

SUMMARY OF EROSION CONTROL WORK
UNIT 83-5
W-LINE/K & K SLOPE

Redwood National Park
Orick, California

By
Louise Johnson

November 1983

UNIT 83-5: W-LINE/K&K SLOPE

TABLE OF CONTENTS

	<u>Page (Rough Draft)</u>
INTRODUCTION	1
Road Network	1
Land Use History	2
Details of Timber Harvest Activities	2
EROSION FEATURES	4
History of Erosion Features	4
Sediment Sources	5
EROSION-CONTROL REHABILITATION WORK	6
Introduction	6
Procedures	6
Objectives	6
Cost Summary	7
Heavy Equipment Phase	7
Heavy Equipment Application	7
Heavy Equipment Sequencing	8
Heavy Equipment Costs	9
Haul Road & Skid Trail Crossing Excavation Costs	9
Road Treatments	11
Landings	11
Landslides	11
Miscellaneous Heavy Equipment Costs	12
Overall Heavy Equipment Evaluation	12
Labor Intensive Phase	14
Labor Intensive Application	14
Labor Intensive Costs	14
Evaluation of the Labor Intensive Application	14

REDWOOD N. P.
LIBRARY
South Operations Center

W-Line traverses one mile through Elk Camp Prairie, then .6 mile through a 10-year old clearcut unit to the W-Line Rock Pit (which was rehabilitated in 1982). The overall gradient is three percent, ranging in elevation from 2,100 feet to 1,680 feet. The road was heavily rocked with an inboard ditch and culverts with trash racks. Rehabilitation work included total outslope of a fill failure at the W-Line Rock Pit, and removal of the adjacent haul road stream crossing (Rx-8). The remaining portion of W-Line to Bald Hills Road was rehabilitated in September, 1983 (Unit 83-7).

Land Use History

Construction of the Klamath-Korbel (K & K) Road in the late 1950's initiated commercial logging in the Emerald Creek basin, and on much of the east side of Redwood Creek (Map B). During the 1960's, three small areas in the unit were cut, each less than 40 acres. These tractor-yarded cutblocks are high on the slope, where drainages are small and few crossings were constructed. Little erosion potential exists in these areas.

Timber harvest activity was greatly accelerated in the early 1970's. Between 1970 and 1973, 177 acres were logged within the unit. The largest cutblock was 92 acres in 1971. Tractors were used to yard timber on 100 percent of this acreage. Numerous skid trail crossings were constructed with slight to moderately-high erosion potentials.

Details of Timber Harvest Activity

In 1962, the K & K had been built and adjacent logging activities had begun. Timber harvest had occurred on 73 acres, which included the strip of land between the Bald Hills Road and the K & K, and a block below the K & K adjacent to Dolason Prairie. All logging was high on the slope where drainages are small; only four crossings were constructed. A few trees were left; timber was yarded by tractors. By 1966, another 46

acres below the K & K and adjacent to Elk Camp Prairie had been select-cut. This was tractor yarded, with random skid trails crossing three streams, and leading to the Anchor-Decks (a spur road off the K & K).

By 1970, 85 acres below the K & K were clearcut, known as the Z-Deck area. Logs were removed by long-line tractor yarding methods. Fifteen stream crossings were constructed on well-incised channels. The fill volume present in streams is 6,125 cubic yards, of which 13 crossings totaling 6,025 cubic yards were removed. Only two very small and stable crossings were left on the slope.

The largest timber harvesting within the unit occurred by June 1973, 92 acres above what would become W-Line in 1977. Skid trail patterns are random, and most stream crossings that were constructed were adjacent to to or later became incorporated into W-Line. These were removed during the 1982 and 1983 rehabilitation units 82-1 and 83-7.

The last timber harvest occurred late in 1977, when the 46 acre select-cut below the K & K and adjacent to Elk Camp Prairie was re-entered and clearcut. Yarding was done by tractors, but no new crossings were built. Following timber harvest all skid trails were waterbarred. Virtually all soil was removed from the skid trails during their construction, resulting in minimal regrowth and minor rill erosion.

EROSION FEATURES

History of Erosion Features

Erosion features within this unit consisted of one mass movement (fill failure), numerous partially eroded and intact skid trail crossings, diversion gullies caused by skid trail crossings, and numerous small rills and gullies on skid trails (Map C). A much larger volume of material resulting from logging exists on the unit as potentially erodible, rather than sediment that has already moved into the fluvial system as a result of logging.

At the time of the 1964 storms, only the uppermost headwaters of the unit had been selectively logged, and no visible erosion occurred. By the 1972 storms, two-thirds of the unit had been clearcut. The anchor deck and Z-deck haul roads had been built, but did not cross any streams. Surface erosion accelerated on most of the skid trails and stream crossings. Approximately five crossings failed, ^{resulting in flow eroding} ~~causing flow to erode across~~ the fill prism, and on three crossings, ^{diversion} gullies formed with approximately 200 cubic yards eroding (Sx-8B, 8C, 10E).

The 1975 storm had the potential to do the greatest damage. The entire unit had now been logged, 60 percent within the preceding five years. This storm caused most of the erosion on the unit that existed prior to rehabilitation. Most of the erosion consisted of increased surface flow erosion, and accelerated decay and collapse of at least two stream crossings (Sx-10F, H), totaling 125 cubic yards. Total eroded volume at stream crossings alone up to this time was approximately 500 cubic yards.

By 1983, only one skid trail stream crossing suffered any significant erosion (Sx-10F) since mapping was completed in 1982, totaling approximately 30 cubic yards.

Most of the potentially erodible volume on the unit would have eroded over a long period of time. Only three crossings (Sx-10A/B, 10F, 10H) had high erosion potentials, with a possibility to release their sediment quickly, the rest were temporarily stable with low to medium erosion potentials.

Sediment Sources

The sediment sources with the potential for introducing material to the fluvial system were judged to be the W-Line fill failure (82-1, R-⁵), and possible diversions and eventual collapse and decay of the skid trail crossings on the slope between the K & K and W-Line. All fifteen were humboldt crossings in various stages of decay, with minimal vegetative regrowth. Their average fill volume was 425 cubic yards, fairly large for skid trail crossings, and stabilization was not increasing ~~through time~~. ~~Thus, through time~~ these crossings would continue to destabilize, and eventually collapse and erode.

The W-Line rock pit fill failure occurred during December 1982, and changed minimally during the rest of the winter. Probable causes ^{was} ~~were~~ concentrated surface flow from several springs in the rock pit, ~~thus~~ saturating the road fill. Once this became mobilized, the lower right portion of the slump failed into channel 8 (between 83-5 Rx-8 and 82-1 Sx-5A), causing lateral sidebank failures on the right bank of Sx-5A. The failure contributed approximately 90 cubic yards of sediment into the stream, possibly 10 cubic yards was transported downstream. If higher flows had occurred, more of this sediment could have been transported. Three scarps developed across the failure, ^{at} ~~at~~ road level, mid-slope, and at the toe, with no more than four feet of vertical displacement. During excavation a spring was uncovered approximately five feet below the road prism by the redwood sprouts, also a buried (but still flowing) culvert. All contributing factors to the failure.

EROSION-CONTROL REHABILITATION WORK

Introduction

* Procedures

There are four phases of rehabilitation work: evaluation, heavy equipment, labor intensive, and documentation. Evaluation of the site consists of inventorying erosional problems and sediment sources, and prescribing treatment where necessary. In the latter part of the phase, costs are estimated and heavy equipment procured. Just prior to equipment work, photo points are established and worksites surveyed. On the W-Line/ K & K Slope Unit, the mapping ~~part of this~~ phase occurred during the winter and spring of 1982. The prescribing, surveys and photo points were completed in June 1983. And the heavy equipment and labor intensive phase occurred during June and August of 1983, respectively.

* Objectives

Logging has greatly accelerated erosion on the slopes of the Redwood Creek basin. The objectives of the project are to minimize erosion on the unit, particularly that occurring in or adjacent to stream channels, and to restore the area as much as possible to its pre-logging condition. This is achieved by removing active and potential sediment sources from the streamside environment, returning drainage networks to their original configuration, and removing roads and their scars.

All skid trail stream crossings with moderate to high erosion potentials were removed. The W-Line rock pit fill failure was totally outsloped, and since the material was push-hauled to the ridge between channel 8 and 9, W-Line crossing on channel 8 was excavated in the process. Many of the skid trails are still void of vegetation 10-15 years after logging, therefore 1.3 miles were ripped to improve infiltration and hopefully revegetation. Along with ripping, many of these skid trails were water-barred to disperse 200-700 feet of concentrated spring and surface flow.

* Cost Summary

Table 1 shows the overall cost summary of erosion-control work on the W-Line/K & K Unit. The grand total of the project was \$26,968.40. Of this, 8 percent was spent on the evaluation and documentation phases and 92 percent on the actual implementation of erosion-control work (88 percent on the heavy equipment and 4 percent on labor-intensive work). Table 5 summarizes the erosion-control work completed. Map D shows all worksite locations.

Heavy Equipment Phase

* Heavy Equipment Application

The heavy equipment phase on the W-Line/K & K Unit was completed by an excavator and one bulldozer (Table 3). The excavator was a John Deere 690B with a 3/4 yd bucket and bucket clamp (owned and operated by Larry Lambert). The bulldozer was a Caterpillar D-7E with a winch, and a four-way hydraulic tilt blade and an interchangeable brush ^{rake} ~~rake~~ blade (owned and operated by Wendell Larkin).

The D-7 bulldozer with the brush rake attached was used for ripping both haul roads and skid trails. Otherwise, the D-7 bulldozer worked with the excavator as a team. On the two largest skid trail stream crossings (800-1400 cubic yards), the bulldozer worked ahead of the excavator dishing down 1/3 to 2/3 of the total crossing volume. Several other crossings were approached in this manner, though less fill was removed prior to the excavators arrival.

The excavator was used entirely for stream crossing excavations and the W-Line fill failure excavation in tandem with the bulldozer. Though, on 5 of the 15 skid trail stream crossings, ranging in volume from 43-124 cubic yards, the excavator completed these excavations solo. On the remaining

stream crossings, the bulldozer would first dish down the fill on the outboard edge of the road to a depth at which the excavator could reach the bottom of the channel. At this point the excavator would work the entire lower half of the crossing, placing fill on the upper road where the bulldozer pushed the fill out and cut this portion of the fill down with each push. Once the lower section was completed, the excavator would move to the upper road and finish the excavation, while the bulldozer pushed fill away on either side-bank.

