

SECTION H

CASUAL MECHANISMS AND PRESCRIPTIONS

INTRODUCTION

The following Causal Mechanism Reports and Prescriptions were specifically prepared for use in the Big River Watershed Analysis Unit (WAU). These prescriptions are meant to help address issues to aid in the stewardship of aquatic resources of the Mendocino Redwood Company ownership in the Big River WAU. The prescriptions are meant to be used in addition to the current California Forest Practice Rules and company policies. At the time of the publication of this watershed analysis MRC's forest management policies are governed a Planning Agreement with the California Department of Fish and Game prior to the issuance of a Habitat Conservation Plan and Natural Community Conservation Plan (HCP/NCCP). Once the HCP/NCCP is approved, the conservation strategies set forth in these documents will become the company policies. A prescription is only presented if it deviates from or adds clarification to current company policies.

The land management prescriptions presented here are the protections that Mendocino Redwood Company will pursue to provide protection of aquatic resources. In addition to these prescriptions Mendocino Redwood Company will build and maintain all of its roads at high design standards such as presented in the Handbook for Forest and Ranch Roads (Weaver and Hagans, 1994).

The causal mechanism reports present the situations where watershed conditions have a likelihood of affecting a vulnerable resource. By addressing each of these situations with an appropriate prescription the situations that could impact sensitive resources will either be removed or their impact significantly reduced. This is to attempt to provide protection to watershed values from receiving significant or cumulative impacts from future management actions.

Monitoring will be conducted in the Big River WAU to ensure that these prescriptions are providing necessary protection to aquatic resources (see Section I, Big River WAU Monitoring Plan). This monitoring is part of an adaptive management approach that tests the hypothesized protections the prescriptions are developed to meet. If it is found that the prescriptions are not providing the appropriate protections, then they will be updated and improved.

CAUSAL MECHANISMS AND PRESCRIPTION REPORTS

Each Causal Mechanism Report and Prescription has specific headings to provide background on the watershed situation and prescription. The following is the description of these headings.

Resource Sensitive Area: the area or topic encompassed by the prescription.

Input Variable and Process: this briefly states what is the source variable or input to a vulnerable resource.

Situation Sentence: presents the situation that will be addressed by the prescription.

Prescriptions: specific land management actions or recommendation for the proposed causal mechanism.

Causal Mechanism Report and Prescription #1

Resource Sensitive Area: Mass Wasting Map Unit (MWMU) 1

Input Variable(s): Coarse and fine sediment from mass wasting and bank erosion.

Situation Sentence:

Small shallow seated landslides and bank erosion are common within the over-steepened slopes of the MWMU 1 topography. The immediate proximity of watercourses to landslides of this MWMU 1 provides direct delivery of fine and coarse sediment. A high amount of mass wasting sediment was determined to be created in MWMU 1. Marginal to deficient salmonid rearing habitat due to high coarse sediment levels is common in the Big River WAU. Fine sediment inputs can reduce spawning habitat quality. Fine sediment can also create higher than natural turbidity during storm flows potentially affecting fish physiology, reduce feeding or in the worst cases increase mortality.

Prescriptions:*MWMU 1 Road construction:*

- If inner gorge topography, no new road or landing construction unless field reviewed and approved by a California Registered Geologist. If not inner gorge topography, road construction shall be minimized. If road construction must occur, the road must utilize the highest design standards to lower risk of mass wasting sediment delivery.

MWMU 1 Existing Roads:

- Existing roads and landings shall be abandoned when no longer needed. If abandoning is not feasible, then roads or landings shall be maintained at the design standards that lower risk of mass wasting sediment delivery.

MWMU 1 Tractor Yarding:

- Equipment exclusion zones on inner gorge slopes. Equipment exclusion zones on non-inner gorge slopes except for existing roads or where alternative yarding method creates potential for greater sediment delivery.

MWMU 1 Skid Trail Construction or Reconstruction:

- No new tractor trail construction on inner gorge slopes, no new tractor trail construction or reconstruction on non-inner gorge slopes unless field reviewed and approved by a California Registered Geologist.

