

**A Section of the C-20 Road & Rock Quarry
Watershed Rehabilitation Project Summary Report**

Unit 88-10

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INTRODUCTION

Watershed rehabilitation Unit 88-10 consisted of the rehabilitation of 2240 feet of the C-20 Road and restoration of an abandoned rock quarry located along that same reach of the C-20.

The purpose of the project was to minimize erosion, realign water flow courses, enhance revegetation processes and improve hillslope aesthetics on areas which were impacted by previous timber harvesting activities.

The project work consisted of export outsliping the road through areas where the C-20 Road alignment crossed small flow courses and outsliping the remaining reaches of the road. The work also included filling-in and recontouring an abandoned rock quarry. Total cost to do all phases of the work was \$16,834.88.

The C-20 Road is visible from the C-line road which is the shuttle bus route for visitors into the park and to the Tall Trees Grove. This proximity of the C-20 Road to the public affords a demonstration of the watershed rehabilitation program at Redwood National Park.

SITE DESCRIPTION

LOCATION

The rehabilitation unit, 88-10, is located 5 miles south east of Orick, California in Redwood National Park (Figure 1). It is located in section 19, T10N, R2E, Humboldt Base line and Meridian on Bald Hills 7 1/2 minute topographic series map. The section of the C-20 Road which was treated in unit 88-10 traverses the hillslope on the east side of Redwood Creek in the Miller Creek drainage basin at elevations ranging from 1200 feet to 1280 feet.

LOGGING HISTORY

The hillslopes surrounding the C-20 Road reach which was treated in 1988 (Unit 88-10) were logged by tractor yarding methods in 1971 through 1973. Road construction began in 1973 (including the reach within unit 88-10) with the entire road completed probably in 1974.

SOILS

Described in Popenoe, 1982.

GEOMORPHOLOGY / GEOLOGY

Refer to Utley, et. al., 1983 (Unit 82-2).

EROSION PROCESSES

Most wonderfully discussed in Utley, et.al., 1983 (Unit 82-2).

EROSION CONTROL WORK

The erosion control work is divided into four phases which are, evaluation, heavy equipment, labor intensive and documentation. Time and costs associated with each phase are summarized and shown in Table 1. The total cost to do all

FIGURE 1:

MAP A:
C-20 ROAD
REDWOOD NATIONAL PARK
WATERSHED REHABILITATION SITE
88-10

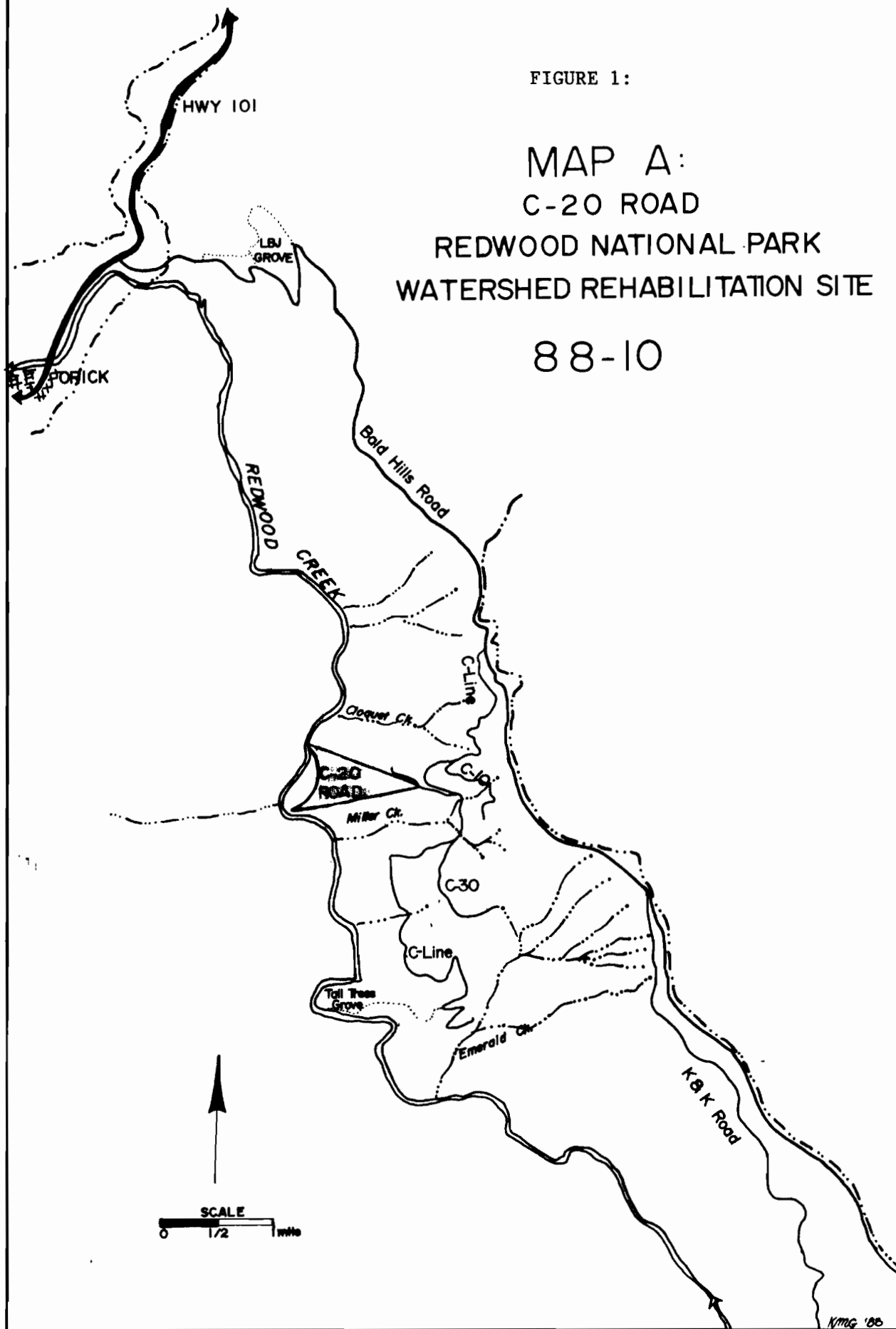


Table 1
Portion of C-20 Road and Rock Quarry
Rehab Unit 88-10

Rehabilitation Work Cost Summary

	TOTAL COST	PERCENT OF TOTAL PROJECT COST (%)
<u>HEAVY EQUIPMENT</u>		
Primary Treatments From Table 2	\$ 7,674.33	45.6
Secondary Treatments From Table 2	317.24	1.9
Other Miscellaneous Costs From Table 5	3,669.77	21.8
Total Heavy Equipment Cost	\$11,661.34	69.3
<u>LABOR INTENSIVE WORK</u>		
Total Labor Intensive Cost From Table 6	3,315.44	19.7
Total Labor Intensive Work Cost	\$ 3,315.44	19.7
<u>TECHNICAL WORK</u>		
Evaluation	158.10	0.9
Supervision	1,200.60	7.1
Documentation	500.00	3.0
Total Technical Work Cost	\$ 1,858.10	11.0
TOTAL PROJECT COST	\$16,834.88	100.0

phases of the erosion control work was \$15,936.63.

EVALUATION PHASE

The evaluation phase for unit 88-10 was predominantly accomplished within the evaluation phase of rehabilitation Unit 82-2 and included air photo analysis and field mapping of the geomorphology and hydrology. Discussions and peer reviews were performed prior to the heavy equipment work of Unit 82-2 in anticipation of completing the entire C-20 Road during the 1982 rehabilitation season.

The 1988 evaluation phase began September, 1988 with the gift of unexpected year end money from other divisions in Redwood National Park. The work consisted of review of geomorphologic maps prepared in 1982 and budgeting and scheduling of heavy equipment.

