

REDWOOD N. P.
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South Operations Center

Watershed Works
c/o Gail Vincent
P.O. Box 4675
Redway, CA 95560
27 October, 1977

Steve Veres
Redwood National Park
P.O. Drawer N
Crescent City, CA 95531

Dear Steve,

Our report is enclosed. If you need more information or explanation please write or call. Otherwise I'll assume we've completed our job, and you may consider this a bill of \$1780 due to Watershed Works (check payable to Gerald Myers).

We would like to have, if possible, copies of the reports of the other contractors, so that we can look at their constructions when we make our winter trip. (If not, perhaps you could leave examination copies on file at the Park office in Orick?) We'll let you know in advance of this trip, if possible, and write you a letter of our observations.

Our "budget" is as follows. This is pretty much the reality of how we intend to spend the money. The \$50 per person day amortizes equipment and gear, as well as paying labor, and covers some living costs. The "slush" is probably the equivalent of administrative expenses. It is intended mostly to cover contract development, and perhaps some specialized tools; and a donation to our parent corporation (pays milling expenses for 5000 board feet of homegrown wood for our school building).

26 person days @ \$50 *	\$1300
photo expenses	22
phone	20
food (overnight trip only)	18
wire	4
duplication & mailing	5
4 vehicle trips @ \$25	100
"slush"	311
TOTAL	\$1780

Any feedback on the report would be appreciated. We certainly enjoyed the chance to do this work, and hope it proves useful to you.

Sincerely,

Gail

Gail Ann Vincent

REPORT ON EROSION CONTROL WORK ON TEST AREA FOUR, REDWOOD NATIONAL PARK, SEPTEMBER - OCTOBER, 1977

1. SUMMARY OF WORK DONE

The active erosion of test area four takes place mostly along the old skid trails and logging roads. Most of the forty acre site is thickly revegetated, with occasional bare and gullied areas on the logging trails. A steep skid trail in the center of the piece develops into a gully four feet deep in places. This central gully appears to be contributing sediment to Little Lost Man Creek. The other eroding areas on both sides of the ridge (demarcated on the aerial photograph by the road) do not appear to be contributing sediment to their respective watersheds.

Our prescribed treatment of these problems is threefold:

a. Divert the water. We sought to divert as much of the volume of water as possible out of the eroding channels with waterbars. Water bars should be deep enough to withstand flood flow and animal traffic. Berms are compacted. When digging water bars in the absence of water flow, a level helps to insure a downhill slope. Care is taken not to divert water where a new channel will form.

Waterbars were constructed on all five treated skid trails and roads. Waterbarring was limited in several cases by high banks and berms, and resulted in less than optimal spacing in some cases. Periodic maintenance of waterbars, especially in their first season, is indicated, to insure proper channeling and adequate depth.

b. Impound the sediment. Bough checkdams slow the velocity of the remaining water in the channels, so that the sediment is deposited behind the dams as the water passes through. Where most of the water has been successfully diverted, most of the sediment accumulating behind the checkdam comes off the sides of the gully.

The bough checkdams we built are varied in size and construction for specific situations. Their maximum practicable height is about two feet, though sediment may be accumulated to a greater depth, where necessary or desired, by successive installations. Because they are permeable they do not create a marked plunge pool effect. We used the bountiful on-site materials; in other cases they could be made in abundance from remains of logging or thinning operations and hauled to a site. A total of 101 checkdams varying from 6 inches to 2 feet high were installed in four out of five of our work areas. Most of the larger dams are in the central gully, which has a total of thirty-three installations. Detailed instructions on our "standard" bough checkdam are included in Appendix A.

c. Re-establish vegetation. Vegetation is the cheapest, most effective, virtually maintenance-free means of erosion control. Once the run-off is diverted, and sediment collected in the bottom of the gullied areas, vegetation may then be re-established in the gullies and on bare banks, either by natural processes, or encouraged by seeding, cuttings and/or transplants. On this job, due to the (necessarily) unseasonable timing of the work, little re-vegetation was attempted, except on a small-scale trial

basis. In work area #3, a small test planting was done on the mound of a cat wderbar, including baccharis cuttings (coyote brush), and transplants of douglas fir, huckleberry, and salal. Appendix B is a sketch of this planting. On the bare flat above work area #2, and on the flat part at the head of area #5 seed gathered in the area were sown,* and baccharis cuttings pllanted. Recommendations on planting are included in this report; and may be supplemented with further recommendations based on observations of test plantings through winter and spring.

