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Cumulative Watershed Effects

Battle Creek

Analysis of Beneficial Uses and Water Quality Criteria to Evaluate CWE Susceptibility

Battle Creek CWEA

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Beneficial Uses of Water

The Battle Creek watershed includes the following subwatersheds: Upper South Fork Digger, Middle South Fork Digger, Panther Creek, Martin Creek, Nanny Creek, Summit Creek, Battle Creek Meadows Tributaries, Panther Creek, and Middle South Fork Battle Creek. The total acreage of this analysis area is 39,659 acres and will be used as the basis for analysis of potential cumulative watershed effects. The California Regional Water quality Control Board directs the Water Quality Control Plan for this basin through the Sacramento River Basin and San Joaquin River Basin plan.

Review of the California Regional Water Quality Control Board State Water Resources for the area identifies the following existing beneficial uses for Battle Creek.

- Agriculture (irrigation and stock watering)
- Power generation
- Recreation (contact and other noncontact)
- Freshwater habitat (warm and cold)
- Migration (cold)
- Spawning (warm and cold)
- Wildlife Habitat

The State and Regional Water Boards entered into agreements with the U.S. Forest Service to control nonpoint source discharges by implementing control actions certified by the State Water Board as best management practices (BMPs). The Regional Water Board enforces compliance with BMP implementation to ensure that water quality is protected. Applicable BMPs will be identified in this document to address water quality concerns related to the action alternatives of the Mineral Project. It is the intent that the BMPs identified for this project will maintain water quality within these subwatersheds and prevent adverse effects to downstream beneficial users. In addition, the land disturbing activities will be dispersed in time and space so that the watershed will not reach or exceed an upper limit of tolerable disturbance. (R-5 FSH 2509.22)

Cumulative Watershed Effects and Water Quality Protection Criteria

Cumulative off-site Watershed Effects (CWE) is defined as “all the effects on beneficial uses of water that occur away from the location of actual land use which are transmitted through the fluvial system”. CWE may be either beneficial or adverse and can result from synergistic or additive changes in watershed structures and processes caused by multiple land management activities within a watershed. Changes in flow regimes, especially peak flows, and sediment introduced to streams can combine to upset the dynamic sediment transport/stream flow equilibrium conditions. In addition, management practices can alter soil condition. This may affect infiltration rates and increase the amount of compacted soils within a subwatershed. Modification of surface ground cover can also change run-off rates and erosion processes. All of these factors have the ability to create cumulative watershed effects.

The use of integrated design features and Riparian Management Objectives are tool to avoid adverse cumulative effects and to ensure that beneficial uses of water are maintained.

Watershed Size

The watershed boundaries form the basic area of analysis and of the following subwatersheds is included:

Table 1: Subwatersheds within the Battle Creek Analysis

Name	Legend	Acres
Middle S.F. Battle	BC1	10,996
Battle Creek Meadows	BC2	2,162
Panther Creek	BC3	6,887
Panther Creek/LNF	BC3A	4,025
Martin Creek	BC4	4,745
Nanny Creek	BC5	3,579
Summit Creek	BC6	2,283
Middle SF Digger	BC7	2,670
Upper SF Digger	BC8	2,312
Total Subwatershed Acres		39,659

The analysis area covers the Mineral Management area and a small portion of the Turner management area. The Mineral area is adjacent to the southwestern corner of Lassen Volcanic National Park. The terrain is mountainous with elevations range from 4,500 feet to the 6,893-foot Turner Mountain. Annual precipitation averages 50 inches. Martin, Nanny, and summit Creeks originate in the eastern portion of the area, and all are tributary to Battle Creek. Panther Creek joins Battle Creek approximately 5 miles below the National Forest Boundary. The confluence of Digger Creek and Battle Creek is much further west below the town of Manton. All of these subwatersheds drain into Battle Creek, which supports runs of anadramous fishes. The elevations range from 4,270 feet downstream from Battle Creek Campground to 7,275 feet along a ridge that forms the area's northern boundary.

GEOLOGY and SOILS

The analysis area is within the Lassen – Almanor ecological Subsection (1997, USDA) and comprises the southern end of the Southern Cascade Range. The climate is cold to very cold and humid.

The lithology and stratigraphy is influenced by Pliocene and Pleistocene basalt and andesite lava flows and pryoclastic deposits. Pleistocene glacial till and outwash are extensive and Recent Alluvial and lacustrine deposits occupy stream valleys and basins.

Moderately steep-to-steep shield and composite volcanoes, plug domes, and cinder cones surrounded by volcanic plateau, dominate the subsection. Cinder cones are most numerous north of Lassen Peak. Glacial ice covered the higher peaks much of the plateau just east of Lassen Peak during the Pleistocene. Lassen Peak has been sufficiently active since the Recent Epoch to obliterate most of the glacial feature on and immediately around it. Glacial deposits are most extensive on the southeast edge of the plateau east of Lassen Peak. Volcanic, mass wasting, glacial, and fluvial processes predominate.

Soils

The soils that are within the analysis area are found in the Tehama County Soil Survey Report. These soils include the following series:

Cb Chummy soils, 0-3 percent slopes
CfD Cohasset gravelly loam, 10 to 30 percent slopes
CfE Cohasset gravelly loam, 30-50 percent slopes
CgD Cohasset stony loam, 10 to 30 percent slopes
CkF Colluvial land, volcanic rocks
CvE Cone extremely gravelly sandy loam, 10-30 percent slopes
IkD Inskip very rocky silt loam, 10 to 30 percent slopes
LvD Lyonsville and Jiggs gravelly sandy loams, 10 to 30 percent slopes
LvE Lyonsville and Jiggs gravelly sandy loams, 30 to 50 percent slopes
LvF Lyonsville and Jiggs gravelly sandy loams, 50 to 65 percent slopes
LyD Lyonsville and Jiggs stony sandy lams, 10 to 30 percent slopes.
LyE Lyonsville and Jiggs stony sandy lams, 30 to 50 percent slopes.
MkD McCarthy sandy loam, 10 to 30 percent slopes
MkE McCarthy sandy loam, 30 to 50 percent slopes
NkB Nanny stony loam, 0 to 8 percent slopes
RtF Rock land
RuF Rubble land
WgD Windy gravelly sandy loam, 10 to 30 percent slopes
WgE Windy gravelly sandy loam, 30 to 50 percent slopes
WnD Windy rocky sandy loam, 10 to 30 percent slopes
WnE Windy rocky sandy loam, 30 to 50 percent slopes
WrE2 Windy Rocky sandy loam, 30 to 50 percent slopes
WsD Windy stony sandy loam, 10 to 30 percent slopes.
WsE Windy stony sandy loam, 30 to 50 percent slopes.

