

SUMMARY REPORT OF WORK  
PERFORMED ON THE W-LINE/ELK  
CAMP PRAIRIE REHABILITATION UNIT,

83-7

by

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November, 1984

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## INTRODUCTION

This report documents the erosion control, rehabilitation work completed in 1983 on the W-Line Unit, 83-7. The author of this report was responsible only for the implementation of an existing rehabilitation plan. Therefore, the scope of this report will focus only on the work completed and associated costs. The interested reader is referred to "Work Summary and Cost Analysis, C-30 & W-Line, 82-1", by Terry Spreiter and Louise Johnson May 1982, for a detailed discussion of the unit's description. It describes the land use history and erosion features identified during the mapping phase.

### Objectives, Methods, and Summary Costs

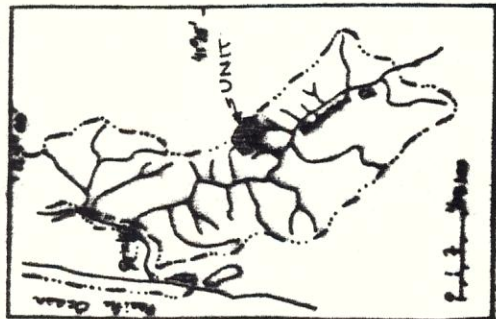
The objectives of rehabilitation were to remove both active and potential sediment sources to stream channels, and to return Elk Camp Prairie to a more natural state. Since a major portion of this rehabilitation unit is visible to the park visitor from the Bald Hills Road, a great deal of importance was placed on the aesthetic appearance of the completed work. Heavy equipment work was performed from September 12-27, under the supervision of Greg Bundros and David Burns.

The rehabilitation unit encompassed 240 acres. It contained 1.5 miles of modern-day logging haul roads (W-Line) and approximately 1 mile of secondary haul road which pre-date W-Line construction (refer to Map A). Approximately 1.1 miles of the W-Line and roughly the entire length of the secondary road had been constructed across Elk Camp Prairie. With the exception of one road segment, the W-Line was in stable condition. Haul road stream crossings had been properly constructed and sediment sources were more potential than active. Constructed much earlier under less stringent guidelines, stream crossings on the secondary road were actively eroding, contributing sediment directly to stream channels.

Outsloping was prescribed for the entire length of the W-Line, but only for the prairie segments of the secondary road (refer to Map B). Road segments adjacent to stream crossing were fill-outsloped using material removed from the stream crossing. All other segments were outsloped using fill retrieved from the road prism. One road segment, however, was treated differently. Road segment #12 crossed the head region of an incipient landslide. This road segment received a total outslope (push-endhaul of fill) to improve drainage on and around this feature. With the exception of segment #12, all road surfaces on the W-Line were ripped prior to burial. Additionally, road stream crossings were excavated to a close facsimile of pre-road, channel geometry. Crossings included all of those located on the W-Line, three crossings on the secondary road, and one skid trail stream crossing located midslope of the two roads.

Because of the high aesthetic value of prairies in Redwood National Park, heavy equipment work attempted to reconstruct the natural morphology of Elk Camp Prairie. This applied not only to the W-Line and secondary road, but also to a double-tier rock pit located in the northernmost corner of Elk Camp Prairie.

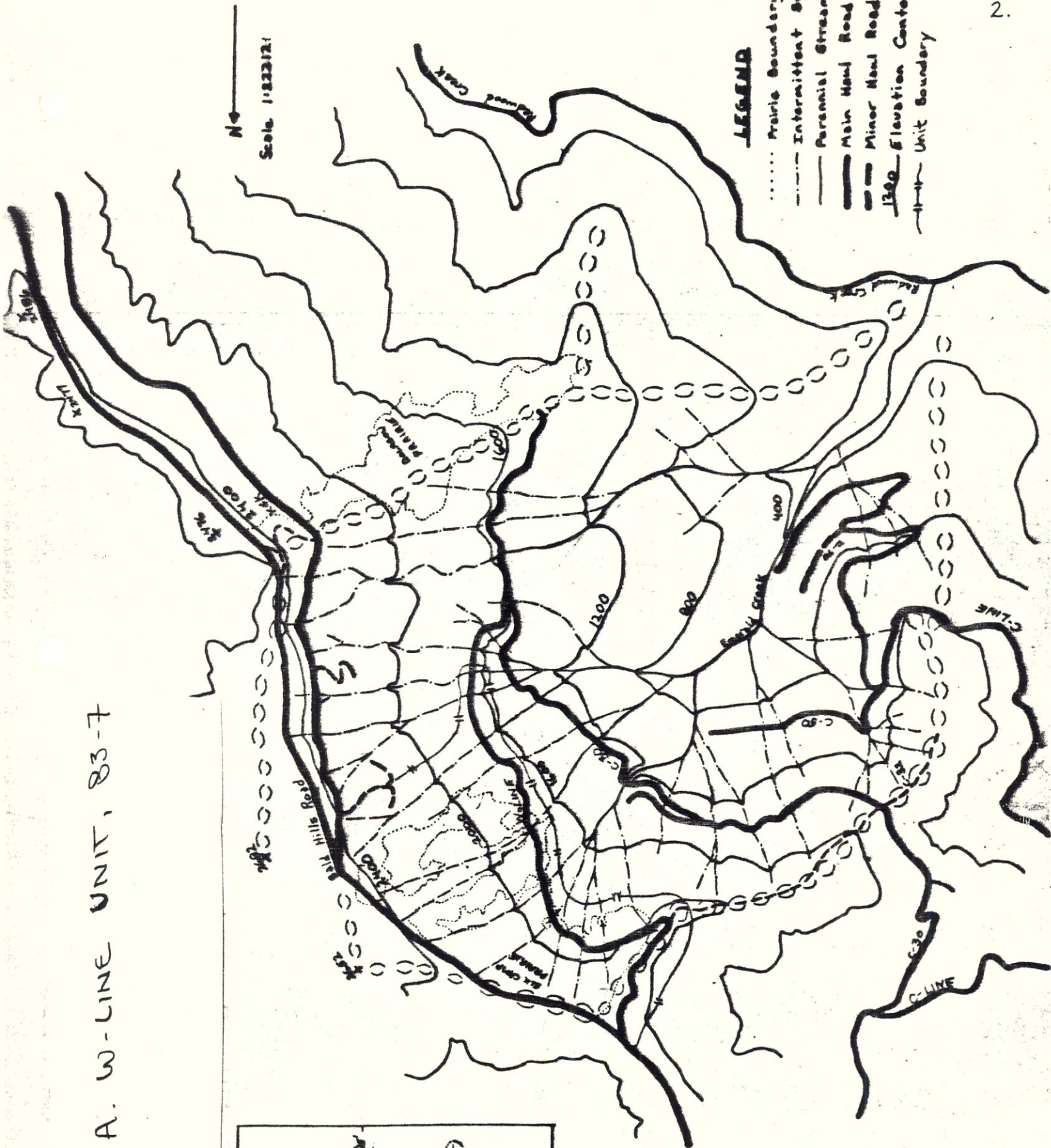
# MAP A. W-LINE UNIT, 83-7



N  
Scale 1:822121

## LEGEND

- ..... Prairie Boundary
- Intermittent Stream
- Perennial Stream
- Main Haul Road
- Minor Haul Road
- 1300 Elevation Contour
- Unit Boundary