The excavator and bulldozer were used to push-haul the W-Line fill failure. Three terraced roads were constructed along the failure slope, with the excavator starting at the bottom, and the bulldozer pushing fill out on the next level. The entire fill volume was push-hauled 300-500 feet to the ^{ridge on} W-Line ~~ridge~~ between chanel 8 and 9.

The only worksite outsloped on the unit was Z-deck, and the bulldozer did 66 percent of the outsloping, with the excavator pulling the berm around the 300-foot edge of the deck.

* Heavy Equipment Sequencing

Sequencing worksites was difficult, especially dealing with skid trail crossings and access to and from with an excavator (Table 4). All slope work was completed around Z-deck and anchor deck first, then the equipment traveled down (via skid trails above the rock pit) to W-Line where Rx-8 and the fill fⁱlure were completed. The bulldozer ~~did start~~ ^{started} three days ahead of the excavator, in order to rip all roads and dish down the largest skid trail stream crossings on the slope.

* Heavy Equipment Costs

Table 5 shows the total and average costs of heavy equipment treatments on Rehabilitation Unit 83-5. Primary treatments involve removal of actual and potential sediment sources from streams, and removing fill from active fill failures. Skid trail surfaces were also treated to reduce and disperse concentrated surface flow. One landing was treated by removing fill from around the edge and outslipping the surface so that water no longer ponded and to establish vegetative cover (definitely^{an} aesthetic treatment due to its visibility across the basin and for miles around).

There were no secondary heavy equipment treatments on the unit.

Miscellaneous costs include standby pay for a full 10-hour rain delay, site discussions, and travel time (which is broken out and included in site costs in Table 8).

Table 5 does not include total lowboy move-in/out expenses. Move-in charges were \$472.50. Both pieces of equipment were lowboyed to other rehabilitation units on the west side of the basin after unit 83-5 was completed. Therefore, these transport costs were billed to 83-2 and 83-3 (\$292.50 billed to 83-2).

The costs shown on this table agree and balance with costs billed to Unit 83-5. They represent the true times and costs of all work done on the site.

* Haul Road and Skid Trail Crossing Excavation Costs (Table 6)

Haul road and skid trail crossings on Unit 83-5 had an overall average cost of \$2.13 per cubic yard. The sixteen crossings ranged from \$.79 to \$3.96 per cubic yard, with 12 out of the 16 crossings ranging from \$1.39 to \$2.69 per cubic yard. The average rate of excavation was 36 cubic yards per hour.

Extra small (1-100 yd³) and large-sized (800-2000 yd³) crossings had the lowest average cost, \$1.74 and \$1.76 per cubic yard respectively. The rates were also the highest at 43 yd³/hr for extra-small crossings and 44 yd³/hr for the large crossings. The excavation techniques for both size categories is the reason for the lower unit costs. The extra-small crossings were done only using the excavator. And the large crossings were dished down with the bulldozer (removing up to 75 percent of the total fill volume), requiring minimal excavator time to finish the excavation. Small crossings (100-400 cubic yards) averaged \$1.86 per cubic yard, still under the overall average unit cost.

Medium crossings (400-800 cubic yards) were the most expensive, at \$2.59 per cubic yard. The cost for these crossings could have been reduced significantly if the percent of bulldozer to excavator time was changed, so the bulldozer spends over 50-60 percent on the crossing. On Sx-10F an extremely large rootwad (D-7 sized) was uncovered in the middle of the stream channel during excavation. To remove the stump required six hours of equipment time costing \$460.50. Another crossing, Rx-8, had a push-haul distance of 200-300 feet, raising the unit cost to \$2.54 per cubic yard. Stream crossing, Sx-10H, was done partially in the rain, which reduced the efficiency of the equipment, and significantly raised the unit cost to \$3.13 per cubic yard.

All sixteen crossings were left unprotected. Only minimal natural rock was uncovered in the excavations, and some smaller organics were left in most of the channels.

* Road Treatments

Road treatments consisted of ripping 1.3 miles of skid trails and .3 mile of haul roads. Total cost of ripping with the bulldozer brush rake was \$588.75, this also included three decks with a total area of 2.15 acres (Table 12).

Eighteen waterbars were constructed by the bulldozer on 1,500 feet of skid trails and secondary haul roads. The total cost was \$136.50, with a unit cost of \$7.58 per waterbar.

No roads were outsloped, only fill outsloping occurred adjacent to the stream crossings.

* Landings (Decks)

One deck was outsloped on Unit 83-5 (Table 9). This was Z-deck located on the sloped logged in 1971. Approximately 1,350 cubic yards was outsloped, at a cost of \$1,526.75, with a unit cost of \$1.13 per cubic yard (or \$5.23 per linear foot). The bulldozer spent 66 percent of the time cutting down 5-8 feet along the outboard edge of the deck and outsloping the material up against the cutbank. Then the excavator pulled up the berm left by the bulldozer and then the bulldozer finished shaping the fill.

* Landslides (Fill Failure)

One active landslide was treated on Unit 83-5 (Table 10). This was the W-Line rock pit fill failure that occurred in December 1982 (on 82-1, R-~~A~~^E). The road prism had slumped up to 4 feet, involving 90 feet of road length. The failure extended down the slope for 150 feet, introducing sediment into drainage no. 8, between Rx-8 (83-5) and Sx-5A (82-1). The remaining perched fill was removed exposing original ground. The excavation volume totaled 1,086 cubic yards, for a total cost of \$3,377.00. Both the excavator and bulldozer worked an equal amount of time, with the dozer having to push the fill 300-500 feet away. The unit cost was \$3.11 per cubic yard, with an excavation rate of 25 cubic yards per hour.

* Miscellaneous Heavy Equipment Costs (Table 11)

Miscellaneous heavy equipment costs totaled \$1,937.125. Travel expenses made up 50 percent of this total, with a portion of this being added as additional costs to Table 8. There was one full 10-hour day of standby for both pieces of equipment due to rain, this totaled \$887.50. The balance of the miscellaneous expenses was site introduction discussion, and changing the bulldozer brush rake to straight blade, this totaled \$78.50.

* Overall Heavy Equipment Evaluation

The combination of the John Deere 690B excavator and the Caterpillar D-7 bulldozer proved to be the most cost effective combo on skid trail stream crossings with less than 1,500 cubic yards in volume. These two pieces of equipment compliment each other in size based on their digging and pushing rates. There never seemed to be a time when either was sitting idle while the other was working.

On stream crossings less than 150 cubic yards in size, the excavator working solo is the most cost efficient approach. Basically, all the fill removed can be placed on either side of the stream crossing against the cutbanks, but far enough away from the channel if a sidebank failure occurs. Using an excavator instead of a bulldozer allows you to define a channel bottom with more accuracy. And if woody debris is encountered during the excavation, an excavator with a bucket clamp can remove it more quickly than setting chokers and winching with a bulldozer. Also on crossings of this size, there will probably not be anything larger than the excavator can remove by itself. Combining units 83-5 and 83-2, 30 skid trail crossings were excavated by the excavator only, with an average unit cost of \$1.26 per cubic yard. The overall excavation ^{rate was higher than the other excavation methods} methods, at 59 cubic yards per hour.

(The 13 crossings done by the excavator and bulldozer combo, the rate was only 36 cubic yards/hour).

On the large stream crossings (800-2000 cubic yards) done this year, up to 75 percent of the fill volume was removed by the bulldozer prior to the excavator starting on the crossing. This is a good cost effective technique with an average unit cost of \$1.76 per cubic yard. The excavation rate was 44 cubic yards per hour. This rate could be increased with the use of a larger bulldozer.

On the medium-sized crossings (400-800 cubic yards) the average cost per yard of \$2.45 could have been reduced considerably if the bulldozer had spent more time dishing down the crossing, removing 50 percent or more of the fill volume. The excavation rate was only 32 cubic yards per hour, but this should be around 50-70 cubic yards per hour by increasing the preparation time by the bulldozer.

Looking back over the last four rehabilitation seasons (80-5, 82-1, and 83-2/5), the excavation rates and cost efficiencies have increased substantially for skid trail stream crossing excavations. For excavations completed by an excavator only, the rates have increased from 15 cubic yards per hour (1980) to 59 cubic yards per hour (1983). This is based on 34 crossings, and the excavator and operator were the same each year. Though in 1983 the excavator had a bucket clamp attached, it is unsure how much if any this increased the efficiency rate.

For combination (excavator and bulldozer) crossing excavations, the overall rates have also increased from 20 cubic yards per hour (1980) to 36 cubic yards per hour (1983). One reason is the bulldozer has increased in size each year, from a D-4/5 size (1980) to a D-7 and D-8 in 1983. Also the percent of excavator to bulldozer time has changed. In 1980, the excavator spent 60 percent versus 40 percent for the bulldozer per crossing excavation. In 1983, this changed slightly to 54 percent excavator and 46 percent for the bulldozer. This data is based on 29 skid trail stream crossings completed since 1980.

The W-Line rock pit failure could have been push-hauled more efficiently by using a D-8 sized bulldozer. The D-7 bulldozer was a little small to be pushing fill 500 feet away. It would have been better to have completed this worksite along with Rx-8 under unit 83-7, since there was a D-8 in use on the unit. But not knowing that the money would come through for Unit 83-7 by the end of the rehabilitation season, it was decided to pull the failure in conjunction with the slope work.

In summary, I feel the heavy equipment work proceeded very efficiently. Both equipment operators were experienced, skilled and very motivated which increased the efficiency of the work completed. The techniques used seemed best suited for the areas that were rehabilitated on this unit.

Labor Intensive Phase

* Application and Costs

Labor intensive work was completed by Redwood National Park laborers and a Youth Conservation Corp (YCC) crew. The only labor intensive treatment on Unit 83-5 was the distribution and application of straw mulch, for a total cost of \$745.65 (Table 13). Only two areas received straw mulch on Unit 83-5. Fifty bales on W-Line worksites, and 100 bales on the Z-deck and nearby stream crossings. The purchase and transport cost was \$461.25 for 150 bales. The total overall cost was \$8.05 per straw bale.

