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Mattole River and Range Partnership Implementation Reduces Sediment in the Upper Mattole Watershed *Janet Blake*

The Mattole River drains a 296 square mile watershed located in the northern California Coast Ranges, in western Humboldt County and northernmost Mendocino County. The river enters the Pacific Ocean about 30 miles south of Eureka and 290 miles north of the Golden Gate. It drains primarily northwestward to the area of Petrolia, then flows west to the Pacific. The watershed shares divides with the Eel River to the east, Bear River to the north, and small drainages leading to the Pacific on the west.

Figure 1. Road– related landslide.

The Mattole watershed is located in a tectonically active area with some of the highest rates of crustal deformation, surface uplift, and seismic activity in North America. It also receives high amounts of rainfall, averaging from 60-115 in/yr. The natural setting of the Mattole watershed, along with accelerated sediment delivery caused by human activities, has resulted in the delivery of high volumes of sediment to streams. As a consequence, salmon and steelhead populations in the Mattole River watershed have declined. Coho salmon (*Oncorhynchus kisutch*), chinook salmon (*O. tshawytscha),* and steelhead trout (*O. mykiss*) in this watershed are all listed as threatened under the federal Endangered Species Act. Salmonids have a variety of requirements related to sediment, which vary by life stage. Sediment of appropriate quality and quantity (dominated by gravels, without excess fine sediment) is needed for redd (salmon nest) construction, spawning, and embryo development. Excessive quantities of sediment or changes in size distribution (e.g., increased fine sediment) can adversely affect salmonid development and habitat.

In 1992, the Mattole River and its tributaries were placed on the 303(d) list due to sediment impairment. The TMDL, adopted in 2003, is based mostly on the *Mattole River Watershed Technical Support Document (TSD) for Sediment and Temperature* (NCRWQCB, 2002) prepared by Regional Water Board staff in support of TMDL development, and by the *Mattole Watershed Synthesis Report* produced by the North Coast Watershed Assessment Program. Sources of sediment delivery to

aquatic habitat include natural erosion processes as well as those influenced by human activities, such as road construction, operation and maintenance, timber harvest activities, and livestock grazing. The total estimated current rate of sediment delivery for the entire watershed is 8000 tons/mi^2/yr, with approximately 36% attributed to natural erosion processes and 64% attributed to human activity.

The Regional Water Board determined that setting the TMDL at 125% of natural sediment delivery is appropriate for the Mattole. Using the estimated natural sediment delivery rate of 2900 tons/mi^2/yr, the TMDL for the Mattole River is: TMDL = Loading Capacity = (125%) x (2900 tons/mi^2/yr) = 3600 tons/mi^2/yr. The allocations, when achieved, are expected to result in the attainment of the applicable water quality standards for sediment for the Mattole River and its tributaries in the long term.

Figure 2 Road sediment draining to stream

The Mattole Restoration Council (Council), established in the early 1980s, has undertaken the task of decreasing the amount of human caused sediment delivery to streams. The Council has also conducted assessments, inventorying sources with sediment delivery potential of 10 cubic yards or more. The Council has implemented a number of grant-funded projects within the watershed over the years, including the Mattole Watershed/Range Partnership Implementation project, targeting sites in the Upper Mattole watershed. The project (Agreement No. 05-060-551-0) began in April 2005 and will end in December 2008.

The goal of this project is to treat 89 sites with a long term sediment pollution reduction of 48,400 cubic yards.

To address the problem the Council has employed several best management practices (BMPs), including culvert replacement; road reshaping; installation of water bars, grade checks and armored fords; stream bank stabilization, excavation of crossings and/or built up sediment; installation of critical and rolling dips and rip rap; and road outsloping. In addition, the Council has a good educational program for both schools and adult workshops that promote watershed stewardship.

