

ALBION RIVER WATERSHED ANALYSIS

EXECUTIVE SUMMARY

The Albion River watershed is a coastal watershed that drains into the Pacific Ocean and is located in western Mendocino county, California. The Albion River watershed encompasses approximately a 43 mi² area and is divided into 4 different planning watersheds as delineated by the California Water Agency. Mendocino Redwood Co., LLC (MRC) owns approximately 54 percent of the land in the Albion River watershed (see Base Map, Albion River Watershed Map and Table 1 of Introduction).

This report presents the results of a watershed analysis performed by MRC on their ownership in the Albion River watershed, the Albion watershed analysis unit (WAU). The watershed analysis of the Albion WAU was conducted following the guidelines modified from the Standard Methodology for Conducting Watershed Analysis (Version 4.0, Washington Forest Practices Board). MRC's approach to the Albion River watershed analysis was to perform resource assessments of mass wasting, surface and point source erosion, hydrology, fish habitat, riparian condition and stream channel condition. The results of the resource assessments are synthesized and reported in a causal mechanism report. A prescription is developed to address the issues and processes identified in each causal mechanism report. Finally, monitoring is suggested to determine the efficacy of the prescriptions to protect sensitive aquatic resources.

RESULTS

Mass Wasting

A total of 270 shallow-seated landslides (debris slides, torrents, or flows) and 136 deep-seated landslides (rockslides) were identified and characterized in the Albion WAU spanning the time period 1977-2003. The shallow seated landslides were estimated to have generated a total of 185,000 tons of sediment delivery. This equates to approximately 335 tons/sq. mi./yr.

Road associated mass wasting was found to have contributed 97,000 tons (170 tons/sq. mi./yr) of sediment over the 23 years analyzed in the Albion WAU. This represents approximately 52% of the total mass wasting inputs for the Albion WAU for 1977-2000. In the South Fork Albion planning watershed, road associated landslide sediment delivery was a major sediment source, contributing 72% of the sediment delivered into the South Fork Albion planning watershed. Better road construction practices currently in use combined with design upgrades of old roads should lower this amount over time. However, this high amount of road mass wasting needs to be a focus of concern.

The Albion WAU was partitioned into five Terrain Units (TU) representing areas of similar geomorphology, landslide processes, and sediment delivery potential (see Map A-2 of the Mass Wasting module). The steep streamside areas of TU 1, 2, and 3 contribute the highest amount of the sediment per unit area in the watershed. In the moderate and low hazard units of TU 4 and 5, a large amount of road associated landslides are occurring, suggesting the need to make improvements on roads within the Albion WAU.

Figure ES-1. Sediment Delivery, in tons, by Time Period for Albion WAU (rounded to 100 tons).

Planning Watershed	1977 - 1987	1988 – 1996	1997 – 2000
Little River	0	3,200	0
Lower Albion River	11,800	33,700	8,200
South Fork Albion River	9,700	52,800	20,400
Middle Albion River	4,700	23,300	13,400
Upper Albion River	3,700	0	0
Total	30,000	113,000	42,000

Surface and Point Source Erosion

Road related surface erosion and skid trail erosion was estimated to be highest in the South Fork planning watershed, with 130 tons/mi²/yr and 40 tons/mi²/yr surface erosion respectively. The Middle Albion planning watershed had the next highest road and skid trail erosion rates, with 100 tons/mi²/yr and 40 tons/mi²/yr surface erosion respectively. The Lower and Upper Albion planning watersheds both had low road and skid trail erosion rates.

A considerable amount of erosion control work has been performed on road by MRC in the Albion WAU. From 1999-2003 approximately 54,108 cubic yards of controllable erosion has been controlled. Currently there are an estimated 10, 386 cubic yards of controllable erosion remaining to be treated. This controllable erosion total is found in 13 sites have high treatment immediacy, 71 sites have moderate treatment immediacy, and 142 with low or undetermined treatment immediacies (note, if no controllable erosion at a site it was not counted).

