry, and maidenhair fern with mosses blanketing the substrate (Gorman and Camp 1953) to open canopies of black oak, Douglas fir, digger pine and California buckeye (Bury et al. 1969). More recent studies performed by Lewendal (1995) suggest Shasta salamander year-round use of limestone outcroppings as small as 0.4 hectares in size with seasonal use of adjacent forested slopes up to 91 meters downslope of these outcroppings during the wet period.

Occurrence on Hearst Forests. To date, Shasta salamanders have not been detected on Hearst property which is located at the extreme north end of the species' known range. However, limestone rock outcroppings known to exist within the Star City Creek drainage may provide habitat for this species. These sites tend to be relatively dry and steep.

Mitigations. Given the nature of the terrain associated with the limestone outcroppings in the Star City drainage, it is unlikely that timber operations could directly affect Shasta salamander habitat. However, in order to minimize potential risk, Hearst shall implement the following mitigation measures wherever habitat exists.

1. Road or skid trail construction or major reconstruction shall not occur within 100 yards of limestone outcroppings within potential habitat in the absence of prior surveying.

2. Said surveys shall be conducted using a survey protocol and surveyors whose qualifications are acceptable to the DFG.

3. In the event surveys indicate salamander presence, road or skid trail construction or major reconstruction shall not occur unless agreed to by the DFG.

4. Unless otherwise agreed to by the DFG on a site-specific basis, timber harvesting within occupied habitat, as determined by prior surveying, shall be restricted to the June 15 - September 15 period.

5. Silvicultural treatments within the designated area shall be limited to selection, sanitation-salvage and commercial thinning. Exceptions may be agreed to by the DFG on a site-specific basis.

These above measures are required to minimize the potential adverse effects of timber operations of Hearst forestlands on State listed species. The probability of actually taking individual animals is low provided that the measures are implemented. Any taking which does occur, in accordance with implementation of the measures, is authorized pursuant to CESA §2091.

If there are any questions regarding this consultation, please contact Environmental Services Supervisor Mark Stopher at (530) 225-2275.

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Appendix G. In-Lieu and Alternative Practices for Hearst Forests

Table G-1
Historical Use of In-Lieu or Alternative Practices on Hearst Forests

The following is a list of in-lieu or alternative practices that Hearst has successfully used in the past. Although used selectively in the past on a site-specific basis, they were not considered as standard practices.

In-Lieu or Alternative Practice	Standard Rule Reference	Reason for In-Lieu or Alternative	THP	Mitigations in Addition to CFPRs	Agency Evaluations
Road reconstruction and heavy equipment use of skid trails within the WLPZ of a Class I watercourse.	14 CCR 936.3(c)	Required for tractor yarding access above existing road; greater impact to Tate Creek if road relocated further upslope.	2-92-8-SIS	Heavy equipment use limited to road and preflagged skid trails above road; light harvest resulting in moderate ground disturbance.	CVWQCB 29Apr92 CDF Final
New road construction within WLPZ of a Class I watercourse.	14 CCR 936.3(c)	To concentrate skidding, loading and hauling away from Angel Creek.	2-92-2-SIS	Construction of erosion control facilities so as to funnel drainage to a nearby Class III watercourse and avoid drainage onto downslope road systems.	CVWQCB 20Apr92 CDF PHI (Part of Plan) CDF Final
Use of landings within Class III watercourses, and within the WLPZ of a Class I watercourse; use of appurtenant skid trails within the WLPZ of the same Class I watercourse.	14 CCR 936.3(c)	Greater impacts to Coyote Creek if landing relocated further upslope.	2-92-2-SIS	Landings to be used when not saturated and absence of water flow in Class III watercourses; landing surfaces and appurtenant skid trail access within 25 feet of watercourses to be treated for erosion control prior to October 15; use of "heel boom" loader type on "Class III" landings within the Class I WLPZ; preflagging of landing critical limits plus appurtenant skid trails prior to operations; no additional excavation or significant disturbance of landing surfaces; decking of logs only on existing brush vegetation immediately adjacent to landings.	CVWQCB 20Apr92 CDF PHI (Part of Plan) CDF Final
Use of existing roads within the WLPZ of a Class I watercourse.	14 CCR 936.3(c)	Greater impacts to Coyote Creek if road system was relocated further upslope on 30-50% sideslopes; no visible current impacts from administrative use of existing roads to Coyote Creek.	2-92-2-SIS	Heavy equipment use limited to running surface of affected road segments; stream side of road to be preflagged as equipment exclusion boundary; canopy vegetation and surface cover buffers between road segments and Coyote Creek to be maintained during operations.	CVWQCB 20Apr92 CDF PHI (Part of Plan) CDF Final
Use of existing skid trails and roads within the WLPZ of Class II springs.	14 CCR 936.3(c)	Greater impacts to springs and other resources if new parallel trails were constructed outside the WLPZ.	2-93-399-SHA	Preflagging of skid trails; construction of additional waterbreaks at 50-foot spacings.	CDF PHI (Part of Plan) CDF Final

In-Lieu or Alternative Practice	Standard Rule Reference	Reason for In-Lieu or Alternative	THP	Mitigations in Addition to CFPRs	Agency Evaluations
Use of existing landings located within or immediately adjacent to Class III watercourses.	14 CCR 936.3(c)	Construction of new landings requires excavation on steeper side slopes, significant changes to existing skid trail network and steeper skid trail access to the new landings; no visible current impacts from existing landings to the watercourses.	2-93-245-SIS	Preapproved skid trail access to affected landings by an RPF; construction of a bermed dip subsequent to operations through all affected landings along watercourse alignment for purposes of diverting surface drainage away from the watercourse while allowing for unrestricted passage of water through the watercourse itself; straw mulching of all areas within 10 feet of the reconstructed watercourse channel subsequent to operations; unmerchantable landing slash to be spread over landings.	CDF PHI (Part of Plan)
Construction of landings greater than one-half acre in size.	14 CCR 943.5(d)	Needed to accommodate logistics associated with helicopter logging operations.	2-94-470-SHA	To be built on existing large, flat areas at considerable distance from watercourses; unmerchantable landing slash to be spread over landings subsequent to operations.	CDF PHI (Part of Plan)
Use of existing landings located within or immediately adjacent to Class III watercourses.	14 CCR 936.3(c)	Construction of new landings requires excavation on steeper side slopes, no visible current impacts from existing landings to the watercourses; watercourses through existing landings are dry most of the year.	2-92-345-SHA	Landings to be used when not saturated and absence of water flow in Class III watercourses; landing activity to be concentrated away from watercourses; landing surfaces and appurtenant skid trail access within 25 feet of watercourses to be treated for erosion control prior to October 15; construction of a bermed dip subsequent to operations through all affected landings along watercourse alignment prior to October 15 for purposes of diverting surface drainage away from the watercourse while allowing for unrestricted passage of water through the watercourse itself.	CDF PHI (Part of Plan)

Table G-2
Proposed In-Lieu or Alternative Practices for Hearst Forests

In-Lieu or Alternative Practice	Standard Rule Reference	Reasons and Justification for In-Lieu or Alternative	Mitigations (BMP Section References)
1. Road construction, reconstruction or use within the WLPZ of a Class I or Class II watercourse.	14 CCR 936.3(c)	• Construction of new roads outside the WLPZ has greater potential for adverse impacts to Class I or Class II watercourses as a result of excavation on steeper side slopes, significant changes to the existing skid trail network, or steeper skid trail access to roads and landings. • To access existing landings outside the WLPZ where no other practical routing alternative exists. • To protect water quality during periods when emergency conditions exist. • Past approval by CDF and CVWQCB subject to implementation of appropriate mitigation measures.	• Construction and reconstruction activities shall not occur during the winter period (2.1, 17.1, 18.8). • Construction and reconstruction shall not occur on "active unstable" areas (14.3). • Heavy equipment use limited to running surface of affected road segments (18.10). • New roads shall have centerline identified on the ground prior to construction activities (2.12). • Existing roads to be reconstructed shall be identified on the ground by an RPF or his designee (18.7). • Flagging for purposes of indicating heavy equipment exclusion shall be hung on all edges of roads that are located within the WLPZ (18.10). • Pioneer road excavation shall be confined to within roadway width limits (2.19). • Excavated material with potential to slough into watercourses shall be stabilized or end-hauled to areas outside the WLPZ where potential for sloughing into watercourses do not exist (2.24). • Erosion control facilities shall be constructed as necessary to minimize the discharge of sediment into watercourses (2.4). • Rock or other stabilization materials shall be placed on and incorporated into road surfaces as needed to minimize the discharge of sediment into watercourses. • Slopes exposed as a result of road construction or reconstruction , and which have the opportunity to transport sediment to watercourses in amounts deleterious to the quality and beneficial uses of water, shall be stabilized (2.69, 2.77, 18.5).

2. Landing construction , reconstruction or use within the WLPZ of a Class I or Class II watercourse.	14 CCR 936.3(c)	• Construction of new landings outside the WLPZ has greater potential for adverse impacts to Class I or Class II watercourses as a result of excavation on steeper side slopes, significant changes to the existing skid trail network, or steeper skid trail access to roads and landings. • To protect water quality during periods when emergency conditions exist. • Past approval by CDF and CVWQCB subject to implementation of appropriate mitigation measures.	• Construction and reconstruction activities shall not occur during the winter period (5.1, 17.1, 18.8). • Construction and reconstruction shall not occur on "active unstable" areas (14.3). • Heavy equipment use limited to running surface of affected landings and appurtenant skid trails (18.10). • New and existing landings within the WLPZ shall be identified on the ground by an RPF or his designee (18.7, 18.10). • Flagging for purposes of indicating heavy equipment exclusion shall be hung on all edges of landings that are located within the WLPZ (18.10). • Pioneer landing excavation shall be confined to within landing width limits (18.10). • Excavated material with potential to slough into watercourses shall be stabilized or end-hauled to areas outside the WLPZ where potential for sloughing into watercourses do not exist (2.24). • Erosion control facilities shall be constructed as necessary to minimize the discharge of sediment into watercourses (2.4). • Rock or other stabilzation materials shall be placed on and incorporated into road surfaces as needed to minimize the discharge of sediment into watercourses. • Slopes exposed as a result of landing construction or reconstruction, and which have the opportunity to transport sediment to watercourses in amounts deleterious to the quality and beneficial uses of water, shall be stabilized (5.12, 5.14, 18.5).
3. Skid trail construction , reconstruction or use within the WLPZ of a Class I or Class II watercourse.	14 CCR 936.3(c)	• Construction of new skid trails outside the WLPZ has greater potential for adverse impacts to Class I or Class II watercourses as a result of excavation on steeper side slopes or steeper skid trail access to roads and landings. • To protect water quality during periods when emergency conditions exist. • Past approval by CDF and CVWQCB subject to implementation of appropriate mitigation measures.	• Construction and reconstruction activities shall not occur during the winter period (8.6, 17.1, 18.8). • Construction and reconstruction shall not occur on "active unstable" areas (14.3). • Skid trail construction or reconstruction or use shall not occur under saturated soil conditions (8.8). • Heavy equipment use is limited to skid trail routes within the WLPZ as identified on the ground by an RPF or his designee (12.5, 18.10). • Erosion control facilities shall be constructed as necessary to minimize the discharge of sediment into watercourses (2.4). • Slopes exposed as a result of skid trail construction or reconstruction, and which have the opportunity to transport sediment to watercourses in amounts deleterious to the quality and beneficial uses of water, shall be stabilized (18.5).

4. Use of existing skid trails and roads within the WLPZ of Class II springs.	14 CCR 936.3(c)	• Construction of new, parallel skid trails outside the WLPZ has greater potential for adverse impacts to Class II springs. • Past approval by CDF and CVWQCB subject to implementation of appropriate mitigation measures.	• Heavy equipment use is limited to skid trail routes within the WLPZ as identified on the ground by an RPF or his designee (18.10). • Skid trail use within the WLPZ of Class II springs shall not occur during saturated soil conditions (8.8). • Rock or other stabilzation materials shall be placed on and incorporated into road surfaces as needed to minimize the discharge of sediment into watercourses.
5. Use of existing landings located within or immediately adjacent to Class III watercourses.	14 CCR 936.3(c)	• No significant adverse impacts from existing landings to adjacent watercourses are currently visible. • Construction of new landings elsewhere has greater potential for adverse impacts to the Class III watercourse as a result of excavation on steeper side slopes, significant changes to the existing skid trail network, or steeper skid trail access to roads and landings.	• Landing use shall not occur during the winter period (18.11). • Appurtenant Class III watercourses shall be dry during timber operating periods or have erosion control structures in place for purposes of diverting or protecting Class III water (18.11). • Landings and skid trail access shall be preapproved and identified on the ground by an RPF or his designee (18.11). • Flagging for purposes of indicating heavy equipment exclusion shall be hung on edges of all affected landings and skid trail access points (18.11). • Subsequent to operations, a bermed dip shall be constructed through all affected landings for purposes of diverting surface drainage away from the watercourse while allowing for unrestricted passage of water through the watercourse itself (18.11). • All areas within 10 feet of the reconstructed watercourse channel shall be straw mulched subsequent to operations but prior to beginning of the winter period (18.11). • Unmerchantable landing slash shall be spread over the surface of affected landings subsequent to operations but prior to beginning of the winter period (18.11). • If the landing is also located within the WLPZ of a Class I or II watercourse, logs shall be loaded onto trucks through use of a "heel boom" loader type only (18.11).
6. Construction of landings greater than one-half acre in size.	14 CCR 943.5(d)	• To accommodate logistics associated with helicopter logging operations. • Although larger in size than conventional landings, fewer landings would be required relative to landing numbers required for tractor or cable operations.	• Landing sites to be approved and preflagged by an RPF prior to use (5.6). • Landings to be built on large, flat areas at considerable distance from watercourses (5.6). • Landings to be the minimum size necessary to provide for safe operations (5.6). • Landings to be located so as to minimize soil excavation and landing fill (5.6).

7. Felling of trees across watercourses.	14 CCR 936.3(e)	• To minimize excessive log breakage or where less damage to residual vegetation would occur. • Past approval by CDF subject to implementation of appropriate mitigation measures.	• Trees shall be felled as close as is practicable to right angles across watercourses (18.12). • When there is reasonable expectation that slash, debris, soil, or other material resulting from timber operations, falling or associated activities, will be deposited in Class I and Class II waters below the watercourse or lake transition line or in watercourses which contain or conduct Class IV water, those harvest activities shall be deferred until equipment is available for its removal (18.12). • Log bucking of tree segments located within or over the immediate watercourse channel shall occur subsequent to log or tree removal operations and shall not occur in the watercourse itself (18.12). • Lopping and scattering of limbs shall occur subsequent to log or tree removal operations (18.12). • Residual wood chunks, limbs and other debris shall be removed from watercourse channels immediately subsequent to log or tree removal operations (18.12). • Removal of adjacent vegetation shall be limited to that necessary for safe felling and removal of affected trees (18.12).
8. Elimination of required water intercepting dip (WID) or waterbreak spacing requirements on slopes less than 5%.	14 CCR 934.6(c)	• Standard rule requires WID or waterbreak construction on flat ground where such construction is either unnecessary or creates greater drainage problems.	• Construction of lead-out ditches and use of natural drainage patterns (2.47). • Other general mitigations as noted in BMPs.
9. Use of heavy equipment on "historically unstable" areas not currently active.	14 CCR 934.2(d)	• Many areas, defined as unstable in the CFPRs, may show signs of historical instability but evidence no significant adverse impacts from past logging activity; avoidance mitigation may therefore be unnecessary.	• Use of heavy equipment is limited to areas categorized as historically unstable but not actively unstable; use of heavy equipment is prohibited in areas categorized as actively unstable (14.3). • Existing roads, landings and skid trails that have weathered and stabilized well shall be used wherever possible (14.2). • Construction of new roads, landings and skid trails shall be undertaken only when necessary and other practical alternatives do not exist (14.2). • Excavation shall be minimized during construction of new roads, landings and skid trails (14.2). • Heavy equipment shall not operate on historic scarps or sideslopes exceeding 65% (14.2). • Additional mitigation measures will be implemented as needed based on pre-harvest site evaluations conducted by the RPF and the CDF inspector (14.2).

10. Retention of less than eight trees per acre which are 18 inches dbh or greater.	14 CCR: 933.3(a)(2)(A)4 933.3(a)(2)(B)4	• All stocking retention standards required under the selection silvicultural system will be met, with the periodic and infrequent exception of retaining eight trees per acre which are 18" dbh or greater. However, the MSP analysis contained in this EIR, equivalent to that required under 14 CCR 933.11(a) or 933.11(b), meets the intent of PRC 4513.	• None.

Appendix H. Soil Complex Descriptions

Wyntoon

Soil	% AREA	AREA	HYDRO C	HYDRO D	HEHR	VEHR	GP	ROCK
Andeptic Cryorthents, 40 to 100	100%	8.5						
Andeptic Cryorthents	75.0%	6.4	0.0	0.0	0.0	0.0	0.0	0.0
Andic Cryumbrepts	12.5%	1.1	0.0	0.0	0.0	0.0	0.0	0.0
Rock outcrop	12.5%	1.1	0.0	0.0	0.0	0.0	0.0	1.1
			0.0	**0.0**	**0.0**	**0.0**	**0.0**	**1.1**
Chatterdown-Nikal Complex, 2 to 15	100%	1256.4						
Chatterdown	60.0%	753.8	0.0	0.0	0.0	0.0	0.0	0.0
Nikal	25.0%	314.1	0.0	0.0	0.0	0.0	0.0	0.0
Gaspar	7.5%	94.2	0.0	0.0	0.0	0.0	0.0	0.0
Scarface	7.5%	94.2	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Germany-Germany Deep Complex, 0 to 20	100%	259.6						
Germany	60.0%	155.8	0.0	0.0	0.0	0.0	0.0	0.0
Germany deep	30.0%	77.9	0.0	0.0	0.0	0.0	0.0	0.0
Ledmount	10.0%	26.0	0.0	26.0	0.0	0.0	0.0	0.0
			0.0	**26.0**	**0.0**	**0.0**	**0.0**	**0.0**
Germany-Shasta Complex, 0 to 20	100%	130.1						
Germany	62.0%	80.7	0.0	0.0	0.0	0.0	0.0	0.0
Shasta	31.0%	40.3	0.0	0.0	0.0	0.0	0.0	0.0
Ledmount	3.5%	4.6	0.0	4.6	0.0	0.0	0.0	0.0
Rock outcrop	3.5%	4.6	0.0	4.6	0.0	0.0	0.0	4.6
			0.0	**9.1**	**0.0**	**0.0**	**0.0**	**4.6**
Kettlebelly-Neuns Complex, 15 to 30	100%	31.7						
Kettlebelly	58.3%	18.5	18.5	0.0	0.0	0.0	0.0	0.0
Neuns	28.3%	9.0	0.0	0.0	0.0	0.0	0.0	0.0
Etsel	6.6%	2.1	0.0	2.1	0.0	2.1	0.0	0.0
Kindig	6.6%	2.1	0.0	0.0	0.0	0.0	0.0	0.0
			18.5	**2.1**	**0.0**	**2.1**	**0.0**	**0.0**
Kettlebelly-Neuns Complex, 30 to 50	100%	65.0						
Kettlebelly	57.5%	37.4	37.4	0.0	37.4	0.0	0.0	0.0
Neuns	32.5%	21.1	0.0	0.0	21.1	0.0	0.0	0.0
Etsel	5.0%	3.3	0.0	3.3	0.0	3.3	0.0	0.0
Kindig	5.0%	3.3	0.0	0.0	0.0	0.0	0.0	0.0
			37.4	**3.3**	**58.5**	**3.3**	**0.0**	**0.0**
Kindig-Neuns Complex, 15 to 30	100%	100.6						
Kindig	45.0%	45.3	0.0	0.0	0.0	0.0	0.0	0.0
Neuns	35.0%	35.2	0.0	0.0	0.0	0.0	0.0	0.0
Kettlebelly	10.0%	10.1	10.1	0.0	0.0	0.0	0.0	0.0
Heer	10.0%	10.1	0.0	0.0	0.0	0.0	0.0	0.0
			10.1	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Kindig-Neuns Complex, 30 to 50	100%	258.8						
Kindig	45.0%	116.5	0.0	0.0	0.0	0.0	0.0	0.0
Neuns	35.0%	90.6	0.0	0.0	90.6	0.0	0.0	0.0
Kettlebelly	10.0%	25.9	25.9	0.0	25.9	0.0	0.0	0.0
Neer	10.0%	25.9	0.0	0.0	0.0	0.0	0.0	0.0
			25.9	0.0	116.5	0.0	0.0	0.0
Kindig-Neuns Complex, 50 to 75	100%	341.2						
Kindig	30.0%	102.4	0.0	0.0	102.4	102.4	0.0	0.0
Neuns	50.0%	170.6	0.0	0.0	170.6	170.6	0.0	0.0
Etsel	6.7%	22.9	0.0	22.9	0.0	22.9	0.0	0.0
Kettlebelly	6.7%	22.9	22.9	0.0	22.9	22.9	0.0	0.0
Neer	6.7%	22.9	0.0	0.0	0.0	0.0	0.0	0.0
			22.9	22.9	295.8	318.7	0.0	0.0
Ledmount Family Rock Outcrop Complex, 0 to 10	100%	470.5						
Ledmount	60.0%	282.3	0.0	282.3	0.0	0.0	0.0	0.0
Rock outcrop	30.0%	141.2	0.0	141.2	0.0	0.0	0.0	0.0
Germany	5.0%	23.5	0.0	0.0	0.0	0.0	0.0	0.0
Delaney	5.0%	23.5	23.5	0.0	0.0	0.0	0.0	0.0
			23.5	423.5	0.0	0.0	0.0	0.0
Neer gravely sandy loam, 50 to 75	100%	69.4						
Neer	85.0%	59.0	0.0	0.0	59.0	59.0	0.0	0.0
Kindig	5.0%	3.5	0.0	0.0	3.5	3.5	0.0	0.0
Neuns	5.0%	3.5	0.0	0.0	3.5	3.5	0.0	0.0
Rubbleland	5.0%	3.5	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	0.0	65.9	65.9	0.0	0.0
Neer-Ponto Complex, 2 to 30	100%	2906.2						
Neer	40.0%	1162.5	0.0	0.0	0.0	0.0	0.0	0.0
Ponto	40.0%	1162.5	0.0	0.0	0.0	0.0	0.0	0.0
Kindig	6.6%	191.8	0.0	0.0	0.0	0.0	0.0	0.0
Neuns	6.6%	191.8	0.0	0.0	0.0	0.0	0.0	0.0
Rubbleland	6.6%	191.8	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	0.0	0.0	0.0	0.0	0.0
Neer-Ponto Complex, 30 to 50	100%	339.0						
Neer	45.0%	152.6	0.0	0.0	0.0	0.0	0.0	0.0
Ponto	35.0%	118.7	0.0	0.0	0.0	0.0	0.0	0.0
Kindig	6.6%	22.4	0.0	0.0	0.0	0.0	0.0	0.0
Neuns	6.6%	22.4	0.0	0.0	22.4	0.0	0.0	0.0
Rubbleland	6.6%	22.4	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	0.0	22.4	0.0	0.0	0.0

Udas Loam, 0 to 2	100%	382.2						
Udas	96.7%	369.6	0.0	0.0	0.0	0.0	0.0	0.0
Stoner	3.3%	12.6	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	0.0	0.0	0.0	0.0	0.0
Ponto Sandy Loam, 2 to 15	100%	1451.7						
Ponto	100.0%	1451.7	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	0.0	0.0	0.0	0.0	0.0
Ponto-Wyntoon Complex, 2 to 15	100%	45.0						
Shasta	50.0%	22.5	0.0	0.0	0.0	0.0	0.0	0.0
Sadie	50.0%	22.5	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	0.0	0.0	0.0	0.0	0.0
Rubbleland-Xerorthents Complex, 50 to 70	100%	506.4						
Rubbleland	45.0%	227.9	0.0	227.9	0.0	0.0	0.0	0.0
Xerorthents	40.0%	202.6	0.0	202.6	0.0	0.0	0.0	0.0
Henry	5.0%	25.3	0.0	0.0	0.0	0.0	0.0	0.0
Neer	5.0%	25.3	0.0	0.0	0.0	0.0	0.0	0.0
Nikal	5.0%	25.3	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	430.4	0.0	0.0	0.0	0.0
Shasta Sandy Loam, 0 to 5	100%	5875.1						
Shasta	75.0%	4406.6	0.0	0.0	0.0	0.0	0.0	0.0
Sadie	12.5%	734.4	0.0	0.0	0.0	0.0	0.0	0.0
Washougal	12.5%	734.4	734.4	0.0	0.0	0.0	0.0	0.0
			734.4	0.0	0.0	0.0	0.0	0.0
Shasta-Germany Complex, 0 to 20	100%	2181.1						
Shasta	60.0%	1308.7	0.0	0.0	0.0	0.0	0.0	0.0
Germany	30.0%	654.3	0.0	0.0	0.0	0.0	0.0	0.0
Sadie	5.0%	109.1	0.0	0.0	0.0	0.0	0.0	0.0
Washougal	5.0%	109.1	109.1	0.0	0.0	0.0	0.0	0.0
			109.1	0.0	0.0	0.0	0.0	0.0
Shasta-Washougal Complex, 0 to 30	100%	269.8						
Shasta	40.0%	107.9	0.0	0.0	0.0	0.0	0.0	0.0
Washougal	30.0%	80.9	0.0	0.0	0.0	0.0	0.0	0.0
Washougal, deep	20.0%	54.0	54.0	0.0	0.0	0.0	0.0	0.0
Germany	10.0%	27.0	0.0	0.0	0.0	0.0	0.0	0.0
			54.0	0.0	0.0	0.0	0.0	0.0
Stoner Gravely Sandy Loam, 2 to 15	[illegible]	195.3						
Water	na	7.8						
Undefined		108.5						
999	na	280.3						

SOIL	% AREA	AREA	HYDRO C	HYDRO D	H EHR	VH EHR	GP	ROCK
Etsel-Neuns Complex, 50 to 75	100%	617.8						
Etsel	55.0%	339.8	0.0	339.8	0.0	339.8	0.0	0.0
Neuns	35.0%	216.2	0.0	0.0	216.2	216.2	0.0	0.0
Kindig	5.0%	30.9	0.0	0.0	30.9	30.9	0.0	0.0
Rock outcrop	5.0%	30.9	0.0	0.0	0.0	0.0	0.0	30.9
			0.0	**339.8**	**247.1**	**586.9**	**0.0**	**30.9**
Kettlebelly-Neuns Complex, 15 to 30	100%	148.4						
Kettlebelly	58.3%	86.5	86.5	0.0	0.0	0.0	0.0	0.0
Neuns	28.3%	42.0	0.0	0.0	0.0	0.0	0.0	0.0
Etsel	6.6%	9.8	0.0	9.8	0.0	9.8	0.0	0.0
Kindig	6.6%	9.8	0.0	0.0	0.0	0.0	0.0	0.0
			86.5	**9.8**	**0.0**	**9.8**	**0.0**	**0.0**
Kettlebelly-Neuns Complex, 30 to 50	100%	531.7						
Kettlebelly	57.5%	305.7	305.7	0.0	305.7	0.0	0.0	0.0
Neuns	32.5%	172.8	0.0	0.0	172.8	0.0	0.0	0.0
Etsel	5.0%	26.6	0.0	26.6	0.0	26.6	0.0	0.0
Kindig	5.0%	26.6	0.0	0.0	0.0	0.0	0.0	0.0
			305.7	**26.6**	**478.5**	**26.6**	**0.0**	**0.0**
Kindig-Neuns Complex, 15 to 30	100%	386.9						
Kindig	45.0%	174.1	0.0	0.0	0.0	0.0	0.0	0.0
Neuns	35.0%	135.4	0.0	0.0	0.0	0.0	0.0	0.0
Kettlebelly	10.0%	38.7	38.7	0.0	0.0	0.0	0.0	0.0
Neer	10.0%	38.7	0.0	0.0	0.0	0.0	0.0	0.0
			38.7	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Kindig-Neuns Complex, 30 to 50	100%	1210.7						
Kindig	45.0%	544.8	0.0	0.0	0.0	0.0	0.0	0.0
Neuns	35.0%	423.7	0.0	0.0	423.7	0.0	0.0	0.0
Kettlebelly	10.0%	121.1	121.1	0.0	121.1	0.0	0.0	0.0
Neer	10.0%	121.1	0.0	0.0	0.0	0.0	0.0	0.0
			121.1	**0.0**	**544.8**	**0.0**	**0.0**	**0.0**
Kindig-Neuns Complex, 50 to 75	100%	3343.6						
Kindig	30.0%	1003.1	0.0	0.0	1003.1	1003.1	0.0	0.0
Neuns	50.0%	1671.8	0.0	0.0	1671.8	1671.8	0.0	0.0
Etsel	6.7%	224.0	0.0	224.0	0.0	224.0	0.0	0.0
Kettlebelly	6.7%	224.0	224.0	0.0	224.0	224.0	0.0	0.0
Neer	6.7%	224.0	0.0	0.0	0.0	0.0	0.0	0.0
			224.0	**224.0**	**2898.9**	**3122.9**	**0.0**	**0.0**

McCloud Reservoir (Continued)

Neer gravely sandy loam, 50 to 75	100%	484.0						
Neer	85.0%	411.4	0.0	0.0	411.4	411.4	0.0	0.0
Kindig	5.0%	24.2	0.0	0.0	24.2	24.2	0.0	0.0
Neuns	5.0%	24.2	0.0	0.0	24.2	24.2	0.0	0.0
Rubbleland	5.0%	24.2	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**0.0**	**459.8**	**459.8**	**0.0**	**0.0**
Neer-Ponto Complex, 2 to 30	100%	707.5						
Neer	40.0%	283.0	0.0	0.0	0.0	0.0	0.0	0.0
Ponto	40.0%	283.0	0.0	0.0	0.0	0.0	0.0	0.0
Kindig	6.6%	46.7	0.0	0.0	0.0	0.0	0.0	0.0
Neuns	6.6%	46.7	0.0	0.0	0.0	0.0	0.0	0.0
Rubbleland	6.6%	46.7	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Neer-Ponto Complex, 30 to 50	100%	405.1						
Neer	45.0%	182.3	0.0	0.0	0.0	0.0	0.0	0.0
Ponto	35.0%	141.8	0.0	0.0	0.0	0.0	0.0	0.0
Kindig	6.6%	26.7	0.0	0.0	0.0	0.0	0.0	0.0
Neuns	6.6%	26.7	0.0	0.0	26.7	0.0	0.0	0.0
Rubbleland	6.6%	26.7	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**0.0**	**26.7**	**0.0**	**0.0**	**0.0**
Obie-Mounthat Complex, 5 to 15	100%	272.2						
Obie	40.0%	108.9	0.0	108.9	0.0	0.0	0.0	0.0
Mounthat	35.0%	95.3	0.0	0.0	0.0	0.0	0.0	0.0
Bundora	12.5%	34.0	0.0	0.0	0.0	0.0	0.0	0.0
Goulder	12.5%	34.0	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**108.9**	**0.0**	**0.0**	**0.0**	**0.0**
Odas Loam, 0 to 2	100%	59.7						
Odas	96.7%	57.7	0.0	0.0	0.0	0.0	0.0	0.0
Stoner	3.3%	2.0	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Ponto Sandy Loam, 2 to 15	100%	154.1						
Ponto	100.0%	154.1	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Ponto-Wyntoon Complex, 2 to 15	100%	220.4						
Shasta	50.0%	110.2	0.0	0.0	0.0	0.0	0.0	0.0
Sadie	50.0%	110.2	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Rubbleland-Rock Outcrop Complex, 30 to 75	100%	46.5						
Rubbleland	55.0%	25.6	0.0	25.6	0.0	0.0	0.0	0.0
Rock outcrop	45.0%	20.9	0.0	20.9	0.0	0.0	0.0	20.9
			0.0	46.5	0.0	0.0	0.0	20.9
0	na	12.3						
There is no distinction between "Kettlbelly-Neuns" and "Kettlebelly-Dry Neuns" in the Pondosa document. Put all in the one category								