This project took place in the upper section of the watershed that extends from the head of the river, at river mile 61, to a half-mile downstream from the mouth of Eubanks Creek, at river mile 42.8. The uppermost two miles of the watershed is typical mountain valley; narrow and steep-sided, with a steep gradient and very little flood plain. This area's sediment delivery is estimated at 4,400 tons/mi^2/yr. Seventy-five sites were treated the first year of this project (2006). Approximately 7,725 cubic yards of potential sediment was removed from stream channels and 15,830 cubic yards of sediment was stabilized. This represents 56 percent of the overall sediment targeted for reduction through this project. (The project has continued into 2007 with significant work at 40 sites, preventing delivery of an estimated 15,000 cubic yards.)

The Mattole Restoration Council partnered with Sanctuary Forest, Upper Mattole River and Forest Cooperative, State Coastal Conservancy, Wildlife Conservation Board, Fishamerica Foundation, and California Department of Fish and Game. The project was supported by a CWA section 319(h) grant

for $500,000 along with $547,068 in match. The project had 68 percent participation by landowners by area.

Figure 3 South Fork of Bear Creek

This project is only one of many efforts in the Mattole River watershed aimed at reducing sedimentation of streams. The Mattole Restoration Council developed the *Elements of Recovery* in 1989 and the *Mattole Watershed Plan* in 2005 both of which recognize the problem of sedimentation of streams, and recommend actions to reduce it. They have conducted many assessments and completed several other grant projects. The reductions in sediment delivery effected by this project represent only those made in the upper part of the watershed in one year. The Council is currently working in other areas of the watershed, as well, to reduce erosion and improve streams. They are involved in forest fuel reductions, water supply issues, education and training, invasive plant removal and native riparian planting, watershed-wide timber harvest permits, cumulative effects analysis, temperature and water quality monitoring, reforestation, estuary improvement, and flow monitoring. Additional grant funds are being sought for future watershed work within this progressive group.

An update on recent enforcement actions and administrative civil liability (ACL) settlements. For March 6, 2008 Regional Water Board meeting.

Thomas Dunbar

Order No. R1-2007-0107 was issued on December 10, 2007 to the **Jorge Saldana** ordering submittal of a technical report pursuant to Water Code section 13267, subsection (b). The technical report is required to address erosion control measures on a parcel of land off Armstrong Woods Road north of Guerneville, Sonoma County. Cleanup and Abatement Order No. R1-2008-0011 was issued on January 18, 2008 requiring workplan submittal for erosion control and site restoration.

Administrative Civil Liability Complaint No. R1-2008-0005 was issued on January 9, 2008 to **Kendall-Jackson Winery, Limited** in the amount of $20,000 in penalties for violations of waste discharge requirements at two of the company's wineries. The Hartford Court Winery and Matanzas Creek Winery both experienced unauthorized discharges of winery wastewater into tributaries of the Russian River as a result of storm-related events.

ACL Complaint No. R1-2008-0021 was issued on February 8, 2008 to the **Redwoods Community College District, College of the Redwoods** in the amount of $72,000 in mandatory minimum penalties for violations of waste discharge requirements at the college's wastewater treatment facility. A public hearing is scheduled for April 24, 2008 for Regional Water Board consideration of this matter.

Small Dams Removed from Shasta River to Improve Water Quality Conditions for Salmon *Kathleen Daly*

Thanks to the Shasta Valley Resource Conservation District, the cooperation of local ranchers and grant funding from several agencies, including the State Water Resource Control Board, Department of Fish and Game, US Fish and Wildlife Service, Natural Resource Conservation Service, five small dams are being removed from the Shasta River to improve habitat for salmon and steelhead trout.