* including rhododendron, Washington Lily, fireweed, salal, manzanita.

TABLE 1: NUMBER OF FIELDWORK DAYS SPENT, BY AREA AND TASK

	whole site	area 1	area 2	area 3	area 4	area 5	TOTAL
1. reconnaissance (mapping, planning)	2.0 days						2.0 days
2. work documentation	1.4						1.4
3. erosion control							
a. checkdams		7.1 days	1.9 days	--	.5 days	2.6 days	12.1
b. waterbars		.8	.8	.5	1.1	.6	3.8
c. planting		--	.3	.1	--	.3	.7
TOTAL	3.4 days	7.9 days	3.0 days	.6 days	1.6 days	3.5 days	20.0 days

TABLE 2: PRODUCTION BY WORK AREA

	area 1	area 2	area 3	area 4	area 5	TOTAL
checkdams	38	14	0	18	39	101
waterbars	5	5	2	5	4	21

II. THE WORK AREAS

The map of work done divides the work into areas, which represent the different skid trails and roads treated. The areas were marked with red flagging streamers, about six to ten feet high, and eighteen inches or so long. (Former flagging is occasionally found on this forty of the same color, but is always short.) These streamers are indicated on the aerial photograph map by red dots. A summary of time spent on the various work areas, and of checkdam and waterbar production will be found in the next section, on time and costs.

Work Area #1 Area one contains the largest gullied area on the forty. The gully deepens progressively in the lower, steeper half of a skid trail. The treated area marked on the map is about 650 feet, with 375 feet of gully, which becomes as deep as four feet, and as wide as five feet.

Treatment: Waterbars were constructed to divert the water, one at the top of the area, and others along the length of the gullied part of the area as indicated on the map. A total of 38 bough checkdams of various sizes (ranging from six inches to two feet in height) were installed along the length of the gully. All of the seven checkdams constructed in the initial reconnaissance visit had collected sediment during the intervening first storms of the season, one of them filled to eighteen inches. Additional checkdams were installed on top of the filled dams.

Work Area #2 Area two is a steeply sloping and mostly bare trail, about 400 feet in length. It has been mainly eroded by sheet wash, with some minor channeling. It seems unlikely that much sediment is still actively entering the creek from this site.

Treatment: The area was waterbarred as indicated on the map. Thirteen checkdams were installed, and one "pillow" of fir boughs to intercept a waterfall action. The flat at the top of the area was seeded with seeds gathered on-site, and a small trial planting of baccharis was attempted.

Work Area #3 Area three is a steep skid trail about 225 feet in length. It has two large waterbars installed by cat at the time of logging which have effectively reduced the erosion in this area. A large percentage of the length is still bare subsoil, but does not appear to be contributing any substantial amount of sediment to the creek at this time.

Treatment: Two additional waterbars were dug, as indicated on the map, and the lower cat waterbar repaired where it was in danger of being overtopped. A test planting was conducted on the

mound of earth which constitutes the lower cat waterbar. The planting includes eighteen cuttings of baccharis, 3/8" to 3/4" in diameter; three 2"-3" douglas fir transplants, four small salal plants, and 2 small huckleberry bushes. A sketch of the planting is included in Appendix B.

Area #4 Area four is a steeply sloping skid trail, about 175 feet long, gullied to a maximum of about one and a half feet deep. It is moderately revegetated. It can be found as follows: Angle sharply leftward at the double streamer on the fir tree in area one, indicated on the map. Plough through a thicket of fir trees for about 30' to 40', until you reach skid trail, flagged in blue at the beginning.