Angel Creek

SOIL	% AREA	AREA	HYDRO C	HYDRO D	H EHR	VH EHR	GP	ROCK
Kindig-Neuns Complex, 30 to 50	100%	178.6						
Kindig	45.0%	80.4	0.0	0.0	0.0	0.0	0.0	0.0
Neuns	35.0%	62.5	0.0	0.0	62.5	0.0	0.0	0.0
Kettlebelly	10.0%	17.9	17.9	0.0	17.9	0.0	0.0	0.0
Neer	10.0%	17.9	0.0	0.0	0.0	0.0	0.0	0.0
			17.9	0.0	80.4	0.0	0.0	0.0
Kindig-Neuns Complex, 50 to 75	100%	1725.5						
Kindig	30.0%	517.7	0.0	0.0	517.7	517.7	0.0	0.0
Neuns	50.0%	862.8	0.0	0.0	862.8	862.8	0.0	0.0
Etsel	6.7%	115.6	0.0	115.6	0.0	115.6	0.0	0.0
Kettlebelly	6.7%	115.6	115.6	0.0	115.6	115.6	0.0	0.0
Neer	6.7%	115.6	0.0	0.0	0.0	0.0	0.0	0.0
			115.6	115.6	1496.0	1611.6	0.0	0.0
Neer gravely sandy loam, 50 to 75	100%	1823.4						
Neer	85.0%	1549.9	0.0	0.0	1549.9	1549.9	0.0	0.0
Kindig	5.0%	91.2	0.0	0.0	91.2	91.2	0.0	0.0
Neuns	5.0%	91.2	0.0	0.0	91.2	91.2	0.0	0.0
Rubbleland	5.0%	91.2	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	0.0	1732.2	1732.2	0.0	0.0
Neer-Ponto Complex, 2 to 30	100%	1377.4						
Neer	40.0%	551.0	0.0	0.0	0.0	0.0	0.0	0.0
Ponto	40.0%	551.0	0.0	0.0	0.0	0.0	0.0	0.0
Kindig	6.6%	90.9	0.0	0.0	0.0	0.0	0.0	0.0
Neuns	6.6%	90.9	0.0	0.0	0.0	0.0	0.0	0.0
Rubbleland	6.6%	90.9	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	0.0	0.0	0.0	0.0	0.0
Neer-Ponto Complex, 30 to 50	100%	1228.8						
Neer	45.0%	553.0	0.0	0.0	0.0	0.0	0.0	0.0
Ponto	35.0%	430.1	0.0	0.0	0.0	0.0	0.0	0.0
Kindig	6.6%	81.1	0.0	0.0	0.0	0.0	0.0	0.0
Neuns	6.6%	81.1	0.0	0.0	81.1	0.0	0.0	0.0
Rubbleland	6.6%	81.1	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	0.0	81.1	0.0	0.0	0.0
Obie-Mounthat Complex, 5 to 15	100%	1608.4						
Obie	40.0%	643.4	0.0	643.4	0.0	0.0	0.0	0.0
Mounthat	35.0%	562.9	0.0	0.0	0.0	0.0	0.0	0.0
Bundora	12.5%	201.1	0.0	0.0	0.0	0.0	0.0	0.0
Goulder	12.5%	201.1	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	643.4	0.0	0.0	0.0	0.0

Obie-Mounthat Complex, 15 to 30	100%	509.0						
Obie	45.0%	229.1	0.0	229.1	0.0	0.0	0.0	0.0
Mounthat	35.0%	178.2	0.0	0.0	0.0	0.0	0.0	0.0
Bundora	10.0%	50.9	0.0	0.0	0.0	0.0	0.0	0.0
Goulder	10.0%	50.9	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**229.1**	**0.0**	**0.0**	**0.0**	**0.0**
Obie-Mounthat Complex, 30 to 50	100%	1657.7	0.0					
Obie	50.0%	828.9	0.0	828.9	828.9	0.0	0.0	0.0
Mounthat	45.0%	746.0	0.0	0.0	746.0	0.0	0.0	0.0
Rock outcrop	5.0%	82.9	0.0	0.0	0.0	0.0	0.0	82.9
			0.0	**828.9**	**1574.8**	**0.0**	**0.0**	**82.9**
Odas Loam, 0 to 2	100%	17.3						
Odas	96.7%	16.7	0.0	0.0	0.0	0.0	0.0	0.0
Stoner	3.3%	0.6	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Ponto-Wyntoon Complex, 2 to 15	100%	258.9						
Shasta	50.0%	129.5	0.0	0.0	0.0	0.0	0.0	0.0
Sadie	50.0%	129.5	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Stoner Gravely Sandy Loam, 2 to 15		145.7						

Star City Creek

SOIL	% AREA	AREA	HYDRO C	HYDRO D	H EHR	VH EHR	GP	ROCK
Esro Silt Loam, 0 to 2	100%	85.9						
Esro	90.0%	77.3	0.0	~~[illegible]~~ 13	0.0	0.0	0.0	0.0
Ricketts	5.0%	4.3	0.0	0.0	0.0	0.0	0.0	0.0
Sweagert	5.0%	4.3	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	~~[illegible]~~ 13	**0.0**	**0.0**	**0.0**	**0.0**
Etsel-Neuns Complex, 50 to 75	100%	1373.4						
Etsel	55.0%	755.4	0.0	~~[illegible]~~ 755.4	0.0	755.4	0.0	0.0
Neuns	35.0%	480.7	0.0	0.0	480.7	480.7	0.0	0.0
Kindig	5.0%	68.7	0.0	0.0	68.7	68.7	0.0	0.0
Rock outcrop	5.0%	68.7	0.0	0.0	0.0	0.0	0.0	68.7
			0.0	~~[illegible]~~ 755.4	**549.4**	**1304.7**	**0.0**	**68.7**
Goulding Family-Rock Outcrop Complex, 50 to 80	100%	12.1						
Goulding	60.0%	7.3	0.0	7.3	0.0	0.0	0.0	0.0
Rock outcrop	30.0%	3.6	0.0	3.6	0.0	0.0	0.0	3.6
Etsel	10.0%	1.2	0.0	1.2	0.0	1.2	0.0	0.0
			0.0	**12.1**	**0.0**	**1.2**	**0.0**	**3.6**
Kindig-Neuns Complex, 15 to 30	100%	411.9						
Kindig	45.0%	185.4	0.0	0.0	0.0	0.0	0.0	0.0
Neuns	35.0%	144.2	0.0	0.0	0.0	0.0	0.0	0.0
Kettlebelly	10.0%	41.2	41.2	0.0	0.0	0.0	0.0	0.0
Neer	10.0%	41.2	0.0	0.0	0.0	0.0	0.0	0.0
			41.2	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Kindig-Neuns Complex, 30 to 50	100%	1498.7						
Kindig	45.0%	674.4	0.0	0.0	0.0	0.0	0.0	0.0
Neuns	35.0%	524.5	0.0	0.0	524.5	0.0	0.0	0.0
Kettlebelly	10.0%	149.9	149.9	0.0	149.9	0.0	0.0	0.0
Neer	10.0%	149.9	0.0	0.0	0.0	0.0	0.0	0.0
			149.9	**0.0**	**674.4**	**0.0**	**0.0**	**0.0**
Kindig-Neuns Complex, 50 to 75	100%	1382.5						
Kindig	30.0%	414.8	0.0	0.0	414.8	414.8	0.0	0.0
Neuns	50.0%	691.3	0.0	0.0	691.3	691.3	0.0	0.0
Etsel	6.7%	92.6	0.0	92.6	0.0	92.6	0.0	0.0
Kettlebelly	6.7%	92.6	92.6	0.0	92.6	92.6	0.0	0.0
Neer	6.7%	92.6	0.0	0.0	0.0	0.0	0.0	0.0
			92.6	**92.6**	**1198.6**	**1291.3**	**0.0**	**0.0**
Mounthat-Rock Outcrop Complex, 50 to 75	100%	1.0						
Mounthat	76.7%	0.8	0.0	0.0	0.8	0.0	0.0	0.0
Rock outcrop	20.0%	0.2	0.2	0.0	0.0	0.0	0.0	0.2
Obie	3.3%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
			0.2	**0.0**	**0.8**	**0.0**	**0.0**	**0.2**

Neer gravely sandy loam, 50 to 75	100%	1030.7						
Neer	85.0%	876.1	0.0	0.0	876.1	876.1	0.0	0.0
Kindig	5.0%	51.5	0.0	0.0	51.5	51.5	0.0	0.0
Neuns	5.0%	51.5	0.0	0.0	51.5	51.5	0.0	0.0
Rubbleland	5.0%	51.5	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**0.0**	**979.2**	**979.2**	**0.0**	**0.0**
Neer-Ponto Complex, 2 to 30	100%	72.2						
Neer	40.0%	28.9	0.0	0.0	0.0	0.0	0.0	0.0
Ponto	40.0%	28.9	0.0	0.0	0.0	0.0	0.0	0.0
Kindig	6.6%	4.8	0.0	0.0	0.0	0.0	0.0	0.0
Neuns	6.6%	4.8	0.0	0.0	0.0	0.0	0.0	0.0
Rubbleland	6.6%	4.8	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Neer-Ponto Complex, 30 to 50	100%	104.5						
Neer	45.0%	47.0	0.0	0.0	0.0	0.0	0.0	0.0
Ponto	35.0%	36.6	0.0	0.0	0.0	0.0	0.0	0.0
Kindig	6.6%	6.9	0.0	0.0	0.0	0.0	0.0	0.0
Neuns	6.6%	6.9	0.0	0.0	6.9	0.0	0.0	0.0
Rubbleland	6.6%	6.9	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**0.0**	**6.9**	**0.0**	**0.0**	**0.0**
Obie-Mounthat Complex, 5 to 15	100%	913.6						
Obie	40.0%	365.4	0.0	365.4	0.0	0.0	0.0	0.0
Mounthat	35.0%	319.8	0.0	0.0	0.0	0.0	0.0	0.0
Bundora	12.5%	114.2	0.0	0.0	0.0	0.0	0.0	0.0
Goulder	12.5%	114.2	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**365.4**	**0.0**	**0.0**	**0.0**	**0.0**
Obie-Mounthat Complex, 15 to 30	100%	672.2						
Obie	45.0%	302.5	0.0	302.5	0.0	0.0	0.0	0.0
Mounthat	35.0%	235.3	0.0	0.0	0.0	0.0	0.0	0.0
Bundora	10.0%	67.2	0.0	0.0	0.0	0.0	0.0	0.0
Goulder	10.0%	67.2	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**302.5**	**0.0**	**0.0**	**0.0**	**0.0**
Obie-Mounthat Complex, 30 to 50	100%	540.5	0.0					
Obie	50.0%	270.3	0.0	270.3	270.3	0.0	0.0	0.0
Mounthat	45.0%	243.2	0.0	0.0	243.2	0.0	0.0	0.0
Rock outcrop	5.0%	27.0	0.0	0.0	0.0	0.0	0.0	27.0
			0.0	**270.3**	**513.5**	**0.0**	**0.0**	**27.0**

Rock Outcrop, Metamorphic	100%	7.1	0.0	0.0	0.0	0.0	0.0	7.1
			0.0	**0.0**	**0.0**	**0.0**	**0.0**	**7.1**
Rubbleland-Rock Outcrop Complex, 30 to 75	100%	46.5						
Rubbleland	55.0%	25.6	0.0	25.6	0.0	0.0	0.0	0.0
Rock outcrop	45.0%	20.9	0.0	20.9	0.0	0.0	0.0	20.9
			0.0	**46.5**	**0.0**	**0.0**	**0.0**	**20.9**

SOIL	% AREA	AREA	HYDRO C	HYDRO D	H EHR	VH EHR	GP	ROCK
Chaix-Chawanakee Complex, 60 to 80	100%	559.7						
Chaix	60.0%	335.8	0.0	0.0	0.0	0.0	0.0	0.0
Chawanakee	30.0%	167.9	167.9	0.0	0.0	0.0	0.0	0.0
Ovall	10.0%	56.0	0.0	0.0	0.0	0.0	0.0	0.0
			167.9	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Chatterdown-Nikal Complex, 2 to 15	100%	105.2						
Chatterdown	60.0%	63.1	0.0	0.0	0.0	0.0	0.0	0.0
Nikal	25.0%	26.3	0.0	0.0	0.0	0.0	0.0	0.0
Gaspar	7.5%	7.9	0.0	0.0	0.0	0.0	0.0	0.0
Scarface	7.5%	7.9	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Deadwood-Neuns Complex, 60 to 80	100%	1427.5						
Deadwood	40.0%	571.0	571.0	0.0	0.0	0.0	0.0	0.0
Neuns	35.0%	499.6	0.0	0.0	499.6	[499.6]	0.0	0.0
Typic Xerorthents	5.0%	71.4	0.0	0.0	0.0	0.0	0.0	0.0
Rock outcrop, metamorphic	5.0%	71.4	0.0	0.0	0.0	0.0	0.0	71.4
Rubbleland	5.0%	71.4	0.0	0.0	0.0	0.0	0.0	0.0
Marpa	5.0%	71.4	0.0	0.0	0.0	0.0	0.0	0.0
Hugo, deep	5.0%	71.4	0.0	0.0	0.0	0.0	0.0	0.0
			571.0	**0.0**	**499.6**	**499.6**	**0.0**	**71.4**
Etsel-Neuns Complex, 50 to 75	100%	3544.4						
Etsel	55.0%	1949.4	0.0	1949.4	0.0	1949.4	0.0	0.0
Neuns	35.0%	1240.5	0.0	0.0	1240.5	[1240.5]	0.0	0.0
Kindig	5.0%	177.2	0.0	0.0	177.2	177.2	0.0	0.0
Rock outcrop	5.0%	177.2	0.0	0.0	0.0	0.0	0.0	177.2
			0.0	**1949.4**	**1417.8**	**3367.2**	**0.0**	**177.2**
Gaspar-Scarface, moist, 2 to 15	100%	1944.9						
Gaspar	55.0%	1069.7	0.0	0.0	0.0	0.0	0.0	0.0
Scarface	35.0%	680.7	0.0	0.0	0.0	0.0	0.0	0.0
Chatterdown	5.0%	97.2	0.0	0.0	0.0	0.0	0.0	0.0
Nikal	5.0%	97.2	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Gaspar-Scarface, moist, 15 to 30	100%	2934.8	0.0	0.0		0.0	0.0	0.0
Gaspar	52.5%	1540.8	0.0	0.0	0.0	0.0	0.0	0.0
Scarface	37.5%	1100.6	0.0	0.0	0.0	0.0	0.0	0.0
Chatterdown	5.0%	146.7	0.0	0.0	0.0	0.0	0.0	0.0
Nikal	5.0%	146.7	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Gaspar-Scarface, moist, 30 to 50	100%	915.1	0.0	0.0		0.0	0.0	0.0
Gaspar	62.5%	571.9	0.0	0.0	0.0	0.0	0.0	0.0
Scarface	22.5%	205.9	0.0	0.0	0.0	0.0	0.0	0.0
Chatterdown	8.8%	80.1	0.0	0.0	0.0	0.0	0.0	0.0
Nikal	8.8%	80.1	0.0	0.0	0.0	0.0	0.0	0.0
Rock outcrop	2.5%	22.9	0.0	0.0	0.0	0.0	0.0	22.9
			0.0	**0.0**	**0.0**	**0.0**	**0.0**	**22.9**
Goulding-Neuns Complex, 50 to 80	100%	1005.7						
Goulding	50.0%	502.9	0.0	502.9	0.0	0.0	0.0	0.0
Neuns	30.0%	301.7	0.0	0.0	301.7	301.7	0.0	0.0
Rock outcrop, metamorphic	6.7%	67.4	0.0	0.0	0.0	0.0	0.0	67.4
Typic Xerorthents	6.7%	67.4	0.0	0.0	0.0	0.0	0.0	0.0
Hugo, mod deep	6.7%	67.4	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**502.9**	**301.7**	**301.7**	**0.0**	**67.4**
Goulding Family Rock Outcrop Complex, 50 to 80	100%	316.1						
Goulding	60.0%	189.7	0.0	189.7	0.0	0.0	0.0	0.0
Rock outcrop	30.0%	94.8	0.0	94.8	0.0	0.0	0.0	94.8
Etsel	10.0%	31.6	0.0	31.6	0.0	31.6	0.0	0.0
			0.0	**316.1**	**0.0**	**31.6**	**0.0**	**94.8**
Gullied land rock outcrop, Mounthat Complex, 50 to 75	100%	955.7						
Gullied lands	50.0%	477.9	0.0	477.9	0.0	477.9	477.9	0.0
Rock outcrop	30.0%	286.7	0.0	0.0	0.0	0.0	0.0	286.7
Mounthat	10.0%	95.6	0.0	0.0	95.6	0.0	0.0	0.0
Etsel	5.0%	47.8	0.0	47.8	0.0	47.8	0.0	0.0
Rubbleland	5.0%	47.8	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**525.6**	**95.6**	**525.6**	**477.9**	**286.7**
Jimmerson loam, stony sandy loam, Complex, 2 to 15	100%	52.2						
Jimmerson loam	62.5%	32.6	0.0	0.0	0.0	0.0	0.0	0.0
Jimmerson stony, sandy loam	35.0%	18.3	0.0	0.0	0.0	0.0	0.0	0.0
shallow soils over weathered bedrock	2.5%	1.3	0.0	1.3	1.3	0.0	0.0	0.0
			0.0	**1.3**	**1.3**	**0.0**	**0.0**	**0.0**
Kindig-Neuns Complex, 15 to 30	100%	24.4						
Kindig	45.0%	11.0	0.0	0.0	0.0	0.0	0.0	0.0
Neuns	35.0%	8.5	0.0	0.0	0.0	0.0	0.0	0.0
Kettlebelly	10.0%	2.4	2.4	0.0	0.0	0.0	0.0	0.0
Neer	10.0%	2.4	0.0	0.0	0.0	0.0	0.0	0.0
			2.4	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Kindig-Neuns Complex, 30 to 50	100%	218.1						
Kindig	45.0%	98.1	0.0	0.0	0.0	0.0	0.0	0.0
Neuns	35.0%	76.3	0.0	0.0	76.3	0.0	0.0	0.0
Kettlebelly	10.0%	21.8	21.8	0.0	21.8	0.0	0.0	0.0
Neer	10.0%	21.8	0.0	0.0	0.0	0.0	0.0	0.0
			21.8	**0.0**	**98.1**	**0.0**	**0.0**	**0.0**
Kindig-Neuns Complex, 50 to 75	100%	3068.0						
Kindig	30.0%	920.4	0.0	0.0	920.4	920.4	0.0	0.0
Neuns	50.0%	1534.0	0.0	0.0	1534.0	1534.0	0.0	0.0
Etsel	6.7%	205.6	0.0	205.6	0.0	205.6	0.0	0.0
Kettlebelly	6.7%	205.6	205.6	0.0	205.6	205.6	0.0	0.0
Neer	6.7%	205.6	0.0	0.0	0.0	0.0	0.0	0.0
			205.6	**205.6**	**2660.0**	**2865.5**	**0.0**	**0.0**
Mounthat-Rock Outcrop Complex, 50 to 75	100%	428.7						
Mounthat	76.7%	328.8	0.0	0.0	328.8	0.0	0.0	0.0
Rock outcrop	20.0%	85.7	0.0	0.0	0.0	0.0	0.0	85.7
Obie	3.3%	14.1	0.0	14.1	14.1	0.0	0.0	0.0
			0.0	**14.1**	**343.0**	**0.0**	**0.0**	**85.7**
Neer gravely sandy loam, 50 to 75	100%	74.4						
Neer	85.0%	63.2	0.0	0.0	63.2	63.2	0.0	0.0
Kindig	5.0%	3.7	0.0	0.0	3.7	3.7	0.0	0.0
Neuns	5.0%	3.7	0.0	0.0	3.7	3.7	0.0	0.0
Rubbleland	5.0%	3.7	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**0.0**	**70.7**	**70.7**	**0.0**	**0.0**
Neer-Ponto, dark surface, Complex, 30 to 50%	100%	3065.5						
Neer	45.0%	1379.5	0.0	0.0	1379.5	0.0	0.0	0.0
Ponto	35.0%	1072.9	0.0	0.0	1072.9	0.0	0.0	0.0
Kindig	6.7%	205.4	0.0	0.0	205.4	0.0	0.0	0.0
Neuns	6.7%	205.4	0.0	0.0	205.4	0.0	0.0	0.0
Rubbleland	6.7%	205.4	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**0.0**	**2863.2**	**0.0**	**0.0**	**0.0**
Neuns Family, 40 to 60	100%	837.1						
Neuns	81.1%	678.9	0.0	0.0	678.9	0.0	0.0	0.0
Hugo, mod deep	6.3%	52.3	0.0	0.0	0.0	0.0	0.0	0.0
Deadwood	6.3%	52.3	52.3	0.0	0.0	0.0	0.0	0.0
Rock outcrop, metamorphic	6.3%	52.3	0.0	0.0	0.0	0.0	0.0	52.3
			52.3	**0.0**	**678.9**	**0.0**	**0.0**	**52.3**

Curtis-Devils Canyon (Continued)

Neuns Family, 60 to 80	1	748.9						
Neuns	75.0%	561.7	0.0	0.0	561.7	0.0	0.0	0.0
Hugo, mod deep	6.3%	46.8	0.0	0.0	0.0	0.0	0.0	0.0
Deadwood	6.3%	46.8	46.8	0.0	0.0	0.0	0.0	0.0
Rock outcrop, metamorphic	6.3%	46.8	0.0	0.0	0.0	0.0	0.0	46.8
Typic Xerorthents	6.3%	46.8	0.0	0.0	0.0	0.0	0.0	0.0
			46.8	**0.0**	**561.7**	**0.0**	**0.0**	**46.8**
Neuns Family-Typic Xerorthents, 50 to 60	100%	19.8						
Neuns	60.0%	11.9	0.0	0.0	11.9	11.9	0.0	0.0
Typic Xerorthents	30.0%	5.9	0.0	0.0	0.0	0.0	0.0	0.0
Deadwood	3.3%	0.7	0.7	0.0	0.0	0.0	0.0	0.0
Marpa	3.3%	0.7	0.0	0.0	0.0	0.0	0.0	0.0
Rock outcrop, metamorphic	3.3%	0.7	0.0	0.0	0.0	0.0	0.0	0.7
			0.7	**0.0**	**11.9**	**11.9**	**0.0**	**0.7**
Neuns-Deadwood Complex, 60 to 80	100%	933.5						
Neuns	50.0%	466.8	0.0	0.0	466.8	466.8	0.0	0.0
Deadwood	30.0%	280.1	280.1	0.0	0.0	0.0	0.0	0.0
Typic Xerorthents	6.8%	63.0	0.0	0.0	0.0	0.0	0.0	0.0
Rock outcrop, metamorphic	6.8%	63.0	0.0	0.0	0.0	0.0	0.0	63.0
Rubbleland	6.8%	63.0	0.0	0.0	0.0	0.0	0.0	0.0
			280.1	**0.0**	**466.8**	**466.8**	**0.0**	**63.0**
Neuns-Holland, Deep Family Complex, 20 to 40	100%	29.4						
Neuns	55.0%	16.2	0.0	0.0	16.2	0.0	0.0	0.0
Holland	35.0%	10.3	0.0	0.0	0.0	0.0	0.0	0.0
Marpa	10.0%	2.9	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**0.0**	**16.2**	**0.0**	**0.0**	**0.0**
Obie-Mounthat Complex, 5 to 15	100%	622.0						
Obie	40.0%	248.8	0.0	248.8	0.0	0.0	0.0	0.0
Mounthat	35.0%	217.7	0.0	0.0	0.0	0.0	0.0	0.0
Bundora	12.5%	77.8	0.0	0.0	0.0	0.0	0.0	0.0
Goulder	12.5%	77.8	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**248.8**	**0.0**	**0.0**	**0.0**	**0.0**
Obie-Mounthat Complex, 15 to 30	100%	1749.6						
Obie	45.0%	787.3	0.0	787.3	0.0	0.0	0.0	0.0
Mounthat	35.0%	612.4	0.0	0.0	0.0	0.0	0.0	0.0
Bundora	10.0%	175.0	0.0	0.0	0.0	0.0	0.0	0.0
Goulder	10.0%	175.0	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**787.3**	**0.0**	**0.0**	**0.0**	**0.0**

Obie-Mounthat Complex, 30 to 50	100%	712.0	0.0					
Obie	50.0%	356.0	0.0	356.0	356.0	0.0	0.0	0.0
Mounthat	45.0%	320.4	0.0	0.0	320.4	0.0	0.0	0.0
Rock outcrop	5.0%	35.6	0.0	0.0	0.0	0.0	0.0	35.6
			0.0	**356.0**	**676.4**	**0.0**	**0.0**	**35.6**
Ponto-Neer, dark surface, Complex, 15 to 30	100%	1100.8						
Ponto	55.0%	605.4	0.0	0.0	0.0	0.0	0.0	0.0
Neer	30.0%	330.2	0.0	0.0	0.0	0.0	0.0	0.0
Gaspar	7.5%	82.6	0.0	0.0	0.0	0.0	0.0	0.0
Scarface	7.5%	82.6	0.0	0.0	0.0	0.0	0.0	0.0
			0.0	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Sheld, 20 to 40	100%	223.6						
Sheld	75.0%	167.7	0.0	0.0	0.0	0.0	0.0	0.0
Revit	6.2%	13.9	0.0	0.0	0.0	0.0	0.0	0.0
Washougal	6.2%	13.9	0.0	0.0	0.0	0.0	0.0	0.0
Yallani	6.2%	13.9	0.0	0.0	0.0	0.0	0.0	0.0
Rock outcrop, volcanic	6.2%	13.9	0.0	0.0	0.0	0.0	0.0	13.9
			0.0	**0.0**	**0.0**	**0.0**	**0.0**	**13.9**
Washougal-Rock outcrop, 60 to 80	100%	544.9						
Washougal	50.0%	272.5	0.0	0.0	0.0	0.0	0.0	0.0
Rock outcrop, volcanic	30.0%	163.5	0.0	0.0	0.0	0.0	0.0	163.5
German	10.0%	54.5	0.0	0.0	0.0	0.0	0.0	0.0
Ledmont	10.0%	54.5	0.0	54.5	0.0	0.0	0.0	0.0
			0.0	**54.5**	**0.0**	**0.0**	**0.0**	**163.5**
Rock Outcrop, Metamorphic, 50 to 80	100%	74.6	0.0	0.0	0.0	0.0	0.0	74.6
Water	na	7.8						
999	na	31.1						

Appendix I. The Hearst Corporation Spotted Owl Management Plan

The Hearst Corporation Spotted Owl Management Plan

Prepared By:

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Woodlands Manager

July 22, 1993

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INTRODUCTION AND BACKGROUND

The Hearst Corporation (Hearst) currently owns over 60,000 acres of land in Siskiyou and Shasta Counties. The entire property, known as The Hearst Wyntoon Tree Farm, includes approximately 58,000 acres of timberland which is managed for a wide variety of forest resource values. These values include, but are not limited to, timber, fisheries, wildlife, water quality and private recreation.

All of the above lands are included in the California Cascades subregion of the designated range of the northern spotted owl, listed by the U.S. Fish and Wildlife Service as a threatened species in July, 1990. "No take" rules promulgated by the California Board of Forestry (BOF), in cooperation with the U.S. Fish and Wildlife Service (USFWS), currently serve to ensure against possible "take" of the species as a result of timber harvesting activities on private land in the state. At the time of their adoption the BOF recognized that these rules were, at best, a short term solution to a problem that required more long term planning. It also expressed concern over the potential negative effect the rules could have on timber harvesting plan (THP) costs and larger timber supply problems. The BOF subsequently decided to develop a state Habitat Conservation Plan (HCP), which could possibly serve as a basis for application through the USFWS of an "incidental take" permit pursuant to Section 10 of the federal Endangered Species Act (ESA). The state HCP, as originally conceived, theoretically would provide for lower THP costs, and allow for some "incidental take" while ensuring overall viability of the owl within its range. As of this writing, a draft state HCP is being prepared, and will be presented to the BOF for review and consideration sometime in 1993.

As a private landowner, The Hearst Corporation has been subject to the BOF "no take" rules in its timber management activities since July of 1990. Hearst has conducted, and continues to conduct, northern spotted owl (NSO) surveys over its entire ownership. These surveys have, for the most part, indicated a lack of NSO presence throughout the property. The reasons for this are not known, insofar as much of the ownership has what has heretofore been defined as "good" NSO habitat. This, coupled with relatively low NSO numbers and a lack of information on NSO's historical occupancy in this subregion, have suggested to some that NSOs may be at the fringe of their natural range in the vicinity of the ownership.

Over the years, Hearst has worked closely with state and federal agencies on a variety of wildlife related issues. The corporation's interest in wildlife management and preservation are well known. This interest, the lack of knowledge about NSO behavior and habitat needs in the California Cascade region, a concomitant desire not to foreclose management options for the owl in the region, and the questionable appropriateness of a state HCP which sanctions "incidental take" for an area with so few owls ... have led to the development of this owl management plan.

The purpose of this owl management plan (OMP) is to ensure that forest management activities on Hearst lands will not result in a "take" of a NSO.

MANAGEMENT ACTIVITIES WHICH COULD CONTRIBUTE TO A TAKING OF A NORTHERN SPOTTED OWL

"Take", as defined by the federal Endangered Species Act, means "to harass, harm, pursue, hunt, shoot, wound, kill, capture, or collect, or to attempt to engage in any such conduct." As further defined by implementing regulation, take can also result through alteration of habitat such that it is no longer suitable for occupation by a given species.

Management activities on the Hearst Wyntoon Tree Farm can result in a take in the following ways:

1) Direct killing or injuring of owls;

2) Disturbance of nesting birds, resulting in nest abandonment or destruction;

3) Altering stand structures so as to eliminate suitable nest structures or associated male roosting locations;

4) Leaving inadequate amounts of suitable foraging habitat within the home range of a nesting pair;

5) Leaving inadequate amounts of dispersal habitat between owl activity areas for use by juvenile birds;

6) Reducing the prey base below levels required to support viable, existing NSO populations;

7) Altering forest stand structures and distributions in such a way as to effect increased predator opportunities.

STATEMENT OF PURPOSE

This OMP shall serve as a guideline for forest management practices on lands of The Hearst Corporation, as agreed to by the corporation and the U.S. Fish and Wildlife Service.

This plan shall ensure the following:

- protection of all northern spotted owls and NSO nests discovered on Hearst lands from disturbance which may arise from forest management activities on the ownership

- retention of suitable NSO habitat, as defined below, over the Hearst landscape.

- retention and management of specified timber types, defined below, for nesting, roosting and foraging habitat characteristics over the Hearst landscape

It is the goal of The Hearst Corporation to manage all the natural resources of its lands in a manner consistent with accepted and sound ecological principles. This plan strives to provide for the biological needs of the northern spotted owl, while recognizing the need to simultaneously and harmoniously manage for a diversity of wildlife and other forest resource values. The means to achieving these goals are detailed further in the pages which follow.

MANAGEMENT HISTORY OF THE WYNTOON TREE FARM

General Description

The Hearst Wyntoon Tree Farm is located approximately 50 miles south of the Oregon border near the town of McCloud. Much of the 61,000 acres that currently constitutes the tree farm was acquired by William Randolph Hearst in the early 1900s. The original acreage was somewhat fragmented, but over the years was consolidated through land exchanges and additional purchases into two main blocks, adjacent to one another, which are referred to as the Kosk Creek and Wyntoon Tracts. The Wyntoon Tract lies just southeast of the town of McCloud and is bisected by the Upper McCloud River.

Elevations range from 2,800 to near 6,000 feet above sea level, with a geomorphology which is fairly typical of many areas along the southern Cascade range. Many of the representative soil series are volcanic in origin, some of which derive from mud flows as recent as 1924. Site productivity on these soils is generally high, although a wide spectrum of site classifications, ranging from 1A to 5 can be found throughout the property. The bulk of the ownership has mild topography with slopes generally less than 60%.

Only 58,000 of the total 61,000 acres is classified as commercial timberland, which support a wide range of coniferous vegetation types -- pure ponderosa pine stands, mixed conifer, pure white fir, pure stands of shasta red fir, and minor amounts of knobcone and lodgepole pine.

A variety of wildlife occur on the property, including but not limited to bald eagle, osprey, golden eagle, northern goshawk, numerous other raptors, great blue heron, black-tailed deer, black bear, elk, wolverine, gray fox, ermine, bobcat, mountain lion, redband trout, Dolly Varden trout, brown trout and rainbow trout.

Logging and Management History

The property was first certified as a commercial forest -- and originally designated the Hearst Wyntoon Tree Farm -- in 1952 by the Western Pine Association. Since 1952, The Hearst Corporation entered into a number of long term contracts with various mills in the region, the most recent of which terminated in 1984. Since then, Hearst has chosen to put annual delivered log offerings up for bid on the open market.

Both even and uneven-aged silvicultural practices have been exercised over the ownership. Despite the fact that 1) significant areas and volumes of virgin old-growth still exist on the property, and 2) most of the property is well stocked with trees of many size classes ... one would have to characterize the Hearst forest as being in a "transition" stage of development between old and fully regulated young growth forest regimes. Some areas heavily impacted in the past continue to be in need of rehabilitation. Others need only to be maintained through selective cuts and commercial thinnings.

Current Management Philosophy

The current land management ethic of the corporation can best be summarized as follows:

1) To keep the land as productive as possible, and to maintain and enhance the health of the timber that grows on it. To this end uneven-aged stand structures are encouraged, but even-aged strategies are also employed as site specific conditions warrant.

2) To institutionalize silvicultural strategies which serve to benefit the diverse wildlife resource as well as timber over the landscape.

3) To promote operational practices which maximize the aesthetic qualities of the landscape.

WILDLIFE HABITAT RELATIONSHIPS

The diversity of vegetation types found on the Wyntoon Tree Farm is well reflected on company stand class maps, which were derived from 1:12,000 scale aerial photographs and site specific cruise information. Crosswalks between company stand types and "California Wildlife Habitat Relationship" (WHR) vegetation types (Mayer and Laudenslayer, 1988) have been developed, and new maps showing distribution of WHR vegetation types and stages over the ownership have been generated. (Reference Appendices D-G)

1992 baseline maps indicate distribution of 57 WHR type/stage combinations over 16 planning watersheds within ownership boundaries.