Soil Characteristics

Characteristics of the major soils have been gathered from the Tehama County Soil Survey, which is available on the Almanor Ranger District. The Chummy Series are typically meadow soils formed from alluvium. They were derived from volcanic rocks that ranged from andesite to rhyolite in composition. The soils typically have an organic mat over a dark gray surface soil. The soils are medium textured to moderately fine textured throughout but may contain some areas of stratified gravels. These soils are found adjacent to McGowan Lake and Dry Lake as well as in other wet meadow areas throughout the project area. They occupy a relatively small proportion of the soils in the landscape analysis. Limitations of these soils include poor drainage and moderately slow permeability. The water table is near the surface early in the summer and may be as deep as 5 feet in the fall.

Cohasset series are gently sloping to steep, well-drained soils that formed in material weathered from volcanic rocks that include andesite and breccia. The Cohasset soil found in this area tends to have 10 to 25 percent of the soil made up of angular gravel. The soils are generally deep and range from 4 to 6 feet. The soils are productive and have a moderate erosion hazard when vegetation is removed. The steeper slopes have a high erosion hazard rating.

Colluvial Land is area of volcanic rocks made up of loose rock and soil material. The slopes are very steep. Soils are very shallow and well drained to excessively drained. Although these slopes may support sparse vegetation they are not areas of intensive management.

The Cone series is on smooth rounded slopes of volcanic cinder cones. Most of the areas are fairly small in size. Drainage is good, runoff is slow and permeability is rapid. Because of steep slopes, it is not well suited to intensive management.

The Inskip series has an uneven surface due to angular stones. Many of the stones are more than 1 foot in diameter, with rock outcrops covering 10 to 50 percent of the surface. The soil is well drained with little or no runoff. Permeability is moderate and the available water holding capacity and fertility are moderate to low. Depth of the soil ranges from 10 to 36 inches making it moderately deep. Due to the surface stones this area is difficult to manage.

The Lyonsville and Jiggs are found on sloping to very steep, moderately deep, well drained soils. These soils are formed from rhyolite and dacite. These soils tend to have a moderate to high erosion hazard rating, which increases based on slope. As vegetation is disturbed the erosion potential increases. Slope limitations for tractor logging are usually imposed on these soils at approximately 25% slope.

The McCarthy series are found on moderately steep to very steep slopes in the mountainous area of the eastern part of the county. Depth to partly weathered rock is 20 to 40 inches. The soil is well drained. Runoff is medium to rapid and permeability is moderately rapid. The underlying rock is porous and fractured, which enables roots and water to penetrate to a depth of many feet. Surface rock may dominate from 5 to 50 percent of the soil. Erosion hazard is low with undisturbed areas.

Nanny Series consists of nearly level to gently sloping, well drained soils formed in alluvium derived mostly from andesitic rock. The soils are generally more than 5 feet deep and found on alluvial fans in the eastern part of the county at elevations of 4,000 to 6,000 feet. The soil is well drained. Runoff is slow, and permeability is moderately rapid. The erosion hazard is slight.

Rock land is mode up of areas that consist of more than 50 percent exposed rock. The areas are on very steep slopes or are on gently sloping lava flows. Little or no use is made of areas of this land type.

Rubble land consists of areas of loose rock. Slopes are steep to very steep and as is similar to the rock land little or no use is made of areas of this land type.

The Windy series are undulating to very steep, well drained soils. They are formed in material from basic volcanic rock that in some places is made up of andesitic and basaltic rock from volcanic flows. The Windy soils within the landscape analysis vary based on slope class and percent surface stones. The gravelly sandy loams have up to 50 percent subsurface stones and the rocky sandy loam has between 5 to 30 percent surface stones. The steeper slopes make logging difficult and displacement and erosion hazard increases with slope from moderate to high once over 35%. The soils are fairly productive overall but can be difficult to regenerate due to doughtiness.

Susceptibility to Impacts or Effects

The soils found within the landscape area can be looked at in terms of their susceptibility to factors that could affect the long-term soil productivity. These factors include compaction, displacement, erosion, nutrient cycling, mass failure and stability.

In general the finer textured soils such as Chummy, Nanny, and Cohasset are more prone to compaction then the coarser textured soils with a high gravel component. Erosion hazard is slight to moderate due to the gentle slopes that these soils are found on. Gully erosion may also occur.

The Lyonsville and Jiggs series are prone to erosion, nutrient deficits, and mass failure when disturbed. Concentration of water on these slopes may result in deep gullies, and mass failures. Maintaining adequate effective ground cover is important to preventing accelerated erosion and to reducing displacement. Road construction and road drainage is important for these soils so to prevent accelerated erosion.

The McCarthy and Windy soils are prone to displacement due to the lack of cohesion. The soils tend to be naturally hydrophobic as the summer progresses. The erosion hazard for these soils is moderate with an effective ground cover that includes portions of an intact duff layer.

Hillslope and Stream Channel Attributes

The hillslope attributes that are important in this analysis are largely based on the soils in the area, and areas with inherent instability. The description above indicates that this area has soils forming from rhyolitic parent material that are very sensitive to manipulation. In addition glacial soils that are deposited on top of impervious volcanic parent material presents instability. The area is within the rain on snow zone, which increases its vulnerability.

Perennial streams within the landscape analysis include Martin Creek, Nanny Creek, Summit Creek, Upper South Fork Digger, and Middle south Fork Digger. Channel conditions along these streams are generally good, (except for some reaches where management activity in the past has extended into the streamside management zone Field review of soil conditions from these sales indicates that on most units' soil cover requirements have been achieved. There is generally 50-80% soil cover in most

units. There are areas of erosion associated with timber harvests that are reflected on landings, roads, and within some stream reaches. In addition, roads may be poorly located and/or intercept subsurface flows. In several units small springs were found along Nanny Creek and indication of slope instability was also detected on the 30N16 road.

