KARUK ECOSYSTEM RESTORATION PROGRAM

Progress Report

Steinacher Creek

Prepared for
Karuk Tribe of California
Department of Natural Resources
Orleans, CA

By
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Ashland, Oregon

KARUK ECOSYSTEM RESTORATION PROGRAM

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

PROGRESS REPORT
31 January 2001

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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), contracted with TerraWave Systems, Inc. to develop a Karuk Ecosystem Restoration Program. 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), TerraWave Systems, Inc. trained 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 will require three years to complete at a cost of $2.58 million dollars. To date, about $788,000 dollars has been spent decommissioning Steinacher Road, completing about 26.5 percent of the required work. 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 completing the Steinacher Unit as well as the other watersheds, which are also 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).

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 their people. Anadromous fish species are both economically and culturally valuable, and the restoration of riparian and aquatic habitat is crucial for their survival.

A 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. The Wooley Creek watershed (a tributary to the Salmon River), wherein Steinacher Unit lies, was ranked as the highest priority according to habitat conditions required for salmonid 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 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 two of these objectives: 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 Karuk Tribe hired TerraWave Systems, Inc. to provide program management services and to train the personnel necessary for the high skilled jobs required by the watershed division. The start-up phase of the program focused on staff development and implementing the first priority restoration unit, Steinacher Unit. East Ishi-Pishi Unit and Thompson Unit are next in priority (see Appendix 1 and Map 2). Funding for the program is being developed through the assistance of NCIDC.

Steinacher Unit

Steinacher Road is 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 remaining 5.2 miles of road are to be decommissioned by the Karuk Tribe.

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.

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 5 years to compete.

Thompson Unit

The third priority is treating Thompson Unit, which was significantly damaged in the 1997 flood. The proposed actions are to decommission 74.5 miles of road, provide approximately 8 miles of vehicle trails, and 4.3 miles of foot and equestrian trails on portions of decommissioned road surfaces.

Start-up 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, TerraWave Systems, Inc. began the watershed restoration specialists training program. 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. Start-up revenues for the program came through six funders (but eight independent funding sources) (Figure 1). Contracts between grantors and the Karuk Tribe were administered through the Karuk Community Development Corporation. Each independently written contract accounted for specific elements that were cumulatively important for the success of the program.

Collectively, these funding sources have contributed over $1 million towards program development, planning, training, and implementation: 16 percent was spent on division development and personnel training; **78 percent was spent on implementing the Steinacher Unit**; and 6 percent was used for collecting road data in the East Ishi Pishi Unit. Revenue expenditures will be further discussed below.

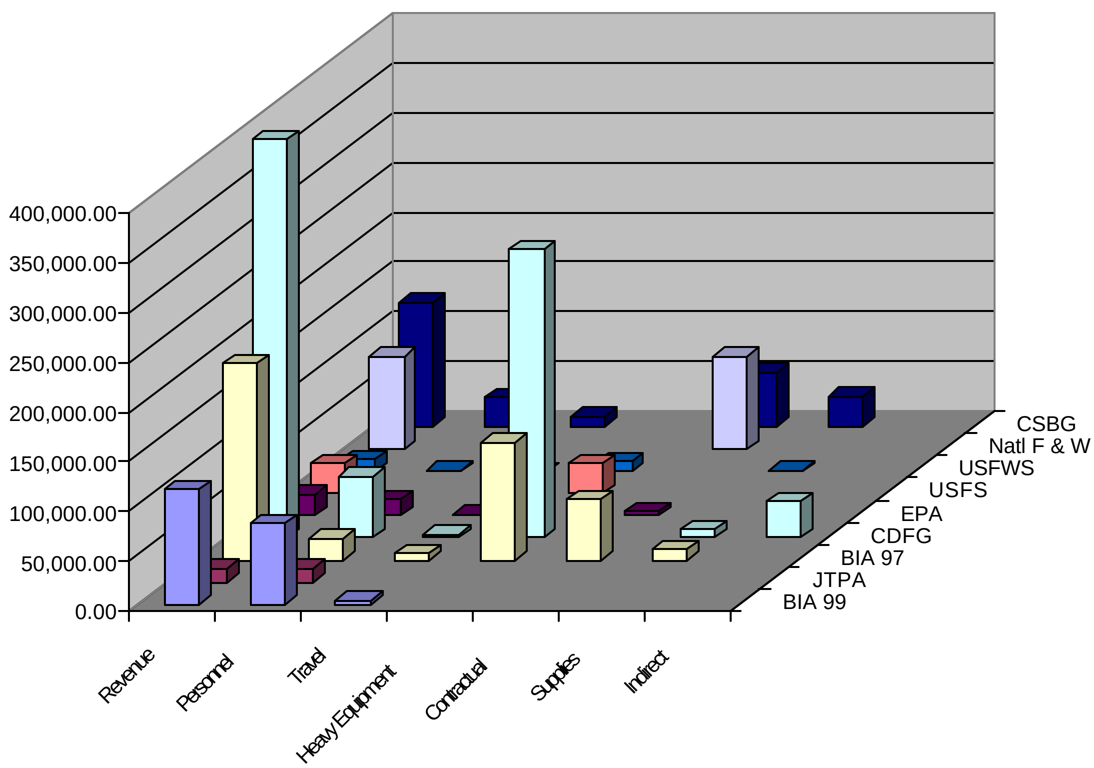


Figure 1.

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 by TerraWave Systems to prepare the Karuk Watershed Division for site management and heavy equipment operations. Students were subjected to rigorous classroom and field study for 240 hours (six weeks). The curriculum, covered:

- Basic geomorphology and hydrology principles within the regional geologic context;
- Mapping, inventorying and surveying techniques;
- TerraForming™ applications, 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.