Roads in the Albion WAU were classified based on their potential for surface erosion. Rankings of low, moderate or high surface erosion potential were given to roads based on their potential for surface erosion delivery to watercourses (see Map B-1 for road surface erosion hazard classifications). The roads with high surface erosion potential are the top priority for improvements or decommissioning.

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.

Currently in the Albion WAU most of the streams are in the moderate in-stream LWD demand classification. Portions of the South Fork Albion River, Albion River and North Fork Albion River are in the high in-stream LWD demand classification (see the large woody debris recruitment potential and in-stream LWD demand for the Albion WAU illustrated in Map D-1, Riparian Function module). The LWD recruitment potential of the riparian areas is generally in the moderate to high categories in the Albion WAU. The increased in-stream LWD demands in the Albion WAU are primarily from low levels of LWD in the stream channels.

Canopy closure over watercourses was observed to be high; most stream segments in the Albion WAU had greater than 80% canopy closure. The high amount of stream canopy closure and the close proximity to the Pacific Ocean are reflected in the stream temperatures of the Albion WAU. The mean maximum daily stream temperatures, as observed from 1992-1997, for the Albion WAU are at levels which are not of significant concern (see Table D-7 of the Riparian Function

module). However, care must be taken with future forest management activities to ensure that the high stream canopy levels which currently exist in the Albion WAU are not lowered, possibly creating higher stream temperatures.

Stream Channel Condition

Baseline information on the stream channels of the Albion WAU was collected and reported (see Table E-1, 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. Six 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-1) (the spatial distribution of these six geomorphic units is shown on Map E-2, Stream Channel Condition module).

Table ES-1. Stream Geomorphic Units and Sensitivities for the Albion WAU.

Stream Geomorphic Unit	Approximate Location(s)	Channel Sensitivity		
		Coarse Sediment	Fine Sediment	LWD
I. Low Gradient Depositional Channels with Tidal Influence	Lower Albion River within Enchanted Meadow	Moderate	Low	Low
II. Confined Depositional Channels	Mainstem Albion, Lower South Fork, North Fork Albion	Moderate	Moderate	Moderate
III. Unconfined Depositional Channels	Railroad Gulch, Tom Bell Creek, & Upper South Fork	Moderate	Low	High
IV. Confined Depositional Tributary Channels	Lower stream segments of most Albion River tributaries	Moderate	Moderate	High
V. Moderate Gradient Transport Channels	Tributary stream channels with slope gradients of 2-8 percent	Moderate	Moderate	Moderate
VI. High Gradient Transport channels	Typically Class II and III watercourses with slope gradients of 8-20 percent.	Low	Low	Low

Fish Habitat Assessment

Anadromous salmonids inhabiting the Albion River WAU are coho salmon (*Oncorhynchus kisutch*), steelhead trout (*O. mykiss*), and Pacific lamprey (*Lamptera tridentata*). Other non-salmonid species within the Albion River WAU include the three spine stickleback (*Gasterosteus aculeatus*) and sculpin (*Cottus spp.*). Both coho and steelhead are present in the mainstem and major tributaries however, steelhead are more likely to inhabit smaller, higher gradient tributaries. (see Map F-1 for fish distribution and Map F-2 for potential spawning, rearing, and overwintering habitat, Fish Habitat Assessment module).

Fish habitat quality for the 3 main life stages; spawning, rearing, and overwintering habitat were evaluated for salmonids for the years 1993-1998 (see Table F-4, Fish Habitat Assessment module). Fish habitat quality for the three life stages has remained relatively the same for the last 5 years. For almost all stream segments assessed, habitat conditions have remained fair to good. Only a few areas have poor habitat quality.