Mechanics for Initiating Cumulative Watershed Effects

Typical mechanisms for initiating CWE in any watershed include the following:

- Changes in hillslope and stream channel hydrology.
- Chronic sedimentation.
- Pulse sedimentation.
- Changes in woody debris.

The mechanisms that dominate these systems include changes in hillslope and stream channel hydrology, chronic sedimentation, and increased frequency of pulse sedimentation associated with catastrophic road failure.

Changes in hillslope and stream channel hydrology are associated with activities that increase the drainage density such as hydrologic connectivity created by insloped roads. Modification of soil porosity by skid trails, landings, and roads may all affect the hillslope and stream channel hydrology by creating more impervious surfaces. In some cases a skid trail or road can intercept surface runoff and redirect the flow.

Chronic sedimentation is associated with constant sources of sediment to the stream channel. Past timber harvests and road layout in Summit Creek subwatershed has removed vegetation, increased skid trail density and created numerous non point sources of sediment to the channel associated with roads, landings, and skidtrails. Other areas with road related sediment problems are found in Panther Creek subwatersheds (BC3, BC3a) where road location adversely affects stream condition.

Pulse sedimentation has occurred in the analysis area as a result of rain on snow events that overwhelmed the drainage features on the roads in the area. Large amounts of material including snowmelt, debris, and bedload began to move through the fluvial system. Where roads intercepted this process, many of the drainage structures were breached and the channel either removed large road fills, or was diverted. As the stream cut a new channel tremendous volumes of sediment entered the system. Although every system receives some sedimentation due to natural processes this was above what would occur naturally.

Changes in woody debris have not been identified as being a limiting factor. Field review indicates that large woody debris is within the expected range.

Watershed History

The watershed history includes previous timber sales: Summit Oak, Twin, Twin Thinning, Bear CDZ, Battle CDZ, Battle Windthrow Salvage, Christies, Cold Creek, Cowslip, Dry Lake, Dry Lake Salvage, Dry SSTS, Hampton Martin, Martin Creek, Mineral Station Hazard Salvage, Mineral summit, Summit Salvage SSTS, Turner Hazard SSTS, Wet Morgan Windthrow SSTS, White Sulphur SSTS, Why, East Morgan Hazard, M&M Windthrow Road Hazard, Gray's Windthrow Salvage, Hazen Flat, Mineral Creek, and Battle Creek.

Review of District records was conducted to analyze the effects of past management on the soil and water resources. The above timber sales, which date from the1950's up until present, were reviewed. Timber harvest treatments included sanitation, thinning, shelterwood, and patch clearcuts. Reforestation and plantation management activities were also reviewed.

Private timberlands harvest records were obtained from California Department of Forestry dating back to the early 1990's. THPs included shelterwood, clearcutting, thinning, and sanitation salvage prescriptions. THPs included in this analysis are: 2-93-133-TEH5, 2-96-358-TEH5 Panther Creek, 2-91-127-TEH5, and 2-98-286-TEH5. In addition, coordination with Sierra Pacific Industries indicated that they would be continuing timber management activities within the Battle Creek watershed on several sale areas. It is expected that they will complete by October of 2001 three of the four sales, which include: Grays Peak (BC3) #2-00-108-TEH5, 2-00-073-TEH5, and 2-96-358-TEH5. The remaining timber management plan, which is scheduled for December 2003 completion is 2-98-286-TEH5 and is located within BC1 (Middle South Fork Battle Creek)

Table 2: Upper Battle Creek Watershed Condition Attributes

Criteria	Existing Condition
Road Density	3.06 mi/sqmi
Steep slope Road Density	0.12 mi/sqmi
Lower 1/3 slope	1.44 mi/sqmi
Within 300 feet stream	.83mi/sqmi
Road Stream intersect density	1.68 mi/sqmi
Intersects per mile	0.55 mi/sqmi

(Reference: Sierra Nevada Framework, Appendix I-26)

Table 3: Equivalent Roaded Acres including existing and action alternatives

Name	Legend	Acres	Road System*	FS Timber Harvest	Private Timber Harvest	**Existing Total**	Alt #1	**Total Alt 1 + EC**	Alt #2	**Total Alt 2 + EC**
Middle S.F. Battle	BC1	10,996	34 miles= 1.3 ERA	2.03	2.5	**5.8**	.8	**6.6**	.75	**6.55**
Battle Creek Meadows	BC2	2,162	15 miles =2.0 ERA	1.7	0	**3.7**	3.7	**7.4**	.8	**4.5**
Panther Creek	BC3	6,887	38.25 miles= 1.6 ERA	.2	5.7	**7.5**	1.3	**8.8**	1.2	**8.7**
Panther Creek/LNF	BC3A	4,025	27 miles= 1.9 ERA	2.0	0	**3.9**	9.1	**13.0**	6.1	**10.0**
Martin Creek	BC4	4,745	14.7 miles= .9 ERA	.4	0	**1.3**	2.3	**3.6**	1.4	**2.7**
Nanny Creek	BC5	3,579	9.5 miles=.8 ERA	.3	0	**1.1**	2.3	**3.4**	1.7	**2.8**
Summit Creek	BC6	2,283	17.65 miles=2.2 ERA	2.1	0	**4.3**	5.1	**9.4**	4.4	**8.7**
Middle SF Digger	BC7	2,670	14.85 miles= 1.6 ERA	2.6	1.9	**6.1**	7.3	**13.4**	4.1	**10.2**
Upper SF Digger	BC8	2,312	1.9 miles= .2 ERA	.9	.7	**1.8**	1.0	**2.8**	.6	**2.4**

ERA calculations are based on a 24-foot wide road prism. (Formula = road length*5280 ft*24 ft wide/43560/subwatershedx100)

Evaluation of Cumulative Watershed Effects Susceptibility

The above chart reflects the existing equivalent roaded acres and identifies changes to those acres based on the two action alternatives. The chart is divided into several components one is the overall ERA associated with the transportation system. This information was gathered from a variety of resources and contains the best available information on the network. The existing timber harvest information was compiled from information obtained from stand record cards. Activities, which produce an ERA value, were analyzed regardless of when they occurred. For example if a timber sale was performed in 1951 with a thinning prescription it was assigned a coefficient to reflect the potential residual impact on the land. If the activity was pruning it was not given an ERA coefficient. Data was gathered to obtain information on timber harvests on private lands within the shared (FS/Private) subwatersheds from CDF. These activities were assigned a coefficient and the ERA was determined for activity on private land. The sum of the transportation ERA, FS timber management ERA, and the Private land ERA were compiled for the existing ERA.