BIOLOGICAL REQUIREMENTS OF THE NORTHERN SPOTTED OWL

The much publicized 1990 report of the Interagency Scientific Committee, "A Conservation Strategy for the Northern Spotted Owl", notes that characteristic NSO habitat has a "multilayered, multi-species canopy dominated by large (30+ inches in dbh) conifer overstory trees, and an understory of shade tolerant conifers or hardwoods; a moderate to high (60 to 80%) canopy closure; substantial decadence in the form of large, live coniferous trees with deformities - such as cavities, broken tops, and dwarf mistletoe infections; numerous large snags; ground cover characterized by large accumulations of logs and other woody debris; and a canopy that is open enough to allow NSOs to fly within and beneath it." (page 157)

For the most part, the ISC report drew from studies in old-growth forest types in Oregon, Washington and, to a lesser extent, northwestern California. Much evidence has accumulated since the ISC report was published indicating that NSOs in northwestern California will utilize a wider variety of timber stands than originally assumed, and are not necessarily old growth dependent as once believed. Recent studies on both Pacific Lumber Company and Simpson Timber Company lands suggest that NSOs will successfully nest, roost and forage in managed stands with canopy closures as open as 25%, so long as important second story stand components and a prey base are present (Kerns 1992, Champion 1991). These studies have provided further evidence that old growth, per se', is not as important to the owl as the presence of important structural attributes within given stands. These findings are supported by other recent studies which are referenced in both the USFS "Draft Recovery Plan for the Northern Spotted Owl", as well as the 1993 USFS report, "Viability Assessments and Management Considerations for Species Associated with Late-Successional and Old-Growth Forests of the Pacific Northwest".

Little is currently known about NSO historical occupancy and habitat needs in the California Cascades subregion of the Klamath Province. What is known is that in this particular region spotted owls occur at low densities. Very little conventional habitat, as defined in the ISC report, exists region-wide. As noted in the ISC report, much of this area includes pine forest types which characteristically and naturally lack "multiple canopies and other structural attributes that render them unsuitable for spotted owls" (page 70). Fire, and to a lesser degree, logging may have amplified these conditions in the past.

NSO SURVEY RESULTS ON HEARST LANDS

Surveys designed to determine the existence, location and nesting status of NSOs over the entire ownership were initiated by Hearst foresters in 1990, and later conducted on an annual basis by Wildland Resource Managers. These surveys have been conducted in accordance with the U.S. Fish and Wildlife Service protocols. Survey design, procedures and results are detailed in Appendix B.

To date, only four NSO vocal responses have been solicited by surveyors since 1990. Two of these were outside the ownership on USFS lands and associated with known owl nest locations at Trough Springs and Whiskey Creek (again, on neighboring USFS land). The third response was from a single male along Kosk Creek, perhaps on Forest Service property. Subsequent efforts to locate and mouse the bird were unsuccessful. The fourth response also came from a single male, but in the lower Angel Creek watershed near the Wyntoon estate. Follow-up attempts to relocate and mouse this owl also were unsuccessful. It is presumed that the latter two owls were so-called "blinkers" who were perhaps passing through the ownership.

A fourth year of NSO surveys have now been initiated on the tree farm, with negative results as of this writing.

POSSIBLE FACTORS CONTRIBUTING TO LOW NSO DENSITIES

Much of the Hearst ownership is in coniferous and non-coniferous vegetation, as well as non-vegetated types, which must be considered as unsuitable as NSO habitat. Approximately 15.5 percent of Hearst lands are currently in barren, lacustrine, mixed chaparral, montane hardwood-chaparral, montane riparian and wet meadow WHR types.

Many coniferous WHR types, of stages "4P" or less (4P,4S,3D,3M,3P,3S, etc.), are currently only marginally suitable as NSO habitat, as conventionally defined by the ISC. These types are a result of both fire and logging activity over the property in years past.

Approximately 35.5 percent of the ownership is in WHR types and stages (4M and greater) which could be considered as good, or potentially good, NSO habitat. The distribution of these types and stages are displayed in Appendices D and G. The distribution pattern of these types/stages indicate some habitat fragmentation, but at levels which appear to be low enough to otherwise allow for viable populations of breeding pairs of owls. The general absence of owls throughout the ownership, even in stands 4M and greater, would suggest that there are other factors which limit owl numbers over the property ... and perhaps throughout the subregion itself.

Many observations have been made about stand and other conditions in the area which may provide clues to this end:

1) Many favored NSO prey species, such as woodrats, flying squirrels and red tree voles, seem to be either absent or limited in numbers.

2) Many stands of WHR stage "4M" or greater, despite exhibiting high canopy closure levels and some stand layering, do not exhibit multiple layers in the same way that Douglas-fir/hemlock, Douglas-fir/mixed conifer or redwood/Douglas-fir stands which typify Washington, Oregon and northwestern California. Large portions of the Hearst

ownership are in pure ponderosa pine, white fir or shasta red fir types which are characteristically devoid of hardwoods and other tree species (such as Douglas-fir) which normally allow for lateral tree branching and roosting opportunities in the understory. Mixed conifer types, although present on the ownership, also do not have a significant hardwood component. Mixed conifer stands that have a high incidence of Douglas-fir in both overstories and understories are scattered in distribution, and are not present in large contiguous blocks.

3) Predator species such as great horned owls and ravens are common, and naturally occur throughout the subregion because of the open forest condition and fire history. Recent studies also suggest that the northern goshawk, another predator species, likewise thrive in the open conditions which typify this region, probably because of the abundance of prey species such as the golden-mantled ground squirrel (Woodbridge, et al 1993).

WYNTOON FOREST MANAGEMENT CONSTRAINTS

A number of internally as well as externally imposed constraints to management activities on the Hearst ownership exist, which are summarized below:

Timber Management Objectives

As noted in discussions above, the general management philosophy of the corporation requires keeping the land as productive as possible, maintaining and enhancing the health of the timber base and the viability of wildlife dependent on it, and institutionalizing silvicultural practices which serve to promote wildlife, recreational and aesthetic values.

The attainability of many of these goals depends, in part, on management of designated areas specifically for promotion of their old growth qualities. As a rule, these areas have been "set aside" and will not be harvested in the years to come.

The attainability of these goals will also depend on implementation of management strategies over other areas of the Hearst forest, designated for timber production, which will eventually result in an even, sustainable flow of timber products from them. Annual harvest levels on the Wyntoon Tree Farm are currently significantly less than annual growth. Because harvest is less than growth, it can be said in a general sense that harvest is already occurring at sustainable levels. Technically speaking, however, a truly sustained yield flow is achieved only when the land is growing timber at full biological (or productive) capacity. Other management constraints (such as maintenance of a diverse wildlife resource, as discussed below) may prohibit complete realization of full biological potential. The fire and logging history of the property has resulted in a mosaic of coniferous and non-coniferous vegetation types, many of which will not be capable of growing timber at full biological capacity for many years. Some may never reach their

full productive potential for timber in light of other management constraints. However, the fact that current annual harvest is significantly less than annual growth will allow Hearst management to achieve a measure of fully regulated, sustained-yield levels sooner, relative to more intensive harvest schedules.

Recent Board of Forestry regulatory changes mandate progress towards sustained-yield forest management by private timberland owners in the state. Even though these rules severely limit even-aged management practices, they do allow forest managers access to the full range of silvicultural tools in order to effect sustained-yield management levels.

Hearst management emphasizes uneven-aged silvicultural practices. It will, however, also employ even-aged methods as necessary in order to maintain and/or enhance the health and vigor of forest stands ... and to achieve sustained-yield harvest levels as quickly as possible. The short and long term implications of these practices for the northern spotted owl will be discussed further in sections to follow.

A listing of current coniferous WHR types/stages that occur on the property, as well as silvicultural treatments in order of emphasis these are expected to receive over the next twenty years, are summarized as follows:

1. *Sierra Mixed Conifer (SMC) Type / Stages 5 and 6.* No silvicultural treatments expected with the exception of some low-level sanitation-salvage.

2. *Sierra Mixed Conifer (SMC), Klamath Mixed Conifer (KMC), Ponderosa Pine (PPN) and White Fir (WFR) Types / Stages 4S,4P,4M and 4D.* Selection, commercial and precommercial thinning, sanitation-salvage and some shelterwood removal.

3. *Sierra Mixed Conifer (SMC), Klamath Mixed Conifer (KMC), Ponderosa Pine (PPN) and White Fir (WFR) / Stage 3.* Precommercial thinning.

4. *Ponderosa Pine (PPN), Jeffrey Pine (JPN) and White Fir (WFR) Types /Stages 1 and 2.* No silvicultural treatments required.

5. *Shasta Red Fir (RFR) Type / Stages 3, 4 and 5.* Some fungal "cytospora" infestations present requiring selection, shelterwood-removal, clearcutting, sanitation-salvage and/or combinations of the above.

6. *Knobcone Pine (CPC) and Lodgepole Pine (LPN) Types / Stage 4.* Selection and shelterwood removal.

Wildlife Objectives

The Wyntoon Tree Farm has a rich variety of other wildlife species that are dependent, at minimum, on maintenance and enhancement of the diverse habitat types and stages present on the ownership. It is the desire of The Hearst Corporation to maintain a diverse and proliferate wildlife resource. A plan completely tailored to the benefit of the northern spotted owl may not necessarily be of mutual benefit to other endangered, threatened or "sensitive" species, special of special interest to The Hearst Corporation ... let alone to "biodiversity" in general.

Hearst foresters are in the process of developing a more comprehensive "wildlife management plan" for the property that takes a broad, landscape oriented approach to wildlife issues. An OMP specific to the Hearst ownership must dovetail in with concepts embodied in this more general wildlife plan.

McCloud River CRMP

Since the acquisition of the property in the early 1900s, special efforts have been undertaken by The Hearst Corporation and others to protect the uniqueness of the McCloud River corridor. These include the establishment of an old growth preserve within the inner gorge of the river by The Hearst Corporation, in which logging and intensive forest management practices are deemphasized. In 1990, Hearst, in conjunction with other principle landowners in the McCloud River drainage, entered into a Coordinated Resource Management Plan (CRMP) for portions of both the upper and lower McCloud. An OMP specific to the Hearst ownership must also complement the goals and activities of the McCloud River CRMP.

Board of Forestry Rules and Regulations

As indicated above, the Board of Forestry recently adopted a comprehensive set of rules and regulations governing forest practices on state and private land in California. It is not known when these will be fully implemented, but are considered currently effective for purposes of this analysis. A summary description of the more important requirements of these and other rules that would factor in the development of an OMP are:

1. Clearcuts and other even-aged regeneration systems are limited to twenty acres in size. The state may allow exceptions allowing even aged regeneration on a total of 40 acres, but only if explained and justified by timber harvesting plan preparers. Minimum stocking standards for the different systems remain in place.

2. Rules governing uneven-aged regeneration systems, such as selection, thinning and sanitation-salvage, allow harvesting down to certain minimum levels, which are a function of the system used and the site classification of the land.

3. Timber harvesting plans (THPs), or sustained yield plans which can be filed to serve as programmatic base documents for THPs, must show how the productive potential of a harvest site will be reached over time.

4. Volumes to be harvested over any rolling ten year period may not exceed projected levels of growth during the last decade of the "planning horizon", which is defined as 100 years.

5. Watercourse and lake protection zones (WLPZs), within which heavy equipment is excluded, are established for all watercourses which provide habitat for fish and non-fish aquatic species, or which are downstream domestic water sources within 100 feet of operations. Zone widths vary from 50 to 200 feet either side of watercourse channels, depending on adjacent slopes and other site specific conditions. Zones may be established for other types of watercourses as conditions dictate. Regeneration systems within WLPZs are restricted to selection and/or sanitation-salvage.

Permanently Unsuitable Habitat

Approximately 15.5%, or 9,416 acres, of the Hearst landbase is comprised of landslides, rock outcroppings, bare ground, or decadent brush types which are inaccessible for conversion purposes. These acres are not capable of providing suitable NSO habitat, and must be factored out of any growth model which may be used for habitat ingrowth projections.

TIMBER STAND GROWTH MODELING

Methodology

Projections of NSO habitat suitability at the end of the twenty year planning period defined for the Hearst OMP necessitate forecasting of timber type changes during that period. Current stocking levels for given WHR types/stages, when combined with current growth rates on Hearst lands and consideration of the management constraints detailed above, allow us to forecast changes in WHR types and stages over time. It is assumed that the predominant silvicultural systems to be employed during this time period will be selection, sanitation-salvage, or modified versions of these two in various combinations. The following summarize these projected changes at the end of each decade over the next twenty years:

1. Fifty percent of all coniferous WHR types currently in size class (or stage) "1" will move into size class "2" at the end of the first decade. The remaining fifty percent will move into size class "2" by the end of the second decade. (It is further assumed that new additions to this size class during the twenty year projection period will be negligible.)

2. Fifty percent of all coniferous WHR types currently in size class "2" will move into size class "3" by the end of the first decade. Fifty percent of size class "2" residuals at the end of the first decade will move into size class "3" at the end of the second decade.

3. Twenty-five percent of all coniferous WHR types currently in size class "3" will move into size class "4" at the end of the first decade. The same movement ratio is expected at the end of the second decade.

4. Fifteen percent of all coniferous WHR types [with the exception of red fir (RFR), knobcone pine (CPC) and lodgepole pine (LPN)], currently in size class "4" will move into size class "5" by the end of the first decade. However, only ten percent of these same types are expected to move into size class "5" at the end of the second decade.

5. Ten percent of red fir (RFR) types currently in size class "4" will move into size class "5" by the end of the first decade. Only five percent of these same types are expected to move into size class "5" at the end of the second decade.

6. No movement is expected in lodgepole pine (LPN) types at the end of either the first or the second decade.

7. All WHR types currently in size classes "5" and "6" are not expected to move into different size classes. Stands currently in size classes "5" and "6" will not be harvested over the next twenty years.

8. Where upward movement between size classes occurs at the end of each decade, canopy closure categorization will also move up one level. For example, if we take a type that is currently classified as a "3P", twenty-five percent of these are expected to move at the end of the first decade into size class "4" as well as canopy closure level "M" to become "4M". The exception to this rule would be CPC types which will become WFR types at the end of the second decade, as noted below.

9. No size class movement is expected in knobcone pine (CPC) types at the end of the first decade. Approximately eighty percent of CPC types, currently in size class "4" and canopy closure level "M" will move into WFR types, but of size class "3" and canopy closure level "P" by the end of the second decade. Changes in size and diameter class designations are not expected for all other CPC stands by the end of the second decade.

Projected Changes in WHR Types/Stages (1992-2012)

A spreadsheet projection of growth movements between size classes and canopy closure levels, built around the above assumptions, is presented in Appendix H. Anticipated acreage changes over the twenty year period 1992-2012 are summarized below in Table 1:

Table 1

Size Class	1992 Acres	2002 Acres	2012 Acres	20 Year Movement
WHR 1	285	143	0	-285
WHR 2	103	194	240	137
WHR 3	1,955	1,518	1,582	-373
WHR 4	48,654	42,140	38,201	-10,453
WHR 5	428	7,430	11,403	10,975
WHR 6	1,840	1,840	1,840	0
Closure Class	**1992 Acres**	**2012 Acres**	**2112 Acres**	**20 Year Movement**
WHR S	26,556	22,674	20,423	-6,133
WHR P	4,853	8,150	10,427	5,574
WHR M	7,057	6,813	6,366	-691
WHR D	12,674	13,648	14,210	1,536

(Reference Appendix D for WHR Size Class and Canopy Closure Definitions)

Table 1 suggests the following qualitative changes over the Hearst landscape over the next twenty years:

1. In 1992 approximately 3.9% of the landscape is in submerchantable, or "immature" timber types (WHR size classes "1"-"3"). Only 3.0% of the landscape is projected to be in these immature classes by year 2012.

2. 1992 acreage in WHR size class "4" is 80.3% of the landbase. This number is reduced to 63.0% in year 2012. However, acreage in size classes "5" and "6" increases dramatically over this same time period from 3.7% to 21.9% .

3. Canopy closure levels over the twenty year period remain relatively unchanged. Canopy classifications of WHR "S" and "P" represent 51.8% of total acreage in 1992, and a similar 50.9% in year 2012. Likewise, WHR classifications "M" and "D" are 32.6% of Wyntoon acreage in 1992, and 34.0% in year 2012.

Appendix H would additionally suggest little change in species composition among WHR timber types, with the exception of some CPC stands which will grow into WFR types over time.

TWENTY YEAR NSO HABITAT SUITABILITY TRENDS

Since northern spotted owls are generally absent from the ownership, it has not been possible to develop quantitative descriptors of NSO nesting habitat on Hearst lands. The concomitant absence of spotted owls throughout the California Cascades subregion has also made generation of regional descriptors difficult.

Some studies have recently been undertaken to promote greater understanding of NSO habitat needs within the subregion. All indications are that results of these probably will not be available for at least two years.

For discussion purposes, a simplified, and more conservative, version of a WHR/NSO Habitat crosswalk developed by Sierra Pacific Industries for use in their "Spotted Owl Management Plan" is presented below.

Table 2
WHR/NSO Habitat Suitability Matrix

WHR Type	Size Class	Nesting/Roosting	Foraging
SMC,KMC,WFR, CPC, LPN, RFR	3		M
	4	M,D	P,M,D
	5	M,D	P,M,D
	6	All	All
PPN, JPN	3		M,D
	4	D	P,M,D
	5	M,D	P,M,D

On the basis of this crosswalk, hypothetical changes in defined habitat acreage from 1992 through 2012 can be recalculated and projected as follows:

Table 3
Changes in Suitable Habitat (1992-2012)

Habitat	1992 Acres	2002 Acres	2012 Acres	20 Year Movement
Nesting/Roosting	20,120	21,053	21,284	+ 1,164 (5.8%)
Foraging *	24,685	28,983	31,134	+ 6,449 (26.1%)

* It is assumed that all nesting/roosting habitat is also suitable for foraging. Nesting/roosting acreage is therefore included in foraging totals.

The Sierra Pacific model also adds in acreage for "dependent" stands of lesser "quality", which exhibit selected habitat characteristics that also qualify them as "functional" habitat types. These functionally equivalent "dependent" stands have not been factored into our analysis. The acreage figures represented here can therefore be considered to be relatively conservative.

The above totals suggest that 33.2% of the Hearst ownership is currently potentially suitable as nesting/roosting habitat, and 40.7% is suitable nesting/roosting/foraging habitat. These percentages increase to 35.1% and 51.4%, respectively, by the year 2012 at projected levels of growth and harvest noted above.

It is unclear from the literature whether habitat "quality" less than that required for foraging is adequate for juvenile dispersal. We have assumed not for purposes of this plan. The ISC , recognizing the value of broad connectivity zones in the landscape matrix over reliance on discrete wildlife "corridors for dispersal, has recommended a "50-11-40" rule for landscapes on federal lands outside designated Habitat Conservation Areas (HCAs). The "50-11-40" rule specifies that at least 50% of the forest matrix outside HCAs be maintained in stands of timber with a mean diameter (dbh) of 11 inches or greater, with at least 40% canopy closure. The appropriateness of such a rule for all portions within the Klamath Province has been questioned by many, and might be difficult to attain under the best of conditions for the California Cascades, given the extensiveness of pine forest types in the subregion. Habitat suitability projections for the Hearst ownership suggest "50-11-40" may not fit the current landscape, but that movement towards a closer fit will occur over the next twenty years in response to planned forest management practices.

HEARST NSO MANAGEMENT PLAN GUIDELINES

Silvicultural Management Strategy

The above analyses suggest that past forest management practices on the Hearst Wyntoon Tree Farm has resulted in a mosaic of different vegetation types over the landscape, many of which provide potentially suitable habitat for the northern spotted owl. Continued implementation of planned timber management activities over the next twenty years should result at minimum in maintenance of this mosaic, and probably will result in increased acreage of available suitable habitat. Planned forest management strategies, incorporating harvest and growth levels discussed above, should provide long term benefits to the spotted owl, allow for a stable flow of forest products from the ownership, result in a healthier forest condition ... and also maintain or enhance biodiversity and general wildlife viability.

Within each major drainage, at least 40% of the coniferous, timbered area will remain in suitable NSO habitat as defined in Table 2.

Annual Surveys

Areas within which timber harvesting activities shall occur, pursuant to a state approved timber harvesting plan, shall be surveyed prior to harvesting utilizing U.S. Fish and Wildlife Service protocol dated March 17, 1992 (Appendix C) or subsequent revisions to same. Areas to be surveyed shall include all Hearst acreage within, plus Hearst acreage out to 1.3 miles beyond the plan area.

If an owl is found during survey activity, follow-up visits will be done to determine status, reproductive status and nest site locations ... and protection measures noted below will be implemented.

Preharvest Information Sourcing

Survey results for outside ownerships within 1.3 miles of the timber harvesting plan boundary will be solicited. At minimum, the California Natural Diversity Database, the state database for the northern spotted owl, biologists designated by the California Department of Fish and Game, and representatives of adjacent landowners will be consulted on an annual basis.

Timber Harvesting Plan Elements

The following standards will be adhered to and programmatically referred to in all timber harvesting plans, or long term sustained yield plans, to be filed with the State of California over the next twenty years.

Annual Surveys

Annual surveys will be conducted in accordance with the existing U.S. Fish and Wildlife Service protocol and other provisions noted in this OMP.

Nest Site Locations and Protection

The following protection measures around all known NSO nests will be implemented:

- Active nest sites discovered as a result of surveys or in the course of other forest management activities will be protected.

- No logging or road construction, reconstruction or maintenance shall occur within 500 feet of the nest site until young have fledged and dispersed.

- Habitat modification will not be allowed within 1/4 mile of nest sites or primary roost areas until after nesting behavior or dispersal of young has ceased.

o Habitat modification will not be allowed within 1,000 feet of an active nest site for a period of three years after the site becomes inactive.

Habitat Retention Standards

During timber harvesting plan preparation, an analysis of landscapes adjacent to active and inactive nests will be made to ensure that at least 40% of postharvest vegetation within a 0.7 mile radius will have 40% canopy closure with an overstory of at least 60' in height.

All timber harvest operations within 0.7 miles of active nest sites will be suspended for a period of thirty (30) days to provide for agency review by the California Department of Fish and Game and the U.S. Fish and Wildlife Service. The goal of this review will be to ensure that The Hearst Corporation ...

> ... maintains adequate acreage of NSO habitat, at or above current California Board of Forestry habitat retention standards for the Northern Forest District, within 0.7 and 1.3 miles of pair activity centers.
>
> ... maintains 18 and 70 acre habitat retention zones around active nest sites and pair activity centers according to California Board of Forestry guidelines for the Northern Forest District.
>
> ... maintains important structural elements of NSO habitat within areas of partial harvesting, including adequate overall canopy closure, dead and down woody material, standing green culls and clumps of residual trees.

Possible effects on activity centers located on adjacent property not owned by The Hearst Corporation, but within 1.3 miles of the timber harvesting plan boundary, will also be reviewed in coordination within the California Department of Fish and Game, the U.S. Fish and Wildlife Service and the adjacent property owner or his representative. Said review will occur within thirty (30) days of notification by Hearst, informing the USFWS of the need for such a review.

Subsequent to the above referred agency reviews, modifications to existing or proposed timber harvesting plans will be made on an "as needed" basis, pursuant to California Department of Fish and Game and U.S. Fish and Wildlife Service recommendations, in order to avoid "take" of NSOs .

Watercourse and Lake Protection Zone Management

Current state forest practice rules and regulations require establishment of watercourse and lake protection zones (WLPZs) upslope from all Class I and Class II watercourses.

Although these zones are designed primarily to protect beneficial uses of water, they also provide contiguous corridors of prime NSO habitat.

Zone widths, as required in the state rules, vary from 50-200 feet depending on prevailing slope conditions immediately adjacent to these watercourses. The Hearst Corporation has opted to establish non-variable 200 foot zones for permanent "late seral" dedication for all Class I and II watercourses. These zones represent 12.3% of the Hearst Wyntoon landbase (7,523.9 acres).

Retention of Important Structural Attributes

Culls and snags. All snags that have been so for one or more years, plus all nonmerchantable cull trees, that do not protrude above the general canopy will be retained. The importance of these stand elements, especially in areas immediately adjacent to watercourse and lake protection zones on south aspects, has been noted in survey results for adjacent landowners where owls are present. Exceptions to this snag retention standard will occur only within special "fire protection zones" designated in BOF rules.

Down woody material. Dead and down material greater than 23" in diameter and 10 feet in length will be retained. It has been noted that such material is especially important to various prey species that are part of the NSO diet (Thomas 1990).

Special Wildlife Management Zones

As noted previously, Hearst foresters are in the process of developing a comprehensive "wildlife management plan" for the property that takes a broad, landscape oriented approach to wildlife issues. One key element of this plan is the establishment of "special wildlife management zones" (Appendix I), which are designed to facilitate development and connectivity of late seral stage habitats. The 200 foot WLPZ areas, which are important components of the more extensive "special wildlife management zones", have already been mentioned above. An additional 5,111 acres of existing "old growth" (WHR stages 5 and 6), plus other strategically located areas adjacent to the McCloud Reservoir and within the Star City and Angel Creek planning watersheds, have also been dedicated to late seral development and are part of the "special wildlife management zone" system.

Although timber harvesting will not occur in stands currently typed as WHR stages 5 or 6 (approximately 2,268 acres), it is expected that all remaining acreage within these special management zones will be *managed* for development of late seral attributes through logging.

Acreage within these "special wildlife management zones" comprises 20.6% of the Hearst Wyntoon landbase.

PLAN IMPLEMENTATION AND MONITORING

Implementation Agreement

Implementation of the OMP outlined above will be governed by an agreement between The Hearst Corporation and USFWS. The following measures are suggested for incorporation as part of the agreement:

1. At the end of each calendar year, Hearst will prepare an annual report to USFWS for review. The report will:

- Summarize NSO survey results for the year, to include information detailing conformance to protocol plus maps of nest locations and/or activity centers.
- Note locations and status of timber harvest and other forest management activities on the property for the year.
- Note NSO responses to timber harvesting operations within the project area.
- If necessary, suggest changes to the OMP that may be necessitated by new information on the owl as it becomes available.

2. At any time during the period this plan is effective, USFWS will be free to conduct periodic reviews of survey data, as well as proposed, active and/or completed habitat modification activities, to ensure that the risk of "take" is negated in all activities. At any time during the effective period of this plan, Hearst will allow USFWS to immediately review habitat modification activities on-site.

Monitoring Measures

In order to effectively monitor changes in owl habitat, and to further "fine tune" existing WHR typing, Hearst has initiated the following steps:

1. A reinventory of the ownership, to begin in 1994, which will allow for continued analysis and potential reclassification of some timber types.

2. Annual enhancement and updating of the Hearst "Geographic Information System" and database to reflect changes in WHR habitat types and stages as a result of forest growth, stand development and timber management activities.

3. A third party validation of current WHR typing for The Hearst Wyntoon Tree Farm. Agreement in principle has been reached between Hearst and Region I representatives of the California Department of Fish and Game (DFG) for DFG participation in such a validation project.

In addition, active nests located in the course of surveying and forest management activities will be monitored on an annual basis in order to track reproductive status of associated owl pairs.

RESEARCH

The relatively low numbers of owls in the California Cascades, plus lack of information regarding NSO historical occupancy in the subregion, has focused attention on the need for additional research in this area. Such research should, among other purposes, seek to:

- provide more accurate descriptions of owl nesting/roosting and foraging habitat for the region
- assess habitat preferences for dispersing juveniles
- identify habitat modification practices that may influence NSO viability,
- more completely explore regional predator and prey base relationships and their effects on NSO presence or lack of presence.

The California Forestry Association has initiated some research that is expected to yield valuable information on habitat descriptions in the months ahead. Additionally, The Hearst Corporation and the California Department of Fish and Game have entered into cooperative research on the northern goshawk, a predator species of the spotted owl.

It is the desire of The Hearst Corporation to work in conjunction with the U.S. Fish and Wildlife Service and other interested parties to enhance our knowledge of the northern spotted owl ... and to develop and, if necessary, continue to make improvements on a management plan through application of sound biological principles. New information, which may derive from these and other research efforts, will be incorporated into future revisions of this OMP as it becomes available, subject to concurrence by the U.S. Fish and Wildlife Service.

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The Hearst Corporation

Spotted Owl Management Plan

1994 Annual Report

THE HEARST CORPORATION
Hearst Forests
800 Pine Ridge Avenue
Mt. Shasta, California 96067

March 1, 1995

Mr. Joel Medlin
Field Supervisor
U.S. Fish and Wildlife Service
2800 Cottage Way, Room E-1803
Sacramento, California 95825

Re: Hearst Spotted Owl Management Plan
1994 Annual Report

Dear Sirs:

In accordance with provisions established in our "no take" management plan for the northern spotted owl (OMP), as approved by the U.S. Fish and Wildlife Service (USFWS) on November 29, 1993, The Hearst Corporation wishes to update the Service on 1994 survey results, as well as the status of forest management activities for 1994 and 1995.

Attached herein are copies of the following:

- Maps of 1991-1994 owl survey transect locations;
- 1994 owl survey results;
- Maps showing location of 1994 timber harvest units;
- Map of scheduled 1995 owl survey transect locations;
- Maps showing location of scheduled 1995 timber harvest areas.

Discussion of Survey Results

1994 surveys were conducted in accordance with the Hearst OMP and protocol procedures as endorsed by the Service on March 17, 1992. As the attached report from Wildland Resource Managers, contract biologist to The Hearst Corporation, indicates, surveys for northern spotted owls on Hearst lands solicited only two responses. Both responses are presumed to have been made by the same bird and from the same general area (lower Kosk Creek) as one solicited in 1992. Follow-up efforts to "mouse" this owl were frustrated by very rough and treacherous ground conditions. Since the time when the 1994 surveys were conducted, road access to lower Kosk Creek has been improved. Surveys in the same general area will be conducted again in 1995, in the hopes of reestablishing contact with this bird and being able to follow through with a more successful "mousing" effort.

Miscellaneous General Comments

On December 6, 1994, USFWS representative Phil Detrich and I met to discuss Hearst progress in meeting the objectives and guidelines of the OMP. To this end, Hearst noted a need to reevaluate one statement in the OMP which specifies that timber stands in WHR size classes "5" and "6" would not be harvested over the next twenty years (reference page 11 of the OMP). Additional field examination of some of the WHR "5" stands now suggests that some light thinning of dominant and codominant trees, plus reduction of understory fuels, may be appropriate in these stands. The stands in question tend to be heavy to white fir, "even-aged" in nature, with closed canopies, minimal vertical structure and little to no coniferous reproduction in the understory. Thinning of these stands would allow for some coniferous regeneration in the understory and long-term promotion of understory layering, which would be of benefit to the owl, as well as other wildlife species. Mr. Detrich agreed with the need for treatment of some of these stands, and gave his approval for us to proceed with plans along these lines. It is mutually understood that all other provisions of the OMP remain in place, including retention of important structural attributes such as culls, snags and down woody material.

Reinventory of the Hearst ownership, noted on page 18 of the plan and initiated in 1994, will continue into 1995. Established inventory procedures, which are integrated with the Hearst GIS, will allow for an automated update of WHR habitat types and stages over the next year. An updated version of the WHR map for the ownership will be provided to the Service upon completion of the inventory.

As always, please feel free to contact our office should you have any additional questions.

Very truly yours,

Rick Swift

Rick Swift
Woodlands Manager

Attachments

cc: A.J. Cooke

The Hearst Corporation

Spotted Owl Management Plan

1995 Annual Report

THE HEARST CORPORATION
Hearst Forests
800 Pine Ridge Avenue
Mt. Shasta, California 96067

February 13, 1996

Mr. Joel Medlin
Field Supervisor
U.S. Fish and Wildlife Service
2800 Cottage Way, Room E-1803
Sacramento, California 95825

Re: Hearst Spotted Owl Management Plan
1995 Annual Report

Dear Sirs:

In accordance with provisions established in our "no take" management plan for the northern spotted owl (OMP), as approved by the U.S. Fish and Wildlife Service (USFWS) on November 29, 1993, The Hearst Corporation wishes to update the Service on 1995 survey results, as well as the status of forest management activities for 1995 and 1996.

Attached herein are copies of the following:

- Map showing location of 1995 timber harvest units;
- Map of 1995 owl survey transect locations;
- Wildland Resource Managers report on 1995 owl survey results;
- Maps showing location of scheduled 1996 timber harvest areas;
- Map of scheduled 1996 owl survey transect locations;
- Department of Fish and Game CWHR analysis of the Hearst OMP.

Discussion of Survey Results

1995 surveys were conducted in accordance with the Hearst OMP and protocol procedures as endorsed by the Service on March 17, 1992, with the exception of one transect (24A) which was inaccessible due to excessive snow until July 24. Insofar as this transect had been run in 1994 with no owl detections, and a more extensive neighboring transect (24) had also been run in 1991, 1992, 1993 and 1994 with no owl detections, Amedee Brickey of the USFWS allowed this breach in protocol on 8 September 1995. Given the survey history of these transects, it was further agreed that 1996 surveys along this transect would not be necessary and scheduled timber harvesting activities in the immediate area would be allowed to proceed.

As the attached report from Wildland Resource Managers, contract biologist to The Hearst Corporation, indicates, surveys for northern spotted owls on Hearst lands solicited only three responses. It is surmised that two responses (Angel Creek drainage) were from the same bird. The third response was heard in the same general area (lower Kosk Creek) as those solicited in 1992 and 1994. Behavior of these birds during follow-up contact efforts suggest presence of single, non-breeding males and no evidence of active nests in the immediate vicinity of the 1995 survey transects.