* Evaluation

The minimal labor intensive work completed on Unit 83-5 went very smoothly and required no supervision from the project supervisor. Though, unfortunately, I feel we did not receive as much work from the YCC crews as we could have due to their 8-hour work day, in which 3-4 hours was spent traveling from Arcata or Crescent City to the rehabilitation sites. Hopefully, this will change next year!

Unit 83-5: W-LINE/K&K SLOPE

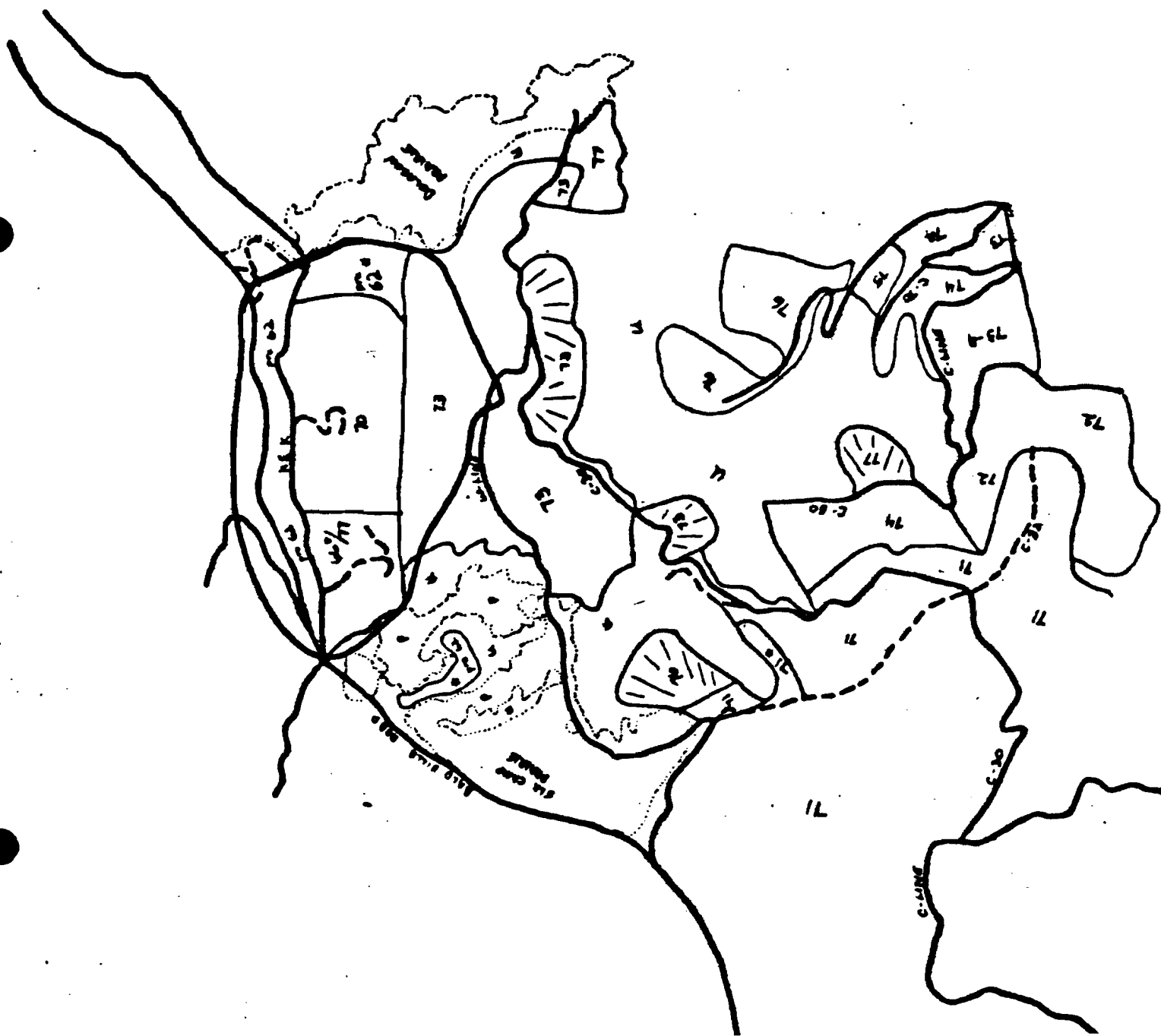
MAPS & TABLES

	<u>Page</u>
Map A - Site 83-5 W-Line/K & K SLOPE	15
Map B - Logging History	16
Map C - Erosion Features	17
Map D - Worksite Locations	17
Table 1. Summary Cost of Erosion-Control Rehabilitation Work	19
Table 2. Rehabilitation Work Summary	20
Table 3. Heavy Equipment Used	21
Table 4. Heavy Equipment Sequencing	22
Table 5. Summary of Average Costs of Heavy Equipment Treatments	23
Table 6. Average Haul Road & Skid Trail Excavation Costs	24
Table 7. Haul Road Crossing Excavation Costs	25
Table 8. Skid Trail Crossing Excavation Costs	26
Table 9. Landing Treatment Costs	29
Table 10. Landslide Treatment Costs	29
Table 11. Miscellaneous Site Costs	29
Table 12. Road Treatment Costs	30
Table 13. Labor Intensive Costs	31
Table 14. Skid Trail Crossing Ages and Drainage Areas	32
Table 15. Survey Data: Post Heavy Equipment Work	33
Table 16. Photo Point Descriptions w/Map.	34

Scale 1:22212

LEGEND

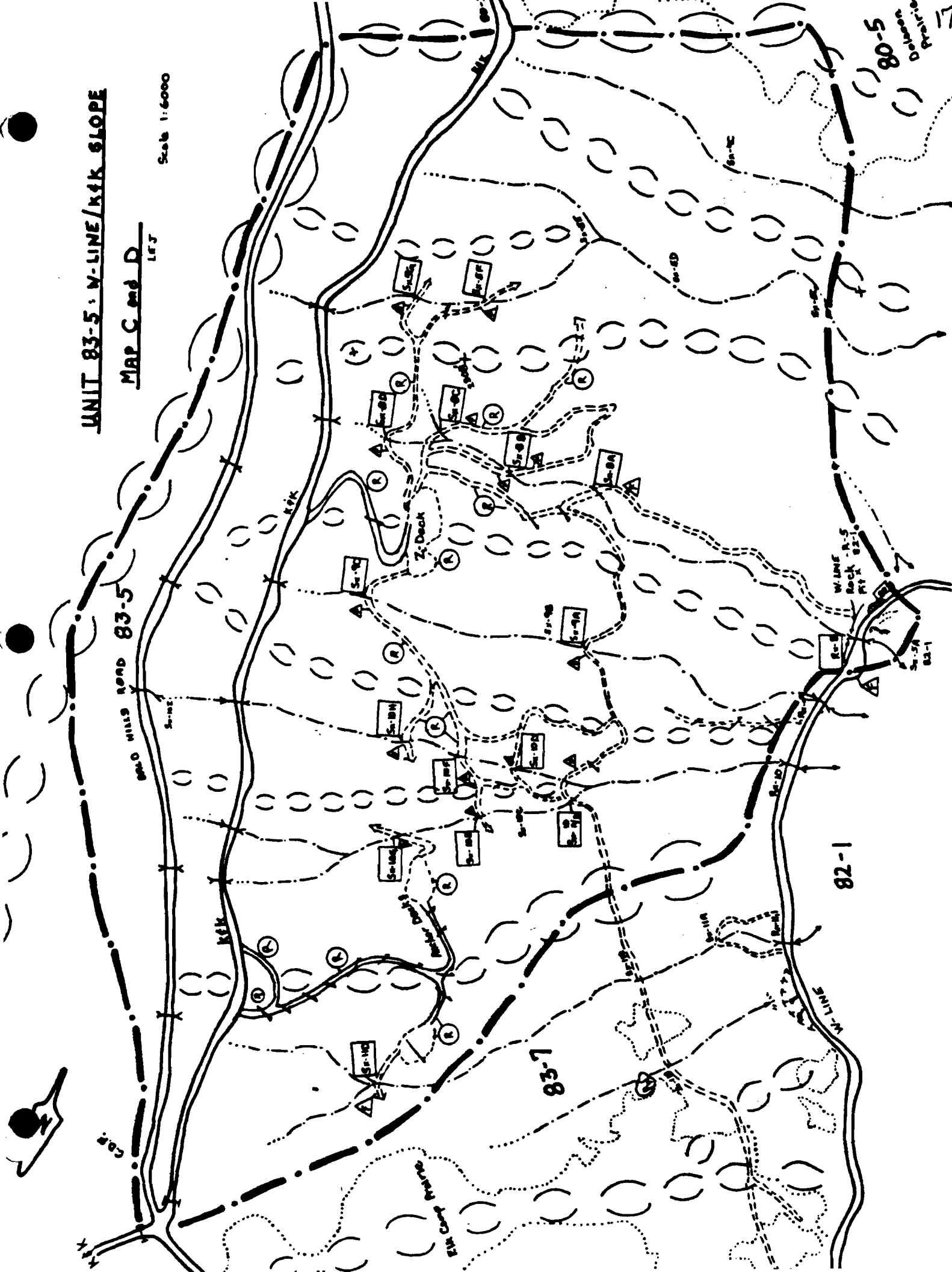
- Mapping Boundary
- Private Boundary
- Cut Block Boundary
- 71 Year of Cut
- U Uncut
- Select Cut
- /// Cable Yarded (all others truster yarded)



Air Photo years used to determine logging history: 62, 66, 68, 70 (partial), 71, 72 (partial), 73, 74, 76, 77, 78.

