KARUK ECOSYSTEM RESTORATION PROGRAM

FINAL REPORT
FY 2002

Salmon River

Karuk Tribe of California
Department of Natural Resources
Orleans, CA
31 March 2003

KARUK ECOSYSTEM RESTORATION PROGRAM

Karuk Ancestral Territory
Mid-Klamath/Salmon River Sub-basin
Humboldt and Siskiyou Counties, California

PROGRESS REPORT
31 March 2003

Prepared by
Karuk Tribe of California

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EXECUTIVE SUMMARY

The Karuk Tribe of California and the Six Rivers and Klamath National Forests are developing a programmatic approach to watershed restoration in the Karuk Ancestral Territory, an area that encompasses the Mid-Klamath and Salmon River sub-basins. In 1996, the Tribe and the two National Forests entered into a Memorandum of Understanding (MOU) that established a framework for the two partners to jointly identify, plan, and accomplish mutually beneficial projects within Karuk Ancestral Territory. The projects identified to benefit both partners are watershed restoration, job training opportunities, and community economic development.

Past mining, excessive logging, and road building activities contributed to environmental degradation within the territory. Many sub-basins are listed as sediment, temperature and/or nutrient "impaired" under 303 (d) of the Clean Water Act and classified as "key watersheds"—critical spawning and rearing habitat for endangered or threatened fish species—by the Northwest Forest Plan.

The Karuk Tribe, in collaboration with the Northern California Indian Development Council, Inc. (NCIDC), hired a contractor to assist in developing a Karuk Ecosystem Restoration Program, as envisioned by the Director of Natural Resources, Leaf Hillman. The initial effort of the program was to create a watershed division to design, manage and implement watershed restoration activities on Steinacher Unit, East Ishi-Pishi Unit, and Thompson Unit over a five-year period.

In fiscal year 1999 (FY99), the initial training of 16 Tribal members who began work primarily on the Steinacher Road Unit. According to the Steinacher Unit Restoration Plan, decommissioning of the 5.2-mile road would require three years to complete. As of November 1st 2002, this task was completed as expected. To date, approximately $3,005,353.00 dollars has been spent decommissioning Steinacher Road. In fiscal year 2000 (FY00), only winter maintenance and monitoring of previous work was done due to insufficient revenue.

Without stable revenue, continuation of the Karuk Ecosystem Restoration Program is uncertain. Adequate funding remains a significant challenge in other watersheds within the Karuk Ancestral Territory, which are in dire need of restoration. We gratefully acknowledge the following funding providers who have made possible the progress to date (see Figure 1): California Department of Fish and Game (CDFG), US Forest Service (USFS), US Environmental Protection Agency (EPA), US Bureau of Indian Affairs (BIA), US Fish and Wildlife Service (USFWS), Northern California Indian Development Council, Inc. (NCIDC, the source for funding from the California State Block Grant [CSBG] and the Job Training Partnership Act [JTPA], and the National Fish and Wildlife Foundation (Natl F&W). "Funding for this project has been provided in full or in part through a contract with the State Water Resources Control Board (SWRCB) pursuant to the Cost-Machado Water Act of 2000 (Proposition 13) and any amendments thereto for the implementation of California's Nonpoint Source Pollution Control Program. The contents of this document do not necessarily reflect the views and policies of the SWRCB, nor does mention of trade names or commercial products constitutes endorsement or recommendation for use."

BACKGROUND

Needs and Priorities

The Karuk people have continually lived in their ancestral territory for over 10,000 years, and have a vested interest in restoring ecological and economic vitality to this land, an area encompassing over 1562 square miles in the Mid-Klamath and Salmon River sub-basins. Ninety-six percent of Karuk ancestral territory lies within the Klamath and Six Rivers National Forests, (Map 1). The environmental degradation of the territory affects water quality, forests, fisheries, and cultural sites important to the Tribe. Anadromous fish species are both economically and culturally valuable, and the restoration of riparian, aquatic, and upslope habitat is crucial for their survival.

A sincere partnership between the Tribe and National Forests is clearly the most effective means for economic and environmental renewal of this region. The Karuk Tribe of California is interested in long-term employment for Tribal members. Karuk Tribe 1999 census data show 87 percent of its members are unemployed or live under the national poverty level. Due to the considerable budget cuts and reduction of Forest Service personnel, the two National Forests lack the necessary funding and staff to restore the Mid-Klamath and Salmon River sub-basins within an acceptable time frame.

In 1979, the Karuk Tribe gained sovereign status with the US federal government and began government-to-government protocols with the USDA Forest Service. While former Tribal participation in Forest Service planning efforts had been limited (being, at best, advisory), recent federal mandates have fostered a more cooperative climate. The Tribe and Klamath and Six Rivers National Forests have since entered into MOUs that established a framework for both to jointly identify, plan, and accomplish mutually beneficial projects and activities.

Redefining and expanding the role of the Karuk Tribe in managing their traditional resources has brought about the development of this new watershed restoration partnership between the Karuk Tribe and the Forest Service. Building the Tribe’s capacity to play an appropriate role in ecosystem management is an effective means by which the Mid-Klamath and Salmon River sub-basins will be restored and community development achieved.

Plans, Analyses and Policies

The Karuk Tribe and Klamath and Six Rivers National Forests have prepared independent management plans to guide restoration of the ancestral territory; these are, respectively, the "Non-Point Source Pollution Assessment and Management Plan” and the “Land and Resource Management Plans” (LRMP). Both plans addressed large-scale watershed restoration by:

- providing brief descriptions of existing Karuk Tribe and Forest Service programs;
- identifying watershed restoration priorities;
- establishing criteria that defines practical completion of restoration efforts; and

- establishing a watershed restoration program that implements a large-scale effort in a cost-effective and timely manner.

In the Karuk plan, watersheds with the most serious or potential impacts to spawning habitat were ranked highest. This ranking was supported by Forest Service's LRMP. Socioeconomic factors are also addressed by this prioritization, given that many of the Karuk people gain cultural and economic support from the fishery resources and habitat associated with healthy fisheries.

Since the establishment of the Forest Service in 1905, the organization has aimed at balancing commodity production with beneficial uses of water. However, commodity production (principally timber) was the dominant management focus in the Mid-Klamath and Salmon River sub-basins during the 1960s and 1970s. The Forest Service has since increased its emphasis on environmental concerns through the National Environmental Policy Act with respect to water, fish and wildlife resources. In addition, new water quality protection programs were added in the 1980s and 1990s:

- "Water Quality Management for National Forest Systems Lands in California" (also known as the Best Management Practice program), 1981;
- "Best Management Practices Effectiveness Program" (BMPEP), 1992;
- Northwest Forest Plan, 1994–1996; and
- LRMP's of the Klamath and Six Rivers National Forest, 1994–1995.

The following has provided further direction for the Karuk Ecosystem Restoration Program:

- Watershed Analyses prepared by Klamath National Forest include: Ishi Pishi/Ukonom, 1998; Indian Creek, 1997; Thompson/Seiad/Grider, 1999; Main Salmon, 1995), and about 15 others;
- Westside Roads Analysis, Klamath National Forest, 1997;
- Happy Camp Ranger District Environmental Assessment (EA), 1999;
- East Ishi Pishi Road Restoration Project, Six Rivers National Forest, draft NEPA scooping document, July 2000; and
- Environmental Assessment for Steinacher Rd. (Rd. 12NO1) Rehabilitation Project Klamath National Forest, 1995.

In the former Forest Service Chief Mike Dombeck's "Natural Resource Agenda for the 21st Century," an emphasis was placed on watershed health, restoration and forest roads. The newly developed long-term road policy is based on four primary objectives:

1. More carefully considered decisions to build new roads;
2. Elimination of old, unneeded roads;
3. Upgrade and maintenance of roads important to public access; and
4. Development of new and dependable funding for forest road management.

The Karuk Ecosystem Restoration Program focuses on all of these objectives, yet two of them have a higher priority: the elimination of old, unneeded roads; and the development of new revenues to provide critically needed watershed restoration.

OVERVIEW

The Karuk Ecosystem Restoration Program began as collaboration between the Tribe and Klamath and Six Rivers National Forests with the assistance of the Northern California Indian Development Council, Inc. to achieve mutual ecosystem management goals and watershed restoration objectives. To expedite those goals and objectives, a watershed division within the Natural Resources Department of the Karuk Tribe was created. The strategy of the watershed division is to systematically implement prioritized watershed restoration action plans in partnership with the National Forests while providing family wage jobs to tribal members and the river community.

The start-up phase of the program focused on staff development and implementing the first priority restoration unit, which was the Steinacher Unit. The East Ishi-Pishi Unit is next in priority (see Appendix 1 and Map 2). Funding for the initial phase of East Ishi-Pishi Restoration has been developed through the assistance of NCIDC.

Steinacher Unit

Steinacher Road was in the lower segment of the Salmon River sub-basin, specifically affecting the lower portion of Wooley and Steinacher Creeks (see Map 3). These watersheds have been classified as "key watersheds" within the Northwest Forest Plan and the top priority for the Tribe. In 1996, the Klamath National Forest decommissioned the upper 2 miles of the 7.2-mile road. The Karuk Tribes' Watershed Restoration Program decommissioned the remaining 5.2 miles of road during fiscal years 1999, 2001, and 2002 respectively.

East Ishi Pishi Unit

Sub-watersheds within the East Ishi Pishi Unit are identified as of "critical concerns" and considered "impaired" by the Northwest Forest Plan and the Clean Water Act. These watersheds include the Ti, Irving, Rogers and Ukonom Creeks, and contain high potential sources of sediment contributing to the degradation of water quality within the Klamath River system. Cool water from the sub-watersheds of East Ishi Pishi is important for maintaining water quality in the Klamath River, and provides optimum water temperature for anadromous fish species. In addition, the lower stream reaches contain spawning and rearing habitat critical to the future viability of these species.

Approximately 64 miles of road are identified as candidates for road decommissioning and roughly 8.5 miles are to be converted to trail. The proposed actions will take over 8-12 years to complete depending on funding availability.

Initial Phases

Program efforts during the start-up phase focused on training watershed division personnel, implementing the Steinacher Unit, and moving forward in the planning and implementation of East Ishi Pishi and Thompson Units. In June 1999, a watershed restoration specialists training program was initiated. Graduates of the basic skills course then interned on the Steinacher Unit and participated on road assessments for Ishi Pishi planning efforts.