Recommended Changes to Hearst OMP

On 8 September 1995 Hearst foresters broached the subject of modifying the existing protocol for future owl survey work on the Hearst ownership with Amedee Brickey. Insofar as Hearst timber management emphasizes individual tree selection as the preferred silvicultural method, resulting in little to no adverse effect to habitat quality and quantity over the landscape, Hearst recommended adjustment of the survey area limits to within 1/4 mile of project boundaries instead of the established 1.3 mile limit established in protocol guidelines. Ms. Brickey suggested that Hearst incorporate this recommendation into this 1995 annual report for formal consideration. Hearst would appreciate further opportunity to discuss this request as soon as possible, with the thought in mind of initiating any changes to protocol before the 1996 survey season.

Miscellaneous General Comments

Attached please find a copy of an analysis of the Hearst OMP by Dave Smith of the Department of Fish and Game (DFG) using the California Wildlife Habitat Relationships Program (CWHR). This analysis seeks to identify effects of implementation of the Hearst OMP not only on the northern spotted owl, but also on other individual wildlife species and taxonomic groups. In summary, Smith's analysis suggests the number of species negatively impacted by implementation of the OMP to be the same as those positively impacted. He further concludes that the OMP will negatively impact mammals, but will improve conditions for birds and amphibians. Reptiles are not impacted either negatively or positively.

Reinventory of the Hearst ownership, noted on page 18 of the plan and initiated in 1994, will be completed in 1996. An updated version of the WHR map for the Hearst ownership will be provided to the Service with the 1996 annual report.

The Hearst Corporation is also in the process of preparing a Program Environmental Impact Report which will serve to address the environmental effects of forest management activities and operations on the property . The Service which will receive a copy of the draft and will be invited to make comment. It is expected that the draft will be available for review and comment sometime in 1996.

As always, please feel free to contact our office should you have any additional questions.

Very truly yours,

Rick Swift

Rick Swift
Woodlands Manager

Attachments

cc: A.J. Cooke

The Hearst Corporation

Spotted Owl Management Plan

1996 Annual Report

THE HEARST CORPORATION
Hearst Forests
P.O. Drawer 295
Mt. Shasta, California 96067
phone. (916) 964-2425 fax: (916) 964-2407

March 20, 1997

Ms. Amedee Brickey
U.S. Fish and Wildlife Service
1125 16th Street, Room 209
Arcata, California 95521

RE: HEARST SPOTTED OWL MANAGEMENT PLAN 1996 ANNUAL REPORT.

In accordance with provisions established in our "no take" management plan for the northern spotted owl (OMP), as approved by the U.S. Fish and Wildlife Service (USFWS) on November 29, 1993, The Hearst Corporation wishes to update the Service on 1996 survey results, as well as the status of forest management activities for 1996 and 1997.

Attached herein are copies of the following:

- Map showing location of 1996 timber harvest units;
- Map of 1996 owl survey transect locations;
- Wildland Resource Managers report on 1996 owl survey results;
- Maps showing location of scheduled 1997 timber harvest areas;
- Map of scheduled 1997 owl survey transect locations;
- Updated WHR map of Hearst Ownership;
- Updated Special Wildlife Zone map of Hearst Ownership.
- Amendment to survey protocol.

Discussion of Survey Results

1996 surveys were conducted in accordance with the Hearst OMP and protocol procedures as endorsed by the Service on March 17, 1992. The attached report from Wildland Resource Managers, contract biologist to The Hearst Corporation, indicates, surveys for northern spotted owls on Hearst lands solicited no responses.

Recommended Changes to Hearst OMP

On Tuesday, January 21, 1997, our consulting wildlife biologist Steve Kerns and I met with Amedee Brickey (USFWS) and Jack Miller (DF&G) to discuss the status of Hearst's NSO management plan and explore several possible changes to the survey protocol. We reviewed six years of intensive NSO survey results for the property and suggested several "common sense" modifications to the language in the approved Plan. Given the low impact land management approach which is implemented on Hearst Forests and the level of knowledge we have amassed from our extensive

implemented on Hearst Forests and the level of knowledge we have amassed from our extensive level of surveys we felt that several amendments to our NSO survey protocol would allow us operational relief and still insure that a NSO "take" does not occur.

The requested amendments were formalized in a letter to Phil Detrich dated February 4, 1997. Mr. Detrich's response, which allows for modification of the standard survey protocol, is attached to this report.

Miscellaneous General Comments

Reinventory of the Hearst ownership, noted on page 18 of the plan and initiated in 1994, was completed in 1996. An updated version of the WHR map, based on actual inventory information collected for the Hearst ownership, is provided to the Service with this annual report.

The Hearst Corporation has also prepared a Program Environmental Impact Report which will serve to address the environmental effects of forest management activities and operations on the property. The Service will receive a copy of the PEIR and will be invited to make comment. It is expected that the document will be available for review and comment later this year. A common item included in both the PEIR and NSO Plan is a map which displays the portions of the property which will be managed for the development of late serial forests. In an effort to better define these areas, several modifications were made to the map which was submitted with the original NSO Plan. The rational for the changes was explained at our January meeting and Amedee Brickey agreed that the PEIR proposal should still maintain an adequate area of continuous late serial cover. An updated map showing the revised "Special Management Areas" has been supplied as part of this report.

As always, please feel free to contact our office should you have any additional questions.

Sincerely,

_____

Lloyd T. Bradshaw
Woodlands Manager

Attachments

Appendix J. Draft Hearst Forests Program Timber Harvesting Plan Checklist

Appendix J. Draft Hearst Forests Program Timber Harvesting Plan Checklist

INTRODUCTION

This appendix presents a checklist to be completed by a registered professional forester (RPF) and submitted with each program timber harvesting plan (PTHP) for Hearst Forests, as required by Section 1092.09(n) of Title 14 of the California Code of Regulations (CCR). The objective of completing the PTHP checklist is to determine whether the timber operations proposed in a PTHP are consistent with the project described in a certified program timberland environmental impact report (PTEIR). No significant environmental impacts are expected to result from implementing such timber operations in conjunction with the mitigation measures specified in the PTEIR.

This checklist is a draft because, inasmuch as the final PTEIR has not yet been prepared, the lead agency (California Department of Forestry and Fire Protection [CDF]) has not yet determined which alternative will be approved or which mitigation measures will be implemented as part of the project. This draft checklist has been prepared based on the assumption that the proposed project will be approved and implemented. If the project is substantially changed before the PTEIR is certified, or if changes to the mitigation measures proposed in the draft PTEIR are made before the project is approved, this checklist will be revised accordingly.

Most of the questions contained in the checklist can be answered based on the RPF's direct knowledge of the physical and biological attributes of the logging area in relation to the proposed operations. Some of the questions address resource protection indirectly by evaluating conformance with the mitigation measures and best management practices (BMPs) adopted by The Hearst Corporation as part of the proposed project. The checklist does not explicitly address all of the operational standards contained in the California Forest Practice Rules (CFPRs). Conformance with all applicable CFPRs is implicitly verified, however, through the RPF certification that completes the checklist.

Completing this checklist will enable the RPF to identify any aspects of the operation that are not covered by the PTEIR and thus could result in significant environmental impacts. As a condition for approval of the PTHP that this checklist accompanies, any operations inconsistent with the approved project or that would otherwise result in significant environmental impacts must be modified or mitigated to be made consistent with the approved project.

This checklist may be revised as needed by the Hearst Forests woodlands manager only if such revisions include resource protection standards at least as stringent as those specified or implied in the following questions.

CHECKLIST

	Yes	No	Not Applicable
I. Cumulative Watershed Impacts			
1. If the proposed operations would affect planning watersheds other than Wyntoon, McCloud Reservoir, Angel Creek, Star City Creek, or Curtis-Devils Canyon, have the cumulative watershed impacts of the proposed operations in conjunction with past and reasonably foreseeable future operations been analyzed consistent with 14 CCR 932.9?	☐	☐	
2. Has a certified geologist or registered engineering geologist reviewed and approved the accuracy and completeness of a map delineating unstable areas and related geomorphic features in the planning watershed in which the timber operations are proposed?	☐	☐	
II. Silviculture			
3. Have all stands proposed for harvesting through uneven-aged management regeneration methods or intermediate treatments been unentered for harvesting (except for salvage operations) for at least 10 years?	☐	☐	
4. If the proposed harvesting includes even-aged management regeneration methods, is the cumulative area to which even-aged management regeneration methods have been applied since the PTEIR was certified (including the area proposed for even-aged regeneration harvesting in this PTHP) less than 5% of the cumulative area that has been harvested on Hearst Forests since the PTEIR was certified?	☐	☐	
5. Does the proposed harvesting area exclude the McCloud River Preserve?	☐	☐	

	Yes	No	Not Applicable
6. Will the proposed harvesting involve an alternative prescription (as described in 14 CCR 933.6)? If so,	☐	☐	
a. Will the minimum stocking standards associated with the most nearly feasible/appropriate standard methods be met throughout the harvest area? If not,	☐	☐	☐
i. Has it been demonstrated in the PTHP that, for areas where minimum stocking standards for the most nearly feasible/appropriate standard method will not be met, the proposed harvesting would result in stand conditions that either increase long-term sustained yield over that achievable through the standard method, or would increase the yield of the stand over the next 20 years relative to the no-harvest alternative?	☐	☐	☐
7. If the proposed operations include the selection silvicultural system, will at least eight trees of dbh 18 inches or greater be retained per acre (reference In-Lieu/Alternative Practice 10)?	☐	☐	
III. Harvesting Practices and Erosion Control			
8. Will all BMPs addressing operations on areas of high or extreme erosion hazard (BMP 13.1) be complied with?	☐	☐	
9. Will the proposed operations include heavy equipment use on unstable areas? If so:	☐	☐	
a. Has a certified geologist or registered engineering geologist identified appropriate mitigation measures to avoid significant impacts resulting from disturbance of unstable areas?	☐	☐	☐
i. If so, have all such measures applicable to timber operations on unstable areas been incorporated into the PTHP?	☐	☐	☐
ii. If not, will the proposed operations comply with all applicable Forest Practice Rules?	☐	☐	☐
10. Will the proposed spacing of water intercepting dips or waterbreaks exceed the maximum distance specified in 14 CCR 934.6 (c) (reference In-Lieu/Alternative Practice 8)? If so:	☐	☐	
a. are the road segments for which such spacing is proposed on slopes less than 5%?	☐	☐	☐
b. will adequate drainage be provided through natural drainage patterns and construction of lead-out ditches?	☐	☐	☐
c. will any additional mitigation measures be implemented? (If so, describe them in an addendum to this PTHP.)	☐	☐	☐

	Yes	No	Not Applicable
11. If the proposed operations will occur between November 15 and April 1, will they conform with all BMPs addressing winter period operations (BMPs 17.1-17.9)?	☐	☐	
12. Will surface runoff from all borrow pits used in conjunction with the proposed timber operations be controlled to protect surrounding land and water resources from erosion, sedimentation, and contamination?	☐	☐	
IV. Roads and Landings			
13. Is the cumulative extent of new roads constructed during the 20 years following certification of the PTEIR, exclusive of roads constructed to replace abandoned roads, less than 10 miles?	☐	☐	
14. Is the cumulative extent of major road reconstruction during the 20 years following certification of the PTEIR less than 40 miles?	☐	☐	
15. Will existing roads and landings be used wherever feasible?	☐	☐	
16. Will the proposed operations include construction or reconstruction of roads, landings, or skid trails? If so:	☐	☐	
a. Will they conform with all BMPs addressing road and landing planning (BMPs 1.1-1-14), road construction and major reconstruction (BMPs 2.1-2.78), landing construction and major reconstruction (BMPs 5.1-5.14), skid trail planning and construction (BMPs 8.1-8.10), and construction of skid trail drainage facilities (BMPs 10.1-10.7)?	☐	☐	☐
17. Will all BMPs addressing road system maintenance (BMPs 4.1-4.44), landing maintenance (BMPs 6.1-6.3), road and landing operations (BMPs 7.1-7.2), skid trail maintenance (BMP 11.1), and skid trail operations (BMPs 12.1-12.6) be complied with?	☐	☐	
18. Will the proposed operations include construction of landings that exceed 0.5 acres (reference In-Lieu/Alternative Practice 6)? If so:	☐	☐	
a. have the proposed landing sites been flagged?	☐	☐	☐
b. are the proposed landing sites large, flat areas at considerable distance from watercourses?	☐	☐	☐
c. are the proposed landing sites the minimum size consistent with safe operations?	☐	☐	☐
d. will the proposed landing sites minimize the need for soil excavation and filling?	☐	☐	☐
e. will any additional mitigation measures be implemented? (If so, describe them in an addendum to this PTHP.)	☐	☐	☐

	Yes	No	Not Applicable
V. Watercourses and Lakes			
19. Will the proposed operations conform with all BMPs addressing road watercourse crossings (BMPs 3.1-3.20), skid trail watercourse crossings (BMPs 9.1-9.7), and watercourse and lake protection (BMPs 18.1-18.37)?	☐	☐	
20. Will the proposed operations include the construction, reconstruction, or use of roads within the watercourse and lake protection zone (WLPZ) of a Class I or II watercourse (reference In-Lieu/Alternative Practice 1)? If so:	☐	☐	
a. will construction and reconstruction occur between April 1 and November 15?	☐	☐	☐
b. will construction and reconstruction avoid active unstable areas?	☐	☐	☐
c. will heavy equipment use of roads in WLPZs be limited to the running surfaces of roads?	☐	☐	☐
d. have roads to be reconstructed been identified on the ground?	☐	☐	☐
e. have the edges of all roads within a WLPZ been flagged to designate a heavy equipment exclusion zone?	☐	☐	☐
f. will all pioneer excavation be confined within roadway width limits?	☐	☐	☐
g. will all excavated material that could slough into watercourses be stabilized or end-hauled to stable areas outside the WLPZ without potential for discharge into watercourses?	☐	☐	☐
h. will adequate erosion control facilities be installed to minimize the discharge of sediment into watercourses?	☐	☐	☐
i. will rock or other stabilizing material be placed on and incorporated into road surfaces as needed to minimize the discharge of sediment into watercourses?	☐	☐	☐
j. will slopes exposed as a result of road construction or reconstruction that have potential to discharge a substantial volume of sediment into a watercourse be stabilized?	☐	☐	☐
k. will any additional mitigation measures be implemented? (If so, describe them in an addendum to this PTHP.)	☐	☐	☐
21. Will the proposed operations include the construction, reconstruction, or use of landings within the WLPZ for a Class I or II watercourse (reference In-Lieu/Alternative Practice 2)? If so:	☐	☐	
a. will construction and reconstruction be restricted to the period of April 1-November 15?	☐	☐	☐
b. will construction and reconstruction avoid active unstable areas?	☐	☐	☐

	Yes	No	Not Applicable
c. will heavy equipment use of landings in WLPZs be limited to the running surfaces of affected landings?	☐	☐	☐
d. have all landings located within a WLPZ proposed for use been identified on the ground?	☐	☐	☐
e. have all edges of landings located within a WLPZ been flagged to designate a heavy equipment exclusion zone?	☐	☐	☐
f. will all pioneer excavation for landings be confined within landing width limits?	☐	☐	☐
g. will all excavated material that could slough into watercourses be stabilized or end-hauled to stable areas outside the WLPZ without potential for discharge into watercourses?	☐	☐	☐
h. will adequate erosion control facilities be installed to minimize the discharge of sediment into watercourses?	☐	☐	☐
i. will rock or other stabilizing material be placed on and incorporated into landing surfaces as needed to minimize the discharge of sediment into watercourses?	☐	☐	☐
j. will slopes exposed as a result of landing construction or reconstruction that have potential to discharge a substantial volume of sediment into a watercourse be stabilized?	☐	☐	☐
22. Will the proposed operations include construction, reconstruction, or use of skid trails within the WLPZ of a Class I or II watercourse (reference In-Lieu/Alternative Practice 3)? If so:	☐	☐	
a. will construction and reconstruction be restricted to the period of April 1- November 15?	☐	☐	☐
b. will construction and reconstruction avoid active unstable areas?	☐	☐	☐
c. will skid trail construction and reconstruction under saturated soil conditions be avoided?	☐	☐	☐
d. will heavy equipment use of skid trails in WLPZs be restricted to the running surfaces of skid trails?	☐	☐	☐
e. will adequate erosion control facilities be installed to minimize the discharge of runoff into watercourses?	☐	☐	☐
f. will any additional mitigation measures be implemented? (If so, describe them in an addendum to this PTHP.)	☐	☐	☐

	Yes	No	Not Applicable
23. Will the proposed operations include use of existing landings within or adjacent to a Class III watercourse (Reference In-Lieu/Alternative Practice 5)? If so:	☐	☐	
a. will use of the landing be restricted to the period of April 1-November 15?	☐	☐	☐
b. will the proposed operations occur when the appurtenant watercourse is dry or when erosion control structures are in place to divert or protect Class III water?	☐	☐	☐
c. have landings and skid trail access been identified on the ground?	☐	☐	☐
d. have the edges of affected landings and skid trail access points been flagged?	☐	☐	☐
e. will a bermed dip be constructed through the affected landing after operations to divert drainage away from the watercourse while not impeding the flow of the watercourse?	☐	☐	☐
f. will the area within 10 feet of the reconstructed watercourse channel be mulched with straw after the proposed operations but before November 15?	☐	☐	☐
g. will slash be spread over the surface of the affected landing after the proposed operations but before November 15?	☐	☐	☐
h. if the landing is also within the WLPZ of a Class I or II watercourse, will the logs be loaded using a "heel boom" loader?	☐	☐	☐
i. will any additional mitigation measures be implemented? (If so, describe them in an addendum to this PTHP.)	☐	☐	☐
24. Will, for purposes of biomass harvesting using feller-bunchers, a heavy equipment exclusion zone less than 50 feet wide be designated within the WLPZ of a Class I or II watercourse? If so:	☐	☐	
a. is the WLPZ on slopes less than 5%?	☐	☐	☐
b. is the heavy equipment exclusion zone (HEEZ) at least 35 feet wide?	☐	☐	☐
c. will any additional mitigation measures be implemented? (If so, describe them in an addendum to the PTHP.)	☐	☐	☐

	Yes	No	Not Applicable
25. Will the proposed operations include felling of trees across watercourses (reference In-Lieu/Alternative Practice 7)? If so:	☐	☐	
a. to the extent practicable, will trees be felled at right angles across the watercourse?	☐	☐	☐
b. if there is a reasonable expectation that falling activities will result in the discharge of material into a Class I, II, or IV watercourse, or below the transition line for such a watercourse, will falling be deferred until equipment is available for removal of such material?	☐	☐	☐
c. will trees felled across a watercourse be removed from the watercourse before the stem is bucked and before the limbs are lopped and scattered?	☐	☐	☐
d. will residual wood chunks, limbs, and other debris resulting from tree falling be removed from watercourse channels immediately following tree or log removal?	☐	☐	☐
e. will removal of vegetation adjacent to trees felled across a watercourse be limited to the minimum consistent with safe operations?	☐	☐	☐
f. will any additional mitigation measures be implemented? (If so, describe them in an addendum to this PTHP.)	☐	☐	☐
26. Will the proposed operations include use of existing roads or skid trails within the WLPZ of a Class II spring (reference In-Lieu/Alternative Practice 4)? If so:	☐	☐	
a. will heavy equipment use within the WLPZ be limited to designated skid trails?	☐	☐	☐
b. will skid trail use within the WLPZ during periods of saturated soil conditions be avoided?	☐	☐	☐
c. will rock or other stabilizing material be placed on and incorporated into road surfaces as needed to avoid discharge of sediment into watercourses?	☐	☐	☐
VI. Hazard Reduction			
27. Will the proposed operations conform with the BMPs addressing hazard reduction and fuel management (BMPs 21.1-21.8)?	☐	☐	
VII. Wildlife			
28. If the proposed operations will affect a late seral management zone as shown in Figure 2-2 of the PTEIR, will they conform with BMPs addressing late seral management zones (BMPs 19.1-19.4)?	☐	☐	

	Yes	No	Not Applicable
29. Have surveys consistent with the protocols specified in The Hearst Corporation Spotted Owl Management Plan and in amendments thereto been conducted for this PTHP?	☐	☐	
30. If any northern spotted owls or nests of northern spotted owls were identified through surveys, will they be protected from disturbance consistent with the standards specified in The Hearst Corporation Spotted Owl Management Plan and in amendments thereto?	☐	☐	
31. Will surveys for active nests of special-status bird species be conducted within stands proposed for harvest before commencement of operations?	☐	☐	
32. If any active nests of special-status species were identified through surveys, will they be protected by retaining the nest trees?	☐	☐	
VIII. Archaeological and Historical Resources			
33. If the proposed operations would affect a previously identified significant archaeological or historical site, will it be avoided or, if unavoidable, have adequate site-specific mitigation measures been approved by the CDF Director and will these mitigation measures be implemented?	☐	☐	
34. If previously unidentified archaeological or historical sites are identified during the proposed operations, will operations within 100 feet of the site immediately be stopped, the CDF Director be notified, and the mitigation measures described in the previous question be implemented?	☐	☐	

CERTIFICATION

I have the authority and responsibility for the preparation of the PTHP to which this checklist is attached. I also have authority to supervise its implementation and to amend it. I certify that a Notice of Intent to Harvest Timber has been distributed consistent with ~~14 CCR 924.1~~ 14 CCR 1092.4.

I certify that I have personally inspected the PTHP area. After considering the PTEIR for Hearst Forests and the mitigation measures required by the PTEIR and the CFPRs, I have determined that the proposed timber operations are consistent with the PTEIR and the Z'Berg-Nejedly Forest Practice Act. Except for the in-lieu and alternative practices identified in Appendix G of the PTEIR and addressed in Questions 7, 10, 18, and 20-26 above, the proposed operations meet or exceed the resource protection standards specified in the CFPRs. I find that implementing the proposed timber operations will result in no significant environmental impacts.

Signature:_____ Date:_____

California RPF License Number: _____

Appendix K. Geology, Landslides, and Geologic Guidelines for Managing Hearst Forests

Geology, Landslides, and Geologic Guidelines for Managing Hearst Forests

INTRODUCTION

This report is intended to provide background information and management guidance to Hearst Forests' professional foresters to assist them in avoiding geologic hazards, minimizing disturbance of geologically unstable areas, and minimizing adverse impacts on water quality due to hillslope failure while managing the property's natural resources. It includes descriptions of:

- the property's bedrock geology and surficial deposits,
- factors that influence slope stability,
- an inventory and maps of existing landslides,
- characteristics of intact hillslopes with potential for failure, and
- management practices and mitigation measures applicable to landslides and potentially unstable areas.

GEOLOGY

Hearst Forests is located in the Cascade Mountains Geomorphic Provenance. The property is located south and southeast of Mt. Shasta. The McCloud and Pit Rivers and some of their tributaries drain the property. It is characterized by flat to very steep topography.

A variety of bedrock materials occur in Hearst Forests. They are in turn overlain by a veneer of various surficial deposits of variable thickness. These bedrock and surficial deposits are discussed below in order of decreasing age. Their general distribution is shown on the Bedrock Geology map, PLATE G1.

BEDROCK

The bedrock geology of Hearst Forests is characterized by a sequence of upper Paleozoic and lower Mesozoic metamorphic, sedimentary, and metavolcanic rocks of the Bragdon and Barid Formations, the McCloud Limestone, Nosoni Formation, Dekkas Andesite, Pit Formation, Hosselkus Limestone, and the Modin Formation and Brock Shale. Within the Hearst Forests these bedrock units exhibit a general northeast strike and southeast dip.

The bedrock formations are locally intruded by Jurassic-age granodiorite, which occurs as isolated outcrops along Mud Creek. Unconformably overlying these bedrock formations are late-Tertiary sedimentary rocks of Montgomery Creek Formation and an unnamed sedimentary rock unit. These rocks are themselves overlain by very late Tertiary and early Quaternary volcanic rocks. These bedrock formations and their locations on the property are briefly described below. The descriptions presented below are compiled from Dupras, 1997; Gardner, 1964; Higinbotham,

1987; Irwin, 1994; Lydon, 1981; Miller, 1983; and Sanborn, 1960; and Wagner and Saucedo, 1987. The formations are mapped in Figure 1.

Bragdon Formation (Cbg) - Metamorphosed mudstone with thinly-laminated shaly interbeds, some sandstone, pebble conglomerate, and fossiliferous limestone. Also includes metavolcanic rocks of aphanitic to porphyritic mafic and andesite flows and small amounts of tuff, tuffaceous siltstone, and diabase. Occurs in the Angel Creek, McCloud Reservoir, and Wyntoon planning watersheds (PWs).

Barid Formation (Cb) - Metamorphosed volcanic sandstone, weakly laminated tuffaceous aphanitic to porphyritic metavolcanic rocks and fine-grained diabase, mafic flows, tuff breccia, and tuff with minor amounts of chert, fossliferous limestone, and mudstone. Occurs as faulted beds in the McCloud Reservoir PW.

McCloud Limestone (PMm1) - Thin-to thick-bedded, fine to coarsely crystalline limestone, fossiliferous with minor amounts of micrite, calcarenite, conglomerate, and minor argillite interbeds. Locally fossiliferous. Occurs in faulted beds in the McCloud Reservoir PW.

Nosoni Formation (PMn) - Tuffaceous mudstone and tuff with interbedded tuff breccia, metamorphosed thin-to thick-bedded quartzite and aphantic to fine-grained mafic lava flows and volcaniclastic sandstone and mudstone with some siltstone, limestone, and conglomerate. Locally tuff can be laminated to welded. Occurs in faulted beds in the McCloud Reservoir PW.

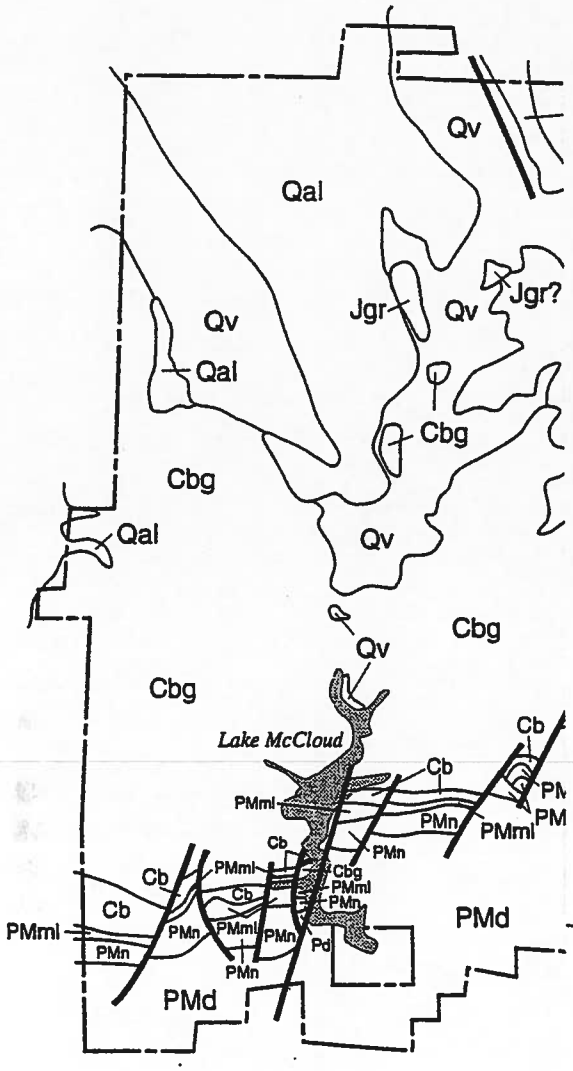
Dekkas Andesite (PMd) - Keratophyre and spilitic lava flows and pyroclastic rocks, lenses of siliceous mudstone and quartz keratophyre, pyroclastic breccia, coarse-to fine-grained tuff breccia, tuff and mudstone; some limestone and minor amounts of fine-grained metadiabase and weakly metamorphosed mudstone and quartzite, locally spilitized lavas. Occurs in the McCloud Reservoir PW.

Pit Formation (PMTRp) - Weakly metamorphosed laminated mudstone, shale, and siltstone with siliceous to mafic aphanitic to porphyritic flows, quartz keratophyre and metadacite tuffs and flows, fine-to coarse-grained tuffaceous breccia. Occurs in the south central area of the forest.

Hosselkus Limestone (TRh) - Thin-bedded to thick-bedded limestone, locally siliceous and jointed, extremely fossiliferous. Occurs in a narrow southwest-northeast trending band that bisects the Wyntoon and Kosk Creek Tracts.

Modin Formation & Brock Shale (TRmb) - Modin Formation: Basal portion is composed of coarse-grained pyroclastic rocks composed of agglomerate, breccia, tuff, and andesite and coarse-grained conglomerate with limestone clasts (Hawkins Creek member) overlain by tuffaceous limestone and fine-to medium-grained sandstone and limestone (Devils Canyon member), in turn overlain by weakly metamorphosed, thin bedded mudstone and argillite, volcanic breccia, and fine-grained tuffaceous sandstone (Kosk Creek members). Brock Shale: Argillite and interbedded tuff and tuffaceous sandstone. Both formations occur in northwestern part of the Curtis-Devils Canyon PW.

Figure 1
Bedrock Geology



Explanation

Qal	Alluvium
Qls	Landslide deposits
Qv	Volcanic Rocks (Pleistocene age)
Tv	Volcanic Rocks (Pliocene age)
Tm	Sedimentary Rocks (Unnamed)
Tmc	Montgomery Creek Formation
Jgr	Granodiorite
TRmb	Modin Formation & Brock Shale
TRh	Hosselkus Limestone
TRPMp	Pit Formation
PMd	Dekkas Andesite
PMn	Nosoni Formation
PMdn	Dekkas Andesite & Nosomi Formation
PMml	McCloud Limestone
Cb	Barid Formation
Cbg	Bragdon Formation
?	Queried where uncertain

Forest boundary

Geologic contact between formations

Fault

SOURCES: Dupras 1997, Gardner 1964, Higinbotham 1987, Irwin 1994, Lydon 1981, Miller 1983, Sanborn 1960, and Wagner 1987.

Compiled by: John Coyle & Associates

The Hearst Corporation
Hearst Forests

Jones & Stokes Associates, Inc.

Granitic Rocks (Jgr) - Coarse-grained biotite-hornblende granodiorite. Occurs as scattered outcrops in a small area in the Wyntoon PW.

Montgomery Creek Formation (Tmc) - Weakly indurated thick-bedded sandstone, pebble to cobble conglomerate, and soft incompetent shale with plant remains, locally some carbonaceous shale and lignite grade coal. Occurs in the northeastern margin of the forest and an isolated patch in the central portion of the Kosk Creek Tract.

Unnamed Sedimentary Rocks (Ts) - Nonmarine sandstone, shale, and conglomerate. Occur in the small portion of the Curtis-Devils Canyon PW.

Volcanic Rocks (Tv) - Nonvesicular olivine basalt and andesite flows with basaltic pyroclastic rocks, breccia, and tuff. Includes Bartle Gap volcanic rocks of Gardner (1964) and Warner basalt discussed in Dupras (1997). Occurs in the Angel, Star City, and Curtis-Devils Canyon PWs.

Volcanic Rocks (Qv) - Vesicular olivine basalt and andesite flows and interbedded pyroclastic rocks. Occurs in northwestern area of the forest.

SURFICIAL DEPOSITS

Overlying the bedrock formations in some places are surficial deposits of landslide debris, colluvium, alluvium, and artificial fill, as described below.

Landslide Debris (Qls) - Poorly consolidated to moderately consolidated, homogenous to heterogeneous mixture of bedrock, soil, and colluvium. In area the delineated *Qls* numerous landslide deposits occur adjacent to one another or "piggy back" on one another and essentially form an extremely large coalescing mass of landslide debris. Elsewhere, they are found throughout the property but are more numerous in the Curtis-Devils Canyon PW.

Colluvium - These deposits consist of material moved downslopes by gravity and sheet-wash processes. They are composed of poorly consolidated, homogenous to poorly stratified accumulations of variable thickness, of rock fragments, sand, silt, and clay. These deposits occur in almost all hillside swales and hollows and along the bases of almost all slopes. They are not shown on the bedrock geology map.

Alluvium (Qal) - Unconsolidated, interbedded gravel, sand, silt, and clay deposited by fluvial processes. Occurs along and in rivers and creeks, and as a relatively thin deposit covering portions of the Wyntoon PW.

Artificial Fill - Artificial fill is composed of poorly consolidated, homogeneous to stratified deposits of rock, soil, and colluvium derived from grading and road building activities; thickness can be quite variable, ranging from a few feet to tens of feet. Artificial fill is found along the outside (downhill) side of most roads and landings in the forest and at stream crossings. (McCloud Dam is a large prism of fill.) These materials are not shown on the bedrock geology map.

SLOPE STABILITY

Landslides within Hearst Forests are common and affect management practices. This report addresses natural and management factors that influence landsliding and slope stability; includes a landslide inventory wherein slides are classified as to type, certainty of identification, and relative stability; discusses areas with relatively high risk of failure; and discusses the spatial distribution of landslides on the property and their relationship to the bedrock geology.

FACTORS INFLUENCING SLOPE STABILITY

Factors that influence slope stability on Hearst Forests are presented below. They include the properties of the topographic conditions, earth materials, geomorphic processes, climatic events, transitory stresses, activities of man, and time.