Data entry and analysis skills.

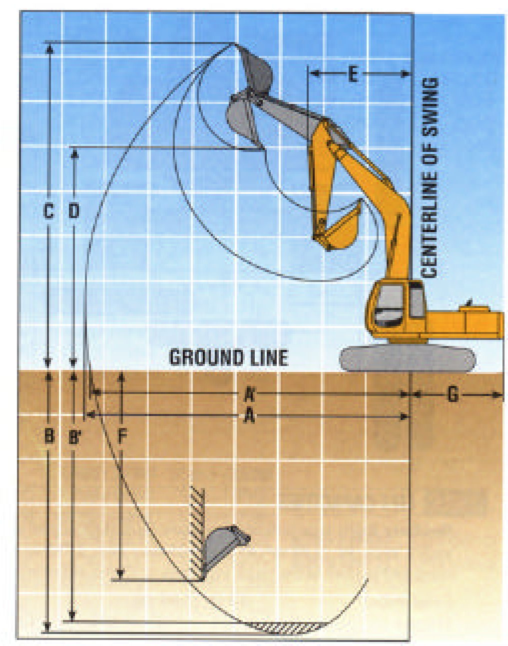
Surveying skills for volume estimates and treatment designs.

Heavy equipment operations.

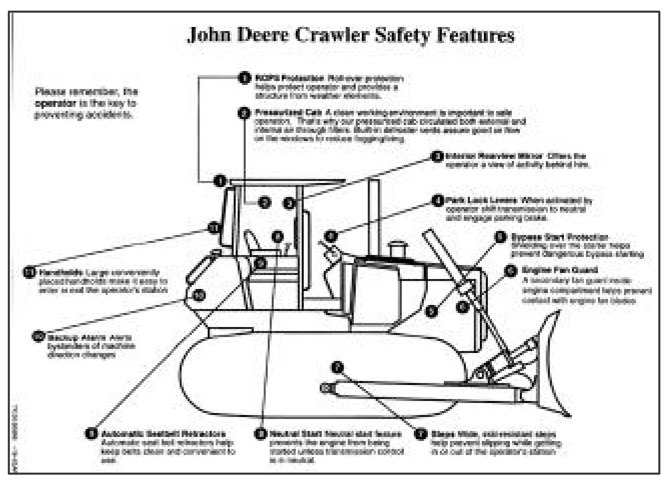
Basic training began with formal classroom and on-the-ground training modules that covered step-by-step operations in the following areas: program management, site management, heavy equipment operations, labor-intensive operations, and native plant operations.

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 basic training, and continues until knowledge is acquired. Upon successfully completing 480 hours (12 weeks) of internship, 16 members of the Karuk Tribe earned TerraWave Systems' Certificates of Initial Mastery as watershed restoration specialists. Certificates were issued for supervisor and heavy equipment operator classifications.

Heavy equipment operations management training.



Students learn the excavator's range of motion.



Students learn to operate heavy equipment safely.

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 is 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 contracted with TerraWave Systems to develop the Tribe's Watershed 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 PWA report and TerraWave's estimates.

Excavator loading dump truck at RX10

These differences were great enough to require revision of the PWA 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 26.5 percent of the project volume. Over 1,000 linear feet of cross drain downspouts were removed, approximately 52,000 yd3 of fill were removed and placed in stable locations, and winter maintenance measures were implemented. Since then no additional excavation work has occurred due to inadequate revenue. From August to November 2000, the Karuk Program resurveyed the rest of the road (RX10 to the gate), and implemented winter maintenance measures.

TerraWave Systems Treatment Specifications

TerraWave Systems' 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. Figure 2 shows the results of the new volume survey.

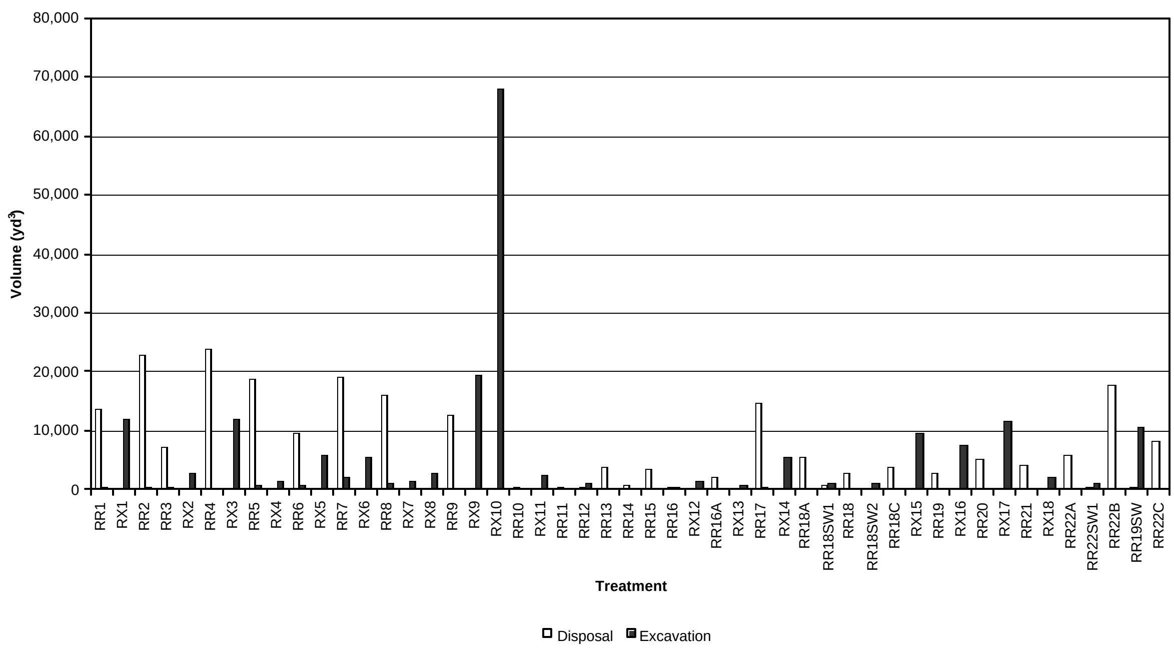


Figure 2. Revised treatment volume estimates.