Overall these numbers indicate that on a scale of low, moderate, and high; the likelihood of adverse CWEs is low within all the subwatersheds. It also indicates that some subwatersheds have very low ERAs within the 2-4 percent range and others

stand out at above 6 percent. To understand if there is a potential for adverse cumulative watershed effects to occur as a result of previous and proposed activities onsite field reviews were conducted. The information gathered from these reviews is linked to Riparian management objectives, water quality objectives, and soil resource objectives. Field review indicates that there are sources of non-point sediment associated with roads, landings, and skid trails. These sites were documented and included in the action alternatives for riparian restoration. In addition there are other sites that are inherently unstable due to geologic characteristics. These areas are found within Martin and Nanny Creek were identified so to avoid any activity that could trigger adverse cumulative watershed effects given the high sensitivity of these soils.

Alternative 1 includes development of a DFPZ through commercial, multiproduct, and or biomass thinning. Precommercial thinning and/or fuels treatments would occur in areas of DFPZ where no commercial product would be removed due to vegetation conditions, limitations in terrain, slopes over 30 percent, or other resource concerns. The effect of this activity on ERAs is modeled based on assigning a coefficient to the activity. Impacts of the activity included a potential reduction in soil porosity due to skid trails, and landings associated with the project. Due to reduced porosity there could be an increase in erosion. However monitoring of other thinning projects has indicated that this type of activity does not significantly reduce soil cover. Therefore, there should not be an increase in chronic sedimentation.

Follow up activities associated with the development of a DFPZ network include tractor piling and burning to reduce and remove fuels from the site. The impact of this activity is also modeled by assigning it a coefficient. The above analysis reflects a worse case scenario by modeling these activities as if they were to all occur this year. In actuality the timber sale or service contract would be awarded and there may be several years between timber removal and site preparation. However, the CWE model can be used to serve as an indicator of which subwatersheds are at or near a threshold of concern.

Another activity proposed in alternative 1 is group selection harvest. Approximately 550 acres would be treated with fuels treatment occurring on 460 acres within the group selections. This treatment would include reforestation and require new construction of approximately 5.0 miles of permanent new road and 5.6 miles of temporary road. This activity has the potential to increase the sources of chronic sedimentation from newly constructed roads and group selections. Although no groups would be placed within RHCAs there could be less soil cover to prevent accelerated erosion and it is likely that there would be rilling and accelerated erosion associated with group selections and the required road construction.

Riparian Restoration is the last activity associated with the proposed action. Several projects help to meet the Act's goal of riparian restoration, including tilling of landings and skid trails, treating headcuts within channels, removing water sources that do not meet BMP standards, relocating roads, reconstruction, and decommissioning of roads. This activity has the potential for beneficial CWEs since it treats existing non-point sources of sediment. This helps to reduce chronic sources of sedimentation.

Under alternative 1, both Panther Creek (BC3a) and Middle South Fork Digger (BC7) indicate a potential for adverse CWEs to occur. Generally any ERA between 10-12 percent requires closer analysis. One of the reasons the ERA is high in these watersheds is due to the amount of area being treated in a given year within relatively

small subwatersheds. However, BC3a, Panther Creek was also targeted for watershed restoration needs to reduce potential sediment sources associated with roads. Approximately 5.1 miles of road would be decommissioned and 1.9 miles of reconstruction to meet riparian objectives would be implemented. An additional .9 miles would be relocated to also achieve riparian management objectives. Middle South Fork Digger would have approximately .2 miles reconstructed to meet Riparian Management objectives. The likelihood of adverse CWEs occurring is low given the riparian protection provided by RHCAs and the BMP direction attached. There may be direct impacts to soil quality standards but there should not be adverse effects to water quality due to buffer widths. Beneficial CWEs can be expected by the removal and/or relocation of the identified roads under Alternative 1 since this will help to address non-point sources of sediment.

Alternative 2 is modified from alternative 1 and does not include any group selection harvests. In addition, total acres have been reduced and fuel reduction strategies include more grapple piling than under alternative 1. This helps to reduce the amount of area disturbed and the type of equipment (grapple piling) is generally lighter on the ground than tractor piling. Watershed restoration would still be an activity under this alternative and would help to reduce existing non-point sources of sediment.

The ERA for alternative 2 reflects the lower acreage and the type of treatment. All the ERAs are below 10.2, which indicate that no adverse cumulative effects are anticipated under this alternative. RHCAs are still in place and BMPs are also an integrated component of the project design. There are no expected adverse effects to water quality and treatments would be monitored to ensure successful implementation of the projects.

The following reflects on-going activities and reasonably foreseeable actions. Review of these activities indicates that there should not be any adverse effects to water quality. Continued BMP monitoring will be on going to evaluate if any of the activities individually poses a threat to water quality. This is a component of the Forest wide Best Management Practices effectiveness monitoring.

PRESENT ACTIONS

Grazing

Grazing within the project area will continue to occur as described in Chapter 3 Affected Environment Section 2. The term grazing permit for the Lyonsville Allotment expires on December 31, 2001. However, this permit will be issued with the same animal numbers and season of use as before as required by the Rescissions Act of 1995.

Existing Special Uses

Activities under Special Use Permits within the project area will continue and include two organizational camps (Mount Lassen Assemblies of God Conference Grounds and Mount Lassen Church Camp Inc.) several apiary sites, a water storage tank and associated water transmission lines.