Topographic Conditions

- Deep Valleys
- Steep Slopes
- Cliffs

Properties of Earth Materials

- Inherently weak bedrock materials or surficial deposits (e.g. landslide debris)
- Weathered materials
- Highly jointed and fractured bedrock
- Adversely oriented structural features (bedding planes, joints, shear zones) that dip out of slope or otherwise weaken a slope
- Contrasting permeability between two layers or types of materials, creating high pore pressures

Fluvial Processes

- Active downcutting (incision) by stream
- Fluvial erosion of the toe of the slope

Climatic Events

- Rain on snow events
- Intense or prolonged rainfall
- Rapid snow melt

Natural Events

- Natural vegetation removal (due to fire or blowdown)

Transitory Stresses

- Earthquake shaking

Human Disturbance

- Excavating potentially unstable hillslopes
- Excavating the toe of a slide
- Loading (surcharging) of the hillside or landslide
- Vegetation removal
- Concentrated runoff

Time

All hillslopes eventually fail; landsliding and erosion are the principal natural processes, working in opposition to tectonic (mountain building) processes, whereby mountain ranges are worn down and hillslopes are flattened. Though all the above factors can influence slope stability, slope failures are usually triggered by climatic events, transitory stresses, or fluvial erosion, often in combination with human-caused disturbance. The properties of the materials that compose a hillslope and the disturbances to which it has been subjected may predispose it to failure.

MANAGEMENT INFLUENCES

Timber harvesting and related management practices can strongly affect slope stability. Timber harvesting can increase erosion and thus sedimentation in streams. It can also increase the potential for shallow slope failures due to reduced transpiration, runoff concentration and resulting soil saturation, and decreased root strength in surficial deposits.

Construction of forest roads and landings in weak rocks or surficial deposits can lead to failure of the cutslope and adjacent uphill slopes. Road fills and sidecast materials, which are weaker than the underlying soils or placed on steep slopes may also be prone to failure. Both cutslope and fill failures mobilize sediment that, under the influences of gravity and runoff, moves downslope often toward a watercourse. Cutslopes, fills, and unpaved road surfaces are relatively erodible, particularly if not properly designed, protected, and maintained. Roads also intercept and concentrate drainage and discharge to hillsides, sometimes resulting in gullying and increased landslide hazards.

LANDSLIDE INVENTORY

For this report, landslides and hillslope areas with ongoing or potential erosion within Hearst Forests were mapped based on interpretation of aerial photographs. Aerial photographs used are listed in APPENDIX A. The boundaries of the features (areas or erosion areas) were observed and transferred by inspection to 1:15,600 scale topographic base maps. Result are presented on PLATES L1, L2, L3 and L4, which are on file at the Hearst Forests office in McCloud, CA.

Because of the seasonal inaccessibility of the study area, no field verification of the landslide mapping on PLATES L1-L4 was conducted for this report. The landslide mapping will be verified and, if necessary, corrected through field surveys of selected areas to be conducted by a CEG in spring, 1998. Additional landslide verification and identification will be conducted on an ongoing basis by Hearst foresters during preparation of timber harvesting plans.

IDENTIFICATION

The landslides were identified on the aerial photographs by noting the topographic, geomorphic, and vegetative features listed below:

- scarps or step-like topography
- broken ground or ground cracks
- a stream that has been "pushed" to one side of a drainage
- disturbed or anomalous drainage patterns
- damaged roads
- disturbed vegetation or jackstrawed trees
- hummocky topography
- ponds or small lakes
- ground appearing to be flowing
- arcuate or angular breaks in slope
- back-tilted slopes and landslide heads
- broken vegetative cover
- lightbulb-shaped blocks of vegetation of generally uniform but of lesser height than adjacent trees/vegetation
- lobate landform impinging on valley floor
- areas of bare bedrock or soil that do not appears to be related solely to erosion processes

CLASSIFICATION

As landslides were identified and mapped, they were classified as to type, level of certainty of identification, and relative stability of the slide mass. Criteria for identification, explanations of landslide types, and criteria for certainty and stability rating are discussed below:

Landslide Type

The following landslide types were recognized and mapped based on the criteria described below:

Rotational Slide (R) - Rotational slides are characterized by a relatively cohesive (intact) mass of earth materials that moves along a relatively deep failure surface that is generally curved (concave) upward. The movement is rotational about an axis parallel to adjacent slopes. Rotational slides usually have arcuate crown and scarps, and their head areas may tilt backwards

into the hillside. They tend to occur in relatively homogenous soils and rocks such as colluvium or mudstone/shale bedrock. The term slump is sometimes applied to rotational slides.

Translational Slide (T) - Translational slides are characterized by a relatively cohesive mass of earth materials that moves along a planar-to-undulating failure surface that is generally parallel to the slope. Translational slides can be relatively thick or shallow, and usually have angular crowns and scarps. Development of failure surfaces and landslide boundaries is generally controlled by structural discontinuities such as bedding planes, joints, faults, or by contacts or transition zones between bedrock and overlying surficial deposits or between soils and artificial fill. Sometimes these slides are referred to as block glides.

Earth Flow (E) - Earth flows are relatively slow-moving, shallow masses of material (soil, colluvium, and large, resistant blocks of rock) that become jumbled as movement proceeds. Earth flow materials are usually saturated, semi-viscous, and highly plastic. Earth flows tend to occur in weak, clay-rich soils, where groundwater movement is restricted by low soil permeability. They often occur on flatter slopes than is typical of other types of landslides. They are highly susceptible to erosion. On Hearst Forests, they mainly occur as large, ancient features in the Kosk Creek tract. Earth flows are characterized by arcuate to angular scarps and crowns, crumpled topography, and a morphology that suggests the ground has been or is flowing downhill.

Debris Flows (Df) - Debris flows are formed by very rapid, short-lived events. They are typically composed of water-laden soil, colluvium, artificial fill, and rock debris. Debris flows occur on relatively steep slopes such as hillsides and in swales, and sometimes extend down to a watercourse. Although usually relatively small and shallow, they can sometimes involve large volumes of earth materials.

Debris Avalanche (Da) - Debris avalanches are a shallow-seated type of landslide. Like debris flows, they are formed by rapid moving, short-lived events and are composed of unconsolidated masses of rock, soil, colluvium, and rock debris. They are generally distinguished from debris flows in that they are confined to very steep slopes (commonly in inner gorges), and result from the tumbling, falling, or collapse (rather than flowage or sliding) of earth materials, and are thus less cohesive than debris flows.

Debris Torrent Tracks (Dt) - Debris torrent tracks are formed when a debris flow or avalanche reaches a stream channel and proceeds to move down the channel, sometimes for a long distance. As it moves down the channel, it scours vegetation and earth materials from the bottom and sides of the drainage, carrying the materials along and eventually depositing them in the lower gradient reaches of the channel or of a higher-order channel. Like debris avalanches and debris flows, they are very rapid moving, short-lived events.

Landslides were sometimes classified as a combination of two of the types discussed above. For example, some were classified as rotational-translational (RT) failures, meaning that the upper part (or head) displays features characteristic of a rotational failure (i.e., an arcuate scarp), while the lower portion of the slide appears to be a translational failure (i.e., moving along a planar

failure surface). Rotational-earth flows (RE) or translational-earth flows (TE) were also identified.

Certainty of Identification

Three levels of certainty of identification and criteria for each level are as follows:

Definite (d) - The landform observed on the aerial photographs or in the field and delineated on the map is certainly a landslide. It displays many, if not all, of the topographic and geomorphic features of a landslide.

Possible/probable (p) - The landform observed on the aerial photographs or in the field exhibits several topographic and geomorphic features (e.g., arcuate slope breaks, suspicious topography, etc.) characteristic of a landslide. However, the feature lacks a clear defining feature, such as a toe or scarp.

Questionable (q) - The landform observed on the aerial photographs or in the field exhibits features suggestive of landslides (e.g., an arcuate break-in-slope or apparent hummocky topography). However, conclusive topographic or geomorphic features of a landslide are not readily apparent or could be explained as well by other natural processes (e.g., differential erosion) or human activities (e.g., excavation).

Relative Stability

Three levels of relative stability were recognized. The criteria for estimating the relative stability of each landslide are listed below. The stability rating refers to the overall slide mass. Thus portions (e.g., steep areas, typically including the toe, lateral margins, or internal scarps) of relatively stable slides could be less stable than other portions under current environmental conditions.

Active (a) - The landslide appears to be moving or to have moved within the past few years, as indicated by sharp unvegetated scarps, broken and unvegetated ground, disrupted drainages, disturbed trees, or damaged roads.

Dormant (d) - Evidence of recent movement is lacking; scarps and other geomorphic features are subdued. However, because of high slope position or erosion of the toe, intense or prolonged rainfall or other major disturbances could reactivate the slide mass. Although road building or timber harvesting would be unlikely to reactivate an entire slide mass, human disturbance of scarps, areas near incised drainages, or other particularly unstable areas within the dormant slide mass might initiate localized failures of varying size and severity.

Static (s) - Evidence of recent movement is lacking; size, slope position, protection of toe of slide, highly subdued topographic expression, or other natural factors suggest the slide mass is relatively stable under current environmental (e.g., climatic) conditions. Poorly designed, built,

or maintained roads or landings, or timber harvest activities on or near incised drainages, steep or unstable slopes, however, could initiate localized failures of varying size and severity.

The landslides presented on PLATES L1, L2, L3, and L4 were mapped and classified by reviewing aerial photographs. Thus the location, site, and attributes accorded them are based upon interpretation of topographic and geomorphic features observed during the mapping process. Because the method is essentially interpretative, some misinterpretation as to existence, type, or activity is inevitable. Corrections and changes to the map will periodically be required. Correcting the type of landslide, certainty of existence, and activity level are perfectly acceptable as long as the new attribute assigned is appropriate as set forth by the definitions presented above. Also, as new landslides occur, they should be mapped and appropriate attributes assigned (as described above) by a certified engineering geologist (CEG) or appropriately trained registered professional forester (RPF).

HILLSLOPES WITH HIGH LANDSLIDE POTENTIAL

Perhaps the leading indicator of low hillslope stability is past landsliding. For example, scarps and steep slopes adjacent to incised channels on dormant or static landslides are relatively likely to fail. In addition to existing landslides, undisturbed slopes are relatively likely to experience landsliding where:

- hillsides and the underlying geology are similar or identical to hillsides that have already experienced slope failures;
- fluvial erosion processes are active (e.g., ephemeral stream channels and gullies are forming);
- swales and hollows (particularly near the junction of two swales or hollows or where swale topography is convergent) are filled with colluvium;
- cutslopes with exposed weak earth materials or adverse bedding or joint orientations occur, and
- large or thick side-cast fill or fill prisms are located.

In evaluating landslide potential, the indicators listed above under "Factors Influencing Slope Stability" need to be considered.

LANDSLIDE DISTRIBUTION AND RELATION TO GEOLOGY

Landslides are common on much of Hearst Forests; however, they are not distributed evenly with regard to type, size, or activity level. They are uncommon in Wyntoon and McCloud Reservoir PWs, but are more common in the eastern portion of the Wyntoon Tract, and are abundant in the Kosk Creek Tract. This distribution probably reflects the flat-lying nature of the basaltic and andesitic flows that underlie much of the western portion of the Wyntoon Tract and its relatively low relief and subdued terrain, in contrast to the severe relief and steep slopes and locally weaker rocks that predominate in the eastern portions of the property.

Most of the landslides on the property are relatively small and shallow debris flows, avalanches, or torrents involving soil, colluvium, older slide debris, or artificial fill; however, some relatively large deep-seated earth flows and rotational and translational slides are also present. Small slides are distributed relatively uniformly over the property, often associated with roads or colluvial swales, features that occur nearly everywhere. Large, deep-seated landslides involving soil, colluvium, and bedrock, are relatively numerous in the Kosk Creek Tract. Their extensiveness in this area likely is controlled in part by the bedrock and locally high relief. In the Kosk Creek Tract, the underlying bedrock consists primarily of relatively weak, poorly indurated rocks (particularly shales) of the Montgomery Creek Formation. In contrast, better indurated rocks commonly occur in the western portions of the property, frequently covered by young basalt and andesite flows.

Numerous small, active debris flows, debris avalanches, and debris torrents are located throughout Hearst Forests. Most of them appear to be associated with management activities, particularly roads. Except for a large, deep-seated earth flow at the headwaters of Bull Canyon in Kosk Creek Tract, no active deep-seated slides were identified. The remaining deep-seated slides in Kosk Creek Tract were classified as static, except where they are underlain by steep slopes, where they were classified as dormant.

MANAGEMENT PRACTICES AND MITIGATION MEASURES FOR LANDSLIDES AND AREAS WITH HIGH LANDSLIDE POTENTIAL

Timber harvesting and associated activities, particularly building of roads and landings, can adversely affect stability of both undisturbed slopes and slopes created by landslide processes. Most hillslopes in managed forests are unlikely to fail, however, over the foreseeable future. Undisturbed slopes, if improperly managed, can fail, whereas landslide areas, if managed properly, need not have stability problems.

The stability of a slope depends on the geologic setting and the influence of geomorphic processes over time. Management practices can upset the balance of conditions and processes that maintain the hillslope's equilibrium. As discussed above, several geologic and geotechnical factors influence slope stability, some of which may be obvious, and others subtle.

Because of the extensiveness of landslides in some areas of Hearst Forests and the need to manage many of forested areas affected by landslides, it is important to recognize and classify each landslide, and to understand what initiated the slide, what forces are responsible for its current stability, and what conditions are likely to result in its reactivation. A preliminary mapping and classification of landslides on Hearst Forests is presented in PLATES L1, L2, L3, and L4. Six different types of landslides were identified, plus some combinations of types. Although the factors that contribute to the hillslope instability are similar for all landslide types (e.g., weak materials, adverse geologic structures, and high water table), the types are different enough with regard to failure mechanisms and other subtle factors that various types of landslides sometimes require specialized management techniques. Management objectives and guidelines for each type of slide are discussed below, beginning with general guidelines that apply to all types of landslides, followed by objectives and guidelines specific to individual types of

landslides. These objectives and guidelines are based in part on the California Division of Mines and Geology Bulletin 50: "Factors Affecting Landslides in Forested Terrain".

GENERAL GUIDELINES

Certified Engineering Geologist Consultation

A certified engineering geologist (CEG) should conduct field reviews and make management recommendations to be followed on Hearst Forests under the following conditions:

- new construction and major realignment of roads and landings on active landslides;
- construction of roads and landings on static or dormant landslides other than earthflows on slopes exceeding 65%, and on static or dormant earthflows on slopes exceeding 50%;
- maintenance of roads damaged by landslides resulting in the movement of material with high potential to enter a watercourse, as needed based on the judgment of an RPF;
- abandonment of roads involving potentially unstable cuts and fills, as needed based on the judgment of an RPF; and
- under any other conditions when, in the judgment of an RPF, there is significant uncertainty regarding the suitability of proposed management practices in relation to local geologic conditions especially where geologic conditions are poorly understood with respect to bedrock structure or bedrock type.

Active Landslides

The following mitigation measures should be applied on all active landslides:

- no clearcutting will occur;
- no operations will occur during the winter period (November 15-April 1);
- drainage facilities will be installed upslope from active landslides in harvest areas to divert runoff from the landslide;
- heavy equipment use will be prohibited except for end-lining of logs to adjacent stable areas and use of existing roads; and
- new construction and major realignments of roads and landings on active landslides will be subject to review and approval by a CEG.

Dormant and Static Landslides

On dormant or static earthflows on slopes exceeding 50%, and on other types of dormant or static landslides on slopes exceeding 65%, new construction of roads and landings will require review and approval by a CEG. On earthflows on slopes from 35%-50%, the following mitigation measures will be implemented:

- cutslopes will not exceed 5 feet in height,
- fills will not exceed 5 feet in height, except where reviewed and approved by a CEG,
- fills will be keyed into the underlying earth materials,
- roads will be consist of a single lane with turnouts, and
- road surfaces will either be arched to direct runoff to natural drainages or outsloped.

ROTATIONAL AND TRANSLATIONAL SLIDES

Management Objectives

Management objectives include minimizing concentration of water on or adjacent to the scarp and lateral margins, avoid undercutting the toe, minimize loading the head or other areas of the slide, and avoiding initiation of debris flows or avalanches in the scarp area.

Management Guidelines

New roads and landings should be sited to avoid loading the head of the slide. Wherever feasible, new roads should be aligned along benches to minimize the need for excavation. Drainage facilities should be installed to divert surface water from the scarp, and the slide mass, and lateral margins.

During harvesting, ground disturbance in the slide area should be minimized. Along the slide margins edges, vegetation removal should be minimized and logs should be moved by end-lining from adjacent stable areas. Where watercourses adjacent to large slides form inner gorges, harvesting should be minimized in the inner gorge.

EARTHFLOWS

Management Objectives

Earthflow surfaces are easily eroded; thus it is important to minimize disturbance of the flow. This can be accomplished, in part, by avoiding concentration of water onto or adjacent to the earthflow, and by avoiding deep cuts or large fills.

Management Guidelines

Construction of roads and landings should be avoided on earthflows wherever possible. Any disturbance resulting in the undercutting of the toe of an earthflow should also be avoided wherever possible. If it is necessary to build a road across an earthflow, the road should be single lane aligned on benches and along contours, and avoid wet areas, as much as possible. Wherever possible, roads should be arched and outsloped to facilitate drainage and avoid concentration of runoff. Major roads across earthflows should be continuously maintained. Artificial slopes should be reseeded as quickly as is appropriate. In addition, the general guidelines and mitigation measures described above for dormant or static earthflows on slopes exceeding 35% should be met or implemented.

During timber operations, ground disturbance and heavy equipment use should be minimized. End-lining should be used within watercourse and lake protection zones and heavy equipment limitation zones.

DEBRIS AVALANCHES

Management Objectives

Management objectives focus on avoiding initiation of new failures on undisturbed slopes adjacent to the debris avalanche scar, and on avoiding enlargement of existing slide scars. Objectives include retaining root support, avoiding undercutting the slope, minimizing loading of the slope, and minimizing concentration of water at the soil-rock interface (the most likely location for failure planes to develop).

Management Guidelines

Road construction across or adjacent to debris avalanche scars should be avoided wherever possible. Where unavoidable roads and landings should be located so as not to load the slide scar or adjacent slopes. Cuts and fills should be kept to an absolute minimum. Wherever possible, new roads should be arched to drain water away from the slide scar or potential slide area, water should not be discharged into the avalanche scar.

A 50-foot buffer zone should be established adjacent to all debris avalanches, within which no heavy equipment should be operated, except for use of existing stable roads and skid trails. Harvesting should be restricted to light selective harvesting; as much of the litter layer as possible should be maintained along with some residual vegetation. Cable yarding and equipment exclusions zones may be needed to preserve the integrity of the slope. Reconstruction of roads across debris avalanches may require cribbing, retaining walls, or riprap.

DEBRIS FLOWS AND TORRENT TRACKS

Management Objectives

The primary management objective should be to minimize the potential for initiation or reactivation of debris flows and debris torrents and related degradation of water quality.

Management Guidelines

Landings should not be constructed on debris flows, in debris torrent tracks, or areas where such failures are likely. Rock-fill, low-water crossings, or other suitable crossings approved by DFG should be used at stream crossings where debris flow or torrent hazards exist.

A 50-foot buffer zone should be established adjacent to all debris flows and torrents, within which no heavy equipment should be operated, except for use of existing stable roads and skid trails. Yarding methods and silvicultural systems used on and adjacent to debris flow/debris torrent tracks should be selected with due consideration of the stability of the channel slopes to minimize additional erosion.

UNDISTURBED SLOPES WITH HIGH LANDSLIDE POTENTIAL

Improper management can initiate sliding on undisturbed slopes, particularly if they display the characteristics of areas with high landslide potential. As discussed above, colluvium-filled swales, ephemeral stream channels, and gullies often have high landslide potential, particularly where they occur in conjunction with very steep slope, adverse bedding planes, weak materials, or improperly placed road fills.

Management Objectives

Water concentration should be minimized, water quality and riparian vegetation should be protected, and adequate root support retained in areas with high landslide potential. Impacts of road construction should be minimized and landings, if necessary, should be carefully located.

Management Guidelines

During planning of timber operations, a CEG or suitably trained RPF should evaluate all undisturbed hillslopes that would be disturbed by the proposed operations (e.g., timber harvesting and construction of roads, landings, and skid trails) with regard to their geologic conditions to assess their relative stability and landslide potential. In addition, practices to consider for high landslide potential areas include:

- carefully locate roads to avoid steeper slopes;
- use full-bench road construction whenever possible;
- minimize cuts;
- key fills into underlying stable earth materials;
- outslope roads;
- install drainage facilities to avoid concentration of runoff;
- design stream crossings to fit the gradient and other site conditions;
- maximize retention of vegetative cover; and
- maximize retention of the litter layer.

In areas where road construction could impact streams special care should be taken in the siting construction and drainage of roads.

APPENDIX A

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APPENDIX B

HEARST FORESTS ROAD HAZARD ASSESSMENT PROCEDURE

PREPARED BY:_____ DATE:_____

LOCATION:_____
Planning Watershed:_____Road or Landing:_____
Milepost:_____ Site Identification Number:_____
Photo Log:_____

FEATURES INDICATING HIGH LANDSLIDE/EROSION POTENTIAL

- ☐ Oversteepened fillslope
- ☐ Oversteepened cutslope
- ☐ Stream crossing with high diversion potential
- ☐ Undersized culvert
- ☐ Partially blocked culvert
- ☐ Skid trail crossing (fill) in ephemeral stream channel
- ☐ Bare soil area

ACTIVE LANDSLIDE/EROSION FEATURES

- ☐ Cutslope failure
- ☐ Fillslope failure
- ☐ Road or landing surface erosion
- ☐ Drainage structure outfall erosion
- ☐ Plugged culvert
- ☐ Stream crossing failure

CAUSE OF HAZARD:_____
_____
_____
_____
_____
_____

AFFECTED AREA:_____acres

VOLUME MOBILIZED TO DATE _____ cubic yards (cy)

POTENTIAL FOR ADDITIONAL MOBILIZATION:
none (0) low (0.25) medium (0.5) high (0.75) extreme (1)

MAXIMUM ADDITIONAL VOLUME THAT COULD BE MOBILIZED:_____cy

POTENTIAL FOR DELIVERY TO STREAM:
none (0) low (0.25) medium (0.5) high (0.75) extreme (1)

PHYSICAL FEATURES:

Topography: Hillslope:_____ inclination:_____ aspect_____

Bedrock: Type:_____
Bedding orientation:_____
Joint/Fractures - Orientation/Spacing:_____
Rock quality:_____

Soil: Type_____
Thickness:_____
Permeability:_____
Composition:_____

Hydrology: Springs or seeps:_____

Cutslope: angle:_____
height:_____
earth materials:_____

Fillslope: angle:_____
max thickness:_____
composition:_____
consolidation:_____

Crossing: type:_____
culvert diameter:_____

SUGGESTED TREATMENT:_____
_____
_____
_____
_____
_____
_____

ESTIMATED REPAIR COST: $_____

ESTIMATED COST EFFECTIVENESS $/cy_____

OTHER COMMENTS:_____
_____
_____
_____
_____
_____
_____

EXPECTED VOLUME OF SEDIMENT DISCHARGE:_____cy

OBSERVABLE FIELD CRITERIA SUGGESTING POTENTIAL, INCIPIENT OR ACTIVE ROAD HAZARDS

Many road hazards are obvious. However incipient features indicative of failures or erosion hazards or other subtle features that suggest concern or potential for problems to develop are listed below.

- Adverse orientation of bedding, etc. in cutslopes
- Arcuate crack patterns across roads or margins of landings, concave in the downslope direction
- Elongate cracking or crack patterns at or near the top of fillslopes or road shoulders that are parallel to subparallel to same.
- Cracks across roads with one side down.
- Oversteepened fillslopes (>1½:1/about 35%).
- Organic debris in fills.
- Poorly oriented culverts at stream crossings.
- Erosion at upper or lower ends of culverts.
- Debris or sediment clogged inlets or trash racks.
- Gulling at culvert outlets, especially on fill slopes
- Gulling on roads.

The list is not inclusive and as hazard inventory proceeds it is expected that field observations will add to the list.

DIRECTIONS FOR COMPLETING ROAD HAZARD ASSESSMENT

In completing the road hazard assessment form, some items may not be applicable in specific situations. Only complete the portions of the form appropriate to the conditions being evaluated.

For items not noted below, completion is self-explanatory.

LOCATION - Note planning watershed and circle if hazard involves a road or landing.

POTENTIAL - vs - Active - If hazard has not already occurred then it is potential hazard; check appropriate box.

CAUSE OF HAZARD - Briefly describe causative factors that resulted in or could result development of hazard.

POTENTIAL FOR ADDITIONAL MOBILIZATION - Circle descriptor that best describes chances that hazard could enlarge.

MAXIMUM ADDITIONAL VOLUME - vs - ADDITIONAL VOLUME EXPECTED - Here determine the maximum amount of material that could be mobilized regardless of time, with regards to additional volume, determine the amount that might be mobilized within a short time span say the next few years.

PHOTO LOG - Record photo number, subject, and direction of view.

PHYSICAL FEATURES - Hillslope: note inclination of slopes above and below hazard (as appropriate) bedrock type here note if is sandstone, shale, granitic rock or metamorphic rock etc.; Bedding orientation with respect to slope the strike and dip of the beds; Joints/Fractures Sparing is the bedrock closely fractured, widely fractured; orientation of fractures with respect to slope and each other. Soil Composition - approximate percentage silt/clay, sand, and gravel. Fill composition/consolidation - should note percentage rock, sand, silt/clay organic debris and if loose, firm, compact, etc.

SUGGESTED TREATMENT - Briefly outline possible mitigation measures.

ESTIMATED REPAIR COST/ESTIMATED COST EFFECTIVENESS - These items to be completed in the office from information on this form and the sketch.

Sketch should be to scale when ever possible with a north arrow. It should provide enough detail so that someone else using sketch in field or office could understand site conditions. Should include appropriate measured or estimated dimensions of length, width, height, depth, and slope inclination so that volumes and areas can be fairly accurately calculated.

Volume calculations should be prepared by breaking down the subject (mound or slab; gully; etc.) into simple geometric shapes - such as prisms, pyramids, cylinders, etc; with geometrically simple ends squares, rectangles, triangles, trapezoids, etc. In some cases it maybe appropriate to stack two pyramids base to base, etc. to determine the volume of a slide or gully - be creative.

APPENDIX C

READING LIST

LANDSLIDES INVESTIGATION AND MITIGATION Special Report 247, prepared by the Transportation Research Board, National Research Board, National Research Council, National Academy Press, Washington, D.C., 1996, edited by A.K. Turner and R.L. Schuster, 673 pages.

CDMG Notes 50, FACTORS AFFECTING LANDSLIDES IN FORESTED TERRAIN, prepared by California Division of mines and Geology, revised June 1997.

GEOMORPHIC PROCESSES AND AQUATIC HABIT in the REDWOOD CREEK BASIN, NORTHWESTERN CALIFORNIA, prepared by U.S. Geological Survey, U.S. Geological Survey professional paper 1454.

CDMG Note 54, GUIDELINES FOR GEOLOGIC REPORTS PREPARED FOR TIMBER HARVEST PLANS, Prepared by California Division of Mines and Geology.

SOIL SLIPS, DEBRIS FLOWS, AND RAINSTORMS IN THE SANTA MONICA MOUNTAINS AND VICINITY, SOUTHERN CALIFORNIA, U.S. Geological Survey Professional Paper 851, prepared by the U.S. Geological Survey.

EARTHFLOWS: MORPHOLOGY, MOBILIZATION, AND MOVEMENT, U.S. Geological Survey Professional paper 1264, prepared by the U.S. Geological Survey.

LANDSLIDES, FLOODS, AND MARINE EFFECTS OF THE STORM OF JANUARY 3-5, 1982, IN THE SAN FRANCISCO BAY REGION, CALIFORNIA, U.S. Geological Survey Professional Paper 1434, prepared by the U.S. Geological Survey.

DEBRIS FLOW/AVALANCHES: PROCESS, RECOGNITION, AND MITIGATION, Geological society of America, Reviews in Engineering Geology Volume VII, prepared by the Geological Society of America.

HANDBOOK FOR FOREST AND RANGE ROADS - A guide for planning, designing constructing, reconstructing, maintaining and closing wild land roads, prepared by W.E. Weaver and D.K. Hagans, for the Mendocino County Resource Conservation District.

SLOPE INSTABILITY, edited by D. Brunsden and D.B. Prior, Wiley-Interscience Publication, John Wiley & Sons.

CHARACTERIZATION OF WEAK AND WEATHERED ROCK MASSES prepared by P.M. Santi and A. Shakoor, Association of engineering Geologist Special Publication #9.

Appendix L. Chapters 1, 2, and 3 of Final PTEIR

Chapter 1. Introduction

ENVIRONMENTAL IMPACT REPORT CERTIFICATION AND PROJECT APPROVAL

Under the California Environmental Quality Act (CEQA), lead agencies must, after completing a draft environmental impact report (EIR), consult with and obtain comments from public agencies concerning the proposed project, and provide the public with opportunities to comment on the draft EIR. The lead agency must also respond to significant environmental points raised during the review and consultation process.

This document comprises the final Program Timberland Environmental Impact Report (PTEIR) for Hearst Forests. The final PTEIR consists of the draft PTEIR, which was circulated separately and is hereby incorporated by reference; comments on the draft PTEIR; responses to comments; and revisions to the draft PTEIR.

As lead agency for the Hearst Forests PTEIR, the California Department of Forestry and Fire Protection (CDF) must review and consider the final PTEIR before certifying it. The final PTEIR must be certified before the proposed project is approved. To support its decision, CDF must prepare written findings of fact for each significant environmental impact identified in the PTEIR. CDF must also adopt a program for reporting or monitoring mitigation measures that were adopted or made conditions of project approval. The purpose of the mitigation monitoring program is to ensure that the required mitigation measures are implemented and to provide feedback to agencies.

The lead agency must provide a copy of the responses to comments to any public agency that submitted comments on the draft EIR at least 10 days before certifying the final EIR. After approving a project, the lead agency must file a Notice of Determination with the county or counties in which the project is located and with the Governor's Office of Planning and Research (OPR). Posting the Notice of Determination starts the statute of limitations period on CEQA challenges.

PUBLIC REVIEW OF THE DRAFT PTEIR

The draft Hearst Forests PTEIR was distributed to interested agencies, organizations, and individuals for their review. As determined by OPR, the state review period began on October 15, 1997, and was scheduled to end on November 24, 1997. Based on requests from the California Department of Fish and Game (DFG) and the Central Valley Regional Water Quality Control Board (CVRWQCB), CDF extended the review period for state agencies to December 15, 1997.

COMMENTERS

Comment letters on the draft PTEIR were received from the Siskiyou County Board of Supervisors; DFG; CVRWQCB; and the California Department of Conservation, Division of Mines and Geology (DMG).

RESPONSES TO COMMENTS

All comment letters received were considered by CDF staff members, the project proponent [The Hearst Corporation (Hearst)], and the PTEIR consultants. Individual comments were identified and numbered. Several resource issues emerged as the most important issues addressed by the comments. These issues, each of which was typically addressed by several comments and often more than one commenter, are summarized and responded to in Chapter 2, "Major Environmental Issues and Responses". The remaining comments are responded to individually in Chapter 3, "Other Comments and Responses".

REVISIONS TO THE DRAFT PTEIR

The final PTEIR identifies one potentially significant environmental impact that was not included in the draft PTEIR: potential mortality of two special-status plant species resulting from timber operations.

Revisions to the text of the draft PTEIR that were made in response to comments are shown in Chapter 4 of this document.

Additionally, three appendices to the draft PTEIR have been substantially revised in response to comments and are reprinted in their entirety as appendices to the final PTEIR. They are:

- Appendix A, "Hearst Forests Resource Monitoring Plan", which replaces Appendix B ("Monitoring Plan") to the draft PTEIR;
- Appendix B, "Biological Opinion", which replaces Appendix F ("Memorandum of Understanding between The Hearst Corporation and the California Department of Fish and Game") to the draft PTEIR; and
- Appendix C, "Hearst Forests Best Management Practices", which replaces Appendix C ("Hearst Forests Best Management Practices") to the draft PTEIR.

In addition, the final PTEIR includes a new appendix (Appendix D, "Geology, Landslides, and Geologic Guidelines for Managing Hearst Forests"), which summarizes all geologic information in the PTEIR, and which was prepared in consultation with John Coyle, Certified Engineering Geologist No. 1263.

Chapter 2. Major Environmental Issues and Responses

This chapter summarizes and responds to the most substantial issues raised in comments on the draft PTEIR. Each comment summary includes a list of the comments addressed in the response, identified by commenter and comment number. (DFG = California Department of Fish and Game, CVRWQCB = Central Valley Regional Water Quality Control Board, DMG = California Division of Mines and Geology).

1. Baseline Assessment, Monitoring, and Retention of Snags and Downed Logs

Comment Summary

The baseline assessment of snags and terrestrial large woody debris (LWD) in the PTEIR is inadequate because it does not quantify their abundance or their distribution by size class or decay stage. The inventory system used to monitor trends in snags and terrestrial LWD is not adequately documented. Neither the California Forest Practice Rules (CFPRs) nor the best management practices (BMPs) for Hearst Forests provide for adequate recruitment of large-diameter snags or LWD. The BMPs require retention of only unmerchantable LWD and unmerchantable snags that have been dead for at least 1 year or that do not protrude above the general canopy, and only within late seral management zones (LSMZs). These restrictions are too narrow to ensure adequate retention and recruitment of snags and LWD. (DFG 3, 6, 17, 18, 19, 24, 33, 34, 35)

Response

The draft PTEIR (page 6-2) reported the ownership-wide average density of snags and downed logs in the tree size and density classes associated with late successional habitat (i.e., California Wildlife Habitat Relationship [WHR] System classes 5M, 5D, and 6). The tables below report the distribution of snags and downed logs by WHR class, decadence class (i.e., hard or soft), and size class. All recorded snags were at least 9.5 inches in diameter at breast height (dbh), and all recorded downed logs were at least 11 inches in diameter at the large end and at least 13 feet long.

