

EXECUTIVE SUMMARY

Watershed Analysis for Mendocino Redwood Company's Ownership in the Southcoast Streams Watershed

This report presents the results of a watershed analysis performed by Mendocino Redwood Company (MRC) on their ownership¹ in the Southcoast Streams watershed, consisting of the ownership area within the Alder Creek, Mallo Pass Creek and Point Arena Streams planning watersheds. The MRC ownership in the Southcoast Streams watershed is considered the Southcoast Streams watershed analysis unit (WAU). This section presents a brief overview of results from the watershed analysis performed by MRC. More specific information is found in the individual modules of this report.

Southcoast Streams and its tributaries support populations of steelhead trout, which are listed as threatened fisheries in the Central California Coast region. For this reason MRC conducted a watershed analysis to assist in their efforts to reduce non-point source pollution, evaluate current and past land management practices and establish a baseline for monitoring of watershed conditions over time. The watershed analysis will also be used to identify needs for site-specific management planning and restoration in the watershed to reduce impacts to aquatic resources and potentially to improve fish and aquatic habitat conditions.

MRC's approach to the Southcoast Streams watershed analysis was to perform resource assessments of mass wasting, surface and point source erosion (roads/skid trails), hydrology, fish habitat, amphibian distribution, riparian condition and stream channel condition. Mass wasting, riparian condition and surface and point source erosion modules address the hillslope hazards. The fish habitat, amphibian distribution, and stream channel condition modules address the vulnerability of aquatic resources. Prescriptions are developed to address the issues and processes identified in the watershed analysis. Finally, monitoring is suggested to determine the efficacy of the prescriptions to protect sensitive aquatic resources. The monitoring will provide the feedback for MRC's adaptive management approach to resource conservation.

RESULTS

Mass Wasting

A total of 423 shallow-seated landslides (debris slides, torrents, or flows) were identified and characterized in the Southcoast Streams WAU. A total of 40 deep-seated landslides (rockslides and earthflows) were mapped in the Southcoast Streams WAU. A considerable effort was made to field verify as many landslides as possible to insure greater confidence in the results. Approximately 20% (82/423) of the identified shallow-seated landslides were field verified. From this level of field observations, extrapolation of landslide depth and sediment delivery is assumed to be performed with a reasonable level of confidence.

¹ It must be emphasized that only the Mendocino Redwood Company ownership is analyzed.

Of the 423 shallow-seated landslides in the Southcoast WAU, 310 are determined to be road associated (includes roads, skid trails, or landings). This is approximately 73% of the total number of shallow-seated landslides. A majority of inventoried landslides originated in convergent topography and steep streamside slopes.

The landscape was partitioned into seven Terrain Stability Units representing general areas of similar geomorphology, landslide processes, and sediment delivery potential for shallow-seated landslides (Map A-2). The TSU's with the largest estimated sediment delivery are TSU 1 and 3, which cumulatively are estimated to deliver 56% of the total sediment input for the Southcoast Streams WAU. Combining all high hazard units (TSU 1, 2, and 3) would yield 82% of the estimated non-road related sediment input on approximately 20% of the MRC-owned acreage.

Surface and Point Erosion (Roads/Skid Trails)

It was determined that there are currently 184 miles of truck roads in the Southcoast Streams WAU (skid trails not included). This represented an average road density of 8.7 miles of road per square mile. Approximately 19 miles of road contributes surface erosion to watercourses (defined as contributing road length). This represents approximately 10% of the total road length in the Southcoast Streams WAU.

Roads in the Southcoast Streams WAU are estimated to generate, on average, 32 tons/mi²/yr of sediment from road-associated surface and point source erosion (Table ES-1).

Table ES-1. Road Associated Surface and Point Source Erosion Estimates by Planning Watershed for the Southcoast Streams WAU.

Planning Watershed	MRC owned (mi²)	Surface Erosion (tons/sq mi/yr)	Point Source Erosion (tons/sq mi/yr)	Total (surface + point source) (tons/sq mi/yr)
Lower Alder Creek	9.2	0	26	26
Lower Brush Creek	0.6	0	8	8
Mallo Pass Creek	3.9	0	32	32
North Fork Alder Creek	3.2	18	29	47
Point Arena Creek	3.4	4	35	39
Upper Brush Creek	0.4	1	3	4
Cuffeys Point	0.4	1	37	38
<i>Southcoast Streams WAU</i>	<i>21.1</i>	<i>3⁺</i>	<i>28⁺</i>	<i>32⁺</i>

⁺Area-weighted average

The future potential for point source erosion was evaluated in the Southcoast Streams WAU. This potential erosion or controllable erosion was identified during the road inventory during 2012. A total of 6,544 cubic yards of controllable erosion (Table ES-2) is currently on the road network in the Southcoast Streams WAU. Since 1998, when the company was formed, 810 cubic yards of erosion from the road network has been controlled.