Treatment: Five waterbars were dug, as indicated on the map, and thirteen small checkdams installed.

Area #5 Area five is gullied in two segments. The upper segment is a long, gently sloping section of the main logging road to the ridge, about 325 feet in length, gullied to a depth of six inches to two feet along most of its length. The lower segment is a steeper skid trail, with twin gullies about six to eight feet apart. The latter segment is about 250 feet, for a total length of 575 feet. About two-thirds of the total length of the gullies has good tree cover, but erosion is still active underneath the vegetation. This is the only treated area on the southwest side of the ridge. It drains to a flat area, where the sediment is contained.

Treatment: Waterbaring is difficult all along this stretch. The upper segment follows a natural depression, and the lower has high berms. We managed four bars in the middle third of the total length, which will greatly reduce the volume of water in the worst gullied stretches. The lower segment has twenty-two checkdams, and the upper seventeen. Some seeding of the upper area with seeds gathered on site was attempted; and some baccharis cuttings planted.

III. TIME AND COSTS

The principle cost of this type of work is the labor. In total, eighteen person-days were spent on the erosion control work (including 1.4 days of on-site documentation), two on initial reconnaissance, and four in report-writing, mapping and photo documentation. For the purposes of this job, a person-day is conceived as an eight-hour workday, with breaks in morning and afternoon, reasonable time spent loading and unloading tools and gear, maintaining tools, dividing and discussing work, and so forth. Time spent setting up camp, meal preparation, breaking down camp, and travel are not included. The work was done in two stages. Four people did a one-day trip on September 14, spending a half-day in reconnaissance, mapping and planning; and a half-day in erosion control work. (a total of two person-days of erosion control). Eight people went for a two-day trip October 1 and 2 (sixteen person-days, of which 1.4 were used in documentation efforts--photography, flagging, mapping and notes.). The splitting of the work in two periods was valuable, as it allowed us to observe the effects of the intervening rains on our initial constructions.

The short term nature of the job inflates the proportion of travel costs, and does not allow an accurate assessment of living costs. A budget is appended for the sake of curiosity.

The greatest bulk of the time, as documented in Table 1, was spent in checkdam construction and installation. The most time-consuming part of this process was the selection and cutting

of trees and limits. Care was taken not to make too obvious an impression on ^{the} Park, so trees were thinned in some cases at some distance from the gullies. The process might be speeded by working from already down brush and boughs, as from a current logging, thinning or pruning operation. Gains would be at least partly offset by hauling costs and time.

The time spent on a checkdam is roughly proportional to its size. Thus the greater amount of time spent on the larger checks in area one, for example, as compared to the smaller ones in other areas. Our average checkdam appears to have taken about an hour to gather, construct and install (taking into account tool maintenance, trekking, breaks, and so forth.)

Waterbarring consumed less than a quarter of the time, yet is probably the most essential aspect of the work. It appears that most of the still active damage on this piece could have been avoided by careful waterbarring at the time of logging. The two cat waterbars we discovered are still functional, 10-15 years later--one of them only now in need of maintenance. The area with these waterbars was the one section of trail we worked on which did not require checkdams for gullying. Even in its present condition, a time-conserving approach to erosion control on a piece such as this would be to install and maintain waterbars. Healing is speeded by the checkdams and planting, but the greatest bulk of the active eroding is probably arrested by the waterbarring, in those cases where waterbars are possible. Our waterbars required a little less than an hour and a half each

to construct (again, taking into account tool maintenance, trekking, breaks, and so forth.)

About half the actual erosion control work time was spent on the central gully (area #1), with areas #5 and #2 next in time significance.

IV. RECOMMENDATIONS

1. On-Site Living In future "labor intensive" contracts to out-of-the-area contractors the Park should give more attention to camping sites. On-site camping would permit maintaining the low costs we offered in this job. Off-site camping, as we experienced, is unsatisfactory. The time and energy needed to set up and break down camp every day, and to commute, would soon rob the work effort; nor are the available public campgrounds appropriate places for crew living quarters.

