

SUMMARY OF EROSION CONTROL REHABILITATION WORK

LOWER SLIDE CREEK

UNIT 81-2

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and

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May 1982

(pnew)

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INTRODUCTION

The Lower Slide Creek Unit, 81-2, is located on the east side of Redwood Creek about 16 miles from Orick. The unit includes the lower portions of No Name, Slide, and Poison Oak (P.O.) drainages. The boundaries are the Maneze/No Name Creek divide on the south, the Airstrip/P.O. Creek divide on the north, the K & K Road on the east, and Redwood Creek on the west. The boundaries encompass 792 acres; mapping was concentrated in the 331 acre logged area between the K & K and 2005 roads and on the 157 acres of prairie, with a total of 488 acres mapped in detail.

Relief in the Slide Creek drainage ranges from 250 feet on Redwood Creek to about 2500 feet on the Bald Hills Ridge. Within the Lower Slide Creek Unit, the highest elevation is 2000 feet on the K & K Road. Slopes are moderate, averaging between 30 and 50 percent.

The drainage area of Slide Creek (upper and lower) is 794 acres. At the mouth of Slide Creek, the calculated 25-year discharge is 611 cfs (using Klamath 10-year data and a runoff coefficient of .35). The drainage area of No Name Creek is approximately 170 acres; 25-year discharge is estimated to be 140 cfs at the mouth.

Original Road Network

The K & K runs along the upper boundary of the unit (elevation 1000-2000 feet) for two miles, with an average gradient of 10 percent. The two major haul roads on the unit, the 2005 and 2010 travel along the contour (at approximately 900 feet and 1200 feet elevation, respectively); their combined length is 3.7 miles. There are 1.5 miles of smaller roads, not used for timber harvest.

The lower road, 2005, is 1.5 miles long with old growth redwood and Douglas-fir below for most of its length. Only .9 mile was drivable in 1981, the major crossings had washed out and been rebuilt numerous times, and several areas were slumping. The road was heavily rocked with an inboard ditch, culverts with trash racks, and numerous wide pull-outs for the first .9 mile. The last .6 mile of the road had not been used since the sixties and was well vegetated. This section had no ditch, no culverts had been used, and the Humboldt crossing at P.O. Creek washed-out in 1964, shortly after construction. The road crossed the lower part of Count's Hill Prairie and ended at the prairie margin (.2 mile through the prairie).

The upper road, 2010, is 2.2 miles long; quarrying at the rock pit had blocked access for a number of years at the south end. Access at the north end was blocked by a deep gully only a year after construction. This road was rocked with shale from the rock pit. Ceanothus 30 feet tall overhung the road, but little vegetation existed on the road surface. Two of the major stream crossings (one culvert, one Humboldt crossing) had washed-out and the road was covered by landslides in two spots. A spur haul road ran across Count's Hill Prairie (.5 mile) to the Airstrip Creek drainage, crossing the earthflow. This was unrocked and unditched, but waterbarred, washed-out and slumped upon.

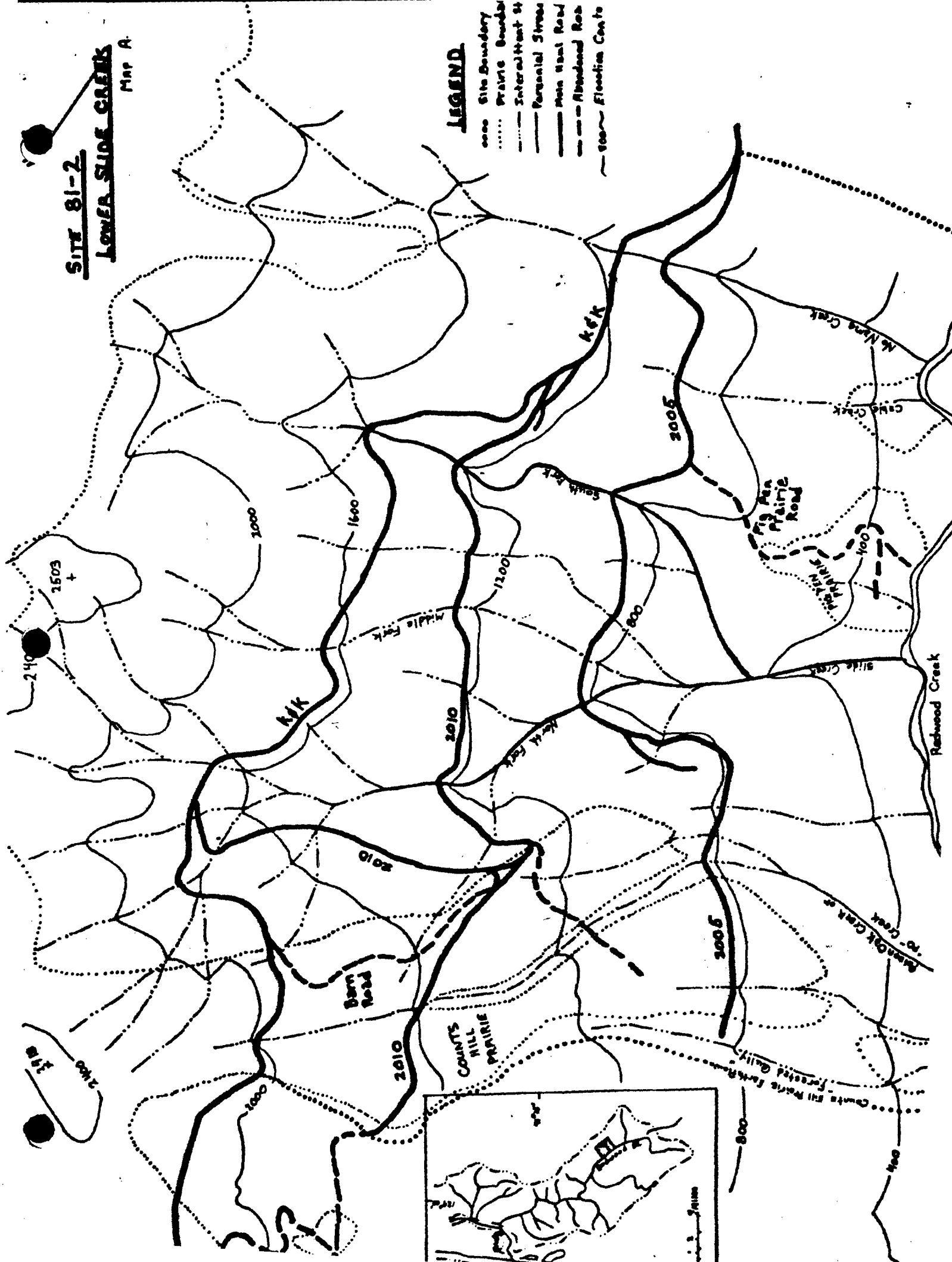
SITE 81-2

LOWEA SLIDE CREEK

Map A

LEGEND

- Site Boundary
- Prairie Boundary
- Intermittent St
- Perennial Stream
- Main Canal Road
- Abandoned Road
- Flowline Conto



Rehabilitation Work Summary

Total site cost ¹	\$105,146
Heavy equipment cost	\$93,190
Labor cost	\$11,956
Total length of all roads treated	4.8 miles
Haul roads treated - Total	2.5 miles
Through logged areas	1.9 miles
Through prairie	0.6 mile
Smaller prairie roads treated - Total	1.3 miles
Access roads used and restored	1.0 mile
Haul road crossings excavated	24 crossings
Unprotected crossings	11
Rocked crossings (530 cy used)	8
Swales or ditches	5
Skid trail crossings excavated	6 crossings
Gullies shaped	4--1965 linear feet
Landing outsloped	1
Outsloped roads - Total Length	4.1 miles
Cross road drains - Total Number ²	28
Ripped - Total Miles	2.0 miles
Access road used and restored	1.0 mile

¹Excludes supervision cost (geologist and technician).

²Includes 21 cross road drains reconstructed on Airstrip access road.

A steep, narrow road, .5 mile long, zig-zagged down through Pig Pen Prairie. This was waterbarred, and was probably never drivable except with a track-mounted vehicle. Another small, narrow road, 1.0 mile long, extended down through Count's Hill Prairie to an old barn site. This road had a wooden plank bridge, now collapsed, over P.O. Creek.

The logged portion of the unit, 331 acres, was criss-crossed with skid trails. At one time there were approximately 70 stream crossings on the unit (including haul road crossings). Many of these have washed-out.

Land Use History

Cultural Resources Statement for the Lower Slide Creek Watershed Rehabilitation Unit - - By Ann Smith.

The Lower Slide Creek watershed rehabilitation unit lies within the ethnographic territory of the Chilula Indians, also known as the Bald Hills or Redwood Creek people. Their territory included a portion of the Redwood Creek drainage extending from a few miles above Redwood Valley down to a few miles above the mouth and probably to the crests of the ridge systems on either side of the creek.

With regard to subsistence, the Chilula did not have full access to the coastal resources and Redwood Creek had only one yearly salmon run. It is thought, therefore, that the Redwood Creek Indians placed great emphasis on vegetable foods and game as well as on fish. During the year, various resources were utilized at the appropriate season and temporary camps or procurement sites were occupied away from permanent villages.

Archaeological survey on the east side of the Redwood Creek basin has shown that there was intensive use of the prairies and prairie margins in which are found prehistoric and ethnographic villages, trail use sites, temporary camps and sacred training areas. Specifically, within the Lower Slide Creek unit is the ethnographic village of Noledin (CA-HUM-234) which was occupied in the late 1800's by Indians who returned to the Redwood Creek basin from the Hoopa Valley to which they had been moved after the influx of Whites in the mid 1800's. It can be assumed that the Lower Count's Hill Prairie and margins were used directly for foods such as edible bulbs and grasses and tan oak acorns; basket materials such as hazel; and indirectly for the game which the prairie and prairie/forest ecotone attracted. In addition, the creek and its resources were in close proximity; the name Noledin means 'waterfall place', a reference to an excellent fishing pool area.

The historic sequence within the lower Redwood Creek basin began with the early explorers in the mid 1800's. With the discovery of gold in the Trinity region, traders and homesteaders and eventually cattle and sheep ranchers utilized the basin. Conflict between Whites and Indians was intense and native populations were greatly decimated. Ranching continued as the main economic activity until logging built up during the 1940's to the 1960's and 1970's.

Within the Lower Slide Creek unit, evidence of historic activities has been recorded. Early ranching equipment is located on the Counts Hill Prairie. The prairie itself undoubtedly served as pastureland for historic grazing. A Counts family, after whom Count's Hill Prairie was perhaps named, was living further up Redwood Creek in 1887. Pig Pen Prairie, located within the unit, was possibly named after early 20th Century pig raising activities.

Historical Structures and Finds

A barn was built on the lower part of Count's Hill Prairie, using square nails; burnt timbers and a few old farm implements are all that remain. Simpson apparently burned the barn in the early 1960's to keep squatters out. Hay may have been grown on some of the gentler slopes as evidenced by old mowers and a pitchfork.

Remnants of a small wooden structure can be found in the woods above Pig Pen Prairie; this was probably used in the hog raising days.

An old trail ran through the forest and across Count's Hill Prairie near where the 2005 Road was later built; this trail used to connect with Dolason Prairie near the old "half" barn (Doug Lane, pers. comm.).

A piece of an old Chilula burden basket was found in a hollow tree by timber cruisers in 1981.

An abandoned dwelling and greenhouse, built with ceanothus limbs, were found on a skid trail deep in the brush.

Timber Harvest History

The K & K Road was constructed during the late 1950's. This was the first major logging haul road through the Slide Creek drainage. The first timber harvest on the Lower Slide Creek (LSC) unit occurred along this road in 1959.

Between 1959 and 1969, approximately 252 acres of the LSC Unit were selectively logged. The majority of this area was cut between 1962 and 1966. All yarding was done by tractor; skid trail patterns are fairly random, and approximately 35 stream crossings existed.

Clearcutting of almost the entire unit above the 2005 Road occurred in 1970 and 1971. Almost all previously select-cut areas and some additional old growth stands were cut and tractor-yarded; total area affected was 287 acres. Again the skid trail patterns were random and approximately 70 stream crossings existed. The entire cut area appears to have been burned.

In 1976, an additional 20 acres below the 2005 Road was clearcut, cable-yarded and burned.

Overall, 331 acres or 42 percent of the site had been logged when the land became a national park in 1978 (none of the Slide Creek drainage was included in the original park "worm"). The remaining old growth (covering 304 acres or 38 percent of the unit) is located below the 2005 Road and along P.O. Creek.

For further details, please refer to the accompanying map and ^{the} historical air photo documentation in the Appendix.

NOTE: Acres cut in various years listed above do not add up to 331 acres because most areas were cut twice and a few areas were only cut once!

Road Construction History (and its relation to logging)

K & K Road

The K & K was built in the late 1950's by Simpson Timber Company to provide access to the Redwood Creek basin and a direct route from Klamath to Korbøl.

Over the years numerous fill failures and flow diversions have occurred due to road construction across steep, often wet slopes, and plugged or under-sized culverts.

When the park acquired the surrounding land it was felt that the road was generally well maintained (D. Hagans, pers. comm.). Simpson continues to use and maintain the road. There are some problems with the K & K and its maintenance, however, that are discussed later in the report.

2005 Road

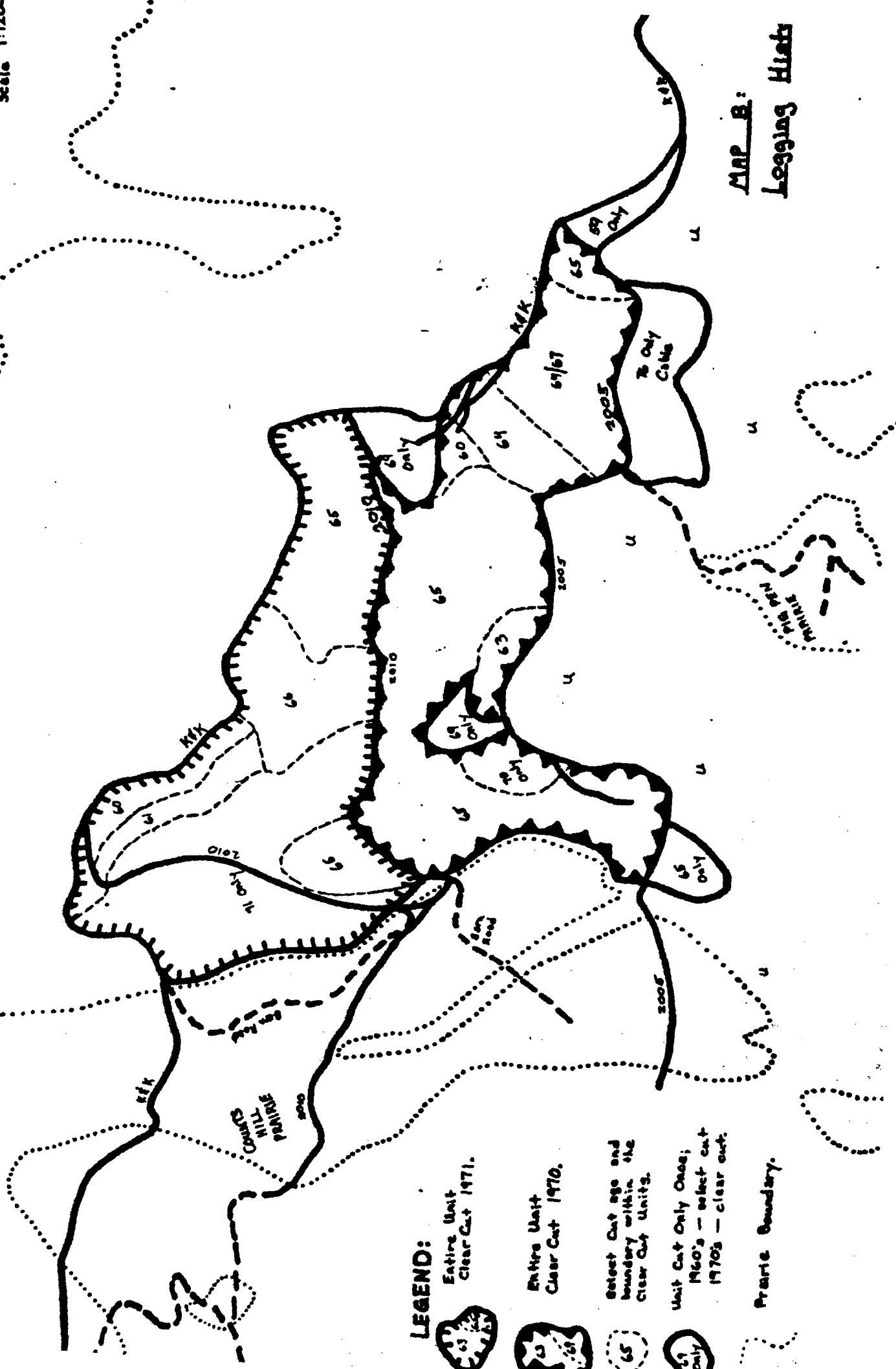
By 1962, the 2005 had been constructed from the K & K to just beyond (north of) the south fork of Slide Creek. A small amount of logging had been done at the beginning of the road. By 1966, the road had been extended across the Slide Creek drainage and Count's Hill Prairie; logging of most of the slopes above the road had occurred.

By 1973, all of the large stream crossing had washed out at least once. Three of these were reconstructed, and one washed out again in 1975. During excavation it was discovered that all of the stream crossings were originally Humboldt crossings. At most crossings (RX-10 through RX-19) culverts were put in on top of the logs, perhaps after the Humboldt crossings washed out. However, the north fork of Slide Creek crossing (RX-9) never had a culvert, even after reconstruction; this crossing receives more runoff than any other on the site (calculated to be about 260 cfs in a 10-year storm).

In 1978 when this area became part of the park, road maintenance was done, consisting of clearing trash racks and inboard ditches, and draining ponded water on slumping road sections near No Name Creek (using RNP's grader and backhoe, directed by D. Hagans and R. Mallonee).

CHILD'S WILL PAYS

Mar 8: South Burley



Entire Unit
Clear Cut 1971.

Entire Unit
Clear Cut 1970.

Select Out ego and boundary within the Clear Out Unit.

Unit Ent Only Case;
1960's - select ent
1970's - clear ent.

Private Boundary.

2010 Road

In the 1962 air photos it appeared that construction of the 2010 was imminent: A small area at the south end of the 2010 had been logged, and a main skid trail follows the present location of the haul road. By 1966 the 2010 had been built to the prairie margin, and logging of much of the surrounding slopes had occurred.

By 1971, two major sections had been added to the 2010. A road extended across Count's Hill Prairie and the earthflow, accessing timber near the feed barn on Airstrip Creek. Another road connected the former end of the road with the K & K, crossing two of the north forks of Slide Creek. The latter may have been a loop that logging trucks used: empty ones came down the steep grade from the north forks area, and the loaded trucks traveled out along contour to the south.

During excavation it was discovered that all stream crossings (except RX-21 in the prairie) were originally Humboldt crossings; all but two (RX-33 and RX-34) had culverts installed later, on top of the logs.

Two, and possibly three, large stream crossings washed out in 1972 and have never been reconstructed. Only one large stream crossing (south fork, RX-28) has survived all the storms - this was the only crossing with a culvert big enough (60 inch diameter) for the calculated storm runoff (approximately 125 cfs in 10-year storm).

The 2010 was waterbarred following timber harvest in 1971, but access was cut off a number of years ago by rock pit operations at the south end and a large gully at the north end. No maintenance has ever been done on this road by the park.

Barn Road

The Barn Road was a winding, narrow road, traveling down the prairie to the old barn. Remnants of the bridge across P.O. Creek can still be seen. This road was built sometime before 1954.

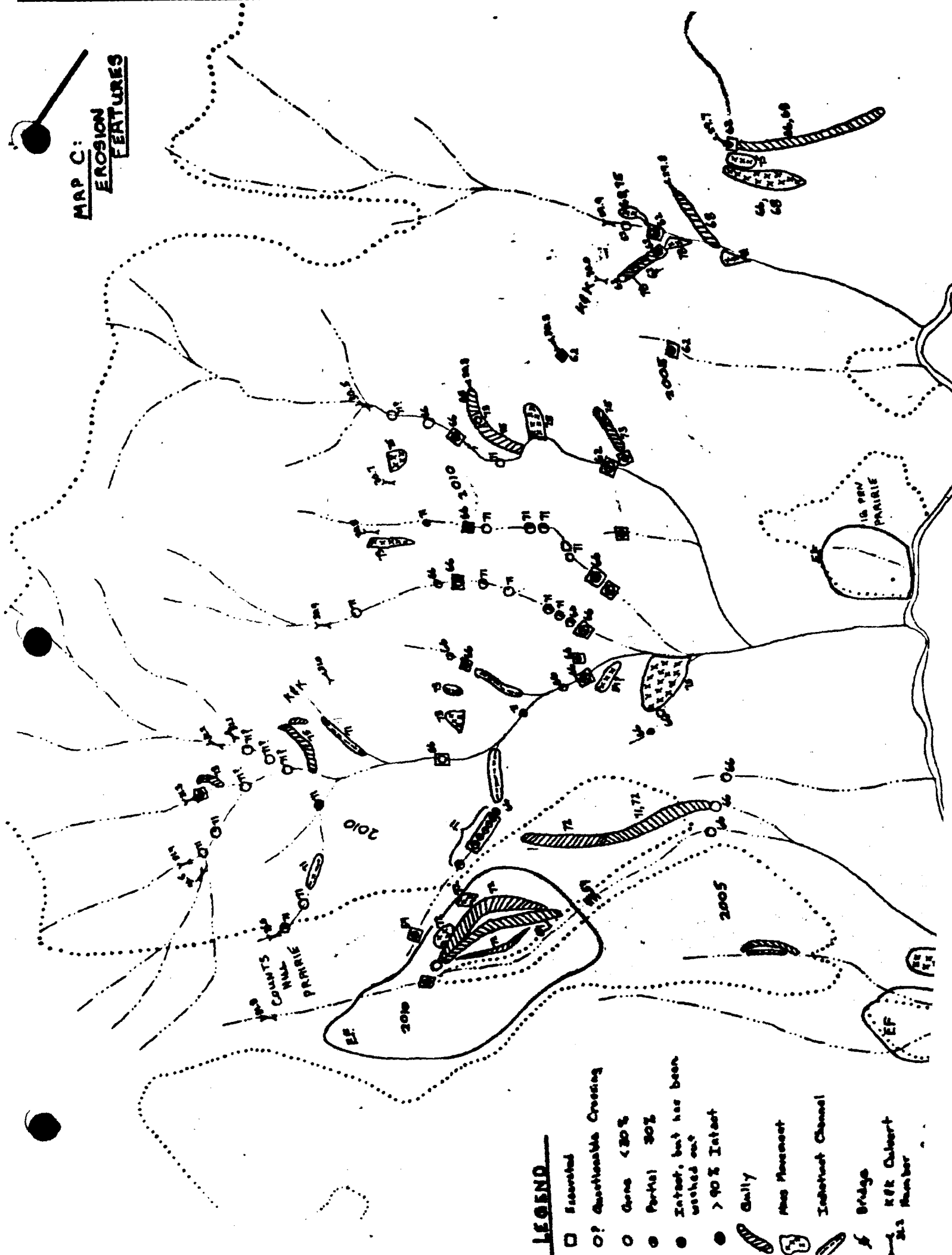
Pig Pen Prairie Road

The Pig Pen Road was built between 1962 and 1966. It extends from the 2005 to Redwood Creek with a spur road going to the mouth of Slide Creek. No one knows the reason this road was built...a crazed catskiner in search of water?