The total cost for the evaluation phase in 1988 is \$158.10. This cost is very low in comparison with the cost of the evaluation phase for other rehabilitation projects in Redwood National Park. This is due to the funds being made available during the last few weeks of the fiscal year, and the need to mobilize equipment very rapidly.

HEAVY EQUIPMENT PHASE

The Heavy equipment phase of Unit 88-10 began September 26, 1988 and was completed September 30, 1988. The work consisted of rehabilitating 2240 linear feet (0.42 miles) of haul road, and the filling-in and recontouring of a rock quarry (approx. 1 acre).

Total heavy equipment costs for the site were \$11,661.34 (Table 2). Export outsliping (blade endhaunched) was prescribed for 340 linear feet of road and 1900 linear feet of road was outsliped. An abandoned rock quarry was filled in with available fill from the export outslope reaches and recontoured. Prescription volumes were not surveyed due to the short start up time, therefore excavation rates and equipment costs per hour could not be calculated. Rehabilitation prescriptions are shown in Figure 2.

The heavy equipment work was done under hourly heavy equipment rental agreements. Two pieces of equipment were used on the site and included a Caterpillar D8H with ripper teeth and "U" blade rented from Twin Parks Lumber Company (\$94.47/hr) and operated by Bill Campbell, and a Case 220 Hydraulic Excavator with a 2 3/4 cu. yd. bucket rented from and operated by Wendell Larkin (\$120.00/hr).

Both pieces of heavy equipment were working in Redwood National Park on rehabilitation Unit 88-9 immediately prior to starting up at unit 88-10. Low boy costs were minimized by using the same two pieces of equipment and operators on sites 88-8, 88-9 and 88-10.

Exported Outsliping

Exported outsliping (blade endhaul) for the C-20 Road cost \$3,383.02 for 340 linear feet of treated road. The cost breakdown is shown in Table 3. All exported fill was blade endhaunched to nearby stable reaches of the road and to the rock pit. Export outsliping was prescribed in reaches of the road which were coincident with seeps and springs immediately upslope and in swales. The exportation of the road fill allows for the free discharge of the seeps and springs across the previous road alignment. Road fill was excavated down to as