2. Further Treatment The most needed forms of further treatment on this site are maintenance of waterbars, and planting of bare areas.

All waterbars need to be maintained periodically, until revegetation is complete, and all tendencies to channelize arrested. We will maintain the waterbars we created once in midwinter. A minimal effort of checking bars (reinforcing where necessary) in future winters will prevent damage (which could require much effort to "patch up" after the fact.)

The silt basins behind the checkdams, once full, can be planted with any, preferably, evergreen species (such as douglas fir, or alder seedlings, or willow cuttings). The alder and willow have the advantage for the steeper gullies of stem sprouting, which will help secure further layers of deposited sediment, and enable the tree to survive such deposits. (Alternately, in these steeper, and deeper places, instead of planting immediately, more checkdams could be constructed atop the old ones. This effort is probably unnecessary--

the vegetation will do the same job with less effort.)

Planting on the bare skid trails and the flat is more of a problem. Here the conifers which have been seeded are severely stunted; clearly, the lack of topsoil nutrients, and compaction of soil do not favor their growth. If the Park anticipates the need to revegetate many similarly impoverished areas, and is not already experienced in the planting of such areas, this parcel would be a good spot for some well-planned trial plantings. We would recommend trials with those local pioneer species which "volunteer" in like areas. The coyote brush (baccharis) is an excellent example, the only plant which is establishing itself even in the gravelled roadway (near the highway on this parcel). The ceanothus species add nitrogen to the soil, and would be a likely species to try. Thistles often do well on impoverished soils. Grasses could be planted in strips, with a nitrogen booster at the time of planting.

The alternative to pioneer species or grasses would be to individually dig and fertilize basins for conifer seedlings. This procedure would most likely be more expensive. However, even the pioneer plants would most likely benefit from loosening of the soil in severely compacted areas.

The very small trial plantings we did may or may not be valuable. At the time of planting, although unseasonable, the ground was wet enough; but subsequent weeks of drying may have lessened the plantings' chances of survival.

APPENDIX A: CONSTRUCTING A BOUGH CHECKDAM

Tools:

small pruners or "Woodsmans Pal" (a modified machete) for cutting branches
linesmans pliers for cutting and fastening wire
wire
tightening strap--a buckled strap of the sort used to attach luggage to car racks is useful, for holding a bundle tightly together while being wired.
bowsaw for cutting stakes
ax, for sharpening stakes
wooden mallet for pounding stakes

Procedure:

Branches or small trees of a size suitable for the gully in question are gathered (somewhat longer than the gully is wide). Any evergreen tree or shrub will do, but conifers are ideal. We found that thinning trees for this purpose is more economical of time than limbing.

The boughs are laid with butts alternating. Bough ends extend further out of the bundle than the butts, for greater flexibility. Once piled, a tightening strap may be pulled around the bundle; or the wire itself used to tighten the pile. (Kneeling into the pile helps to get it tight.) In either case the wire is wrapped to form a secure belt around the middle of the pile.