Funding. NCIDC has been a vital resource for securing revenue for the program. Revenues for the program came through eight different funding entities (Figure 1). Contracts between grantors and the Karuk Tribe were administered through the Karuk Community Development Corporation, and later through the Karuk Tribe Administration. Each independently written contract accounted for specific elements that were cumulatively important for the success of the program.

Collectively, these funding sources have contributed approximately $3 million towards program development, planning, training, and implementation. The graph below (Figure 1) depicts the amount and source of the funding.

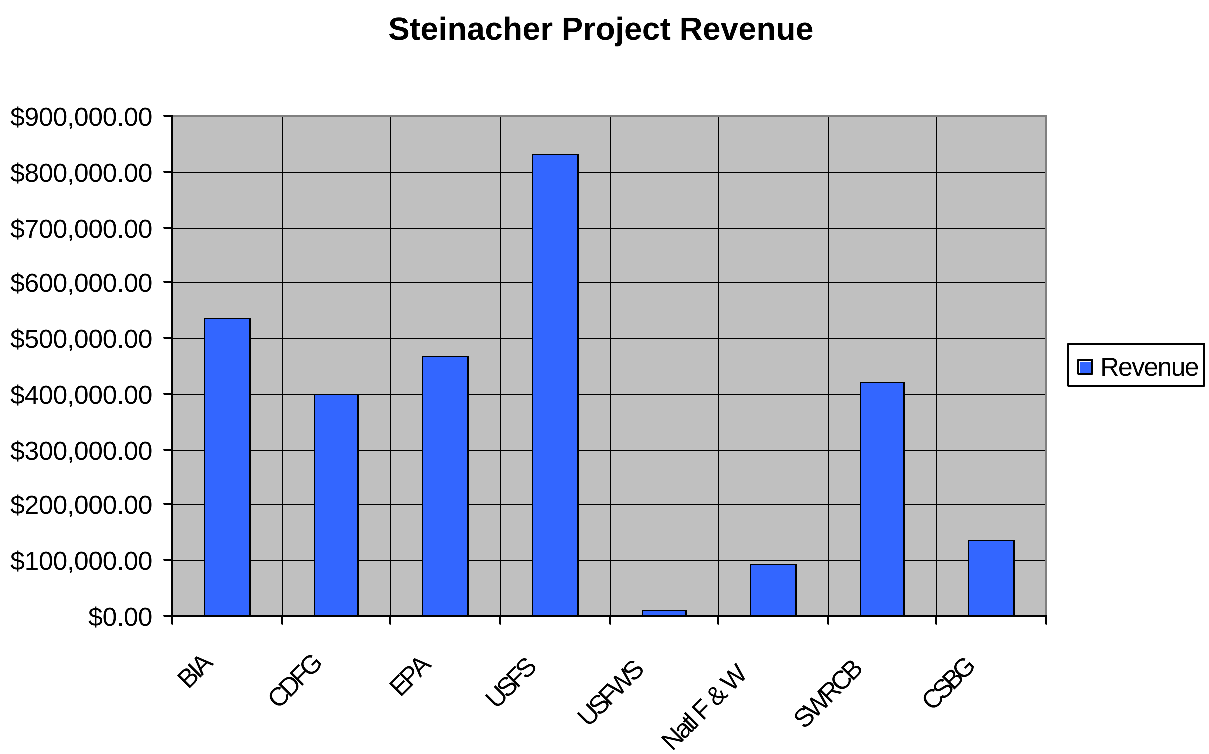


Figure 1.

Training. The training phase was designed to provide the basic knowledge and advanced job skills necessary to accomplish cost-effective, long-term watershed restoration within the Karuk Ancestry Territory. Sixteen Tribal members were hired through the Karuk Community Development Corporation to participate in the Karuk Department of Natural Resources, Watershed Division.

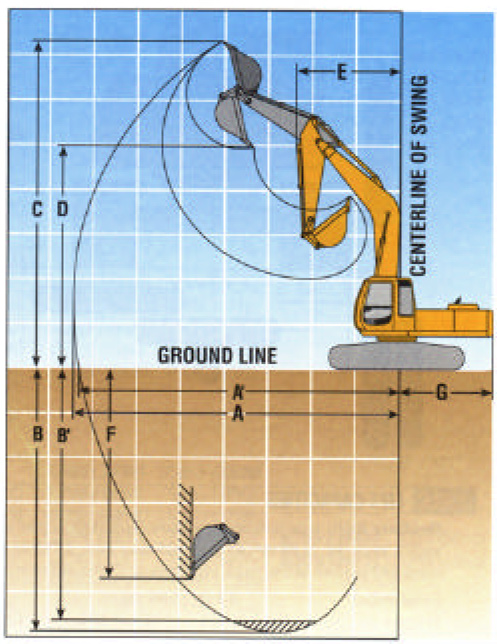
A top-quality watershed restoration-training program is an investment in the Karuk Watershed Division. Training has focused on specific regional restoration objectives and cultural demands; the high quality skills these require will pay off many times over as the program grows in maturity.

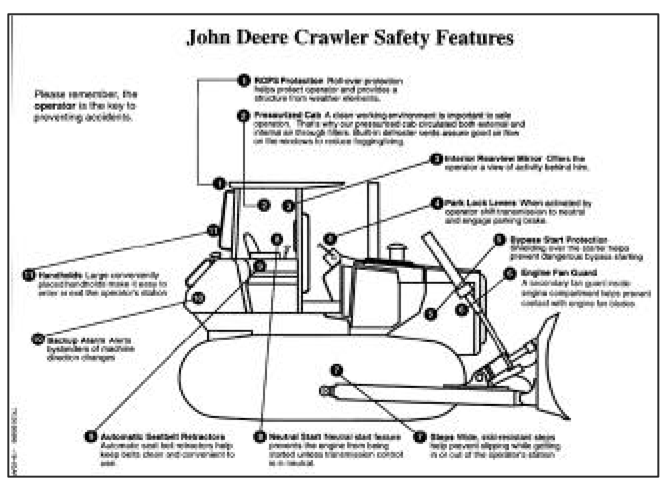
The training curriculum was developed to prepare the Karuk Watershed Division for site management and heavy equipment operations. Students were subjected to rigorous classroom and field study. The curriculum, covered:

- Basic geomorphology and hydrology principles within the regional geologic context;
- Mapping, inventorying and surveying techniques;
- Prescriptions and treatment layout;
- Heavy equipment operations and labor-intensive application;
- Unit management, record keeping and monitoring methods; and
- Communications, safety, CPR and first aid.

Initial training began with formal classroom and on-the-ground training modules that covered step-by-step operations in the following areas: program management, site management, heavy equipment operations, labor-intensive operations, and native plant operations.

Internship. The internship phase provided on-the-job apprenticeships for watershed restoration specialists after completing the basic core curriculum. Internships reinforce the consistency and quality taught in initial training, and continues until a sufficient knowledge base is acquired.





STEINACHER ROAD UNIT

Introduction

The Steinacher Road Unit is defined by the hydrologic boundary of Steinacher Creek, a lower tributary to Wooley Creek, which flows into the Salmon River, (map 3). In 1996, the Steinacher Road Environmental Assessment was completed and identified the need to decommission Steinacher Road (Forest Service road #12N01).

Steinacher Road was the only road within the Steinacher Creek watershed. Planned to be the primary transportation route to cut timber and haul logs from the Salmon River basin to mills in Happy Camp, road construction began in 1968. However, only 7.2 miles of it was completed due to the creation of Marble Mountain Wilderness. Construction of the road was complex: topography, incompetent soils, and bedrock presented engineering difficulties in maintaining a 26-foot roadbed with a uniform grade. In 1997, the Klamath National Forest decommissioned the upper 2 miles of the 7.2-mile road.

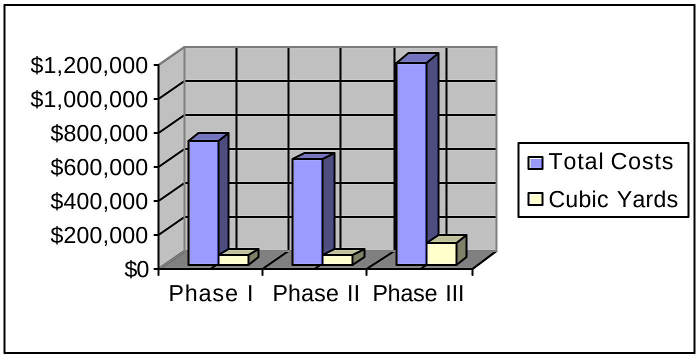
Steinacher Road

In 1997, the Karuk Tribe contracted with Pacific Watershed Associates (PWA) to prepare a technical specifications report for decommissioning the remaining 5.2 miles of Steinacher Road. This report estimated **172,265 yd^3** of fill material to be excavated from 23 treatment sites over a three-year, heavy equipment work schedule at an estimated cost of $2.2 million.

By 1999, planning efforts were underway to include Steinacher Road in the program. The Karuk Tribe then contracted with TerraWave Systems Inc. to assist in the development of the Tribe's Watershed Restoration Division and implement the road decommissioning as part of the training and internship phase. During the road decommissioning survey-training component, a critical treatment volume disparity surfaced between the two contractors estimates.

These differences were great enough to require revision of the treatment specifications, which increased the final excavation volume by 23,791 yd^3. Technical changes were required to be made before heavy equipment began, which significantly impacted the work schedule and logistics.

By the end of FY99, the first field season of heavy equipment operations excavated approximately 52,000 cubic yards of fill were removed and placed in stable locations, and winter maintenance measures were implemented. From August to November 2000 (FY 2000), the Karuk Program resurveyed the rest of the road (RX10 to the gate), and implemented winter maintenance measures, no additional excavation work occurred due to inadequate revenue. During FY 2001, approximately 48,823 cubic yards of fill material was excavated and placed in a stable location. The final phase of the Steinacher Project completed in FY 2002 removed and placed in appropriate locations approximately 117,853 cubic yards of fill material. The graph below compares cost to cubic yardage. **Overall, for the entire project the cost per cubic yard is calculated to be $11.52.**



Treatment Specifications

The revised treatment specifications detail the work schedule by itemizing: excavation and disposal sites, secondary erosion control measures, labor-intensive work, winterization measures, monitoring, and other special conditions or concerns.