Map C and D 165

Scale 1:6000



MAP C and D LEGEND

- Ephemeral Stream Channel
- - - - - Intermittent Stream Channel
- Perennial Stream Channel
- Active Gully
- Prairie Boundary
- ○ Ridge
- ===== Main Haul Road
- - - - - Skid Trails
- X Culvert
- ——— • Unit Boundary
- + ○ Knobs
- Sx-# Skid Trail Crossing and Number
- Rx-# Haul Road Crossing and Number
- 83-1 Site numbers; rehabed in 1983; 83-5 only.
- // Waterbars
- Ⓡ Ripped Road Reach or Deck
- ~~~~~ Mass Movements: Fill Failure
- △ Fill Outslope
- Photo Point numbers

TABLE 1
SUMMARY COSTS OF EROSION-CONTROL REHABILITATION WORK SITE 83-5

	Task	RNP Employees Geologist & Technician		Laborers	Heavy Equipment Rentals	Y.C.C.	Total Task Costs	% Total Cost	Phase Totals	Phase %
EVAL- UATION PHASE	Mapping	\$489.70 (1982)		-	-	-	\$489.70	2	\$1,088.15	4
	Prescription	598.45		-	-	-	598.45	2		
HEAVY EQUIPMENT PHASE	Primary Treatment	1,328.60		-	\$20,412.625	-	21,741.225	81	\$23,678.35	88
	Secondary Treatment	-		-	None	-	-			
	Miscellaneous	-		-	1,937.125	-	1,937.125	7		
LABOR INTENSIVE PHASE	Secondary Treatments (Straw)	-		\$745.65	-	96 Person- Hours ¹	745.65	3	\$1,206.90 (incl. cost of materials)	4
	[Materials]	-		[461.25]	-	-	[461.25]	1		
DOCUMENT- TATION PHASE	Cost Analysis and Report	995.00		-	-	-	995.00	4	\$995.00	4
TOTALS:		\$3,411.75		745.65	\$22,349.75	FN ¹	GRAND TOTAL:		<u>\$26,968.40</u>	
				[461.25]						
% OF TOTAL:		13%		3%	83%	-				
				[1%]						

¹ y.c.c. costs not available at time of report.

TABLE 2

Rehabilitation Work Summary, 83-5

Total site cost	\$26,968.40
Heavy equipment cost	\$22,349.75
Labor cost ¹	\$ 745.65
Total length of haul roads treated	.3 mile
Total length of skid trails treated	1.3 miles
Haul road crossings excavated	1 crossings (597 cy)
Unprotected crossing	1
Skid trail crossings excavated	15 crossings (6331 cy)
Unprotected crossings	15
Landings outsloped	1
Outsloped roads - total length (FOS)	.3 mile
Cross road drains - total number (skid trail crossing access)	18
Ripped - total miles	1.6 miles
Stabilized slide areas	1 slides

¹ Cost does not include wages for YCC, see Table 13 in the Labor Intensive section of this report.

Table 3

Site 83-5

HEAVY EQUIPMENT USED

TYPE	DESCRIPTION	OWNER and OPERATOR	COST/ HOUR	DATES IN USE (WEEK NUMBER)
Excavator	John Deere 690B, 3/4 yd bucket w/ clamp.	Larry Lambert	\$75.00	1-4
Bulldozer	Caterpillar D-7, winch, 4-way hydraulic tilt blade, w/brush rake blade.	Wendell Larkin	\$78.50	1-4

Table 4.

Site 83-5

HEAVY EQUIPMENT SEQUENCING

WEEK NUMBER	DATES (WEEKLY)	WORK LOCATIONS	TYPE OF EQUIPMENT
1	June 20 - 24	-- Ripping Z-deck & road, and skid trails. -- W-Line/K & K Slope; (Sx - 8C, 8B, 8A, 5F and 8D).	D-7 Excavator
2	June 27 - July 1	-- W-Line/ K & K Slope; (Sx - 8A, 5F, 5G, 8D, 11D, 10G, 10A/B, 9A, 10D, 10E, 10F, 10H, and Z-Deck).	D-7 Excavator
3	July 5 - 8	-- W-Line/K & K Slope; (Sx - 10H, 9C, 8A, and Z-Deck). -- W-Line: slump	D-7 Excavator
4	July 11 - 12	-- W-Line: Slump and Rx-8	D-7 Excavator

TABLE 5
SUMMARY OF AVERAGE COSTS OF HEAVY EQUIPMENT TREATMENTS
83-5

Treatment	# of Work-sites	Total Quantity	Total Cost	Average Costs:		Cost/Quantity Range
				Work-Site	Quantity	
Haul Road Crossings ¹	1	597 yd ³	\$1,517.125	\$1,517	\$2.97/yd ³ ¹	same
Skid Trail Crossings	15	6331 yd ³	13,266.50	884	2.10/yd ³	.79 - 3.96 yd ³
Landings	1	1350 yd ³	1,526.75	1,527	1.13/yd ³	same
Landslides	1	1086 yd ³	3,377.00	3,377	3.11/yd ³	same
Cross Road Drains (WB)	18	-	136.50	-	7.58/CRD	same
Rip Roads	1.6 miles	8300 ft.	588.75	-	.07/L.F.	same
TOTAL PRIMARY TREATMENT			= \$20,412.625			
Travel	-	-	971.125	-	-	-
Standby (rained-out)	-	-	887.50	-	-	-
Misc. Work	2	-	78.50	-	-	-
TOTAL MISCELLANEOUS WORK			= \$1,937.125			
TOTAL HEAVY EQUIPMENT COSTS			= <u>\$22,349.75</u>			

¹ Average Unit Cost includes three hours of excavator time from Unit 83-7.

TABLE 6.
AVERAGE HAUL ROAD AND SKID TRAIL CROSSING EXCAVATION COSTS
83-5

Type of Worksite	# of Work-sites	Range: vol. fill yd ³	Equip.	Range: Hours	Total Sites Cost	Average Cost/ Worksite	Range: Cost	Total yd ³	Average: Cost/ yd ³	Range: Cost/ yd ³	Average Rate: yd ³ /Hr.
EXTRA-SMALL 1-100 yd ³	4	43-81	Excav. (100%)	1-2	\$431.25	\$108	\$75-150	248	\$1.74	\$1.39-2.03	43
SMALL 100-400 yd ³	5	124-386	Excav. (56%) Cat. (44%)	3/4 - 6 1/4 1 1/2 - 6	2,544.50	509	113-940	1,366	1.86	.79 - 2.69	41
MEDIUM 400-800 yd ³	5	484-689	Excav. (52%) Cat. (48%)	7 1/4 - 12 3/4 7 - 12 1/4	7,669.75	1,534	1,172 - 1,918	2,964	2.59	1.70 - 3.96	30
LARGE 800-2000 yd ³	2	873 - 1,477	Excav. (23%) Cat. (77%)	4 3/4 - 7 1/4 16 1/2 - 24 3/4	4,138.125	2,069	1,839 - 2,299	2,350	1.76	1.56 - 2.11	44
EXTRA-LARGE 2000 yd ³	None	-	-	-	-	-	-	-	-	-	-
TOTALS:	16 crossings	43-1,477 cubic yards	Excav. Cat.	3/4 - 12 3/4 1 1/2 - 24 3/4 Hours	\$14,783.625	\$924/ work-site	\$75 - 2,299 Range	6,928 yd ³	\$2.13/ yd ³ Average	\$.79 - 3.96 cubic yard	36 yd ³ / Hr.
				Total Hours:	192 1/4						

TABLE 7.
HAUL ROAD CROSSING EXCAVATION COSTS
83-5

Site Number	Equipment	Hours	Cost	Site Cost	Quantity yd ³	Cost/ yd ³	Rate: yd ³ /Hour	Remarks:
Rx-8	Excavator	9 1/2	\$712.50	\$1,517.125	597 ✓	\$2.54	30	Push-haul distance of 200 feet.
	Bulldozer	10 1/4	804.625	[1,772.125] ¹		[2.97] ¹	[26] ¹	
TOTALS: 1 crossing		19 3/4 Hours		\$1,517.125	597 ₃ yd ³	\$2.54/ yd ³	30 yd ³ / hr.	

¹ This cost, cost/cubic yards, and rate includes three hours of Excavator time (\$85.00/hour) from Unit 83-7.

TABLE 8.
SKID TRAIL CROSSING EXCAVATION COSTS
83-5

Site Number	Equipment	Hours	Cost	Site Cost	Quantity yd ³	Cost/ yd ³	Rate: yd ³ /Hour	Remarks: Percent Done Per Equipment
Sx-5F	Excavator	11 1/4	\$843.75	\$1,393.25	660	\$2.11	36	62% Excavator