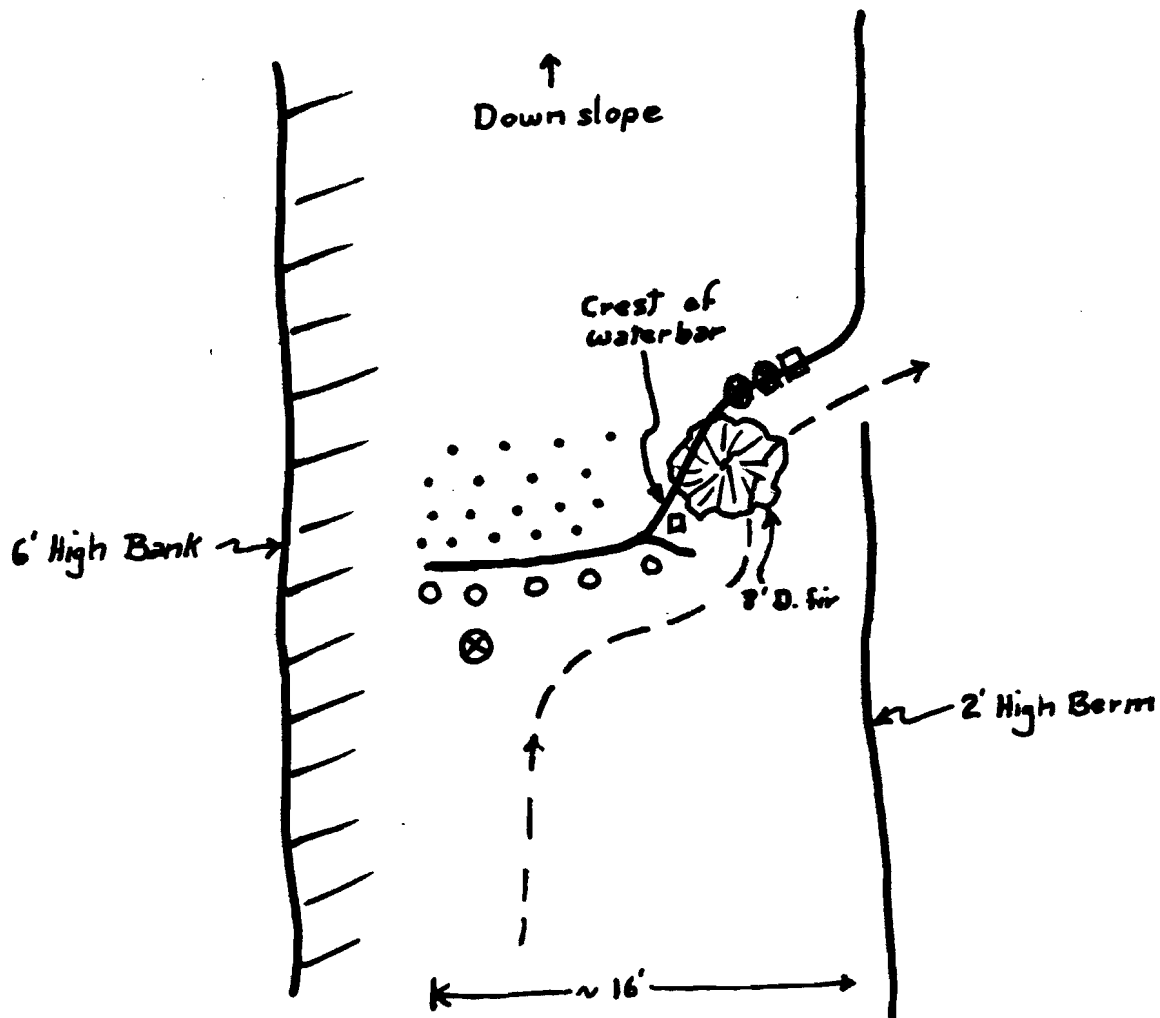
Stakes long enough to stake the checkdam securely into the bottom of the gully may be handily made from the trunks of trees, or split from logging slash. In the case of a tree, a whorl of branches at the butt end may be left extending a few inches, to help press the bundle firmly into the ground. The end of the stake is sharpened.

The checkdam is placed crossways of the gully, with boughs flexing up around the sides of the gully a bit, for a tight fit. Additional limbs may be piled under the checkdam lengthwise in the case of a V-shaped bottom, for a tight fit; or to increase height of structure. Such a bottom layer also adds a tongue, which will absorb much of the kinetic energy of the water coming through and over the dam.