# Map B. TREATMENT MAP,

SITE 83-7

## Legend

RX# excavated road crossing

SX# excavated skid-trail crossing

out sloped road

fill - outslope

total outslope

ripped only

unit boundary

SCALE

1:6000



Quarried rock remaining in the pit was distributed to fill major voids in the hillslope. Top soil was then gathered and spread over the two-acre site to blend with existing prairie morphology.

Manual labor crews performed the secondary treatments. Redwood National Park and Redwoods United Inc. crews spread straw over most of the treated length of the W-Line. In addition to straw, labor crews spread grass seed and fertilizer on the treated rock pit.

The total cost of rehabilitation, including supervision costs was \$30,603 (refer to Table 1). Of this total, heavy equipment and labor costs accounted for 88 and 8 percent, respectively. Evaluation costs accounted for the remaining 4 percent of the total cost. This unit had been mapped and treatments prescribed in 1981. Evaluation costs, therefore, do not include the erosion inventory mapping and treatment prescription costs. Primary treatments were performed exclusively by heavy equipment. Secondary treatments were performed largely by manual labor crews. Primary treatments accounted for 78 percent and secondary treatments accounted for 4 percent of the total cost of erosion/control rehabilitation work.

#### Heavy Equipment Phase

Heavy equipment work was performed by three pieces of equipment. Work began on September 12, and was completed on September 27, 1983. Table 2 lists equipment owners, operators, and describes equipment types.

Table 2. EQUIPMENT AND OPERATORS

| Owner                              | Operator       | Equipment          | Rate     |
|------------------------------------|----------------|--------------------|----------|
| Wendell Larkin                     | same           | Cat D7E w/winch    | \$ 78.50 |
| Twin Parks Lumber Co. - Jay Franke | same           | Cat D8H w/rippers  | \$110.00 |
| Whitey Brown                       | Ellis Campbell | Case 980 excavator | \$ 85.00 |

The hydraulic excavator was the first piece to begin work. As it walked in to begin work on this unit, it lifted straw bales already distributed at set intervals along the road, and placed them above the cutbanks. It then performed hillslope work, excavating crossings on the secondary road and skid trails. The excavator performed its work without the assistance of a tractor.

Table 1. SUMMARY COSTS OF EROSION-CONTROL REHABILITATION WORK: UNIT 83-7

| Phase                    | Task                                           | --RNP Employees--         |          | Heavy<br>Equipment<br>Rental | Redwoods<br>United | Total<br>Task<br>Costs | %<br>Total<br>Cost | Phase<br>Totals | Phase<br>% |
|--------------------------|------------------------------------------------|---------------------------|----------|------------------------------|--------------------|------------------------|--------------------|-----------------|------------|
|                          |                                                | Geologist &<br>P.S. Tech. | Laborers |                              |                    |                        |                    |                 |            |
| Evaluation<br>Phase      | Mapping <sup>1</sup>                           | --                        | --       | --                           | --                 | --                     | --                 | \$1,102         | 4          |
|                          | Prescriptions,<br>Planning, &<br>Documentation | \$1,102                   | --       | --                           | --                 | \$1,102                | 4                  |                 |            |
| Heavy Equipment<br>Phase | Primary Treatments                             | \$1,887                   | --       | \$21,547                     | --                 | \$23,434               | 77                 | \$27,018        | 88         |
|                          | Secondary Treatments                           | 54                        | --       | 298                          | --                 | 352                    | 1                  |                 |            |
|                          | Access Costs                                   | --                        | --       | 1,319                        | --                 | 1,319                  | 4                  |                 |            |
|                          | Miscellaneous Costs                            | --                        | --       | 1,913                        | --                 | 1,913                  | 6                  |                 |            |
| Labor Intensive<br>Phase | Primary Treatments                             | --                        | --       | --                           | --                 | --                     | --                 | \$2,483         | 8          |
|                          | Secondary Treatments                           | \$33                      | \$644    | --                           | \$706              | \$1,383                | 4                  |                 |            |
|                          | Travel Time                                    | --                        | 301      | --                           | 799                | 1,100                  | 4                  |                 |            |
|                          | Miscellaneous                                  | --                        | --       | --                           | --                 | --                     | --                 |                 |            |
| Totals                   |                                                | \$3,076                   | \$945    | \$25,077                     | \$1,505            |                        |                    |                 |            |
|                          |                                                | GRAND TOTAL = \$30,603    |          |                              |                    |                        |                    |                 |            |

<sup>1</sup>Mapping completed in 1981 by Spreiter and Johnson.

<sup>2</sup>Most prescriptions completed in 1981 by Spreiter and Johnson.

Starting one day after the excavator, the D7 was the next piece to begin work. It outsloped all of the isolated road segments of the secondary road that crossed Elk Camp Prairie. Once the hillslope work was completed, the hydraulic excavator and tractor initiated the first road crossing excavation on the W-Line. The D8 was delivered at this time. It performed preliminary excavations at road crossings and initiated the road outsloping while the D7 and excavator completed a crossing excavation. In many cases, the excavator was able to work unassisted at a crossing, allowing the tractors enough time to complete road outsloping between crossings. Specifically, the tractors performed 99 percent of all road outsloping, allowing the excavator to focus entirely on stream channel excavations.

Once all W-Line stream crossings were completed, the excavator was terminated, leaving the two tractors to complete the work on this unit. Together they erased the rock pit and northernmost segments of the secondary road from Elk Camp Prairie, and outsloped the W-Line to the Bald Hills Road.

The total heavy equipment cost (less supervision) was \$25,077, or 82 percent of the total rehabilitation cost. Of this total, primary and secondary treatments accounted for 77 and 5 percent, respectively. Access and miscellaneous costs accounted for an additional 10 percent (refer to Table 1).

Average heavy equipment costs are listed in Table 3. A complete breakdown of all equipment hours by task is included in Appendix A. The W-Line Road outsloping cost listed in Table 3 represents only those road segments which were outsloped with material retrieved from the road prism. In other words, fill outsloping costs are accounted for in the haul road crossings excavation costs. Road segments were not surveyed prior to equipment work so, unfortunately, units of work are reported in miles rather than volumes.