OHV Trail Use

Portions of the newly designated California Backcountry Discovery Trail and the Morgan Summit Winter OHV trail network occur within the project area. Future use of these trails systems is expected to increase.

Ongoing Recreational Uses

Typical recreation activities occurring within the project area are expected to continue and include developed camping at the Battle Creek Campground, dispersed camping throughout the project area, hiking on the Heart Lake National Recreation Trail and the Sugar Pine Trail, cross country skiing on the McGowan Lake National Recreation Trail, as well as hunting, fishing, driving for pleasure and firewood cutting throughout the area. The Heart Lake Further Planning Area was recommended for Wilderness designation and will continue to be managed as Wilderness.

REASONABLY FORESEEABLE ACTIONS

Following is a list of reasonably foreseeable actions that may occur before August 20, 2004, which marks the end of the QLG's five-year pilot project.

Powerline Hazard Helicopter Timber Sale

The objective of this sale is to remove hazards to the powerline to the Mill Creek Recreation Residences and Trailer Tract and Camp Tehama. The portion of the timber sale within the Mineral Forest Recovery Project area is located east of the Mineral Work Station in T.29N. R.4E., Sections 19, 20, 28, and 29. Logging on this sale hasn't begun yet. It will terminate in 2002.

Environmental Assessment for the Mineral Community Defense Zone Fuel Break Project

Stands within the defense and threat zones (described in Sierra Nevada Forest Plan Amendment EIS ROD) surrounding the community of Mineral and analyzed in the Environmental Assessment for the Mineral Community Defense Zone Fuel Break Project could be implemented if alternative 3 is selected. An estimated 779 acres would be pre-commercially thinning. Approximately 427 acres would be underburned and 18 acres would have brush masticated after thinning. (Appendix <> summarizes the treatments by stand.) All thinning will be done by hand due to slope, soil, and riparian considerations.

Cultural Work

The foreseeable cultural activities in the Mineral Management Area are associated with the previous timber sale areas: Battle, Bear, Hampton Martin, Hazen, Mineral Summit, Summit Oak, and Twin. The following treatments will be implemented: release (190 acres), pre-commercial thinning (450 acres), site preparation (10 acres), planting (10 acres), interplanting (100 acres), and animal control (100 acres).

Hazard Tree Removal

Hazard tree removal will occur during the implementation of the Mineral Forest Recovery Project for the maintenance of Forest roads or the safe travel of Forest users (2400-6 Timber Sale Contract clause C/CT2.322 or service contract section C.2.2.3). Hazard trees that exist within the analysis area but are either outside of the timber sale boundaries or develop subsequent to the completion of the project and are considered a risk to Forest roads and users will be removed by separate salvage projects.

DFPZ Maintenance

Defensible fuel profile zones will require varying methods of treatment to reduce fuel loading and remove vegetation, including trees, brush and forbs.

In areas where prescribed burning will occur, such as in brushfields and understocked areas, it is likely that DFPZ effectiveness will be reduced in a relatively short time period; in 5 years or less, without additional treatment. Approximately 100 acres of brushfields are proposed for underburning.

Approximately 185 acres of the project area will have canopy closure of 40 percent or less following DFPZ construction. These areas are primarily comprised of plantations, and previously understocked areas. After the completion of thinning, mastication and/or piling and underburning, manzanita and snowbrush will sprout and could reduce DFPZ effectiveness within 5 years of initial treatment. It may be appropriate to initiate follow-up activities in some areas within 2 to 3 years following the initial treatment.

Approximately 285 acres may require additional treatment, which would include either additional underburning, or herbicide treatment. It is unclear at this time which method, if either, may be utilized. (See Vegetation Resource, Cumulative Effects section for more detail.)

Proposed Kimshew Land Exchange in the Gray's Peak Area

A land exchange between the Lassen National Forest and Sierra Pacific Industries has been proposed. The National Forest System land within the Mineral Forest Recovery Project that would be included in the land exchange is located in:

SE1/4 NE1/4 Section 9, T.29N. R.3E.;
NE1/4, SE1/4 NW1/4, NW1/4 SW1/4, NE1/4 SE1/, Section 4, T.29N. R.3.E.;

S1/2 SW1/4, NW1/4 SW1/4 Section 15, T.29N. R.3E.; and
NE1/4 NW1/4 Section 34, T.30N. R.3E..

This land will be exchanged in 2004 at the earliest. In the interim, SPI's management in this area may include thinning.

Riparian Management Objectives for Battle Creek

1. Maintain water quality to a degree that provides for stable and productive riparian and aquatic ecosystems. Water quality parameters that apply include timing and character of temperature, sediment, and nutrients.

   No increase in water temperature in perennial streams due to management activities over reference (pre-project conditions).

   Treat existing known sediment sources within units and associated with roads. Identifying site-specific problem areas within RHCAs that are contributing sediment.

   - Remove landings in the RHCA (KR#43)
   - Remove 3 landings in RHCA on 29N64C spur @ Summit Creek.
   - Till and improve drainage and Waterbars in Summit Creek @ unit 264-167.
   - Relocate water source on S. Fork Panther Creek to create off channel water source below 17 road. Obliterate access road to water source.
   - Remove water source at Martin Creek (30N16J), which is an active source of sediment.
   - Remove landing on tributary to Panther Creek at intersection of 29n21Y and 29N21YA

2. Maintain or RESTORE stream channel integrity, channel processes, and sediment regime under which the riparian and aquatic ecosystems developed. Elements of the sediment regime include the timing, volume, and character of sediment input and transport.

   - Restore channel integrity on Summit Creek by relocation and obliteration of portions of road 29N64, and 29N64c which provide increased sediment, interception and diversion of stream channels, reduction in riparian buffer, and compacted surfaces adjacent to and within the riparian area.
   - Restore channel integrity on Summit Creek by removal of 29N60G and water source that is an in-channel drafting site.
   - Restore channel integrity on Martin Creek by improving stream channel integrity through opening and modifying crossing of East branch of Martin Creek on 29N36C, removal of 29N36, and opening drainage features and decommissioning portions of 29N71 (rd up Martin creek 29N11)
   - Reduce opportunities for stream channel diversion through road reconstruction and diversion prevention dips. (Locations identified on Engineering report)

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   RF-3 Inventory and evaluate all existing roads in Riparian Habitat Conservation Areas. Through an interdisciplinary team review process, determine the influence of each road upon the RMO. Roads that are found to pose a substantial risk to riparian conditions will be improved or obliterated. Priority will be based on the potential impact to riparian

resources, the ecological value of the riparian resources affected, and the need to each road. Roads not needed for future management activities will be closed, obliterated, and stabilized. All obliteration work will meet RMOs and provide for adequate long-term drainage and stability.