	Bulldozer	7	549.50					38% Bulldozer
Sx-5G	Excavator	1 1/2	112.50	112.50	81	1.39	54	100% Excavator
Sx-8A	Excavator	7 1/4	543.75	1,839.00	873	2.11	37	31% Excavator
	Bulldozer	16 1/2	1,295.25					69% Bulldozer
Sx-8B	Excavator	5	375.00	610.50	386	1.58	48	63% Excavator
	Bulldozer	3	235.50					37% Bulldozer
Sx-8C	Excavator	4 3/4	356.25	2,299.125	1,477	1.56	50	16% Excavator
	Bulldozer	24 3/4	1,942.875					84% Bulldozer
Sx-8D	Excavator	3/4	56.25	174.00	220	.79	98	33% Excavator
	Bulldozer	1 1/2	117.75					67% Bulldozer
Sx-9A	Excavator	2	150.00	150.00	74	2.03	37	100% Excavator ¹
Sx-9C	Excavator	7 1/4	543.75	1,171.75	689	1.70	45	48% Excavator
	Bulldozer	8	628.00					52% Bulldozer
Sx-10 A/B	Excavator	6 1/4	468.75	939.75	373	2.52	77	51% Excavator ²
	Bulldozer	6	471.00					49% Bulldozer
Sx-10D	Excavator	1 1/4	93.75	93.75	50	1.88	40	100% Excavator

TABLE 8.
SKID TRAIL CROSSING EXCAVATION COSTS, Page 2
83-5

Site Number	Equipment	Hours	Cost	Site Cost	Quantity yd ³	Cost/ yd ³	Rate: yd ³ /Hour	Remarks:
Sx-10E	Excavator	1 1/2	\$112.50	\$112.50	124 ✓	\$.91	83	100% Excavator
Sx-10F	Excavator	12 3/4	956.25	1,917.875	484 ✓	3.96	19	51% Excavator ³
	Bulldozer	12 1/4	961.625					49% Bulldozer
Sx-10G	Excavator	1	75.00	75.00	43	1.74	43	100% Excavator
Sx-10H	Excavator	10 3/4	806.25	1,669.75	534 ✓	3.13	25	49% Excavator ⁴
	Bulldozer	11	863.50					51% Bulldozer
Sx-11D	Excavator	5 1/4	393.75	707.75	263 ✓	2.69	28	57% Excavator ⁵
	Bulldozer	4	314.00					43% Bulldozer
TOTALS: 15 crossings	Excavator	78 1/2	\$5,887.50	\$13,266.50	6,331 yd ³	\$2.10/ yd ³	37 yd ³ / Hour	46% Excavator
	Bulldozer	<u>94</u> 172 1/2 Hours	7,379.00					54% Bulldozer
Include Travel Time in Costs:								
	Excavator	6 1/2	\$487.50	\$781.875	(Approximately 6 miles traveled on Skid Trails.)			
	Bulldozer	3 3/4	294.375					
		<u>10 1/4</u> Hours						
Summary Totals:			\$14,048.375		6,331 yd ³	\$2.22/yd ³		

TABLE 8.
SKID TRAIL CROSSING EXCAVATION COSTS, Page 3
83-5

Footnotes:

- 1 Down for 30 minutes . . . track off roller.
- 2 Numerous logs and rootwads winched from the crossing fill.
- 3 Six hours spent removing a very large rootwad from the center of the channel excavation.
- 4 First 3rd of the excavation done in the rain, then rained out one full day, then completed on a Monday morning.
- 5 Numerous logs winched from the stream crossing fill.

TABLE 9.
LANDINGS (DECKS)
83-5

Site Number	Equipment	Hours	Cost	Total Site Cost	Quantity yd ³	Area Outslped	Cost/ yd ³	Rate: yd ³ / Hour
Z"-Deck	Excavator	6 3/4	\$506.25	\$1,526.75	1,350	1.05 acre	\$1.13	68
	Bulldozer	13	1,020.50					

TABLE 10.
LANDSLIDES
83-5

Location/ Site Number	Equipment	Hours	Cost	Total Cost	Volume Removed yd ³	Cost/ yd ³	Rate: yd ³ / Hour
W-Line Rock Pit Slump	Excavator	22	\$1,650.00	\$3,377.00	1,086	\$3.11	25 ¹
	Bulldozer	22	1,727.00				

¹ Push-haul 300-600 feet.

TABLE 11.
83-5 MISCELLANEOUS SITE COSTS FOR HEAVY EQUIPMENT

Category	Equipment	Hours	Cost	Site Cost
Travel	Excavator	8 1/2	\$637.50	\$971.125
	Bulldozer	4 1/4	333.625	
Standby (rain delay)	Excavator	10	452.50	887.50
	Bulldozer	10	435.00	
Changing Dozer Blades, and Discussions	Bulldozer	1	78.50	78.50
TOTALS:		Excavator	18 1/2 hours	\$1,937.125
		Bulldozer	15 1/4 hours	

TABLE 12.
SKID ROAD AND HAUL ROAD TREATMENT COSTS
83-5

Treatment	Equipment	Hours	Cost	Total Cost	Total Quantity	Cost/Quantity
Cross Road Drains	Excavator	1/4	\$18.75	\$136.50	18	\$7.58/CRD
Skid & Haul Roads)	Bulldozer	1 1/2	117.75			
Gravel Paving	Bulldozer	7 1/2	588.75	588.75	8,300 feet (1.6 miles)	.07/Linear Foot
Skid & Haul Roads)						
Fill Outslope)	included in nearby stream crossing costs.					
TOTALS:	Excavator	1/4	\$18.75	\$725.25		
	Bulldozer	9	706.50			

TABLE 13
LABOR INTENSIVE COSTS
83-5

Work Types	Type of Laborers	Person Hours	Cost	Total Cost	Quantity	Cost/Quantity	Straw Cost	Total Cost/Quantity
Distribution and Application of Straw Mulch	RNP	85	\$745.65	\$745.65	150 Bales	\$4.97/Bale	\$461.25	\$8.05/Bale
	YCC	<u>96</u>	<u>1</u>					
		181 Person Hours						

¹ YCC costs were not available at the time for printing!

TABLE 14.
83-5 SKID TRAIL CROSSING
Ages and Drainage Areas

Site No.	Age	Drainage Area (acres)	(cfs) Q ₂₅	Excavated Vol. (yd ³)	Total Cost	Cost/ yd ³	Comments
Sx-5F	'68	11	7	660	\$1,393.25	\$2.11	
Sx-5G	'68	7	5	81	112.50	1.39	
Sx-8A	'70	25	16	873	1,839.00	2.11	10 hours of D-7 Prep. Work.
Sx-8B	'70	17	11	386	610.50	1.58	
Sx-8C	'70	13	8	1,477	2,299.125	1.56	20 hours of D-7 Prep. Work.
Sx-8D	'70	10	6	220	174.00	.79	
Sx-9A	'70	30	19	74	150.00	2.03	Excavator stuck for 45 minutes.
Sx-9C	'70	15	9	689	1,171.75	1.70	
Sx-10 A/B	'70	58 (combined)	37	373	939.75	2.52	Many large organics (logs and rootwads) winched from the crossing excavation.
Sx-10D	'70	26	16	50	93.75	1.88	
Sx-10E	'70	25	16	124	112.50	.91	
Sx-10F	'70	24	15	484	1,917.875	3.96	Three hours spent removing a very large rootwad from the middle of the channel bottom excavation.
Sx-10G	'70	19	12	43	75.00	1.74	
Sx-10H	'70	21	13	534	1,669.75	3.13	First 3rd of the excavation done in a light rain and thick fog.
Sx-11D	'66/77	23	14	263	707.75	2.69	Numerous large organics winched from the stream.
				6 331 yd ³	\$12 266 50	Average \$2 10/yd ³	

TABLE 15.
83-5 SURVEY DATA SUMMARY

Site	Volume yd ³	CHANNEL: Gradient	Length	(Top/Bottom) Width	SIDE SLOPES: Length (IBD/OER)	Average Angle (LB/RB)
Sx-5F	660	10°	152'	7'/9'	25'/35' - 45'	18°/22°
Sx-5G	81	11°	36'	5'/6'	10'/15'	35°/31°
Sx-8A	873	12°	114'	7'/11'	20'-25'/40'-50'	21°/35°
Sx-8B	386	13°	186'	5'/7'	20'-25'/25'-35'	17°/26°
Sx-8C	1477	12°	163'	7'/8'	30'/45'-135'	5°/29°
Sx-8D	220	14°	81'	5'/4'	20'-25'/20'-25'	12°/17°