Erosion Features

The largest erosion features on the Lower Slide Creek Unit are gullies resulting from flow diversions. The majority of these gullies are due to undersized culverts that received insufficient maintenance during major storm or runoff events. Culverts or their trash racks either plugged with organic debris and bedload (in December, 1981 storm, bedload commonly was what plugged up trash racks) or could not handle the amount of runoff received. In either case, depending on local road gradient, streams were diverted, and/or washed out the road prism.

MAP C:
EROSION
FEATURES



LEGEND

- Scattered
- ? Questionable Crossing
- Gens < 20%
- Parts 30%
- Intact, but has been washed out
- > 90% Intact
- Gully
- Plus Placement
- Indistinct Channel
- Bridge
- K&E Culvert
- 2.3 Number

Numerous smaller gullies are present on skid trails, resulting from flow diversions at skid trail crossings and concentrated runoff from springs and skid trail surfaces.

Other erosion features on the unit include stream bank failures, landslides and an active earthflow. All stream channels have been severely impacted by logging activities. Channel reaches especially, in the logged areas where massive amounts of organic debris were added, have aggraded several feet or more. Aggradation has also occurred in the old growth.

Erosion Caused by the K & K Road

On the K & K, streamflow from plugged culverts was usually diverted. The K & K consistently has a gradient of 5 to 13 percent to the south as it passes through the Slide Creek drainage, making these diversions a common occurrence. Flows from large streams far exceed the "channel" capacity of the inboard ditch, so flow runs down the road (and gullies the ditch), and veers off the road via outboard drains or wherever road slope allows. Massive gullies formed on the slopes below until the flow reentered the natural channel. The large amount of sediment introduced from the gullies has caused additional problems in the natural channels; this is discussed under streambank failures. Large gullies below the K & K associated with culvert malfunctions are found on No Name Creek (culvert number 29.9) and on three of the north forks of Slide Creek (culvert numbers 31.1, 31.3, and 31.4; two culverts at 31.4, 31.5)

Gullies have also developed below the K & K where slope and inboard ditch flow has been concentrated by an insufficient number of culverts in inappropriate locations. Large gullies of this origin, some feeding directly into major stream channels, are found beneath culverts number 30.3 and 30.0, 29.8, 29.7.

Erosion Caused by the 2005 and 2010 Roads

On the 2005 and 2010, when culverts plugged, the road prism generally washed out without diverting the stream flow. In general, these roads run along contour reducing the chance of diversion down the inboard ditch. All of the major stream¹ crossings, except RX-28 (south fork 2010) had washed out at least once. In total, at least eight wash-outs have occurred on the major streams on this unit, each contributing several hundred cubic yards of sediment. RX-24 (north fork, 2010) is a prime example of an undersize culvert: it has a 36 inch culvert, but was fed by six similar or larger (18 to 48 inch) culverts on the K & K.

A very large gully, Doug's Gully (RX-226), formed on Count's Hill Prairie due to road diversion of all flow from the broad clear-cut bowl on the north side of the north fork Slide Creek. The slope has a very high density of skid trails and no continuous channel can be found on the slope. Drainage structures (culverts, Humboldt crossings, or waterbars) were not provided on the 2010 road reaches, and all intercepted flow was concentrated in the inboard ditch.

← 33, 35 and 36)

¹"Major streams" refers to the north and south forks of Slide Creek, No Name Creek, and P.O. Creek.

The huge gully in the prairie formed during a weekend storm in 1972. Doug Lane noticed the large amount of diverted flow on the prairie on a Friday afternoon and notified Simpson maintenance crew of the problem. They said they did not have time to get to it. By Monday morning irreversible damage had occurred. The gully was 20 to 30 feet wide, and 10 to 20 feet deep, and 965 feet long; approximately 8000 cubic yards had been eroded in less than three days. Another large gully on Count's Hill Prairie, the Diversion Gully (RX-21G) also formed in 1972, due to a plugged culvert on the 2010, where the road crossed P.O. Creek. This is discussed in detail in the mass movement section.

Erosion Caused by Skid Trails

Numerous smaller gullies (up to 7 feet by 7 feet) can be found on most skid trails on the unit. These resulted from flow diversions by poorly designed skid trail crossings of smaller creeks or concentrated runoff along skid trails with an insufficient number or lack of waterbars.

Mass Movement Features

Streambank failures and landslides into creeks are another large sediment source on this unit. Numerous streambank failures have occurred along virtually all streams. These are probably due to the large influxes of sediment and organic debris from intensive logging activities followed by major storms in 1972 and 1975, temporarily (or permanently) deflecting flows into channel sidebanks. The effects of increased sediment loads can also be seen in the old growth channels below the logged areas, particularly on No Name Creek and the north fork of Slide Creek, where there are many recent bank failures which have toppled streamside trees.

A factor contributing to landslides into creeks is road construction and/or logging on the naturally unstable, steep slopes directly above the "outside" bends of the creek. Three such landslides have occurred on the unit: one from the rock pit on the 2010 into the south fork of Slide Creek, another from the 2005 (near RX-7) into the north fork of Slide Creek (this was visible in 1962 as an area of much smaller trees before any logging or road construction occurred), and a third in the cable-yarded area which failed directly into No Name Creek.

Probably the largest, long-term sediment source on the site is the Count's Hill Prairie earthflow. This is a very large and fairly active feature. The headscarp is in the prairie between the K & K and the 2010; it covers much of the prairie and apparently can be traced down through the old growth to a very active, gullied, poison oak-infested prairie that is sliding into Redwood Creek, adding new boulders to the Gorge. A large amount of natural as well as man-induced erosion has occurred here.

The earthflow has been studied and monitored for movement since 1974 by Mike Nolan of the U.S.G.S. The most active stake line crosses P.O. Creek just above the point where a major stream diversion occurred in the late 1960's, prior to any road construction in the area. In the last six years, the most active point on the stake line, immediately adjacent to P.O. Creek, has moved eighteen feet. The stake line overall has averaged a little less than a foot of movement per year (Nolan, et. al., 1978 and pers. comm.).

The diversion was caused by headward migration of a large gully which captured P.O. Creek. This may have been aided by earthflow movement on either side of P.O. Creek creating a topographically inverted drainage (i.e. stream was on a slight ridge). The gully formed perhaps due to concentrated subsurface flow (piping) in the "new" low area. Piping was observed to be a contributing factor in other gully formation on Count's Hill Prairie.

The history of this diversion can be seen in the old air photos. In 1962, a major gully parallels P.O. Creek. The head of the gully is about 150 to 200 feet below the diversion point, and distinctly separate from P.O. Creek. The only roads in the area at that time are the K & K and a road crossing on Count's Hill Prairie above the K & K. These roads' inboard ditches undoubtedly contributed some additional flow to P.O. Creek from cutbank springs and intercepted runoff from the surrounding slopes (not all of which originally drained into P.O. Creek).

In 1966 the gully and P.O. Creek are barely separated. By 1968, stream capture had occurred and the gully was much more distinct in the air photos.

In 1971 when the 2010 was extended across Count's Hill Prairie, a culvert was installed where the natural diversion gully crossed the road. At this point, man-induced erosion took over. The culvert washed out in the 1972 storms, and another large gully formed adjacent to the "natural" one. Slumping of the road prism into the new gully also occurred, probably due to removal of support below the road by the gully, in addition to local earthflow movement. In total, approximately 8100 cubic yards of "natural" erosion and 1500 cubic yards of man-induced erosion occurred here. All of the sediment has been delivered to P.O. Creek; some is stored in the channel and has caused old and recent streambank failures; the rest has probably gone to Redwood Creek, or hopefully, the ocean.

Erosion in Relation to the Major Storms

The 1964 storm was the first major storm to have any impact visible on air photos. At that time, about one-fourth of the present total logged portion of the site had been selectively cut (according to S. Veir's Logging History map). Most of the erosion occurred in No Name Creek drainage: RX-18 washed out, and three gullied, debris avalanche chutes formed below the 2005. Other erosion features, if they existed, are obscured by the long shadows in the 1966 air photos, but the overall impact appears to be less than in the 1972 storm. RNP does not have photos, 4/2 + 4

Two major storms occurred in the winter of 1972. During the preceding summer, virtually the entire site had been clearcut and tractor-yarded. Approximately 70 stream crossings of varying size existed at that time and 22 of these crossings were on major streams, capable of quickly transporting sediment directly to Redwood Creek. The remaining 48 crossings were on smaller streams with much lower discharges (which were incapable of rapid sediment transport).

All of the crossings on major streams were washed out in 1972 except RX-28. Of those crossings which were washed out, 17 were Humboldt crossings and 4 had undersized culverts. RX-28 was the only stream crossing with a culvert able to handle a 10-year storm. A rough guesstimate is that 4200 cubic yards of sediment were eroded from major stream crossing failures in 1972 (assuming 200 cubic yards per crossing, probably a low figure).

Crossings on the smaller tributary streams are hard to see on aerial photos. However, there are many gullied skid trails visible on the 1973 photos indicating that diversions probably occurred. Most of the skid trail crossings were washed out when the unit was mapped in 1981.

Massive gullying occurred on Count's Hill Prairie in the 1972 storms, yielding approximately 10,000 cubic yards of material (an educated guesstimate).

Other erosional features that developed in the 1972 storms include the 2010 rock pit landslide directly into the south fork of Slide Creek, several other landslides or fill failures on the 2010 and the K & K which did not reach major streams, and the large gully diversion around RX-34 (due to a K & K culvert plugging).

The 1975 storms had a much smaller impact than the 1972 storm. The main erosion that occurred was enlargement of previously existing gullies and the formation of several new gullies (due to K & K culverts plugging). The large landslide from the 2005 (RX-7) into the north fork of Slide Creek happened along with several fill failures off the K & K, one of which dumped directly into No Name Creek. No major stream crossings washed out, although several were rebuilt following the 1972 storm. There was no additional logging between 1972 and 1975 on the Lower Slide Creek unit.

The unit did not experience much erosion during the dry periods between 1975 and 1981; during the mapping phase very little erosion was discovered that was not visible in the 1975 photo. Two obvious new features were that the 2005 was beginning to fail (slump) as it passed through the No Name Creek drainage, and a large streambank failure had occurred, also on No Name Creek.

The site is now covered with a dense growth of ceanothus and baccharis; a few trees are struggling to break out of the brush. Hopefully the vegetation and the rehabilitation work completed in the summer of 1982 will help minimize further erosion on the unit.

However, a major problem still exists in the Slide and No Name Creek drainages: this is the K & K Road, with undersized culverts and insufficient maintenance during high runoff periods.

In the December 1981 storm, three culverts plugged on Slide Creek alone. The trash racks at culverts 30.5 (south fork) and 31.2 (north fork) plugged, and the flow washed over the K & K, causing gullying across a rehabilitated road, and failure of the outside edge of the K & K directly above an excavated stream channel. This happened again in April!

Numerous other K & K culverts plugged with debris during this storm. Two things must be done in the near future to prevent major erosion during the next big storm: replace undersized culverts, and during storms, have more frequent checking of trash racks.

Many of the culverts on the K & K cannot handle the expected runoff of a 10- or 20-year storm. They are lucky to survive a 2-year storm. Rehabilitation work is designed for 10- to 20-year storms, so it seems that if the K & K is to be a permanent road, it too should be able to withstand this size storm. Expected runoff should be calculated for all streams at the K & K, and undersized culverts should be replaced. Trash racks should be built with slats far enough apart to permit passage of storm-sized bedload. In addition, a more frequent patrol of the K & K is necessary during the major runoff events. Everyone (even Rangers and visiting dignitaries) who drives the road should be required to check and clear all trash racks--particularly those that are coded red--not just drive on by and report the problem to John Wilson.

By next summer most of the drainages along the K & K will have been rehabilitated; the K & K remains the weak link on these slopes. Erosion resulting from the K & K will not only result in more sediment in Redwood Creek, but it has a high potential to damage rehabilitated stream reaches. It does not make sense to throw away the money spent on rehabilitation for lack of money to improve the stability of the K & K. The question of whose responsibility the road is must be answered soon.

Sediment Sources

On the Lower Slide Creek Unit the erosion features present in 1981 represent a much larger volume of erosion than that remaining as actual and potential sediment sources.

Most of the skid trail crossings have washed out and the slopes are severely gullied. Many of the major haul road crossings have washed out repeatedly. Much of the erosion on the unit occurred in the 1972 storm, and in heavy storms in the following years when vegetation on the site was virtually nonexistent. The site is now covered with a very dense cover of ceanothus and baccharis. The average winter storms of 1981 did not cause any new gullies or crossing failures. Streamside landslides and bank failures however, continue to occur as the channels adjust of post-logging conditions, and attempt to regain equilibrium (as much as it exists in this naturally erosive terrain).

P.O. Creek and its diversion gully was the largest active sediment source on the unit. The stream was diverted from its natural channel by a combination of natural and man-induced activities. The gully had raw, unvegetated banks and was undermining a large earthflow slope.

Intact haul road crossings were another major sediment source, although most were potential rather than active sources during the winter of 1981. Possibilities of diversions were low, but hundreds of cubic yards of material would be lost in each crossing should the culvert plug. Culverts were not large enough for much more than a 1-2 year storm, and with no scheduled maintenance, culvert plugging was likely in the future.

Intact and partially washed out skid trail crossings were evaluated for diversion potential and magnitude of possible sediment loss. Most had low diversion potential and would contribute only a few tens of cubic yards, probably released over a number of years as organic matter decays and readjustment occurs. These were not treated.

A few skid trail crossings were evaluated as having significant sediment yield in the near future and/or were diverted and actively eroding. These were treated during the heavy equipment phase by clearing debris from the channel and returning drainages to their natural course.

Along the 2005, much of the outboard edge of the road showed tension cracks or settling. At the south end of the road two debris avalanche/gully chutes create obvious swaths of destruction through the old growth. It was felt that numerous stretches of the 2005 could fail in a similar manner, some directly into the perennial stream channels. These unstable road reaches were outsloped and fill placed in more stable locations.

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 through aerial photo reconnaissance and detailed field mapping, estimating the erosion potential of the sediment sources and prescribing treatments 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 Lower Slide Creek Unit, this phase occurred in the winter and spring of 1981.

The heavy equipment and labor intensive phases occur simultaneously during the summer months. This is when the bulk of the erosion control work is performed. The labor intensive work generally closely follows the heavy equipment sequence (detailed in Table 3).

Documentation of work performed, cost analyses, and report writing is done in the fall, and carries on through the winter (and sometimes spring!), interspersed with the evaluation of the next year's unit.

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 intact haul road crossings, and those skid trail crossings with high erosion potential were removed. In the prairies, roads were completely removed, and gullies caused by flow diversions were blended into surrounding topography. In areas adjacent to old growth forest, roads were slightly outsloped to restore runoff patterns and moderately outsloped where road stability was questionable. Roads in cutover areas were ripped and/or drained (waterbarred) as a cheaper method of partially restoring runoff patterns.

Cost Summary

Table 1 shows the overall cost summary of erosion control work on the Lower Slide Creek Unit. The grand total cost of the project was \$124,586.33. Of this, 12 percent was spent on the evaluation and documentation phases, and 88 percent on the actual implementation of the erosion control work, (79 percent on the heavy equipment, and 9 percent on labor-intensive work). Map D shows all worksite locations.

DIFFERS FROM TABLE
SHORT BY
#3

TABLE 1.
SUMMARY COSTS OF EROSION-CONTROL REHABILITATION WORK SITE 81-2

	Task	RNP Geologist & Technician	Employees Laborers	Heavy Equipment Rentals	Redwoods United	Total Task Costs	% Total Cost	Phase Totals	Phase %
EVAL- UATION PHASE	Mapping	\$ 4,896.05 ² ✓				\$ 4,896.05	4%	✓	8%
	Prescription ¹	5,276.10 ² ✓				5,276.10	4%	\$10,172.15 ✓	
HEAVY EQUIPMENT PHASE	Access			\$ 4,785.63 ✓		4,785.63	4%	this adds to 98159.48 — \$100,159.48 79% 98159.48 (2000 missing!) 4101822.48 ✓ 95189	
	Primary Treatments	(4,804.61) ✓	224.1- 41.75	63,690.75 ✓ 67353.75		70,537.11	55%		
	Secondary Treatments	(-)	123.08 ✓	16,133.40 ✓		16,356.48	13%		
	Misc.			8,580.26		8,580.26	7%		
LABOR INTENSIVE PHASE	Travel ^{to base} to		1,529.70 ✓			1,529.70	1%	(12130)	
	Primary Treatments	(24)	4550.01			--			
	Secondary Treatments	68	68.52 ✓	4,548.01	\$3,828.13 ✓	9575.06 8,444.66	7%	\$11,860.10	9%
	Misc.			1,885.74 ✓		1,885.74	1%		
DOCUMENTATION PHASE	Cost Analyses and Report	5495 5,494.65 ² ✓				5,494.65	4%	\$5,494.65 ✓	4%
TOTALS:		✓ 22532.93 \$22,539.93	8312.53 \$8,128.28	\$93,190.04	\$3,828.13 ✓	GRAND TOTAL: \$127,686.38			
% of Total:		18% HIGH BY \$2000-	6%	73% 96853.04 ✓	3%	129529 129577 882	(130479.33)		

¹ Prescription costs also include photo point and site survey costs.

² Estimated cost.

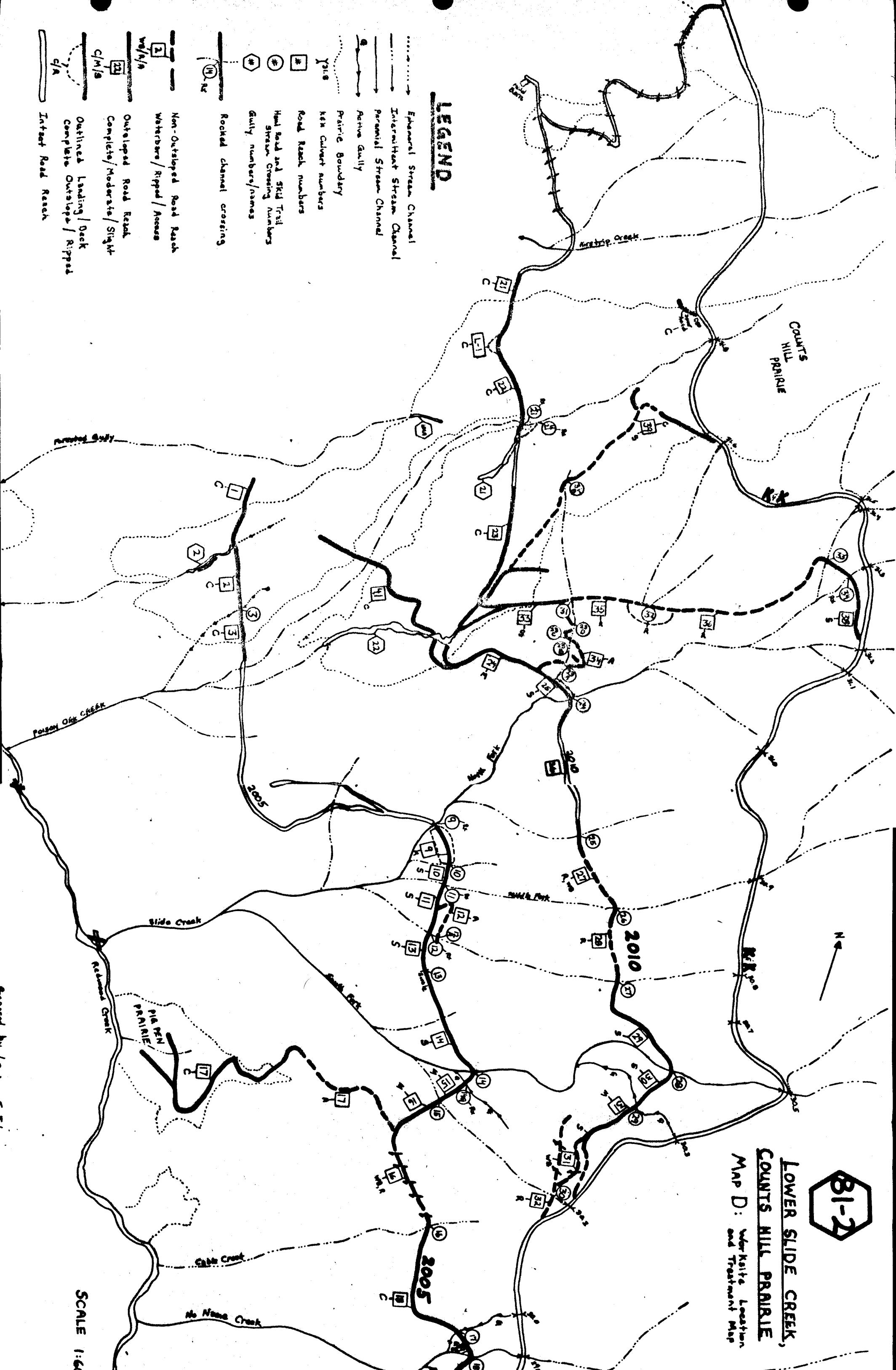
129533

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81-2

LOWER SLIDE CREEK,
COUNTS HILL PRAIRIE
MAP D: Water Site Location
and Treatment Map

- LEGEND**
- Epineural Stream Channel
 - Intermittent Stream Channel
 - Perennial Stream Channel
 - Active Gully
 - Prairie Boundary
 - Key Culvert numbers
 - Road Reach numbers
 - Head Road and Skid Trail Stream Crossing numbers
 - Gully numbers/names
 - Rocked channel crossing
 - Non-Outsloped Road Reach
 - Waterbore/Riprap/Access
 - Outsloped Road Reach
 - Complete/Moderate/Slight
 - Outlined Landing/Dock
 - Complete Outslope/Riprap
 - Intact Road Reach



HEAVY EQUIPMENT PHASE

Heavy Equipment Application

The entire primary heavy equipment phase on the Lower Slide Creek Unit was completed by an excavator and bulldozer team. The excavator was a John Deere 690B with a 3/4 yard bucket, owned and operated by Larry Lambert, at an hourly cost of \$79.50. The bulldozer was a Case 1450, with winch and 6-way hydraulic blade, owned by H.O. "Whitey" Brown and operated by Gary Netherby, at an hourly cost of \$70.00. The major haul roads, the 2005 and 2010, in the woods, were decompacted using a D-8 Caterpillar 46A with rippers owned and operated by Tom Coy, at an hourly cost of \$80.00. At haul road crossing RX-28, bulldozers were used to remove and outslope the fill: the 1450 and a Caterpillar D-7E, with winch and manual 6-way blade, owned and operated by Bill Richardson at \$75.00/hour. The park backhoe operated by Dick Mayle was used for rock delivery to RX-21 and RX-24, and for culvert work on the K & K. Please refer to Table 2 for equipment and dates used.