REHABILITATION UNIT 88-10

A PORTION OF THE C-20 ROAD & ROCK PIT

PRESCRIPTION MAP

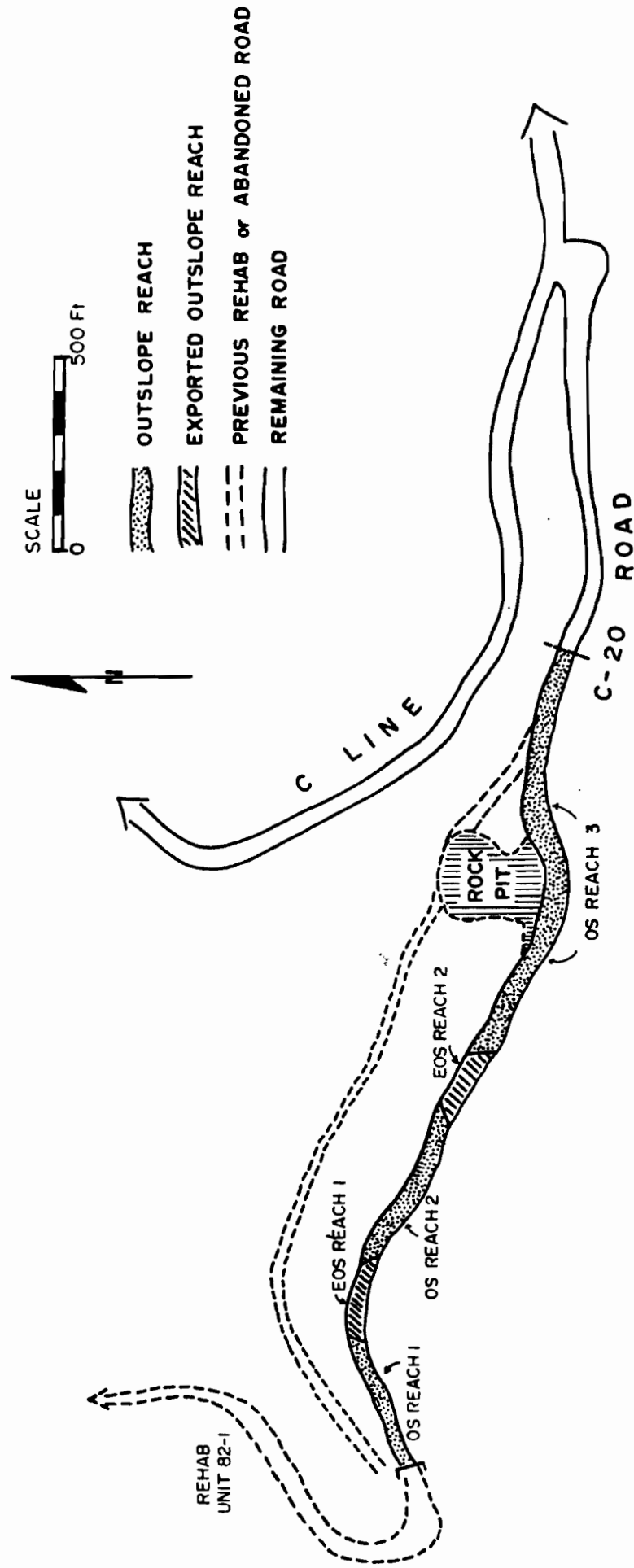


Figure 2: Prescription map for unit 88-10

Table 2
 Rehab Unit 88-10
 Portion of C-20 Road and Rock Quarry
 Heavy Equipment Work Cost Summary

Treatment	Worksite Quantity	Total Cost \$	Average Cost Per Worksite Quantity
<u>PRIMARY TREATMENTS</u>			
Exported Outslope	340 LF ¹	3,383.02	\$ 9.95/LF
Outslope	1900 LF	3,700.87	\$ 1.95/LF
Rock Quarry	1 acre	590.44	590.44/acre
Total Primary Treatments		\$ 7,674.33	
<u>SECONDARY TREATMENTS</u>			
Mulch distribution		317.24	
<u>OTHER MISCELLANEOUS COSTS</u>			
From Table 5		3,669.77	
TOTAL HEAVY EQUIPMENT COST		\$ 11,661.34	

¹LF = Linear Feet

Table 3
Rehab Unit 88-10
Portion of C-20 Road and Rock Quarry

Exported (Blade Endhauling) Outsloping Costs Summary

Reach #	Linear Feet of Road	Total Cost \$	Unit Cost \$/LF ¹	Equipment Hours	
				D8H	220
1	120	849.59	7.08	5.50	2.75
2	220	2,533.43	11.52	14.75	9.50
AVERAGE OR TOTAL	340	3,383.02	9.95	20.25	12.25

¹ LF = Linear Feet of Road.

Notes:

1. Push distances up to 600 ft and up 8% road gradients.
2. Volumes were not surveyed due to lack of time.

Table 4
Outsloping Costs Summary

Reach #	Linear Feet of Road	Total Cost \$	Unit Cost \$/LF ¹	Equipment Hours	
				D8H	220
1	440	289.79	0.66	2.75	0.25
2	410	673.41	1.64	3.00	3.25
3	1050	2,737.67	2.61	6.75	17.50
AVERAGE OR TOTAL	1900	\$3,700.87	1.95	12.50	21.00

¹ LF = Linear Feet of road

Notes:

Volumes were not surveyed due to lack of time.

near as possible to original ground to inhibit the potential for gullying and to expose any remaining top soil buried during road construction. Push distances of the fill were long (up to 600 feet) and up 8% road slopes. Volumes were not surveyed due to the rapid start up time, therefore, excavation rates cannot be determined.

