

SECTION H

CASUAL MECHANISMS AND PRESCRIPTIONS

INTRODUCTION

The following Causal Mechanism Reports and Prescriptions were specifically prepared for use in the Garcia Watershed Analysis Units (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 Garcia 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 by a planning agreement prior to the issuance of a Natural Community Conservation Plan (NCCP). Mendocino Redwood Company is also working on a Habitat Conservation Plan (HCP). Further, MRC has been drafting an Erosion Control Plan and Site Specific Management Plan (ECP/SSMP) to meet the Garcia Total Maximum Daily Load implementation plan. Once these plans are 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 these policies.

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 lessened. 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 Garcia WAU to ensure that these prescriptions are providing necessary protection to aquatic resources (see Section I, Garcia 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 and inner gorges of the MWMU 1 topography. The immediate proximity of watercourses to landslides of this MWMU 1 provides direct delivery of fine and coarse sediment. The majority 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 Garcia 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 Garcia 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 1, 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 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% 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 unless it is the best skid trail alternative⁴.

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, soils from slump must be either end-hauled or retained in trail prism if trail is used.

⁴ Best skid trail alternative – the placement has a lower potential for sediment production and greater cost effectiveness.

Causal Mechanism Report and Prescription #4

Resource Sensitive Area: Rockslides

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

Situation Sentence:

Rockslides are deep-seated landslides within the Garcia 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.

Water flow from roads, skid trails and landings will not be concentrated across the toe, head, or lateral margin of any unstable area.

Causal Mechanism Report and Prescription #5

Resource Sensitive Area: Roads and skid trail use associated with watercourses

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

Situation Sentence:

The roads and skid trails adjacent to or crossing watercourses have a greater likelihood of producing high amounts of sediment inputs to watercourses. 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:

The following table (Table H-1) defines the Aquatic Management Zone within the Garcia WAU.

Table H-1. Dimensions of the AMZ Bands.

Watercourse	Slope Class (%)	AMZ Band Widths (slope distance in feet from watercourse)		
		Inner	Middle	Outer
Class I*	0-30	0-50	50-100	100-130
	30-50	0-50	50-130	130-150
	>50	0-50	50-150**	150**-190
Large Class II	0-30	0-25	25-50	50-100
	30-50	0-25	25-75	75-130
	>50	0-25	25-100**	100**-150
Small Class II	0-30	-	-	50
	30-50	-	-	75
	>50	-	-	100
Class III	0-30	-	-	25
	>30	-	-	50

** - Subtract 20 and 25 feet for cable or helicopter yarding operations adjacent to Class I and Class II AMZ, respectively.

Roads within the Aquatic Management Zone (AMZ; see Table H-1 for definition) will receive special consideration for stabilization of the road surface to prevent sediment delivery.

- Permanent and seasonal roads within the inner and middle bands (see Table H-1 for definition) of the Class I AMZ will be surfaced with competent rock to a sufficient depth to minimize fine sediment from discharging into watercourses.
- Permanent roads within the inner and middle band of Class II AMZ will be surfaced with competent rock to a sufficient depth to minimize fine sediment from discharging into watercourses.
- Temporary roads that are within a Class I AMZ will have the surface stabilized with rock, grass, mulch and /or slash prior to the winter period.

- Temporary or seasonal roads that are within a Class II AMZ will have the surface stabilized with rock, grass, mulch and /or slash prior to the winter period.
- All roads that are within a Class III AMZ will have the surface stabilized with rock, grass, mulch and /or slash prior to the winter period.
- All new watercourse crossings will be sized to pass the 100-year flood. Any existing watercourse crossing that currently will not pass the 50-year flood will be upgraded to pass the 100-year flood according to the schedule in the Erosion Control Plan.
- The outlet of all road drainage structures within 100 feet of a watercourse and with less than 90 percent vegetation buffer will have slash piled, rock rip-rap placed, silt-fences or straw bale check dams installed prior to the winter period to create a sediment trap or filter prior to a watercourse.
- All soil disturbances within an AMZ greater than 100 square feet in area will be treated with mulch or slash to provide cover to reduce soil loss. This treatment will occur prior to October 15 unless the disturbance occurs after October 15 then the site will be treated following use or prior to a 30% chance of precipitation as forecasted by the National Weather Service.
- There shall be no construction, reconstruction, or use of roads within the channel of any watercourse. This measure does not apply to watercourse crossings.
- Temporary watercourse crossings that will not carry water or debris that pass the 100 year flood discharge shall be removed prior to October 15 of the year of installation or immediately after use if after October 15. Use of temporary crossings after October 15 must:
 - be removed if 30% of chance of rain is forecasted by the National Weather Service.
 - be discontinued following 2 inches of cumulative rainfall in a water year.
 - not be re-installed for 48 hours following ½ inch of rainfall.

Skid trail use on slopes greater than 40% within 200 feet of a watercourse must follow these guidelines:

- Skid trail use will be limited by the equipment exclusion zones (EEZ) and equipment limitation zones (ELZ) shown in Table H-2.
- When skid trails are used outside of the EEZ and ELZ on slopes over 40% within 200 feet of a watercourse, only stable existing trails⁵ can be used.
- No construction of new skid trails or reconstruction of unstable trails will occur on slopes greater than 40% within 200 feet of a watercourse unless developed in consultation with NCRWQCB.
- Following use, the portion of the existing stable skid trail within 100 feet of a watercourse will be stabilized with mulch, grass, or packed with slash prior to the wet period. NCRWQCB can review additional need for stabilization beyond 100 feet during Timber Harvest Plan review.
- MRC will include in Timber Harvest Plans when skid trial use occurs within 200 feet of a watercourse for NCRWQCB to review.

⁵ Stable trail – skid trail that has >85% of prism 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.

Table H-2. Equipment Exclusion Zones (EEZ) and Equipment Limitation Zones (ELZ) for Watercourses in the Garcia WAU. (Distances are slope distances in feet for each side of the watercourse)

	Class I EEZ	Class II EEZ	Class III ELZ
<30% slope	150'	50'	25'
30-50% slope	150'	75'	50'
>50% slope	150'	100'	50'

The equipment exclusion zones will be allowed a few exceptions. These exceptions would be proposed in a timber harvest plan as an in-lieu practice and would be explained and justified. These exceptions are for existing crossings, for erosion control or restoration purposes, or where sediment delivery is determined to be less when using trails, designated crossings or landings in this zone. The use of a skid trail, landing or designated crossing in these areas is allowed if it can be shown that alternative yarding practices would create a greater risk and magnitude of sediment delivery and the cost of implementing those alternatives are not reasonable. Existing roads can be used in these zones.

Causal Mechanism Report and Prescription #6

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.

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.

Causal Mechanism Report and Prescription #7

Resource Sensitive Area: Known high and moderate treatment immediacy sites for roads in the Garcia 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 high and moderate 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 #8

Resource Sensitive Area: Aquatic Management Zone (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 Garcia 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 Garcia 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 Garcia River WAU range from very good within the tributaries to the Garcia River to poor for salmonids in the mainstem Garcia. The water temperatures in the mainstem Garcia lower as it travels through the MRC lands due to cool water from tributaries and lower air temperatures. Maintaining the cool water in the tributaries to the Garcia River and where possible promoting greater canopy cover on the mainstem of the river is necessary to maintain suitable summer rearing habitat for salmonids and cooling river water temperatures.

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.

Along the mainstem Garcia River the following guidelines apply:

- 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.