Four different bulldozers, in addition to the ripping bulldozer, were used to assist the excavator. Except at RX-28, only one bulldozer at a time worked with the excavator. Originally we procured a John Deere 750 bulldozer. This could not be acquired by contractor H.O. "Whitey" Brown, so the Case 1450 replaced the JD 750. The 1450 was unavailable for the first week, so it was replaced by a Case 1150, with winch and hydraulic 6-way blade, at a reduced rate. Once the 1450 was on-site it broke down several times and the Case 1150 was brought out to the site for a short time again (transportation costs both times were paid by Whitey Brown). The JD 750 bulldozer used on Site 81-3 was also used once to replace the down 1450. The Caterpillar D-7E was "borrowed" from site 81-1 for two days to assist the Case 1450 in the large excavation at RX-28.

Generally, the excavator and bulldozer worked on all stream crossings together. On a large crossing the bulldozer dished out the fill, creating a lower level from which the excavator started digging. The excavator sat on the outboard edge of the road prism digging the culvert out and laying back the sides of the channel as it moved back and up the channel. The excavator placed the fill on the inboard side of the road, and the cat pushed it out of the crossing, simultaneously working the channel banks back with each pass. The channel fill was used to partially or completely outslope the road reach on either side.

Once the excavator removed the culvert and reached the desired depth at the outboard edge, the channel bank slope on the far side was completed. The excavator then left the channel bottom and positioned itself on the near bank to complete the desired channel width, gradient, and sideslope. If the channel was to be rocked with quarried rock, the excavator started rocking before the near sideslope was completed. Once the channel was completely rocked, the excavator finished sloping the near channel bank.

TABLE 2.
SITE 81-2
HEAVY EQUIPMENT USED

Type	Description	Owner and Operator	Cost/ Hour	Dates in Use (Week No.)
Excavator	John Deere 690B 3/4 yd. Bucket	Larry Lambert	\$ 79.50	1-7, 9-12
Bulldozer	Case 1450, winch 6-way blade	H.O.Whitey Brown Gary Netherby	70.00	2-9, 11-12
Bulldozer	Case 1150, winch 6-way blade	H.O.Whitey Brown Gary Netherby	56.00	1, 3
Bulldozer	Caterpillar 46A, D-8 tilt blade, rippers	Tom Coy	80.00	3
Bulldozer	John Deere 750, winch 6-way blade	H.O.Whitey Brown Bill Campbell	70.00	9-10
Bulldozer	Caterpillar D-7E 6-way blade (manual) winch	Bill Richardson	75.00	6
Backhoe	Case 580	RNP Dick Mayle	35.00*	3, 8

W-LINE ROCK PIT

Dump Truck	10-yard	Jim Cossairt	35.00	1-2
Dump Truck	10-yard	Duane Cossairt	35.00	1-2
Dump Truck	10-yard	Frank Vyskocil	31.99	1-2
Loader	Caterpillar 977	Carl Vollweiler	39.00	1-2

*Equivalent price if rented.

If the channel was to be rocked with natural rock, hopefully found during excavation, the approach was a little different. While the excavator was still in the channel, each boulder or rock that was excavated was stockpiled along a bank, allowing the channel to be dug to the desired width and depth, then the rocks were placed back in the channel. If the boulders were too large to move, then the excavator worked around the rock, incorporating it into the channel design. Thus with natural rock, placement takes place in channel length segments, not all at once as with quarry rock. The rest of the excavation is the same as above.

While the excavator was placing rock, the bulldozer usually ran out of work at the crossing, so we found it very efficient to send the bulldozer down the road to start outslowing between channels. This was done by blading off the layer of road rock (between 12 and 18 inches in depth) and cornering it into the inboard ditch. The result was a road base with little or no rock remaining, which was much easier for the excavator to work on. When the excavator finished the channel, it moved along the outboard edge of the road, removing one or two bucketfuls and placing them in the inboard ditch. Meanwhile, the bulldozer had gone ahead and dished out the next crossing. The bulldozer then came back and worked in the fill, completing a slight outslope. This method kept both pieces of equipment working constantly. An advantage to using the excavator in road outslowing to pull up the outside edge of the road, as opposed to using a large bulldozer, is that there is virtually no sidecast.

There were only two stream crossings along prairie roads on Counts Hill Prairie. RX-21 was the only major crossing, and was also one of the most difficult crossings on the unit to excavate and rock. The other one (RX-3) was a minor swale dished out by the bulldozer; a channel down the center was defined by the excavator, and it was left unprotected. All prairie roads were completely outslowed and were moderate to steeply sloping.

The excavator and bulldozer worked together on the outslowing of the prairie roads with the excavator leading, doing the majority of the fill moving, and the bulldozer following, shaping the fill into the natural slopes and contours. Two road reaches (R-1 and R-3) were outslowed almost entirely by the bulldozer. On R-3 this proved very efficient, but on R-1 difficulties arose in trying to work between the oak trees, and no cost benefits were realized. All we got was a frustrated operators who finally had to knock one tree down! It is definitely more efficient to have the excavator pull up the steepest sections of road sidecase first.

The heavy equipment worked on three gullies located on Counts Hill Prairie, below both the 2005 and 2010. These gullies were shaped almost entirely by the bulldozer. Surrounding slopes were too steep for the excavator. Gully shaping consisted of knocking down the near vertical banks, partially filling the gully. Top soil was initially pushed away from gully edges. The bulldozer worked on one side at a time, blading fill downslope, and cornering it into the gully channel. This would take up to a dozen passes, compacting each fill layer, to complete the desired shape. Any remaining topsoil was then spread over the compacted, finished site.

On RX-21G (Diversion Gully), the excavator helped shape the upper section of the gully where it crossed the 2010, defining a flow course, in case RX-21 (upper) failed and flow returned to the gully. The bulldozer worked on the lower half shaping the right gully sidewall in the same manner as on RX-22.

Heavy Equipment Sequencing

The first five weeks of the heavy equipment phase were spent on Counts Hill Prairie. Once the prairie was completed, the equipment moved to the forested section of the 2010 (two weeks), then to the forested section of the 2005 (five weeks). Table 3 shows a detailed account of the heavy equipment sequence.

Complications existed in the equipment sequencing due to the lack of access to prairie worksites, and to RX-24 on the 2010 Road. Originally both the 2005 and 2010 provided access to Counts Hill Prairie, but these were blocked by landslides, washed-out crossings, and the Counts Hill earthflow. We wanted to avoid filling the washed-out crossing because they were on perennial streams and were fairly stable (these included RX-9 and RX-4 on the 2005, and RX-24 on the 2010). Landslides covered or had removed sections of both roads in the forested/logged area (R-6, R-8, and RX-7 on the 2005 and R-26 on the 2010), and in the prairie, sections of the 2010 had been obliterated by earthflow movement. It was felt that reconstructing roads across these mass movement features could trigger future slope stability problems. Thus the steep, narrow Barn Road was used for access to the 2005, RX-24 and the prairie work sites south of P.O. Creek. The rehabilitated road from the Airstrip feed barn was used to allow rock delivery to RX-21, a crossing located on the most active portion of the earthflow, and to provide access to work sites on the 2010 north of P.O. Creek. The Barn Road was too steep for rock delivery equipment, and its use would still have required reconstruction of the road across the earthflow to reach RX-21 and the north prairie. On the Airstrip Road two crossings were partially filled and then re-excavated on the way out. Both crossings initially had very steep sideslopes due to downcutting post-rehab; during re-excavation these sideslopes were laid back to a more stable angle. Waterbars were replaced where they had been smoothed out for dump trucks.

Another major problem with equipment sequencing on the prairie was the inability to keep the bulldozer working full-time with the excavator during the outslowing process. Gully shaping and walking-in straw slowed the bulldozer down to a point where it could not keep up with the excavator's outslowing. The distance between the gullies and other work sites prevented the bulldozer from working on gully shaping during short periods of free time. Travel costs were high due to these problems. At one point, the excavator was put on standby without operator for a day to allow the bulldozer to catch up.

TABLE 3.
SITE 81-2
HEAVY EQUIPMENT SEQUENCING

	Dates (Weekly)	Work Locations	Type of Equipment
1	July 6-10	--W-Line Rock Pit, Load and Delivery --Open Roads; 2010, Counts Hill Prairie Barn Road --2005 Prairie	Loader, 3 Dump Trucks Bulldozer Only Excavator, Bulldozer
2	July 13-17	--Rock Delivery --2010 Prairie (SE side) to Rx-24	Loader, 3 Dump Trucks Excavator, Bulldozer
3	July 20-24	--2010 Upper Woods (Sx-23A-D, R-39, Rx-34) --Ripped 2010 and 2005 (Woods)	Excavator, Bulldozer D-8 Ripper Cat
4	July 27-31	--2010 Prairie (NW side)	Excavator, Bulldozer
5	August 3-7	--2010 Prairie (NW side), Airstrip, K&K Spur Road --Started 2010 Woods on Friday	Excavator, Bulldozer Excavator, Bulldozer
6	August 10-14	--2010 Woods --Started 2005 Woods on Friday	Excavator, Bulldozer
7	August 17-21	--2005 Woods (Rx-9, 10, and R-9)	Excavator, Bulldozer
8	August 24-27	--Rx-22, and walk-in straw 2010 Prairie	Bulldozer Only
9	Aug 31- Sept 4	--2005 Woods and Pig Pen Prairie	Excavator, Bulldozer
10	September 8-11	--2005 Woods	Excavator, Bulldozer
11	September 14-18	--2005 Woods	Excavator, Bulldozer
12	September 21-22	--Finished 2010 and 2005	Excavator, Bulldozer

Heavy Equipment Costs

Table 4 shows the total and average costs of heavy equipment treatments on Site 81-2. Primary treatments involve removal of actual and potential sediment sources from streams, removing roads, shaping prairie gullies, and restoring drainage patterns to their original configuration as much as possible across roads. Secondary treatments attempt to minimize erosion and stabilize the completed primary worksites. This includes channel armoring with quarried rock and mulch application on treated roads. Mulch was "walked in" on prairie roads to prevent wind loss and also to further compact outsliping. Walking-in was done up and downslope, rather than on contour, to avoid having grozer marks develop into rills, and also because the horizontal grozer marks catch seed and fine sediment, helping in revegetation. Rock was used in one-third of the crossings, all but two of which were on the 2005 Road. These crossings were chosen because of the extremely large flows expected, or to act as sediment "traps" immediately above the old growth where possibilities existed of delivery of significant volumes of sediment from unprotected excavations or unstable channel reaches above, or because of their location on unstable earthflow terrain. Rocking costs in Table 4 include quarrying, transportation, and placement.

NOTE: Total heavy equipment costs on Table 4 are not the same as the total cost billed to Site 81-2 due to: 1) Redwood National Park's backhoe being used and included in our tables and costs, 2) the quarrying and transport of all rock used on the east side was billed to our account, and 3) we "borrowed" and were "borrowed from" in times of heavy equipment need. The tables in this report reflect the true times and costs of the work done.

Access costs include equipment lowboy, transportation, relocation within the unit (between worksites), and road clearance for access to skid trail crossings.

Miscellaneous worksites include culvert work on the K & K Road, opening access through the Airstrip Rehabilitation Unit, and then restoring the two crossings and 21 waterbars on the Airstrip Road. Reasons for re-entering the Airstrip Rehabilitation Unit are discussed under Heavy Equipment Sequencing (page 22). The K & K culvert work included adding a second culvert at the No Name Creek crossing (existing culvert was less than half the necessary diameter for expected runoff), removing a poorly located culvert (which had caused gullying, road slumping, and a large strembank failure), and pulling back perched road fill above a culvert with an excavated channel (RX-34) directly below. Miscellaneous heavy equipment costs include standby paid in full (when a piece of equipment was unable to work for short periods of time due to lack of room or work), standby with or without operator, breaks and discussions of work, and some work done on Site 81-3. The reader is referred to the appendix for specific worksite costs.

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TABLE
SUMMARY OF AVERAGE COSTS OF HEAVY EQUIPMENT TREATMENTS

Treatment	# of Work-Sites	Total Quantity	Total Cost	Average Costs:		Cost/Quantity Range
				Work-Site	Quantity	
Haul Road Crossings ¹	24	7,289 yd ³	\$27,268.30	\$1136	\$3.74/yd ³	\$1.22-22.00 yd ³
Skid Trail Crossings	6	417 yd ³	1,232.89	205	2.96/yd ³	2.07-14.90 yd ³
Outsloping	29	15,338 ft.	~~27,303.18~~ 27,747	941	1.78/LF	.05-15.24 linear ft.
Cross Road Drains	2	1,425 ft.	416.75	208	59.54/XRD	29.17-82.31 XRD
Rip Roads	3	10,870 ft.	1,460.00	487	.13/LF	.11-.14 LF
Gullys	4	1,965 ft.	2,386.25	596	1.11/LF	.65-1.61 LF
Landings	1	441 yd ³	3,595.38	3595	8.15/yd ³	8.15/yd ³
Other Road Treatments	4	4,960 ft.	28.00	7	.01/LF	0-28.00 LF
TOTAL PRIMARY TREATMENT			~~= \$63,690.75~~ ^{64137.75} + 3213 = 67353.75			
Channel Rocking ²	8	530 yd ³	12,836.40	1605	24.22/yd ³	17.87-39.81 yd ³
Mulch Distribution	12	815 bales	1,400.00	117	1.72/bale	N/A
Mulch Walk-In	12	815 bales	1,897.00	158	2.33/bale	N/A
TOTAL SECONDARY TREATMENT			= \$16,133.40 ^{SECONDARY}			
Access			4,785.63			
Misc. Work Sites	4	42 hours	2,692.76	673		
Misc.	5 Types	86 1/4 hrs.	5,887.50	1178		
TOTAL HEAVY EQUIPMENT COSTS			~~= \$93,190.04~~ 96851			

ROCKING OF CHANNEL KINGDS
NOT INCLUDED. \$3213

¹Excavation only

²Includes quarrying, transport, and placement

Footnotes continued on following page.

³Total heavy equipment costs on Table 4 are not the same as the total cost billed to Site 81-2 due to: 1) Redwood National Park's backhoe being used and included in our tables and costs, 2) the quarrying and transport of all rock used on the east side was billed to our account, and 3) we "borrowed" and were "borrowed from" in times of heavy equipment need. The tables in this report reflect the true times and costs of the work done.

Haul Road and Skid Trail Crossing Excavations

Haul road and skid trail crossings on Unit 81-2 had an overall average cost of \$3.70 per cubic yard excavated. Excavation costs were compared using two slightly different methods, with similar results (Tables 5 and 6).

Table 5 divides all crossings on the unit into groups according to their size. Average costs for each size group were calculated. Small crossings (<200 cubic yards) proved to be the most expensive per cubic yard and also had the widest range in unit cost. We had only one large and two extra-large crossings. Averaging the costs of these three crossings yields a unit cost of \$3.18 per cubic yard for excavations over 500 cubic yards. Unit costs on medium-sized crossings (200-500 cubic yards) averaged \$3.76 per cubic yard.

The big crossings were the cheapest per cubic yard to excavate because the large working area enabled the bulldozer-excavator team to work efficiently without getting in each other's way. A greater length of time spent at each crossing also allowed the equipment to get a synchronized system going where they could work for several hours in the same pattern without setting up another approach angle. With smaller crossings, each set-up was relatively short, requiring a proportionally greater amount of time on logistics. Primarily, however, the higher unit costs on small crossings were due to the often confined working space which required careful maneuvering, and having each piece of equipment periodically move out of the other's way.

All size groups of crossings showed a wide variation in unit costs. To determine whether there was a reason for this, crossings were grouped by their unit costs (Table 6) to see if there were any similarities in problems encountered, general approach, size, etc.

The highest cost group contained unusual crossings: one with nearly 100 logs (RX-9), the horseshoe ditch (RX-16), and the diverted prairie channel on the earthflow (RX-21 Upper). In the \$4 to \$8 range, the main similarity is that all the crossings are fairly small, but straightforward.

The \$3 to \$4 crossings were generally large and straightforward. The least expensive group, less than \$3.00 per cubic yard, contains crossings of varying size, including several swales (RX-3, RX-19, and RX-30). These and other swales could probably have been classified as cross-road drains, however they were haul road crossings of small stream channels.

Only one (RX-34) required substantial time winching; most of this was done by the excavator. (The volume estimate on this crossing maybe high, based on group feelings on the field review; volume maybe closer to 500 cubic yards.)

TABLE 5.
HAUL ROAD AND SKID TRAIL CROSSING EXCAVATION COSTS¹

Type of Worksite	# of Work-sites	Range: vol. fill yd ³	Equipment	Range: Hours	Total Sites Cost ²	Average Cost/ Worksite	Range: Cost	Total yd ³	Average: Cost/ yd ³	Range: Cost/ yd ³
SMALL 0-200 yd ³	21	10-200	Excavator Bulldozer	4-13 4-8	\$8298	\$395	\$35-1470	1732	\$4.79	\$1.22- 22.00
MEDIUM 200-500 yd ³	6	219-474	Excavator Bulldozer	5-25 2-15	7695	1283	736-2535	2048	3.76	1.67- 11.58
LARGE 500-1000 yd ³	1	887	Excavator Bulldozer	12 10	1632	--	---	887	1.84 ³	--
EXTRA-LARGE Over 1000 yd ³	2	1450-1589	Excavator Bulldozer Bulldozer	26-34 34 17	10,877	5438	4519-6358	3039	3.56 ³	3.12- 4.00
TOTALS:	30	10-1589	Excavator Bulldozer	4-34 4-34	\$28,503	\$950	\$35-6358	7706 yd ³	\$3.70	\$1.22- 22.00

¹This table does not include reexcavated crossings on Airstrip Access Road.

²Costs were rounded to the nearest dollar.

³Grouping large and extra-large crossings together, average cost is \$3.18 per cubic yard.

TABLE 6.
HAUL ROAD CROSSINGS
Unit Cost Versus Volume Comparison

<u>Worksite</u>	<u>Unit Cost</u>	<u>Volume</u>
I. Less than \$3.00 per yd ³ -- average volume 248 cy.		
RX-3	\$1.22	44 yd ³
RX-10	1.80	127
RX-12	1.67	441
RX-19	1.79	32
RX-21 (lower)	2.60	358
RX-27	2.73	326
RX-29G	1.61	136
RX-30	2.06	17
RX-31	1.50	119
RX-34	1.84	887
II. Between \$3.01 and \$4.00 per yd ³ -- average volume 992 yd ³ .		
RX-11	3.48	178
RX-14	3.47	474
RX-18	3.12	1450
RX-28	4.00	1589
III. Between \$4.01 and \$8.00 per yd ³ -- average volume 126 yd ³ .		
RX-14G	7.32	49
RX-15	4.86	85
RX-17	4.75	163
RX-24	7.35	200
RX-25	4.08	30
RX-26	4.17	230
IV. Over \$8.00 per yd ³ -- average volume 118 yd ³ .		
RX-9	11.58	219
RX-16	13.36	71
RX-21 (upper)	22.00	64

Road Treatments

Roads through both prairie and forest were treated by outsloping to various degrees. These costs are compared in Table 7. Average cost of outsloping for all roads was \$1.78 per linear foot or \$9,398 per mile. In the woods, cost per linear foot depends on degree of outsloping. The most complete and expensive outsloping was done on a slumping section of the 2005 Road above a large perennial stream channel. Most of the road was only slightly outsloped, to restore natural runoff patterns, and costs were much lower: \$1.40 per linear foot, or \$7,392 per mile.

All prairie roads were completely outsloped. These were divided into two groups according to the slope of the finished outsloping. Oddly, the steeper outsloping was less expensive per linear foot.

Some road segments were cross-road drained. Drains cost an average of \$60 each.

Other roads listed on the table were used for worksite access, and required only minimal treatment on the way out. These were included on the summary table to show the overall distribution of road treatment costs.

Landings

One large landing on Count's Hill Prairie was totally outsloped (see Table 8). This was an expensive worksite, however treatment was justified for aesthetic reasons: the landing was built on a highly visible ridge, and had cutbanks up to 25 feet high.

Gully Treatments

Three gullies on Count's Hill Prairie were shaped to rounded swales, and a fourth gully system was dewatered by construction of a ditch (N.M.A.) (see Table 8). RX-22, Doug's Gully, was the largest gully with 8,036 cubic yards eroded. This was the most expensive per linear foot (\$1.61) to treat due to its large width and depth. The other two shaped gullies cost an average of \$.72 per linear foot. The N.M.A. (Netherby Memorial Airstrip - describes how it appeared when viewed from above by "The Bosses".) ditch was constructed to direct surface flow away from a developing gully system and into a more stable gully/channel in the forest. This cost was \$1.40 per linear foot. Erosion prevented is not known, but could be significant in a major storm, however subsurface flow still reaches the gullies.