#### Evaluation of Heavy Equipment Application

In general, the three pieces of equipment hired for this project were well suited for the work. All three of the operators had just completed similar work in the park, and, by this time, were well experienced with this type of work. Additionally, the work performed was well within the capabilities of each piece of equipment.

Table 4 summarizes haul road and skid trail crossing excavation costs. Road crossing excavations averaged \$1.37/yd<sup>3</sup> for 13 crossings. As can be seen from Table 4a, only one medium-size crossing was treated and its cost was \$3.14/yd<sup>3</sup>. This cost is inconsistently high compared to other costs for this unit, and there is no clear explanation why. In general, the road crossing excavation costs were very good and reflect operator experience, efficient equipment application, and the advantage of straightforward sequencing.

Skid trail excavation costs averaged \$1.12/yd<sup>3</sup> for four crossings on the secondary road and one crossing on the hillslope. The hydraulic excavator performed the work without the assistance of a tractor which was one factor for the low unit cost. This was an efficient approach to the excavation of small crossing, because the excavator can generally reach everything from a single setting and dispose of its own dirt.

Table 3. SUMMARY OF AVERAGE HEAVY EQUIPMENT COSTS: UNIT 83-7

| Treatment                                 | # of Work-sites | Total Quantity       | Total Cost | Avg. Cost Worksite | Avg. Cost Quantity     | Range Cost/Quant.                  |
|-------------------------------------------|-----------------|----------------------|------------|--------------------|------------------------|------------------------------------|
| <u>Primary Treatments</u>                 |                 |                      |            |                    |                        |                                    |
| Haul road crossings                       | 13              | 6356 yd <sup>3</sup> | \$8,702    | \$669              | \$1.37/yd <sup>3</sup> | $\frac{\$.75 - 3.14}{\text{yd}^3}$ |
| Skid trail crossings                      | 5               | 760 yds              | 850        | 170                | \$1.12/yd <sup>3</sup> | $\frac{\$.71 - 1.27}{\text{yd}^3}$ |
| Road ripping                              | unit            | 1.5 mi.              | 962        | --                 | \$641/mi.              | --                                 |
| W-Line Road <sup>1</sup> outsloping       | unit            | 1.2 mi.              | 5,262      | --                 | \$4,385/mi.            | --                                 |
| W-Line Road <sup>1</sup> total outsloping | 1               | 150 ft.              | 1,660      | --                 | \$11.06/ft.            | --                                 |
| Upper prairie road outsloping             | unit            | 0.5 mi.              | 1,488      | --                 | \$2,976/mi.            | --                                 |
| Rock pit restoration                      | 1               | job                  | 2,250      | --                 | --                     | --                                 |
| Arch. site & landing                      | 1               | job                  | 373        | --                 | --                     | --                                 |
| Total Primary Treatment Costs             |                 |                      | \$21,547   |                    |                        |                                    |
| <u>Secondary Treatments</u>               |                 |                      |            |                    |                        |                                    |
| Place straw                               | unit            | 520 bales            | \$298      | --                 | \$.57/bale             | --                                 |
| Total Secondary Treatment Cost            |                 |                      | \$298      |                    |                        |                                    |
| <u>Access Costs</u>                       |                 |                      |            |                    |                        |                                    |
| Lowboy                                    | --              | 4 moves              | \$1,036    | --                 | \$259/move             | --                                 |
| Travel <sup>2</sup>                       | unit            | --                   | 283        | --                 | --                     | --                                 |
| Total Access Cost                         |                 |                      | \$1,319    |                    |                        |                                    |

Table 3 - cont'd. SUMMARY OF AVERAGE HEAVY EQUIPMENT COSTS: UNIT 83-7

| Treatment                        | # of Work-sites | Total Quantity | Total Cost      | Avg. Cost Worksite | Avg. Cost Quantity | Range Cost/Quant. |
|----------------------------------|-----------------|----------------|-----------------|--------------------|--------------------|-------------------|
| <u>Miscellaneous Costs</u>       |                 |                |                 |                    |                    |                   |
| Preliminary jobs                 | 1               | 1 job          | \$59            | --                 | --                 | --                |
| Non-productive <sup>3</sup> time | unit            | --             | 1,364           | --                 | --                 | --                |
| Administrative <sup>4</sup> time | unit            | --             | <u>490</u>      | --                 | --                 | --                |
| Total Miscellaneous Costs        |                 |                | \$1,913         |                    |                    |                   |
| TOTAL HEAVY EQUIPMENT COSTS      |                 |                | <u>\$25,077</u> |                    |                    |                   |

<sup>1</sup>Yardage excavated during road outslowing is not available.

<sup>2</sup>Time associated with equipment relocation on the unit and recorded only if greater than 15 minutes/relocation.

<sup>3</sup>Paid break time averaging 1/2 hour/day.

<sup>4</sup>Time spent discussing work and/or safety; recorded if greater than 15 minutes/discussion.

Table 4a. SUMMARY OF HAUL ROAD CROSSINGS COST: UNIT 83-7

| Type of<br>Worksite                  | # of<br>Sites | Range<br>Volume<br>of fill | Equip.         | Range<br>Hours                           | Avg. Cost<br>Worksite | Range<br>Cost | Avg. Cost<br>yd <sup>3</sup> | Range<br>Cost/yd <sup>3</sup>         |
|--------------------------------------|---------------|----------------------------|----------------|------------------------------------------|-----------------------|---------------|------------------------------|---------------------------------------|
| Small<br>(100-400 yd <sup>3</sup> )  | 8             | 127-400 yd <sup>3</sup>    | D7<br>D8<br>HE | 1/2 - 3<br>1/2 - 3<br>3/4 - 3            | \$274                 | \$161-582     | \$1.12/yd <sup>3</sup>       | \$ <u>.75-1.45</u><br>yd <sup>3</sup> |
| Medium<br>(400-800 yd <sup>3</sup> ) | 1             | 626 yd <sup>3</sup>        | D7<br>D8<br>HE | 7 3/4<br>7 1/2<br>6 1/4                  | \$1,965               | --            | \$3.14/yd <sup>3</sup>       | --                                    |
| Large<br>(800-2000 yd <sup>3</sup> ) | 4             | 868-1034 yd <sup>3</sup>   | D7<br>D8<br>HE | 1 1/4 - 10 1/2<br>1 3/4 - 5<br>1 1/2 - 7 | \$1,135               | \$788-1557    | \$1.18/yd <sup>3</sup>       | \$ <u>.89-1.55</u><br>yd <sup>3</sup> |