The following classified and unclassified roads were identified for decommissioning in response to the above criteria.

Compartment 261

- UC-36-01 unit 35
- Temporary rd unit 45 with accelerated erosion

Compartment 262

- Decommission 29N93 and utilize the E spur in its place.
- Decommission 30N16D
- Decommission 29N21YA and relocate access, rehab landing 29N21YA
- Decommission 29N21Y due to its proximity and effective sediment delivery potential to Panther Creek. Relocate with access on the YB.
- Decommission portion of Hazen Flat Rd UC 10-01 (7/10 Mile) and provide alternate access off 29N21YE spur to provide access to 196, 107, and 108.
- Decommission Unclassified roads at Hampton Butte UC-34, and UC35 (verify #'s w/engineers)
- Decommission 29N81 and landing on road since access is not needed. 6/10 mi
- Decommission 31N17F, access is no longer needed and road enters meadow area and intercepts drainage.
- Decommission unclassified rd 13-01
- Decommission unclassified road 14-01
- Decommission unclassified road #41 and landing (KR)

Compartment 263

- Decommission portion of 29N36 (spur) due to steepness and location within RHCA
- Decommission portions of 29N71 (pull culverts and rehab)

Compartment 264

- Decommission 2/10 29N64YA and relocate.
- Decommission 29N64 reconstruct and relocate
- Decommission 29N64C
- Decommission 29N64A
- Decommission 29N64 from Summit Ck crossing to Church camp
- Decommission road that ties thru 29N22 and 29N64 accesses 159 and 160. Use as a temporary and then full decommissioning after.
- Relocate, redesign, reconstruct 29N64B for 4/10 mi
- Decommission 29N36A and landing
- Obliterate 29N64D

Compartment 265

- Decommission UC 31-01 from 29N60A to Hwy 172 (.5mi)

3. Maintain in stream flows to support desired riparian and aquatic habitats, the stability and effective function of stream channels, and the ability to route flood discharges.

- Analyze watershed drainages to ensure culvert capacity at Martin Creek.
- Redesign stream crossings on non-fish bearing streams to incorporate boulder fords where possible.

4. Maintain the natural timing and variability of the water table elevation in meadows and wetlands.
    - Remove compacted roads and surfaces (landings) in meadow areas or adjacent to meadows. This includes meadow adjacent to Christie Hill (264-156?) Stringer meadow areas in 263-30,130, and 138.

5. Maintain or restore the diversity and productivity of native and desired non-native plant communities in the riparian zone.

    Identify opportunities to thin in RHCAs to meet desired vegetative communities.

6. Maintain riparian vegetation to provide an amount and distribution of large woody debris characteristic of natural aquatic and riparian ecosystems.

    In-channel large woody debris levels are representative of natural condition in terms of frequency and distribution. Large woody debris is sufficient to sustain physical complexity and stability of stream channel attributes.

    Recruitment meets, or is trending towards site potential. Develop prescriptions to accelerate production of recruitable wood when existing condition does not meet site potential and or RMO for Large woody debris is not meet.

    TM-3 Design Silvicultural prescriptions for Riparian Habitat Conservation Areas and allow unscheduled harvest to control stocking, reestablish and culture stands, and acquire desired vegetation characteristics needed to attain Riparian Management Objectives.

7. Maintain habitat to support populations of well-distributed native and desired non-native plant, vertebrate, and invertebrate populations that contribute to the viability of riparian plant communities.

8. Maintain or restore riparian vegetation to provide adequate summer and winter thermal regulation within the riparian and aquatic zones.

9. Maintain or restore riparian vegetation to help achieve rates of surface erosion, bank erosion and channel migration characteristics of those under which the desired communities developed.

    FM-1 Design fuel treatment and fire suppression strategies, practices, and activities to meet RMOs, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire management activates could damage long-term ecosystem health.

    FM-4 Design prescribed burn projects/prescriptions for areas next to RHCAs so that RHCAs are protected. Where riparian ecosystems would be enhanced by use of prescribed fire, clearly identify the specific objectives and risks.

10. Maintain and restore riparian and aquatic habitats necessary to foster the unique genetic fish stocks that evolved within that specific geo-climatic ecoregion.

Soil, Water, and Riparian

Appropriate standards and guidelines from the Forest Land and Resource Management plan (USDA 1993) will be applied, under the requirements of the Riparian/Fish Prescription, the Forest standards and guidelines for soil, water, and riparian areas, and PACFISH direction (USDA and USDI, 1995)

Riparian Habitat Conservation Areas as defined by the Scientific Advisory Team (SAT) guidelines will be applied. These guidelines are nearly identical to those directed by PACFISH, and vary only by using horizontal distance rather than slope distance to establish base riparian habitat conservation area (RHCA) widths.

The following Best Management Practices will apply to the Mineral Forest Recovery Project:

BMP 1.1 Timber Sale Planning Process
Objective: To incorporate water quality and hydrologic considerations into the timber sale planning process.
Implementation: Maintenance of SAT buffers and protection of water quality.

BMP 1.2 Timber Harvest Unit Design
Objective: To ensure that timber harvest unit design will secure favorable conditions of water quality and quantity.
Implementation: No entry into SAT buffers by equipment and grouping of group selections to minimize landings.

BMP 1.3 Determination of Surface Erosion Hazard for Timber Harvest Unit Design
Objective: to identify high erosion hazard areas in order to adjust treatment measures to prevent downstream water quality degradation.
Implementation: Review of soil input has identified areas to have a moderate erosion hazard. Units on rhyolitic soils have a high erosion hazard.