TABLE 7.
SUMMARY OF AVERAGE COSTS OF ROAD TREATMENT

Type of Worksite	# of Work-Sites	Range: L.F.	Equipment	Range: Equip. Hours	Total Sites Cost ¹	Average: Cost/ Worksite	Range: Cost	Total L.F.	Average: Cost/ L.F.	Range: Cost/ L.F.
I. Wooded Roads:										
Complete	1	625	Excavator Bulldozer	13	\$1936	\$1936	\$1936	625	\$3.10	\$3.10
Moderate	6	125-1050	Excavator Bulldozer	1-33	7698	1283	277-4191	2900	2.65	.51-15.24
Slight	12	100-960	Excavator Bulldozer	1-11	7214	601	35-1597	5135	1.40	.05-2.66
II. Prairie Roads (Complete)										
Moderate 15-25%	5	165-550	Excavator Bulldozer	1-9	3457	691	84-1221	1683	2.05	.42-2.61
Steep over 25%	5	450-1700	Excavator Bulldozer	2-26	6996	1399	325-3191	4995	1.40	.56-2.66
TOTALS:	29	100-1700 L.F.		1-33 hours	\$27,301	\$941	\$35-4191	15,338 L.F.	\$1.78/ L.F.	\$.05-15.24/ L.F.
Cross Road Drained Roads ²	2	575-850 L.F.	Excavator Bulldozer	1½-3	\$417	\$208	\$88-329	1,425	\$60/XRD	\$29-82/XRD
Road Reaches Requiring only Minimal Treatment	4	775-1760 L.F.	Bulldozer	0-½	\$28	\$7	0-\$28	4,960	\$.01/ L.F.	--

Abbreviations: L.F. = Linear Feet

GRAND TOTAL - \$27,746

¹Rounded to nearest dollar

²Waterbars on Airstrip Access Road

TABLE 8.
LANDINGS (Prairie)

Worksite	Equipment	Hours	Cost	Site Cost	Quantity	Cost/ yd ³	Remarks
L-1	Excavator	19 1/4	\$1530.38				
	Bulldozer	29 1/2	2065.00	\$3595.38	441 yd ³	\$8.15	complete outslope Moderate slope (25% 20' cutbank

GULLIES (Prairie)

Worksite	Equipment	Hours	Cost	Site Cost	Quantity LF yd ³	Cost/ LF yd ³	Remarks
Rx-2G	Bulldozer	4 1/2	\$252.00	\$252.00	385' LF 440 yd ³	.65/LF .57/yd ³	large gully system
Rx-21G	Excavator	2	159.00		445' LF	.79/LF	large gully
Diversion Gully	Bulldozer	2 3/4	192.50	351.50	824 yd ³	.43/yd ³	system
Rx-22	Excavator	1/2	39.75		935' LF	1.61/LF	large gully
Doug's Gully	Bulldozer	22	1463.00	1502.75	8036 yd ³	.19/yd ³	system
NMA: Netherby Memorial Airstrip	Bulldozer	4	280.00	280.00	200' LF	1.40/LF	ditch connecting two gully systems

TOTALS:

[illegible]

¹Value given in cubic yards represents volume of the gully before treatment.
Volume estimated from field mapping notes and dimensions.

The main objective of the gully shaping was to reduce the slope of the gullies' sidebanks so revegetation would occur, and to eliminate the appearance of massive man-induced scars on the prairies by blending the contours with surrounding slopes. All three gullies were partially filled in the shaping process. Simply laying back the sideslopes without adding fill would have been preferable, however slopes were too steep for excavator work. Varying amounts of erosion have occurred in the gullies but they have not grown to their former extent by any means! At this point they probably look fairly similar to their pre-logging road-building condition: broad swales with small channel incisions.

Secondary Heavy Equipment Treatments

The purpose of secondary treatments is to minimize erosion and stabilize the completed worksite. Secondary treatments performed by heavy equipment include mulch distribution and "walking-in" channel armoring or rocking. Mulch was distributed by the bulldozer and skidder sled on the prairie where vehicle access was impossible, and walked-in to prevent wind loss and to mix the straw into the top few inches of soil (Table 9).

Table 10 has rocking costs broken up into the categories of quarrying, transportation and placement, and shows a comparison of haul road crossing excavation and rocking cost. Total excavation costs are virtually the same as the cost to rock these channels! Five of the eight rocked crossings cost more to rock than they did to excavate! The quarrying and transportation of rock is what drives the cost of rocking up the most. Actual placement costs are generally quite reasonable. A total of 3,646 cubic yards were excavated from the rocked crossings at a cost of \$3.49 per cubic yard. Anywhere from a few to perhaps a hundred cubic yards at each crossing was saved by the addition of rock, depending on the amount of flow and the excavation design and completeness. This represents from \$802 to \$16 per cubic yard of material saved. For these eight crossings, one would have to expect erosion equal to the amount excavated for rocking to become the same prices as excavating, per cubic yard saved.

On the Lower Slide Creek Unit, natural channel rock was uncovered in all channels where high, erosive flows were expected. Small ephemeral streams did not have much rock, but they don't need the size of rock that comes from our quarrying operations, nor have they experienced significant erosion in the winter's storms. Thus it appears that on selected east side sites nature may provide the rehabber with plenty of rock when needed, if the rehabber digs deep enough in the right spot. However, rock is very important if the excavation is not complete, if it is not an original streambed (i.e. a gully), or if it is a channel where high flows are expected, but no large rock is observed in the natural channel above and below.

TABLE 9.
MULCH DISTRIBUTION USING HEAVY EQUIPMENT

Task	Equipment	Hours	Cost	Total Cost	Remarks
Transport/ load/unload	1450 Bulldozer	17	\$1119.00		Using Bob Mallonee's wooden skidder sled built in 1980.
	1150 Bulldozer	3 3/4	210.00	\$1400.00	
Walking-In	1450 Bulldozer	12 1/2	875.00		
Straw	750 Bulldozer	10	700.00		
	1150 Bulldozer	5 3/4	322.00	1897.00	
TOTALS:		49 hrs.		\$3297.00	

Note: Heavy equipment was used exclusively for mulch distribution and "punching-in" on the prairies - 2010, 2005, and Pig Pen. A quantity of 815 bales were used on the prairies with a cost of \$4.05/bale for "handling, delivery and walking!"

STRAW BALE DISTRIBUTION/ROAD REACH/POUNDS PER ACRE USAGE

Road/Site	Linear Feet	Quantities:		Pounds Per Acre Spread	Number of Haul Road Crossings
		Acreage ¹	Bales ³		
2005, Prairie	950'	1.2	140	7000	1
2010, Prairie	2493'	4.3	305	4256	1
Barn, Road	5030'	1.3	65	3000	2
2005, Woods	4775'	5.5	297	3240	12
2010, Woods	7875'	9.0	225	1500	8
Airstrip, Woods	3500'	2.4	52	1300	2
Pig Pen Prairie	1700'	2.0	70	2100	0
Gullies	1965'	2.4	300	7500	0
TOTALS:	28,288 linear feet 5.4 miles	28.1	1454 ² bales	Average: 3105 lbs/acre	

¹Prairie road and gully acreage was measured in the field: for each 100' long length, a width and slope angle was measured. An average width of 50' was used for wooded roads.

²Bale count is approximate. Bales on wooded roads were counted individually, bales on prairie were estimated from number of sled loads.

³Average bale weighed 60 lbs.

TABLE 10.
HAUL ROAD CROSSING ROCK COSTS

Work Site	Quantity yd ³	Quarry Cost/yd ³	Transport Cost/yd ³	Placement Cost/yd ³	Total Cost/yd ³	Total Rock Cost	Total Excav. Cost	Labor Int. Cost	Total Site Cost
Rx-9	50	\$4.90	\$11.48	\$10.34	\$26.72	\$1336.00	\$2535.88	\$41.75	\$3913.63
Rx-11	80	4.90	11.48	1.49	17.87	1429.60	620.25	0.00	2049.85
Rx-12	80	4.90	11.48	3.48	19.86	1588.80	736.25	0.00	2325.05
Rx-14G	60	4.90	11.48	1.66	18.04	1082.40	358.63	0.00	1441.03
Rx-18	100	4.90	11.48	5.76	22.14	2214.00	4519.38	59.28	6792.66
Rx-21 upper	20	4.90	21.98 ¹	5.96	32.84	656.80	1401.88	0.00	2058.68
Rx-21 lower	60	4.90	21.98 ¹	12.93	39.81	2388.60	931.13	0.00	3319.73
Rx-34	20	5.25 ²	4.80 ²	L.I.	10.05				
	80	4.90	11.48	7.86	24.24	2140.20	1632.63	63.80	3836.63
TOTALS:				Average:	Average:				
8	530			\$6.19	\$24.22	\$12,836.40	\$12,736.03	\$164.83	\$25,737.26

¹Park backhoe used to transport rock from dump site on Airstrip to the stream crossing on Counts Hill Prairie.

²Park backhoe loaded rock into one dump truck at W-Line Rock Pit, and then rock was placed by labor crews.

Evaluation of Heavy Equipment Application

The heavy equipment used on Lower Slide Creek worked very well for the tasks performed. The operator is an extremely important element in the performance of a piece of equipment; we were fortunate to have two operators, Larry Lambert and Gary Netherby, who had previous experience in RNP rehabilitation work, and had worked together as a team before. Previous successful experience in rehabilitation work is critical in keeping costs low and in having work proceed efficiently. They had many valuable suggestions on approaches to excavations, and were willing to attempt almost anything. The combination of an excavator and a moderately large bulldozer is capable of completing the majority of tasks necessary to watershed rehabilitation.

The prescribed treatments appear to have been very successful so far. Channel excavations have withstood the high flows of this winter with only minor adjustments, and are capable of handling much higher flows. Road treatments have been successful in keeping flow dispersed and only one of the many areas which showed signs of instability pre-rehab has been active this winter. The prairie roads have experienced some minor slumping ("burps"), however, this was expected and has not increased sediment yield from the unit. Gully treatments were only partially successful: they look better, but they did contribute sediment to the streams. The lower half of RX-22 (Doug's Gully) became a small gully again (average cross sectional area of 2 yds^2), releasing approximately 150-200 yd^3 of sediment. Flow emerging from springs was more than expected here. The lower reach of Doug's Gully appears to have been a small channel in old air photos, and although unfortunately a considerable amount of material was lost, the area now resembles its original morphology, and looks much better than it did with a 50 foot wide, 25 foot deep gully. RX-26 also experienced gullying this winter. Flow from a spring upslope (inactive during mapping season) came down through the shaped gully rather than across the outsloped road in a swale provided. The gully was also fed by a major spring in the fractured sandstone cutbank (only a seep the previous winter). Unfortunately the flow did not enter the vegetated, natural channel adjacent to the gully. If it had, erosion would have been minimal.

Fractured sandstone cutbanks, even on small ridges, are capable of producing astounding amounts of flow in major runoff events, causing outsloping failure or gullying. This was observed on Dolson Prairie as well as on Count's Hill. Most of the other small outsloping failures are due to buried seeps or springs, and are somewhat expected.

The Diversion Gully, RX-22G, fared well with only minor downcutting. This gully was not as extensively infilled as the other two, because of its extremely springy Atwell soil/earthflow banks. For future gully work, infilling is appropriate for gullies without springs; seeps can be successfully buried. Laying back the sideslopes, as done on some of the Maneze Road gullies, is preferable to filling flowing gullies.

The large channel excavations all experienced some downcutting at their upstream ends due to incomplete removal of the sediment ponds which had accumulated behind the culverts. It was observed during excavation that when the main excavation was at original grade, there was usually a waterfall

did a variety of tasks, though again the main treatment work was mulch distribution and application. Other secondary treatments included seeding, gathering and spreading lupine seed, and channel armoring (Table 11).

Primary treatments were completed by Redwood National Park laborers, and site geologist and technicians, and consist mainly of setting chokers for the winch cat during stream crossing excavations. One task which could be considered a primary treatment was included in the miscellaneous grouping: stream clearance at RX-33.

Miscellaneous labor intensive work was completed entirely by Redwood National Park laborers. This included a variety of tasks such as brushing stream crossings, eliminating Douglas-fir along prairie roads, and rebuilding the skidder sled.

Labor intensive work was divided into two stages: pre-heavy equipment and during-heavy equipment. Work completed prior to the heavy equipment phase included brushing stream crossings along the 2005 and 2010 in the woods, and collecting lupine seed for later application along the "disturbed" (treated) prairie roads and gullies. Labor intensive work during heavy equipment phase followed or coincided with the heavy equipment sequence, and consisted almost exclusively of mulch distribution and application.

Labor Intensive Costs

The distribution and spreading of straw mulch was the single largest cost (64 percent) of the labor intensive phase (Table 11). When the cost of distribution and walking-in the straw by the bulldozer is added (Table 9), this treatment totals \$11,099.49, which is 9 percent of the total site cost (Table 1). These costs include \$1,400 for the bulldozer and skidder sled, and \$1,266.58 for Redwood National Park laborers for mulch distribution. The application cost was \$6,575.91 by both Redwood National Park laborers and Redwoods United employees. The heavy equipment cost to walk-in the straw was \$1,897. Approximately 28.1 acres were mulched with a unit cost of \$395/acre. Average application rates are shown in Table 9. Not included in the mulch distribution costs is the use of the Redwood National Park's 2 1/2 ton, flat-bed truck and drivers.

The use of the bulldozer and skidder sled for straw distribution lowered the unit cost considerably. The sled could haul up to 42 bales per load (compared to 22 per pickup truck load), and did not require a reasonably flat road. The bulldozer and sled could go anywhere on the prairie (bottom of RX-22, Doug's Gully, on 45 percent slopes and even down the 2005 via the old Barn Road). Daily, the bulldozer needed to refuel, and a full sled load brought down and distributed where needed that day.

The second highest labor intensive cost was travel time to and from Orick to Lower Slide Creek daily. This accounted for 28 percent of the labor intensive cost. All other tasks were a small percentage to this year's labor intensive costs. Labor intensive channel rocking, which was a large cost in 1980, played a minor role this year: only 1 percent of the total labor intensive cost.

from the "natural", but aggraded (stuffed) channel above. However, we had to stop somewhere, or else we would have ended up excavating our way up to the K & K! The downcutting is an adjustment between the stuffed and cleared out channel reaches, and seems unavoidable.

The large channels also experienced downcutting throughout the excavation as the small rock and remaining intermixed fill was mobilized by the high flows. A stable boulder bed now exists in most of these large channels. A few sidebank failures also occurred.

Excavations in low-flow, unprotected channels fared very well. Virtually no erosion occurred in low-flow rock channels; deposition occurred in most, with the roughness from rocks being smoothed into aggraded reaches.

Most of the channels on the 2005 Road were rock to provide a stable base level for the disturbed (logged) reaches above. For comparison, the crossings on the 2010 Road were left unprotected. It was also hoped that the rock might trap some of the coarser sediment eroded from partially washed out or excavated crossings above. This did happen, but the sediment saved is probably insignificant. It seems that rock is most appropriate for channels in extremely unstable terrain ("blue-goo" Atwell soils, earthflows, etc.) or where flow is not in an established channel (i.e. large gully systems fed by intercepted groundwater flow). In general, on the east side of Redwood Creek where coherent sandstone bedrock is expected and present in the natural channel above and below the excavation, imported rock is not necessary; natural channel bedload exposed during excavation is usually sufficient. The key is to insure adequate channel dimensions (25 to 50 percent wider than the natural channel), keep side banks at less than 40 percent slopes, and dig until the natural rock is encountered.

Most of the accessible, active, and potential sediment sources of significant size on the Lower Slide Creek Unit have been removed from the streamside environment. Overall sediment yield from the unit appears to have been reduced. In addition, the outsloping of roads both in the prairies and the woods have successfully restored the area to a close to mimic of its pre-logging condition (minus the trees).

For further details on effects of 1981-82 winter on Unit 81-2, reader is referred to the site file kept by Technical Services in Orick, which includes storm notes, photos and maps. Measurements and evaluation of the erosion that occurred during this first winter in relation to treatments is presently being compiled by the Technical Services Geologic Division in Orick (Sonnevil, Babcock, Klein and LaHusen). This will provide valuable information for planning this coming year's rehabilitation work.

LABOR INTENSIVE PHASE

Labor Intensive Application

Labor intensive work was completed by Redwood National Park laborers, Redwoods United, Inc., employees, and the site geologist and technicians. Redwoods United was entirely used for mulch application. Redwood National Park laborers

TABLE 11.
LABOR INTENSIVE COSTS

	Work Types	Type of Laborers	Person Hours	Cost	Total Cost	Quantity	Cost/Quantity	Remarks
PRIMARY TREATMENT	Winching:							
	Rx-9 & R-9	RNP	5	\$41.75 ✓		~15 logs	\$2.78/log	
		Techs	25	164.25		~100 logs	1.64/log	
	R-14	Geol.	2	18.46	\$224.46	~15 logs	1.29/log	
	TOTALS		32		\$224.26	130 logs	\$1.73/log	
SECONDARY TREATMENT	1. Material Distribution (straw)	RNP	161	1226.58	1226.58 ✓	1454 bales	.84/bale	See footnote 1.
	2. Mulch Application (straw)	RNP	343	2747.78		1454 bales	4.52/bale	Covers approximately 33 acres. ²
		RUI	565	3828.13	6575.91 ✓			
	3. Lupine Seed Rx-22	RNP	62	482.45 ✓		1.7 acres affected	283.79/acre	includes collecting & spreading.
		Techs	2	13.14 ✓		.2 acres affected	204.15/acre	
		Geol.	3	27.69 ✓	523.28 ✓			
	4. Ground Cover	Geol.	3	27.69 ✓	27.69 ✓	800 feet	.03/LF	covering R-17, access road with organic material.
	5. Seeding	RNP	12	91.20 ✓	91.20 ✓	See Vegetation Report by Lois Reed.		Count's Hill Prairie. Doesn't include Bio. Tech. supervising time.
	6. Channel Armor Rx-18	RNP	8	59.28		100 yd ³	.59/yd ³	
	Rx-34	RNP	8	63.80	123.08 ✓	100 yd ³	.64/yd ³	
TOTALS - Secondary Treatment				\$8567.74				

TABLE 11.
LABOR INTENSIVE COSTS - cont'd

Work Types	Type of Laborers	Person Hours	Cost	Total Cost	Quantity	Cost/Quantity	Remarks
MISCELLANEOUS	1. Brushing	RNP	68	1333.80✓	15 HRC	88.92/xing	
	2. Rx-33	RNP	8	63.80✓	~35' channel	1.82/LF	stream clearance ³
	3. Douglas-fir elimination	RNP	12	95.70✓	30 trees	3.19/tree	D.F. invading prairie along the K&K.
	4. Rebuild sled	RNP	36	252.80✓	1 sled	--	
	5. Safety meetings	RNP	6	47.85✓	--	--	
	6. Discussions	RNP	13	91.79✓	--	--	work problems
	7. Travel	RNP	192	1529.70✓	96 person round-trips	15.93/p.r.t.	
GRAND TOTAL:			\$12,207.64✓				

FOOTNOTES:

Abbreviations:

LF = Linear Feet

DF = Douglas-fir

p.r.t. = Person Round-Trips

HRC = Haul Road Crossing

¹ Does not include time or cost of park's two-ton truck and associated laborers; only the time and cost of moving materials on or to the site by our assigned laborers. Also does not include time or cost of bulldozer used to distribute mulch (see Table 9).

² Does not include time or cost of bulldozer walking-in straw (see Table 9).

³ Could be considered a primary treatment.

INDEX TO APPENDIX

NOTE: All of this material is in Resource Management and Technical Services files in Orick and Arcata

Detailed Cost Tables

Haul Road Crossings

Skid Trail Crossings

Road Reaches

Access Costs and Haul Road Ripping

Miscellaneous Primary Heavy Equipment Work Sites

Historical Photo Documentation (1954 through 1981)

Includes roads, logging, crossings constructed and erosion visible in the following air photo years: '54, '62, '66, '68, '71, '72, '73, '75, '78, and '81.

Also includes a series of mylar overlays detailing gully development on Counts Hill Prairie.

Photo Point Locations - detailed descriptions

Drainage Areas and Runoff

Stream Crossing Volume Survey and Calculation Methods

Redwoods United Labor Cost Breakdown

Evaluation of Labor Intensive Application

The main labor intensive treatment on Lower Slide Creek Unit was the application of straw mulch on treated haul roads and crossings, and on shaped gullies. Straw mulch helps prevent rilling and surface erosion, and slows drying out of the soil surface, which may aid revegetation.

On the prairie, straw was walked-in by the bulldozer running ^{over (up and down)} the slope several times with the blade up. This increased the expense of straw application, however it was justified in order to prevent losing the straw in the winds, which commonly occur in summer and fall afternoons. Walking in straw has the added benefits of further compacting the outslope, and of mixing any seeds on the surface into the first few inches of soil (hopefully not buried too deeply). Regeneration of grass on the prairies has been very good this year.

On the roads through the woods, straw was applied mainly to help maintain soil moisture, and on the 2010 to add some organics to the ripped, but rocky road surface. It also keeps the fine soil from being washed away when roads have been outslowed or ripped. Unstrawed areas are now armored with small pebbles. Straw was applied more heavily on excavated stream banks to help reduce surface erosion. In areas where seeps or springs trickle across the outslowing, the straw is beneficial in minimizing rilling. However in terms of cost per cubic yard of erosion prevented, straw mulch does not rate very high. Its benefits mainly seem to be in aiding revegetation, and perhaps in creating a copesthetic appearance to complete a very expensive project.

LIST OF AVAILABLE INFORMATION

(See Terry Spreiter or Louise Johnson in Orick)

Detailed Erosion Feature Maps (3 blue-line sheets)

Photo Points: Pre & Post Erosion Control Work

Storm Photos, Notes, Maps

Erosion Potentials

Original Mapping & Field Notes

Heavy Equipment Daily Records

Labor Intensive Daily Records

Work Statements (weekly)

Original Cost Breakdown

Stream Crossing Volume Survey Data

DETAILED WORK AND COST TABLES

LOWER SLIDE CREEK

UNIT 81-2

NOTE: The tables in this report reflect the true times and costs of work done, and do not total the amount billed to Unit 81-2 due to 1) RNP's backhoe being used and included in our tables and costs (\$35/hour); 2) the loading and transport of all rock on the east side was billed to our account; and 3) we "borrowed" and were "borrowed from" in times of heavy equipment need!