The Shasta River drains 795,000 square miles in Siskiyou County, California and flows into the Klamath River near the Oregon border. Watershed elevations range from 2,000 feet at the mouth to 14,200 feet at the top of Mount Shasta (an active volcano) where glaciers provide a constant source of cold, clean water. Melting snow and glaciers percolate down through lava tubes that emerge as numerous large springs that flow into the River. This cool water source once provided very productive habitat for spring chinook, fall chinook, coho salmon and steelhead trout. The Shasta River has long been recognized as the single most important spawning tributary for salmon in the Klamath Basin. Counts of fall chinook returning to the Shasta (even after substantial declines) went as high as 82,000 in 1931. By the early 1990s they had dropped to a little over 500 fish. Spring Run Chinook no longer inhabit the river and coho salmon are listed as endangered under the State and Federal Endangered Species Acts. The decline in fish populations have been attributed to poor water quality and fish migration barriers caused by the dams. Poor water quality conditions include elevated stream temperatures and low dissolved oxygen levels. Salmon need cool, clean, oxygenated water in order to thrive.

The Shasta River is listed as impaired on the 303(d) list of the Federal Clean Water Act due to elevated stream temperatures and low dissolved oxygen levels. The Shasta River TMDL was adopted by the USEPA and became State law on January 26, 2007. The TMDL contains an Action Plan with the following requirements designed to reduce water temperatures and increase dissolved oxygen levels:

- Remove five minor impoundments or dams on the Shasta River.
- Protect streams from cattle grazing to increase shade and riparian vegetation.
- Reduce tail-water return flows that introduce warm nutrient rich water from pastureland.
- Reduce sediment, nutrients and other oxygen consuming materials from cities/towns, roads, etc.
- Increase dedicated cold water to the Shasta River.
- Address poor water quality conditions in Lake Shastina

This past October (2007) two of the five dams were removed from the river. Two more dams are scheduled for removal next year. Once all the dams are removed water quality conditions are expected to improve and salmon will once again be able to freely migrate up the river to spawn and reproduce.

Upper Redwood Creek Watershed Improvement Project *Kathleen Daly*

The total maximum daily load (TMDL) for sediment for the Redwood Creek watershed, approved by the U.S. Environmental Protection Agency in 1998, calls for significant reduction in road-related sediment sources within the watershed in order to achieve existing water quality objectives necessary to protect beneficial uses of the basin, particularly the cold water fishery.

Nonpoint source erosion from over 1,000 miles of logging and ranching roads in the upper Redwood Creek watershed remains the single

largest threat to the water resources and ancient streamside redwoods in Redwood Creek. The waters of the Redwood Creek watershed have a number of beneficial uses, including providing critical habitat for threatened species of salmon and steelhead, numerous recreational opportunities and terrestrial wildlife habitat associated ancient redwood forests along the banks of Redwood Creek.

Roads in the Redwood Creek watershed were primarily constructed to support timber harvesting as areas were entered for first and second cycle logging. Many routes were aligned across steep inner gorge slopes using Humboldt stream crossings and sidecast construction techniques.

The purpose of the Upper Redwood Creek Watershed Improvement Project was to prevent sediment from eroding from sites along the 0-3 Road and entering Redwood Creek and its tributaries; the initial inventory estimated that more than 7,700 cubic yards of sediment had the potential to erode from these sites.

Prior to decommissioning, the 0-3 Road was an abandoned truck road that terminated near the Redwood National and State Parks property boundary. The Road included 14 small to large stream crossings, long segments showing fill slope instabilities and multiple ditch relief culverts.

A single excavator and bulldozer crew treated all sections of the 0-3 Road. Because the road had not been used for some time, the crew first had to open the road in order to reach the treatment sites.

Pacific Watershed Associates supervised treatment of approximately 1.75 miles of road and 27 sites along the 0-3 Road. The McCullough Construction crew spent approximately 20 working days and 223 hours for the excavator, 204 hours for the bulldozer and 425 hours for dump trucks treating and repairing the sites along the road; this does not include the time that was necessary to install road drainage treatments. All decommissioned stream crossings and disturbed areas with potential for sediment delivery were seeded and straw mulched to help prevent surface erosion. The 0-3 Road included extensive unstable fill slopes along many sections, especially adjacent to stream crossings. Identified and treated sites included 6 stream crossings, 8 landslides, and 13 “other” sites.