MWMU 1 timber harvest:

- MWMU 1 will receive no harvest on inner gorge slopes unless approved by a California Registered Geologist. On other areas (non-inner gorge slopes) within MWMU 1, in addition to the riparian protections set as company policy, timber harvest must retain a minimum of 50% overstory canopy dispersed evenly across the slopes.
 - The MWMU 1 protections will extend from the edge of the watercourse transition line up to the break in slope of the inner gorge and 25 feet of additional slope distance after the break in slope of the inner gorge.
 - For those areas that do not have well defined inner gorge topography in MWMU 1 timber harvest must retain 50% canopy¹.

¹ Only trees greater than 30 feet in height count towards canopy measurement.

Causal Mechanism Report and Prescription #2

Resource Sensitive Area: Mass Wasting Map Unit (MWMU) 2

Input Variable(s): Coarse and fine sediment from mass wasting.

Situation Sentence:

The incised topography adjacent to watercourses of MWMU 2 has high risk for shallow seated landslide sediment delivery and bank erosion. The landslides in MWMU 2 are typically associated with destabilization of the toe of a watercourse's steep side slopes. Landslides or soil failures could be aggravated by soil disturbance by heavy equipment, road building or removal of ground stabilizing vegetation. The immediate proximity of watercourses to these hillslope failures provides direct delivery of fine and coarse sediment. Marginal to deficient rearing habitat due to high coarse sediment levels occurs in the Big River WAU. Fine sediment inputs can reduce spawning habitat quality. Fine sediment can also create higher than natural turbidity during storm flows potentially affecting fish physiology, reduce feeding or in the worst cases increase mortality.

Prescriptions:*MWMU 2 Road construction:*

- If inner gorge topography, no new road or landing construction unless field reviewed and approved by a California Registered Geologist. If not inner gorge topography, road construction shall be minimized. If road construction must occur, the road must utilize the highest design standards to lower risk of mass wasting sediment delivery.

MWMU 2 Existing Roads:

- Existing roads and landings shall be abandoned when no longer needed. If abandoning is not feasible, then roads or landings shall be maintained at the design standards that lower risk of mass wasting sediment delivery.

MWMU 2 Tractor Yarding:

- Equipment exclusion zones on inner gorge slopes. Equipment exclusion zones on non-inner gorge slopes except for existing roads or where alternative yarding method creates potential for greater sediment delivery.

MWMU 2 Skid Trail Construction or Reconstruction:

- No new tractor trail construction on inner gorge slopes, no new tractor trail construction or reconstruction on non-inner gorge slopes unless field reviewed and approved by a California Registered Geologist.

MWMU 2 Timber Harvest:

- No harvest on inner gorge slopes unless approved by a California Registered Geologist. On other areas (non-inner gorge slopes) within MWMU 2, in addition to the riparian protections set as company policy, timber harvest must retain a minimum of 50% canopy (see footnote 1, page H-2) dispersed evenly across the slopes.
 - The MWMU 2 protections will extend from the edge of the watercourse transition line up to the break in slope of the inner gorge and 25 feet of additional slope distance after the break in slope of the inner gorge.
 - For those areas that do not have well defined inner gorge topography in MWMU 2 timber harvest must retain 50% canopy (see footnote 1, page H-2).

Causal Mechanism Report and Prescription #3

Resource Sensitive Area: Mass Wasting Map Unit (MWMU) 3

Input Variable(s): Coarse and fine sediment from mass wasting.

Situation Sentence:

Steep and/or convergent slopes of MWMU 3 can have shallow seated landslides associated with them. These landslides can travel moderate distances across hillslopes to reach streams or draws where sediment delivery and sometimes debris torrents or flows occur. When sediment delivery occurs with these landslides, sediments will travel down the watercourses and are delivered to river and stream channels. If the frequency and amount of shallow seated landslides are increased from management actions in MWMU 3 this can contribute to poor rearing habitat, downstream aggradation or high turbidity.

Prescriptions:

MWMU 3 Road construction:

- No new road construction across MWMU 3 unless field reviewed and approved by a California Registered Geologist unless it is the best road alternative².