HAUL ROAD CROSSINGS

Work-Site	Equipment	Hours	Cost	Site Cost	Quantity ¹ yd ³	Cost/ yd ³	Heavy Equipment 2 ⁰ Treatment		Labor Intensive 2 ⁰ Treatment			Total Site Cost
							Rock yd ³	Cost ² yd ³	Type	Hours	Costs	
Rx-3 ³	Excavator	1/2	\$39.75		44							
	Bulldozer	1/4	14.00	\$53.75	swale	\$1.22	-0-					\$53.75
Rx-9	Excavator	18 1/4	1450.88									
	Bulldozer	15 1/2	1085.00	2535.88	219	11.58 ⁴			Wc.	5	\$41.75	
	Excav.(Rx) ²	6 1/2	516.75	516.75			50 Q	\$10.34 ⁵				3094.38
Rx-10	Excavator	2	159.00									
	Bulldozer	1	70.00	229.00	127 ¹⁹	1.80	-0-					229.00
Rx-11	Excavator	4 1/2	357.75									
	Bulldozer	3 3/4	262.50	620.25	178 ¹⁹	3.48						
	Excav.(Rx) ²	1 1/2	119.25	119.25			80 Q	1.49 ¹⁶				739.50
Rx-12	Excavator	7 1/2	596.25									
	Bulldozer	2	140.00	736.25	441 ¹⁹	1.67						
	Excav.(Rx) ²	3 1/2	278.25	278.25			80 Q	3.48 ¹⁶				1014.50
Rx-13	Excavator	1/2	39.75		N/M							
	Bulldozer	2	140.00	179.75	swale	--	-0-					179.75
Rx-14	Excavator	11	874.50									
	Bulldozer	11	770.00	1644.50	474	3.47	-0-					1644.50
Rx-14G	Excavator	2 3/4	218.63									
	Bulldozer	2	140.00	358.63	49	7.32 ⁶						
	Excav.(Rx) ²	1 1/4	99.37	99.37			60 Q	1.66 ¹⁶				458.00
Rx-15	Excavator	3	238.50									
	Bulldozer	2 1/2	175.00	413.50	85	4.86	-0-					413.50
Rx-16	Excavator	7 3/4	616.13		71							
	Bulldozer	4 3/4	322.50	948.63	ditch ⁷	13.36	-0-					948.63

HAUL ROAD CROSSINGS

Work-Site	Equipment	Hours	Cost	Site Cost	Quantity ¹ yd ³	Cost/ yd ³	Heavy Equipment ²⁰ Treatment		Labor Intensive ²⁰ Treatment			Total Site Cost
							Rock yd ³	Cost ² yd ³	Type	Hours	Costs	
Rx-17	Excavator Bulldozer	6 4 1/4	477.00 297.50	774.50	163	4.75	-0-					774.50
Rx-18	Excavator Bulldozer Excav. (Rx) ²	26 1/4 34 3/4 7 1/4	2086.88 2432.50 576.37	4519.38 576.37	1450	3.12	100 Q	5.76 ⁸	channel armor	8	59.28	5155.03
Rx-19	Excavator Bulldozer	1/2 1/4	39.75 17.50	57.25	32 swale	1.79	-0-					57.25
Rx-21 upper ³	Excavator Bulldozer Excav. (Rx) ²	11 1/4 7 1/4 1 1/2	894.38 507.50 119.25	1401.88 119.25	64	22.00 ⁹	20 Q	5.96 ¹⁰				1521.13
Rx-21 lower ³	Excavator Bulldozer Excav. (Rx) ² Bulld. (Rx) ²	7 3/4 4 1/2 8 2	616.13 315.00 636.00 140.00	931.13 776.00	358	2.60	60 Q	12.93 ¹¹				1707.13
Rx-24	Excavator Bulldozer	11 8 1/2	874.50 595.00	1469.50	200 ¹²	7.35 ¹³	-0-					1469.50
Rx-25	Bulldozer	1 3/4	122.50	122.50	30 ditch	4.08	-0-					122.50
Rx-26	Excavator Bulldozer	7 5 3/4	556.50 402.50	959.00	230	4.17	-0-					959.00
Rx-27	Excavator Bulldozer	5 1/4 6 3/4	417.38 472.50	889.88	326 ¹⁸	2.73	-0-					889.88
Rx-28	Excavator Bulldozer	34 34	2703.00 2380.00 1275.00	6358.00	1589	4.00	-0-					6358.00

HAUL ROAD CROSSINGS

Work-Site	Equipment	Hours	Cost	Site Cost	Quantity ¹ yd ³	Cost/ yd ³	Heavy Equipment 20 Treatment		Labor Intensive 20 Treatment			Total Site Cost
							Rock yd ³	Cost ² yd ³	Type	Hours	Costs	
Rx-29G	Excavator	2 3/4	218.63	218.63	136	1.61						
	Excav.(Rx)	1 1/4	99.37	99.37			10 N	9.94 ¹⁴				318.00
Rx-30	Bulldozer	1/2	35.00	35.00	17 swale	2.06	-0-					35.00
Rx-31	Excavator	2 1/4	178.88	178.88	119	1.50	-0-					178.88
Rx-34	Excavator	9 3/4	775.13									
	Bulldozer	12 1/4	857.50	1632.63	887 ¹⁷	1.84			channel armor	8	63.80	
	Excav.(Rx)	7 1/4 ²	576.38									
	Bulld.(Rx)	3/4 ²	52.50	628.88			80 Q	7.86 ¹⁵				2325.31
TOTALS: Excavation: 363 3/4				\$27,268.30			Average: 530-Q	Average				
(24)	Rocking:	40 3/4		3,213.49	7289	\$3.74	10-N	\$5.95		21	\$164.83	\$30,646.62
GRAND TOTAL:			<u>404 1/2 hours</u>	<u>\$30,481.79</u>								

Abbreviations

- 20 - Secondary
- N - Natural, near work site
- Q - Quarry Rock
- Rx - Rocking
- Wc - Winching
- N/M - Not measured

HAUL ROAD CROSSINGS--FOOTNOTES

NOTE: Rock placement costs for channels using natural rock are included in excavation costs. All site costs exclude access (relocation), breaks, and discussions.

- ¹Volumes calculated by "double end area method"; surveyed using tape and clinometer.
- ²Rock placement only.
- ³Prairie crossing.
- ⁴High cost per cubic yard due to winching about 100 logs from the crossing.
- ⁵High cost of rock placement due to using additional, very large, natural rock (up to 6' diameter) found on channel's right bank. One of these rocks required winching to move it into place.
- ⁶High cost of excavation due to excavator working between old growth redwoods.
- ⁷High cost of excavation due to unusual nature of excavation--a 289 foot long horseshoe-shaped ditch. In retrospect, could have just made a 150 foot long cross road drain--flow was supposed to drain out both ends of horseshoe somewhat equally; instead it all goes to the left side.
- ⁸Rock placement on steep slope increased cost.
- ⁹Extremely high cost to excavate due to encountering 8 foot diameter knocker in mid-channel. This was excavated, winched out, and buried to prevent it from rolling downslope, possibly injuring someone, or plugging the excavation. In general, digging proceeded more slowly and carefully than usual for a stream excavation because we wanted to assure that this topographically inverted stream would not re-divert.
- ¹⁰Rock placement costs were high because the backhoe was unable to dump rock right at the crossing, and so the excavator had to ferry it up (approximately 100 feet) bucket by bucket.
- ¹¹Rock placement costs were high due to difficulties in getting rock to stay put in steep upper section of channel.
- ¹²Volume estimated, not surveyed.
- ¹³Excavation cost was high because of winching numerous logs and several old growth root wads.
- ¹⁴Rock placement cost was high because rock was carried several hundred feet by the excavator.
- ¹⁵Rock placement cost was high because of placing rock in awkward bend in the channel above true excavation.
- ¹⁶Rock placement costs were low because rock was within reach of the channel, and the channel was straight with a gentle gradient.
- ¹⁷Field review group felt volume measured was too high; perhaps 500 cy is more realistic, giving a cost per yd³ of \$3.27.
- ¹⁸Field review group felt volume measured was too high, however volume does include 127 yd³ of material moved to build a ditch from cattail pond on adjacent deck, leaving 199 cy from the crossing itself. Ditch volume maybe high but the crossing seems about right.

¹⁹Field review group felt that volumes measured at RX-10 and RX-12 were high; volume calculations were double checked, but no errors were found. We feel that 127 cy from RX-10 is about right. Volume of 441 yd³ at RX-12 could be a little high, but we feel that its at least 350 cy, giving a cost per yd³ of \$2.10. If anything, the volume listed at RX-11 is low: 275 yd³ is more realistic, giving a cost per yd³ of \$2.26.

SKID TRAIL CROSSINGS

Worksite	Equipment	Hours	Cost	Site Cost	Quantity ¹ yd ³	Cost/ yd ³	Total Site Cost	Remarks
Sx-12A	Excavator	3	\$238.50					
	Bulldozer	2 ½	175.00	\$413.50	200	\$2.07	\$413.50	Excavation only.
Sx-23A	Excavator	2 ½	198.75					
	Bulldozer	1 ½	70.00	268.75	83	3.24	268.75	} Times and costs include access.
Sx-23B	Excavator	2 ½	178.88	178.88	12	14.90 ²	178.88	
Sx-23C	Excavator	3	238.50	238.50	95	2.51	238.50	
Sx-23D	Excavator	1 ½	99.38	99.38	17	5.85	99.38	
Sx-31B	Excavator	½	19.88					
	Bulldozer	½	14.00	33.88	10 ³	3.39	33.88	Excavation only.
						Average:		
						\$2.96/ yd ³		
<u>6</u>		<u>16 ½</u>			<u>417 yd³</u>		<u>\$1232.89</u>	

¹Volume calculated by the double end area method; surveyed using tape and clinometer.

²SX-23B was difficult to get to: excavator had to claw his way over a sharp ridge, and fill a gully.

³Volume estimated, not surveyed.

ROAD REACHES

Work Site	Location	Equipment	Hours	Cost	Site Cost	Quantity LF or XRD	Cost/ LF or XRD	Degree of Outsloping (slope)	Remarks
R-1	P	Excavator Bulldozer	1 9 3/4	79.50 546.00	625.50	300'	2.09	complete (moderate)	
R-2	P	Excavator Bulldozer	4 1/2 3 1/4	357.75 227.50	585.25	450'	1.30	complete (steep)	
R-3	P	Bulldozer	1 1/2	84.00	84.00	200'	.42	complete (moderate)	
R-9	W	Excavator Bulldozer	23 33 3/4	1828.50 2362.50	4191.00	275'	15.24	moderate	Included winching approx. 100 logs from around the deck, and Rx-9.
R-10	W	Excavator Bulldozer	1 3/4 1	139.13 70.00	209.13	100'	2.09	slight	
R-11	W	Excavator Bulldozer	4 1/4 3 1/2	337.88 245.00	582.88	275'	2.12	slight	
R-12	W	Excavator Bulldozer	1/2 2	39.75 140.00	179.75	275'	.65	slight	Opened, then outsloped access to Sx-12A
R-13	W	Excavator Bulldozer	4 1/2 2 1/2	357.75 175.00	532.75	400'	1.33	slight	
R-14	W	Excavator Bulldozer	9 1/2 10	755.25 700.00	1455.25	575'	2.53	slight	
R-15	W	Excavator Bulldozer	1 1/2 2 1/4	119.25 157.50	276.75	125'	2.21	moderate	
R-16 OS	W	Excavator Bulldozer	6 6 1/4	477.00 437.50	914.50	575'	1.59	moderate	

Abbreviations: P = Prairie; XRD = Cross Road Drain; W = Wooded; LF = Linear Foot; OS = Outsloping; CHP = Counts Hill Prai

ROAD REACHES

Work Site	Location	Equipment	Hours	Cost	Site Cost	Quantity LF or WB	Cost/ LF or WB	Degree of Outsloping	Remarks
R-16 WB	W	Excavator Bulldozer	1 1/2 3	119.25 210.00	329.25	575' 4-WB	82.31	--	
R-17	P	Excavator Bulldozer	15 15 1/4	1192.50 1067.50	2260.00	800' 1700' OS	Access 1.33 ²	complete (steep)	Access road covered with windfalls on way out.
R-18	W	Excavator Bulldozer	12 1/4 13 3/4	973.88 962.50	1936.38	625'	3.10	complete (moderate)	To prevent mass movement and to bring top soil to surface.
R-19	W	Excavator Bulldozer	1 3/4 1/2	139.13 35.00	174.13	200'	.87	slight	
R-20	W	Excavator Bulldozer	9 1/2 11 3/4	755.25 822.50	1577.75	1050'	1.50	moderate	
R-21	P	Excavator Bulldozer	9 1/4 6 3/4	735.38 472.50	1207.88	550'	2.20	complete (moderate)	
R-22	P	Excavator Bulldozer	7 9 1/2	556.50 665.00	1221.50	468'	2.61	complete (moderate)	
R-23	P	Excavator Bulldozer	25 3/4 17	2047.13 1144.50	3191.63	1200'	2.66	complete (steep)	
R-24	P/W	Excavator Bulldozer	3 1/4 1 1/4	258.38 87.50	345.88	675'	.51	moderate	
R-25	W	Excavator Bulldozer	5 1/4 1 1/2	417.38 105.00	522.38	375'	1.39	slight	
R-29	W	Bulldozer	1/2	35.00	35.00	725'	.05	slight	Dug a swale
R-30	W	Excavator Bulldozer	1 1/2 5	119.25 350.00	469.25	300'	1.56	slight	

ROAD REACHES

Work Site	Location	Equipment	Hours	Cost	Site Cost	Quantity LF or XRD	Cost/ LF or XRD	Degree of Outsloping (Slope)	Remarks
R-31 NW	W	Excavator Bulldozer	2 1/2 2 3/4	198.75 192.50	391.25	200'	1.96	moderate	
R-31 rock pit	W	Excavator Bulldozer	11 1/2 9 3/4	914.25 682.50	1596.75	600'	2.66	slight	Outsloped to bring up topsoil to aid revegetation of rock pit.
R-31 SE	W	Bulldozer	1 1/4	87.50	87.50	850' 3-XRD	29.17	N/A	
R-33	P/W	Excavator Bulldozer	7 1/2 7 1/2	596.25 525.00	1121.25	960'	1.17	slight	
R-34	W	Bulldozer	1/2	28.00	28.00	775'	N/A	N/A	Providing access for the excavator to Sx-23A,B,C,D.
R-38	W	Excavator Bulldozer	2 1/4 2 1/4	178.88 157.50	336.38	350'	.96	slight	
R-39	P	Excavator Bulldozer	5 4 1/4	397.50 238.00	635.50	1760' 1125' OS	Access .56 3	slight to none complete (steep)	
R-41	P	Excavator Bulldozer	1 3/4 3 1/4	139.13 185.50	324.63	1625' 520' OS	Access .62 3	slight to none complete (steep)	
CHP:K&K Spur Road	P	Excavator Bulldozer	2 1/4 2	178.88 140.00	318.88	165'	1.93	complete (moderate)	Located on the northwest corner of Counts Hill Prairie just below the K&K.
TOTALS:		Excavator Bulldozer	181 1/4 195	14,409.43 13,338.50					
GRAND TOTAL --						21,723' or 4.1 miles			

Footnotes on following page.

ROAD REACHES--FOOTNOTES

1. "Degree of outslope" refers to how much of the cutbank was buried. Complete = cutbank buried; moderate = generally 1/3 to 2/3 of cutbank buried; slight = cutbank buried just enough to allow water to drain off the road.
"(Slope)" refers to slope of the completed outslope and its surrounding terrain. Slope of moderate and slight outslloping is not considered to be a factor in unit costs, and was not included.
2. Unit cost calculated for outslloped section only. Covering access road with windfalls was done on the way out (cost negligible).
3. Unit cost calculated for outslloped section only. Treatment of remaining road (used as access) was minimal and was included in outslloping cost.
4. Length of 4.1 miles includes all road reaches where treatment (even if minimal; i.e., smoothed out after used for access) went beyond ripping.

Total length of road ripped and/or treated = 4.8 miles.

ACCESS COSTS

Equipment	Move-In/ Move-Out	Relocation Within site		Road Clearance		Cost
		Hours	Cost	Hours	Cost	
Excavator	\$394.50	19 3/4	\$1570.13	0	0.00	\$1964.63
D-8 Cat	0.00 ¹	3 1/2	280.00	0	0.00	280.00
1450 Bulldozer	337.50	18	1260.00	0	0.00	1597.50
1150 Bulldozer	0.00 ²	4 1/4	238.00	9 1/4	\$518.00	756.00
D-7 Cat	0.00 ³	2 1/2	187.50	0	0.00	187.50
TOTALS	\$732.00	48	\$3535.63	9 1/4	\$518.00	\$4785.63

HAUL ROAD RIPPING

Work Site	Equipment	Hours	Cost	Site Cost	Quantity L.F./mi.	Cost L.F./mi.	Remarks
2010 upper woods	D-8	4 3/4	\$380.00	\$380.00	2695' .5 mi.	\$.14/LF 760/mi.	Includes Rx-32 (wet deck)
2010 lower woods	D-8	4 1/2	360.00	360.00	3400' .65 mi.	.11/LF 554/mi.	
2005	D-8	7 3/4	620.00	620.00	4775' .9 mi.	.13/LF 689/mi.	
2005 dish culvert	D-8	1 1/4	100.00	100.00	--	--	This was done simultaneously with the ripping.
TOTALS:							
3		18 1/4		\$1460.00	10,870' 2.05 mi.	Average: .13/LF 663/mi.	

Abbreviations:

LF = Linear Feet

mi = Miles

Footnotes for these tables on following page.

ACCESS COSTS--FOOTNOTES

Access costs include equipment move-in and move-out by lowboy truck, relocation within the unit (between worksites), and road clearance for access to skid trail crossings.

Special notes:

¹Move-in/out charges for D-8 (rip cat) were billed to Site 81-3; cat worked on all three east side units.

²No move-in/out charges for the 11150. The 1450 was not available for the first week, so the contractor provided the 1150 at a lower hourly rate without move-in/out charges.

³No move-in/out charges for the D-7. This was "borrowed" from North Copper Creek Unit.

HAUL ROAD RIPPING--FOOTNOTES

Rocked haul roads on the unit were ripped to decompact the surface. On the 2005, the D-8 also "dished out" some fill (approximately 5-20 cubic yards) over each culvert in passing. Roads through the prairie (not rocked) were not ripped by the D-8, but the road surface was broken up using the excavator bucket just prior to outsloping. Refer to Map for ripping locations.

MISCELLANEOUS PRIMARY HEAVY EQUIPMENT WORK SITES

Work Site	Equipment	Hours	Cost	Site Cost	Remarks
K&K culvert No. 31.3	Excavator	3 1/4	\$258.39		Pulling back the edge of the K & K perched above RX-34.
	Bulldozer	3 1/2	245.00	503.38	
K&K culvert No. 30.0	Backhoe (NPS)	3	105.00	105.00	Removal.
K&K culvert No. 29.9	Backhoe (NPS)	8	280.00	280.00	Installed an additional 36" culvert next to the 36" culvert already at the road crossing.
Airstrip Access	Excavator	11 1/4	894.38		Includes opening the road, re-excavating 2 crossings and re-constructing 21 waterbars.
	Bulldozer	13	910.00	1804.38	
TOTALS:					
4		42		\$2692.76	

MISCELLANEOUS

Task	Equipment	Hours	Cost	Total Cost
Standby -- Paid in Full ¹	Excavator	2 1/2	\$198.75	
	Bulldozer	11 1/4	773.50	\$972.25
Standby -- w/out operator ²	Excavator	10	347.50	347.50
Standby -- w/operator ³	Excavator	1	45.75	45.75
Break	Excavator	26	2067.00	
Discussions	Bulldozer	33 1/4	2275.00	
	D-8	1 1/4	100.00	4442.00
Work on 81-3 ⁴ (2020)	D-8	1	80.00	80.00
TOTALS:		86 1/4		\$5887.50

¹ Short periods of time when a piece of equipment was unable to work for various reasons (lack of space, work, etc.).

² Bulldozer was busy with gully work; nothing for excavator to do alone efficiently.

³ Bulldozer broke down; nothing for excavator to do alone efficiently.

⁴ Ripping bulldozer recalled to Unit 81-3 for shorttime. See Bundros and Huber report for details.

HISTORICAL PHOTO DOCUMENTATION

1954

- Roads:
1. No logging roads, no K & K.
 2. Barn Road from Bald Hills to barn on lower Counts Hill Prairie. Bridge crossing on P.O. Creek.
 3. No change since 1936 oblique air photos (slightly blurred).
- Logging: None -- all old growth on lower Slide Creek Unit.
- Crossings: 1. Bridge over P.O. Creek, on Barn Road.
- Erosion: Earthflow has basically similar configuration as now.

1962 (HCN-2 22-61 to 63)

- Roads:
1. K & K - built in late 50's.
 2. 2005 - built to just beyond South Fork Slide Creek.
 3. R-39 - drops down off K & K for a few hundred feet; connects to Barn Road.
- Logging:
1. Select-cut (tractor) below K & K on RB of North Fork Slide Creek drainage.
 2. Clear-cut (tractor) from beginning of 2010 Road to the rock pit.
 3. Select-cut (tractor) in No Name Creek drainage between K & K and 2005 Road.
- Crossings:
1. No Name Creek - RX-18, 2 SX's.
 2. South Fork Slide Creek - RX-14.
 3. Others: RX-19, RX-17, SX-17C, RX-16, RX-15.
- Erosion:
1. North Fork Slide Creek - two natural slides visible about where 2005 and RX-9 now are -- trees smaller than surrounding forest.
 2. Redwood Creek - mouth of Slide Creek, only a few logs piled against the big rock.
 3. Count's Hill Prairie
 - a. Earthflow -- headscarp same as now; trees on scarp are small.
-- "scabface" area (above N.M.A. ditch) looks active (freshly gullied).
 - b. Gullies
 - G-1 -- present, not fresh; not obviously connected to P.O. Creek by RX-21.

-- several small old gullies/flow routes visible between G-1 and P.O. Creek.

G-2, G-3 -- present, fairly fresh.

G-AX --axial gully to earthflow present; headcut approximately same location as now.

G-4 -- (Doug's gully) visible as discontinuous incised swale, lower half only. Upper half is smooth swale; Barn Road crossing ok.

G-5 -- natural-looking prairie channel or incised swale. Lower half (below bay) more incised than upper half.

G-6 and vicinity -- rumpled looking. Several small gullies and/or slumps.

G-7 -- not a gully, just a line of juncus.

G-8 -- vegetated small gully.

1966 12-21-66 209.25 1:15000 AV-775-08-15 to 17

2 years after 1964 storm. Shadows are very long in these photos, details are obscured.

- Roads:
1. 2005 - built all the way across Count's Hill Prairie, to the Forested (axial) Gully (G-AX).
 2. 2010 - built beyond the North Fork Slide Creek, to edge of prairie.
 3. Pig Pen Prairie Road (R-17) built all the way to Redwood Creek. Purpose unknown.
- Logging:
1. Approximately 235 acres of select-cut, tractor-yarded. Includes all land presently logged except the north side of the North Fork Slide Creek between K & K and 2010 Road, the cable cut below 2005 Road, and a few other small spots.
- Crossings:
1. South Fork Slide Creek (main stem): RX-28, 1 skid trail crossing above 2010.
 2. North Fork Slide Creek (main stem): RX-9, RX-24, 1 possible SX.
 3. P.O. Creek: RX-4.
 4. Others: RX-2, RX-3, RX-5(B), RX-6(B), RX-7(B), RX-8(B), RX-10, RX-11, RX-12, SX-11A, SX-12A, SX-25A, SX-26A.
- ((B) indicates bowl or indistinct channel, rather than distinct channel.)

- Erosion:
1. No Name Creek drainage
 - a. RX-18 plugged; outside half of road gone.
 - b. Near K & K culvert 29.8 - gullied or fill failure from K & K to 2005.
 - c. Below and near RX-19, two debris avalanche/fill failures have occurred into old growth.
 2. Slide Creek drainage - can't see much, too shadowy.
 3. P.O. Creek - RX-4 has washed out.
 4. Count's Hill Prairie
 - a. Earthflow looks about the same as 1962.
 - b. Gullies
 - G-1 -- has migrated headward, almost to P.O. Creek; very fresh, distinct scar.
 - G-5 -- a distinct, but discontinuous gully now parallels natural channel (to R). Head of gully is at new road; road probably diverted natural channel's flow, and increased surface runoff by exposing cut bank springs.
 - G-8 -- has migrated headward; a very small gully.
- All other gullies show no change.