The treatment specifications require the removal of road fill from stream crossings, swales, and unstable sidecast areas that threaten waterways and downstream salmonid habitat. Stream crossings are to be excavated to original width, depth, and slope to expose natural channel armor and buried topsoil or achieve stable engineered dimensions for maximum cost-effectiveness. Sidecast fill material, with high failure potentials affecting watercourses, is to be excavated to reduce erosion hazard and expose buried topsoil. Excavated material is to be moved to stable road locations, placed along cutbanks and in through-cuts, and then shaped to specific slope and compaction requirements.

Treatment specifications (see Appendix 2) are designed with tentative grades and dimensions, which provide the basis for estimates of volumes to be excavated. As the work progresses, the site supervisor (who monitors the excavation) determines the final grades and dimensions. The final grades and dimensions provide the basis for determining actual volumes excavated. While monitoring the excavations, the site supervisor instructs the equipment operators to adjust the excavation's grade, alignment, and bank dimensions to preserve latent boundary conditions, such as: original topsoil, natural channel armor, bedrock outcrops, or stumps in the growth position. (It is extremely important not to remove or disturb these natural boundary features.)

Treatment Locations. All treatment sites are referenced to a common datum using the standard engineering P-Line "station" method. Station stakes or wire flagging are installed on the cutbanks along the road every 100 feet at the start or end of a work site. These stakes are labeled with a station number, such as "STA 25" or "STA 25+00."

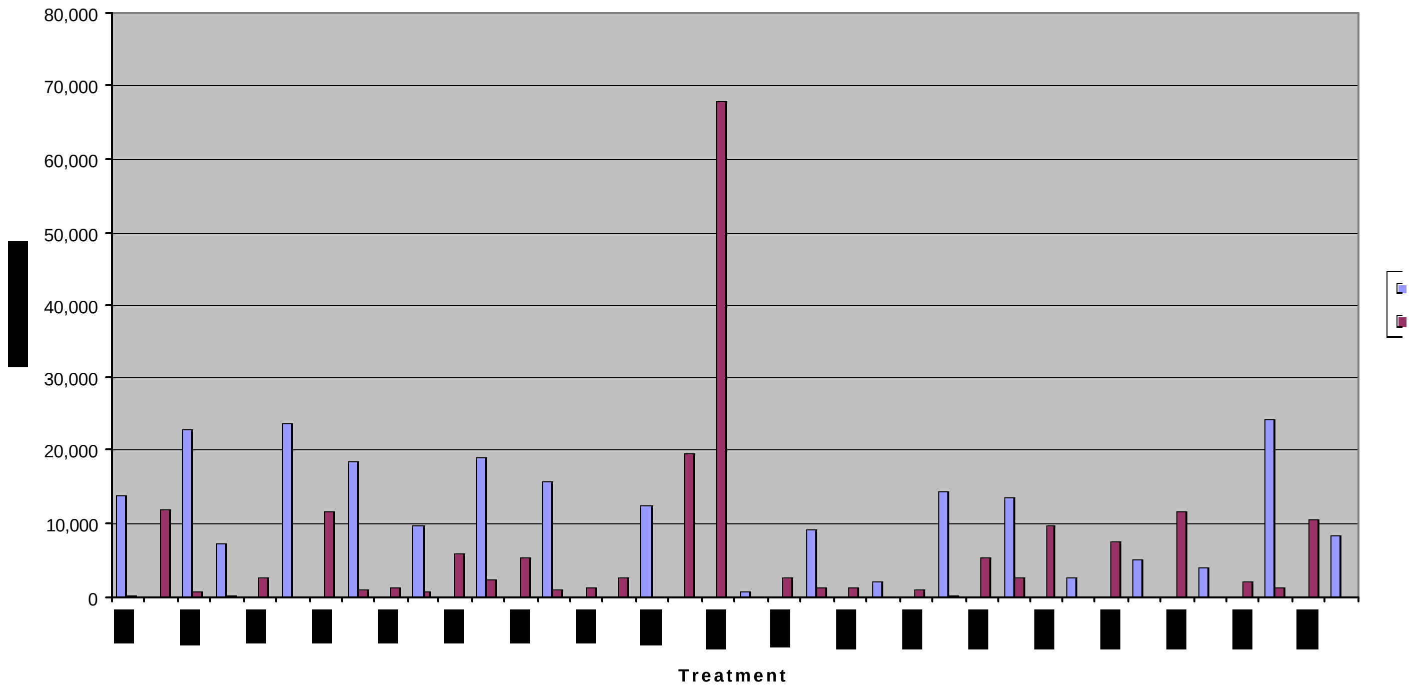
Locations between station stakes are identified such as "STA 25+25," which means a location is found 25 feet beyond the station "STA 25+00" stake (2,525 feet) from the start of the work site.

Each stream crossing (RX) or road reach (RR) treatment is referenced by a control point (CP) to a common datum, such as RX10 located at station CP155+80. Road reaches are segmented into individual treatment types depending on road stability and construction design.

As mentioned above, earlier treatment specification estimates required refinement. Final revisions to the treatment specifications [for (STA 0+00) to RX10 (CP 155+80)] affecting approximately 3 miles of road were made during FY99. The remaining changes to the treatment specifications [from RX10 to the end of the road (STA 260+00)] were completed in FY00.

Treatment Volume Estimates. All stream crossing excavations and a variety of road reach treatments required volume calculations for managing fill materials, developing the work schedule, and for estimating costs. A detailed volume survey was undertaken to revise prescriptions and improve the accuracy of earlier excavation and storage volume estimates. The graph below shows the results of the new volume survey.

Excavation and Disposal Treatment Volumes



Stream crossings and swale treatments accounted for 94 percent of the total 196,056 yd^3 volume to be excavated on the project. (Excavation sites ranged in volume from about 1,100 yd^3 to nearly 68,000 yd^3 in size.) Road reach volume storage capacities range from about 200 yd^3 to about 24,000 yd^3 in size, and collectively have a maximum-engineered capacity of 228,919 yd^3 to dispose fill material along the entire road (see Appendix 3). Note the sharp excavation volume spikeed at RX9 and R 10 and the lack of disposal space adjacent to them (discussed below).

Technical Challenges

Decommissioning Steinacher Road presented more technical challenges than usual. Although we estimated a net disposal site volume surplus of 32,863 yd^3 over the length of the entire project, this actual excavation/storage volume difference is less than 6 percent after factoring for material expansion and compaction coefficients. Because fill material is imported into a disposal reach from both end-hauled sources (end-hauling is loading fill into dump trucks) and adjacent excavation sources, experienced supervision is essential to achieve cost-efficiency and accurate volume capacity.

Steinacher Road traversed steep, erosive, mountainous terrain. Variations in fill material and ground conditions add to decommissioning complexity. The majority of fill material was composed of uniform, very coarse-grained rock fragments typical of a grus regolith, commonly known as decomposed granite (DG), with occasional concentrations of small rocks and boulders.

The moisture content of the fill material varied from dry to completely saturated. Ground conditions changed frequently, with variable road width, cut bank height, hillslope repose, crossing orientation, channel flow, and bedrock competency.

Fifteen stream crossing excavation sites contained more than 2,500 yd^3 of fill. Seven of those sites contained more than 10,000 yd^3 and two sites contained more than 19,000 yd^3. The largest excavation is estimated at 67,828yd^3 at RX10 (CP155+80), halfway through the project.

Two crossings (RX 9 and RX 10) have fill volumes that exceeded nearby disposal site capacity by 86 percent. Nearly 75,000 yd^3 from these two crossings were trucked to distant disposal sites along the length of the road. Careful supervision of end-hauling material was required to balance locally derived excavated fill with fill from distant areas, while at the same time maximizing disposal site volume.

Stream crossing excavations were further complicated and consequently time-consuming due to their size and geometry. For example, many crossing excavations have asymmetric geometry, in which the natural channel is oblique to the road alignment and/or natural channel beds curve through crossings. Some channels had culverts with buried elbow joints, while other channels had culverts not set to natural grade. Many pipes carry flowing water year round, required additional water quality measures during excavation.

Three crossing excavations were considered double crossings, in which the design geometry and final shape must take into account the crossing being built on the confluence of two stream channels. These excavations were very complex and complicated operations.

For example, RX10 was a double crossing; as well, about 90 percent of the 67,828 cubic yard volume was end-hauled. The culvert in the primary channel, a 5-foot diameter, bolted multi-plate pipe, and 330 feet in length required it to be cut into manageable sections. The secondary channel is an intermittent stream on the exit side of the excavation; it had a 24-inch culvert that was not set to grade, and oblique to the road and primary channel.

Work Schedule

Decommissioning the 5.2 miles of Steinacher Road required three heavy equipment work seasons. The work schedule details the heavy equipment, labor intensive and monitoring operations needed to complete the project. At the end of each season, erosion and sediment control measures were implemented.

Work generally started nearest the end of the road and proceeded backward to the beginning of the road. However, due to the large volume of end-hauled material from RX9 and RX10, the work schedule incorporated complex end-hauling operations to manage the interspersed disposal sites.

RX10 is the largest excavation of the Steinacher Unit, and together with RX9, required ten separate road reaches to dispose of the 75,000 cubic yards of end-hauled fill they generated. Consequently, individual disposal sites had to be managed so to balance the needs for local storage (from adjacent excavations) with that of imported fill to maximize the available capacity within the limited storage capacity of the entire road. The rate of linear road progress (that is, miles completed) was directly linked to the rate of excavation at RX9 and RX10.

It is important to note that there is an economic push-distance threshold for disposing of fill by the bulldozer, at which it becomes necessary to end-haul material. The larger the excavation, the further material has to be moved, requiring multiple pieces of heavy equipment to manage. Therefore, the farther the distance material must be moved, the greater the cost.

Due to the erosive nature of soils in the unit, secondary erosion-control measures are required on completed work. These measures consist of applying a layer of certified weed-free rice straw mulch at 4,000 lbs/acre to bare surfaces and an erosion-control native grass seed mix with fertilizer. In addition, a few crossings required rock armor in the final channels. The rock armor was onsite thereby not requiring the importation of said material.

After each heavy equipment season, winterization measures were implemented for the remaining road not yet decommissioned. These measures included: reopening rolling dips that were filled to facilitate end-haul operations; examining and maintaining straw-bale surface-erosion check dams; and, because RX10 is very large, constructing a sediment detention basin within the excavation to capture local sediment runoff. This sediment detention basin captured a considerable amount of material during the 2001-2002 off-season.