Table 4b. SKID TRAIL CROSSINGS COSTS: UNIT 83-7

| Type of<br>Worksite                     | # of<br>Sites | Range<br>Volume<br>of fill | Equip. | Range<br>Hours | Avg. Cost<br>Worksite | Range<br>Cost | Avg. Cost<br>yd <sup>3</sup>   | Range<br>Cost/yd <sup>3</sup>          |
|-----------------------------------------|---------------|----------------------------|--------|----------------|-----------------------|---------------|--------------------------------|----------------------------------------|
| Extra Small<br>(0-100 yd <sup>3</sup> ) | 3             | 30-50 yd <sup>3</sup>      | HE     | 1/4 - 3/4      | \$35                  | \$21-63       | \$ <u>.90</u> /yd <sup>3</sup> | \$ <u>.71-1.27</u><br>yd <sup>3</sup>  |
| Small<br>(100-400 yd <sup>3</sup> )     | 2             | 300-350                    | HE     | 4 - 4 3/4      | \$372                 | \$340-404     | \$1.14/yd <sup>3</sup>         | \$ <u>1.13-1.15</u><br>yd <sup>3</sup> |

Of course, the experienced nature of the operator was another prime factor.

As a heavy equipment application to perform secondary treatments, the hydraulic excavator was extremely cost-effective with the distribution of straw. With the assistance of a single worker to stand a bale and tip it into the bucket, the excavator placed 520 bales of straw above the cutbank of the W-Line in 3 1/2 hours (including travel time). This resulted in a cost of \$.57/bale and a placement rate of 2 1/2 bales/minute. If travel time were excluded; i.e., the excavator would travel this route anyway, placement costs computed to \$.37/bale. Based on past experience, labor crews have averaged 7 bales/hour/person over an entire workday (actually 7 hours of work) and cost \$1.73/bale. Besides the savings in time and cost, the safety hazard of climbing up a cutbank with a 70-pound bale of straw was eliminated.

#### Labor Intensive Phase

Labor work was performed by Redwood National Park and Redwoods United, Inc. labor crews. They spread straw (approximately 2,000 lb/acre) over most the length of the W-Line, and spread fertilizer, grass seed, and straw on the treated rock pit.

The total labor costs (less supervision) was \$2,483 or 8 percent of the total rehabilitation costs. Of this total labor cost, transportation accounted for 44 percent. Average labor costs are summarized in Table 5. In general, we received excellent field support from the labor crew.

Table 5. SUMMARY OF AVERAGE LABOR COSTS: UNIT 83-7

| Treatment                        | Type of Labor    | Total Person Hours | Avg. Cost Per Hour | Total Cost | Quantity                                      | Avg. Cost Quantity |
|----------------------------------|------------------|--------------------|--------------------|------------|-----------------------------------------------|--------------------|
| <u>Primary Treatments - None</u> |                  |                    |                    |            |                                               |                    |
| <u>Secondary Treatments</u>      |                  |                    |                    |            |                                               |                    |
| Distribute straw                 | RNP <sup>1</sup> | 27                 | \$8.37             | \$259      | 600 bales                                     | \$2.32/bale        |
|                                  | RNP <sup>2</sup> | 3 1/2              | \$9.43             |            |                                               |                    |
| Spread straw                     | RNP <sup>1</sup> | 46                 | \$8.37             | \$955      | 600 bales                                     | \$.63/bale         |
|                                  | RUI              | 67                 | \$8.50             |            |                                               |                    |
| Seed & fertilize rock pit        | RNP <sup>1</sup> | 4                  | \$8.37             | \$169      | 2 acres<br>(440 lbs seed; 175 lbs fertilizer) | \$84.74/acre       |
|                                  | RUI              | 16                 | \$8.50             |            |                                               |                    |
| Total Secondary Cost             |                  |                    |                    | \$1,383    |                                               |                    |
| <u>Travel Time</u>               |                  |                    |                    |            |                                               |                    |
|                                  | RNP <sup>1</sup> | 36                 | \$8.37             | \$1,100    |                                               |                    |
|                                  | RUI              | 94                 | \$8.50             |            |                                               |                    |
| Total Travel Cost                |                  |                    |                    | \$1,100    |                                               |                    |
| TOTAL LABOR COST                 |                  |                    |                    | \$2,483    |                                               |                    |

<sup>1</sup>Redwood National Park labor crew.<sup>2</sup>Hydrologist/Physical Science Technician (Geologist).

## 83-7: W-line/Elk Camp Prairie Rehabilitation Unit Revegetation Report

## INTRODUCTION

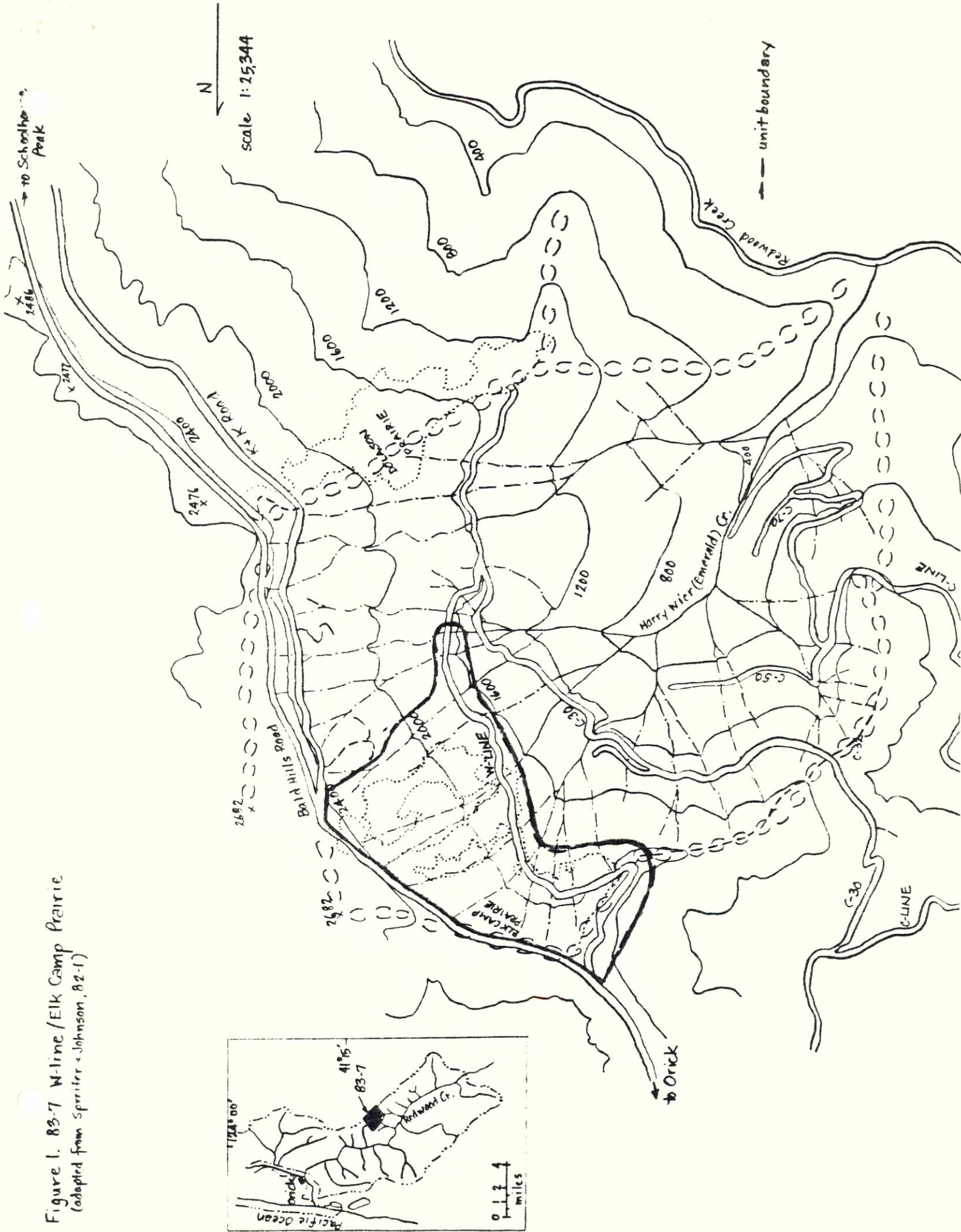
Site Description.