1968 3-30-68 AV-840-06-17 to 20

Roads: No new roads.

Logging: No new logging. The trees R.I.P.!

Crossings: No new crossings.

Erosion: Many of these features may have been present in 1966 but were not visible due to shadows.

1. No Name Creek
 - a. Large gully formed below K & K culvert 29.8.
 - b. K & K culvert 29.9 on No Name Creek may have plugged and flowed over road causing fill failure.
 - c. RX-18 flowing over road or 70% washed out (?).
 - d. Debris avalanche areas below and near RX-19 are very bare.
2. South Fork Slide Creek
 - a. Small gully present below and near RX-30.

- b. Flow coming down skid trail to RX-15, then flows down 2005.
- c. Gully beginning below K & K culvert 30.3; hasn't reached 2010 yet.
- 3. North Fork Slide Creek
 - a. RX-9 - flow going over road; may be washed out. Flow goes to L of Douglas-fir (as it does now).
- 4. Count's Hill Prairie
 - a. G-1 has migrated headward, capturing P.O. Creek. A dark line is visible down the gully -- assume this is flow!
 - b. No other changes.

1971

7-12-71

Roll 31

CH71-R25B-54 to 57

Roads:

- 1. 2010 now extends up from Count's Hill/Slide Creek divide to the K & K.
- 2. 2010 also extends across Count's Hill Prairie and into Airstrip Creek, but does not connect to the Barn Road as a major haul road.
- 3. Rock Pit and related roads at south end of 2010 are present.

Logging:

Death, Destruction and D-8's run rampant through the redwoods!

- 1. All remaining uncut patches above the 2005 are gone.
- 2. All former select-cut areas are now clearcut.
- 3. A few scattered tanoaks are all that remains in the way of vegetation.
- 4. Logs are on the ground everywhere.
- 5. Logs are decked up on L-1 and deck by Airstrip.
- 6. An 18-wheeler is on it's way across the prairie with a load of prime old growth!
- 7. Only area not re-entered is the north side of North Fork between 2005 and 2010, and a small area below the 2005 near CHP.

Crossings:

- 1. No Name Creek - no new crossings.
- 2. South Fork Slide Creek - one new SX, one possible SX.
- 3. North Fork Slide Creek and tributaries - 23 new SX's, 4 possible SX's, 4 new haul road crossings.
- 4. P.O. Creek - one new haul road crossing (culvert actually not at P.O. Creek but at gully).

- Erosion:
1. RX-9 - flowing over or washed out road. Flow going on R side of Douglas-fir. This probably caused gullying on R side of fir where rocks are now dumped.
 2. All other RX's and SX's are intact. (RX-18 has been rebuilt).
 3. G-4 (Doug's Gully) is beginning; starts at new 2010 Road, goes down as far as Barn Road. Discontinuous for upper half, then continuous, fresh, and enlarged for lower half of total present gully size.

1972 3-7-72 1:5000 RNP 1 - 174 to 176
 Taken 2 days after second major storm; covers Count's Hill Prairie only.

Roads, Logging, Crossings - nothing new constructed; many washed out.

Erosion: Massive!

1. Count's Hill Prairie (the 2010 across the prairie was water-barred).
 - a. G-1 has been abandoned; diversion gully has formed, rejoining G-1 at bay trees.
 - b. Water bar caused reactivation of small old gully between P.O. Creek and G-1.
 - c. Water bar caused increase in size and length of G-2; G-2's flow now heads downslope to a new gully (G-7).
 - d. Major section of road has failed to L of diversion gully (G-6 area). Cut bank came down on the road, and OER has also failed. Slight, rounded bench remains where road was.
 - e. G-4 - Doug's Gully - has grown to present size. Flow feeding gully comes from above the "wet deck"; possibly from K & K culvert 31.6. Barn Road crossing washed out; flow fanned out on first bench, many flow routes visible. Main flow went down present gully.
 - f. G-5 - a new gully parallels old gully for short distance.
 - g. G-7 is now a small gully.
 - h. G-9 formed along road due to diversion of swale flow.
 - i. Several other small gullies or small slumps present.
 - j. Fresh scarp around head of steep bowl (10).
2. North Fork Slide Creek

RX-24 gone, no diversion
 SX-32A gone, no diversion

1973 6-05-73 1:5000 7-28 to 30

Roads, logging, crossings - nothing new.

Erosion: 1. No Name Creek - RX-18 gone.

2. South Fork Slide Creek

RX-14 gone.

RX-14G: road looks wet here.

All skid trail crossings gone.

Large debris avalanche directly into South Fork from rock pit on 2010.

3. North Fork Slide Creek drainage

RX-9 - flowing over road to right of Douglas-fir.

RX-10 - flowing over road.

RX-11 - gone.

RX-12 - flowing over road.

RX-24 - gone.

RX-33 - gone.

All North Fork main stem skid trail crossings gone.

North Fork tributary channels - skid trail crossings hard to see, but many skid trails are gullied -- possible diversions? "Ify" channel looks gullied below the 2010. Channel diverted into RX-10's drainage? No incised channel.

K & K culvert 31.3 plugged, causing large gully which bypassed RX-34, then rejoined the North Fork.

Debris avalanche/gully between K & K culvert 30.8 and 30.9 occurred.

R-26, north end, covered by landslide. Cause unknown.

R-26, south end, covered by landslide. Caused by failure of a skid trail crossing a springy swale.

Wet Deck (on north side of North Fork) being fed by two springs on slope above; flow goes down skid trails to deck; small gullies off edge of deck; some flow goes down road towards G-4 (Doug's Gully).

1975

RNP 75

1:10000

8-26 7-10 to 13

Roads and Crossings:

1. 2005 rebuilt: RX-9, RX-14, RX-18.
2. Reconstruction of RX-9 involved blasting rock knob on right bank; debris used to fill gully formed by flow diverted to right of Douglas-fir; new road constructed above original road (but doesn't seem to go anywhere).

Logging: 1. Area below K & K, adjacent to Lower Slide Creek unit, but in Maneze Creek drainage now clearcut.

Erosion: 1. No Name Creek - looks like K & K culvert 29.9 (No Name) may have plugged and flowed over road, causing gullying or debris avalanche failure south of culvert.
- A new fill failure on 2005 on small ridge on R-20.

2. North Fork Slide Creek
RX-12 flowing over and down road.
RX-11 - washed out.
RX-9 - has flowed over road (?).

Large landslide (at RX-7) occurred - debris has gone straight to the creek. Bare ground from 2005 to creek.

Gully from K & K to North Fork - probably caused by K & K culvert 31.1 plugging and flow going down road. Channel above K & K has been driven up (see Upper Slide Creek Report).

3. South Fork Slide Creek

Gully from K & K culvert 30.3 has formed; goes all the way to South Fork (gullied through 2010 Road).

RX-14 Gully has enlarged, especially from 2005 to first skid trail above 2005. Small gully visible above first skid trail; flows down skid trails, jumps off at switchback corners, feeding RX-14G.

Debris avalanche off K & K just below culvert 30.7.

4. Count's Hill Prairie

G-7 is more prominent, possibly enlarged; right fork now connects to main gully.

1978 RNP 78 7-30-78 1:6000 14-81 to 85

Roads: 1. Skid trail around new cable unit below 2005.

Crossings: Nothing new.

Logging: Clearcut, cable yarded area below 2005 on "Cable Creek".

Erosion: 1. No Name Creek

Gully formed below K & K culvert 30.0, washing out uppermost skid trail crossing, partially washing out others. Feeds SB failure below RX-17.

Large gullied landslide/streambank failure below RX-17. All debris in creek; caused other smaller streambank failures downstream.

2. South Fork Slide Creek

RX-14 Gully has migrated headward, enlarging, to second skid trail above 2005 (switchback corner).

3. North Fork Slide Creek

RX-9 washing out - probably looks very similar to 1981 pre-rehabilitation condition.

4. Count's Hill Prairie - no changes obvious.

1981

Roads, crossings, logging: nothing new - all parkland now.

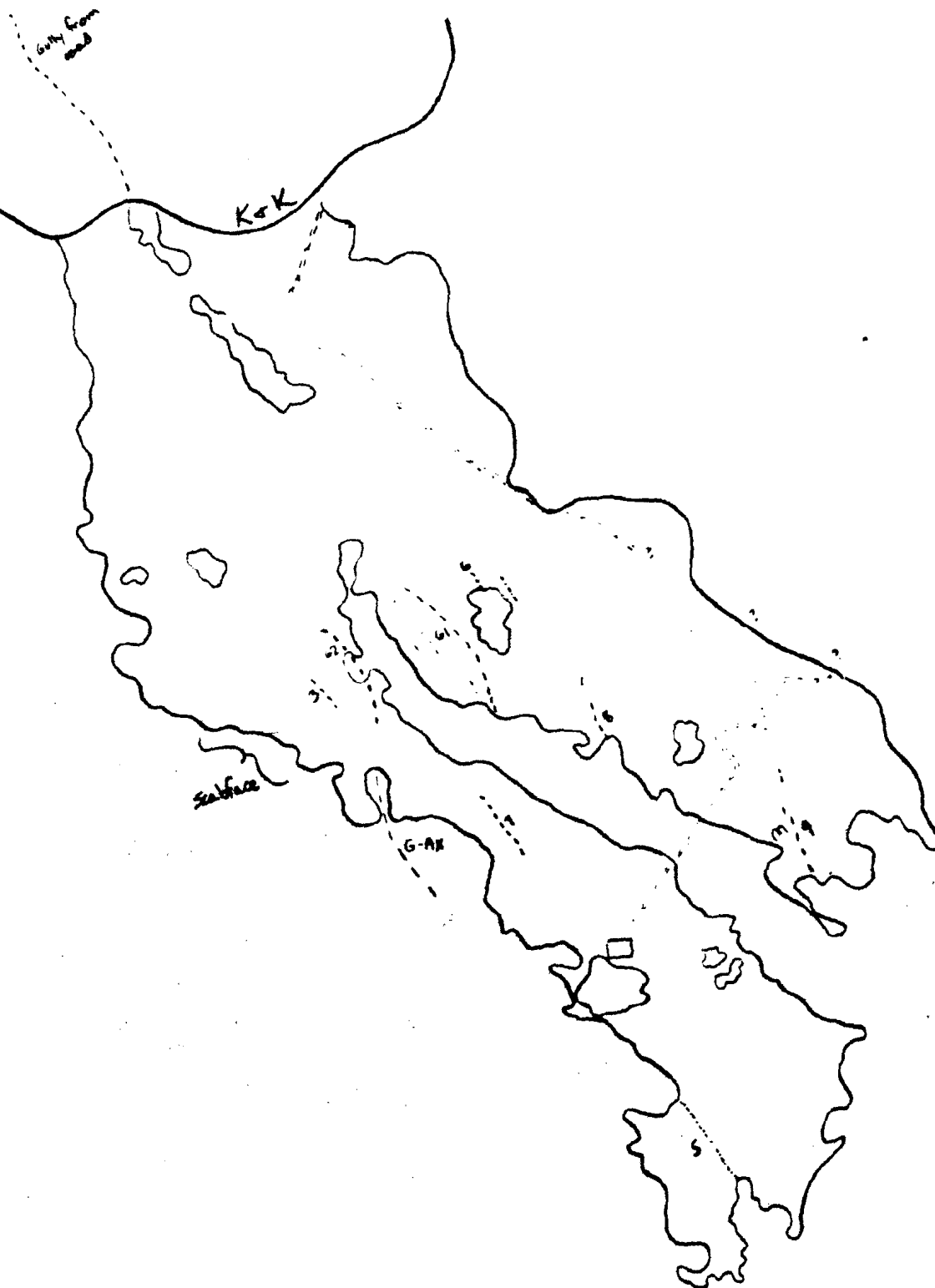
Erosion: (see large scale erosion map for details).

1. No Name Creek - large streambank failure, right side. Head scarp in cable cut, but not fed by any streams or diversions (in a very small drainage bowl of its own). Probably caused by removal of old growth, loss of root strength?

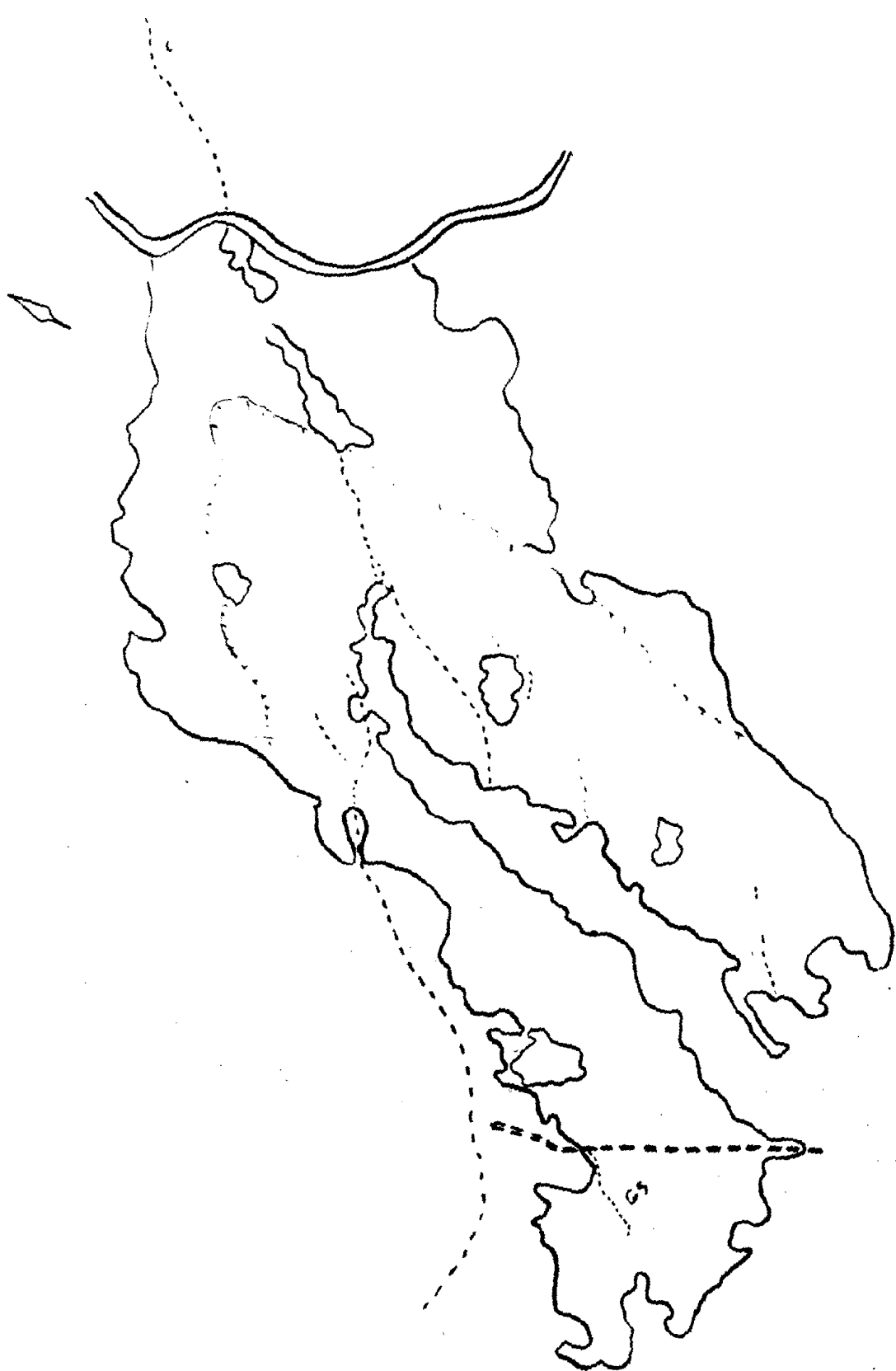
Nothing else obvious occurred since 1978.

1962

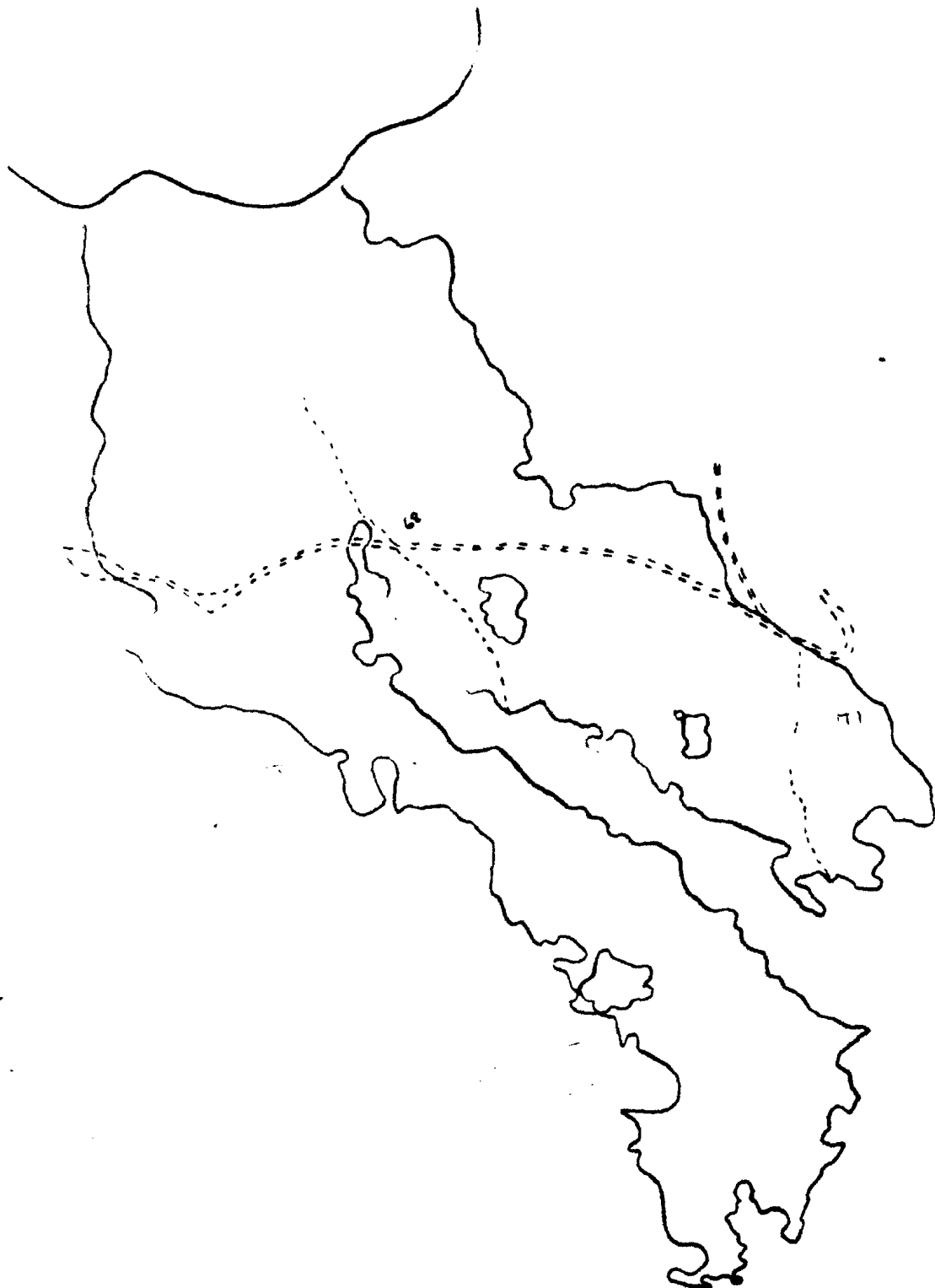
14684

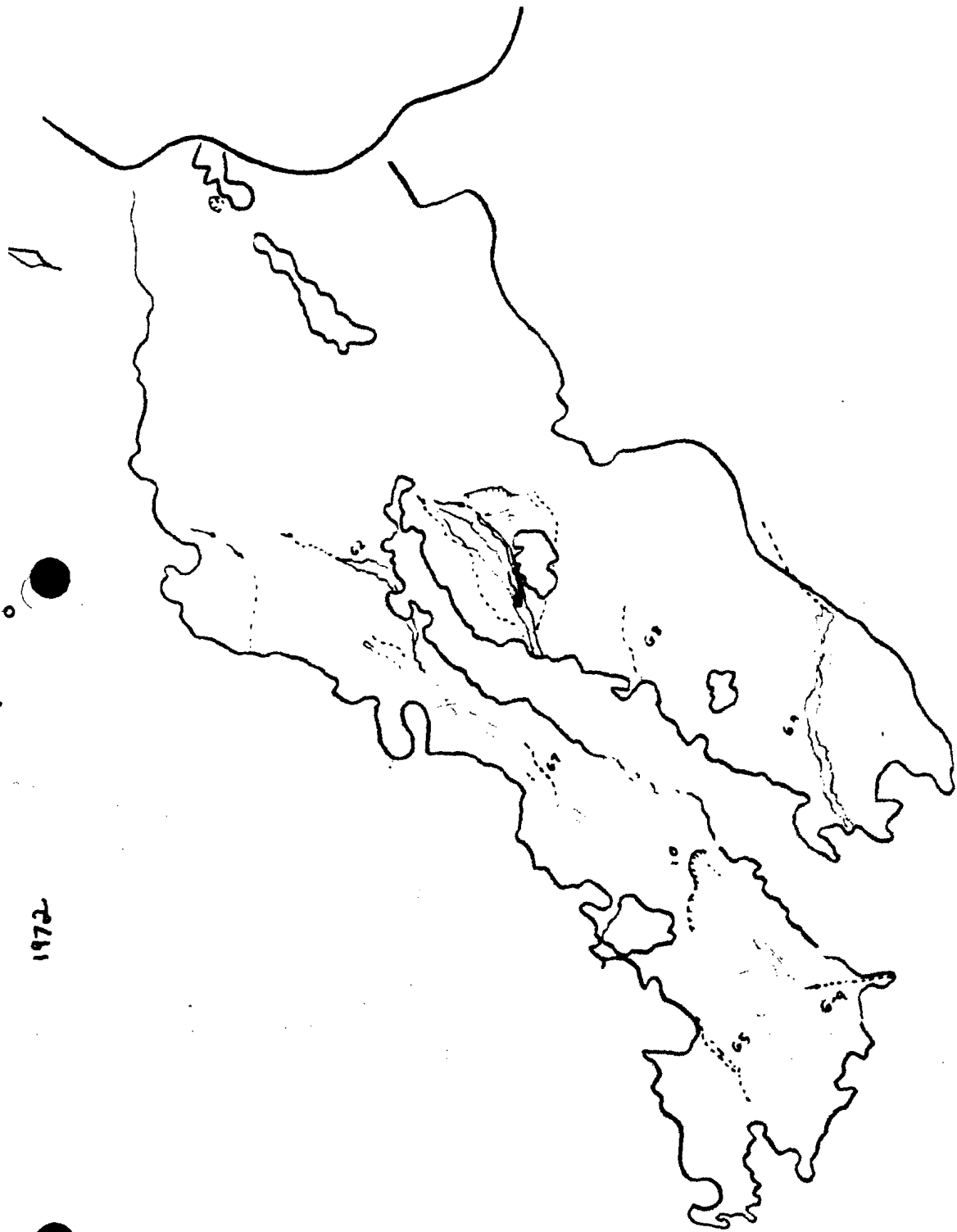


1966



1971





1972

1077

81-2 LOWER SLIDE CREEK REVEGETATION REPORT

General Site Description

The Lower Slide Creek Rehabilitation Unit is located on the east side of Redwood Creek, approximately 16 miles from Orick. Elevation within the unit ranges from 250 feet at Redwood Creek, the lower boundary, to 2,000 feet at the Klamath-Korbel Road (K & K), the upper boundary; slopes average 30 to 50 percent. The lower portions of Slide, Poison Oak and No Name Creeks drain the 792 acre unit (see Figure 1). Redwood forest and prairie compose the major vegetation types. Oak woodlands are found on prairie margins while mixed evergreen types are found along watercourses.