Stream crossings and swale treatments account for 94 percent of the total 196,056 yd^3 volume needing to be excavated on the project. (Excavation sites range 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 spikes at RX9 and R 10 and the lack of disposal space adjacent to them (discussed below).

Technical Challenges

Decommissioning Steinacher Road presents more technical challenges than usual. Although we estimate 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 traverses steep, erosive, mountainous terrain. Variations in fill material and ground conditions add to decommissioning complexity. The majority of fill material is 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 varies from dry to completely saturated. Ground conditions change frequently, with variable road width, cut bank height, hillslope repose, crossing orientation, channel flow, and bedrock competency.

Fifteen stream crossing excavation sites contain more than 2,500 yd^3 of fill. Seven of those sites are contain more than 10,000 yd^3 and two sites contain 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 exceed nearby disposal site capacity by 86 percent. Nearly 75,000 yd^3 from these two crossings must be trucked to distant disposal sites along the length of the road. Careful supervision of end-hauling material is required to balance locally derived excavated fill with fill from distant areas, while at the same time maximizing disposal site volume.

Stream crossing excavations are 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 have culverts with buried elbow joints, while other channels have culverts not set to natural grade. Many pipes carry flowing water year round, requiring additional water quality measures during excavation.

Three crossing excavations are 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 are very complex and complicated operations.

For example, RX10 is a double crossing; as well, about 90 percent of the 67,828 yd^3 volume must be end-hauled. The culvert in the primary channel is a perennial stream with a 5-foot diameter, bolted multi-plate pipe, and 330 feet in length. The secondary channel is an intermittent stream on the exit side of the excavation; it has a 24-inch culvert that is not set to grade, and is oblique to the road and primary channel.

Work Schedule

Decommissioning the 5.2 miles of Steinacher Road requires 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, winterization measures are needed for the remaining open road segment. Ideally, the heavy equipment season would run from June to October.

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

RX10 is the largest excavation of the Steinacher Unit, and together with RX9, requires ten separate road reaches to dispose of the 75,000 yd^3 of end-hauled fill they generate. Consequently, individual disposal sites have to be managed that 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) is 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 straw mulch at 4,000 lbs/acre to bare surfaces and an erosion-control seed mix with fertilizer. In addition, a few crossings require rock armor in the final channels.

After each heavy equipment season, winterization measures are done for the remaining road not yet decommissioned. These measures include: 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.

Completed Work FY99 and FY00

On July 13, 1999, the Steinacher Road FY99 heavy equipment phase began and continued through October 15 of that year, the deadline for Forest Service field operations. No heavy equipment work except winterization measures has occurred since that date due to lack of funding.

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 (see Table 1).

Interns from the Karuk Training Program operated the heavy equipment. Trucks and their operators were provided through a local subcontractor.

MODEL	TYPE	Weight Class	Bucket Capacity
CAT D6	dozer	50,000 lb.	
CAT D8K	dozer	90,000 lb.	
CAT D8R	dozer	90,000 lb.	
CAT 320	excavator	48,000 lb.	1.5 yd3
JD 200	excavator	48,000 lb.	1.5 yd3
EX 330	excavator	65,000 lb.	2.5 yd3
10/12 yd Dump Trucks		4 to 9 trucks used daily	
Water Truck		4,000 gal. Capacity	

Table 1.

Work teams were established to manage the various operations. Manual labor was used for surveying operations, monitoring, establishing photo points, culvert operations, erosion control operations, and applying straw mulch and fertilizer. Crews were also used for refueling heavy equipment.

Early efforts were directed toward brushing and surveying to provide timely revisions to the treatment specifications from the beginning of the project to RX10. Once these efforts were complete, teams concentrated on culvert operations. More than 1000 feet of pipe was dismantled and hauled for temporary storage at the Karuk Work Center in Somes Bar.

Culvert downspout being removed from the project.

Before and during heavy equipment operations, straw bales were staged at all work sites. After heavy equipment operations were complete, work teams spread straw mulch and applied seed and fertilizer to bare ground.

Personnel monitored heavy equipment operations. Constant monitoring of disposal sites was required to meet specific volume and compaction specifications and balance end-hauled fill with local fill needs and ensure maximum storage capacity. Teams were used at RX10 to track and manage truck production and operations at excavation sites.

When the heavy equipment season ended, personnel distributed straw bale as a winterization measure on the untreated road. They also took post-treatment photo points.

All prescriptive work from the beginning of the project through RX2, nearly 1 mile in length, has been completed; this includes all heavy equipment, operations, straw mulching, seeding, and stocking native plants. Only two road 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.

Photo point showing before and after fill disposal in through-cut in RR1.

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.

RX1 during excavation.

RX 1: culvert section being removed.

Completed RX1: note rocky outcrop on right bank and secondary channel entering from the left.

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.

During imported fill disposal operations access to RX1 was maintained. Note the base of fill is at the outboard edge of the road.

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.

Photo point showing before and after importing fill and outsloping.