Table ES-2. Controllable Erosion by Treatment Immediacy for the Southcoast Streams WAU.

Road Feature	Controllable Erosion by Treatment Immediacy (yd ³)		
	High	Moderate	Low
Culverts	906	171	1557
Crossings	447	110	656
Landings	0	0	157
Erosion Sites	0	16	86
Road slides	134	1489	815
Total	1487	1786	3271

The Southcoast Streams WAU was evaluated for skid trail sediment delivery from the 1940s to 2010. The greatest sediment delivery from skid trails occurred from 1940s to the 1970s with the majority of activity occurring in the Lower Alder Creek and Mallo Pass Creek watersheds.

Hydrology

Using the peak flow record from 1952-1983, the flood of record was in January 1974 (30,300 cfs) calculated to be approximately a 17 year event for the Garcia River. This suggests that the Southcoast Streams WAU has been subjected to stressful hydrologic conditions, possibly creating a greater incidence of landslides, road failures or surface erosion.

Riparian Function

The riparian function assessment is divided into two groups: 1) the potential of the riparian stand to recruit large woody debris (LWD) to the stream channel along with the level of concern about current LWD conditions in the stream, and 2) a canopy closure and stream temperature assessment.

Our analysis showed a need for large woody debris in most (69%) of the channel segments of the Southcoast Streams WAU due to low instream LWD and low riparian recruitment potentials. Channel segments with LWD levels that are well below targets will need to be a priority for future recruitment and restoration work. Riparian LWD recruitment potential in the Southcoast Streams WAU is moderate to low. The majority of the LWD in Southcoast Streams consists of older redwood logs.

The Southcoast Streams WAU generally has favorable stream shade conditions. These conditions are typical of the coastal streams that have cool stream temperatures as well as adequate canopy cover. Topographical shading from the steep, dissected terrain in the Southcoast Streams WAU also plays a large role maintaining desired stream temperatures.

Stream temperatures in the Southcoast Streams WAU are generally within the range preferred by steelhead trout (maximum weekly average temperatures below 15°C) with the main exception being North Fork Alder Creek (inland).

Stream Channel Condition

Baseline information on the stream channels of the Southcoast Streams WAU was collected and reported (see Module E Stream Channel Condition module). Individual channel segments were categorized into geomorphic units using the baseline stream channel information, topography the channel segments are found in, position in the drainage network, and gradient/confinement classes. Four stream geomorphic units were established to represent the range of channel conditions and sensitivities to input factors of coarse and fine sediment and LWD (Table ES-3). Long term channel monitoring observations have been

collected on one monitoring segment in Mallo Pass Creek in 2007. The results for these observations are presented in the Stream Channel Condition module.

Table ES-3. Stream Geomorphic Units and Sensitivities for the Southcoast Streams WAU.

Stream Geomorphic Unit	Channel Sensitivity		
	Coarse Sediment	Fine Sediment	LWD
Geomorphic Unit I. Confined Low Gradient Channels.	Moderate	Moderate	High
Geomorphic Unit II. Low Gradient Confined to Moderately Confined Transport Channels.	Moderate	Moderate	High
Geomorphic Unit III. Moderate Gradient Confined Transport Channels	Moderate	Moderate	Moderate
Geomorphic Unit IV. High Gradient Transport Channels.	Low	Low	Low

Fish Habitat Assessment

The anadromous fish species inhabiting the Southcoast Stream WAU are steelhead trout (*Oncorhynchus mykiss*). Other fish species include prickly sculpin (*Cottus asper*), three-spine stickleback (*Gasterosteus aculeatus*) and coastrange sculpin (*C. aleuticus*).