Two major haul roads, 2005 and 2010, traverse the unit. An extension of the 2010 road (Upper 2010) was added to provide access to areas cut in 1971. Intensive logging between 1963 and 1976 virtually eliminated old-growth redwood above the 2005 road. Intact redwood forest is still found below most of the 2005 road. Currently, large Ceanothus thyrsiflorus (blueblossom), Ceanothus velutinus (varnish-leaf ceanothus), and Baccharis pilularis var. consanguinea (coyote brush) dominate the shrub vegetation in the cutover forest.

General Rehabilitation Treatments

Rehabilitation work concentrated on stream crossings along the heavily rocked 2005, 2010, and Upper 2010 Roads; skid trail crossings on slopes adjacent to the forested portions of these major roads; and the gullies and earthflows across Counts Hill Prairie. Many crossings had already failed while others required extensive excavation to reach the original stream gradient. Plugged culverts on the 2010 Prairie Road had caused massive gullying and rechanneling of streams. Active earthflows had caused massive road failures. Treatment for forest roads included ripping, some minor outsloping and strawing. Prairie roads were ripped, completely outsloped and recontoured and had straw "walked-in". More specific details are found in the heavy equipment report (Spreiter and Johnson, 1982).

Revegetation Treatments

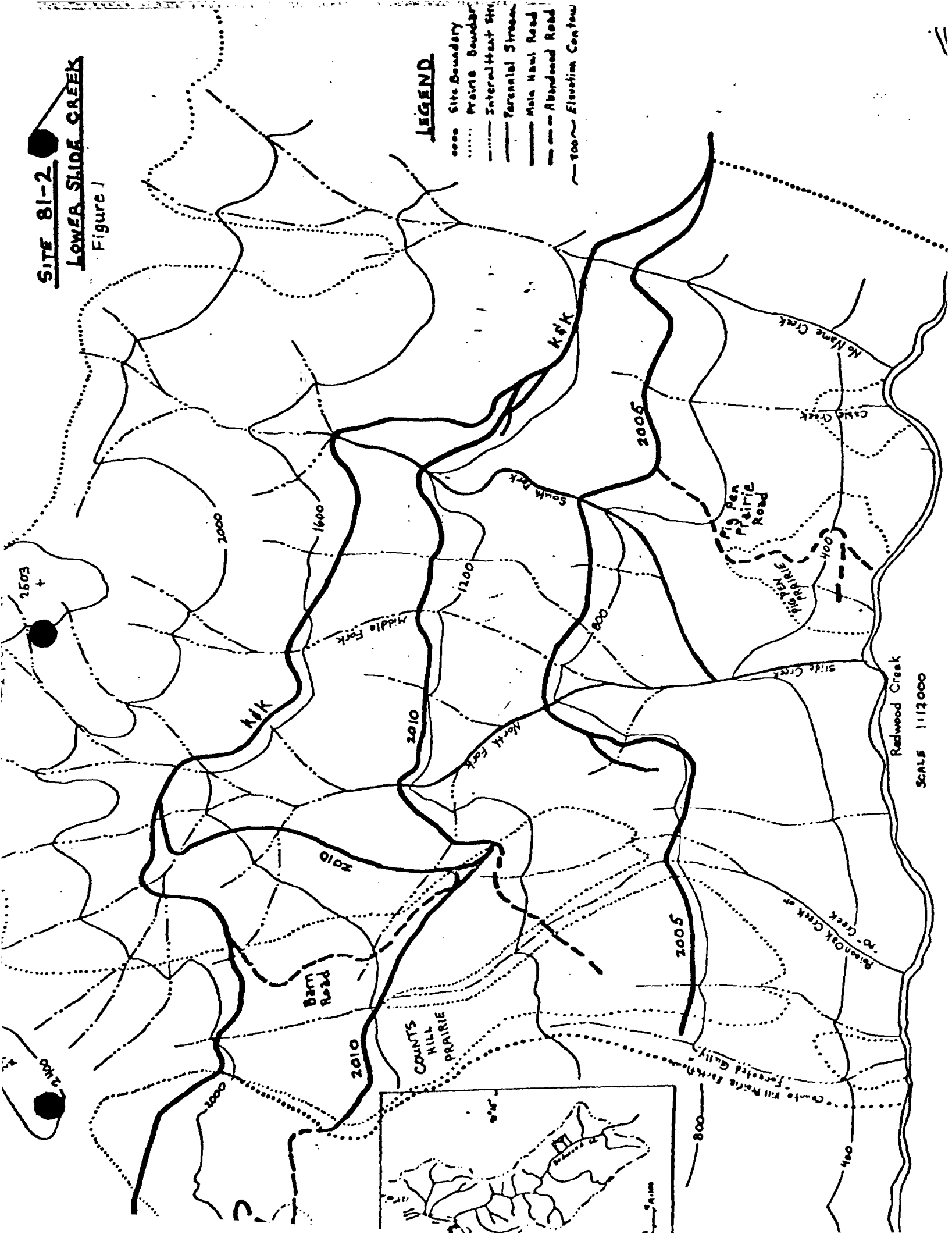
Minimal vegetation treatments were done this year (see Figure 2). Natural revegetation had effectively covered some of the roads and skid trails. Those that were disturbed in forested areas were planted with 6,170 conifers by in-house laborers. Pseudotsuga menziesii (Douglas-fir) was alternated with Sequoia sempervirens (coast redwood) at 8 to 10 foot spacing. No grass seeding was done on forest roads. Grass seeding was done on prairie roads in areas of greatest disturbance to speed revegetation. Remaining prairie areas were left to reseed naturally from the adjacent prairie. Three species were seeded separately this year: Agrostis tenuis (Highland colonial bent-grass), Bromus mollis (Blando brome), and Festuca megalura (Zorro fescue). The application of a mixture of these grasses did not prove efficient. Seeding was done by in-house laborers and biological technician. Tables 1 and 2 list the vegetation treatments and locations.

LOWER SLOPE CREEK

Figure 1

LEGEND

- 0000 Site Boundary
 Prairie Boundary
 --- Interalluvial Str.
 --- Parental Stream
 --- Main Nail Road
 --- Abandoned Road
 --- Elevation Contour



SCALE 1:12000

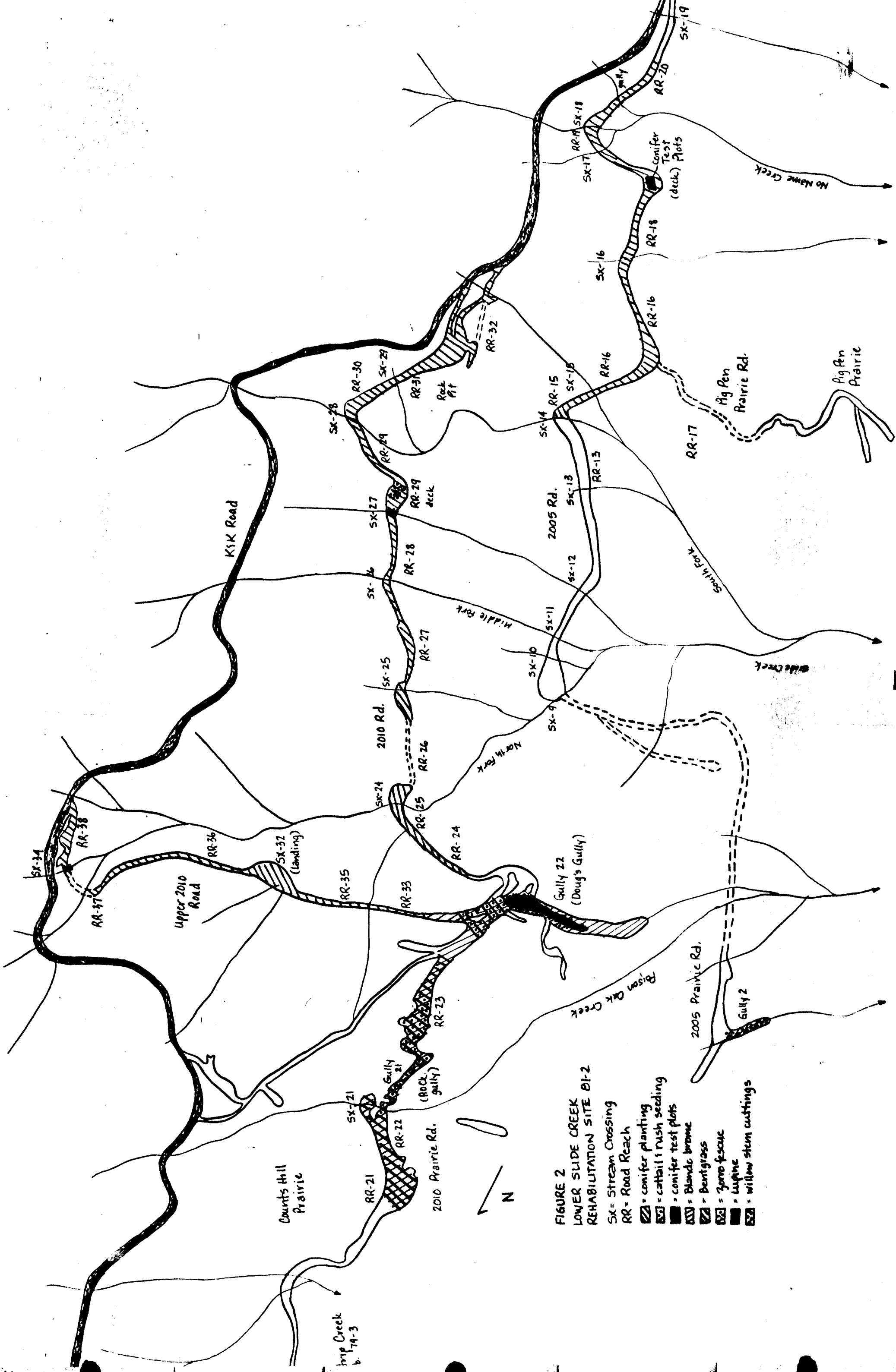
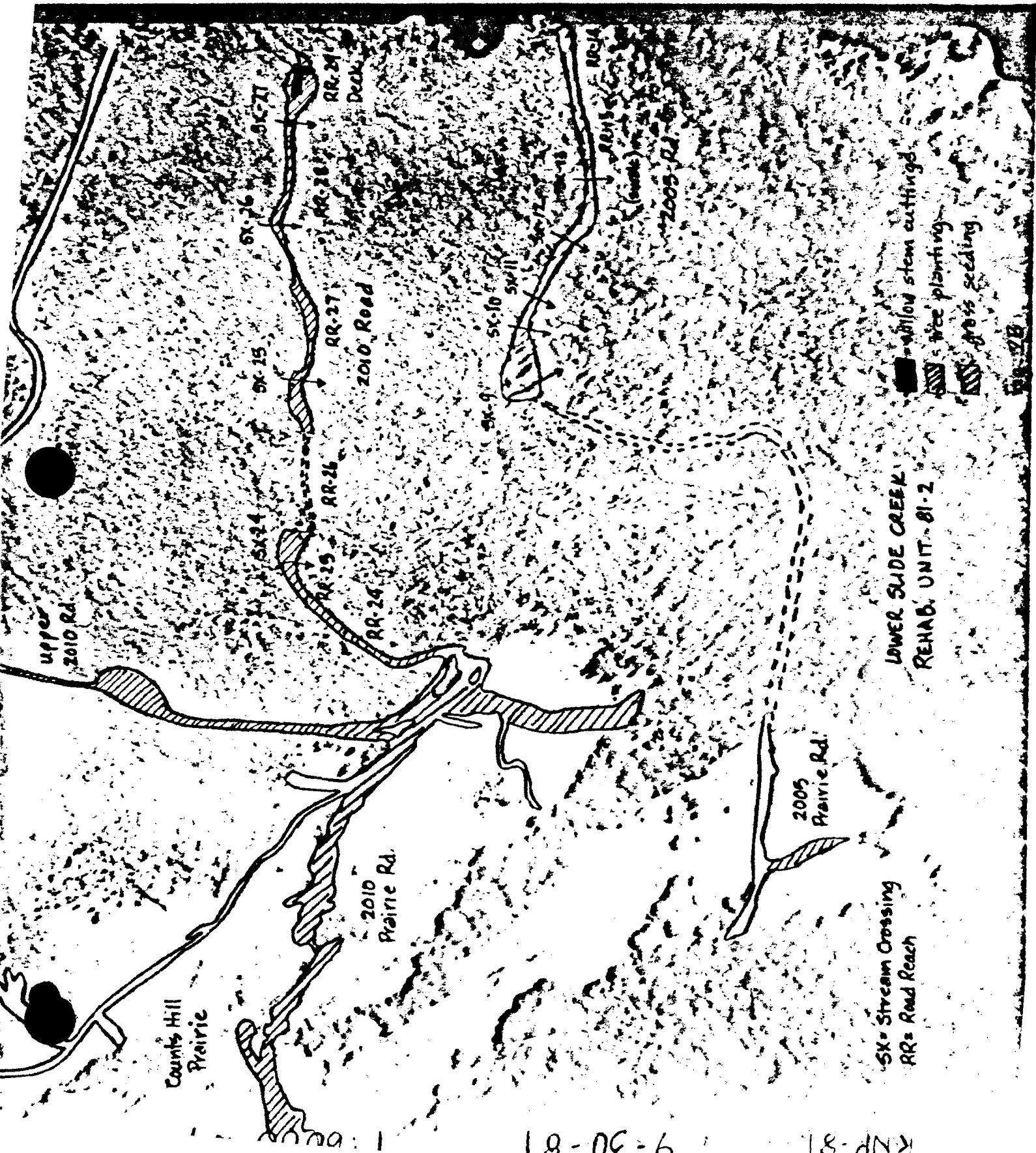


FIGURE 2
 LOWER SLIDE CREEK
 REHABILITATION SITE 01-2
 SX = Stream Crossing
 RR = Road Reach
 [diagonal lines] = conifer planting
 [cross-hatch] = cattail/rush seeding
 [dots] = conifer test plots
 [wavy lines] = Blondo browse
 [zig-zag] = Bentgrass
 [horizontal lines] = Zorro fescue
 [vertical lines] = Lupine
 [stippled] = willow stem cuttings



LOWER SLIDE CREEK
REHAB. UNIT - 81-2

- Shallow stem cuttings
- Tree planting
- Gross seeding

SX = Stream Crossing
RR = Road Reach

RNP-81-9-30-81

RNP-81 9-50-81 1:6000 N.A. 12

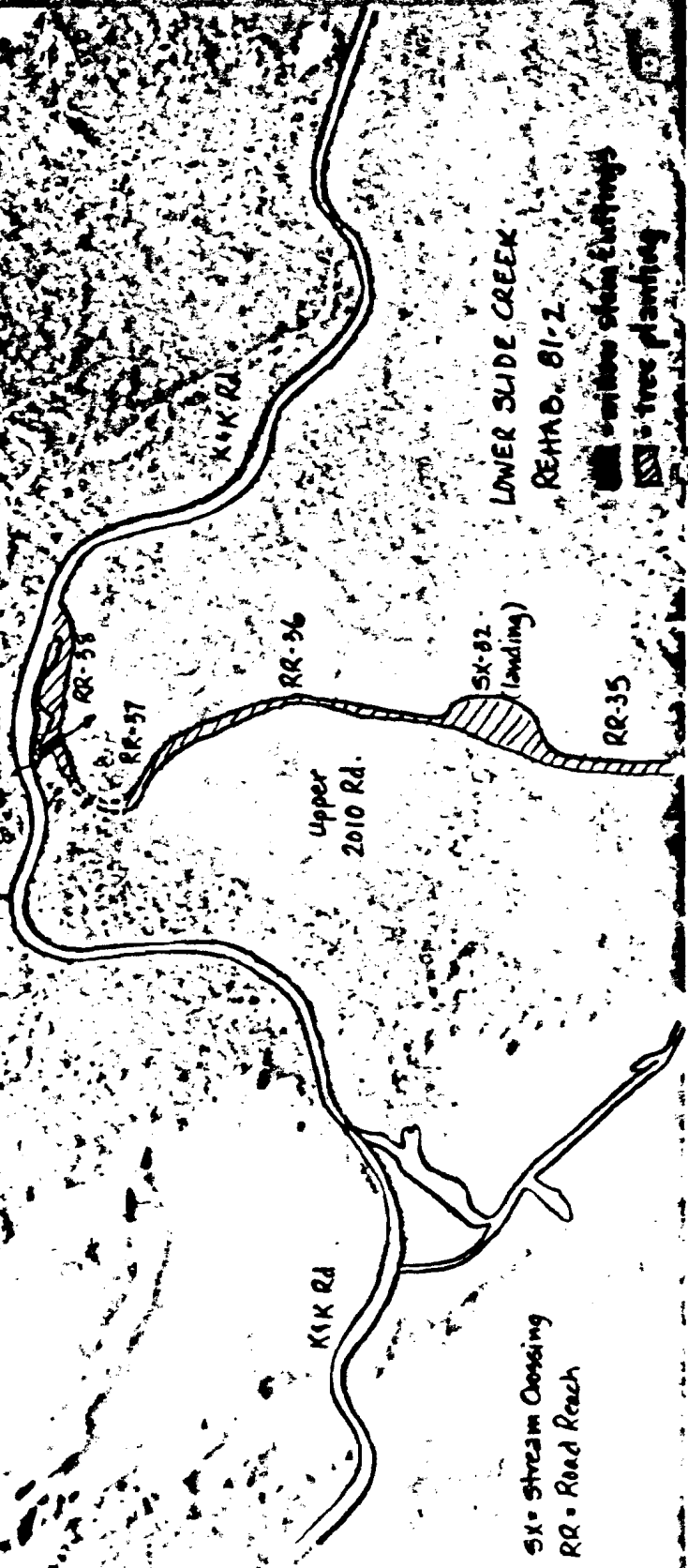
Upper Slide Creek
Rehab Unit 81-3

LOWER SLIDE CREEK

REHAB. 81-2

SK - stream crossings
RR - road reach
SS - tree planting

Fig. 20



SK - stream crossings
RR - road reach

RNP-81 9-30-81 1:6000



- LOWER SLIDE CREEK
REHAB. UNIT 81-2
- Blando Brome
 - Bentgrass
 - 3000 fescue
 - Lupine
- SX - Stream Crossing
RR - Road Reach

Fig. 2D

81-2 LOWER SLIDE CREEK VEGETATION PROCEDURES

TABLE 1.

SEEDING

Date	Site	Fertilizer Tablets	Broadcast Fertilizer	Lupine	Blando brome	Zorro fescue	Bentgrass	Other
8/31/81	Gully 22 (Doug's Gully)			20 bags	100 lbs.			
	Gully 21 (P.O. Creek gully)			10 bags				
9/1/81	2010 Prairie Rd. (RR-21 thru RR-23)				160 lbs.	2.0 lbs.	4.0 lbs.	
	Gully 2 (2005 Prairie Rd. gully)				40 lbs.	2.0 lbs.		
	Gully 22 (Doug's Gully)		320 lbs.			4.3 lbs.	2.6 lbs.	
10/29/81	RR-29 (Deck)							5 cattails 12 rushes
2/1/82	RR-18	150						
		150	320 lbs.	30 bags	300 lbs.	8.3 lbs.	6.6 lbs.	

RR= Road Reach

81-2 LOWER SLIDE CREEK VEGETATION PRESCRIPTIONS

TABLE 2.

TREE PLANTING

Date	Site	2-0 Douglas-fir	1-0 Redwood	2-0 Redwood	Willow
1/25/82	2010 Upper Rd. (SX-34; RR-36,37,38)	510	490		
	2010 Rd. (Rockpit - SX-28,29; RR-30-32)	250	110		
1/26/82	2010 Rd. (RX-31,32; RR-33,35)	510	200	200	
1/27/82	2010 Rd. (SX-25,26,27; RR-24 thru 29)	900	150	350	
	2010 Rd. (RR-18) Test plots	120	100	100	
	2005 Rd. (RR-16)	180		40	
1/28/82	2005 Rd. (RR-16 thru RR-18)	260	200	600	
3/8/82	2010 Rd. (SX-34; RR-29 deck)				675
3/10/82	2005 Rd. (RX-18,19; RR-15,16,20)	900			
		3630	1250	1290	675

SX = Stream Crossing

RR = Road Reach

To speed revegetation in the two major prairie gullies, 30 bags of Lupinus sp. (lupine) growing in Counts Hill Prairie were collected prior to rehabilitation. Twenty bags were spread in the Gully 22 and ten in Gully 21. Four bags of ammonium nitrate/sulfate (16-20-0-13) were also spread in the Gully 22.

The only additional vegetation available for use this year was rooted Salix, sp. (willow) stem cuttings. One hundred fifty were planted at Stream Crossing 34 (SX-34) and 525 were planted at the Road Reach-29 (RR-29) deck on SX-27 for a total of 675. Most of the cuttings were poorly rooted and are not expected to survive. Detailed planting site maps are on file. Several Typha latifolia (cattail) and Juncus effusus (rush) seedheads were scattered at the RR-29 deck.

Conifer Test Plots

Test plots for conifer growth and survival were established on the 2005 Road. The three types of planting stock were used. Thirty rows each having ten trees were to have been planted on an outsloped landing (RR-18) above a cable-yarded clearcut. Two rows of Douglas-fir, two rows of one-year old redwood and two rows of two-year old redwood were to have been alternated across the plot. The actual planting scheme is shown in Figure 3. The first row of each pair received a slow-release fertilizer tablet (20-10-5). Initial height and stem diameter measurements and later periodic measurements will be made for a conifer growth study. Trees were planted by in-house labor and fertilizer tablets were added by a technician.