RR4 has the largest disposal storage capacity on the road: 23,772 yd^3. There are no internal excavation treatments in the reach; therefore RR4's storage potential can be used for fill from RX2, RX3, and RX10. Currently, the capacity is filled with 1,050 yd^3 from RX2 and about 4,746 yd^3 end-hauled from RX10, leaving 17,976 yd^3 of storage potential for future needs. End-hauling operations for FY99 stopped here.

Approximately 31,800 yd3 was end-hauled from RX10.

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 has been extracted.

RX10: November 2000 after winterization

Size can be deceptive in photographs. RX10 (on the right) is less than half excavated, and about 36,028 yd^3 remain.

Figure 3 illustrates the current RX10 stream profile. The heavy line shows the original crossing profile and the lighter line shows the current profile. The dashed line at the bottom is the projected final channel grade. About 36,028 yd3 remains to be excavated.

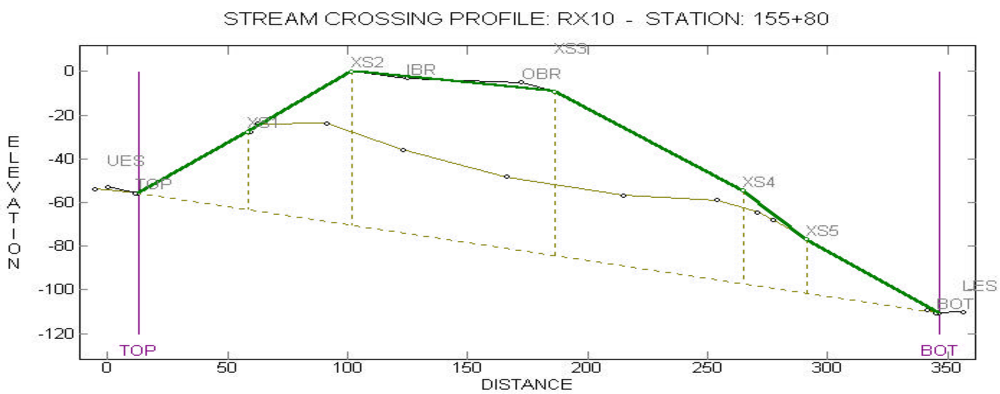


Figure 3

Trucks disposing of fill from RX10 into RR2 near photo point on right.

Photo point after outsloping imported fill.

Financial Summary

Due to the project size and technical complexity, TerraWave Systems estimates the total project cost to be $2.58 million. In FY99, approximately $1 million was secured from six independent sources, of which $788,000 was spent decommissioning Steinacher Road. In FY00 and FY01, additional funding was requested from these and other sources. In FY00, about $480,000 was secured; however, these funds were received too late in the field season to implement heavy equipment work.

Steinacher expenses were tracked in six categories: personnel, heavy equipment, supplies and materials, travel, contractual, and indirect costs (see Figure 4). Personnel costs (for heavy equipment operators, monitoring, survey teams, and labor intensive tasks) account for about 16 percent of total expenditures, with approximately 70 percent of this cost was associated with heavy equipment operations. Heavy equipment procurement was the largest expense, approximately 55 percent of the total project cost for FY99; dump trucks account for 48 percent of the heavy equipment category. Contractual expenses account for about 19 percent of the total, which include project management expenses; expenditures to TerraWave Systems for project management were approximately 12 percent of this total cost. The remaining material and supplies, travel and indirect cost categories represented 5 percent, 2 percent and 3 percent of the total costs, respectively.

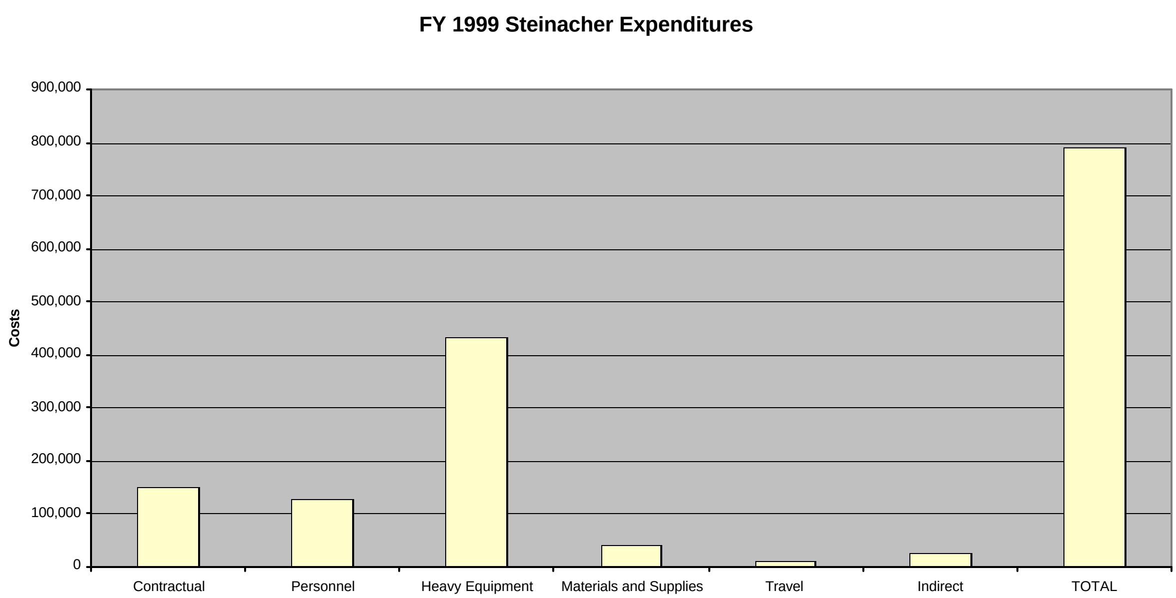


Figure 4

The original financial budget was prepared using data from the PWA treatment specifications report. After revising the treatment specifications and accounting for work completed, a new financial budget was prepared. Because of the increase in excavated fill volume, the revised project cost estimate rose approximately 29 percent. Appendix 4 presents the revised financial budget to complete the Steinacher Road project.