Habitat typing data indicated that spawning habitat was generally fair to poor throughout most of the Southcoast WAU. Fine sediment deposition in pools (V*), however, was not indicative of highly disturbed systems, but longitudinal profile data indicate a lack of deep pools. Reduction of erosion rates should increase the quality of spawning gravel in the Southcoast WAU. Throughout most of the Southcoast WAU, summer rearing and over-wintering habitat were rated as poor to fair. Land management activities that promote woody debris recruitment and sediment reduction should directly increase the quality of rearing habitat in the Southcoast WAU.

Amphibian Distribution

The amphibian species detected in the Southcoast Streams WAU represent three of the four species having geographical ranges in the area. The three detected amphibian ‘Species of Special Concern’ (as designated by the State of California) are coastal tailed frogs, foothill yellow-legged frogs, and southern torrent salamanders. Aquatic habitat types have remained functional in the South Coast Streams WAU to support the tailed frogs and southern torrent salamanders, which have been extirpated both locally and regionally. During surveys for southern torrent salamanders, tailed frog adults were observed within seeps and small watercourses at three sampling locations. Based upon this evidence it appears as if seeps adjacent to larger watercourses may be an important habitat for tailed frogs, whether for foraging habitat or reproductive habitat. Two federally listed “Threatened” California red-legged frog documented breeding sites were identified; however minimal breeding habitat on MRC forestlands could explain the overall low density of red-legged frog in the South Coast Streams WAU.

Synthesis

The habitat quality ratings and sediment input summaries show that large woody debris and road associated sediment have the most significant need for improvement. Stream temperature conditions in the coastal portions of Southcoast Streams are at a desirable level for steelhead as well as having favorable canopy conditions. Currently MRC has made good strides toward controlling road sediment in Southcoast Streams, but a significant amount of controllable sediment remains to be controlled. Long-

term monitoring data in the Southcoast Streams is in its infancy since 2007 was the first year that this type of monitoring was conducted, but initial data suggests that large woody debris levels are low, pool depths and frequencies are very low and fine sediment deposition levels are acceptable.

Land Management Prescriptions

The following prescriptions were specifically prepared for use in the Southcoast Streams 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 Southcoast Streams 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 interim guidelines 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 these policies.

Mass Wasting

Terrain stability unit 1 – Inner gorge or steep streamside slopes adjacent to low gradient watercourses

Where there is inner gorge within TSU 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.

TSU 1 Road construction:

- No new road or landing construction unless field reviewed and approved by a California Professional Geologist.

TSU 1 Existing Roads:

- Roads or landings shall be maintained at the design standards that lower risk of mass wasting sediment delivery. Existing roads and landings within TSU 1 should be considered for abandonment if no longer needed.

TSU 1 Tractor Yarding:

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

TSU 1 Skid Trail Construction or Reconstruction:

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

TSU 1 Timber Harvest:

- TSU 1 will receive no harvest on inner gorge slopes unless approved by a California Professional Geologist. On steep streamside slopes within TSU 1, in addition to the riparian protections set as company policy, timber harvest must retain a minimum of 50% canopy² dispersed evenly across the slopes.

² Only trees greater than 30 feet in height count towards canopy measurement.

Terrain stability unit 2 – Inner gorge or steep streamside slopes adjacent to moderate to high gradient watercourses

Where there is inner gorge within TSU 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.

TSU 2 Road construction:

- If inner gorge topography, no new road or landing construction unless field reviewed and approved by a California Professional Geologist. If steep streamside slope 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.

TSU 2 Existing Roads:

- Roads or landings shall be maintained at the design standards that lower risk of mass wasting sediment delivery. Existing roads and landings within TSU 2 should be considered for abandonment if no longer needed.

TSU 2 Tractor Yarding:

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

TSU 2 Skid Trail Construction or Reconstruction:

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

TSU 2 Timber Harvest:

- No harvest on inner gorge slopes unless approved by a California Professional Geologist. On steep streamside slopes within TSU 2, in addition to the riparian protections set as company policy, timber harvest must retain a minimum of 50% canopy (see footnote 2) dispersed evenly across the slopes.

Terrain stability unit 3 – Steep dissected terrain

This area is characterized primarily by 1) steep convergent and dissected topography located within steep gradient colluvial hollows or headwall swales and small high gradient watercourses, and 2) locally steep planar slopes where there is strong evidence of past landsliding. Please see the mass wasting module for the full definition.

TSU 3 Road construction:

- No new road construction across TSU 3 unless field reviewed and approved by a California Professional Geologist unless it is the best road alternative³.