Completed Work Field Seasons 1999-2003

On July 13, 1999, the Steinacher Road heavy equipment phase began and continued through October 15 of that year. Six large pieces of heavy equipment and up to nine dump trucks were used to execute the earthwork. Large bulldozers, excavators, dump trucks, a water truck, and for a brief time, a grader were all used on the project. Interns from the Karuk Training Program operated the heavy equipment. Trucks and their operators were provided through a local subcontractor.

No heavy equipment work except winterization measures occurred in FY 2000 due to lack of funding. During this period rolling dips and straw bale check dams were installed. Treatment revisions were also accomplished during this time.

The field season for 2001 ran from June 18 through September 21. The occurrence of a summer storm stopped work from June 27 through June 29. In addition no work occurred July 4 through July 6. Due to funding limitations heavy equipment operations were limited to four ten-hour days.

The third and final phase began June 19, 2002 with the staging of post project erosion and sediment control material (weed-free rice straw) and revegetation supplies (native grass seed and fertilizer). Also during this time frame heavy equipment mobilization occurred. This was the first year the Tribe has taken on the responsibility of heavy equipment rental. Heavy equipment operations started on June 24 and continued until November 1. The Final Phase work schedule was the most demanding to date. The crews and heavy equipment maintained five-ten hour days throughout the length of the project. The only day operations ceased was July 4. To keep up with the decommissioning, Watershed Restoration Laborers classification was created and tribal members hired, to implement erosion and sediment control measures as the project progressed.

Prescriptive Work Completed

Phase I

All prescriptive work from the beginning of the Phase I through RX2, nearly 1 mile in length, were completed by October 15 1999; this includes all heavy equipment, operations, straw mulching, seeding, and stocking native plants. Only two stream crossing excavations (RX1 and RX2) were completed within the FY99 budget. In addition, approximately 31,800 yd^3 (45 percent) of the fill in RX10 has been excavated and end-hauled to disposal sites in RR1, RR2, RR3, and RR4.

RR1 stored approximately 13,766 yd^3 of fill: 600 yd^3 was end-hauled from RX10; 11,164 yd^3 was pushed by bulldozers from RX1; and 411 yd^3 came from internal excavation sites. Before starting to excavate RX1, end-hauling to RR1 had to be completed. As well, before RX1 could be completed, all disposal outsloping within RR1 had to be finished.

RX1 was a complicated double-crossing excavation with 12,151 yd^3 of fill: channel A had a 48-inch culvert on grade with the natural bed; channel B had a 24-inch culvert that was not on grade. Both pipes contained flowing water at the time of excavation. Water quality measures were taken to safeguard off-site effects, which consisted of diverting flow away from the excavation and installing in-channel straw bale catchments. Approximately 92 percent of the fill material is disposed in RR1. The remaining 987 yd^3 is disposed in RR2.

RR2 has the second largest storage capacity on the road at 23,010 yd^3. Spoils imported into RR2 came from RX1, internal excavation treatments, and end-hauled material from RX10—approximately 987 yd^3, 561 yd^3 and 21,462 yd^3, respectively. While disposal operations were occurring on RR2, a pioneer road had to remain open to access RX1. Once RX1 was finished, outsloping of fill disposed in RR2 could then proceed.

RR3 had a disposal storage volume estimate of 7,243 yd^3. Its capacity was filled with 340 yd^3 from a small internal swale, 750 yd3 from RX2, and 6,153 yd^3 from RX10.

RX2 was an average size stream crossing with a massive rock outcrop on the left bank. A 42-inch engineered oval culvert was set above natural channel grade with an elbow and 70 feet of down spout. Although the crossing had a volume estimate of 2,771 yd^3, only about 1,800 yd^3 was necessary to excavate due to the rocky composition of the fill and high percentage of large boulders encountered during excavation. We suspect the boulders came from the massive rocky outcrop during road construction. Because the culvert was oblique to the channel grade, minimum water quality measures were necessary so that stream flow could remain in the pipe during the excavation process. Boulders extracted from the fill were stockpiled for later transport to RX8, a crossing that will require channel armoring. Fill from RX2 was disposed in RR3 and RR4—approximately 750 yd^3 and 1,050 yd^3, respectively.

Phase II

RR4 had the largest disposal storage capacity of the project: 23,772 yd^3. There are no internal excavation treatments in the reach; therefore RR4's storage potential was used for fill from RX2, RX3, and RX10. The reach was filled with 4,746 yd³ from RX2 and RX10 in FY99, and the remaining 17,976 yd³ were filled from RX3 and RX10. After the spoils were imported, the CAT 325L shaped materials to the finished slope specifications.

RX3 was the first stream crossing to be completed in FY01; over 11,917 yd³ of material was excavated. A D8R began by excavating the stream crossing. The material was pushed into disposal areas in RR4 and RR5. The original crossing fillslopes were veneered with rock slope protection (RSP), large boulders that act to reduce surface erosion and stabilize the fill prism. This RSP was salvaged and reused to armor the new channel bottom. More RSP was recovered than needed locally so the excess was hauled down to RX10; over 200 yd³ was loaded into an A30 and hauled out. Although RX3 was a very large crossing, working conditions soon were cramped due to staging of the rock and as the excavation got deeper. Heavy equipment worked for 26 days to reach and remove the 60 inch diameter culvert.

Technical specifications for RX3 did not prescribe rock armor; however, due to the abundance of RSP, specifications were changed to include rock armor placement; a considerable amount of time, effort and expense.

RR5 was 1,542 feet in length and designed to store 18,705 yd³ of material. Its capacity was filled with 964 yd³ from four internal swales, over 8,810 yd³ from RX3, 300 yd³ from RX4 and 8,331 yd³ from RX10. Material imported from RX10 occupied two specific reaches, CP 74+41 to CP 77+09 and CP 79+83 to CP 81+21. The remaining area was reserved for local excavations (RX3,RX4 and swales). Extra material from RX3 required a specifications change to increase specific reach grade to 50 percent to accommodate added volume. Approximately 195 bales of straw were used for mulching the bare ground.

RX4 was a normal, average size stream crossing with a volume of 1,362 yd³. A D8R was used to excavate the top portion of the crossing; then a CAT 325L and D6R finished the job. A 36-inch diameter culvert (not to grade) was removed. No channel armoring was prescribed. Rock salvaged during excavation was installed as channel armor conjunct with native rock outcropping in the bed and on the right bank. Fill removed from RX4 was disposed in RR5 and RR6.

RR6 contains two road segments (A and B), separated b y RX5, a total treatment length of 1,571 feet; segment-A extended between RX4 and RX5, segment-B extended between RX5 and RR7. Nine specific treatments were prescribed within the total reach. Disposal sites were designed to store 9,615 yd³ of material. Spoils imported from RX4, RX5 and RX10 filled most of the storage capacity, 741 yd³ were filled from spring drain and swale excavations within the reach.

RX5 is a large stream crossing excavation between segments A and B of RR6, approximately 5,981 yd³ in volume. A 36 –inch diameter, 145 –foot long culvert was removed and hauled away for disposal. The natural crossing banks are steep, the left bank averages 150% slope, the right bank averages 81% slope. The channel is 31% grade. Water quality was maintained through out the excavation by pumping stream flow around the job.

The initial crossing volume was excavated using a Volvo 360 excavator and end-hauling by an A30 off-road dump truck to the farthest disposal site in RR6. Rock RSP was encountered during the excavation and salvaged for reuse in armoring the finished channel. No rock channel armor was originally prescribed. The crossing was left unfinished to allow access to the above work then completed between September 7th and 11th using the CAT 325L, D8R and D6R. The total excavation took approximately 9 days to complete (about 2.5 days were spent moving rocks during excavation and armoring the finished channel).

RR7 is 1,929 feet long and designed to hold 18,075 yd³ of material. Within the reach 3,007 yd³ of local excavations occur. In FY01, about 100 feet of the reach was completed. The remaining length was completed in Phase III, FY02.

RX10 is the largest stream crossing excavation undertaken on Steinacher road and in the region. Built on the confluence of two streams, it is also the most technically challenging design and excavation. The 60-inch diameter culvert was buried in the primary channel and is constructed of multiple metal plates bolted together forming a 330-foot long straight pipe. Although the general grade will be uniform when completed in FY02, the primary channel will have an "S" shape emulating the original valley contour.

Estimating the volume of fill to excavate at a double crossing, where two or more streams join at the road crossing, is difficult to calculate. Complex buried landscape and natural channel geometry adds uncertainty to the volume estimate. To date, approximately 56,203 yd³ (83%) of fill has been removed from the original estimate of 67,828 yd³ in RX10: approximately 32,000 yd³ in FY99 and an additional 24,403 yd³ during a 25-day period beginning on 26 June 2001.

All spoil material from RX10 was end-hauled to disposal sites as described above. From volume survey calculations at the end of Phase II there was approximately 11,625 yd³ of remaining fill to excavate. However, to excavate the best channel alignment based on natural hillslope and channel irregularities the surveys suggest the remaining volume could range between 12 and 15 thousand cubic yards depending on the final configuration as exposed during channel excavation.

Excavation of **RX10** commenced on July 19. The trucking operation ran from July 20 to September16. A Hitachi 330 excavator with a 2.5-yd^3 bucket capacity was used to load dump trucks that hauled the fill to disposal sites mentioned above. Up to nine trucks were used per day, making a total of 3,673 loads, hauling approximately 31,800 yd^3 of fill. A truck was loaded or dumped every four to seven minutes for 39 days. Daily haul production rate fluctuated, depending on disposal site conditions, such as: frequency of turn around locations; length of back up in the disposal reach; road width, and steepness of disposal ramps. Approximately 45 percent of RX10's volume had been extracted at the end of Phase II. Size can be deceptive in photographs. RX10 is less than half excavated, and about 36,028 yd^3 remained.

Phase III

RR7 was 1,929 feet in length and accommodated approximately 18,075 yd³ of fill material. In FY01, about 100 feet of the reach was completed. The remaining length was completed during Phase III, FY02. Of the 18,075 yd³ of capacity within this reach, 3,007 yd³ of which was local fill. The local fill was excavated from three swales and two spring drains. Imported material totaling 11,512 yd³ from RX 10 was disposed of along four separate reaches of RR 7. An additional 3,556 yd³ was end-hauled from RX 9. The

finished grade along this road reach is less than 40 percent.