Issues and Concerns

On a project of this magnitude, accurate survey detail is 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, such as on Steinacher Road, results in significant financial obligations. As discussed earlier, the PWA technical specifications report estimated **172,265 yd^3** of fill to excavate. Our detailed volume surveys estimate **196,056 yd^3** to excavate. An analysis of the volumetric changes between the two reports is not presented here; however, our survey showed individual site volume changes were both larger and smaller than reported by PWA.

The additional 23,791 yd^3 of fill to move is mostly from RX10. RX10 has 30 percent more fill to excavate than first reported adding to higher costs.

Personnel involved in the Karuk Program did an excellent job documenting and revising these concerns. Many pieces of heavy equipment were used on this project, due to diligent training and safety discussions, no injuries or heavy equipment damage has occurred.

1999 Karuk Watershed Team

FUNDING NEEDS FOR THE FUTURE

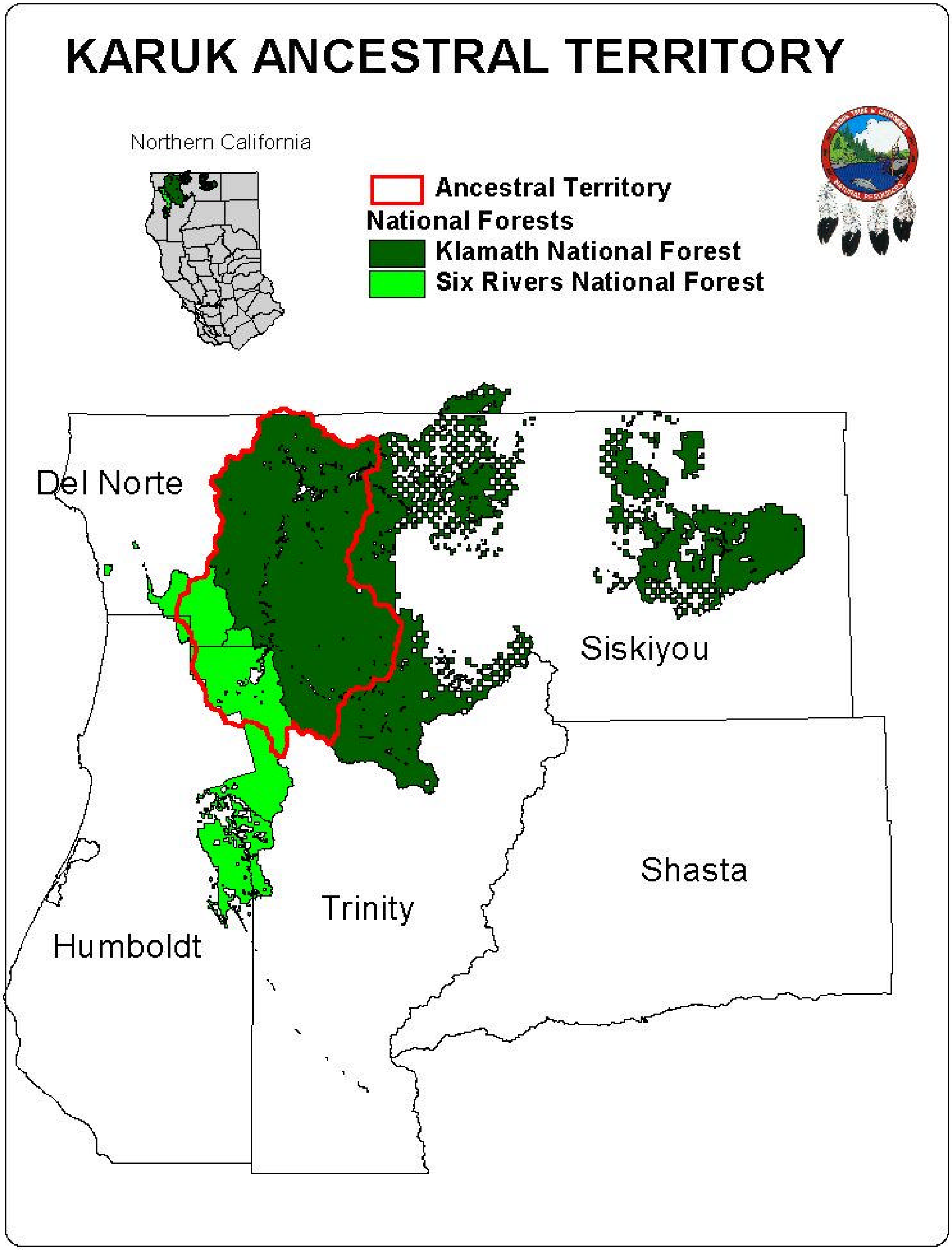
The Karuk Tribe and the Forest Service should be commended for tackling one of the largest road decommissioning projects in the Pacific Northwest to date. This project is vitally important for restoring historical fish populations in the Wooley Creek basin, as well as for the local economy. However, continued financial commitment is necessary to complete this project and move on to other important watershed restoration work in East Ishi Pishi and Thompson Units.

Competition for funds has exponentially increased over the last two years. 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.

NCIDC has applied for a total of $6.9 million for the Karuk Program from federal, state and non-governmental organizations. Approximately $1.66 million has been received for FY99 to FY01: $1.03 million in FY99; $480,000 in FY00; and about $150,000 in FY01. Approximately $900,000 requested is under evaluation currently.