As described on page 6-25 of the draft PTEIR, snags and downed logs will generally be retained throughout Hearst Forests; this policy is not restricted to the LSMZs. Snags standing above the general canopy will be removed because such trees attract lightning strikes and pose a substantial fire hazard. Similarly, snags that pose a hazard to timber operators will be removed, consistent with the CFPRs and the guidelines of the California Occupational Safety and Health Administration. Although some snags that have been dead for less than 1 year will be harvested, such harvesting is expected to capture less than 10% of the snags that are produced each year, because snags will only

be harvested as part of normal timber operations and the cutting cycle for Hearst Forests stands is at least 10 years. Snags that have been dead for more than 1 year are considered by Hearst to be unmerchantable and will be retained.

Snag Density (number per acre) by Habitat Type, Decadence Class, and Size Class									
	Hard				Soft				
WHR Class	1	2	3	4	1	2	3	4	Total
3M	0	1.11	0	0	0	0	0	0	1.11
4S	0.09	0.83	0	0	0.09	0.09	0	0	1.10
4P	0.62	1.01	0.08	0.02	0.01	0.39	0.11	0.14	2.45
4M	0.94	4.08	0.20	0	0	0.17	0.65	0.96	7.02
4D	0.37	2.03	0.27	0	0.05	1.30	0.65	0.05	4.77
5P	0	1.11	0	0	0	1.11	0	0.56	2.78
5M	0.37	1.30	0.19	0.74	0.18	0.56	0	0.76	4.09
5D	0.84	3.34	0.28	0	0	0.84	0	0	5.30

Notes: 1 = 9.5"-11" dbh.
2 = 11"-24" dbh.
3 = 24"-35" dbh.
4 = more than 35" dbh.

Downed Log Density (number per acre) by Habitat Type, Decadence Class, and Size Class							
	Hard			Soft			
WHR Class	1	2	3	1	2	3	Total
3M	0	0	0	0	0	0	0
4S	0.03	0.06	0	0.03	0.06	0	0.18
4P	0.29	0.34	0.16	0.24	0.01	0.02	1.08
4M	0.33	0.18	0.05	0.44	0.05	0	1.07
4D	0.31	0.39	0.08	0.15	0.01	0	0.93
5P	0.50	0.50	0.33	0.33	0.33	0	2.00
5M	0.11	0.61	0.17	0.22	0.06	0	1.17
5D	0.67	0.17	0	0.58	0.33	0	1.75

Notes: 1 = 11"-20" in diameter at large end.
2 = 20"-35" in diameter at large end.
3 = more than 35" in diameter at large end.

Snags and downed logs were inventoried as part of the timber inventory system described on page 8-2 of the draft PTEIR. This system will also be used to monitor trends in snag and downed-log abundance over time. As discussed in the Hearst Forests Resource Monitoring Plan, if inventory results indicate that snag or downed-log density is declining over time, appropriate adjustments will be made to the Hearst Forests timber harvesting program to ensure that such declines do not persist.

2. Baseline Assessment and Monitoring of Aquatic Habitat

Comment Summary

Baseline data on aquatic habitat in the PTEIR provide an inadequate basis for describing the existing condition of aquatic habitat throughout the ownership. Poor baseline conditions could indicate the need for conservative timber harvest practices. The reliability of applying the proposed adaptive aquatic management approach based on monitoring habitat in Angel and Star City Creeks is unknown. Timber operations on Hearst Forests could result in significant downstream impacts. Aquatic habitat should also be monitored in Kosk Creek. In addition to the parameters proposed for monitoring, water temperature should be monitored. Fish distribution and species composition should be documented in each of the five planning watersheds (PWs) addressed in the PTEIR and in Tate Creek. Monitoring schedules should be developed in consultation with DFG and the CVRWQCB, and monitoring results should be reported to these agencies. Repeating the baseline surveys in five years as proposed will not provide adequate data for assessing the impacts of timber operations; surveys should be repeated following major watershed disturbances, such as major floods or landslides. (DFG 4, 5,10, 13, 14, 15; CVRWQCB 23, 24, 27)

Response

Based on consultations with DFG and CVRWQCB, Hearst will modify its aquatic habitat monitoring program to focus on Angel and Kosk Creeks, rather than Angel and Star City Creeks. To improve knowledge of the natural variation in aquatic habitat conditions, Hearst will complete a total of two baseline sediment surveys in the selected streams over the next 3 years. This means that one additional baseline sediment survey will be conducted in Angel Creek, replicating the 1995 survey, and two baseline sediment surveys will be conducted in Kosk Creek over the next 3 years. The sediment surveys will focus on two selected geomorphic reference reaches in each stream. In addition, baseline habitat typing surveys and fish abundance surveys will be conducted in Kosk Creek following the standard protocols applied previously in Angel and Star City Creeks. Kosk Creek habitat typing and fish abundance surveys will be restricted to the accessible portion of the stream within Hearst Forests, namely, the approximately 3-mile reach between the crossing in Section 26 (T. 38 N., R. 1 E.) and the crossing in Section 7 (T. 38 N., R. 2 E.). Finally, continuous stream temperature recording will be conducted during the summer months at one accessible location in the lower portion of each study area for at least 2 years.

Following completion of the baseline aquatic surveys, Hearst and CDF will develop, with input from DFG, a schedule for conducting subsequent aquatic surveys involving at least one additional sediment survey and one year of stream temperature recording in Angel and Kosk Creeks. Based on the results of the baseline surveys, Hearst and CDF will also develop thresholds of departure from baseline conditions to use in determining whether substantial habitat degradation has occurred. If the thresholds are exceeded, the reasons for the degradation will be explained, and, if warranted, additional habitat typing and fish abundance surveys will be conducted. If the reasons for the habitat degradation are not readily apparent, additional surveys will be conducted in tributary streams, or on hillslopes to determine the extent and sources of the damage. If deemed necessary by Hearst and CDF, additional measures (e.g., reduced harvesting in streamside areas, increased road abandonment, or increased stabilization of active erosion sites) will be implemented to restore habitat quality.

3. Watershed Effects of the January 1997 Flood

Comment Summary

To test the validity of the flood sensitivity analysis in the PTEIR, the responses of watersheds in Hearst Forests to the flood of January 1997 should be assessed. The flood may have substantially altered baseline watershed conditions (e.g., riparian habitat, pool abundance, and base streamflows) relative to those described in the PTEIR. (DFG 8, 9; CVRWQCB 9, 16, 22, 26)

Response

McCloud River flows on January 1, 1997, exceeded the rate estimated for a 100-year flood event. The draft PTEIR analyzed flooding potential of the five PWs composing the watershed assessment study area, and ranked the PWs in increasing order of flooding hazard as follows: McCloud Reservoir, Wyntoon, Angel Creek, Star City Creek, and Curtis-Devils Canyon. Results of postflood surveys of washed-out bridge approaches, culvert failures and related road damages, and stream channel changes were generally consistent with this ranking of PWs by flooding hazard. For example, of a total of 91 sites on the property where flood-related road damage was observed, 36 sites were in Curtis-Devils Canyon PW, 20 in Angel Creek PW, 18 in Star City Creek PW, and the remaining 17 in other watersheds. One of the more substantial examples of road damage resulting from the flood was on a section of the road along Angel Creek that was scoured and undermined by flows deflected into the bank by an accumulation of riparian trees and other debris that had fallen into the stream.

Because of the steep canyon topography characteristic of the eastern and southern portions of Hearst Forests, most streams in these PWs have confined channels without extensive floodplains. Consequently, there were few occurrences of out-of-channel floodflows at high velocities and rates, and there was relatively little damage to riparian vegetation. No major stream channel movements (e.g., cutting off of meanders) occurred, even in the meadow reaches of Angel, Star City, and Huckleberry Creeks, although minor channel reconfigurations (e.g., thalweg shifts from one side of

the channel to the other) occurred extensively. No new barriers to fish migration have been identified.

Effects of the flood on aquatic habitat condition (e.g., pool extent and average depth) are currently largely unknown. Forthcoming additional baseline sediment surveys in Angel Creek, however, are expected to determine whether substantial sediment deposition has occurred since the 1995 surveys. If so, additional habitat typing will be conducted on Angel Creek to assess changes in pool extent and average depth. Based on other observable effects, however, the flood appears to have resulted in no major adverse effects on watershed productivity or functioning, or substantial alterations in baseline watershed conditions.

4. Baseline Assessment and Protection of Special-Status Plants

Comment Summary

The PTEIR provides insufficient information on special-status plants to support the conclusion that no significant impacts on botanical resources will result from the proposed project. No floristic surveys were conducted to determine species presence or absence. The PTEIR does not describe the methods used to select the five identified special-status species with potential to occur on Hearst Forests. Section 15380 of the State CEQA Guidelines specifies that an impact that reduces the number of any species that meets the criteria for classification as rare, threatened, or endangered is significant. Impacts on special-status plants need to be assessed through site-specific habitat observations for program timber harvesting plans (PTHPs). (DFG 16, 25, 26, 27)

Response

Special-status plant species with potential to occur on Hearst Forests were identified through review of DFG's Natural Diversity Data Base, as well as data bases maintained by the California Native Plant Society and the Shasta-Trinity National Forests. An initial species list was developed from documented observations of special-status species in the area bounded by Mount Shasta on the north, Medicine Lake highlands on the east, Lake Shasta on the south, and Mount Eddy on the west, which extends several miles beyond Hearst Forests in each direction. This initial list, which included 12 species, was screened to eliminate species confined to habitats that do not occur on Hearst Forests. This screening resulted in the list being reduced to include only the five special-status species described in Chapter 5 of the draft PTEIR.

The draft PTEIR specified that impacts on special-status plants listed as threatened or endangered under the federal or state Endangered Species Acts were considered significant if the project would result in any take. Of the five special-status species with potential to occur on Hearst Forests, however, none is listed as threatened or endangered. Impacts on other special-status species were considered significant if they would result in the extirpation of a plant population. Based on consultation with DFG, this significance threshold has been changed in the final PTEIR to be consistent with criteria specified in Section 15065 of the State CEQA Guidelines (i.e., reducing the

number or restricting the range of a rare or endangered species). As also agreed on in consultation with DFG, reconnaissance surveys will be conducted to identify any suitable habitat for Scott Mountain phacelia (*Phacelia dalesiana*) and long-haired star tulip (*Calochortus longebarbatus* var. *longebarbatus*) as part of PTHP preparation. If suitable habitat is identified through such surveys, either it will be flagged and avoided, or surveys will be conducted by a qualified person trained in the identification of these species to determine whether they are present. If individuals of these species are found to be present, a population protection plan will be prepared by Hearst and CDF, with input from DFG, and the population will be protected consistent with this plan.

5. Environmental Assessment of Alternative and In-Lieu Practices

Comment Summary

The analysis of alternative and in-lieu practices is inadequate to support the conclusion that, in all cases, they will not result in significant environmental impacts; such practices should be reviewed onsite for subsequent PTHPs. In some cases, constructing facilities outside the watercourse and lake protection zone (WLPZ) has fewer long-term impacts than using existing facilities within a WLPZ. Because no performance standards for alternative and in-lieu practices are specified in the monitoring plan for the PTEIR, the "effectiveness" monitoring plan is incomplete. (DFG 22, 31; CVRWQCB 8, 21, 27, 52)

Response

The CFPRs covering PTEIRs and PTHPs (14 CCR 1092) require that any alternative practices intended to be implemented under a PTEIR must be identified and analyzed in the PTEIR to reasonably demonstrate that they will provide resource protection equal to or better than the corresponding standard practices specified in the CFPRs. The Hearst Forests PTEIR meets this requirement by:

- identifying all alternative and in-lieu practices intended to be applied in the future;
- documenting evidence that most such practices have been repeatedly and effectively used in the past on Hearst Forests;
- proposing mitigation measures that will, in all foreseeable circumstances, reasonably ensure that significant resource impacts are avoided; and
- allowing for field review of each proposed application of an alternative or in-lieu practice in subsequent PTHPs, as well as incorporation of additional site-specific mitigation measures determined through the field review to be needed to avoid significant impacts. DFG and CVRWQCB will have the opportunity to comment on the adequacy of mitigation measures proposed for alternative and in-lieu practices in individual PTHPs.

As discussed in the Hearst Forests Resource Monitoring Plan, survey procedures for use in evaluation of the effectiveness of hillslope practices, focusing on alternative and in-lieu practices, will be developed within 1 year following certification of the PTEIR. These procedures will include criteria for determining whether the effectiveness of the practices has been satisfactory.

6. Key Planning Assumptions

Comment Summary

What are the key planning assumptions for the PTEIR? (DFG 23)

Response

Following are the key planning assumptions used in preparing the Hearst Forests PTEIR:

- On average, approximately 2,000 acres will be harvested annually on Hearst Forests.
- The annual timber harvesting rate will be 1.7%-2.5% of the timber inventory and 67%-88% of the timber growth rate on Hearst Forests over the next 100 years.
- Approximately 95% of the harvesting will involve silvicultural systems that promote or result in uneven-aged stand structures.
- The harvest cycle for individual stands will be 10-20 years, except for areas (up to 5% of the timberland) that receive regeneration harvests.
- No commercial harvesting will occur in the 1,107-acre McCloud River Preserve or on 7,879 acres of nontimberland.
- Only limited harvesting designed to promote development and enhancement of late-successional habitat will occur in the designated 9,452-acre network of LSMZs.
- Snag removal will be limited to trees that have been dead for less than 1 year and snags that extend above the general canopy or pose a public safety hazard.
- All large downed logs will be retained.
- Approximately 10 net additional miles of new road will be constructed and 30-40 miles of existing roads will be reconstructed over the next 20 years.
- Tractor harvesting will be restricted to slopes of less than 65%, or up to 100% of the Wyntoon PW, 70% of the McCloud Reservoir PW, 95% of the Angel Creek PW, 80% of the Star City Creek PW, and 80% of the Curtis-Devils Canyon PW.

- Except for the alternative and in-lieu practices specifically identified and analyzed in the PTEIR, management practices on Hearst Forests will conform to the operational standards specified in the current CFPRs.

7. Expert Participation in Development of Geologic Information

Comment Summary

Geologic information in the PTEIR, including geologic maps and guidelines and mitigation measures for managing landslides and other unstable areas, should be developed with the assistance of a registered geologist or a certified engineering geologist. (CVRWQCB 6; DMG 3, 6)

Response

All geologic information in the PTEIR was developed in consultation with John Coyle, Certified Engineering Geologist No. 1263.

8. Additional Mitigation Measures to Protect Listed Wildlife Species

Comment Summary

Besides the mitigation measures specified to protect listed wildlife species addressed in the memorandum of understanding (MOU) between Hearst and DFG (Appendix F to the PTEIR), DFG determined that additional mitigation measures are needed to minimize adverse impacts of the proposed project on the bald eagle, willow flycatcher, great gray owl, and Shasta salamander pursuant to Fish and Game Code Section 2090. (DFG 42, 43, 44, 45)

Response

Additional mitigation measures needed to protect the wildlife species addressed in the MOU have been identified by DFG and will be implemented by Hearst. These measures have been documented in findings contained in a biological opinion issued by DFG to CDF authorizing incidental take of the affected species, a copy of which is included in this final PTEIR.

Chapter 3. Other Comments and Responses

This chapter presents the comment letters on the draft PTEIR and responses to individual comments not responded to in the major issues discussions in Chapter 2. Within each letter, each comment has been assigned a number. Responses to comments follow each letter and are numbered corresponding to the comment referenced. For comments discussed in Chapter 2, the applicable section of Chapter 2 is referenced.

STATE OF CALIFORNIA

Governor's Office of Planning and Research
1400 Tenth Street
Sacramento, CA 95814

December 1, 1997

ALLEN ROBERTSON
DEPARTMENT OF FORESTRY AND FIRE PROTECTION
PO BOX 944246
SACRAMENTO, CA 94244-2460

Subject: TIMBER OPERATIONS ON HEARST FORESTS SCH #: 96072103

Dear ALLEN ROBERTSON:

The State Clearinghouse submitted the above named environmental document to selected state agencies for review. The review period is closed and none of the state agencies have comments. This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act.

Please call Kristen Derscheid at (916) 445-0613 if you have any questions regarding the environmental review process. When contacting the Clearinghouse in this matter, please use the eight-digit State Clearinghouse number so that we may respond promptly.

Sincerely,

Antero A. Rivasplata

ANTERO A. RIVASPLATA
Chief, State Clearinghouse

Notice of Completion and Environmental Document Transmittal Form

Mail to: State Clearinghouse, 1400 Tenth Street, Sacramento, California 95814 — (916) 445-0613

SCH# 96072103

Project Title: Draft Program Timberland Environmental Impact Report
Lead Agency: California Department of Forestry and Fire Protection

Project Location: The Hearst Corporation Forestlands

City: near McCloud, CA County: Siskiyou and Shasta

Within 2 miles: a. State Hwy #: Highway 89 b. Airports: ____
c. Railways: ____ d. Waterways: McCloud River

Project Description: The Hearst Corporation proposes to harvest timber on its 60,801 acre ownership in Siskiyou and Shasta Counties under the Board of Forestry's new Program Timber Harvest Plan (PTHP) provisions. PTHPs submitted in the future must be within the scope of this Program EIR, meet the forest resource protection standards of the California Forest Practice Rules (CFPR) and alternative standards included in this document. Harvesting rates are designed to maintain or increase the extent of late successional habitat over time. The CFPR and alternative practices are designed to protect the beneficial uses of water as well as a diversity of wildlife. A forest resource monitoring plan is included to ensure the key assumptions of this Program EIR are valid, that applicable resource protection standards are being implemented, and that these standards are achieving their objectives.

Document Type:

CEQA		NEPA	
1. ___ NOP	6. ___ Supplement/ Subsequent EIR (Prior SCH NO.): ____	8. ___ NOI	12. ___ Joint Document
2. ___ Early Consultation	7. ___ Final EIR	9. ___ FONSI	13. ___ Final Document
3. ___ Initial Study/Neg Dec	8. ___ NOE	10. ___ Draft EIS	14. ___ Other ____
4. X Draft EIR	9. ___ NOC	11. ___ EA	
5. ___ Mitigated Neg Dec	10. ___ NOD		

PROJECT ISSUES DISCUSSED IN DOCUMENT

1. X Aesthetic/Visual	9. X Geologic/Seismic	17. ___ Sewer Capacity	25. ___ Water Supply
2. ___ Agricultural Land	10. ___ Pop./Employment/Housing	18. X Soil Erosion	26. X Wetland/Riparian
3. ___ Air Quality	11. ___ Minerals	19. ___ Solid Waste	27. X Wildlife
4. X Archaeological/Historical	12. ___ Noise	20. ___ Toxic/Hazardous	28. ___ Growth Inducing
5. ___ Coastal Zone	13. ___ Public Services	21. X Traffic/Circulation	29. ___ Incompatible Landuse
6. ___ Economic	14. ___ Schools	22. X Vegetation	30. X Cumulative Effects
7. X Fire Hazard	15. ___ Recreation	23. ___ Utilities	31. X Other Forest Mgmt.
8. ___ Flooding/Drainage	16. ___ Septic Systems	24. X Water Quality	

Address where Copy of Document is Available:

CDF, Headquarters, 1416 9th Street, Room 1516-22, Sacramento
CDF, Shasta-Trinity Ranger Unit, 1000 Cypress Avenue, Redding
CDF, Siskiyou Ranger Unit, 1809 Fair Lane Road, Yreka

Public Review Period (to be filled in by Lead Agency):

Starting Date: 10/15/97 Ending Date: 11/28/97

Contact Person: Allan S. Robertson,
Environmental Coordinator
California Department of Forestry and Fire Protection
P.O. Box 944246
Sacramento, CA 9424' 2460

Phone (916) 657-0300

FILED
OCT 15 1997
STATE CLEARINGHOUSE

State Clearinghouse Contact: Mr. Chris Belsky
(916) 445-0613

State Review Began: 10-15-97
Dept. Review to Agency 11-19
Agency Rev to SCH 11-24
SCH COMPLIANCE 11-26

Please note SCH Number on all Comments

96072103

Please forward late comments directly to the Lead Agency

AQMD/APCD 32 (Resources: 10115)

Project Sent to the following State Agencies

X Resources		State/Consumer Svcs
___ Boating		___ General Services
___ Coastal Comm		Cal/EPA
___ Coastal Consv		___ ARB
___ Colorado Rvr Bd		___ CA Waste Mgmt Bd
X Conservation		___ SWRCB: Grants
X Fish & Game # 1		___ SWRCB: Delta
___ Delta Protection		
___ Forestry		___ SWRCB: Wtr Quality
X Parks & Rec/OHP		___ SWRCB: Wtr Rights
___ Reclamation		X Reg. WQCB # 5R
___ BCDC		___ DTSC/CTC
X DWR		
___ OES		Yth/Adt Corrections
Bus Transp Hous		___ Corrections
___ Aeronautics		Independent Comm
___ CHP		___ Energy Comm
X Caltrans # 2		X NAHC
___ Trans Planning		___ PUC
___ Housing & Devel		___ Santa Mn Mtns
Health & Welfare		X State Lands Comm
___ Drinking H20		___ Tahoe Rgl Plan
___ Medical Waste		___ Other: ____

COUNTY OF SISKIYOU

Board of Supervisors

P.O. Box 338 • 311 Fourth Street
Yreka, California 96097

(916) 842-8081
FAX (916) 842-8093

November 24, 1997

Mr. Allen S. Robertson
Environmental Coordinator
California Department of Forestry and Fire Protection
PO Box 944246
Sacramento, California 94244-2460

Dear Mr. Robertson:

Subject: Draft Timberland Environmental Impact Report for Hearst Forests (SCH No. 96072103)

This letter is in response to your request for comments regarding the aforementioned proposal. We offer our comments and support.

As you are aware, a significant portion of Siskiyou County is in Federal ownership. This is particularly true of our forested areas. Forest resources are an integral part of this county's heritage and continue to influence our very lifestyles. Every constituent we serve relies upon forest resources. This Board supports forest management practices that promote wise use of these resources; sustained yield is a goal we both acknowledge and support. We are satisfied that the Board of Forestry's rules are designed with this goal in mind.

We therefore encourage that the environmental review for the proposed timber harvest plan for Hearst Forests be prepared in a comprehensive manner following adopted rules. Areas requiring special attention (e.g., historic/archeological, riparian corridors, areas of scenic value, etc.) should be closely scrutinized to minimize or avoid potential deleterious effects. A well-prepared plan should facilitate the plan's implementation in an expeditious manner. This would result in both promotion of our timber resources and economic benefit; net public benefit would be achieved.

Thank you for this opportunity to participate in the public process.

Sincerely,

Bill Hoy

Bill Hoy
Siskiyou County Board of Supervisors

WV:lrf

JOAN T. SMITH District 1 | *LA VADA ERICKSON* District 2 | *BILL HOY* District 3 | *JERRY GIARDINO* District 4 | *KAY M. BRYAN* District 5

Response to Comment from Siskiyou County Board of Supervisors

1. Comment noted.

State of California

Memorandum

To : Mr. Allen S. Robertson
Environmental Coordinator
California Department of Forestry and Fire
Post Office Box 9442246
Sacramento, California 94244-2460

Date : December 15, 1997

Post-it™ brand fax transmittal memo 7671 | # of pages ▸ 18

To Nicle Dennis	From A. Robertson
Co. J & S.	Co. CDF
Dept.	Phone #
Fax #	Fax #

From : Department of Fish and Game - Region 1
601 Locust Street, Redding, California 96001

Subject : Comments on the Draft Program Timberland Environmental Impact Report for Hearst Forests (SCH #96072103)

The California Department of Forestry and Fire Protection (CDF), as a State lead agency under the California Environmental Quality Act (CEQA), has completed a draft Program Timberland Environmental Impact Report (PTEIR) for the Hearst Forests. The draft PTEIR was accepted for a 45-day public and agency review by the State Clearinghouse on October 15, 1997 (SCH #96072103). The CDF subsequently extended the comment period until December 15, 1997. The Department of Fish and Game (DFG) responded to the notice of preparation by memorandum dated September 6, 1996.

The proposed project includes commercial timber harvesting, site preparation, and construction and maintenance of roads, stream crossings, skid trails, landings and fuel breaks on 60,801 acres owned by the Hearst Corporation in Shasta and Siskiyou counties. Once the PTEIR is certified by the CDF, project level program timber harvest plans (PTHP) can be "tiered" to the report and thereby reduce the level of documentation normally required under the California Forest Practice Rules (CFPRs).

The DFG has jurisdiction over the conservation, protection and management of fish, wildlife and plants, and the habitat necessary for biologically sustainable populations of these species pursuant to Section 1802 of the Fish and Game Code (FGC). Commensurate with the State objective of perpetuating sustainable populations of all wildlife species (FGC Section 1801), the PTEIR process can offer a reasonable opportunity to address potential impacts of large-scale timberland management. This landscape level effort can be used to expand the traditional focus of short term, site-specific assessments of individual timber harvest operations to include the cumulative effects these operations often have over time and space. It also offers the opportunity to assess and monitor all timber operations including operations such as sanitation salvaging which is often omitted from impact assessment under the "functional equivalent process" provided by the CFPRs.

The DFG is impressed by the time and energy devoted by the State lead agency to the Hearst Forest draft PTEIR. The project proponent is commended for early consideration of threatened and endangered species and management of habitat for the northern goshawk. Commitments to maintain a specified amount of habitat in late seral management zones are also to be commended.

The following comments are presented to help ensure all potentially significant impacts to wildlife species and wildlife habitat have been identified and addressed so that implementation of commercial forest management activities on the Hearst Forest will assure sustainable wildlife populations. The DFG is concerned with the overall assessment and implementation strategy. A number of resource-specific issues also require further examination. These concerns are not necessarily directed at the type or amount of forest management activities proposed for the Hearst forests per se but with the process used to identify, quantify, monitor and mitigate potentially significant adverse effects over time and space.

ASSESSMENT AND IMPLEMENTATION STRATEGY

The basic scope of the proposed project is commercial timber harvest operations on the 60,801- acre Hearst Forest. The period of time covered by the proposal is not specified and is assumed to be open ended. The project employs a strategy of adaptive management to address environmental concerns using five basic steps:

Step 1. Assess and document baseline conditions.

Step 2. Determine the level and means of resource management commensurate with environmental regulations and the goals and objectives of the landowner (management goals and objectives).

Step 3. Develop key planning assumptions concerning how proposed operations may impact various resources.

Step 4. Identify potentially significant effects and cumulative impacts, and develop protection standards and mitigation measures.

Step 5. Implement a three-pronged monitoring effort: a) **validation monitoring** to determine whether key planning assumptions are correct, b) **compliance monitoring** to ensure resources protection commitments are being met, and c) **effectiveness monitoring** to ensure mitigation measures and resource protection standards meet their intended objectives.

This basic strategy has merit but does not provide an adequate impact assessment in its current form. While some improvement is needed at each step of the assessment process, inadequate baseline information, an incomplete monitoring program and absence of a specific feedback or adjustment mechanism is problematic (see: Holling 1978, Walters 1986, Walters and Holling 1990, Thomas et al. 1993, Borman et al. 1994). This is of concern in light of the open ended nature of the proposed project. The DFG strongly recommends that the scope of the project be clearly specified by identifying a definite period for which approval is being sought. The DFG also recommends that specific feedback and adjustment mechanisms be included as an integral part of the management strategy. This should be coupled with a quantifiable baseline assessment and a monitoring program designed to track potential changes in baseline parameters.

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Specific DFG concerns regarding the management strategy are as follows:

Step 1. Assessment of Baseline Conditions

Baseline conditions were primarily assessed using aerial photos and standard forest inventory techniques to establish the current amount and distribution of timber types by size and canopy closure class. Soil maps and field surveys were used to classify and assess erosion hazard and slope stability. Museum records, the DFG Natural Diversity Data Base and field surveys were implemented to determine the occurrence and status of various fish and wildlife species. While these techniques provide an overall view of baseline resource conditions in and around the project area, they did not focus well on some habitat elements of critical importance to fish and wildlife such as snags and large woody debris (LWD). The DFG does not consider that this level of baseline assessment provides adequate detail upon which to base the effect of the proposed project on wildlife resources. It is also not an adequate foundation for adaptive management. The DFG recommends the baseline assessment be augmented with quantifiable and repeatable measurements of specific habitat elements and parameters to supplement the baseline assessment presented in the draft PTEIR.

3

Baseline Watershed Assessment

The watershed assessment is based on the "Cumulative Offsite Watershed Effects Analysis Process" to describe the condition or sensitivity of a watershed. It is based on a characterization of natural sensitivity to disturbance using a natural sensitivity index (NSI) combined with an assessment of cumulative disturbance using the equivalent roaded area (ERA) method. Consideration of soil characteristics, erosion hazard ratings and local hydrology are synthesized into the assessment. Riparian areas and stream channels are also characterized. Potential watershed impacts are considered significant if a proposed activity could result in increased erosion, runoff, sediment discharge, flooding, water temperature or in a substantial deficiency of instream LWD. "Conclusions as to the effects of proposed activities are based on professional judgements of both the effectiveness and limitations of the CFPRs and the (Hearst Forest) Best Management Practices (BMPs) in avoiding or minimizing watershed impacts" (page 3-28).

As indicated by the draft PTEIR, the watershed assessment methodology is primarily based on indices and professional judgment, not on direct, repeatable measurement of key parameters known to be directly related to impacts attributed to commercial timber harvesting. Significant increases could indicate problems with the management prescriptions which should be corrected or mitigated. The reliability of this "Adaptive Aquatic Management" approach applied on two key fish-bearing streams to assure functional aquatic ecosystems over the ownership is unknown. The DFG recommends that this monitoring proposal be more fully developed and expanded to address other hydrologic units on the ownership including Kosk Creek.

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Stream temperature is another critical habitat parameter for assessing impacts to fish and other aquatic vertebrates. Professional judgment is used to determine that the proposed project will have negligible adverse effects. However, on an open-ended project based on
5 adaptive management, the DFG recommends that baseline water temperatures be measured and monitored through time to inform future management decisions.

LWD in streams is another key indicator of a properly functioning aquatic ecosystem. This element is of critical importance to salmonids and other aquatic species. While the draft PTEIR indicates that data regarding LWD was collected during stream surveys, no specific definition of LWD is provided and no quantifiable baseline data is presented in the draft PTEIR. It is therefore not possible to assess the State lead agency's conclusion that sufficient LWD is available in all areas of the proposed project and will remain so during project
6 implementation. The DFG recommends that the PTEIR provide a definition for an LWD, and quantify the baseline abundance of this habitat element on the project area as the basis for future monitoring. One example of a workable LWD definition is "Large woody debris" includes all logs (with or without roots attached), chunks (short cut pieces of tree boles), large branches and root wads (wholly detached or forming channel bank and/or bottom) that have a diameter of at least 10 cm (4 inches), a length of at least 2 meters (6.6 feet), and intrude into the stream, river or lake."

The cumulative disturbance index used as part of the watershed analysis represents a summation of historical and projected disturbances by type and extent of disturbance and its year of occurrence. In developing this index, it was assumed that disturbances related to timber operations gradually recover over time so that, after a period of at least 10 years, the watershed functions approximately as it did before the disturbance (page 3-3). In addition, because the cumulative impact assessment guidelines in the CFPRs reference a 10-year period for analysis of past projects and because there was a lack of consistent data on areas harvested prior to 1985, information on disturbances was only compiled for the 10-year period between
7 1985 and 1996. The DFG does not concur with the 10-year recovery assumption and concludes that the PTEIR should support this assumption with findings from peer-reviewed scientific literature. As indicated in the draft PTEIR, stream channel conditions sometime reflect sedimentation from timber operations that occurred more than 40 years ago (page 3-5).

The draft PTEIR states that results of the ERA analysis indicate proposed timber operations could result in "minor increases" of flooding potential over the next 20 years and that increases in peak flow resulting from future management activities are expected to be nearly offset by the gradual natural recovery of areas subject to past disturbance (page 3-37). To test the validity of this ERA analysis, the CDF should assess how watersheds within the
8 ownership (e.g., Star City Creek, Angel Creek, Tate Creek, Kosk Creek) responded to the January 1997 flood event and whether observed peak flows were within the range predicted by the ERA. We note that the baseline watershed assessment was developed from information
9 collected prior to the flood events of early 1997 and may not accurately reflect the current, preproject baseline.

Baseline Fisheries and Fish Habitat Assessment

The draft PTEIR states that the fisheries study area consists of planning watersheds (PWs) analyzed for the watershed assessment: the Wyntoon, McCloud Reservoir, Curtis-Devil's Canyon, Angel Creek, and Star City Creek PWs. "These PWs account for all Class I (i.e., fish-supporting) waters within Hearst Forests. Principal study area waters include McCloud Reservoir, the McCloud River between Lower Falls and McCloud Reservoir, Huckleberry Creek, Star City Creek, Angel Creek, Mud Creek, Quail Gulch and upper Kosk Creek." Also analyzed was a section of Tate Creek (in the Tate Creek PW) in Hearst ownership because it supports a population of redband trout, a candidate species for Federal listing as threatened.