Sx-9A	74	12°	40'	5'	20'/20'	20°/20°
Sx-9C	689	Top Bottom 19° 10°	90'	4'/5'	20'-30'/37'	22°/25°
Sx-10A/B	373	A B 21°/20°	A B 51'/40'	4'/20' A 5'/20' B	15'/30'	28°/24°
Sx-10D	50	20°	33'	5'	10'/15'	23°/28°
Sx-10E	124	Top Bottom 9° 16°	55'	5'/7'	15'/20'	22°/22°
Sx-10F	484	Top Bottom 17° 7°	103'	6'/11'	20'/30'	28°/25°
Sx-10G	43	9°	40'	4'	10'/20'	29°/14°
Sx-10H	534	14°	102'	6'/5'	20'-30'/35'-45'	27°/19°
Sx-11D	263	2°/14°/6°	84'	4'/5'	15'/25'	20°/17°
Sx-8	597	14°	114'	6'/5'	25'/40-50'	21°/26°
1-line	1086	-	-	-	length 147' by 57'-122' wide = .4 Acres	22°

TABLE 16

83-5 PHOTO POINTS

Pre PP - June 16, 1983

Post PP - October 6 & 11, 1983

Weather: Clear skies

<u>P.P. No.</u>		<u>Lense mm</u>	<u>Site No.</u>	<u>Description</u>
1	Pre-action/ Post	50 H,V	Sx-5F	Taken from lower left bank, ~5' left of thalweg. Stake is ~10' left of thalweg.
2	Post only	28 H	Sx-5G	Taken from the lower end of channel in thalweg. Stake on right bank.
3	Post only	50 V	Sx-8D	Taken from the lower end of thalweg. Stake in log on left bank.
4	Pre/Post	28 H	Sx-8D	Taken from cutbank on right bank, upper end. Stake in ground.
5	Pre/Post	28 H 50 H (Post only)	W-Line Rx-8	From stump sprouts at entrance to rock pit. Stake in ground.
6	Pre/Post	28 H	W-Line Rx-8	From Douglas-fir stump upper left bank. Tag and flag nailed to stump.
7	Post only	28 H, V	W-Line Rx-8	From lower left bank in front of redwood sprouts. Tag and flag nailed to redwood.
8	Pre/Post	28 H	Rock pit W-Line slump	From redwood stump on left bank of Rx-8 (82-1, PP-14).
9	Pre/Post	28 H	Rock pit W-Line slump	Taken from big redwood stump on right bank of Sx-5A (82-1). Tag and flag on side of stump.

TABLE 16, Page 2

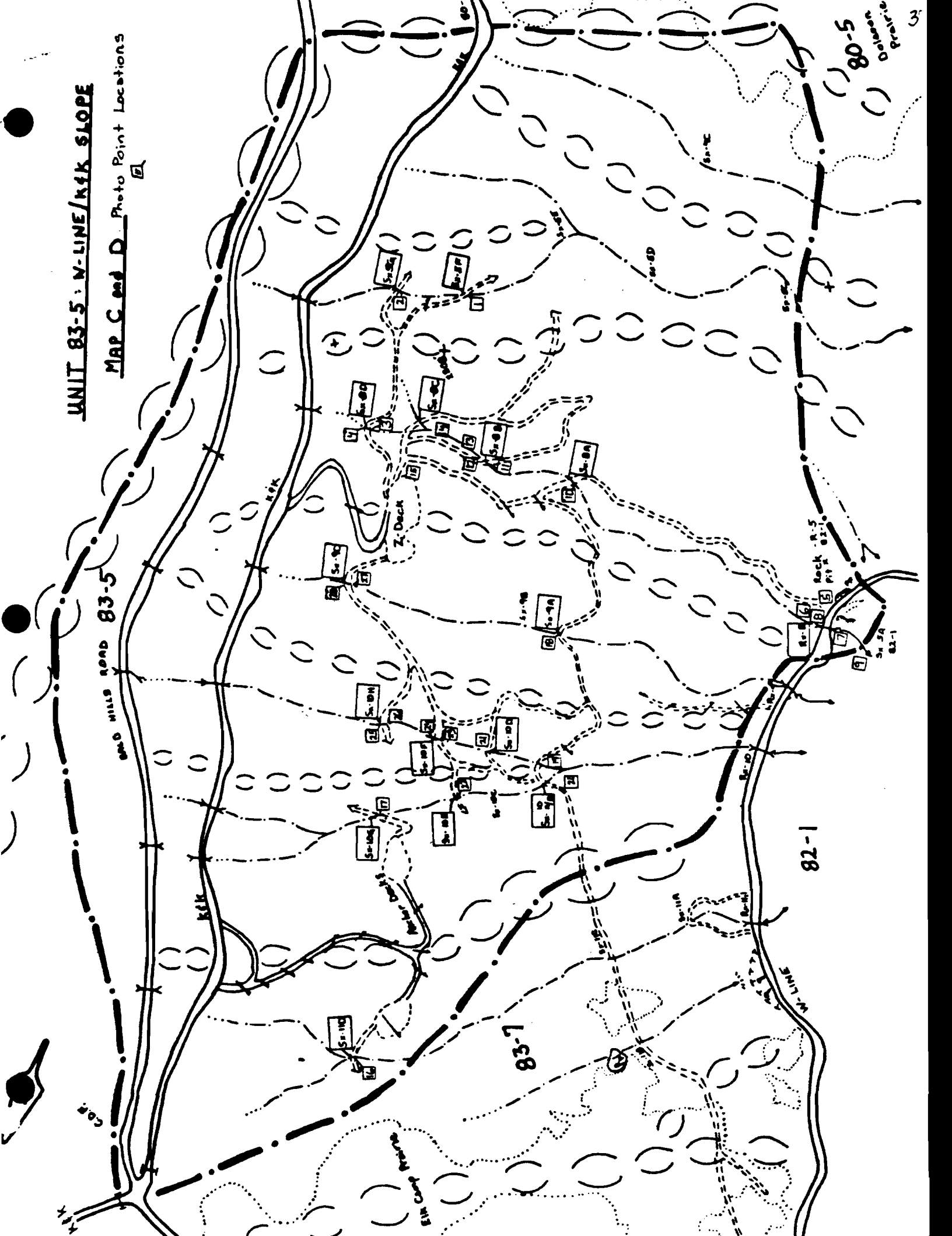
<u>P.P. No.</u>		<u>Lense mm</u>	<u>Site No.</u>	<u>Description</u>
10	Post only	35 V	Sx-8A	From log on lower left bank. Stake on log.
11	Action/Post	35 V	Sx-8B	From lower end, left bank. Stake in ground.
12	Pre-action/ Post	28 H	Sx-8B	From mid-upper right bank, just to the right of flagged Douglas-fir. Stake in ground.
13	Post only	35 H	Sx-8B	"Taken mid-excavation looking up thalweg from right bank. Stand about equal distance to right of thalweg as tag on log is to left of thalweg. Tag on logchunk on left bank." TAS
14	Post only	50 V	Sx-8C	From lower left bank at stake in ground.
15	Pre/Action/ Post	28 H	Sx-8C	From Douglas-fir stump on upper right bank. Stake on stump.
16	Post only	35	Sx-11D	From thalweg at bottom of excavation on a log. Tag and flag nailed to log.
17	Post only		Sx-10G	Taken downstream in thalweg. Stake in ground.
18	Post only		Sx-9A	Taken from stump on right bank lower end. Stake in stump.
19	A	28	Sx-10A	Taken from a rootwad lower thalweg. Tag and flag on rootwad.
	B Post only	28	Sx-10B	
20	Post only	28	Sx-10A/B	From stump on right bank skid trail. Stake on stump.

TABLE 16, Page 3

<u>P.P. No.</u>		<u>Lense mm</u>	<u>Site No.</u>	<u>Description</u>
21	Post only	28	Sx-10D	From base of willow in thalweg lower reach. Stake in ground.
22	Post only	28	Sx-10E	From thalweg downstream on left bank. Stake in ground.
23	Post only	28	Sx-10F	From base of stump lower reach thalweg. Tag and flag nailed to stump.
24	Pre/Post	28 H	Sx-10F	From right bank skid trail on stump above the cutbank. Stake in stump.
25	Pre/Post	28 H	Sx-10H	From right bank above crossing on fill outslope. Stake in ground.
26	Post only	28	Sx-10H	From thalweg by right bank stump, lower reach. Tag and flag nailed to stump.
27	Post only	28	Sx-9C	From thalweg downstream by willow. Stake in ground.
28	Pre/Post	28 H	Sx-9C	From right bank above cutbank on a skid trail. Stake in ground.

UNIT 83-5: N-LINE/K4K SLOPE

MAP C and D Photo Point Locations



~~Crescent City~~
Orick -

VEGETATION SUMMARY REPORT
WATERSHED REHABILITATION UNIT 83-5
W-LINE / K AND K SLOPE

APRIL 1984

Bonnie C. Griffith

Introduction

Site Description

Rehabilitation Unit 83-5, 13 miles east of Orick, is located on the east side of Redwood Creek basin between the K and K Road and the W-Line (Unit 82-1) (see map 1). Flanked by Elk Camp Prairie to the northwest and Dolason Prairie to the south, Unit 83-5 covers 296 acres of logged terrain. The unit has a southwest aspect with an elevation range of 1600 to 2682 feet and a slope of 25 to 50 percent. Weather conditions range from cool, foggy summers to cool rainy winters with a mean annual precipitation of 70 to 100 inches and a mean annual temperature of 53° F.

Prior to logging, Unit 83-5, supported and old growth redwood, Sequoia sempervirens and Douglas-fir, Pseudotsuga menziesii forest and its associates. These included Tanbark-Oak, Lithocarpus densiflora; Madrone, Arbutus menziesii; Western hemlock, Tsuga heterophylla; Bigleaf maple, Acer macrophyllum; California rose-bay, Rhododendron macrophyllum; salal, Gautheria shallon; Yerba de Selva, Whipplea modesta; California huckleberry, Vaccinium ovatum; Oregon grape, Mahonia nervosa; and sword fern, Polystichum munitum. Wet areas are dominated by red alder, Alnus oregona; willow, Salix sp. and Western coltsfoot, Petasites palmatus.

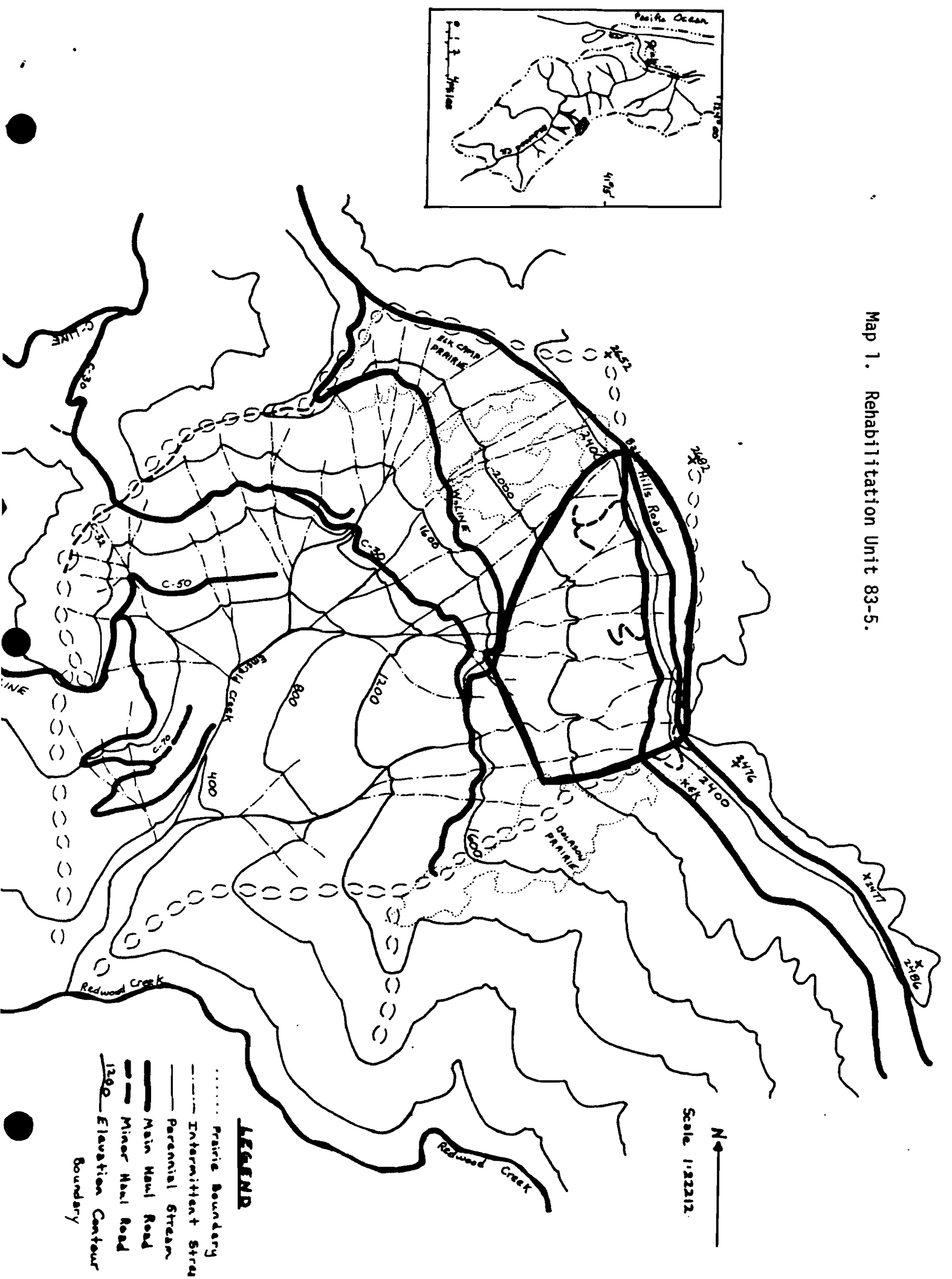
Timber harvest began in 1962 with three tractor-yarded, cutblock units for a total of 73 acres. An additional 46 acres were tractor-yarded in 1966. From 1970 to 1973, 177 acres were tractor-yarded, resulting in many skid trail crossings with slight to moderately high erosion potential. In 1977, 46 acres below the K and K Road and adjacent to Elk Camp Prairie were re-entered and selectively tractor-yarded. With skid trail construction, nearly all the soil was removed causing minimal regrowth and minor rill erosion. The vegetation of the logged areas has become dominated by second growth Douglas-fir and to a lesser extent redwood, coyote brush, Baccharis pilularis var. consanguinea; Blue brush, Ceanothus thyrsiflorus; Madrone, California rose-bay and Oregon grape.