RR8 contains two road segments (A and B) separated by RX6 and terminates at RX7. The total length of road treated was 2,096 feet. Nine road treatments were prescribed in this reach including a 1,014-yd³ swale located in RR8B. The total designed fill capacity of this reach was 15,811 yd³. The excavation and placement of fill from RX6 contributed 5,487 yd³ toward filling this reach. An additional 6,362 yd³ was end-hauled from RX9, and 1,349 yd³ from RX7.

RX6 was a relatively large stream crossing excavation located between RR8A and RR8B. The total amount of fill within this crossing was approximately 5,487 yd³. A 36" diameter, 155' culvert was excavated and transported to a temporary storage area onsite. The natural bank steepness within this crossing varies between 38%-156% depending upon location. The channel length, measured in slope distance (SD) is 172' with a 10' channel bottom. The channel gradient is approximately 32%, with a slight curvature (meander) to approximate natural conditions. At the time of excavation no water quality control measures were necessary due to dry conditions. Rock (RSP) encountered during excavation was utilized to armor the head of the channel. The head of the channel on the left bank was widened to incorporate a spring into the finished crossing. The total post-excavation disturbed area of 21,672ft² was mulched with certified weed-free rice straw, and seeded with a native grass seed mix to the extent possible due to slope steepness.

RX7 located at the termination of RR8B was an average size crossing with an approximate volume of 1,549yd³. The culvert in this crossing was a 36" width and 110" in length. The bank steepness varied between 41%-98%, once again depending upon location within the crossing. Finished channel gradient in this crossing is 40% and the length is166' (SD), with a channel width of 10'. The majority of the volume excavated was utilized in RR8B.

RR9 contained three segments: A, B and C separated by RX 8 and RX 9, respectively. RR9 had the design capacity to accommodate approximately 14,906 yd³ of fill material. RR9A was filled to design capacity utilizing fill material from RX7. Imported fill material from RX8 and RX9 was used in RR9B. The finished fill grade is 40% throughout RR9. A large through-cut in RR9C was filled and outsloped using material from RX9. An additional 2,350 yd³ of material was imported from the ongoing excavation of RX10 into this reach.

RX8 was a moderate sized stream crossing with a total volume of 2,844 yd³. The material from this crossing was utilized in RR9B. The bank steepness varied between 30%-71%, and the overall channel length is 104' (SD) with a gradient of 27%. A 36" 100' culvert was excavated and hauled to storage site. This crossing required the use of a gasoline-powered trash-pump and over 120' of hose to dewater this site for water quality purposes. The total disturbed area consisted of 12,245 ft², which was mulched and seeded by Restoration Laborers.

RX9 was the second largest crossing excavation on the Steinacher Project. The total volume of material excavated exceeded 19,597 yd³. The depth of excavation at the outboard edge of road (OBR) to the top of the culvert was approximately 62.2' as compared to RX6 with a depth of excavation at the OBR of only 33.5'. The bank steepness through this excavation varies between 65%-104%. The channel excavation length was 254' (SD), with a gradient of 18%-19%. As with RX6, a meander was re-established to approximate natural conditions prior to road building activities. Rock encountered during excavation was used as channel armoring. In addition a series a rock check dams were placed in the channel. The culvert used to convey flow through this crossing was a 60"-multi-plate, with a total length of 235' and a cement headwall. A multi-plate culvert is assembled on-site utilizing sections that are bolted together resulting in one continuous length of culvert. The cement headwall had to be broken apart with a hydraulic hammer attachment in lieu of a bucket on the CAT 330 excavator. The amount of stream flow encountered during excavation required dewatering the site to protect water quality.

RX10 with an initial 67,828 yd³ of fill material required three seasons to completely excavate and reshape. In FY99 32,000 yd³ was excavated, while in FY01 resulted in the removal of 24,403 yd³. During the Final Phase excavation of FY02, 36,267 yd³ had been excavated along with the dismantling and disposal of 325 linear feet of 60? MULTI-PLATE culvert. Two channels merging in the excavation, forming a double stream crossing exacerbated the complexity of this excavation. The sheer amount of RSP encountered during excavation required it to be handled numerous times before final placement. The RSP salvaged from the excavation was utilized for channel armoring along the entire channel length. As with previous crossings a meander was re-established to emulate the original valley contour. This excavation included RX10B, which created a double crossing. Without the dedication of our team coupled with the expertise provided by our contractor, this crossing would still have the potential to deliver over 67,000 yd³ of material downstream.

RR 10 required the treatment of 93 linear feet of road. This reach was designed to hold 551 yd³ of material. The excavation of RX10 contributed 451yd³, while fill material from RX11 included 100yd³ to be disposed and outsloped.

RX11 was another mid-sized crossing excavation with 2,669 yd³ of material. The channel length for this crossing was 102 feet with a 46% grade. A 24? culvert was removed and hauled to storage site for future removal from site. The average left bank slope gradient 69%, while the right bank averages 68%.

RR11 resulted in the treatment of 1,144 feet of road. This road reach was designed to accommodate 9,386 yd³ of material. The majority of fill (2,569yd³) came from RX11, while another 782 yd³ came from RX12. Internal fill material (1,492 yd³) was derived from the excavation of one swale, two outslope portions, and a spring-drain. The net fill volume reserve was utilized to accommodate fill material from other locations.

RX12 was another relatively small crossing with a volume of approximately 1,452 yd³. This crossing required the removal of a 24? culvert and anchors. The designed channel configuration consisted of an 8 ft channel width that was 107 ft in length, with a channel gradient of 31%. The average left bank slope was 54%, while the average right bank slope was 58%.

RR12 was only 160 ft in length and designed to hold 2,079 yd^3 of fill material. Imported fill material consisted of 670 yd^3 from RX12 and 461 yd^3 from RX13. The majority of this material was used to fill and outslope a through-cut. A total of 127 yd^3 was obtained through internal prescriptions.

RX13 was one of the smallest crossings excavated with 922 yd^3 of fill material. The final channel length is 115 ft., with a gradient of 41%. The channel width is 8 ft. with a average left bank slope of 54% and on average a right bank slope of 54%. Removal of a 24-inch culvert was also accomplished. The culvert inlet was buried for an undetermined amount of time, which is the major contributor to road crossing failures.

RR13 totaled 635 ft. of road treatment, with a design capacity of 14,575 yd^3. RX13 contributed 461 yd^3 of fill material to this reach, while RX14 added an additional 2,853 yd^3. An internal swale excavation of 486 yd^3 was also disposed and outsloped within this road reach.

RX14 had 5,705 yd^3 of material, which was evenly distributed between RR13 and RR14. The channel length is 242 ft., with a channel gradient of 51%, which is the steepest, yet encountered during the Final Phase. The channel width of 8 ft. was achieved, while the left and right bank slope averaged 69% and 75% respectively. We also removed a 24inch culvert with about 60 ft. of downspout. In addition we removed a 12" culvert on the right-side outboard edge of road (OBR) with an 80 ft. downspout.

RR14 was 1,204 ft. in length and designed to accommodate 13,373 yd^3. A portion of this road reach was filled with 2,853 yd^3 from RX14 and 3,890 yd3 from RX15. Two internal swales accounted for an additional 2,493 yd^3 of local fill. Approximately 2,803 yd^3 of this material was utilized to fill a through-cut and outslope the material to a 40% grade.

RX15 had approximately 9,904 yd^3 of fill material. This crossing had a curved channel alignment adding to the complexity of excavation. The channel length was 283 ft., and an average 10ft. width with a channel grade approaching 44%. The average left bank slope is 89%, while the average right slope of 84% is representative of the natural slopes both upstream and downstream of the site. A 36" CMP with accompanying perforated pipe was removed. This channel has also been armored with RSP.

RR15 treated 234 feet of road with a design capacity of 2,878 yd³. One minor internal excavation consisted of removing a 12" CMP cross drain. As with other cross drains throughout the project, associated down spouts and anchors were removed early in the season. This task was completed with an excavator and a ground crew using chains and logging cables (chokers and straps). The vast majority of material disposed of and outsloped in this reach was excavated from RX15 (2,778 yd^3). The remaining material, 100 yd³ had been end hauled from RX16.

RX16 was another large stream crossing excavation containing approximately 7,654 yd³ of material. The 24"CMP angled 45 degrees to the right edge of cut, at this point an elbow reduced the pipe to 12" CMP down the fillslope had to be excavated and removed. The channel length is 221 ft. in length with a 42% gradient. The channel width at the top of the crossings is 8 ft., while the bottom portion approaches 15 ft. The finished left and right bank slope average is 58% and 77%. Extensive gully erosion on the bottom half of the fill added a complexity that had yet been encountered so far in the project.

RR16 had a design capacity of 5,138 yd³ and is 320 ft. in length. A 12" CMP drop outlet and hardware was removed from this road reach. The fill material used in this reach was acquired from the excavation of RX15-17. RX15 contributed approximately 3,059 yd³, while RX16 and RX17 contributed 1,979 yd³ and 100 yd³ respectively.

RX17 was another large stream crossing excavation with 11,699 yd³ of material. The channel length of 276 ft. is the second longest excavated during this Final Phase. The channel gradient through this crossing is approximately 43%. Channel width in this crossing is 10ft. The average left bank slope is 75%, while the average right bank is 68%. The culvert removed from this crossing was a 36" CMP with a flared inlet.

RR17 is 287 feet in length with a design capacity of 4,088 yd³ of material. Another through-cut was filled and outsloped in this road reach. The majority of fill used to outslope this reach came from RX17, totaling approximately 3,988 yd³. A 12" CMP drop outlet and downspout was also removed

RX18 contained approximately 2,077 yd³ of fill material. The length of this channel is around 153 feet, with a gradient approaching 49% that makes it one of the steeper channel gradients. A 24" CMP and associated perforated pipe was excavated and removed. The final channel slopes are on average 68% for the left bank, and 84% for the right bank.

RR18 was one of the longer road reaches treated with a design capacity of 1,915 yd³ of storage. Internal excavation prescriptions for a swale and spring drain accounted for approximately 1,368 yd³ of fill material. In addition, two 18" and one 12" CMPs with over 480 feet of downspout were removed. This road reach is also the beginning of trail construction, which will link the end of the road to Steinacher Trail Head. Logs were placed diagonally across the finished slope to demarcate where the trail heads downslope. Pioneer road width along portions of this road reach was a safety concern involving the off-road dump trucks, so extra added caution was used in negotiating this reach.