BMP 1.4 Use of Sale Area Maps (SAM) and/or Project Maps for Designation of Water Quality Protection Needs.
Objective: To ensure recognition and protection of areas related to water quality protection delineated on a SAM or Project Map.
Implementation: Need to identify all widths

BMP 1.6 Protection of Unstable Areas
Objective: To provide special treatment of unstable areas to avoid triggering mass slope failure with resultant erosion and sedimentation.
Implementation: Within the proposed project area there are several unstable areas. These areas will be identified on sale area maps and will be treated in such a way to avoid triggering mass movement.

BMP 1.8 Streamside Management Zone Designation
Objective: To designate a zone along riparian areas, streams and wetlands that will minimize potential for adverse effects from adjacent management activities. Management activities within these zones are designed to improve riparian values.
Implementation: Identification of buffers (BMP 1.4) and identification of riparian management objectives (RMO's) for the project area with the interdisciplinary team.

BMP 1.9 Determining Tractor Loggable Ground
Objective: To minimize erosion and sedimentation resulting from ground disturbance of tractor logging systems.
Implementation: There are rhyolitic soils within the analysis area that have a high erosion hazard. Slope limitation of 25% for units with rhyolite will be identified.

BMP 1.10 Tractor Skidding Design
Objective: By designing skidding patterns to best fit the terrain, the volume, velocity concentration and direction of runoff, water can be controlled in a manner that will minimize erosion and sedimentation.
Implementation: Sale Administrators may work with the operator to end line or minimize skid trail density by using low ground pressure equipment. If 15% or more of the activity area is compacted, major skid trails will be tilled to stay within the LRMP direction.

BMP1.12 Log Landing Location
Objective: To locate new landings or reuse old landings in such a way as to avoid watershed impacts and associated water quality degradation.
Implementation: Landings within RHCAs will be tilled. Sale administrators will utilize existing landings where possible. Grouping harvest areas where feasible will minimize new landings development. In addition the following criteria may be applied: (1) Cleared or excavated size shall be no larger than that needed for safety; due to the silvicultural prescriptions this may be up to ½ acre in size. (2) New sites selected for the least amount of excavation and erosion potential; utilize existing landings were feasible. (3) Outside of RHCAs and where sidecast will not enter drainages or damage other sensitive areas; (4) In group selection harvests these areas will be placed to minimize landing construction. (5) Groups that are scheduled for planting will have landings and skid trails tilled.

BMP 1.13 Erosion Prevention and Control Measures During Timber Sale Operations
Objectives: To ensure that the purchasers' operations will be conducted reasonably to minimize soil erosion.
Implementation: Equipment will not be operated when ground conditions are such that excessive damage will result. Soil should be dry to avoid compaction. Purchaser may have to adjust work to ground and weather conditions. Erosion control work required by the contract will be kept current.

BMP 1.16 Log Landing Erosion Control
Objective: To reduce the impacts of erosion and subsequent sedimentation associated with log landings by use of mitigating measures.
Implementation: Include proper drainage on landings and avoid use of poorly located landings. If these landings are used then they will be tilled to improve infiltration and foster vegetative recovery.

BMP 1.17 Erosion Control on Skid Trails
Objective: To protect water quality by minimizing erosion and sediment derived from skid trails.
Implementation: Ensure that no more than 15% of the activity area (unit) has compacted skid trails. Units with over 15% skid trails will be tilled to improve infiltration.

BMP 1.18 Meadow Protection During Timber Harvesting

Objective: To avoid damage to the ground cover, soil and the hydrologic function of meadows.
Implementation: Maintain RHCA buffer widths as identified in SAT guidelines. Consult with Forest Soil Scientist/Hydrologist or Fisheries biologist for any areas that appear ambiguous. Ensure that Riparian Management Objectives that have been identified are followed.

BMP 1.19 Streamcourse and Aquatic Protection
Objectives: (1) To conduct management actions within these areas in a manner that maintains or improves riparian and aquatic values; (2) To provide unobstructed passage of stormflows; (3) To control sediment and other pollutants from entering streamcourses; and (4) To restore the natural course of any stream as soon as practicable, where diversion of the stream has resulted from timber management activities.
Implementation: RHCA widths are implemented and equipment is excluded from the area.

BMP 1.20 Erosion Control Structure Maintenance
Objective: To ensure that constructed erosion control structures are stabilized and working.
Implementation: Field review of erosion control structure immediately after construction and sampling the following year to ensure that the structures are functional.

BMP 1.21 Acceptance of Timber Sale Erosion Control Measures Before Sale Closure
Objective: To ensure the adequacy of required erosion control work on timber sale.
Implementation: Sale Administrators will inspect erosion control measures prior to accepting the unit. Coordinate routine inspections with Forest Soil Scientist.

BMP 1.23 Five-Year Reforestation Requirement
Objective: To assure a continuous forest cover and to limit disturbance on areas with limited regeneration potential where there is no assurance that the site can be reforested within 5 years.
Implementation: The interdisciplinary team assesses capability of proposed areas for reforestation. On-site evaluation by layout forester for group selections.

BMP 2.1 General Guidelines for the Location and Design of Roads
Objective: To locate and design roads with minimal resource damage.
Implementation: Review by interdisciplinary team of proposed new road location and decommissioning of old road prism. Road design emphasizes drainage features that reduces maintenance cost and is in keeping with the crossing. Roads meet standards and guidelines for RHCAs and have been evaluated in the field.

BMP 2.2 Erosion Control Plan
Objective: To limit and mitigate erosion and sedimentation through effective planning prior to initiation of construction activities and through effective contract administration during construction.
Implementation: Work with Engineering on erosion control plan for site-specific work.

BMP 2.7 Control of Road Drainage
Objective: To minimize the erosive effects of water concentrated by road drainage features; to disperse runoff from disturbances within the road clearing limits; to lessen the sediment yield from roaded areas; and to minimize erosion of the road prism by runoff from road surfaces and from uphill areas.

Implementation: Project location, design criteria and detailed mitigation are determined and documented.

BMP 2.12 Servicing and Refueling of Equipment
Objective: To prevent pollutants such as fuels, lubricants, bitumens and other harmful materials from being discharged into or near rivers, streams and impoundments, or into natural or man-made channels.