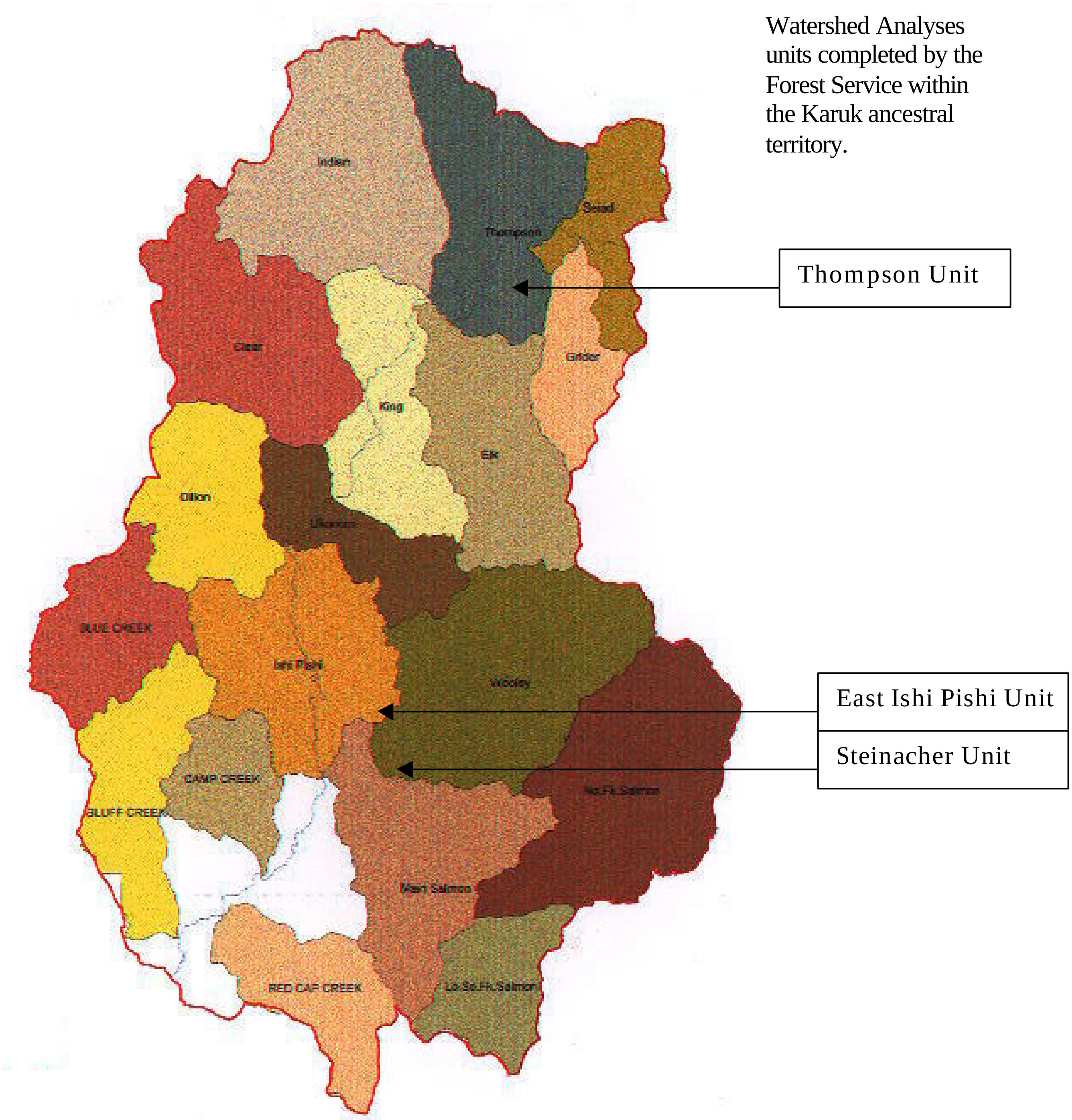
To achieve the goals of the Karuk Ecosystem Restoration Project and realize the benefits of a programmatic/scale of economy approach; a steady stream of revenue must be sustained.

Map 1.