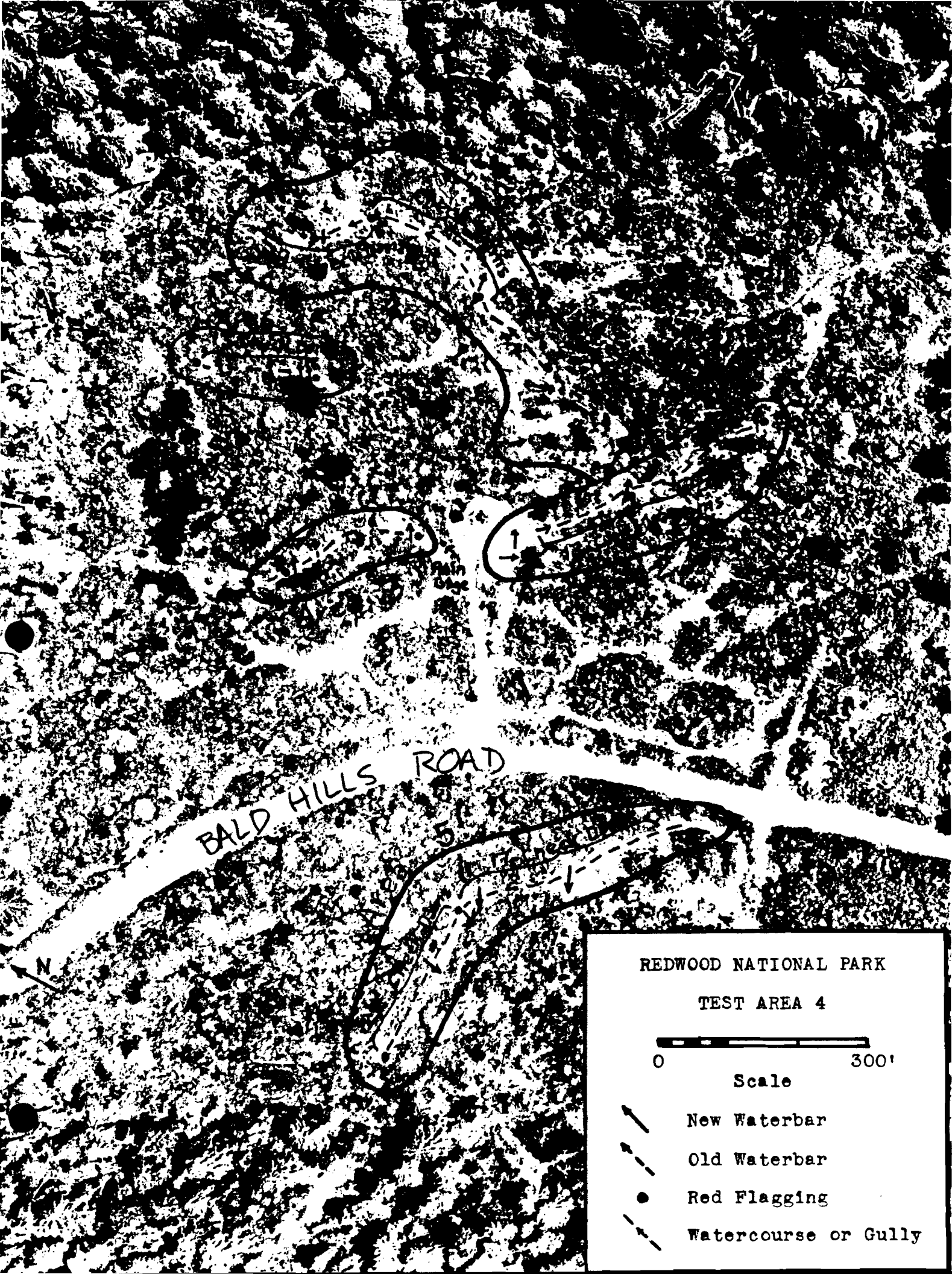
The bundle is then staked through the middle, with care taken that the bottom of the gully is firmly contacted all the way across, leaving no chance for the water to cut a channel beneath the dam. Sometimes two stakes will be necessary. A wooden mallet about 4½" to 5" in diameter is ideal for pounding stakes, and can be made from a section of seasoned hardwood, attached to a handle.. Litter or dirt may be piled a few inches on the upstream side of the dam for insurance against undercutting.