The fisheries assessment provides some qualitative background information on historical regional fish resources and management. It identifies rainbow, brown, and brook trout as the common fish species found in the study area and describes, in mostly qualitative terms, their life histories and habitat requirements. The status of redband trout in the upper McCloud River drainage is discussed briefly and it is stated that Tate Creek supports an isolated population of redbands. However, most of the baseline information on fish occurrence, distribution, relative abundance and size distribution for much of the study area (especially headwater tributaries) is either lacking, incomplete or speculative. It is mostly qualitative information and is based on references to regional reports or walk-by field observations. Two exceptions are the snorkeling and electroshocking surveys conducted by T.R. Payne and Associates in lower Angel Creek in 1995 and lower Star City Creek in 1996. Although quantitative fisheries data was collected during these surveys, it is not presented in the draft PTEIR. The DFG does not believe the level of baseline fishery information presented
10 in the draft PTEIR is adequate to assess potentially significant effects of proposed activities on fisheries. Existing baseline fisheries data should be augmented by documenting fish distribution and species composition relative to habitat availability in a broad representation of aquatic habitats within each of the five PWs and Tate Creek.

According to the PTEIR, information on stream channel and fish habitat conditions in Class I waters within the study area were obtained from field observations, discussion with agency biologists and Hearst foresters, and from habitat and fish surveys. Stream channel stability and sensitivity to disturbance were evaluated using channel typing results based on analysis of USGS topographic maps and aerial photographs of Class I streams. Most of the information presented, however, is qualitative in nature. Some of the watercourse habitat
11 descriptions are abbreviated and superficial even when they hint at potential environmental problems. For example, Quail Gulch, including Lick Creek, is discussed in three sentences and includes the fact that it is heavily aggraded by sediment (page 4-7). The aggradation is not quantified; no reason is given for this condition or when it may have occurred. Information is also not provided on whether the condition is static, recovering or worsening.

During an examination of Kosk Creek in 1995 (page 4-9), it was noted that cobbles were embedded approximately 30%-50% in sand and gravel and that no pools were present. This is a serious condition with respect to habitat for fish and other aquatic species that justifies further analysis and discussion. The PTEIR acknowledges that "Because data on past and present fish populations and aquatic habitat are limited, and because quantitative relationships between timber operations and their effects on fish habitat in the study area have not been specified, the assessment of fishery impacts was generally qualitative (page 4-10)." 12

The PTEIR states that "Impacts on fishery resources were considered significant if proposed actions (either alone or in conjunction with past, present, and future actions) would directly or indirectly cause or contribute to substantial short- or long-term reductions in fish abundance or distribution (page 4-10).

The PTEIR concludes that under the proposed project increased sedimentation is the only potentially significant fishery impact that may occur throughout the ownership. Relatively rigorous quantitative habitat typing has only been conducted on a 6.7- mile section of lower Angel Creek and a 6.8- mile reach of lower Star City Creek. Since Angel and Star City creeks account for 39% of the total length of Class I streams on the ownership, the PTEIR proposes to implement adaptive aquatic management including periodic monitoring of geomorphic conditions and fish populations only on the lower reaches of Angel and Star City creeks. The selected monitoring reaches would be resampled in 10- year intervals to evaluate changes in sediment and fish populations and, if any mitigation measures were implemented, monitoring would be conducted 5 years after the implementation to evaluate instream responses. No other aquatic monitoring is proposed for any other stream in the ownership.

The PTEIR's baseline qualitative aquatic habitat information is insufficient for describing the existing condition of aquatic habitat throughout the ownership. Thus, it is impossible to accurately identify and predict proposed project impacts on fishery and aquatic habitat resources and to adequately evaluate cumulative effects. Due to the diversity of landscape types, stream and riparian conditions, past and proposed future management in the various PWs, and the open-ended nature of the PTEIR, it is unrealistic to use segments of lower Angel and Star City creeks as index streams representative of aquatic habitat conditions throughout the ownership. 13

The DFG recommends that the aquatic baseline assessment include quantifiable and repeatable habitat data from a representative sample of channel types from each PW and Tate Creek. The data collected should include but not be limited to channel typing, habitat typing and measurements of flow, water temperature, dissolved oxygen, LWD, stream shading, substrate embeddedness and pool sedimentation. The monitoring schedule would be dependent on the level and frequency of management disturbance in the respective watersheds, the occurrence of natural events such as catastrophic floods and the implementation of mitigative treatments. Monitoring schedules should be developed in consultation with DFG fisheries biologists. The baseline assessment should also fully identify watercourses that are presently severely impacted. Such areas should be proposed for immediate restoration treatment. Poor baseline conditions in such areas, even if naturally occurring, argue for conservative timber harvest operations. 14 15

Baseline Vegetation Assessment

16 The PTEIR does not provide sufficient information on special-status plant species for use in evaluating the potential impact of proposed timber operations. No floristic surveys have been conducted and the methods to select the five identified special-status species potentially occurring in Hearst forests are not described.

Baseline Wildlife Assessment

The State lead agency employs the concept of wildlife habitat relationships combined with specific information on the distribution and condition of special-status species to assess potential impacts to wildlife resources. Baseline information sources include the Hearst Forest's timber resource inventory, timber type maps, aerial photos, the Natural Diversity Data Base and field surveys. Habitat types are classified using the California Wildlife Habitat Relationship system (CWHR). This system is used as a tool to predict the occurrence of wildlife species based on habitat relationships and to evaluate the potential occurrence in the future based on habitat changes resulting from the proposed project. Baseline CWHR habitat type maps are provided for the entire ownership.

The DFG endorses the use of wildlife habitat relationships and the CWHR system to help establish baseline conditions for wildlife resources and to assess impacts of a proposed project. However, effective assessment of potential impacts to wildlife in forested environments requires close scrutiny of habitat elements such as snags and terrestrial LWD. While the baseline forest inventory data indicates there is an average of 3.3 snags per acre at least 9.5 inches diameter at breast height (DBH), no information is provided regarding size class distribution or decay stage by habitat type. Likewise, it is reported that the Hearst Forest currently provides 13.6 downed logs per acre at least 11 inches diameter at the large end and
17 at least 13 feet in length. However, no information is provided regarding the size class distribution or decay stage of LWD by habitat type. Without this critical information, baseline wildlife habitat conditions cannot be adequately assessed.

A main component of the Hearst Forest wildlife management strategy is to maintain a portion of the land base in "late seral habitat". Late seral habitat (LSH) is defined in the draft PTEIR as forest stands meeting the CWHR size and canopy class criteria 5M, 5D and 6. The draft PTEIR identifies the baseline amount of LSH as 3,082 acres or about six percent of the available timberland on Hearst forests. Noticeably absent from the definition of LSH is any mention of habitat elements critical to the proper function of LSH for dependent wildlife (e.g.,
18 large decadent trees, snags and terrestrial LWD). DFG does not consider the baseline assessment of LSH to be adequate without information quantifying the status and distribution of these critical habitat elements.

It should be noted that the definition of LSH in the CFPRs includes "functional characteristics" such as large decadent trees, snags and large down logs (Section 895.1, Title 14, California Code of Regulations (CCR)). The CFPRs also provide that when LSH is proposed for harvesting and such harvesting will significantly reduce the amount and distribution of LSH stands **or their functional wildlife habitat value**, the project proponent shall provide habitat structure information for such stands (Section 939.16, Title 14, CCR).

In summary, the PTEIR's assessment of baseline information for wildlife resources is deficient because it does not include information regarding critical habitat elements, specifically snags and terrestrial LWD.

Baseline Timber Resource Assessment

A forest inventory system specifically designed for Hearst forests was used to help assess baseline timber resources. This system will be employed to help model and track growth and yield projections over the life of the proposed project. While a brief description of the inventory system, sampling design and parameters to be measured is provided in the draft PTEIR, the level of documentation is not sufficient to assess the capability of the system to track the status of critical wildlife habitat elements such as snags and LWD. 19

Step 2. Management Goals and Objectives

A primary goal of the proposed project is to sustain annual timber harvest at 1.7 % to 2.5 % of inventory for at least the next 100 years while employing silvicultural strategies which benefit the diverse wildlife resources. In particular, Hearst proposes to maintain between 6% and 10 % of timberland habitat in late seral stands, primarily in late seral management zones (LSMZ) in riparian areas. It is not clear from the level of information provided that this annual harvest rate is consistent with environmental constraints associated with the stated goals and objectives. For example, there is no documented plan to actively recruit large diameter snags and LWD and it is not clear whether the volume of timber needed for this purpose has been taken into account when calculating the rate of annual harvest. 20

Step 3. Key Planning Assumptions

A key planning assumption of the draft PTEIR is that existing CFPRs and/or the Hearst Forests BMPs are measures proven to avoid significant impacts resulting from forest management operations. In other words, it is assumed that compliance with these rules and practices is sufficient to avoid most significant impacts. The DFG is unaware of any scientific study to systematically validate the effectiveness of the CFPRs or the Hearst Forest's BMPs. 21

For example, the draft PTEIR letter states on page B-7 that "...CDF is currently conducting several studies to assess the effectiveness of various CFPRs." Without such documentation, assumptions regarding the efficacy of the these rules and practices are premature and this illustrates the need for a comprehensive adaptive management approach using strategic baseline assessment, iterative resource monitoring and an effective corrective mechanism.

Section 1092, Title 14, CCR, states that alternate standards such as the Hearst Forest BMPs may only be accepted by the CDF Director when a PTEIR provides an analysis demonstrating that implementation will result in impacts below the level of significant effect as defined by CEQA and other applicable State laws. The DFG concludes that the analysis presented in the draft PTEIR for the Hearst Forest's BMPs is inadequate to demonstrate that impacts will be below the level of significance as defined by CEQA. 22

A principal component of the adaptive management strategy presented in the draft PTEIR is a monitoring plan to validate "key planning assumptions upon which the analyses in the EIR are based". The PTEIR, however, does not clearly identify the key planning assumptions. This makes it difficult to appraise the suitability of the assumptions and to assess whether the validation monitoring proposal is adequate. The DFG recommends that the final PTEIR clearly identifies key planning assumptions both as they are introduced in the text and as they are addressed in the validation monitoring plan. 23

Step 4. Identify and Mitigate Potentially Significant Effects and Cumulative Impacts

CEQA defines a significant environmental effect as a substantial or potentially substantial adverse change in the environment. The CEQA guidelines define cumulative impacts as two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts. The individual effects may be changes resulting from a single project or a number of separate projects.

The PTEIR identifies potentially significant effects and cumulative impacts in the Hearst Forest's draft PTEIR by assessing the susceptibility of baseline resources to potential impacts of proposed timber management operations. A summary of impacts and mitigation measures is presented in Table ES-1 of the draft PTEIR. The report also states on page ES-3 that the only cumulative impact is the potential for excessive sediment discharges and related degradation of fish habitat.

The PTEIR does not document the abundance and distribution of large-diameter snags and LWD as part of the baseline assessment, consequently, it is unknown whether these habitat elements are currently available in adequate numbers to provide for sustainable populations of wildlife species which use these resources, particularly bald eagles, osprey, wolverine, and fisher. Neither the CFPRs or the Hearst Forest's BMPs specifically provide for the long-term recruitment of large-diameter snags and LWD, and proposed silvicultural prescriptions can severely reduce recruitment of these critical habitat elements. This effect can be especially significant in late seral management zones and watercourse and lake protection zones because large-diameter snags and LWD are basic to the definition and function of these zones. 24

The proposed impact assessment methodology for special status plant species is flawed in several respects. These include:

25 1. The baseline assessment provides insufficient information to determine whether the five identified species, or additional species, may be present on the Hearst ownership.

26 2. While the ecological significance of impacts to listed species may be greater than similar impacts on a special status species which is not listed, the significance threshold determination for CEQA compliance is the same. An impact which reduces the number of any species which meets the criteria outlined in CEQA guideline section 15380 as rare, threatened or endangered plants is significant.

27 3. Since there have been no surveys to provide baseline information for the PTEIR, a PTHP impact assessment method appears warranted. A range of options exist from project specific floristic surveys to alternative risk management strategies which identify potential affected special status species and then compares habitat requirements with geographic information system data layers (e.g., elevation, vegetation type, soils, hydrology, etc.) and site specific habitat observations made during development of future timber harvest plans.

The current proposal offers little prospect for identifying and avoiding potentially significant adverse impacts on special status plant species.

Step 5. Monitoring (Validation, Compliance, Effectiveness)

The PTEIR recognizes monitoring as a key component of an open-ended project to commercially manage forest resources on an adaptive management basis. The stated objectives of the proposed monitoring plan are to determine whether key planning assumptions are valid (**validation monitoring**), to ensure resources protection commitments are being met (**compliance monitoring**) and to ensure that mitigation measures and standards for resource protection are meeting their intended objectives (**effectiveness monitoring**). A monitoring plan based on these three monitoring activities could be an effective tool for documenting success and/or correcting a variety of potential problems arising from project implementation. 28 In its current form, however, the proposed monitoring plan is not adequate to meet its stated objectives because the basic elements of the three monitoring activities are not clearly defined or integrated into a feedback loop to assure that problems are corrected.

Validation Monitoring

Key planning assumptions are not specifically identified in the main body of the text and are not summarized as part of the validation monitoring proposal. It is therefore not possible to determine whether the variables proposed for inclusion in the monitoring effort will 29 provide information necessary to confirm key planning assumptions. It is also not clear whether the techniques or methods proposed for tracking the variables will provide quantifiable results which are comparable over time in a repeatable way.

Compliance Monitoring

The compliance monitoring proposal is two paragraphs long and indicates that "The objective of compliance monitoring is to ensure the environmental commitments specified in the PTEIR are met" (page B-6). It also states that "These commitments consist primarily of the management practices and standards specified in the CFPRs and in the Hearst Forests BMPs".

The draft PTEIR includes many proposed mitigation measures and environmental commitments in addition to compliance with the CFPRs and the Hearst Forest's BMPs. For example, a mitigation measure identified in the "Fisheries section" calls for implementation of "adaptive aquatic management" for Angel and Star City creeks (page 4-11). Public Resources Code (PRC) Section 21081.6 requires a public agency to adopt a reporting or monitoring program for mitigation measures and to ensure their enforceability. The DFG concludes that the compliance monitoring proposal included in the draft PTEIR Appendix B by the State lead agency does not meet the requirements of PRC Section 21081.6.

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The draft PTEIR states on page 1-5 that "The mitigation monitoring program for Hearst Forests will be described in the final EIR". The DFG assumes that the mitigation monitoring program referred to in this sentence is the monitoring program required by PRC Section 21081.6. The DFG requests that a draft mitigation monitoring plan be transmitted to the DFG at least 10 days prior to inclusion in the final PTEIR for certification, review and comment.

Effectiveness Monitoring

The purpose of effectiveness monitoring is to assess the performance of protection and mitigation measures in meeting their intended goal of reducing potentially significant environmental or cumulative impacts to a level of insignificance. This requires strategic selection of resource parameters for which baseline data must be quantified using repeatable methodologies. Nonconformance with stated performance objectives must be addressed through a feedback loop which results in the alteration of management activities or prescriptions causing or contributing to the identified problem. A properly designed effectiveness monitoring plan is a core element of any adaptive management strategy.

The effectiveness monitoring plan proposed in Appendix B of the draft PTEIR is primarily based on a commitment to monitor the effectiveness of in-lieu and alternative practices proposed by the project proponent. The performance standards to be evaluated are not specifically identified and it is not clear what specific resource parameters are to be quantified including their baseline condition. The DFG therefore concludes that the proposed effectiveness monitoring plan is incomplete. The plan to periodically monitor the quality of aquatic habitat and fish abundance in Angle and Star City creeks has merit but is not described in adequate detail to assess its capability to evaluate trends in the quality of aquatic habitat or whether the selected streams are truly representative of the project area.

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SIGNIFICANT EFFECTS ON WILDLIFE RESOURCES IDENTIFIED BY DFG

The DFG concludes that the proposed project may result in a number of potentially significant effects to wildlife resources not identified in the draft PTEIR or not adequately mitigated to a level of insignificance by measures proposed in the report.

Large Woody Debris (LWD) and Snags

Proposed timber operations on the Hearst forests could significantly affect the abundance, distribution and recruitment of aquatic and terrestrial LWD, snags, den trees and nest trees required by up to 160 wildlife species, many of which play a vital role in maintaining the overall health of timberlands [CFPR Technical Rule Addendum No.2, C(4)(a)and (b); also see Thomas et al. (1979), Raphael and White (1984), Brown et al. (1985), Miller (1985), Morrison and Raphael (1993), Richter (1993) and Washington Department of Fish and Wildlife (1995) Wildlife Tree Committee of British Columbia (1995)].

33 Mitigation measures proposed in the PTEIR are not sufficient to assure the retention and recruitment of these elements even in late seral management zones or watercourse and lake protection zones. The CFPRs currently allow almost any snag to be felled and provide no minimum standards for LWD or snag retention or recruitment. The Hearst Forest BMPs also provide no minimum recruitment standards for either habitat element. The BMPs are more progressive with regard to retention of LWD and snags. For example, the BMPs require **unmerchantable** LWD greater than 23 inches DBH and 10 feet in length be retained but only in late seral management zones. All **unmerchantable** cull trees and snags that have been so for at least one year and do not protrude above the general canopy level must also be retained. Again, however, this BMP only applies to late seral management zones. Because these provisions are drawn so narrowly, it is doubtful they will provide adequate numbers of LWD or snags for dependent wildlife over time. Reduction of LWD or snags below levels necessary to provide sustainable populations of dependent wildlife species would be a significant effect pursuant to Appendix B (item "t") of the CEQA Guidelines and Section 1802 of the FGC..

To ensure LWD and snags are retained **and** recruited in adequate numbers over space and time to sustain populations of species dependent on these habitat elements, the DFG recommends the following mitigation measures:

34 1. In consultation with the DFG, the State lead agency and the project proponent shall develop an LWD and snag management plan with the performance objective of assuring Hearst forests contribute these habitat elements at a level needed to sustain dependent wildlife species over the life of the project on a landscape basis. Guidelines or reference documents which could be used to develop this management plan include, but are not necessarily limited to, Thomas et al. (1979), Raphael and White (1984), Brown et al. (1985), Morrison and Raphael (1993), Richter (1993) and Washington Department of Fish and Wildlife (1995).

2. Major elements of the plan should include but not be limited to:

a) determination of minimum LWD and snag management levels commensurate with the needs of local wildlife species in a commercial forest setting,

35 b) agreement on standardized inventory methods and inventory interval by habitat type and/or management prescription including the level of precision and confidence (see Bull et al. 1990),

c) baseline assessment of LWD and snags,

d) development of a basic menu of adaptive management measures and

e) reporting requirements.

Aquatic Resources

The DFG concurs with the PTEIR in its conclusion that activities proposed in the Hearst Forest's draft PTEIR could result in significant cumulative impact involving excessive sediment discharges to surface waters and related degradation of fish habitat. However, the DFG does not agree that measures proposed in the draft PTEIR are sufficient to mitigate this potential impact to a level of nonsignificance.

36 To ensure excessive sediment discharges resulting from the proposed project do not significantly impact fish resources, the DFG hereby recommends the following mitigation measure:

1. In consultation with DFG, the State lead agency and the project proponent shall develop a comprehensive sediment monitoring and management plan.

THREATENED AND ENDANGERED SPECIES

Pursuant to FGC Section 2090, each State Lead Agency shall consult with the DFG to ensure that any action authorized, funded or carried out by the State lead agency is in conformance with the California Endangered Species Act (CESA). There are a number of wildlife species listed pursuant to CESA which inhabit or may inhabit the Hearst forests over the planning period. These species include the bald eagle, willow flycatcher, great grey owl, greater sandhill crane, wolverine, Shasta salamander and peregrine falcon. Certification of the Hearst Forest PTEIR by CDF would constitute an action authorized by a State lead agency.

37 In April of 1997, the Hearst Corporation and DFG entered into a memorandum of understanding (MOU) establishing procedures to avoid incidental "take" of State-listed species which may result from timber harvesting activities on lands managed by Hearst. This agreement primarily addressed "flag and avoid" mitigation measures associated with individual timber harvest plans (THPs) proposed by the Hearst Corporation. The agreement did not specifically address potential cumulative impact issues associated with activities proposed in the Hearst Forest draft PTEIR. The MOU does address many pertinent issues related to

threatened or endangered species management on Hearst forests and the DFG concludes that the MOU can continue as the management foundation for the proposed project as modified by the reasonable and prudent measures outlined below to minimize any potential adverse impacts pursuant to FGC Section 2091.

FGC Section 2090 directs DFG to issue a written finding whenever it consults with a State lead agency which includes three basic determinations: 1) whether the proposed project will jeopardize the continued existence of any endangered or threatened species, 2) whether the proposed project will result in destruction or adverse modification of habitat essential to the continued existence of any endangered or threatened species, or 3) whether the proposed project will result in any taking of an endangered or threatened species incidental to the proposed project.

38 The information provided in the PTEIR is insufficient for the DFG to make any findings with respect to rare, threatened or endangered plant species. In this particular respect, the DFG believes that the PTEIR is not adequate to comply with CEQA (CEQA guidelines section 15096(e)). Through subsequent consultation with DFG prior to certification of the final PTEIR it is probable that this deficiency can be remedied.

Written Findings Pursuant to FGC Section 2090

Pursuant to FGC Section 2090, DFG finds and determines as follows:

39 1. Forest management activities specifically proposed in the Hearst Forest's draft PTEIR, dated April 8, 1997 are not likely to jeopardize the continued existence of the bald eagle, willow flycatcher, great grey owl, greater sandhill crane, wolverine or Shasta salamander. This finding is contingent on the full implementation of and adherence to all of the prescribed mitigation measures.

40 2. Forest management activities proposed in the Hearst Forest's draft PTEIR, dated April 8, 1997, are unlikely to result in the destruction or adverse modification of habitat essential to the continued existence of bald eagle, willow flycatcher, great grey owl, greater sandhill crane, wolverine or Shasta salamander.

41 3. Forest management activities proposed in the Hearst Forest's draft PTEIR, dated April 8, 1997, may result in the incidental take of individual bald eagles, willow flycatchers, great grey owls, greater sandhill cranes, wolverine or Shasta salamander. The adverse effect of any such take incidental to the proposed activities will be minimized if the mitigation measures identified in Exhibit A of the MOU dated April 8, 1997, between the Hearst Corporation and the DFG dated April 8, 1997, and all additional mitigation measures outlined below are fully implemented and adhered to.

Additional Mitigation Measures

Potential taking incidental to the proposed project has been determined by DFG pursuant to FGC Section 2090. In accordance with FGC Section 2091, the following reasonable and prudent measures, in addition to the mitigation measures identified in Exhibit A of the MOU dated April 8, 1997, between the Hearst Corporation and the DFG are necessary and appropriate to minimize the adverse impacts of the incidental taking.

Bald Eagle

42 In addition to the mitigation measures included in Exhibit A of the MOU dated April 8, 1997, between the Hearst Corporation and the DFG the State lead agency and project proponent, in consultation with the DFG, shall develop a specific plan to recruit future bald eagle nesting habitat in and around the McCloud Reservoir. An objective of this plan shall be to maintain at least one pair of nesting bald eagles in the project area over the project period.

Willow Flycatcher

43 Field investigations conducted by the DFG in the McCloud Flats area in 1997 indicated that territorial willow flycatchers will inhabit patches of dense riparian habitat greater than one meter in height and containing a significant component of deciduous shrubs adjacent to rivers and streams as well as "thick willow growth in wet meadows" (as identified in Exhibit A of the MOU dated April 8, 1997, between the Hearst Corporation and DFG. Consequently, the definition of suitable willow flycatcher habitat which must be surveyed or avoided pursuant to Alternatives 1 and 2 of Exhibit A must also include dense riparian habitat adjacent to rivers and streams. The definition of suitable willow flycatcher habitat may require further revision as more is learned about the habits and habitat of the species.

Great Grey Owl

44 In addition to the mitigation measures included in Exhibit A of the MOU dated April 8, 1997, between the Hearst Corporation and the DFG, the following measure shall be implemented:

> Surveys for great grey owls shall be conducted by a qualified person according to protocols acceptable to the DFG prior to conducting any timber harvest operations during the great grey owl breeding season (March 1 to August 15) within 0.25 miles of Huckleberry Meadow or Stouts Meadow (or any other meadow at least 15 acres in size and bordered by forest habitat).

Shasta Salamander

45 Under the "Mitigation" heading for Shasta salamander in Exhibit A of the MOU dated April 8, 1997, between the Hearst Corporation and the DFG, it is stated that "Given the general terrain associated with the limestone outcroppings in the Star City drainage, it is unlikely that timber operations could directly affect Shasta salamander habitat. However, in order to minimize potential risk, Hearst shall implement the following mitigation measures wherever habitat exists."

This statement could be interpreted to mean that the Shasta salamander mitigation measures included in the MOU only apply to limestone outcroppings in the Star City drainage. It is the specific intent of the DFG, however, that the Shasta salamander mitigation measures included in the MOU apply to any potential Shasta salamander habitat wherever it may occur on the Hearst forests.

OTHER COMMENTS

Hardwood Management

46 Little information is provided in the draft PTEIR regarding management of hardwoods or hardwood-dominated habitats. While baseline hardwood resources on the Hearst forests appear to be minimal, management objectives and mitigation measures for maintaining and managing hardwoods and wildlife species dependent on this habitat type is lacking. The DFG recommends a specific plan be developed to maintain and recruit hardwoods in areas where they naturally occur.

Herbicides

47 Most commercial forest operations employ chemical herbicides to help control brush and other unwanted vegetation to reduce competition for commercial conifer species. No mention is made of proposed herbicide use in the Hearst Forest's PTEIR and the DFG therefore assumes that herbicides are not proposed for use on the Hearst forests. However, if herbicides are to be employed, then an assessment of potential impacts to the environment should be included in the PTEIR.

48 Pursuant to PRC Section 21092.5, the DFG looks forward to receiving a written response to these comments at least 10 days prior to certification of the Hearst Forest's PTEIR. As requested above, the DFG specifically requests that a draft of the mitigation monitoring plan required pursuant to PRC Section 21081.6 be transmitted to the DFG for review and comment prior at least 10 days to inclusion in the final PTEIR for certification..

If we can be of further assistance, please contact Mr. Jack Miller of my staff at (530) 225-2273 (CALNET 442-2273).

Richard L. Elliott
Regional Manager

cc: see attached list

Responses to Comments from California Department of Fish and Game

1. Specifying a definite time period for which the PTEIR applies is contrary to criteria specified in the State CEQA Guidelines for the "shelf life" of a CEQA document; CEQA documents remain effective until substantial changes occur with respect to the circumstances under which the project is undertaken.

2. Based on consultations with DFG and CVRWQCB, baseline assessments and subsequent monitoring surveys have been expanded relative to how they were described in the draft PTEIR. See "Hearst Forests Resource Monitoring Plan" in this final PTEIR and items 1, 2, 3, 4, 5, and 8 in Chapter 2, "Major Environmental Issues and Responses".

3. See item 1 in Chapter 2.

4. See item 2 in Chapter 2.

5 See item 2 in Chapter 2.

6. See item 1 in Chapter 2.

7. As discussed on p. 3-4 of the draft PTEIR, the 10-year recovery rate was assumed to apply only to the impacts of tree falling and log movement from the stump to the skid trail; roads were assumed to never recover and skid trails were assumed to recover only partially. No known evidence indicates that the watershed impacts of tree falling and log movement from stump to skid trails persist longer than 10 years.

8. See item 3 in Chapter 2.

9. See item 3 in Chapter 2.

10. See item 2 in Chapter 2.

11. Consistent with the State CEQA Guidelines, descriptions of watershed conditions in the PTEIR constitute full disclosure of the best available data, including aerial photograph interpretation and reconnaissance surveys. Quantitative data and trend analysis results (e.g., static, recovering, or worsening) of watercourses were generally not available.

12. Based on the very low level of historical disturbance (equivalent roaded area [ERA] = 1%) in the Kosk Creek watershed, the 30%-50% embeddedness conditions and absence of pools are more likely to reflect the natural instability of the hillslopes than the effects of management. Monitoring of aquatic habitat in Kosk Creek and of hillslope practice effectiveness in the Devils-Curtis Creek PW (see Hearst Forests Resource Monitoring Plan) will ensure that timber operations do not have significant adverse impacts on fish habitat in Kosk Creek.

13. See item 2 in Chapter 2.

14. See item 2 in Chapter 2.

15. It is infeasible to conduct baseline surveys of all streams in the ownership, as would be required to "fully identify watercourses that are presently severely impacted". Hearst's proposed timber operations (e.g., the near avoidance of even-aged management and establishment of late successional management zones constituting 17% of the ownership) are highly conservative by industry standards.

16. See item 4 in Chapter 2.

17. See item 1 in Chapter 2.

18. DFG appears to be confusing the designated LSMZs with existing late successional habitat. LSMZs are expected to develop late successional forest habitat elements over time; they do not necessarily have such elements today. Also, see item 1 in Chapter 2.

19. See item 1 in Chapter 2.

20. The timber growth and yield and harvest scheduling analyses described in the draft PTEIR (pages 8-3 to 8-5) took into account the need to recruit large-diameter snags through a system of linear-programming constraints (i.e., tree retention requirements) incorporated into the harvest prescriptions that were available for application to LSMZs.

21. Comment noted.

22. See item 5 in Chapter 2.

23. See item 6 in Chapter 2.

24. See item 1 in Chapter 2.

25. See item 4 in Chapter 2.

26. See item 4 in Chapter 2.

27. See item 4 in Chapter 2.

28. See response to DFG comment 2, above.

29. See item 6 in Chapter 2.

30. As assumed by DFG, the mitigation monitoring plan required for compliance with Section 21081.6 of the California Public Resources Code will accompany the final PTEIR; it is a separate monitoring plan from the Hearst Forests Resource Monitoring Plan.

31. See item 6 in Chapter 2.

32. The methods that will be used to monitor aquatic habitat will replicate those used by Thomas R. Payne and Associates in the 1995 and 1996 surveys of Angel and Star City Creeks.

33. See item 1 in Chapter 2.

34. See item 1 in Chapter 2.

35. See item 1 in Chapter 2.

36. See items 2 and 5 in Chapter 2.

37. Comment noted.

38. Comment noted.

39. Comment noted.

40. April 8, 1997, is the date of the MOU, not the date of the PTEIR.

41. See response to comment 40.

42. Although retention of bald eagles on the ownership is a Hearst management objective, Hearst cannot ensure occupancy of its ownership by any species. Also, see item 8 in Chapter 2, "Major Environmental Issues and Responses".

43. See item 8 in Chapter 2.

44. See item 8 in Chapter 2.

45. As described on page 10 of Appendix F to the draft PTEIR, mitigation measures to protect the Shasta salamander will be implemented on suitable habitat (i.e., limestone outcroppings) throughout the ownership, not just in the Star City Creek drainage. Also, see item 8 in Chapter 2.

46. Hardwood resources on Hearst Forests consist almost entirely of black oak trees growing in conifer stands and relatively pure stands of low-growing live oaks in the northwest portion of the Kosk Creek Tract. No harvesting of live oaks is proposed. Individual black oak trees will be removed in the context of timber operations only if they constitute hazards.

47. Herbicide use was not discussed in the PTEIR because it is not considered to be a component of timber operations as defined in the Forest Practice Act (PRC 4527) and is therefore not part of the proposed project.

48. Comment noted.

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

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Pete Wilson, Governor

12 December 1997

Mr. Allen S. Robertson
Environmental Coordinator
California Department of Forestry and Fire Protection
P.O. Box 944246
Sacramento, CA 94244-2460

DRAFT PROGRAM TIMBERLAND ENVIRONMENTAL IMPACT REPORT (PTEIR) FOR HEARST FORESTS, CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

The following comments regarding the subject Draft PTEIR are provided as specified in the California Environmental Quality Act (CEQA) and the California Forest Practice Rules (FPRs). Our comments are focused on proposed practices which affect water quality and are subject to the California Water Code. Our comments generally follow the format of the Draft PTEIR and refer to specific pages or sections as much as possible.

Chapter 1. Introduction

1 Page 1-3 Scope of the Environmental Impact Report should specifically include water quality.

2 Page 1-5 Using a baseline for assessing erosion and sedimentation levels of the No-Project alternative does not take into account impacts of existing facilities and impacts from past logging operations.

3 The monitoring program provided in this document is not developed. Regional Board staff will assist in the development of the program.

Chapter 2. Proposed Project and Alternatives

4 Page 2-6 Secondary roads will be repaired in conjunction with timber harvest. If road damage is creating significant impacts to water quality the road should be stabilized to prevent impacts and not left for 10-30 years until the road is needed. See additional comments regarding BMPs and road inventories.

5 Roads near watercourses often impact water quality and require extensive maintenance. The distinction between primary and secondary roads is important for prioritization of maintenance and stabilization. When considering replacement, secondary roads with

potential to impact water quality, should be given the same priority as primary roads to avoid significant effects to water quality.

Pg 2-6 & 2-7 This section describes mapping and mitigation to be developed by a Registered Geologist (RG) or Certified Engineering Geologist (CEG) for operations in and around unstable areas. BMPs listed in Appendix C do not include this mitigation. In the interim until the road study is completed there is potential for reconstructing roads that may not be needed in the future. The primary and secondary road network should be reviewed and mitigated as part of this PTEIR to avoid potential location and mitigation conflicts in the future.