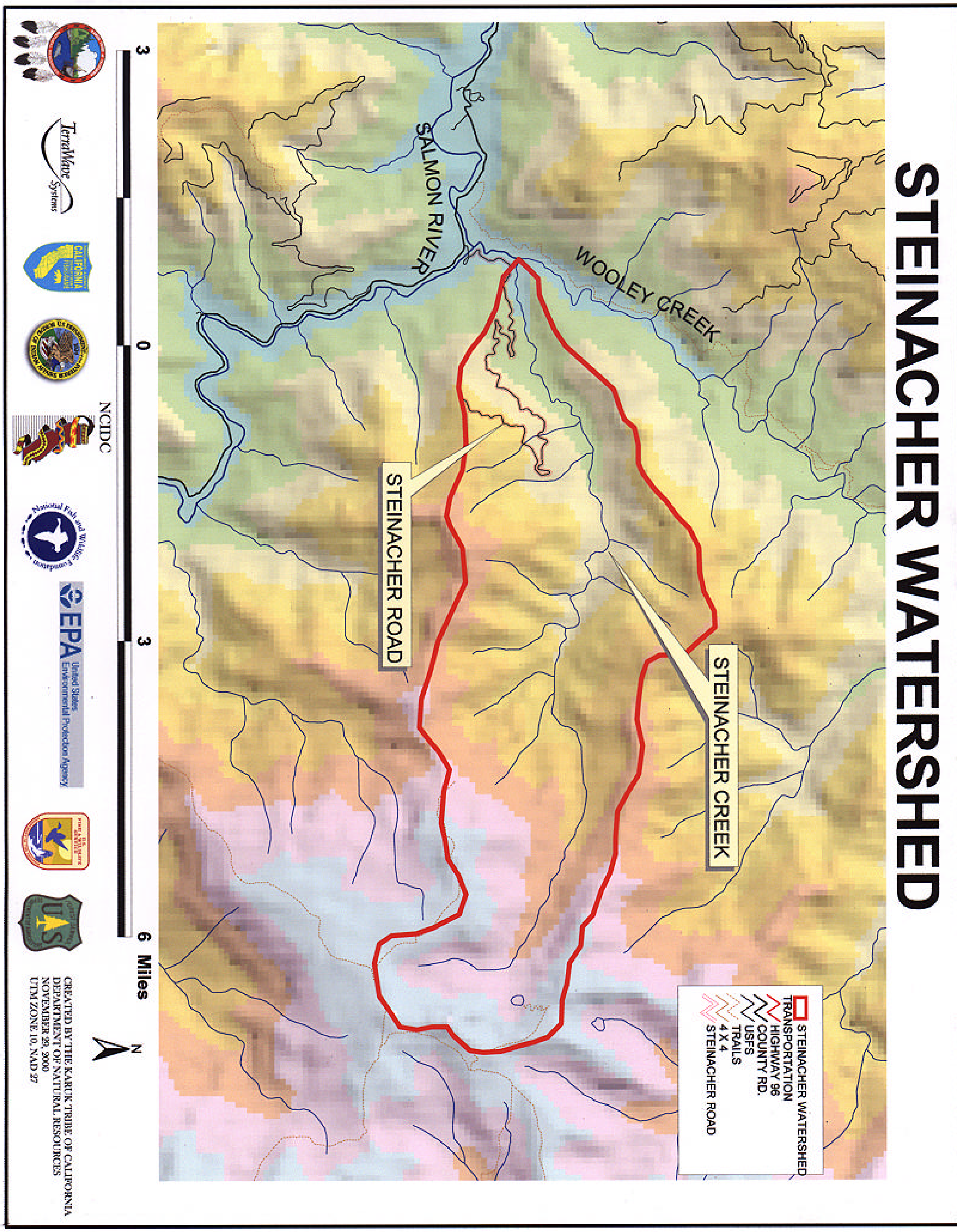


KARUK ANCESTRAL TERRITORY
Northern California
Ancestral Territory
National Forests
Klamath National Forest
Six Rivers National Forest
Del Norte
Siskiyou
Humboldt
Trinity
Shasta

Map 2. Watershed Restoration Unit Location Map.



Map 3.



STEINACHER WATERSHED
SALMON RIVER
WOOLEY CREEK
STEINACHER ROAD
STEINACHER CREEK
STEINACHER WATERSHED
TRANSPORTATION
HIGHWAY 96
COUNTY RD.
USFS
TRAILS
4 X 4
STEINACHER ROAD
3 0 3 6 Miles
NCIDC
N
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	In progress,

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**	

III. Thompson Unit

Road #	Road Name	Length (mi.)	# Road /Stream Crossings	Remarks
14N06B	Kings Creek	.71	0	
15N06	Bear Creek	2.8	13	
15N06A	Bear Creek	3.76	29	
15N13	Malone	3.21	1	
17N07	Middle Thompson	3.54	23	
17N21	Clauson	.53	0	
17N30	Elk Lick	3.59	8	
17N32	SF Indian	4.38	38	
17N32C	SF Indian	.99	5	
17N40	Elk Lick	.65	0	
17N40A	Elk Lick	.45	1	
17N41	Elk Lick	2.14	3	
18N01	Thompson Creek	4.3	27	Proposed for 2001 implementation
18N07	E Thompson	5.44	17	
18N07A	E Thompson	1.27	3	
18N07B	E Thompson	.16	2	
18N17	EF Indian	1.78	2	
18N17A	EF Indian	.63	0	
18N27A	Tom Gray	1.06	6	
18N42	Little Grayback	.86	4	
19N01D	Thompson Ridge	.72	2	
40S07C	Grayback	.48	5	
45N78	Cliff Valley	2.34	0	
45N78B	Cliff Valley	.99	0	
45N81	Rancheria Creek	2.93	6	
46N28Y	Ridge Loop	1.53	5	
46N43Y	Middle Grider	1.1	0	
46N61	Maple Springs	.63	2	
46N61A	Maple Springs	2.8	6	
46N63	Blue Mtn.	3.21	0	
46N64	Walker Creek	3.36	25	
46N70Y	Middle Grider	.96	0	
46N71Y	Middle Grider	.75	0	
46N76	Joe Miles	1.87	12	
46N77	Grider Ridge	3.93	8	
46N78	Three Biscuit	2.11	14	
46N80X	Big Blue	2.09	0	
	Total	**74.05**	**267**	

APPENDIX 2:
TerraWave Systems 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. 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 evolution 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.

Winterization Measures

Winterization measures were implemented on Steinacher Road to control erosion from the remaining untreated road segments and the unfinished stream crossing excavation at RX10. These measures include the construction of rolling dips (RD), sediment detention basins (SDB), and mulching.

Rolling Dips (RD). A rolling dip is a shallow, rounded dip in the road where the road grade reverses for a short distance and surface run off is directed through the dip and off the outboard edge of road. Rolling dips are drainage facilities constructed to remain effective while allowing vehicular passage at reduced speeds. Rolling dips convey water from the inboard ditch, a culvert area, or road surface across and off the road into the watershed; they protect against culvert or other drainage structure failures. Rolling dips are also used to lessen or prevent stream diversions and disperse road run off on roads that are to remain. Fill from rolling dip construction are disposed in a similar matter as a XRD.