The W-line/Elk Camp Prairie Rehabilitation Unit (83-7) is located on the east side of Redwood Creek about 13 miles from the Orick Operations Center via Bald Hills Road (Figure 1). The unit encompasses 240 acres, mainly prairie, in the upper reaches of the Harry Wier (Emerald) Creek drainage. Elevation ranges from 1650 at the southern end of the unit to 2400 feet at the northern boundary, Bald Hills Road. The general aspect is southwest with moderate slopes, 25-65 percent.

Soils along the W-line are mainly mass movement colluvium similar to Atwell soils. These deep, wet soils often exhibit poor drainage. Many seeps and springs emerge during winter and spring. Revegetation is rapid, especially in prairie areas with topsoil available. Areas prone to mass movement have steeper slopes where deep cuts have intercepted drainage. Concentrated water from skid trails on saturated slopes has contributed to recent mass movement failures along the road. Roads across these soils can be fairly stable when placed on slopes less than 15 percent with cut slopes of less than 30 percent. Most of W-line was stable at the time of rehabilitation. (See Popenoe for more complete soil information.)

Four main vegetation types are found in the unit: prairie, oak woodland, uncut redwood forest, and second growth forest (including recent logged units). Since settlement, the prairie has been heavily grazed by cattle

Figure 1. 83-7 W-line / Elk Camp Prairie  
(adapted from Spritzer & Johnson, 82-1)



and sheep. Since the ranch house was relinquished in 1982, deer and elk have become frequent grazers in Elk Camp Prairie. The Oregon white oak (Quercus garryana) woodlands nearest the W-line have been encroached by Douglas-fir (Pseudotsuga menziesii). Sufficient time since invasion has elapsed that portions of the oak woodland have been converted to forest. Along the stream channels where oak is abundant, red alder (Alnus rubra) is found mixed with the oaks.

Uncut forest vegetation is dominated by old-growth redwood (Sequoia sempervirens) with a large component of Douglas-fir, madrone (Arbutus menziesii), and tanoak (Lithocarpus densiflorus). Post-logging vegetation in cut areas is mainly coyote brush (Baccharis pilularis var. consanguinea) and some blueblossom (Ceanothus thyrsiflorus). Red alder is invading the moist inboard ditches along the road.

Several forested areas were cut prior to construction of W-line (Figure 2). The first one-third mile of W-line along the ridge was constructed in 1971 to provide access to units cut that year. By 1973, the C-30 road was extended to near Dolason Prairie. Extensive logging was conducted both above and below the road. A secondary haul road was constructed across the prairie and many skid trails traverse the cut unit above the C-30 road. By 1976, the W-line was extended from the ridge to Dolason Prairie. The new road did not follow existing road or skid trail patterns, so several W-line road stream crossings have other stream crossings located nearby.

The main erosion problem was sediment capable of entering stream channels. Potential sediment sources from the 13 properly constructed stream crossings



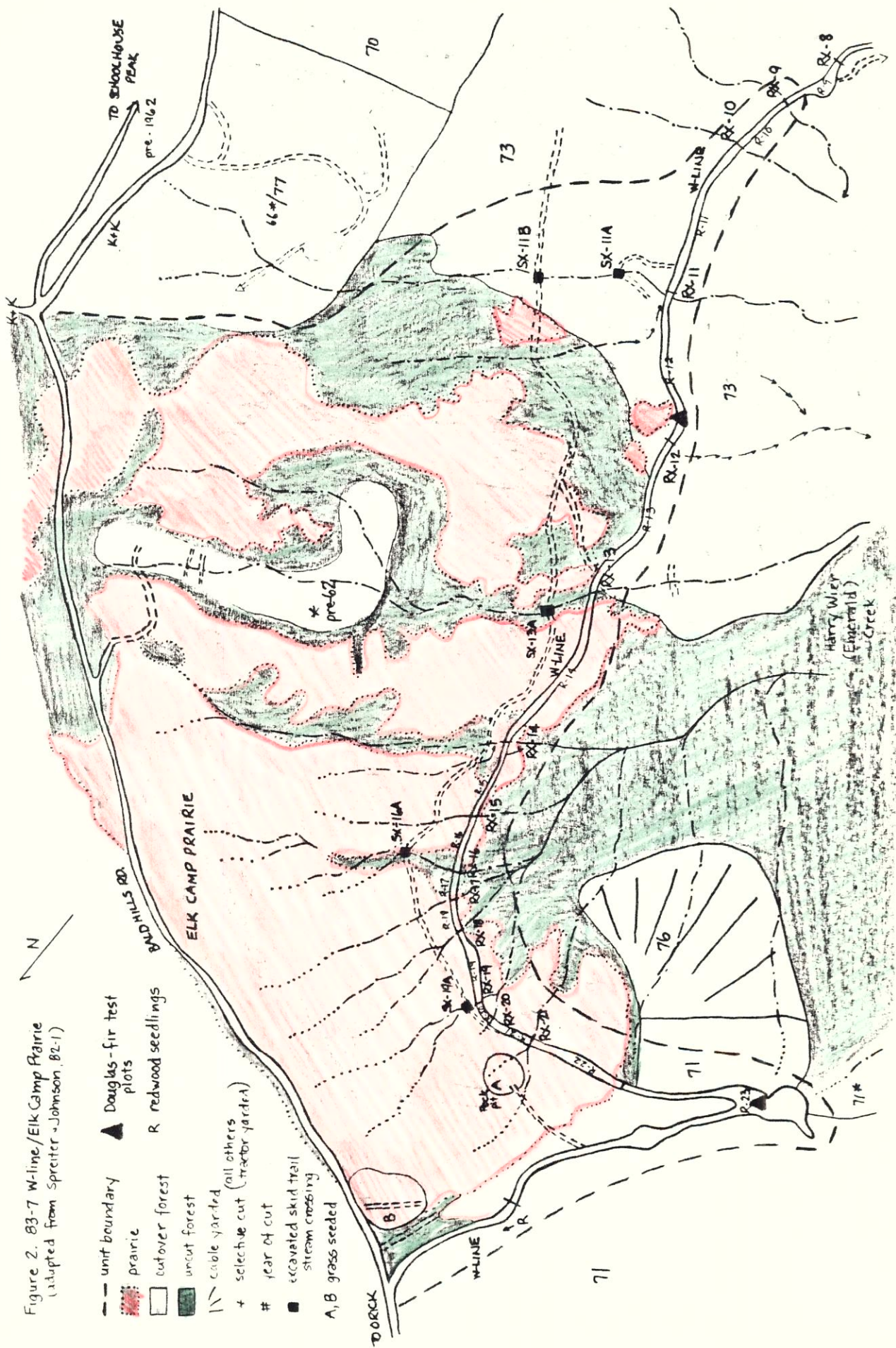
Figure 2. 83-7 W-line/Elk Camp Prairie (adapted from Spreiter & Johnson, 82-1)