Tribal Chairman Alvis Johnson with crew

RX19 was the final crossing to be excavated on the Steinacher Project. This crossing exhibited more physical traits of a swale, so was survey and excavated accordingly. The survey indicated a possible 10,672 yd³ of fill material. The handling and outsloping of this material was extremely difficult due to amount of rock/rubble encountered during excavation. Natural ground was encountered shallower than expected, especially very large boulder outcrops, precluding the need for further excavation.

RR19 had a design capacity of 8,147 yd³ of material and is 878 linear ft. in length. The prescription for this reach called for the finished slope to be less than 40%. Due to the limited amount of excavated material from RX19, a portion of the road reach has a less than 20% grade. A spring drain excavation of approximately 40 yd³ and the removal of two sections of 18" CMP also occurred. On November 1st at approximately 10:20 am a Gate Pulling Ceremony was held to show our gratitude to all who were involved with this monumental project.

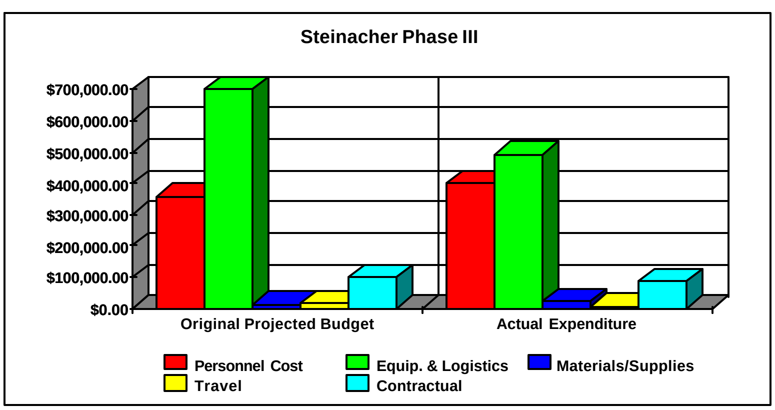
TO ALL WHO PARTICIPATED IN THE STEINACHER ROAD DECOMMISSIONING PROJECT

YOOTAV

Phase III Financial Summary

Due to the project size and technical complexity, the total Steinacher Road Decommissioning Project cost is approximately $3 million. In FY02, $1,189,322.00 was secured from four independent sources. These sources included the Environmental Protection Agency, Bureau of Indian Affairs, U.S. Forest Service and finally funding secured by the Northern California Indian Development Council through the State Water Resources Control Board.

Phase III expenses were tracked in five categories: personnel, heavy equipment and logistical, supplies and materials, travel, contractual. Personnel costs (for heavy equipment operators, project site monitoring, and labor intensive tasks) account for about 39.59 percent of total expenditures. Heavy equipment procurement was the largest expense, at 48.96 percent of the total project cost for Phase III. Material and supplies were 2.39 percent, while travel accounted for a mere 0.66 percent. Contractual expenses accounted for 8.41 percent of the total.



Issues and Concerns

On a project of this magnitude, accurate survey detail was critical for its ecological and financial success. Determining the appropriate survey resolution is crucial. For example, a less detailed survey of a stream crossing in the 2,000 yd^3 range may amount to only a 10 percent increase in volume with minor cost adjustments; however, a 10 percent increase in a 15,000 yd^3 crossing, results in significant unexpected financial outlays. Another issue which had been raised before the project started was the need for the technical drawings to match the staking in the field, and to agree on the edge of cuts for stream crossing excavation. A further concern expressed was the desire by both the Tribe and USFS to improve the lines of communication and mutual respect.

Personnel involved in the Karuk Program and the USFS have done an excellent job documenting and revising and addressing these concerns. As partners in this extensive watershed restoration effort this is the only path on which to tread. Many pieces of heavy equipment were used on this project, due to diligent training and safety discussions, no significant injuries or major heavy equipment damage has occurred over the past three phases of the project.

FUNDING NEEDS FOR THE FUTURE

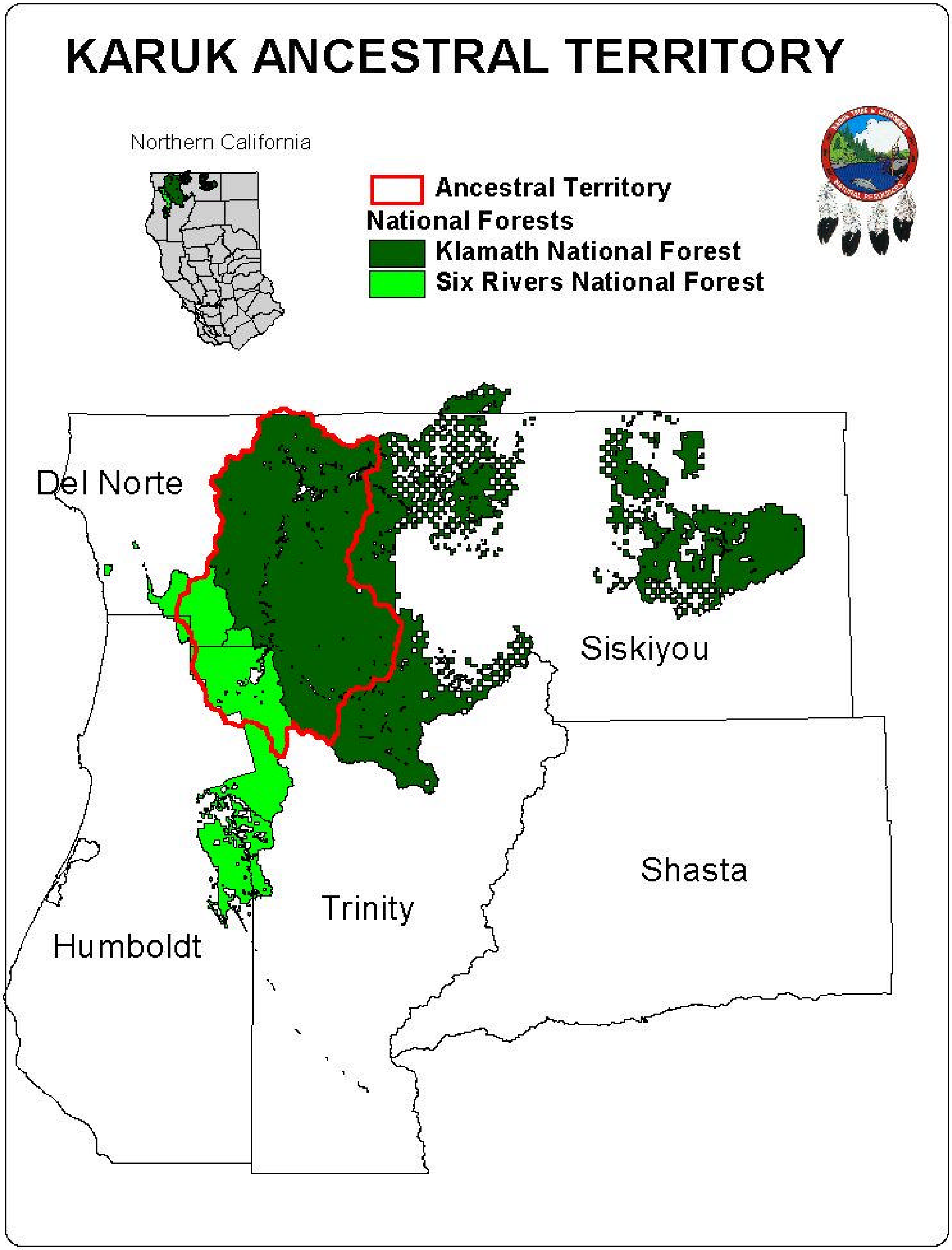
The Karuk Tribe and the Forest Service should be commended for tackling one of the largest road decommissioning projects in the Pacific Northwest to date. This project was vitally important for maintaining viable fish populations in the Wooley Creek watershed, as well as for the local economy. However, continued financial commitment is necessary to move on to other important watershed restoration work in East Ishi Pishi and other critical watersheds within the Ancestral Territory.

Competition for limited funds has exponentially increased. Funding sources relied on to date must be applied for on an annual basis, and evaluated among others submitted within a highly competitive climate. This factor is jeopardizing the continuity of the Karuk Program.

The Karuk Tribe is continuing to seek and apply for funding from various sources to maintain a viable program. With national priorities focused elsewhere the funding pool from which we compete are becoming very limited. At this junction, the Federal Government must not forget the Tribal Trust Responsibility it has with the Karuk Tribe and the resources we depend on as a people.