6

Page 2-8 Facilities within WLPZs were evaluated during two pre-harvest inspections by Regional Board staff. No post-harvest evaluation was done by Regional Board staff to verify the practices were protective. On individual THPs those practices are often approved but there is seldom documentation of their effectiveness of protecting beneficial uses of water. This PTEIR is an opportunity to establish a system to verify effects of these practices and replace practices or facilities, that have potentially significant impacts, with facilities and practices that present insignificant impacts. Impact monitoring of specific practices should be incorporated in the document.

7

Table G-2 does not list site specific situations which allow for conclusions that the impacts resulting from the alternative is less than significant. To allow these alternative practices, without review in individual PTHPs, the level of detail should be as specific as required in the FPRs. It is not reasonable to assume that excavation on slopes away from watercourses will always have significant impacts or create greater long term impacts than use of existing facilities in or near watercourses. During previous THP review (see Attachment 1, PHI Report for THP # 2-92-2 SIS) site specific mitigation measures were developed to reduce potential impacts. Broad scale approval of the proposed alternative practices is not appropriate because the analysis is not of sufficient detail to demonstrate that implementation will result in impacts that are below the level of significant effect. See additional comments regarding Appendix G.

8

Environmental Setting

Observations of the area covered by this section appear to have been made in 1995 and 1996. The area should be reviewed again to ensure conditions have not changed as a result of high flows in January 1997.

9

Page 3-2 Combination of the Curtis-Devils Canyon watershed may bias the watershed assessment due to the fact that a majority of the Devil's Canyon area is in USFS ownership and managed as a late successional reserve. The Final Environmental Impact Statement for the Shasta-Trinity National Forest (STNF) indicates an existing ERA of seven percent for the portion of the Kosk Creek watershed under their control (Final EIS 1994).

10

11 The time period of ten years for recovery of disturbed areas may bias analysis and underestimate ERA. The STNF uses a linear recovery over a thirty year period for recovery of disturbed and compacted areas. A residual ERA is retained to account for system roads which do not recover over time.

12 Page 3-3 Disturbance and adverse impact to water quality from early harvest has been observed by Regional Board staff during inspection of Coyote Creek (see Attachment 1 memorandum). Log jams and collapsed Humboldt crossings were observed to be diverting flow to erodible banks resulting in excessive sediment deposition in Coyote Creek. Road repairs on roads adjacent to watercourses also indicate impacts. It appears impacts of past operations are underestimated.

13 Page 3-5 Sensitivity analysis for evaluation of impacts of roads near watercourses appears to have negated impact of these roads by reducing the weight factor for roads away from watercourses. Cumulative Watershed effects analysis for Cat Creek Watershed in the Eldorado National Forest (Kuehn and Cobours, 1988) accounts for the fact that improperly drained roads have a greater impact than other roads by assigning a factor greater than one. The basic analysis assumes a minimum factor of one for roads. Additional weight is given to areas with greater sediment delivery potential, such as mass wasting, bank erosion, or crossings with diversion potential.

14 Page 3-13 & Table 3-4 The percentage of total length by total canopy cover class section of Table 3-4 should be divided into one more class of 26-50 to allow comparison of practices with 14 CCR 936.3(f). Where cover class is near 50 percent it may affect the use of alternative practices which have potential to damage retained canopy.

15 Page 3-15 The Water Quality Control Plan (Basin Plan) for the Central Valley Region (Third Edition 1994) specifically lists beneficial uses for the McCloud River and the Pit River from the mouth of Hat Creek to Shasta Lake. Beneficial uses generally apply to their tributary streams. In some cases a beneficial use may not be applicable to an entire water body. In these cases the Regional Water Boards judgement will be applied on a case-by-case basis. This judgement with regards to timber operations is accounted for in the beneficial uses for watercourse classification specified in the FPRs. Beneficial uses of the waters in the ownership were also specified in Waste Discharge Requirements adopted in 1976 for the ownership.

16 Page 3-20 There is no evidence that tributaries to Angel Creek were investigated for impacts. The attached memorandum (Attachment 1) and THP map describes impacts of past activities in Coyote Gulch. The PTEIR vegetation study in WLPZs also describes impacts of early logging that continue. This assessment was done prior to the floods of January 1997 which may have altered conditions in the watershed. Angel Creek and its tributaries should be assessed following this event to verify assumptions are still valid.

Page 3-23 The road south of Star City Creek traverses steep terrain, has modified natural drainage patterns and contributed to active slides and debris torrents. The road was constructed many years ago presumably for harvest but is still creating watershed impacts. This contradicts assumptions regarding impacts of past practices. 17

Page 3-29 The conclusion drawn in the no project alternative for the Angel Creek TO of 35.1 percent does not match Table 3-2 value of 25 percent. Which is correct? 18

The description of a two year study to evaluate feasibility of reducing sediment hazards is not clear. Criteria to be used to determine feasibility and who will determine feasibility and mitigation measures should specified. How the information will be factored into the FRA analysis should also be specified. Weight factors for ERA analysis of sediment sources should be specified. 19

We agree that aerial systems are generally less damaging than tractor yarding. We are concerned however that road systems have been constructed for tractor yarding and may need to be altered to accommodate aerial systems. Accounting for these changes should be incorporated in TO analysis for future activity, but how this will be done is not described in the PTEIR. 20

Page 3-35 Same concern regarding feasibility analysis as described above applies to comments regarding the two year study.

Alternative practices should not be approved as proposed. There are usually alternatives for use of facilities in WLPZ which may require skidding further distances or other equipment. The proposed alternatives and justification do not adequately analyze such possibilities. This analysis is site specific and should be reviewed and approved in subsequent PTHPs. 21

Statement regarding pools having relatively high frequency conflicts with statement on page 4-8 which describes pool habitat is limited. The condition and analysis of watersheds was done prior to the high flows of January 1997. Conditions should be analyzed in light of the high flows to determine if the assessment is still valid. 22

Fisheries

Page 4-12 Kosk Creek should be monitored due to potential downstream impacts. Sensitive conditions (mainly potential for mass movement and steep slopes) on the Hearst property have potential for significant downstream impacts. Harvest activity in these areas have potential for significant impacts to the watercourse and should be monitored. 23

Stream surveys and monitoring should be reported to the agencies which review PTHPs. Results of monitoring can be verified by agencies during PTHP review. Monitoring five years after mitigation will not provide monitoring of impacts from harvest operations. 24

Monitoring frequency should be timed with activities (such as road reconstruction or harvest) and events (such as high flows) which can change watershed conditions.

Page 4-13 A conclusion is drawn that there is adequate Large Woody Debris (LWD) in the channels to provide habitat without any measurement or estimate of the amount present. Changes in LWD abundance cannot be tracked without baseline estimates. High flows in January 1997 may have changed this conclusion and should be investigated. 25

Page 4-14 High water flow from the storms of January 1997 may have significantly altered stream flow and impacted habitat. The effects on habitat should be analyzed prior to final PTEIR submission to ensure conditions have not changed which would find PTHPs are not within the scope of the PTEIR as required in FPR 1092.20(b)(2) and (3). 26

Appendix B. Monitoring Plan for Program Timberland Environmental Impact Report for Hearst Forests

Page B-5 Cumulative watershed disturbance should include updating based on results of the two year study, compliance and effectiveness monitoring. Monitoring of effectiveness of in-lieu and alternative practice will be useful justification of their use in future PTHPs. It would be useful to develop the monitoring plan (possibly a checklist) for submission with PTHPs. Records of yearly maintenance should be kept in addition to the proposed monitoring. Aquatic habitat and fish abundance monitoring should be done following events in a watershed which would impact variables to be monitored, such as extreme flow conditions or land slides. If no extreme events occur then a set time interval may be appropriate. We cannot comment further without more detailed description of the monitoring program. The monitoring program should be reviewed in draft form prior to incorporation into the final PTEIR. 7

Appendix C. Hearst Forests Best Management Practices

If the PTEIR is the standard, this section should be reviewed to insure that all operational standards, as specified in 14 CCR 1092, are included in the section. It would be beneficial for the Board of Forestry or CDF to develop a list of operational standards to eliminate confusion between operational and performance standards. Some of the BMPs specified in this section are abbreviated from their corresponding FPRs. Where these abbreviations occur it is important to establish which is the standard that PTHPs must comply. The applicable standard of either the PTEIR or FPRs is particularly important when FPRs are changed in the future as part of the BMP process. FPRs for winter period regarding placement of erosion control measures and Class III watercourse protection have recently been changed and are not reflected in the PTEIR. 28 29

The following comments are referenced by BMP number in the PTEIR:

Planning Guidelines Specific to Logging Roads and Landings

30 1.12 This BMP conflicts with the proposed alternative and should be modified to acknowledge there may be construction in the WLPZ when it is the only option and after approval of review agencies as part of the PTHP process. Modification could also reference another BMP where this option is discussed.

31 1.14 This BMP should reference BMP 4.13 procedures for abandonment.

Road Construction and Major Reconstruction

32 2.3 Definition of "significant damage to water quality" should be described as noticeable change in turbidity of downstream waters. If waste discharge requirements are adopted for the property this definition will be provided numerically.

33 2.5 This BMP conflicts with requested alternatives.

34 2.6 This BMP should be modified to include review and approval in the PTHP.

35 2.12 New road construction should be centerline flagged prior to submission of PTHP for inspection and approval during review or prior to clearing and grubbing if no inspection is required.

36 2.24 This BMP should include no sidecast where material could erode into a watercourse.

37 2.47 This BMP should be modified to prevent road discharge directly to watercourses. Where road surfaces are below natural grade drainage should be provided at a maximum spacing of 300 feet. Drainage may be in the form of lead out ditches or diversion berms.

38 2.56 This BMP should be clarified to mean permanent crossings.

39 2.72 - 2.74 Appropriate seed mixtures, application rates and materials should be specified in the PTHP.

Watercourse Crossings - Roads

40 3.2 Spawning seasons should be specified since the watercourses and species are known.

Road System Maintenance

41 4.3 & 4.5 Records should be kept of needed road repairs and estimated volumes discharged to allow evaluation of roads which should be moved, upgraded or abandoned, particularly

where alternative practices are used based on justification that construction of new roads would create more impacts to water quality than use of existing facilities.

42 | 4.37 - 4.39 Materials should not be placed where they may enter watercourses.

Landing Construction and Major Reconstruction

43 | 5.5, 5.6, 5.8 Landings and mitigation pursuant to these BMPs should be identified in the PTHP, reviewed and approved by reviewing agencies (see comments regarding Appendix B).

44 | 5.9 If sidecast or fill is to be placed on 65 percent slopes more detailed construction methods or limits on the amounts should be specified. Proposed fill placed on 65 percent slopes for landings should be reviewed and approved by the director similar to FPR 943.5.

Planning and Construction Guidelines Specific to Skid Trails

45 | 8.4 Skid trails in WLPZs or ELZs (for Class's III & IV) should be flagged and approved as part of the PTHP.

Operational Guidelines on Skid Trails

46 | 12.3 Slope percentages should be based on a maximum of 20 acres. Smaller acreage are often appropriate, particularly steep slopes near watercourses or inner gorge areas.

47 | 12.5 See comments regarding Appendix G.

Unstable Areas

48 | 14.2 & 14.3 Discussion in Chapter 2 (Page 2-6) states that operations in unstable areas will be reviewed and mitigation measures will be developed. Potential change in the BMPs should be acknowledged. Review should include multi-disciplinary review.

Site Preparation

49 | 15.7 Watercourse and lake protection measures are not described until after this BMP.

Winter Operations

50 | 17.2 Disturbance from site preparation should be included in calculation of EHR.

Watercourse and Lake Protection

51 | 18.3 & 18.4 Soil deposited in Class III watercourses should be removed prior to the winter period.

52 | 18.6 & 18.7 See previous comments regarding alternative, in-lieu and exception practices and comments on Appendix G.

53 | 18.10, 18.32 Where roads are located within WLPZs flags shall not reduce the standard width WLPZ (14 CCR 936.4(b)(f)(5)). Feller buncher use within the WLPZ should be reviewed and approved as part of the PTHP. There is opportunity for excessive disturbance of ground cover within the WLPZ, particularly where roads are also in the WLPZ and skidding of bunched logs is required.

54 | 18.11,18.12 See previous comments regarding alternative, in-lieu and exception practices and comments on Appendix G.

55 | 18.16,17&.18 A minimum of 50 percent canopy should be retained.

56 | 18.21 Burning in WLPZs of class I and II watercourse and class III watercourses should be reviewed on a case-by-case basis.

57 | 18.27 See previous comments regarding alternative, in-lieu and exception practices. This BMP implies that BMPs are to be the standard for PTHP operations. If this is the case the BMPs should be carefully reviewed to ensure all operational standards are included as described in 14 CCR 1092.

58 | 18.30 The proposed WLPZ width for Class I watercourses with side slope less than five percent is an alternative practice and should not be approved. Reduction in WLPZ width should be no greater than those specified in 14 CCR 936.4 and only after on the ground inspection and approval.

59 | 18.31 Equipment limitation zones for Class III watercourse where slopes exceed 30 percent should be increased to 50 feet to comply with recently updated watercourse and lake protection rules. Class IV watercourse protection should be based on the beneficial use of water in the watercourse. The proposed width may be adequate if domestic supplies or other sensitive use is not present.

60 | 18.32 See previous comments for 18.10 and 18.32.

61 | 18.36 It is not clear whether the standard width is as specified in BMPs 18.30 and 18.31 or Table 1, 14 CCR 936.5.

62 | 18.37 Centerline flagging may be appropriate where flagging is clearly visible from outside the specified HELZ width.

Appendix G. In-lieu and Alternative Practices

We do not feel that the proposed in-lieu and alternative practices adequately address site specific practices without additional review and approval in individual PTHPs. The ten practices described have potential to create a significant effect on the environment as defined in the State CEQA Guidelines (Section 15382), but are site specific. To determine whether the practice or facility has a potential for significant impact requires individual review of each site. If the intention of including these practices in the PTEIR is to allow future use of these alternatives without individual review and approval, then their use should not be approved as proposed because the level of detail is not adequate to reach a conclusion that resulting impacts are less than significant. If the intention is to mention these practices to allow future use with individual, site specific, multi-agency review and approval to determine that the practice does not create a significant potential for impacts, then the alternatives can be included in the PTEIR. 63

Comment Summary

In addition to the specific comments above, we have concerns regarding the PTEIR process. The lack of opportunity for interagency input on PTHPs is of concern especially where FPRs have been abbreviated in BMPs. It appears that PTHPs can only be reviewed for determination of whether a practice conforms to the PTEIR. This raises the question as to what is the standard, the PTEIR or the FPR. With this process it appears to be the PTEIR. This should be clarified by the Lead Agency prior to certification of the final PTEIR. 64

Article 6.8 of the FPRs specifies the process by which PTEIRs are to be submitted and reviewed. It is not clear in 14 CCR 1092 which operational standards apply. There are many rules in the specified subchapters which are not specifically operational or planning, particularly with regard to alternative, in-lieu, and exceptions to standard operational practices. These non-specific practices have been developed to allow flexibility to address variability of field conditions, but are to be made specific (and enforceable) by the RPF developing a timber harvest plan for a specific area. Proposed practices and language in a THP is normally reviewed on the ground by CDF and other reviewing agencies to verify they do not create a significant impact. Often these practices or proposed mitigation measures are modified to protect water quality or to provide enforceable standards during the review process. It is not clear whether there is opportunity for any agencies (including CDF) to provide recommendations or require changes in the PTHP to protect resources. When agencies do recommend changes the only options for the PTHP submitter is to modify the PTHP, withdraw the PTHP, and submit a THP or amend the PTEIR. These options are only available if the CDF inspector agrees with the agency representative's recommendation that the modification to the PTHP is necessary to substantially reduce significant effects. If the inspector does not agree with the other agency there is no appeal process. 65

It is not clear whether the PTEIR is the standard or the FPRs are the standard where practices are addressed in the PTEIR that are less specific than the FPRs. Does the Director have authority to make standards and practices more or less restrictive than the PTEIR? It is not clear how the Director is to make enforceable standards when the PTEIR allows an RPF to modify practices and specify the modification in the PTHP. 66

67 The monitoring plan needs to be developed between the agencies and Hearst and needs to be approved and included in the PTEIR before final certification. The monitoring program should be reviewed in draft form prior to incorporation into the final PTEIR.

We commend Hearst Forests for their effort in preparing the draft PTEIR. We hope our concerns regarding process practices and monitoring can be addressed in the final PTEIR and that the final product will result in protection of water quality. If this process fails to adequately protect water
68 quality, the Central Valley Regional Water Quality Control Board reserves the right to issue Waste Discharge Requirements pursuant to Section 13260 of the California Water Code for timber operations on the property.

If you have questions regarding these comments, please contact Mark Harvey of our staff at (530) 224-4856, or the letterhead address.

Sincerely,

JAMES C. PEDRI, P.E.
Assistant Executive Officer
Shasta Cascade Watershed

MHH:tch

cc: Mr. Mark Stopher, California Department of Fish and Game, Region 1, Redding

Responses to Comments from Central Valley Regional Water Quality Control Board

1. See text change, page 1-3

2. As analyzed using the Equivalent Road Acreage model, all alternatives, including the No-Project Alternative, take into account the long-term impacts of existing facilities and past watershed disturbance.

3. See items 1, 2, 3, and 5 in Chapter 2.

4. As described in BMPs 4.3 and 4.5, damage to secondary roads used for harvest operations will be identified through inspections pursuant to the timber harvesting plan (THP) work-completion reporting process and will be repaired promptly thereafter. In addition, road-related watershed hazards will be identified within 2 years of PTEIR certification through a watershed hazard assessment; hazards that can be cost-effectively remediated will be repaired based on priorities determined through the assessment.

5. Comment noted.

6. Roads considered for reconstruction will be evaluated to determine whether they are needed for future use before they are reconstructed. If they will not be needed, they will be abandoned rather than reconstructed.

7. The Hearst Forests Resource Monitoring Plan describes the adaptive management process by which compliance and effectiveness will be assessed for alternative and in-lieu practices, including construction and use of WLPZ facilities. As described in the monitoring plan, ineffective practices will be replaced with more protective practices. See item 5 in Chapter 2.

8. As described on page 2-8 of the draft PTEIR, proposed alternative and in-lieu practices will be reviewed as part of PTHP preparation. As part of this process, site-specific mitigation measures needed to avoid significant impacts will be identified and incorporated into the operations. The CVRWQCB will be invited to comment on the application of such measures.

9. See item 3 in Chapter 2.

10. The majority (52%) of Devils Canyon PW is owned by Hearst, not the Forest Service. As discussed on page 3-1 of the draft PTEIR, combining Curtis and Devils Canyon PWs for the purposes of the watershed assessment in the PTEIR was appropriate because they are hydrologically connected (i.e., they make up the upper and middle portions of Kosk Creek watershed, respectively). Although the percentage ERA calculated for the Hearst-owned portion of Kosk Creek watershed (1.1%) is substantially lower than that calculated for the Forest Service-owned portion of the watershed (7%), the estimate in the PTEIR is reasonably

accurate. Forest Service land ownership (12,158 acres) is concentrated in the lower, most densely roaded portion of the Kosk Creek watershed.

11. See response to DFG comment 7, above.

12. Site-specific examples of watershed impacts were described in the draft PTEIR for each PW. That such site-specific impacts are not explicitly taken into account by the ERA model does not imply that the impacts of past operations were underestimated. The ERA model is appropriate for programmatic watershed assessment.

13. Roads near streams were given increased weight only for the purposes of sensitivity analysis, as described on page 3-5 of the draft PTEIR. In the principal application of the ERA model, all roads were given the same weight, irrespective of their location in the watershed; the impact of roads away from watercourses was not negated.

14. Harvest prescriptions will be evaluated relative to canopy retention in individual PTHPs.

15. See revised text for page 3-15 in Chapter 4 of this final PTEIR.

16. Selected tributaries of Angel Creek were examined during the reconnaissance survey. Aquatic habitat in Angel Creek will be monitored periodically as described in Appendix B. If substantial habitat degradation is observed, additional surveys (including surveys of tributaries) will be conducted as needed to identify and remediate conditions resulting in the degradation. See item 3 in Chapter 2.

17. The ERA model assumes that roads never recover. Evidence that the Star City Creek road is still creating watershed effects does not contradict the assumptions of the ERA model.

18. 35.1% is correct; see revision of Table 3-22 in Chapter 4 of this final PTEIR.

19. The ERA model was never intended to be used in the monitoring program; results of the ongoing watershed hazard assessment program will not be factored into the ERA analysis. Design and feasibility assessment of road hazard remediation projects will be conducted by Hearst foresters.

20. Future road construction was taken into account in the ERA model by the assumption that 2 additional miles of collector roads would be constructed immediately (i.e., in the first future year) in each of the five PWs. The net 10 miles of new roads excludes replacement roads, such as roads constructed to accommodate aerial systems that replace tractor roads.

21. Use of alternative and in-lieu practices will be reviewed in the field as part of PTHP preparation. See item 5 in Chapter 2.

22. The apparent conflict between the descriptions of Angel Creek pool habitat as "limited" (page 4-8) and as having "relatively high frequency" (page 3-35) is the result of these descriptions being taken out of context. Pool habitat may be "limited" in the sense of being

the principal limiting factor for fish populations in streams with a wide range of relative pool frequencies. See item 2 in Chapter 2.

23. See item 2 in Chapter 2.

24. See item 2 in Chapter 2.

25. No conclusions were drawn in the PTEIR regarding the abundance of LWD. It was concluded, however, that pool habitat and cover, the principal aquatic habitat features affected by LWD, are adequate to support healthy fish populations.

26. Changes in watershed conditions resulting from the January 1997 flood will be summarized in an addendum to the setting section of the watershed assessment. See item 2 in Chapter 2.

27. See item 2 in Chapter 2.

28. As stated on pages ES-2 and 2-2, all operational standards specified in the CFPRs will apply to PTHPs for Hearst Forests except in cases where such standards will be replaced by alternative or in-lieu practices specifically addressed in the PTEIR (Appendix G). Except for such practices, the best management practices (BMPs) provide management direction supplemental to that contained in the CFPRs.

29. Operational standards in PTHPs will comply with the requirements of Section 4583 of the California Forest Practice Act.

30. See revised text of BMP 1.12 in Appendix C of this final PTEIR.

31. See revised text of BMP 1.14 in Appendix C of this final PTEIR.

32. "Significant damage to water quality" is used in the PTEIR consistent with its meaning in 14 CCR 936.3. It means the discharge of pollutants in quantities deleterious to fish, wildlife, or the quality and beneficial uses of water.

33. None of the alternative or in-lieu practices proposed for use on Hearst Forests involves construction or reconstruction of roads in watercourses, which is the focus of BMP 2.5. Thus, there is no conflict between the proposed alternative or in-lieu practices and BMP 2.5.

34. See revised text of BMP 2.6 in Appendix C of this final PTEIR.

35. See revised text of BMP 2.12 in Appendix C of this final PTEIR.

36. See revised text of BMP 2.24 in Appendix C of this final PTEIR.

37. See revised text of BMP 2.47 in Appendix C of this final PTEIR.

38. See revised text of BMP 2.56 in Appendix C of this final PTEIR.

39. Specifying appropriate seed mixtures, application rates, and materials is not a requirement of PTHPs.

40. See revised text of BMP 3.2 in Appendix C of this final PTEIR.

41. Comment noted.

42. See revised text of BMPs 4.37-4.39 in Appendix C of this final PTEIR.

43. Landing locations and additional related mitigation measures not identified in the PTEIR will be identified in PTHPs.

44. Locations where fill or sidecast material will be deposited on slopes greater than 65% will be identified, reviewed, and approved in PTHPs.

45. Consistent with the CFPRs, WLPZ skid trails will be flagged for Class I watercourses and for watercourse crossings for other stream classes (except for dry Class III watercourses, existing road crossings, and new skid trail and road crossings approved by DFG). In other cases, WLPZ skid trails will be flagged at the option of the registered professional forester (RPF) or as required by CDF.

46. See revised text of BMP 12.3 in Appendix C of this final PTEIR.

47. See item 5 in Chapter 2.

48. See "Geology, Landslides, and Geologic Guidelines for Managing Hearst Forests".

49. See revised text of BMP 15.7 in Appendix C of this final PTEIR.

50. The Board of Forestry's erosion hazard rating procedure for use in THPs accounts for disturbance from site preparation through the "protective vegetative cover remaining after disturbance" factor.

51. Soil deposition into Class III watercourses is addressed in BMP 18.4.

52. See item 5 in Chapter 2.

53. The 50-foot standard width for Class I watercourses on slopes of less than 5% is consistent with 14 CCR 916.4 (b) (5). Allowance of a 50-foot-wide WLPZ rather than the 75-foot width specified in 14 CCR 916.5 will be reviewed and approved in the PTHP. Use of feller bunchers within a WLPZ will be reviewed and approved as part of the PTHP.

54. See item 5 of Chapter 2.

55. As specified on page 3-38 of the draft PTEIR, except for sanitation/salvage operations, a minimum of 50% canopy cover will be retained in WLPZs. As stated in 14 CCR 916.4(b), a combination of the CFPRs, the WLPZ, and additional mitigation measures approved by CDF will jointly protect all resources and functions of watercourses.

56. See revised text of BMP 18.21 in Appendix C of this final PTEIR.

57. See response to comment 28.

58. See response to comment 53.

59. See revised text of BMP 18.31 in Appendix C of this final PTEIR.

60. See response to comment 53.

61. Because the operational standards specified in 14 CCR 936.5 (i.e., Table 1) need to be considered in conjunction with those in 14 CCR 936.4 (b) (5), and because the WLPZ and heavy equipment exclusion zone widths specified in BMPs 18.30 and 18.31, respectively, are consistent with the operational standards specified in the CFPRs, the zone widths specified in BMPs 18.30 and 18.31 are not alternative or in-lieu practices and are applicable to PTHPs.

62. Comment noted.

63. See item 2 in Chapter 2.

64. CDF will determine whether a preharvest inspection is required for a PTHP [14 CCR 1092.16]. If so, the CVRWQCB will be invited to participate. In addition, CDF will transmit a true copy of all PTHPs to the CVRWQCB inviting written comments, and the Director will consider all such comments [14 CCR 1092.18]. Written comments should address "any areas where there is a question of consistency with the PTEIR, the Act, the applicable rules of the Board, and any other applicable legal requirements".

65. See response to comment 64.

66. See item 5 in Chapter 2.

67. See items 1, 2, 3, and 5 in Chapter 2.

68. Comment noted.

State of California **The Resources Agency**

MEMORANDUM

To: Project Coordinator
Resources Agency

Date: December 15, 1997

Mr. Allen S. Robertson
Environmental Coordinator
California Department of Forestry and Fire Protection
P.O. Box 944246
Sacramento, CA 94246-0460

From: **Department of Conservation**
Office of Governmental and Environmental Relations

Subject: Draft Program Timberland Environmental Impact Report (DPTEIR) for the Hearst Corporation Forestlands - **SCH# 96072103**

The Department of Conservation's (Department) Division of Mines and Geology (DMG) has reviewed the above referenced document. DMG generates maps and other data related to geologic hazards, such land slide-prone areas, that may impact the safety and economic well-being of Californians. DMG provides these comments based upon: (1) reconnaissance level field review of roads, slopes and channel conditions in the vicinity of Mud Creek, the McCloud River north of McCloud Reservoir, Angel Creek, and Star City Creek by Trinda Bedrossian on July 27; and (2) input from DMG engineering geologist John Schlosser, who has conducted on-the-ground geologic reviews of the Timber Harvest Plans (THP) in the Devil's Canyon and Kosk Creek portion of the DPTEIR. DMG's comments address geology, slope stability, erosion and sedimentation control, road construction, and potential cumulative effects in the DPTEIR area. Previous comments regarding the DPTEIR were submitted to the California Department of Forestry and Fire Protection (CDF) on June 11 1997 and August 6, 1997 (attached).

1. DMG continues to have concerns regarding the accuracy and reliability of geologic and slope stability mapping contained in the Draft DPTEIR.

   - In general, relative stability is based on the nature of underlying geologic conditions combined with the effects of natural processes over time. Management practices can alter this relative stability. It was apparent from the reconnaissance field review that many unstable areas in the DPTEIR are not identified or represented on Figure 3-2, Know Unstable and Eroded Areas; and that most of the obvious potential problems are associated with the nature of the underlying geologic conditions (i.e., adversely dipping bedding planes, changes in bedrock type, erodibility of underlying units). This is particularly true of steep slopes along the inner gorge of the McCloud River and road cuts in the Star City drainage, and in the actively eroding

Devil's Canyon area. Because source data and locations are not referenced on Figure 3-2, the reliability of the data is uncertain.

2 • There are several significant errors on Figure 3-5, Bedrock Geology, related to the labeling and description of the geologic units that should be corrected prior to approval of the PTEIR. For example, the units labeled QV^b, PV^b, MV, and TB^b should be Qv^b, Pv^b, Mv and Tv^b respectively to reflect geologic nomenclature. The first capitalized letter refers to the age of the unit (i.e. Q = Quaternary, P = Pliocene, M = Miocene, T = Tertiary) while the second lower case letter refers to the nature of the rock (i.e. v = volcanic origin). The unit labeled PT_b is either mislabeled and/or described incorrectly in the legend. Current geologic references indicate these rocks are andesites, mudstones, and tuffs rather than metamorphosed marine rocks. This discrepancy, as well as gaps in the data used for compilation of Figure 3-5, could be eliminated through additional research of existing published and unpublished data (i.e. DMG's Regional Geologic Mapping Project files) and reconnaissance geologic field mapping. A list of references that may provide additional information applicable to evaluation of geologic conditions underlying the Hearst Forests was sent to the Hearst Corporation for consideration as part of DMG's June 11 1997 review of the PTEIR.

3 • Because accuracy and reliability of background information on geology and slope stability is crucial to an understanding of the cumulative watershed effects within the ownership, DMG suggests that geologic and slope stability information in the Final DPTEIR be prepared by, or with the assistance from, a Registered Geologist (RG) or Certified Engineering Geologist (CEG) licensed in California. A list of RGs and CEGs can be obtained from the: Board of Registration for Geologists and Geophysicist, 2535 Capital Oaks Drive, Suite A, Sacramento, CA 95833, (916) 263-2133.

2. The Draft DPTEIR does not fully address DMG's original concerns regarding mass wasting/unstable areas.

4 • Impacts and Mitigation Measures for Mass Wasting (p. 3-33) and Best Management Practices (BMPs) (p. C-32) for mass wasting/unstable areas proposed in the DPTEIR continue to provide less protection than existing Forest Practice Rules (FPRs). (See June 11, 1997 memo, Item 6).

• The proposed Mitigation Measures and BMPs may be appropriate in some situations but not others. Because several types of landslide processes can occur in any given area, and because management activities can alter slope stability, mitigation depends upon evaluation of multiple site specific factors that can contribute to failure, i.e., not all landslides can be treated the same

5 way. For this reason, DMG believes that proposed activities on all unstable areas should be evaluated on a site specific basis as currently required in the FPRs.

- Although provisions for additional mitigation measures developed by a RG or CEG have been added (p. 3-33) the DPTEIR implies that the mitigations will be applied to all subsequent PTHPs involving unstable areas and that more site specific measures will be based on the judgment of Hearst Corporation foresters. DMG suggests that a geologist be consulted in the development and design of site specific mitigations for unstable areas. 6

3. The Draft DPTEIR (p. 2-6 paragraph 4) addresses DMG's previous concerns regarding locations of, and potential erosion from, mines and rock/borrow pits to be used for roadbed construction and maintenance. However, DMG suggests that similar language regarding stabilization of cut slopes and control of surface runoff be added to the list of BMPs for Rock Quarries, Gravel Pits and Spoil Disposal Areas (p. C-33). (See June 11, 1997 memo, Item 2; and August 6, 1997 memo, Item 4). 7

The Department appreciates the opportunity to comment on the DPTEIR for the Hearst Forests. If you have any questions, please contact Trinda L. Bedrossian at (916) 327-6977.

Jason Marshall
Assistant Director

Attachments

cc: T. Bedrossian, Division of Mines and Geology
J. Schlosser, Division of Mines and Geology

Responses to Comments from California Division of Mines and Geology

1. Figure 3-2 has been revised consistent with this comment.

2. Figure 3-5 has been revised consistent with this comment.

3. See item 7 in Chapter 2.

4. Proposed In-lieu and Alternative Practice 9 has been revised in consultation with a certified engineering geologist to ensure that appropriate mitigation measures are implemented for timber operations on unstable areas.

5. Timber operations proposed for unstable areas will be evaluated on a site-specific basis during preparation of the PTHP.

6. As discussed in "Geology, Landslides, and Geologic Guidelines for Managing Hearst Forests", specific mitigation measures have been developed for four types of unstable areas (rotational/translational slides, earthflows, debris avalanches, and debris flows and torrents) depending on whether they are active, relatively stable, or dormant. Such unstable areas have been mapped at a 1:24,000 scale based on aerial photograph interpretation, and this mapping will be verified through field reconnaissance in 1998, following snowmelt. The mapping of unstable areas will be further verified and corrected in the field by a suitably trained RPF during PTHP preparation. See item 7 in Chapter 2.

7. See BMP 16.2 in Appendix C of this final PTEIR.