The dominate soil series of Unit 83-5 are Coppercreek, Lacks, Ahpah and Slidecreek (see map 2). The following are brief soil descriptions of each series:

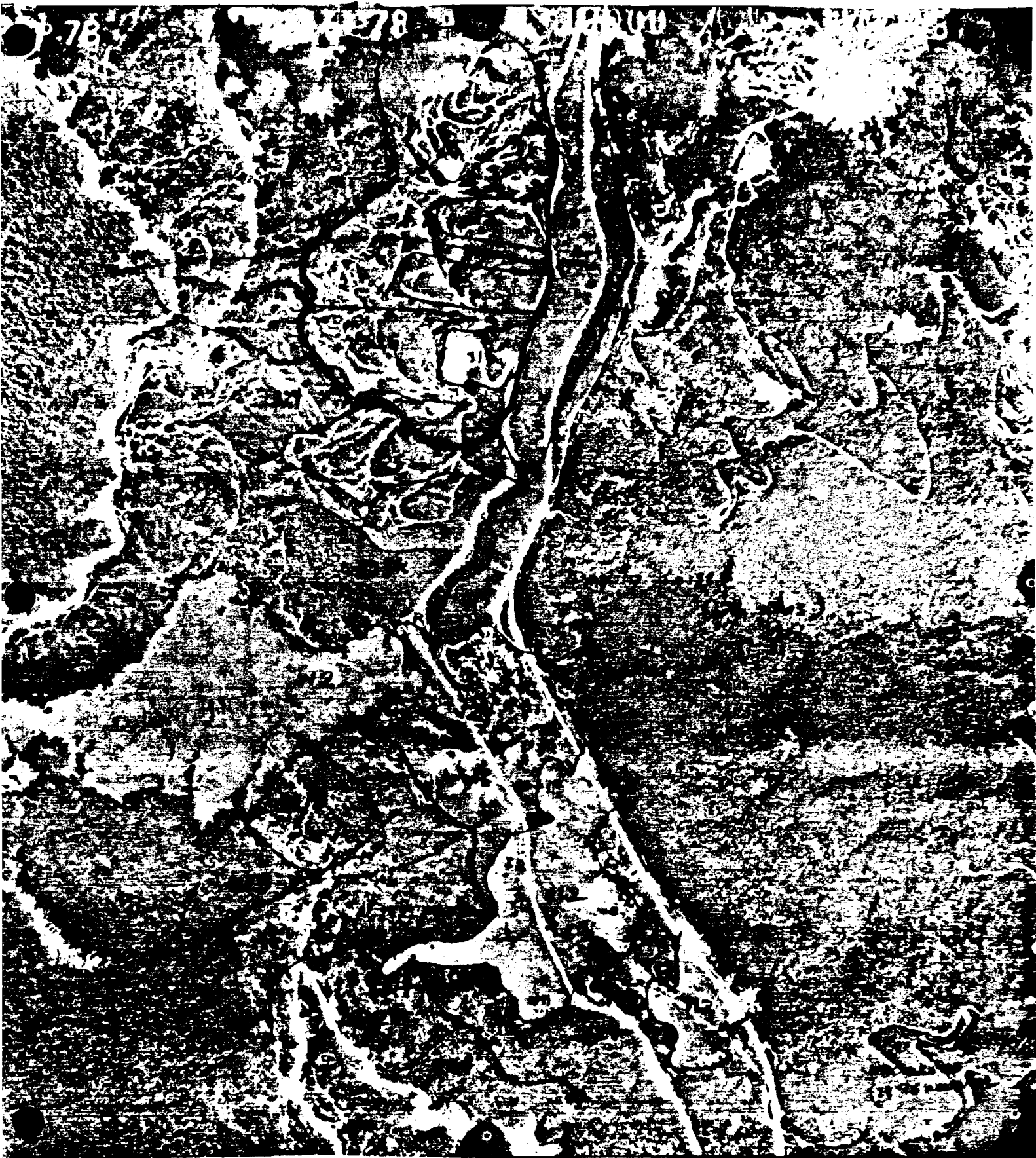
Coppercreek

Coppercreek soils are formed in colluvium and residuum derived from sandstone. These soils are well drained, deep to very deep with medium runoff. They have dark brown loam A horizons and yellowish-brown to brown gravelly clay loam B and C horizons. Coppercreek soils are classified as a fine loamy, mixed, isomesic Typic Humidtropepts. They occur on hillslopes with 15 to 70 percent slopes. Old growth vegetation associated with these soils are redwood, Western hemlock, Tanbark-Oak, Douglas-fir, California rose-bay, and sword fern.

Map 1. Rehabilitation Unit 83-5.



Map 2. Rehabilitation Unit 83-5. Soil description.
115 - Coppercreek-Ahpap-Lacks Complex.
225 - Coppercreek-Slidecreek-Lacks Complex.



Map by James Popenoe

Ahpah

Ahpah soils are formed from residium weathered from sandstone. These soils are well drained, deep to moderately deep with medium runoff. They have brown gravelly loam A horizons and yellow-brown gravelly clay loam B and C horizons. Ahpah soils are classified as fine-loamy, mixed isomesic Typic Humitropepts. They occur along ridgelines and upper hillslopes with this soil type includes Douglas-fir, Tanbark-Oak, Madrone, redwood, salal and California rose-bay.

Lacks

Lack soils are formed in residium and colluvium weathered from sandstone. These soils are well-drained, moderately deep with medium runoff. They have brown gravelly loam A horizons and light yellowish-brown very gravelly clay loam B and C horizons. Lacks soils are classified as loamy skeletal, mixed, isomesic Typic Humitropepts. They occur on convex hillslopes in highly dissected terrain with slopes of 30 to 75 percent. Vegetation associated with the soil are Douglas-fir, redwood, Tanbark-Oak, Madrone and huckleberry.

Slidecreek

Slidecreek soils are formed in colluvium and residium from graywacke sandstone and shale. These soils are well drained, deep with medium runoff. They have dark brown gravelly A horizons and light yellowish-brown very gravelly clay loam B and C horizons. Slidecreek soils are classified as loamy-skeletal, mixed, isomesic Typic Humitropepts. They occur on hillslopes with 30 to 75 percent slope. Vegetation associated with this soil type includes redwood, Douglas-fir, Tanbark-Oak, Madrone and huckleberry.

Heavy equipment phase, under the supervision of Louise Johnson, project leader, was accomplished by a D-7 caterpillar tractor and an excavator from June 20 to July 12, 1983. This resulted in the ripping and/or outslowing of 0.3 miles of haul roads and 1.3 miles of skid trails. Excavation of 15 stream crossings (see map 3). For a total of approximately 6.2 acres of disturbed ground. Areas straw mulched included 'Z' Deck, the right bank of Sx-8C and part of the adjacent skid trail at an application rate of 4000 to 5000 lb/A. The W-Line out-sloped area and Rx-8 received straw mulch at an average application rate of 4700 to 5500 lb/A. For additional information refer to: Summary of Erosion Control Work Unit 83-5, W-Line/K and K Slope, Louise Johnson, November, 1983 (On file at OCC).

Table 1. Vegetation Treatments - Rehabilitation Unit 83-5.

Date Planted	Worksites	Area (sq. ft.)	Spacing (feet)	Douglas fir	Redwood
1-23-84	D-2	6,641	10		
	D-2 to D-4	21,537	10	370	570
	D-4	1,521	10	30	---
	D-2/D-3 to D-3	4,810	No	treatment	
	D-3	3,162	No	treatment	
	Sx-10G	1,200	No	treatment	
	Sx-11D	3,360	No	treatment	
1-24-84	"Z" Deck	47,848	10	100	---
	"Z" Deck to				
	Sx-8A	11,567	No	treatment	
	Sx-8A	7,695	4	100	200
	Sx-8B	9,765	4	70	140
	Sx-8C	22,820	4		
	Sx-8C to end of			260	600
	ripped road	10,924	10		
	"Z" Deck to				
	Sx-5G	9,639	10		
	Sx-8D	3,645	10	115	200
	Sx-5F	10,640	4		
	Sx-5G	900	No	treatment	
	"Z" Deck to				
	Sx-9C	8,997	10		
	Sx-9C	5,220	4		
	Sx-9C to Sx-10H	11,960	10	390	730
	Sx-10H	6,630	4		
	Sx-10H to Sx-10F	3,856	10		
	Sx-10F	5,150	4		
	Sx-10F to Sx-10E	---	No	treatment	
	Sx-10E	963	No	treatment	
	Sx-10F to Sx-10D	---	No	treatment	
	Sx-10D	825	4	---	20*
	Sx-10D to Sx-A/B	---	No	treatment	
	Sx-10A/B	1,024	5	55	---
	Sx-10A/B to Sx-9A	---	No	treatment	
	Sx-9A	800	4	10	10
	Sx-9A to Sx-8A	---	No	treatment	
Total		223,099		1,500	2,470

D - Deck

Sx - Stream crossing

*Only planted right slope

Table 2. Rehabilitation Unit 83- 5. Revegetation Costs.

PLANTING

<u>Redwood National Park</u>	<u>Hours</u>	<u>Costs</u>
Biological Technician ¹	10	\$ 94.10
Transportation ²	2	37.48
Subtotal	12	131.58
In-house Labor ³	12	114.72
Transportation	3	48.58
Subtotal	15	163.30
<u>Redwoods United, Inc.</u>		
Personnel	97	447.29
Transportation	20	94.73
Overhead ⁴		124.69
Subtotal		843.15
Total		1,138.03
COST PER TREE		0.27

PLANNING AND REPORTS

<u>Biological Technician</u>		
General	5	49.99
Experimental Plots	3	35.49
Reports	10	94.10
Subtotal	18	179.58
TOTAL	162	\$1,317.61

¹Wages include 11 % for government benefits - term employees.

²Transportation includes 125 mi. x \$ 0.50 /mi. plus 2 days @ 62.50/day.

³Wages include 7% for government benefits - temporary employees.

⁴18 % Administrative charge on wages plus transportation.

Table 3. Planting Stock Costs

Planting Stock	# Planted	Purchase Cost/Tree	Subtotal	Transportation Cost/Tree	Subtotal	Total