TSU 3 Existing Roads:

- Roads or landings shall be maintained at the design standards that lower risk of mass wasting sediment delivery. Existing roads and landings within TSU 3 should be considered for abandonment if no longer needed.

³ Best road alternative – the placement has a lower potential for sediment production and greater cost effectiveness.

TSU 3 Tractor Yarding:

- Equipment limited to existing roads or stable trails⁴.

TSU 3 Skid Trail Construction or Reconstruction:

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

TSU 3 Timber Harvest:

- Retain 50% canopy (see footnote 2, page v) 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 Professional Geologist.

Rockslides

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

Roads*High and Moderate Erosion Hazard Roads*

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.

High and moderate treatment immediacy sites for roads in the Southcoast Streams WAU

The 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.

The moderate treatment immediacy controllable erosion sites will be the next highest priority (relative to the high treatment immediacy sites) for erosion control, upgrade, or modifications to existing design. The moderate treatment immediacy sites will typically be addressed when in close proximity to high treatment immediacy sites.

Riparian*Large woody debris recruitment*

⁴ 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.

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.

Stream Shade

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.

Monitoring

Aquatic resources monitoring will be conducted in the Southcoast Streams WAU. This monitoring is to assist Mendocino Redwood Company to assess impacts to aquatic resources associated with past or future timber harvest and related forest management activities in the Southcoast Streams WAU. The monitoring suggested in this plan is monitoring that MRC does across all its lands including the Southcoast Streams WAU. However, other monitoring efforts not mentioned here may be conducted by MRC in the Southcoast Streams WAU. Currently a comprehensive monitoring plan is being developed for the MRC lands. Once that plan is finalized it will supercede the monitoring presented here.

Monitoring Plan Goals:

- Test the efficacy of the Southcoast Streams WAU prescriptions to address impacts to aquatic resources from timber harvest and related forest management activities.
- To assess long term channel conditions. Are current and future forest management practices inhibiting, neutralizing or promoting stream channel conditions for aquatic habitat?

A monitoring report will be produced each year that monitoring is conducted in the Southcoast Streams WAU. The report will cover the monitoring and analysis that has occurred up to that year; if no monitoring is conducted in a given year than no report will be produced. Table ES-4 summarizes some of the monitoring to be conducted in the Southcoast Streams WAU over time.

Table ES-4. Monitoring Matrix for Mendocino Redwood Company Lands Including the Southcoast Streams Watershed Analysis Unit.

Monitoring Objectives	Reasoning, Comments	Technique
1. Determine effectiveness of measures to reduce management created mass wasting.	Management created mass wasting is significant contributor of sediment delivery.	Evaluation of mass wasting after approximately 20 years.
2. Determine effectiveness of erosion control practices on high and moderate surface erosion hazard roads and landings.	Roads provide sediment delivery in the Southcoast Streams WAU.	Evaluation of watercourse crossings, landings, and road lengths for erosion evaluation.
3. Determine in-stream large woody debris amounts over time.	Large woody debris is needed for stream channel and aquatic habitat improvement in the Southcoast Streams WAU.	Stream LWD inventories and mapping of LWD designation areas in select stream reaches and long term channel monitoring sites.
4. Determine if stream temperatures are staying within properly functioning range for salmonids.	Stream temperature can be a limiting factor for salmonid growth and survival.	Stream temperature probes and assessment conducted in strategic locations.
5. Determine if fine sediment in stream channels is creating effects deleterious to salmonid reproduction.	Many forest practices can produce high fine sediment amounts. Need to ensure fine sediments are not impacting salmonid reproduction.	V-star measurements on select stream reaches (bulk gravel samples if necessary).
6. Determine long-term channel morphology changes from coarse sediments.	Channel morphology can be altered from sediment increases, possibly affecting aquatic habitat.	Thalweg profiles and cross section surveys on select stream reaches.
7. Determine presence and absence of fish species in Class I watercourses.	Management practices and resource protections can affect distribution of aquatic organisms.	Electro-fishing and snorkeling observations at select locations to determine species composition and presence.

Southcoast Streams Watershed Analysis Unit

Vicinity Map

- ■ ■ MRC Ownership
- South Coast Streams Watershed Analysis Unit
- Roads**
- ▬ Major Roads
- ▬ Major Streams
- ▬ 200' Contour
- ▬ Planning Watershed Boundary