With the extensive restoration of these 27 specific sites, the threat of sediment delivery to salmon bearing streams in the watershed has been significantly diminished. Although it is difficult to assess the immediate benefits of the erosion prevention project to fish habitat, the lasting benefit of removing over 14,000 cubic yards of material, and preventing the delivery of over 7,700 cubic yards to the Redwood Creek system should help to promote habitat recovery over the next several decades.

Status of Green Diamond’s Watershed-Wide WDR in South Fork Elk *Adona White*

On August 9, 2006, the Regional Water Board adopted watershed-wide waste discharge requirements (WWDRs), Order No. R1-2006-0043, for the Green Diamond Resource Company (GDRCo) land holdings in the South Fork Elk River watershed. This watershed is underlain by bedrock of the undifferentiated Wildcat Group, some of which are prone to landslides, high erosion rates, and production of fine grained sediment. Due to the physical characteristics of the Elk River watershed and the history of timber harvest activities in the watershed, Elk River has become cumulatively impacted by timber harvest-related discharges of sediment.

Based on the record of the cumulative impacts and the scale and intensity of timber harvesting activities in the Elk River watershed, GDRCo’s

timber harvest activities are not eligible for either the *General Waste Discharge Requirements for Discharges Related to Timber Harvest Activities On Non-Federal Lands in the North Coast Region* (GWDRs) (Order No. R1-2004-0030) or the *Categorical Waiver of Waste Discharge Requirements for Discharges Related to Timber Harvest Activities on Non-Federal Lands in the North Coast Region* (Categorical Waiver) (Order No. R1-2004-0016). As such, staff developed watershed-wide WDRs (WWDRs) for GDRCo and Pacific Lumber Company (PL) for timber harvest activities in the watershed.

The GDRCo WWDRs permit timber harvest activities while recognizing the unique watershed conditions and treating sediment sources within GDRCo's 1,900 acre ownership over the 10-year life of the requirements.

GDRCo selected to voluntarily commit to maintaining an annual rate of harvest that is below the rate that would have been allowable under the *Empirical Landslide Model* used on the PL WWDRs. Under the application of the *Empirical Landslide Model* in South Fork Elk, there is no distinction between high and low hazard acreage. At the time of GDRCo's WWDR adoption, a finding was made that there was not enough evidence available to conclude that flood frequency and flood magnitude had significantly increased in the South Fork Elk River watershed. Therefore, the WWDRs do not contain an effluent limitation based on peak flow increases. There was not an evaluation of flooding effects on the Mainstem Elk River.

The WWDRs contain several components, including: 1) harvest on no more than 750 acres (40%) of their South Fork Elk River (SFER) ownership over a 15 year period, ending in 2015; 2) the SFER Management Plan, which was prepared by GDRCo and includes specifications for watercourse protections, provisions for geologic review if an unstable feature is found within a harvest unit, six-year adjacency practice, "shovel logging" on slopes less than 35% and cable yarding on steeper slopes, road surfacing at watercourse crossings and winter restrictions on road usage, depending on surfacing; and 3) a sediment reduction strategy which was designed to contain all the same components as would be specified under a cleanup and abatement order (CAO).

The sediment reduction strategy is based on a fundamental approach which includes inventories, prioritization, and development of master treatment schedules, as well as annual workplans, treatment, and monitoring and reporting. Sediment sources are identified and treated in one of three ways: 1) sites within THP boundaries are identified and treated under erosion control plans (ECPs) within the life of the THP; 2) a complete road inventory was conducted and non-THP sites are scheduled to be treated over the life of the permit; or 3) non-road, non-ECP sites are scheduled for inventory and treatment when operations are occurring in the vicinity. Of great value have been maps depicting the location and schedule of harvest units, road treatment, and non-road/non-ECP sites for each year through the life of the permit. This method ensures that no portions of the watershed are going to be "missed" and sediment sites are left uninventoried and untreated after GDRCo has completed their harvesting under the WWDRs.