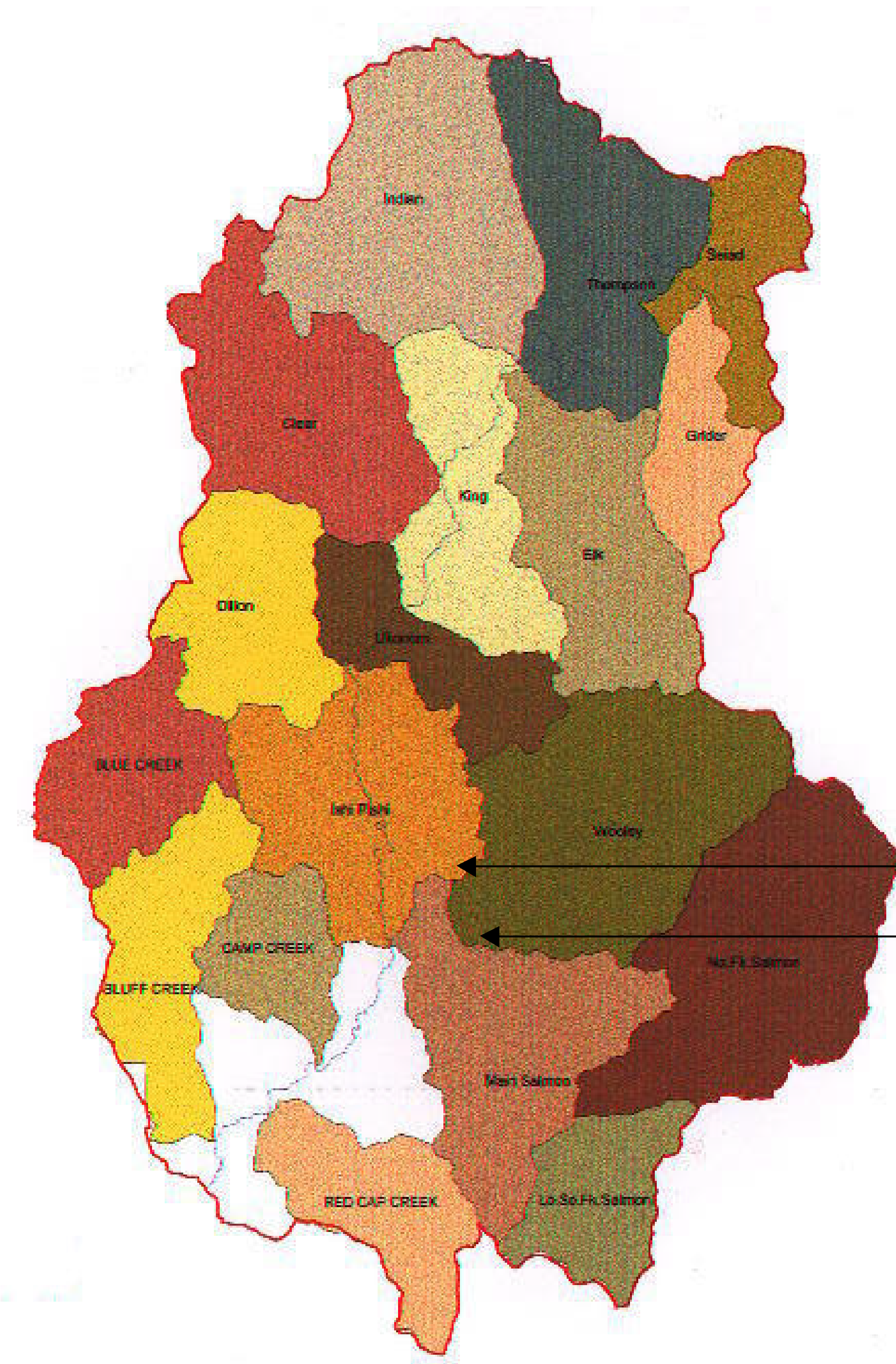
To achieve the goals of the Karuk Ecosystem Restoration Project and realize the benefits of a programmatic/scale of economy approach; a steady stream of revenue must be sustained. In a economically depressed area, the jobs we provide is a mechanism by which native people can live and raise their children in a land we have called home since the beginning of time.

Map 1.


KARUK ANCESTRAL TERRITORY
Northern California
Ancestral Territory
National Forests
Klamath National Forest
Six Rivers National Forest
Del Norte
Siskiyou
Humboldt
Trinity
Shasta

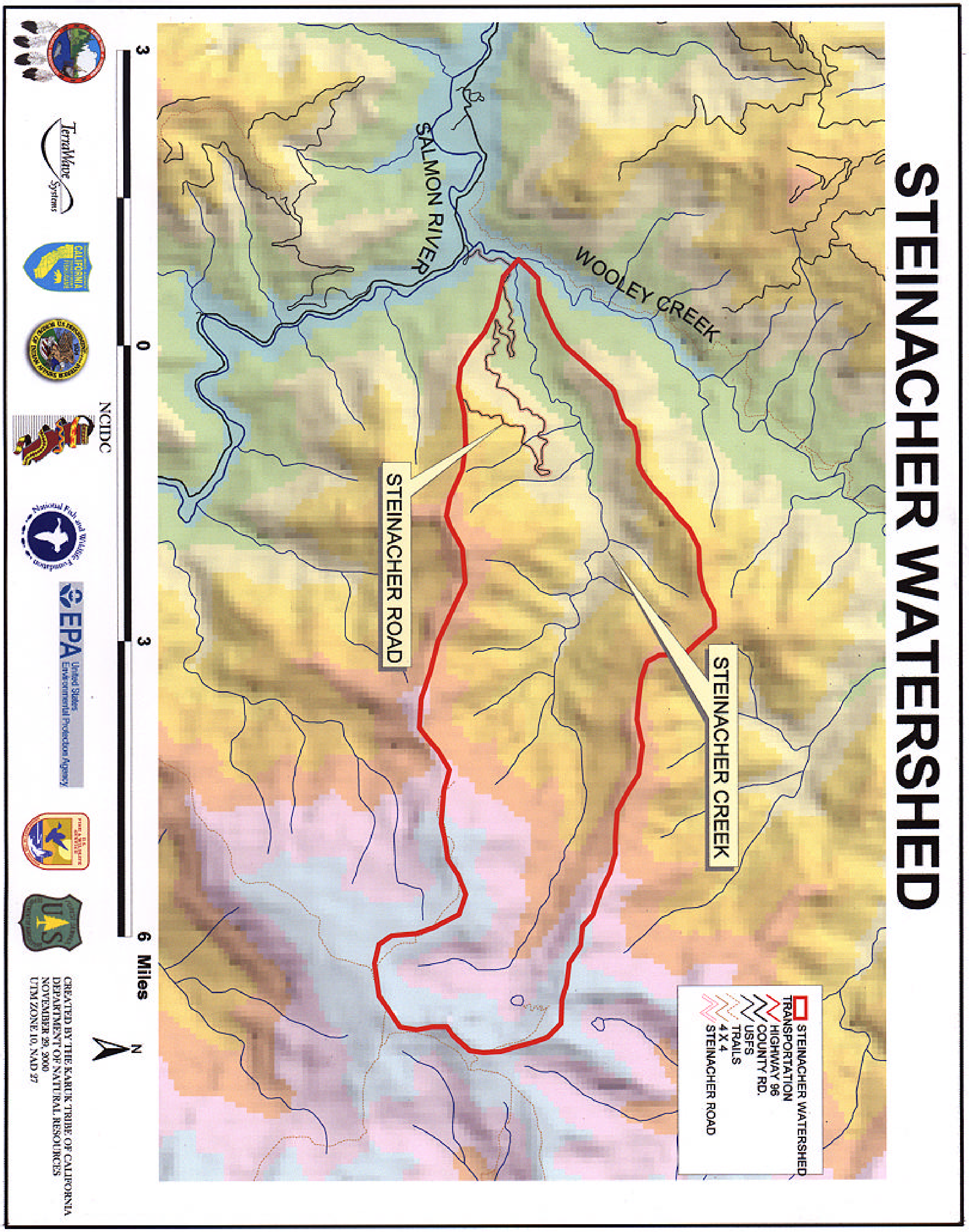
Map 2. Watershed Restoration Unit Location Map.

Watershed Analyses units completed by the Forest Service within the Karuk ancestral territory.



East Ishi Pishi Unit
Steinacher Unit

Map 3.


STEINACHER WATERSHED
WOOLEY CREEK
SALMON RIVER
STEINACHER ROAD
STEINACHER CREEK
STEINACHER WATERSHED
TRANSPORTATION
HIGHWAY 96
COUNTY RD.
USFS
TRAILS
4 X 4
STEINACHER ROAD
3
0
3
6
Miles
N
NCIDC
EPA United States Environmental Protection Agency
CREATED BY THE KARUK TRIBE OF CALIFORNIA
DEPARTMENT OF NATURAL RESOURCES
NOVEMBER 29, 2000
UTM ZONE 10, NAD 27

APPENDIX 1:

Six Rivers And Klamath National Forests Road Decommissioning Priorities

I. Steinacher Unit

Road #	Road Name	Watershed	Length (mi.)	Crossings	Cu. Yds	Remarks
12N01	Steinacher	Wooley Cr.	5.2	18	196,000	Completed

II. East Side Ishi Pishi

UNIT 1

Road #	Road Name	Watershed	Length (mi.)	Remarks
12N08	Irving Gates	Irving	4.3	High Priority
12N08A	Irving Gates	Irving	.9	High Priority
12N08B	Irving Gates	Irving	.3	High Priority
12N26	Flatlander	Irving	.4	High Priority
12N26A	Flatlander	Irving	.5	High Priority
12N26B	Flatlander	Irving	.2	High Priority
12N29	Bald Butte	Irving	2.0	High Priority
12N29A	Bald Butte	Irving	1.3	High Priority
Total Miles			9.9	

UNIT 2

Road #	Road Name	Watershed	Length (mi.)	Remarks
12N09B	Merrill Mtn. Loop	Rogers	.1	
12N13N	Bull Pine	Rogers	.2	
12N13X	Bull Pine II	Rogers	2.0	Convert to Trial
12N13Y	East Bull Pine	Irving	.5	Convert to Trial
12N14	Leach	Katamin	.5	
12N24	Camp Out	Rogers/Irving	1.0	
12N24A	Camp Out	Rogers/Irving	.3	
12N32A	West Camp Three	Rogers/Irving	.2	
12N41	Merrill Mtn. Loop	Rogers/Wooley	1.0	
12N43	View-it	Rogers	1.1	High Priority
12N44	Roger Davis	Rogers	.7	High Priority
12N46 Spur	Merrill Off	Merrill	.2	
15N17N	Camp Three	Merrill	.1	
Total			7.9	

UNIT 3

Road #	Road Name	Watershed	Length (mi.)	Remarks
12N05	Haypress	Wooley	3.3	After silviculture treatment
12N07 & A	Merrill Creek.	Merrill	2.75	After silviculture treatment
12N47	Gates Creek	Wooley	1.1	
12N47A	Gates Creek	Wooley	1.8	
13N04	Bridge Creek	Wooley	2.09	
13N04A	Bridge Creek	Wooley	.2	
Total			**11.24**	