Douglas-fir	1,500	\$0.120	\$180.00	\$0.020 ¹	\$30.00	\$210.00
Redwood	2,470	0.149	368.03	0.012 ²	29.64	397.67
Total	3,970		\$548.03		\$59.64	\$607.67
Overall Cost/Tree		\$0.134		\$0.016		\$0.153

Costs include transport from Arcata Lumber Company, Smith River to Orick, California and to rehabilitation sites.

Costs include transport from Louisiana-Pacific Nursery (Crannell) to Orick, California and to rehabilitation sites.

Revegetation Objectives

The main objective of planting with Douglas-fir and redwood seedlings is to accelerate the revegetation and the stabilization of rehabilitated logged slopes, haul roads, skid trails, and road and stream crossings.

There are several reasons why revegetation treatments are not prescribed for all ripped and/or outslowed areas. The ground may be too rocky for planting tools or too wet for the planting stock. On a steep slope, planting may result in unwanted ground disturbance. In these instances, it is better to rely on the surrounding vegetation to establish new plant growth. Vegetation treatments may not be prescribed when there is a sufficient seed source available to the rehabilitated area. During the first winter season, it may be more cost effective to defer revegetation treatment in a few areas when a definite possibility of mass movement exists.

Vegetation Treatments

Planting stock consisted of two-year, bareroot Douglas-fir (seed zone 092, elevation 2000 feet) grown and purchased from Arcata Lumber Company, Smith River and one-year containerized redwood and red alder grown and purchased from Louisiana-Pacific Corporation, Big Lagoon Nursery, Crannell.

Unit 83-5 is a fairly dry and exposed site, in particular 'Z' Deck and some of the road surfaces. In these areas Douglas-fir was planted at 10 foot spacings. The ratio of Douglas-fir to redwood seedlings was dependent on the slope exposure. In dry areas 2 Douglas-fir were planted for every redwood; shaded areas were planted at a ratio of 1 to 1. The skid trail stream (Sx) crossings were planted at an average spacing of 4 foot centers. There are four former logging decks (D). 'Z' Deck and Deck 4 are extremely dry and exposed areas were planted with Douglas-fir at 10 spacings. Due to a future compost study, the upper section of 'Z' Deck was left untreated except for straw mulch. Deck 2 was planted with one redwood for every Douglas-fir. No vegetation treatment was prescribed for Deck 3 due to the abundance of existing vegetation (Table 1) (map 3).

The cost for planting and planning the revegetation prescription for Unit 83-5 is summarized in Table 2. Table 3 is the cost analysis for planting stock.

Test Plots

On April 6, 1984 a study to determine the effects of slow release fertilizer tablets (20-10-5) on two-year, bareroot Douglas-fir seedlings was established at 'Z' Deck. There are seven rows of test trees. Fertilizer tablets were planted six to eight inches from twenty-five trees at an average depth of six inches. An additional twenty-five trees will serve as controls. Each fertilized tree (blue wooden stake) was paired with a control tree (unpainted wooden stake).

To study the effects of mulch on Douglas-fir and redwood planting stock, two survival plots were set up between 'Z' Deck and Sx-9c on a strawed and unstrawed road reach. The boundaries of each plot was marked with unflogged wooden stakes. Flagging was not used because it has attracted the unwanted curiosity of deer and elk. The strawed plot contains 27 Douglas-fir and 21 redwood; the unstrawed plot has 14 Douglas-fir and 19 redwood.

Trees from both studies will be monitored at the end of summer (August, 1984) and in the following Spring of 1985.

Monitoring Recommendations

There are no specific areas with Unit 83-5 which warrant additional monitoring at the present time.

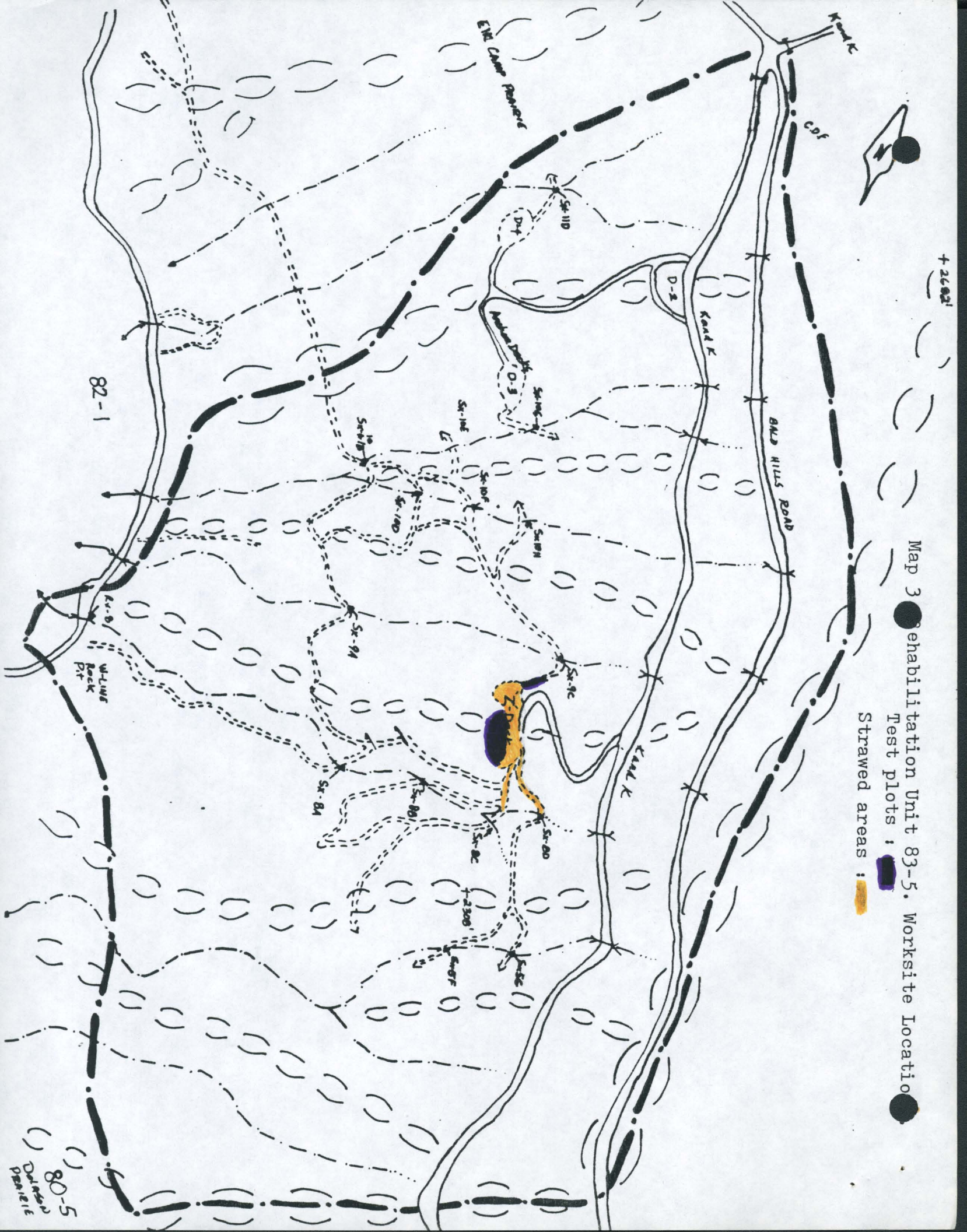
+ 2602'



Map 3 Rehabilitation Unit 83-5. Worksite Location

Test plots :

Strawed areas :



- grass clump around base
- Coyote bush at base

Unit B5-5

TREE GROWTH RECORD

- Length is ground to leader for current season, (mm)
- Height measured 10 cm above soil surface
- Girth is diameter measured on internode above first node, (mm)

Notes:

- B - browsed
- D - dead, not apparently trampled
- L - lost; cannot find tree; tag may be lost
- T - trampled

2' Deck

Date	2-6-84		2-6-84			
Personnel	R.M. HILLIS BLISS STARRS BCC/RNM		Control Plain stakes		BCC/RNM	
	HEIGHT (mm)	GIRTH (mm)	Height (mm)	GIRTH (mm)		
1	500	4.8	500	9.3		
2	486	6.9	383	6.0		
3	452	4.6	441	6.6		
4	710	9.4	763	8.2		
5	677	4.5	590	7.3		
6	494	6.1	448	6.4		
7	585	7.6	502	8.5		
8	507	9.6	600	8.1		
9	506	4.6	360	4.6		
10	556	8.9	291	2.5		
11	561	10.4	447	6.4		
12	460	4.7	430	8.2		
13	522	9.0	491	4.9		
14	329	4.0	490	6.2		
15	605	9.1	522	5.2		
16	490	6.1	408	4.0		
17	392	5.6	696	6.7		
18	492	7.5	490	10.6		
19	415	7.6	630	5.5		
20	530	5.3	450	4.2		
21	240	4.6	673	6.4		
22	508	6.4	332	5.5		
23	374	4.5	402	5.0		
24	345	4.0	592	7.5		
25	610	7.5	593	5.9		
Total	12144	163.3	12472	159.7		
X	485.76	6.532	498.88	6.388		
SD	99.5	2.006	115.64	1.811		
V	9831.11	4.025	13348.53	3.281		

* Note skipped a tree in control now due to exposed roots.



Unit: 83-5 Ref. #1-A 6/16/83 PP#15 SX 8C



Unit: 83-5 Ref. 1-B 6/21/83 PP#15 SX 8C



Unit: 83-5 Ref. 1-C 10/6/83 PP#15 SX 8C



Unit: 83-5 Ref. 1-D 8/9/84 PP#15 L.T.



Unit: 83-5 Ref. 2-A 6/23/83 PP#12 Pre Action



Unit: 83-5 Ref. 2-B 6/23/83 PP#12 Post Action



Unit: 83-5 Ref. 2-C 8/9/84 PP#12 L.T.



Unit: 83-5 7/28/83 PP#3A D.V.



Unit: 83-5 8/4/84 PP#4 D.A.S.



Unit: 83-5 8/9/84 PP#4 D.A.S.