Monitoring

Along with the WWDRs, a Monitoring and Reporting Program (Order No. R1-2006-0043) was issued to GDRCo which contains three types of monitoring for different objectives.

First, *Water Quality Trends* monitoring is designed to evaluate if the combination of measures applied to the watershed result in a consistent trajectory to water quality standards. This component involves turbidity, suspended sediment, and streamflow sampling to characterize runoff, sediment loads, and

chronic and acute turbidity. The monitoring is being conducted to produce data comparable to those of other gauges in the watershed. The monitoring station is located at the lower end of the watershed on PL property (GDRCo does not own the mouth of the creek). Regional Water Board staff facilitated the dialogue between the entities to obtain access to this monitoring site. Monthly *Water Quality Trend* monitoring reports are required, and GDRCo has submitted these reports completely and on time, in an accessible format, consistent with the quality assurance project plan and associated standard operating procedures.

Due to the relatively short monitoring period (< 2 full years), staff have not conducted trend analysis of the data for McCloud Creek. However, as part of TMDL development, staff has been able to compare available data from gauging stations in the watershed. Table 1 shows, for available Elk River gauges, the station name, drainage area, 2007 sediment load, and unit sediment load (i.e. sediment load normalized to drainage area). The 2007 unit sediment loads are presented in Figure 1. Note not all Elk River gauging stations are included in these summaries since not all data have been finalized.

Table 1. Suspended sediment data from stations in Elk River. MC-2 data were collected and reported by GDRCo; all other station data were collected and reported by Pacific Lumber Company.

Station Name	Location	Drainage Area (km^2)	2007 Suspended sediment loads (metric tons)	2007 Unit sediment load (metric tons/km^2)
534	Little South Fork Elk River (Headwaters)	3.1	14.5	4.7
522	Corrigan Creek (South Fork)	3.4	241	71.3
519	South Branch North Fork Elk River	5.5	1140	206.1
517	Bridge Creek (North Fork)	5.8	250	43.5
MC-2	McCloud Creek (South Fork)	6	734	122.3
533	Tom Gulch (South Fork)	6.5	3420	526.2
188	South Fork Elk River above THP 1-97-520	15.7	1300	83
183	South Fork Elk River below THP 1-97-520	19	1320	69.6
510	Lower South Fork Elk River	49.4	9710	196.8
511	Lower North Fork Elk River near Scout Camp	57.7	7070	122.6
509	Mainstem Elk River at former USGS gage station	111.6	17630	158

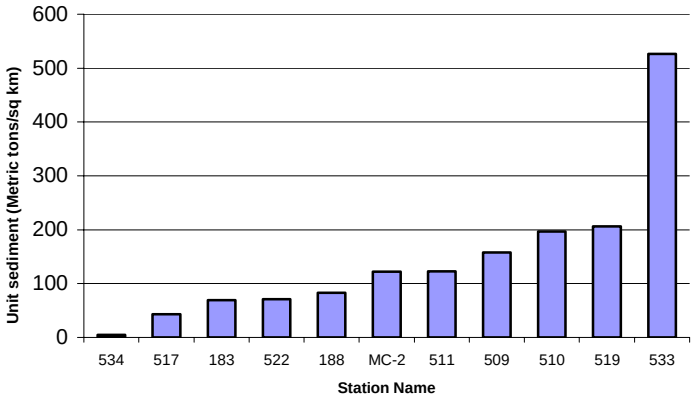

Figure 1. Normalized 2007 suspended sediment loads for stations in Elk River.

The second type of monitoring is *Landslide* monitoring designed to evaluate the landslide pattern and sediment delivery rate, and changes in response to land management. This is to be done at three-year intervals. GDRCo already collects photos on this schedule and the monitoring frequency was designed to optimize resources, as opposed to being triggered by storm events.