Sediment Detention Basin (SDB). A sediment detention basin is a temporary erosion control measure constructed to intercept sediments entering the fluvial system. SDBs are constructed in areas where high sediment run off is predicted; they have maintenance access. Sediment detention basins constructed on Steinacher Road range in size from less than 1 yd^3 at rolling dips to 25 yd^3 at RX10. Sediment detention basins are constructed by simply installing straw bale berms to retard inboard ditch or surface flow, or through excavating a depression and/or berm structure and installing spillway controls.

Mulching. Mulching is the application of straw to bare ground at an application rate of 4000 lbs per acre. Straw mulch is an excellent erosion control measure that decreases raindrop impact, increases the infiltration potential, and reduces surface erosion.

Appendix 3.

Steinacher Road, 12N01 Decommissioning Project
Treatment Excavation/Storage Volume Estimate Table

Control Point (100 Feet)	Treatment	Description	Storage Vol.yd^3 (Fill Volume)	Excavation Vol.yd^3 (Cut Volume)
0 -18.83	RR1	DOS, swale, FOS, XD	13,766	441
19.55	**RX1**	Crossing	0	12,151
20.27 - 38.00	RR2	DOS, swale, FOS	23,010	561
38.00 - 45.6	RR3	DOS, swale	7,243	340
46.21	**RX2**	Crossing	0	2,771
46.84 - 65.93	RR4	DOS	23,772	0
66.85	**RX3**	Crossing	0	11,917
67.11 - 82.85	RR5	DOS, swale	18,705	964
82.98	**RX4**	Crossing	0	1,362
83.12 - 99.15	RR6	DOS, swale,OS,RPB	9,615	741
88.95	**RX5**	Crossing	0	5,981
99.19 - 118.44	RR7	DOS, swale, OS	19,213	2,315
129.23	**RX6**	Crossing	0	5,437
118.47 - 139.4	RR8	DOS,swale, FOS,OS	16,007	1,042
139.46	**RX7**	Crossing	0	1,549
143	**RX8**	Crossing	0	2,844
139.5 - 153.6	RR9	DOS	12,523	0
147.73	**RX9**	Crossing	0	19,597
155.8	**RX10**	Crossing	0	67,828
		SUBTOTAL	**143,854**	**137,841**

Steinacher Road, 12N01 Decommissioning Project
Treatment Excavation/Storage Volume Estimate Table (Continued)

Control Point (100 Feet)	Treatment	Description	Storage Vol.yd^3 (Fill Volume)	Excavation Vol. (Cut Volume)
157.73 - 158.33	RR10	DOS	551	0
158.84	**RX11**	Crossing	0	2669
159.13 - 160.07	RR11	DOS	519	0
160.07 - 162.43	RR12	SWALE	371	1107
162.43 - 164.82	RR13	DOS	3882	0
164.82 - 166.48	RR14	OS	738	85
166.48 - 168.90	RR15	DOS (TC)	3481	0
168.90 - 170.57	RR16	SP/OS	395	300
170.82	**RX12**	Crossing	0	1340
171.00 - 172.84	RR16A	FOS	2079	127
173.02	**RX13**	Crossing	0	922
173.16 - 179.70	RR17	DOS	14575	486
180.14	**RX14**	Crossing	0	5705
180.53 - 185.35	RR18A	DOS (TC)	5656	197
185.55 - 187.02	RR18SW1	SWALE	668	1195
187.02 - 188.42	RR18	DOS	2803	0
188.42 - 189.64	RR18SW2	SWALE	256	1298
189.64 - 192.71	RR18C	DOS	3990	0
192.38	**RX15**	Crossing	0	9728
192.71 - 195.48	RR19	DOS	2878	0
196.02	**RX16**	Crossing	0	7654
196.44 - 199.64	RR20	DOS	5138	0
200.1	**RX17**	Crossing	0	11699
200.52 - 203.39	RR21	DOS	4088	0
203.52	**RX18**	Crossing	0	2070
203.64 - 207.97	RR22A	DOS	5969	0
207.97 - 209.92	RR22SW1	SWALE	529	1307
209.92 - 222.79	RR22B	DOS	17763	61
223.17 - 224.52	**RR19SW**	SWALE	589	10672
224.52 - 233.30	RR22C	DOS	8147	34
		Subtotal	**85,065**	**58,656**
		TOTAL	**228,919**	**196,497**

Assuming 10% volume expansion		19,650 yd^3
Balance Comparison	**228,919 yd^3**	**216,147 yd^3**

Appendix 4.

Revised Financial Budget
Steinacher Road 12n01 Decommissioning Project
Revised 12/14/00

(2 Operating Seasons June – October 15) Approximately 32 weeks total

	Current thru RX-10	RX-10 to Gate	Project Total
PERSONNEL COSTS			
Staff and Benefits	**105,980**	**100,580**	**206,560**
OPERATING EXPENSES			
Heavy Equipment with operators	618,000	372,000	990,000
Trucking	289,250	0	289,250
Mobilization / Demobilization	15,000	10,000	25,000
Materials and Supplies	9,600	5,700	15,300
Water Quality Control Measures	15,000	5,000	20,000
Disposal (downspouts and culverts)	2,000	500	2,500
Transportation	18,000	14,400	32,400
Project Management	90,000	72,000	162,000
TOTAL OPERATING EXPENSES	**1,056,850**	**479,600**	**1,536,450**
PERSONNEL AND OPERATING EXPENSES SUBTOTAL	**1,162,830**	**580,180**	**1,743,010**
Administrative Overhead 5 %	58,142	29,009	87,151
TOTAL ESTIMATED BUDGET	**1,220,972**	**609,180**	**1,830,161**