Legend:

- unit boundary
- Douglas-fir test plots
- prairie
- cutover forest
- uncut forest
- cable yarded
- selective cut (all others)
- year of cut
- excavated skid trail
- stream crossing
- A, B grass seeded

Map Labels:

- TO SCHOOLHOUSE PEAK pre-1962
- KVK
- 66\*/77
- 70
- 73
- 76
- 71
- 71\*
- DORCK
- W-LINE
- R-11
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on W-Line were removed. Five older and actively eroding secondary haul road and skid trail stream crossings which were contributing sediment directly into stream channels were treated. Crossings were excavated to restore pre-road channel geometry.

The rockpit ("A" in Figure 2) and Elk Camp Prairie received special treatments since they are highly visible from Bald Hills Road. Heavy equipment attempted to reconstruct the natural morphology of the prairie. Outsloping roads, removing stream crossings, redistributing quarried rock and covering the rockpit with topsoil were prescribed to enhance the aesthetic value of the prairie.

Heavy equipment operations removed the final 1.5 miles of W-Line between September 12-27, 1983. (See Spreiter and Johnson, 1980 and 1982 for previous W-Line road removal projects.) One mile of secondary haul road was removed. Most of W-Line was outsloped but only the prairie portions of the secondary road were outsloped. One section of R-23 on the ridge was ripped only. All of the rest of W-Line was ripped and outsloped, except R-12 which was totally outsloped. W-Line was strawed up to R-23. Most of the secondary road was strawed. The rockpit was strawed, but no straw was available for the disturbing area "B" in the northeast corner of the unit. (See Bundros and Burns, 1983 for a detailed description of heavy equipment work completed on this unit.)

#### Revegetation Objectives.

The revegetation objectives at W-Line/Elk Camp Prairie were straightforward: re-establish prairie on outsloped road through prairie areas, re-establish conifers on roads through cutover and unlogged forested areas. Since most

disturbance by heavy equipment fixing road removal across the prairie was minimal areas were strawed to reduce surface erosion and abundant seed source available, no grass seeding was prescribed. Even though a layer of soil was spread on the rockpit. The entire two acre site was seeded. Straw was spread over the rockpit shortly after seeding since none was available at seeding time. The relatively flat at the top of the prairie area ("B") adjacent to a prairie sampling plot, was seeded but left unstrawed.

Douglas-fir seedlings were planted on W-Line road sections where forest restoration was desired. Douglas-fir survival is expected to be high where drainage is adequate, low where ponded water or saturated soil conditions persist. Survival is expected to be high since the redwoods were planted in a fairly protected area with adequate soil moisture. Forest sections of the secondary have road were narrow with good seed source from the surrounding uncut forest so were not planted. Only a few redwood seedlings were available for planting. More redwood seedlings should be planted in the future, if available.

#### VEGETATION TREATMENTS

Grass seed was sown on on large, bare areas ("A" & "B") in Elk Camp Prairie on September 29, 1983, two days after heavy equipment operations were completed. The mild, warm weather allowed uncomplicated sowing. Approximately 440 pounds of seed was spread on about 2 2/3 acres at a rate of 165#/A. Table 1 gives the species composition of the seed mix.

TABLE 1. 83-7: W-Line/Elk Camp Prairie Grass Seed Mix

| Scientific Name                                                     | Common Name                 | # Of Seeds Used | Date Of Purchase |
|---------------------------------------------------------------------|-----------------------------|-----------------|------------------|
| <u>Festuca rubra</u>                                                | Creeping Red Fescue         | 150             | 1982             |
| <u>Festuca ovina</u><br>var. <u>duriscula</u>                       | Durarhard Fescue            | 50              | 1980             |
| <u>Bromus mollis</u><br>(= <u>B. hordaceus</u> )                    | Blando Brome                | 120             | 1980             |
| <u>Trifolium subterraneum</u>                                       | Mt. Barker subclover        | 25              | 1980             |
| <u>Agrostis tenuis</u>                                              | Highland colonial Bentgrass | 10              | 1979             |
| <u>Festuca megalura</u> <sup>2</sup><br>(= <u>Vulpia megalura</u> ) | Zorro Fescue                | 10              | 1981             |
| Dry Mix                                                             | mixes of above              | <u>75</u>       | 1980             |
| TOTALS                                                              |                             | 440             |                  |

The rate was higher than the usual 50 pounds per acre because germination was expected to be low. (The actual germination rates were not determined.) Most of the seed was 3-4 years old and had been stored in less than ideal conditions. The heavy rate was to reduce the inventory of old seed. The purchase price of the grass seed was not listed due to the questionable viability and unusually high rates.

The seed was mixed in large metal garbage cans just before sowing. The subclover was inoculated with the appropriate Rhizobium bacteria at that time also. One hundred seventy-five pounds of ammonium phosphate/sulfate (15-20-0-13) fertilizer was spread of part of the rock pit. All labor was provided by a Redwoods United, Inc. crew.