Outsloping

Outsloping cost \$3,700.87 and accounts for treatment of 1900 linear feet of road. The costs are summarized and shown in Table 4. Outsloping was prescribed along reaches of the C-20 Road which had persistantly dry, stable inboard edges and cut banks.

The outboard edge fillslope of the C-20 Road supported a dense stand of Douglas fir and ceanothus which required a significant amount of excavator time to remove.

Rock Quarry Recontouring

A rock quarry immediately adjacent to the C-20 road was filled in and recontoured for a total cost of \$590.44.

Straw Distribution

Both pieces of heavy equipment distributed straw on the hillslopes above the prescription areas. The straw had been placed along the inboard edge of the road by the labor crews with the understanding that the heavy equipment could best place it on the hillslope. Total cost for the equipment to distribute the straw was \$317.24.

Miscellaneous Costs

Miscellaneous costs created by the heavy equipment are summarized in Table 5 and total \$3,866.27. Miscellaneous costs are the costs paid to the heavy equipment which are not accountable to actual erosion control worksites, but which are part of the overall job.

LABOR INTENSIVE PHASE

The labor intensive phase included the delivery and spreading of straw mulch on completed work sites by Redwood National Park Labor Crews and Redwoods United Incorporated labor crews. The labor intensive work is summarized in Table 6 and totals \$3,315.44. Straw mulch delivery and spreading continued intermittantly along with heavy equipment as treatments were completed.

Mulch was spread at approximately 6000lbs./acre on the recontoured rock quarry and on the outslope and export outslope reaches.

DOCUMENTATION PHASE

The documentation phase was completed by D. Short and T. Spreiter in December, 1988. This phase of Unit 88-10 cost \$500.00.

Table 5
Rehab Unit 88-10
Portion of the C-20 Road and Rock Pit

Other Miscellaneous Heavy Equipment Rehabilitation Costs Summary

Task	Task Cost \$	Equipment Hours	
		hr	
		D8H	220
Access	\$ 90.00	--	3.25
SB ^W /Operator	939.58	5.50	3.25
Breaks	529.79	2.75	2.25
Discussion	626.18	2.50	3.25
Rip/Brush	431.50	4.25	0.25
Down Time Paid	154.47	1.00	0.50
Move in/out	\$ 898.25	\$671.25	\$227.00
TOTAL	\$3,669.77		

Table 6
Rehab Unit 88-10
Portion of C-20 Road and Rock Quarry

Straw Mulch Summary of Costs

	Number of Bales	RNP ¹		RUI ²		TOTAL COST \$	Cost Per Bale \$
		Person Hours	Cost \$	Person Hours	Cost \$		
Materials	320	--	--	--	--	1,001.60	3.13
Distribution	320	30	344.10	50	341.30	685.40	2.14
Spreading	320	114	1,628.44	--	--	1,628.44	5.09
TOTAL	320	144	\$1,972.54	50	\$341.30	\$ 3,315.44	\$10.36

¹RNP: Redwood National Park, Resource Management labor crew

²RUI: Redwood United Incorporated labor crew

DISCUSSION

Rehabilitation project unit 88-10 worked out very well as a year-end extra money project. The prescriptions had been previously assigned and were straight forward allowing for quick review and start up. The D8H caterpillar and the Case 220 excavator worked very well together for the most part, and all of this combined made for a very efficient project. One area that was an exception to this efficiency was the filling-in of the rock quarry. The D8H had long push distances into the middle of the quarry and was pushing up approximately 8 to 10% slopes. This caused a slow down as the excavator was often idle while waiting for the cat to push and reshape excavated fill. It would have been beneficial to have a second D8H or a D7 to assist with filling in and recontouring the rock pit during the last two days of the project. However, cost effectiveness of bringing in a second dozer would have possibly been offset by the increase in costs due to additional lowboy expenses.

REFERENCES

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