MWMU 3 Existing Roads:

- Existing roads and landings shall be abandoned when no longer needed. If abandoning is not feasible, then roads or landings shall be maintained at the design standards that lower risk of mass wasting sediment delivery.

MWMU 3 Tractor Yarding:

- Equipment limited to existing roads or stable trails³.

MWMU 3 Skid Trail Construction or Reconstruction:

- No new tractor trail construction or reconstruction unless field reviewed and approved by a California Registered Geologist.

MWMU 3 Timber Harvest:

- Retain 50% canopy (see footnote 1, page H-2) with trees dispersed evenly across slope. Tree retention shall be emphasized in the axis of headwall swales. Deviations from this default must be field reviewed and approved by a California Registered Geologist.

² Best road alternative – the placement has a lower potential for sediment production and greater cost effectiveness.

³ Stable trail – skid trail that has >85% of trail's tread intact, fill cracks or settling can have occurred provided the trail is still 85% intact and can have corrective action such that the trail presents little risk of future sediment delivery after use. Cut bank slumps can occur on stable trails, however, the slump cannot be removed if it buttresses failure of upslope soils.

Causal Mechanism Report and Prescription #4

Resource Sensitive Area: Rockslides (deep seated landslides)

Input Variable(s): Coarse and fine sediment from mass wasting.

Situation Sentence:

Rockslides are deep-seated landslides within the Big River WAU. These features can be active, dormant or have sections of the landslide active with sections of the landslide dormant. Increases in sub-surface water from loss of evapo-transpiration or concentrated water from road drainage can activate or accelerate movement and sediment delivery from these features. The increased sediment delivery could contribute to adverse fish habitat by pool filling, increased channel scour, fine sediments smothering spawning gravel and loss of stream channel complexity.

Prescriptions:

No harvest or new road construction will occur on active portions of rockslides with a risk for sediment delivery unless approved by a California Registered Geologist.

Causal Mechanism Report and Prescription #5

Resource Sensitive Area: High and Moderate Erosion Hazard Roads

Input Variable(s): Coarse and fine sediment from surface and point source erosion.

Situation Sentence:

The erosion hazard ratings suggest the likelihood and amount of future sediment delivery to be delivered from a road. The high erosion hazard roads would be considered the greatest risk, with the moderate erosion hazard roads next. Many of the high erosion hazard roads in the Big River WAU are classified as high due to their close proximity to watercourses. Generally these roads were placed here to facilitate historic tractor yarding. With cable yarding being the preferred forest harvest yarding method many of these roads can be abandoned and replaced with an upper slope or ridge top road network.

These roads commonly have areas of long un-drained road lengths that increase the amount of fine sediment delivery. Many of these roads are directly adjacent to watercourses. Water drainage off these roads can increase or cause point source erosion contributing both fine and coarse sediment deliveries to watercourses. If the frequency and amount of erosion is increased from management actions this can contribute to poor rearing habitat, high turbidity or decreased spawning habitat quality.

Prescriptions:

The roads with a high erosion hazard rating should be given special attention for maintenance or erosion control. These roads should be considered high priority roads for rock surface, improved and increased road drainage relief, design upgrades or decommissioning.

The moderate erosion hazard roads should be given similar attention, but not as high a priority as the high erosion hazard roads.

The roads in close proximity to watercourses in the Big River WAU will be assessed, where possible, for decommissioning based on road network connectivity and harvesting needs. Assessment or scheduling of road decommissioning will consider operational considerations of harvest scheduling, proximity and availability of equipment, magnitude of the problem, and accessibility to the site.

The following roads can have been identified, to date, for decommissioning:

- Road DC-023 from DC0023-05 to SC-018
- Road DC-23-07
- Road SC-037
- Road SC-016-07
- Road SC-012
- Road M-150
- Road GC-018

Causal Mechanism Report and Prescription #6

Resource Sensitive Area: Known high treatment immediacy sites for roads in the Big River WAU.

Input Variable(s): Sedimentation from surface and point source erosion.

Situation Sentence:

Individual culverts, bridges, landings and road erosion sites were identified that had a high likelihood of near-term sediment delivery. If the frequency and amount of erosion is increased from management actions this can contribute to poor rearing habitat, or degradation of spawning habitat quality.