Six index stations within the Albion River WAU have been observed using electrofish multi-pass removal or snorkel survey methods from 1991-1998. Coho salmon densities ranged between 0.03 to 0.47 fish/square meter with an average density of 0.19 fish/square meter. Lower coho densities

were seen in 1998 compared to 1996, however there were higher coho salmon densities at two of the three-mainstem index stations (see Figure F-1, Fish Habitat Assessment module). The Coho salmon life history cycle, unlike steelhead trout, sticks to a three-year cycle. It is more appropriate therefore to compare coho densities at three-year intervals. The 1998 coho densities should be compared with 1995 densities. In 1998 three sites of the six index stations have higher densities, one station (lower mainstem Albion River) is the same and two stations in the South Fork Albion have lower coho densities (see Figure F-3, Fish Habitat Assessment). Steelhead trout densities ranged between 0.13 to 0.30 steelhead/square meter with an average density of 0.21 steelhead/square meter. Higher densities were found at three of the six index stations in 1998 compared to 1996 data, and the three other stations had similar densities as 1996 (see Figure F-3, Fish Habitat Assessment).

Sediment Input Summary

The average estimated sediment input for the past twenty years for the Albion WAU is 500 tons/square mile/year. The majority of this input in the Albion WAU comes from mass wasting (74%) and to a lesser extent surface and point source erosion from roads and skid trails (26%). Skid trail erosion was found to be a low component of sediment inputs for the Albion WAU, contributing only about 9% of the total estimated erosion. Mass wasting is the dominant sediment contributing process in the Albion WAU.

Table ES-2. Estimated Sediment Inputs by Process for Planning Watersheds of the Albion WAU.

Planning Watershed	Road Surface and Point Source Erosion (tons/mi ² /yr)	Hillslope Mass Wasting (tons/mi ² /yr)	Road Associated Mass Wasting (tons/mi ² /yr)	Skid Trails Surface and Point Source Erosion (tons/mi ² /yr)	Total (tons/mi ² /yr)
Lower Albion	130	150	370	70	770
Middle Albion	40	270	90	20	440
Upper Albion	100	180	150	40	490
South Fork Albion	20	20	50	20	110

Monitoring

Aquatic resources monitoring will be conducted in the Albion 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 Albion WAU. The monitoring suggested in this plan is monitoring that MRC conducts across all its lands including the Albion WAU. However, other monitoring efforts not mentioned here may be conducted by MRC in the Albion WAU. Currently a comprehensive monitoring plan is being developed for the MRC lands. Once that plan is finalized it will supercede the monitoring presented in this watershed analysis.

Land Management Prescriptions

The following prescriptions were specifically prepared for use in the Albion 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 Albion 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

Mass wasting map unit 1 – Inner gorge or steep streamside slopes adjacent to low gradient watercourses

The general location of terrain units are mapped in Map A-1 but final determination of the unit existence and boundaries will be determined from field observations.

Where there is inner gorge within 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.

MWMU 1 Road construction:

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

MWMU 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 MWMU 1 should be considered for abandonment if no longer needed.

MWMU 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.

MWMU 1 Skid Trail Construction or Reconstruction:

- No new tractor trail construction 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 steep streamside slopes within MWMU 1, in addition to the riparian protections set as company policy, timber harvest must retain a minimum of 50% canopy¹ dispersed evenly across the slopes.

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

Mass wasting map unit 2 – Inner gorge or steep streamside slopes adjacent to moderate to high gradient watercourses

The general location of terrain units are mapped in Map A-1 but final determination of the unit existence and boundaries will be determined from field observations.

Where there is inner gorge within 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.

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 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.

MWMU 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 MWMU 2 should be considered for abandonment if no longer needed.

MWMU 2 Tractor Yarding:

- Equipment exclusion zones on inner gorge slopes. Equipment exclusion zones on steep streamside slopes 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 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 steep streamside 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 2) dispersed evenly across the slopes.

Mass wasting map unit 3 – Steep dissected terrain

The general location of terrain units are mapped in Map A-1 but final determination of the unit existence and boundaries will be determined from field observations.

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:

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

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

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 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 Registered Geologist.

Rockslides

The general location of rockslides is mapped in Map A-1 but final determination of the rockslide existence and/or activity will be determined from field observations.

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.

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 Albion 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.

Riparian

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.

Large woody debris recruitment

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.

Areas of the mainstem Albion River and the South Fork Albion River should be the highest priority for LWD in the Albion WAU.

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 conducted to determine if this is correct.