BMP 2.13 Control of Construction and Maintenance Activities Adjacent to SMZs
Objective: To protect water quality by controlling construction and maintenance actions within and adjacent to any streamside management zone so that SMZ functions are not impaired.
Implementation: Appropriate mitigation measures are incorporated in project design and contract to ensure water quality objectives are achieved.

BMP 2.15 Diversion of Flows Around Construction Sites
Objective: To ensure that all stream diversions are carefully planned, to minimize downstream sedimentation, and to restore stream channels to their natural grade, condition, and alignments as soon as possible.
Implementation: Project location, bypass design, and detailed mitigation will be developed in the design and planning process.

BMP 2.16 Stream Crossings on Temporary Roads
Objective: To ensure that temporary roads do not unduly damage stream channels and to ensure that fish passage is unimpeded by stream crossing structures.
Implementation: If a temporary crossing is required the sale administrator should consult with the Forest transportation planner, soil scientist/hydrologist or fisheries biologist on layout and RMOs for the site.

BMP 2.17 Bridge and Culvert Installation
Objective: To minimize sedimentation and turbidity resulting from excavation for in-channel structures. Implementation: When improving drainage or locating a new road as part of the proposed action follow guidelines for diversion of water and excavation of material and ensure that project design achieves RMOs.

BMP 2.19 Disposal of Right of Way and Roadside Debris
Objective: To ensure that organic debris generated during road construction is kept out of streams so that channels and downstream facilities are not obstructed. To ensure that debris dams are not formed which obstruct fish passage, or which could result in downstream damage from high water flow surges after dam failure.
Implementation: During construction of new roads ensure that material disposal sites are identified that meets other resource objectives including RMOs.

BMP 2.20 Specifying Riprap Composition
Objective: To minimize sediment production associated with the installation and utilization of riprap material.
Implementation: Riprap will be utilized in many of the road improvement projects. Ensure that it is appropriately sized and installed to resist erosive water velocities. Consult with Forest soil scientist/hydrologist.

BMP 2.21 Water Source Development Consistent with Water Quality Protection
Objective: To supply water for roads and fire protection while maintaining existing water quality.

Implementation: Current water sources, which do not BMP standards, have been identified and will be restored. New locations are selected and design for water sources is consistent with BMPs.

BMP 2.22 Maintenance of Roads
Objective: To maintain roads in a manner which provides for water quality protection by minimizing rutting, failures, sidecasting, and blockage of drainage facilities all of which can cause erosion and sedimentation and deteriorating watershed conditions.
Implementation: Work with transportation planner to ensure roadwork is done in a manner that is consistent with RMOs.

BMP 2.23 Road Surface Treatment to Prevent Loss of Materials
Objective: To minimize the erosion of road surface materials and consequently reduce the likelihood of sediment production from those areas.

BMP 2.24 Traffic Control During Wet Periods
Objective: To reduce road surface disturbance and rutting of roads. To minimize sediment washing from disturbed road surfaces.
Implementation: Control hauling activities when conditions exist that could create adverse effects to the road and resources.

BMP 2.26 Obliteration or Decommissioning of Roads
Objective: To reduce sediment generated from temporary roads or unneeded system roads by obliterating or decommissioning them at the completion of the intended use.
Implementation: All temporary roads used in the project will be tilled and allowed to revegetate. Sideslopes will be reshaped and stabilized. Sale administrators will work with Forest soil scientist and transportation planner to ensure that roads are fully restored.

BMP 5.2 Slope Limitations for Mechanical Equipment Operation
Objective: To reduce gully and sheet erosion and associated sediment production by limiting tractor use.
Implementation: This is for vegetative manipulation as a part of site preparation. Ensure that tilling is on the contour and soil cover is approximately 50%. Include soil scientist for questions and soil cover requirements on a site-specific basis.

BMP 5.3 Tractor Operation Limitation in Wetlands and Meadows
Objective: To limit turbidity and sediment production resulting form compaction, rutting, runoff concentration, and subsequent erosion by excluding the use of mechanical equipment in wetland and meadows except for the purpose of restoring wetland and meadow function.
Implementation: The application of this BMP will be mandatory on all vegetation manipulation projects as prescribed in the environmental document. Mitigation includes maintaining RHCA buffers and restricting mechanized equipment in these areas.

BMP 5.6 Soil Moisture Limitations for Mechanical Equipment Operations
Objective: The objective of this measure is to prevent compaction, rutting, and gullying, with resultant sediment production and turbidity.
Implementation: Ensure soil conditions are evaluated and soil moisture is low prior to implementation.

BMP 6.1 Fire and Fuel Management Activities

Objective: To reduce public and private losses and environmental impacts which result from wildfires and/or subsequent flooding and erosion by reducing or managing the frequency, intensity and extent of wildfire.
Implementation: Fuel treatments will be implemented in conjunction with the DFPZ development and in areas outside of DFPZs to reduce public and private losses and environmental impacts.

BMP 6.2 Consideration of Water Quality in Formulating Fire Prescriptions
Objective: To provide for water quality protection while achieving the management objectives through the use of prescribed fire.
Implementation: The fire prescription will include elements such as fire weather, slope, aspect, soil moisture, and fuel conditions. These elements influence the fire intensity and have a direct effect on whether or not a desired ground cover remains after burning, and whether or not a water-repellent layer is formed. The prescription will include at the watershed and subwatershed scale the optimum and maximum burn block size, aggregate burned area, and acceptable disturbance for contiguous and aggregate burned.

BMP 6.3 Protection of Water Quality from Prescribed Burning Effects
Objective: To maintain soil productivity, minimize erosion, and minimize ash, sediment, nutrients, and debris from entering water bodies.
Implementation: Fuel treatments will meet RMO objective and minimize disturbance or riparian ground cover and vegetation. No ignition would occur within RHCAs. Fire would be allowed to back into the RHCAs to achieve low intensity burning.

BMP 7.1: Watershed Restoration
Objective: To repair degraded watershed condition and improve water quality and soil stability.
Implementation: Riparian improvement projects associated with road decommissioning, landing restoration, and treatment of non-point sources of sediment are included in the proposed action. These activities will be monitored for effectiveness of treatment.