Prescriptions:

The known high treatment immediacy controllable erosion sites will be the highest priority for erosion control, upgrade, or modifications to existing design. These sites will be scheduled for repair based on operational considerations of harvest scheduling, proximity and availability of equipment, magnitude of the problem, and accessibility to the site.

Causal Mechanism Report and Prescription #7

Resource Sensitive Area: Fish passage barriers from culverts in the Big River WAU.

Input Variable(s): Barrier to fish migration.

Situation Sentence:

Culverts must pass not only water beneath roads but the sediment and debris that is transported down the watercourses and the fish migrating through the stream. If a culvert is not properly sized for the water it must pass or has too a steep grade or a high drop at the outlet it can be a barrier for fish migration. There are 5 culverts currently identified as barriers to upstream fish migration. The culverts analyzed are on road crossings of Frykman Gulch, Bull Team Gulch, Boardman Gulch and 2 culverts on Donkey House Gulch. Removal of these barriers will make available additional stream lengths for anadromous fish habitat.

Prescriptions:

The 5 known culverts shall be removed or replaced with a drainage facility that will pass both juvenile and adult salmonids. All of these crossings should be a high priority for fish passage improvement.

Other fish migration barriers likely exist and need to be investigated over time.

Causal Mechanism Report and Prescription #8

Resource Sensitive Area: Riparian Areas

Input Variable(s): Large woody debris recruitment

Situation Sentence:

Large woody debris (LWD) is an important component of stream habitat. Large woody debris provides sediment storage in channels, creates areas of scour for pool creation, provides cover for fish habitat and adds channel roughness for habitat complexity. Historic forest management practices did not require watercourse protection measures like current California Forest Practice Rules mandate. Historic removal of LWD from the Big River WAU has created a deficient of LWD available for fish habitat and stream channel diversity. Historic harvesting practices have removed many of the large conifer trees which provide the current and future large woody debris recruitment needed in these areas.

This watershed analysis has presented, by stream segment, the instream LWD demand based on riparian stand recruitment potential and instream LWD conditions. The majority of streams in the Big River WAU have a high LWD demand, suggesting lack of LWD and short term LWD recruitment potential

Prescriptions:

The company policies for streamside stand retention are considered to be appropriate at this time for LWD recruitment. Monitoring of LWD recruitment will be done to determine if this is correct.

In the interim MRC will promote attempts to place LWD in stream channels to provide habitat structure. The stream locations with high instream LWD demand should be considered the highest priority for LWD placement. The moderate instream LWD demand segments would be next.

Causal Mechanism Report and Prescription #9

Resource Sensitive Area: Canopy closure over Class I and II watercourses

Input Variable(s): Canopy closure and stream temperature

Situation Sentence:

Stream temperatures in the Big River WAU range from deficient to rearing salmonids to within preferred range. The range of stream temperatures in the Big River WAU reflects a range of environmental conditions. A few areas of the Big River WAU do have stream canopy conditions below what would naturally be expected in those locations. High water temperature can be deleterious and even fatal to many fish and aquatic species and warrant concern. Therefore, promoting appropriate stream canopy cover is important. Areas that are unnaturally low in canopy should be targeted for restoration and concern given to management activities that do not promote increased canopy.

Prescriptions:

The company policies for promoting streamside canopy and riparian management are considered to be appropriate at this time to improve stream canopy. Monitoring of stream temperatures and canopy will be done to determine if this is correct.

Areas with unnaturally low canopy in the Big River WAU will have the following considerations for canopy improvement:

- Tree planting along the river for restoration of riparian vegetation should be emphasized.
- Restoration harvest within the AMZ will not remove trees providing effective shade.
- Stream temperatures will be monitored to determine if temperatures are lowering as canopy grows in over time.

LITERATURE CITED

Weaver, W. and D. Hagans. 1994. Handbook for forest and ranch roads, a guide to planning , designing, constructing, reconstructing, maintaining and closing wildland roads. Prepared for: The Mendocino Resource Conservation District, Ukiah, CA.