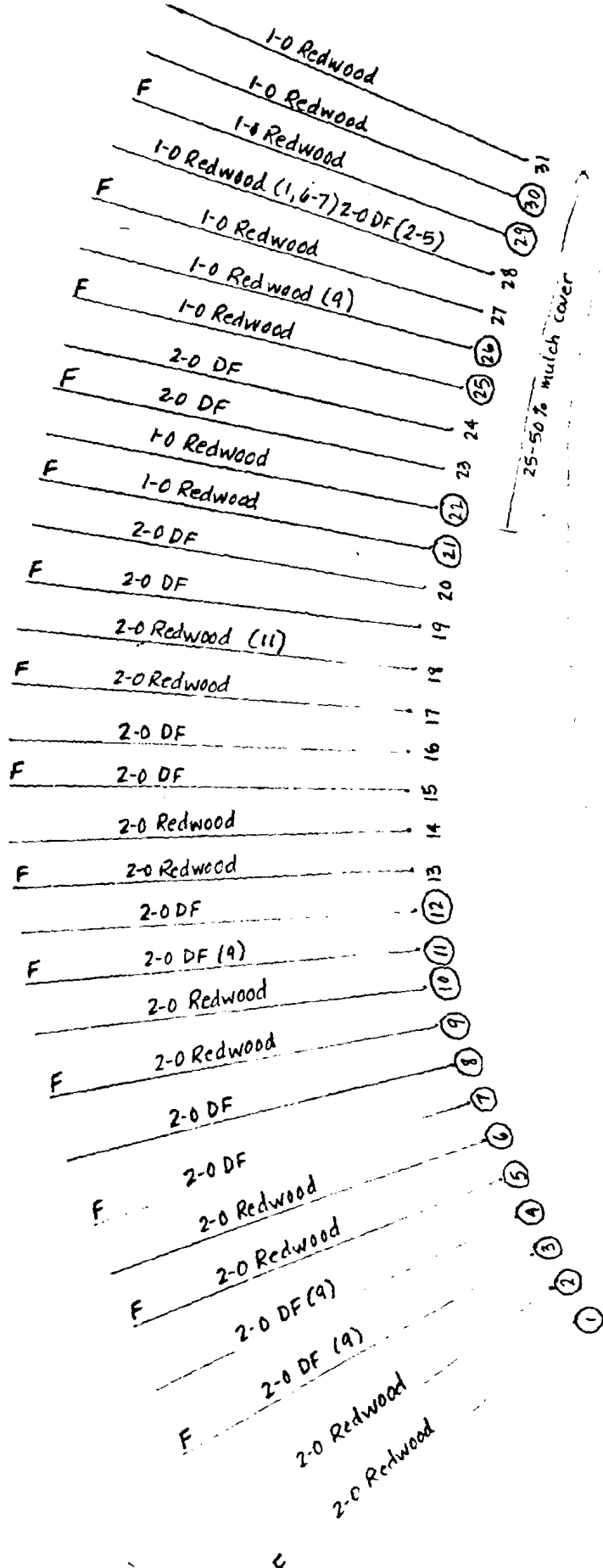
Cost Analysis

The total cost for plant materials and supplies (Table 3) for the Slide Creek Rehabilitation Unit amounted to \$1,826.18. The total labor cost for vegetation treatments (Table 4) was \$1,836.85. The total of \$3,663.03 did not include two days reconnaissance or the two days spent with the geologists discussing heavy equipment treatments.

Trees cost \$641.87. Tree planting labor costs amounted to \$1,378.73 for 164 hours work or \$0.223 per tree (\$223.46 per thousand). Grass seed for approximately 7.6 acres cost \$803.69. Labor for the 22 hours required in transporting and applying grass seed cost \$169.92 or \$22.35 per acre. Total cost for grass seed purchase and application was \$973.61 or \$128.11 per acre.

2/

2005 Rd.
RR-29 Deck



K.K.
/ R.L.

81-2 LOWER SLIDE CREEK REHABILITATION UNIT - COST SUMMARY

TABLE 3

PLANT MATERIALS AND SUPPLIES

Type	Source	Unit Price	Quantity	Cost
2-0 Douglas-fir (bareroot)	Arcata Lumber (Smith River)	\$ 0.0875 ea.	3630	\$317.63
1-0 Redwood (6-inch plug)	Simpson Timber Co. (Korbel)	0.15 ea.	1250	187.50
2-0 Redwood (bareroot)	USFS (McKinleyville)	0.106 ea.	1290	136.74
Willow (rooted stem cuttings)	FLAPCO (Phillipsville)	0.50 ea.	675	337.50
Bentgrass	Nilsen Feed Co. (Eureka)	3.55/lb.	6.6 lb.	23.48
Zorro fescue	Albright and Towne (Concord)	12.00/lb.	8.3 lb.	99.21
Blando brome	Clyde-Robin Seed Co. (Castro Valley)	2.27/lb.	300 lb.	681.00
Ammonium Nitrate/Sulfate	Nilsen Feed Co. (Eureka)	8.08/80 lb.	320 lb.	32.32
Fertilizer tablets	Forestry Suppliers (Jackson, Mississippi)	36.00/500	150	<u>10.80</u>
TOTAL -				\$1826.18

81-2 LOWER SLIDE CREEK REHABILITATION UNIT - COST SUMMARY

TABLE 4

LABOR

Date	Persons	Hours	Task	Cost
8/31/81	3	18	Spreading lupine & grass	\$146.16
9/1/81	3	16	Grass seeding	121.20
	3	14	Fertilizing	93.44
1/25/82	3	30	Tree planting	252.20
1/26/82	4	40	Tree planting	336.80
1/27/82	4	40	Tree planting	336.80
	1	4	Conifer test plots	32.44
1/28/82	4	40	Tree planting	336.80
2/1/82	1	2	Fertilizing	16.22
3/8/82	2	6	Willow planting	48.66
3/10/82	2	14	Tree planting	<u>116.13</u>
			TOTAL	\$1836.85

MEASUREMENTS

Stem diameter at base
V = browsed

4-22-82

Row	Species	Age	Fertilizer	Tree	ht(cm.)	dia(mm)
1	Redwood	2-0	yes	top	23.0	3
				2	14.0	2
				3	3.5	2
				4	9.5 ✓	4
				5	9.5	2
				6	7.5	3
				7	9.0	4
				8	9.0	2
				9	23.5	3
				10	16.5	2
2	Redwood	2-0	no	top	31.5	4
				2	9.5	2
				3	14.0	3
				4	43.0	5
				5	21.0	7
				6	22.0 ✓	5
				7	19.0	4
				8	17.5	3
				9	6.5	3
				10	17.0	4
3	Doug-fir	2-0	yes	top	27.5	4
				2	35.5	5
				3	30.5	5
				4	26.0	4
				5	33.5	6
				6	25.5	4
				7	42.0	6
				8	45.5	5
				9	49.0	6
4	Doug-fir	2-0	no	top	27.5	4
				2	31.5	4
				3	22.0 ✓	4
				4	20.0 ✓	4
				5	32.0	6
				6	16.0	3
				7	23.0	4
				8	26.0	3
				9	25.0	4

MEASUREMENTS

stem diameter 10 cm
V = barked

4-22-82

Row	Species	Age	Fertilizer	Tree	ht (cm.)	dia (mm.)
5	Redwood	2-0	yes	top	18.0	4
				2	17.0	4
				3	12.0	3
				4	6.0	2
				5	17.5	4
				6	9.5	3
				7	23.5	4
				8	16.0	4
				9	10.0	4
				10	16.0	4
6	Redwood	2-0	no	top	9.0	5
				2	9.5	5
				3	10.5	4
				4	17.5	3
				5	17.0	4
				6	6.0	4
				7	3.5	2
				8	11.0	3
				9	26.0	5
				10	22.5	5
7	Doug-fir	2-0	yes	top	20.5	4
				2	19.0	3
				3	34.5	4
				4	41.0	4
				5	34.0	5
				6	28.0	5
				7	32.0	4
				8	30.5	5
				9	18.5	4
				10	33.0	6
8	Doug-fir	2-0	no	top	19.0	4
				2	19.0	4
				3	32.0	6
				4	35.5	6
				5	21.5	4
				6	16.5	3
				7	18.5	3
				8	17.0	4
				9	25.5	4
				10	17.0	3

MEASUREMENTS

1.2 g/L
 Stern. Arthropoda - 100000
 V. brewed

1-22-82

Row	Species	Age	Fertilizer	Tree	ht(cm.)	dia(mm)
9	Redwood	2-0	yes	top	19.5	5
				2	9.0	3
				3	20.5	4
				4	17.0	4
				5	15.0	3
				6	4.5	4
				7	14.0	3
				8	13.0	4
				9	12.5	4
				10	9.5	4
10	Redwood	2-0	no	top	21.0	5
				2	14.0	4
				3	22.5	4
				4	5.0	3
				5	7.5	4
				6	6.5	2
				7	15.0	4
				8	13.0	3
				9	14.0	3
				10	24.0	3
11	Doug-fir	2-0	yes	top	32.5	5
				2	37.0	4
				3	26.5	3
				4	33.0	6
				5	30.5	5
				6	20.0	3
				7	24.5	3
				8	21.0	4
				9	45.0	7
12	Doug-fir	2-0	no	top	19.5	4
				2	16.0	4
				3	25.5	4
				4	42.5	7
				5	34.0	6
				6	31.0	4
				7	33.0	4
				8	28.5	4
				9	17.0	3
				10	19.5	3

MEASUREMENTS

Shore Diameter = 1.1
 ✓ = browsed

4-22-82

Row	Species	Age	Fertilizer	Tree	Ht(cm.)	dia(mm)				
21	Redwood	1-0	yes	top	13.0	3				
				2	7.0	2				
				3	11.5	2				
				4	16.5	2				
				5	7.5	2				
				6	15.5	2				
				7	5.5	2				
				8	10.5	2				
				9	13.5	2				
				10	10.0	2				
22	Redwood	1-0	no	top	9.5	3				
				2	11.5	2				
				3	7.0	2				
				4	4.5 ✓	2				
				5	8.0 ✓	3				
				6	13.0	3				
				7	5.0	2				
				8	8.0	3				
				9	10.0	2				
				10	11.0	2				
25	Redwood	1-0	yes	top	5.5	2				
				2	3.0 ✓	3				
				3	7.0	2				
				4	6.5	3				
				5	5.5 ✓	3				
				6	3.5	2				
				7	4.5 ✓	2				
				8	6.5	2				
				9	9.5	2				
				10	5.0	3				
26	Redwood	1-0	no	top	11.0	2				
				2	10.5	3				
				3	8.5	2				
				4	4.0 ✓	2				
				5	4.0 ✓	2				
				6	2.5	2				
				7	10.5	2				
				8	8.5	3				
				9	10.5	3				

MEASUREMENTS

4-22-82

height
stem diameter - mm
✓ = browsed

Row	Species	Age	Fertilizer	Tree	ht(cm.)	dia(mm)
29	Redwood	1-0	yes	top	11.0	2
				2	4.5	2
				3	4.0	2
				4	9.5	2
				5	5.0 ✓	2
				6	4.0	2
				7	4.0 ✓	2
				8	3.5	2
				9	9.5	2
				10	7.0	2
30	Redwood	1-0	no	top	10.0	2
				2	13.5	2
				3	3.5	2
				4	1.5	2
				5	7.0 ✓	3
				6	9.0 ✓	3
				7	8.5 ✓	2
				8	10.0 ✓	3
				9	2.0 ✓	3
				10	13.0	3

B1-2 Lower Slide Creek

LABOR COSTS (Includes 6% overhead for RNP employees, 18% overhead for Redwoods United)

<u>Date</u>	<u>Persons</u>	<u>Hours</u>	<u>Task</u>	<u>Wage/hr</u>	<u>Cost</u>	
8/31/81	George Bigovich	6	Lupines Grass Seeding	7.45	44.70	
	William Quinn	6	Lupines Grass Seeding	8.96	53.76	
	Lois Reed	6	Lupines Grass Seeding	7.95	47.70	<u>146.16</u>
9/1/81	George Bigovich	6	Grass Seeding	7.45	44.70	
	Doug Emmons	6	Grass Seeding	7.45	44.70	
	Lois Reed	4	Grass Seeding	7.95	31.80	
	William Quinn	6	Fertilizing	8.96	53.76	
	Dana Cassidy (R.U.)	4	Fertilizing	4.96	19.84	
	Chris Benoit (R.U.)	4	Fertilizing	4.96	19.84	<u>214.64</u>
1/25/82	Tim Tanno	10	Tree Planting	8.96	89.60	
	William Quinn	10	Tree Planting	8.13	81.30	
	Doug Emmons	10	Tree Planting	8.13	81.30	<u>252.20</u>
1/26/82	Tim Tanno	10	Tree Planting	8.96	89.60	
	William Quinn	10	Tree Planting	8.13	81.30	
	Doug Emmons	10	Tree Planting	8.13	81.30	
	Keith Richey	10	Tree Planting	8.46	84.60	<u>336.80</u>
1/27/82	Tim Tanno	10	Tree Planting	8.96	89.60	
	William Quinn	10	Tree Planting	8.13	81.30	
	Doug Emmons	10	Tree Planting	8.13	81.30	
	Keith Richey	10	Tree Planting	8.46	84.60	
	Lois Reed	4	Conifer Test Plots	8.11	32.44	<u>369.24</u>
1/28/82	Tim Tanno	10	Tree Planting	8.96	89.60	
	William Quinn	10	Tree Planting	8.13	81.30	
	Doug Emmons	10	Tree Planting	8.13	81.30	
	Keith Richey	10	Tree Planting	8.46	84.60	<u>336.80</u>
2/1/82	Lois Reed	2	Fertilizing	8.11	16.22	<u>16.22</u>
3/6/82	Lois Reed	4	Willow Planting	8.11	32.44	
	Neil Sugihara	2	Willow Planting	8.11	16.22	<u>48.66</u>
3/10/82	Doug Emmons	7	Tree Planting	8.13	56.91	
	Keith Richey	7	Tree Planting	8.46	59.22	<u>116.13</u>
						<u>1836.85</u>

INSPECTOR'S DAILY RECORD
OF CONSTRUCTION OPERATIONS

Project Lupine Date 8-31-81
Weather Hot & Clear

SHIFT
700 to 530

No.	LABOR CLASSIFICATION	No.	EQUIPMENT TYPE	PRODUCTION TIME (Man Hours)								EQUIP. TIME	
												Work	Idle
	McIntosh												
	Quinn			3	3	2	2						
	Tanno												
	Bigovich	George not	Brobisky										
	Boyce												
	Bretnall												
	Brobisky			3	3	2	2						
	Emmons		<i>off day</i>										
	Holliger												
	Rhodes												
	Richey												
	Roberts												
TOTALS (man hours)				20									

PRODUCTION SUMMARY		
Item No.	Station to Station	Quantities
	<i>In truck sheet</i>	

NARRATIVE REPORT: Descriptions, progress, problems, visitors, materials received and brief general comments. (Continue on back if necessary)

- We spreaded + covered Doug Gully. It is done with that.

No problem

- good progress

"Brobisky" killed

SAFETY SUMMARY	
ACCIDENTS	UNSAFE OPERATIONS
<i>none</i>	

REVIEWED BY		REPORTED BY	
(Signature - ROAD ENGINEER)	(Date)	(Signature - WORK LEADER)	(Date)
		<i>Wm Quinn</i>	<i>8-31-81</i>

INSPECTOR'S DAILY RECORD OF CONSTRUCTION OPERATIONS

ct *Don Lib*
ner *17* *Tric*

Date 9-1-81

SHIFT

7:00 to 5:30

LABOR CLASSIFICATION	No.	EQUIPMENT TYPE	PRODUCTION TIME (Man Hours)						EQUIP. TIME	
									Work	Idle
McIntosh										
Quinn				8			2			
Tanno										
Bigovich				2	6		2			
Boyce										
Bretnall										
Brobisky										
Emmons				2	6		2			
Holliger										
Rhodes										
Richey										
Roberts										
			30							

TOTALS (man hours)

PRODUCTION SUMMARY

No.	Station to Station	Quantities
.	<i>In track sheet</i>	
	<i>2</i>	

NARRATIVE REPORT: Descriptions, progress, problems, visitors, materials received and brief general comments. (Continue on back if necessary)

↓ worked with
Redwood United. We moved
Bale in place for spread.
its. Doug Gully is all
done.

SAFETY SUMMARY

DENTS	UNSAFE OPERATIONS
none	

Eng + Doug spread out
loaded with tools.
They also moved
Bills.
Excellent work Eng + Doug

REVIEWED BY

REPORTED BY

re ROAD ENGINEER)

(Date)

(Signature - WORK LEADER)

(Date)

INSPECTOR'S DAILY RECORD OF CONSTRUCTION OPERATIONS

Project Tree Planting Date 1-25-82
Weather fair

SHIFT
7:00 to 5:30

No.	LABOR CLASSIFICATION	No.	EQUIPMENT TYPE	PRODUCTION TIME (Man Hours)				EQUIP. TIME	
								Work	Idle
	ED EAST								
	Tom Estrada								
	Kenale Miller								
	Rory CO Trissel								
	Don Petersen								
	Don Petersen								
	Tim Tanno			9	1				
	H. Quinn			9	1				
	Doug E.			9	1				
	Keith R.					10			

TOTALS (man hours)

40 HRS.

PRODUCTION SUMMARY

NARRATIVE REPORT: Descriptions, progress, problems, visitors, materials received and brief general comments. (Continue on back if necessary)

No.	Station to Station	Quantities

We Planted R-36 Rd
weve old B&B was last
summer, 1040 TREES total
510 D.F. - 490 R.W.
2010 Rd. 110 - R.W. - 6"

SAFETY SUMMARY

250 - D.F. 2.4x. olds.
Total TREES Planted
(1400) TREES.
need to Plant - 2 yrd.
Redwood.

ACCIDENTS	UNSAFE OPERATIONS

none

none

REVIEWED BY

REPORTED BY

By ROAD ENGINEER (Date)

(Signature - WORK LEADER)

(Date)

TANNO

1-25-82

INSPECTOR'S DAILY RECORD
OF CONSTRUCTION OPERATIONS

54

Zick

FOUR

40 HRS.

NARRATIVE REPORT: Descriptions, problems, visitors, materials received, general comments. (Continue on back)

We Had a Bad Day
weather was Bad
we got 400 D.F. and
2 yr. R.W., "3506" R.W.

✓ Total Per 11 9

None

Neha

REPORTED BY

(Date)

(Signature - WORK LEADER)

Date

TAXNO

1-26

INSPECTOR'S DAILY RECORD
OF CONSTRUCTION OPERATIONS

Weather fair & Raining

SHIFT

2020 5

TOTALS (man hours)

40 HRS

PRODUCTION SUMMARY

NARRATIVE REPORT: Descriptions, progress, problems, visitors, materials received and brief general comments. (Continue on back if necessary)

on 2010 Rd. we Planted
1400 TREES, 2005 Rd.
Did rest Plts 200,
rest 200.

SAFETY SUMMARY

Total Trees in
(1900)

REVIEWED BY

REPORTED BY

Signature - ROAD ENGINEER)

(Date)

(Signature - WORK LEADER)

(Date)

Tanno

1-27-82

INSPECTOR'S DAILY RECORD
OF CONSTRUCTION OPERATIONS

*Kick and Road
Project Time*

Project Tree Planting Date 1-28-92
Weather fair

SHIFT
1200

No.	LABOR CLASSIFICATION	No.	EQUIPMENT TYPE	PRODUCTION TIME (Man Hours)					EQUIP.	
									Work	
	ED EAST									
	Tom ESTRADA									
	Leevale Miller									
	Romy CO Trissel									
	Dan Petersen									
	Don Petersen									
	Tim Tanno									
	W. Quinn									
	Doug E.									
	K. Smith R.									

TOTALS (man hours)

PRODUCTION SUMMARY

Item No. Station to Station Quantities

NARRATIVE REPORT: Descriptions, progress items, visitors, materials received and general comments. (Continue on back if

*we finished planting
2005 Rd - 1040 TRE*

*Total 2" IS 40 TREE:
In 2005 Rd*

SAFETY SUMMARY

ACCIDENTS

UNSAFE OPERATIONS

*did not have trees
for airstrip Rehab.*

no problems.

REVIEWED BY

REPORTED BY

(Signature - ROAD ENGINEER)

(Date)

(Signature - WORK LEADER)

(Date)

TANNO

1-28-92

8-2 LOWER SLIDE CREEK TREE PLANTING

INSPECTOR'S DAILY REPORT
OF CONSTRUCTION OPERATIONS

PROJECT Split & Road m. DATE 3-10-82

WEATHER Rain

*Split w. A-9 Rd. m.
Travel Time
Planting Tree*

NO.	LABOR CLASSIFICATION	NO.	EQUIPMENT TYPE	PRODUCTION TIME (MAN HOURS)
	McIntosh			
	Quinn			8 2
	Tanino			8 2
	Bigovich			
	Boyce			8 2
	Bretnafl			
	Brobisky			
	Emmons			28 2 6
	Holliger Rick			8 2
	Rhodes			
	Richey			3 2 6
	Roberts			
	Mike			5
TOTALS (MAN HOURS)				60 44

PRODUCTION SUMMARY		
ITEM NO.	STATION TO STATION	QUANTITIES

NEEDATIVE REPORT: DESCRIPTIONS, PROGRESS, VISITORS, MATERIALS RECEIVED AND BRIEF GENERAL COMMENTS. (CONTINUE ON BACK IF NECESSARY.)

Split 35 Post at Deck. (clean up) st more. about 15 Post clear. Road. M-2 B5-1. didnt get to the M-7-5-4 1/2 Help mac load Truck.

SAFETY SUMMARY	
ACCIDENTS	UNSAFE OPERATIONS

none

none

no PROBLEMS
Doug Kieth Plant TREES
2005 Rd. 900 DF

REVIEWED BY		DATE	REPORTED BY		DATE
SIGNATURE (ROAD ENGINEER)			SIGNATURE (WORK LEADER)		
			TANINO		3-10



Unit: 81-2 1-A 7/14/81 PP#C 2010 Rd. R-23



Unit: 81-2 1-B 7/16/81 PP#C 2010 Rd. R-23



Unit: 81-2 1-C 9/29/81 PP#C 2010 Rd. R-23



Unit: 81-2 1-D 8/31/82 PP#C 2010 Rd. R-23



Unit: 81-2 2-A 6/24/81 PP#21 2010 Rd. R-28



Unit: 81-2 2-B 8/11/81 2010 Rd. R-28



Unit: 81-2 2-C 10/13/81 PP#21 2010 Rd. R-28



Unit: 81-2 2-D 11/16/81 PP#21 2010 Rd. R-28 W.A.



Unit: 81-2 3-A 12/83 PP#21