Third, the *South Fork Elk River Sediment Reduction Monitoring Plan* requires that sediment treatment sites are monitored to track post-treatment erosional voids and overall

treatment effectiveness. This occurs by comparing post treatment geometry and photos with those same conditions present after the first winter. These data will be incorporated into the TMDL sediment budget.

Road Sites

GDRCo has developed a master treatment schedule and locations for harvesting as well as a schedule for road construction, reconstruction, upgrade, and decommissioning of specific road segments, to be followed during the life of the permit. Generally GDRCo plans to construct and reconstruct a ridge road system and decommission roads lower in the watershed. As such, the initial stages of permit implementation involved significant lengths of road disturbance. During the construction season, Regional Water Board and GDRCo staff inspected the work while it was in progress and visited sites treated the previous year. This approach led to productive discussions about the overall effectiveness of the treatments and necessary modifications in site design and treatment to better control sediment discharges.

Consistently, the suggestions from staff and lessons learned from earlier sites were applied to the new sites. GDRCo sought feedback as the season progressed and promptly implemented staff recommendations into the treatment of new sites.

Figure 2. Stream crossing treated in summer 2007. Note rock armor in channel to minimize scour, logs and matting to minimize bank slumps over the extent of the excavation.

Class III Watercourses

As part of TMDL development for the Elk River watershed, Regional Water Board staff have conducted surveys to characterize the development and headward extension of low order watercourses. In general, subsurface water appears to concentrate following harvest-related disturbance and results in increased runoff, compaction, and intercepted shallow ground water. The results are an elevated density of surface water channels as well as destabilized channels (including bank erosion, sink holes, etc.) and overall increased sediment delivery. During inspections associated with two recent GDRCo THPs in McCloud Creek, staff raised these concerns. The discussions resulted in distinctions between major landform Class IIIs and those altered by skid trails, increased tree retention for interception and root strength, and characterization of pre/post harvest canopy and erosional features. GDRCo staff has shown a willingness and flexibility to collaborate on protections.

Shovel Logging

Tractor-related compaction and blading can result in erosion via the collapse of swales and interception of shallow ground water, effectively increasing surface watercourse

density and erosion and sediment delivery. GDRCo is employing “shovel logging” in South Fork Elk which involves tracked feller-buncher type equipment running on slash and does not involve blading. The overall result is more ground cover, less soil movement, and presumably less compaction than with more tradition tractor operations, as trees are picked up and moved, not dragged along the ground. This is a good step toward minimizing the impact of logging on sediment delivery to watercourses. Staff remains concerned about shovel operations in swales and the potential for hydrologic disruption, is investigating this topic, and will address it, if necessary.

Surface erosion control

The fine grained sediment in the Elk River watershed is easily mobilized when exposed to rainfall and runoff. GDRCo recognizes this condition and in response, has limited vehicular traffic in the winter time and applied surfacing to roads. Unfortunately, GDRCo does not have a nearby rock source and thus the cost of rock application is a major consideration for the company. Newly constructed roads are fully mulched in the first year, effective techniques for controlling surface erosion.

Figure 4. Recent shovel logging adjacent to newly constructed and reconstructed, mulched road surface. Note the extensive ground cover on the recent cut areas.

WWDR and the Elk River TMDL

At the time of WWDR development, it was envisioned that this first WWDR would be a near-term permitting mechanism to allow harvesting while the Elk River TMDL is under development. Staff anticipates the TMDL will continue to rely on a WWDR for permitting, with modifications to ensure consistency with the load allocations, as well as with the implementation and monitoring plans. The primary anticipated modifications for sediment control are the use of landslide hazard maps, class III watercourse protections, and surface erosion controls.

Recommendations for Future WWDRs

WWDRs appear to be a very effective and practical mechanism to permit timber harvest operations while working toward watershed restoration. Based on our experiences, the following recommendations are offered as considerations in the development of future watershed-wide WDRs.

Figure 4. Flooding of home on Mainstem Elk River on January 31, 2008.