APPENDIX B

Sketch map of trial planting on the lower of two old cat dug waterbars along the logging road in work area 3. The planting area is marked with red flagging.



- Coyote Brush Cuttings
- ⊗ Douglas Fir Transplants
- Salal transplant
- Huckleberry Transplant



REDWOOD NATIONAL PARK

TEST AREA 4



-  New Waterbar
-  Old Waterbar
-  Red Flagging
-  Watercourse or Gully

WORK AREA ONE



1. Upper section of gully in area one.



2. Installation of checkdam in gully shown in picture #1.



3. Pack resting on 18" of sediment which filled in behind checkdam in area one during first rains of season.

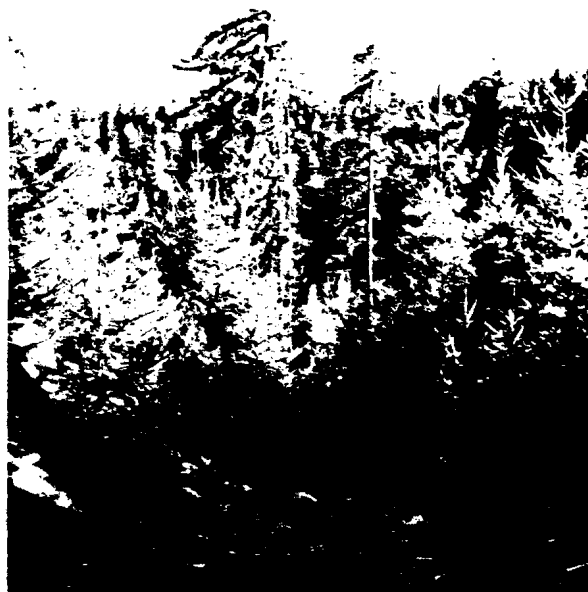


4. Checkdams installed in lower section of gully; arrow indicates checkdam installed on top of the one shown in picture #3.

WORK AREAS TWO AND THREE



5. Area two: view up lower section of eroded skid trail, with checkdams.



6. Area two: view down middle of eroded skid trail, with checkdams.

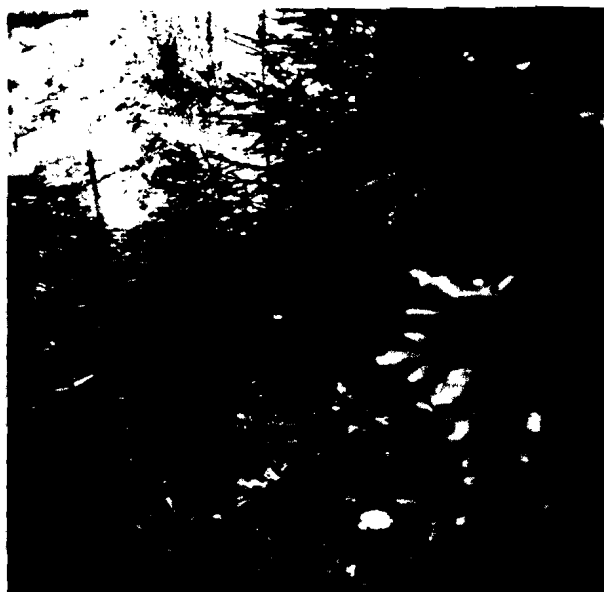


7. Area three: upper waterbar (next to rain gage).



8. Area three: trial planting area on 2' mound of cat-dug waterbar.

WORK AREAS FOUR AND FIVE



9. Area four: three checkdams on lower part of gullied skid trail.



10. Area five: pack rests in one of twin gullies, which run underneath foliage, near lower end of area five.



11. Area five: typical view of eroded skid trail in middle part of area five.



12. Area five: checkdam installation in middle part of gullied skid trail.