UNIT 4

Road #	Road Name	Watershed	Length (mi.)	Remarks
13N06	Ti Creek	Ti	.7	
13N06A	Ti Creek	Ti	1.3	
13N06B & Spur	Ti Creek	Sandy Bar	.5	After silviculture and fuels treatment
13N06E	Ti Creek	Ti	1.2	
13N07A	Karoo	Ti	.7	
13N10	Sandy Bar Loop	Sandy Bar	4.2	Convert to Trail, after silviculture treatment
13N11B	Sandy Bar	Stanshaw	.7	
13N11D	Sandy Bar	Ti	.4	
13N11F	Sandy Bar	Sandy Bar	.3	After silviculture treatment, arch. survey
13N12A	Stanshaw	Stanshaw	1.1	After silviculture treatment, arch. survey
13N12D	Stanshaw	Stanshaw	.6	
13N25	Ti Tie	Sandy Bar	1.0	Convert to Trail, after silviculture treatment
13N33	Cabbage Head	Ti	1.5	After silviculture treatment, arch. survey
13N43	Ti Loop	Ti	1.1	After silviculture treatment, arch. survey
13N51Y	Sandyshaw	Sandy Bar	1.1	After Sandollar
13N52	Potse	Eyese	.4	
15N17D	Camp Three	Irving	.9	After fuels treatment
Total			**17.7**	

UNIT 5

Road #	Road Name	Watershed	Length (mi.)	Remarks
13N01	Upper Cub	Ukonom	1.1	
13N03	Camp Four	Ti	2.5	After silviculture and fuels treatment
13N06Y	No. Ti Creek	Ti	1.3	
13N09	Middle Ti	Ti	3.0	After silviculture and fuels treatment
13N09A	Middle Ti	Ti	.3	After silviculture and fuels treatment
13N22	Poo Bear	Ukonom	1.0	
13N45	Ten Bear Trail	Ti, Ukonom	.8	Road to trail, after fuels treatment

13N45A	Ten Bear Trail	Ukonom	.5	
14N01A	Ten Bear	Ukonom	.5	
14N01B	Ten Bear	Ti	.7	
14N01F	Ten Bear	Ti	.8	
14N01N	Ten Bear	Ti	.2	Unnamed spur
14N12	Cub Creek	Ukonom	1.2	
14N63	Cub Poo	Ukonom	.3	After silviculture treatment, arch. survey
14N63A	Cub Poo	Ukonom	.3	After silviculture treatment, arch. survey
15N17H	Camp Three	Ukonom	.9	
Total			**15.4**	

UNIT 6

Road #	Road Name	Watershed	Length (mi.)	Remarks
13N08A	Ukonom Mtn.	Ti	.2	
13N08C	Ukonom Mtn.	Ukonom	.2	
13N08E	Ukonom Mtn.	Kennedy	.4	
13N08F	Ukonom Mtn.	Thomas	.3	
13N08H	Ukonom Mtn.	Ukonom	.3	
13N11J	Sandy Bar	Ti	.4	After silviculture treatment, arch. survey
13N15	Lower Ten Bear	Ti	2.8	After silviculture and fuels treatment
13N15A	Lower Ten Bear	Ti	.3	After silviculture and fuels treatment
14N01C	Ten Bear	Ti	.4	After silviculture and fuels treatment
14N01D	Ten Bear	Ti	.4	After silviculture and fuels treatment
14N01E	Ten Bear	Ti	.7	
14N01G	Ten Bear	Ti	.4	
14N08	Kennedy Flats	Burns	1.6	Maintain now, then silviculture and fuels treatment
14N08A	Kennedy Flats	Burns	.8	
14N15A	Delahaye	Burns	.2	
14N22 Spur	Grand Slam	Ukonom	.2	Unnamed spur
Total			**9.6**	

APPENDIX 2:

Technical Treatment Descriptions For Steinacher Road

Treatment specification plans provide prescriptions for each road segment and detail the work to be performed, providing volume estimates, road dimensions, culvert sizes and lengths, disposal locations, and special instructions that are included in the prescriptions.

Several types of treatments are required for Steinacher Road. The road alignment may traverse a hillslope, cross a stream channel, or cut through a ridge. The reach may contain ditches, berms, seeps, or springs. The road grade and surface composition may differ from one reach to another, just as the stability of fills and cutbanks may differ. Some road reach treatments require both excavation and disposal prescriptions. This is determined by the original construction design of a particular reach. Road reaches are delineated between major stream crossings and require specific treatments, depending on the road stability and original construction design. Excavated fill goes to disposal sites.

Disposal sites serve two functions: to provide stable, long-term storage for imported fill; and to buttress cutbank instability.

The disposal site capacities stated in the technical specifications are derived from detailed, on the ground surveys, and represent estimated volumes. Disposal site volumes are defined by road prism cross-section surveys and treatment length. Natural conditions may cause actual disposal site volumes to vary from designed volumes by minute variations in cutbank shape or changes in the finished grade.

The fill material is shaped and compacted to specifications. All fill is placed against cutbanks so that a seam is not created between the cutbank and fill in a manner that prevents concentration, containment, or diversion of surface run off. The finished grade must be a free-draining surface. Except for designated locations, all finished grades on Steinacher Road were at 40 percent slope.

Unless otherwise stated in the technical specifications, all areas to be buried with fill are first decompacted to a minimum depth of 80 cm (2 feet) prior to the placement of fill. Technical specifications for Steinacher Road require specific fill compaction density.

Stream crossing excavations (RX). Stream crossing excavations involved the removal and disposal of the road fill and culverts from a stream channel, and shaping the excavation to blend with the surrounding terrain. Salvaged culverts were transported off site to Karuk property for storage and subsequent recycling. The completed excavation mimics the original pre-road construction stream channel and side bank configuration.

The technical specifications for each crossing treatment are described and include information on: total expected excavated volume; channel gradient, length and bottom width; average side bank slope; and maximum depth. The estimated volumes were calculated from defining an upper and lower excavation point in each channel and taking several cross-sections perpendicular to the channel across the road prism at important locations. This data was then entered into Redwood National Park's roads software program (WinRoad). Volume estimate accuracy is subject to site conditions and the number of cross-sections taken. Surveys are benchmarked to allow for important pre- and post-excavation volume calculations and channel adjustment monitoring.

Several stream crossing excavations are double crossings, meaning the crossing was built on the confluence of two streams. In other stream crossings, the channel curves. In both of these situations, volume estimates are less accurate. Experienced site supervision is critical in these situations. Stream crossing treatments occur in perennial and intermittent stream channels and through-fill locations.

Spring Drain (SD). A spring drain treatment is a mini-crossing excavation. The primary purpose of the treatment is to allow for water from springs emerging from the road cutbank or roadway and to follow the natural hillslope fall line. Usually the base-of-cut is the same depth as adjacent treatments, and the top-of-cut is the in-board edge of road. No fill is stored on or above the spring, and the finished channel grade does not exceed 40 percent.

Exported Outslope (EOS). An exported outslope treatment can either remove the entire road prism width or only the outboard portion of the prism. In both cases, some or the entire excavated fill cannot remain local and must be moved some distance to a stable disposal site. The estimated excavation volume exceeds that of the local disposal volume. EOS prescriptions commonly occur in topographic swales or ephemeral streams where the risk of debris landslides is great. Any fill that is placed locally is shaped according to specifications. In the situation of partial excavation, the remaining road bench is a free draining surface, minimally graded to a 5-percent outslope. The average finished EOS grade does not exceed 50 percent slope.

Straight Outslope (OS). An outslope treatment excavates fill material from the outer edge of the road or landing; however, there are no landings on Steinacher Road. The material is placed directly against the adjacent local cutbank and shaped to according to specifications. Commonly, OS prescriptions occur in balanced cut/fill road locations where the fill slope grade exceeds the stable angle of repose of the material, and the risk of failure (causing impacts to waterways) is high. The finished OS grades do not exceed 40 percent, per specification, and excavation volume is defined by surveys. There are few OS treatments on Steinacher Road.

Fill Outslope (FOS.) A fill outslope treatment is prescribed at locations where a side-cast excavation is required and the volume of excavated fill material is less than the volume of maximum local storage. The unstable road edge can be pulled back and there is room for importing and disposing fill from other excavations treatments. A majority of the road bench can be used for disposal storage. The cut and fill area is defined by cross-section surveys. Fill is placed against the cutbank and graded from the fill-to-here mark to the catch-point and excavated from the cut-to-here flag to the top-of-cut mark. The two grades may not be the same.

Disposal Outslope (DOS). A disposal outslope treatment occurs on full bench-cut road segment where in-situ regolith (stable native ground) is present at the out-board edge of road. The road prism is bedrock or native soils, with no side-cast materials. The entire road bench can be used for storage. Fill is placed against the cutbank and graded from the fill-to-here mark on the cutbank to zero at a defined catch-point, commonly the outboard edge of road.

Straight Disposal (DS). Straight disposal treatments occur at through-cut locations or large topographic flats. In through-cut locations, DS treatments are flanked by and blend with disposal outslope (DOS) treatments and/or taper to fill outslope (FOS) treatments. Fill is graded to the top of both cut banks and compacted to specifications. The entire through-cut can be filled with imported material. The finished grade is less than 50 percent slope. Because through-cuts often cut spur ridges, the finished grade averages 20 percent slope, and the 50-percent slope is the transition to other treatments.

Other Road Treatments

There are two other road reach treatment types commonly prescribed to dissipate water flow paths along stable road segments. These prescriptions are designed to decrease hillslope run off and increase water infiltration; they include: rip and pull berm (RPB) and cross road drains (XRD).

Rip and Pull Berm (RPB). A rip and pull berm treatment is the thorough decompaction of a road or landing surface and all berms that concentrate run off removed to re-establish the natural hillslope run off pattern. Any method of decompaction is acceptable, as long as the areas are thoroughly scarified to a depth of 80 cm (2 feet).

Cross-Road Drain (XRD). A cross-road drain is a deeply cut ditch excavated across a road surface that drains the roadbed and inboard ditch to the outboard edge of the road. Cross road drains are more substantial and deeper than conventional waterbars and are steeper and more abrupt than rolling dips described below. Cross-road drains are not a usual restoration treatment, but more typically a winterization treatment to reduce erosion on untreated road segments. Properly constructed XRDs are deep enough to prevent vehicular access.

The depth of the XRD is coincident to the depth of the existing inboard ditch at its inlet and deep enough on the outboard side to be free draining. Each XRD grade is steep enough to prevent sediment from building up in the drain, and steeper than the original road grade. The orientation of the XRD ranges from 60 to 90 degrees perpendicular to the inboard ditch, depending on grade of road as specified in the technical specifications. Fill from XRD construction are placed and smoothed on the downhill side and inboard ditch of the XRD. No spoils are disposed on the road surface uphill of the drain, and the uphill inboard ditch freely drains into the XRD. On level roads, spoils are placed such that the existing inboard ditch remains open so that run off can enter the XRD from either direction.