The three-person crew seeded and fertilized the area in 4 hours. An in-house Labor Leader, the Redwoods United Supervisor and a Biological Technician provided supervision and mixed and distributed the grass seed and fertilizer. Straw was spread on the rock pit the next week to prevent seed wash during fall rains. Figure 3 shows the areas that were seeded and fertilized. Table 2 gives a summary of grass seeding in Elk Camp Prairie. Table 3 lists labor and hours worked by seeding personnel and supervisors. No seedlings were ordered since the W-Line project was not anticipated when seedling orders were placed in Spring 1983. Seedlings purchased for other rehabilitation units but not needed due to changes in heavy equipment work completed were planted at W-Line. Two year old bareroot Douglas-fir seedlings were purchased from Arcata Lumber Company Nursery in Smith River, California. A few redwood seedlings found after planting on other sites had been completed were also planted at W-Line. These seedlings were one-year old containerized stock purchased from Louisiana-Pacific Corporation Nursery in Crannel, CA and were grown in styroblocks with one-inch by six-inch cavaties. A total of \$298.83 was spent on plant materials, including the cost to transport seedlings to the rehabilitation site, or \$0.140 per seedling. Seedling costs are listed in Table 4.

TABLE 2. 83-7: W-Line/Elk Camp Prairie Grass Seeding Summary

| DATE     | SITE | AREA(A) | #GRASS SEED | RATE<br>#FERTILIZER | RATE |
|----------|------|---------|-------------|---------------------|------|
| 9/29/83. | A    | 2.0     | 330 165#/A  | 175 <sup>1</sup>    | 250  |
| 9/29/83  | B    | 0.67    | 110 165#/A  | 0                   | 0    |
| TOTAL    |      | 2.67    | 440         |                     |      |

(1) Fertilizer only applied to part of rockpit (2/3 A) see Figure 4.

Figure 3. 83-7 W-line Elk Camp Prairie  
VEGETATION TREATMENTS

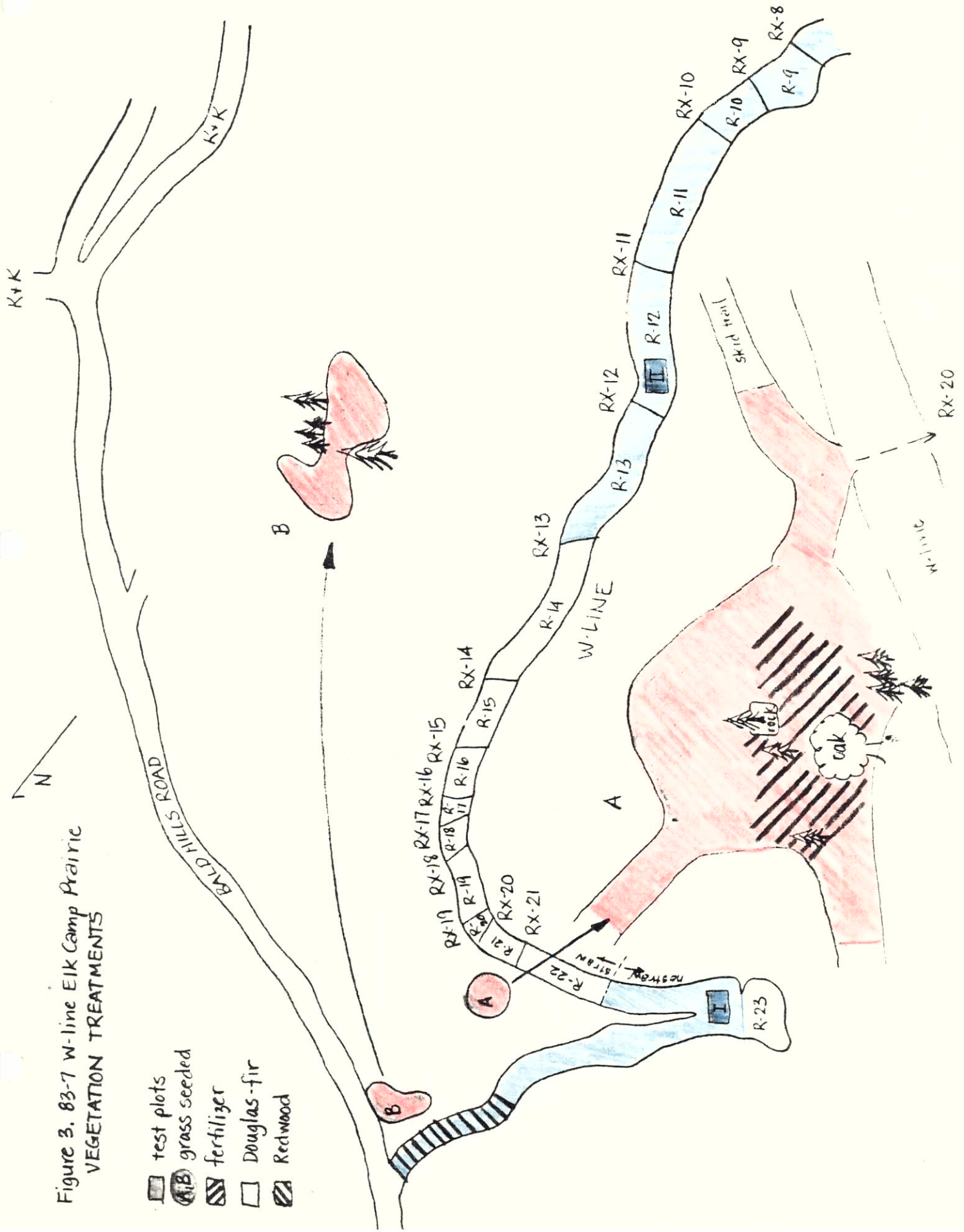


TABLE 3. 83-7: W-Line/Grass and Fertilizer Labor Cost Summary

| DATE    | LABOR CREW            | HOURS | PERSONNEL COSTS | TRANSPORTATION COSTS | OVERHEAD COSTS | TOTAL COST |
|---------|-----------------------|-------|-----------------|----------------------|----------------|------------|
| 9/29/83 | Biological Technician | 6     | 58.34           | 7.67                 |                | 66.01      |
|         | In-house laborers     | 4     | 35.74           |                      |                | 35.74      |
|         | Redwoods United, Inc. | 17    | 110.10          | 25.00                | 24.32          | 159.42     |
| TOTALS  |                       | 27    | \$204.18        | 32.67                | 24.32          | 251.17     |

TABLE 4. 83-7: W-Line/Elk Camp Prairie confier seedling costs.

| PLANT MATERIALS | # PLANTED | MATERIALS Cost/Tree | COSTS Subtotal | TRANSPORTATION COSTS Cost/Tree | Subtotal | Total    |
|-----------------|-----------|---------------------|----------------|--------------------------------|----------|----------|
| Douglas-fir     | 2100      | \$0.12              | \$252.00       | \$0.02 <sup>1</sup>            | \$42.00  | \$294.00 |
| Redwood         | 30        | \$0.149             | 4.47           | \$0.012 <sup>2</sup>           | \$ 0.36  | 4.83     |
| TOTALS          | 2130      |                     | \$256.47       |                                | \$42.36  | \$298.83 |

Overall cost/tree \$0.140

1 Costs include vehicle and labor to transport seedlings from Arcata Lumber Company Nursery, Smith River to Orick and to rehabilitation site.

2 Costs include vehicle and labor to transport seedling from Louisiana-Pacific Nursery, Crannell to Orick and to rehabilitation site.

All planting stock was in good condition at planting time. Part of two days, January 24-25, 1984 was required to plant the entire site. Treeplanting was completed by Redwoods United Inc. crews with supervision by 2 in-house Labor Leaders in addition to Redwoods United supervisory personnel. The fair planting conditions and easy access enabled the crews to work rapidly. Seedlings were planted at eight-foot spacings starting with Rx-8 (see Johnson 1983 83-5 heavy equipment rehabilitation). Planting was done with dibbles and hoedads. No fertilizer tablets or browsing protection were used. A total of ----- acres were planted with 2130 Douglas-fir seedlings and 30 Redwood seedlings. The redwood seedlings were all planted near the end of the W-Line road near Bald Hills Road (Figure 3). Table 5 gives a summary of treatments.

Labor costs for tree planting were \$617.59 or \$0.29 per tree. Combined cost for purchase and planting of seedlings was \$916.42 or \$0.43 per tree. Table 6 lists labor costs for tree planting. Included in the cost is approximately 1 hour per person non-planting time to allow for transit to and from site, loading trees and planting tools. Table 7 gives all revegetation labor costs for the 83-7 unit.

TABLE 5. 83-7: W-Line/Elk Camp Prairie Tree Planting Summary

| DATE    | SITES                      | AREA(Sq. ft)   | NO. OF TREES PLANTED |         |
|---------|----------------------------|----------------|----------------------|---------|
|         |                            |                | Douglas-fir          | Redwood |
| 1/24/84 | Rx-8 <sup>1</sup> to Rx-13 | 105600         | 1650                 | 0       |
| 1/24/84 | R-23 (Upper)               |                |                      | 30      |
| 1/25/84 | R-23                       | 28800          | 450                  |         |
| TOTAL   |                            | 134400 (3.1 A) | 2100                 | 30      |

(1) Heavy equipment work on Rx-8 performed during 83-5 rehabilitation but planted with 83-7.

TABLE 6. 83-7: W-Line/Elk Camp Prairie Tree Planting Labor Cost Summary

| DATE    | LABOR CREW            | HOURS | PERSONNEL COSTS | TRANSPORTATION COSTS | OVERHEAD COSTS | TOTAL COST |
|---------|-----------------------|-------|-----------------|----------------------|----------------|------------|
| 1/24/84 | In-house Laborers     | 10    | 93.95           | 9.09                 |                | 103.04     |
|         | Redwoods United, Inc, | 48    | 309.76          | 62.50                | 67.00          | 439.26     |
| 1/25/84 | In-house Laborers     | 1     | 9.86            | 11.08                |                | 20.94      |
|         | Redwoods United, Inc. | 6     | 33.56           | 12.50                | 8.29           | 54.35      |
| TOTAL   |                       | 65    | 447.13          | 95.17                | 75.29          | 617.50     |

#### TEST PLOTS On April 23, 1984

Two test plots were established on this site to document Douglas-fir survival. Plot 1 is on R-23 at the bend of the road, an unmulched site delineated by four blue and red wooden stakes. Twenty-five Douglas-fir were counted within

the area again, none were browsed. Both sites are southwest facing and located on a ridge. These sites should give accurate survival information for the site. Survival and browsing will be checked periodically. Since so few redwoods were available for planting on this rehabilitation unit, no survival plots were set up. If redwood is available in future years, the site would benefit from planting. The landing on the Westside of R-23 would make a good redwood test plot. Cut Douglas-fir trees have been spread on most of the landing.

TABLE 7. 83-7: W-Line/Elk Camp Prairie Rehabilitation Unit Revegetation Costs.

GRASS SEEDING

| <u>Redwood National Park</u>       | <u>Hours</u> | <u>Costs</u>   |
|------------------------------------|--------------|----------------|
| Biological Technician <sup>1</sup> | 6            | 58.34          |
| Transportation <sup>2</sup>        |              | 7.67           |
| Subtotal                           |              | \$ 66.01       |
| In-house Labor <sup>3</sup>        | 4            | 35.74          |
| Transportation <sup>4</sup>        |              | 0              |
| Subtotal                           |              | 35.74          |
| <u>Redwood United, Inc.</u>        |              |                |
| Personnel                          | 17           | 110.10         |
| Transportation                     |              | 25.00          |
| Overhead <sup>5</sup>              |              | 24.32          |
| Subtotal                           |              | \$159.42       |
| TOTAL SEEDING COST                 |              | \$261.17/2.67A |
| COST PER ACRE                      |              | 97.82          |

TREE PLANTING

Redwood National Park

|                |    |        |
|----------------|----|--------|
| In-house Labor | 11 | 103.81 |
| Transportation |    | 20.17  |
| Subtotal       |    | 123.98 |

| <u>Redwood United, Inc.</u>  | <u>Hours</u> | <u>Costs</u>        |
|------------------------------|--------------|---------------------|
| Personnel                    | 54           | 343.32              |
| Transportation               |              | 75.00               |
| Overhead                     |              | 75.29               |
| Subtotal                     | 92           | \$493.61            |
| TOTAL TREE PLANTING COST     |              | \$617.59/2100 trees |
| COST PER TREE                |              | 0.294               |
| TOTAL REVEGETATION COSTS     |              | \$878.76            |
| PLANNING AND REPORTS         |              |                     |
| <u>Biological Technician</u> |              |                     |
| General                      | 12           | 120.28              |
| Experimental                 | 2            | 20.05               |
| Reports                      | 40           | 400.92              |
| Subtotal                     | 54           | \$541.28            |
| TOTAL HOURS                  | 146          |                     |

1. Wages include 11% for government benefits - term employees.
2. Transportation includes 97 mi. X \$0.16/mi. plus 2 days @ \$3.67/day.
3. Wages include 7% for government benefits - temporary employees.
4. Transportation includes 147 mi. x \$0.19/mi. (Ave.) plus 3 days @ \$4.86/day (Ave.)
5. 18% Administrative charge on wages plus transportation.



Unit: 83-7 W-Line Rehab 9/83



Unit: 83-7 W-Line Before



Unit: 83-7 W-Line After Rehab