USA: California: Steinacher Road Restoration

Overview

The Karuk Tribe of California and the Six Rivers and Klamath National Forests worked on 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

Quick Facts

Project Location:
Forest Service Rd 15N17, Happy Camp, CA 96039, USA, 41.60342889053567, -123.4286498359375

Geographic Region:
North America

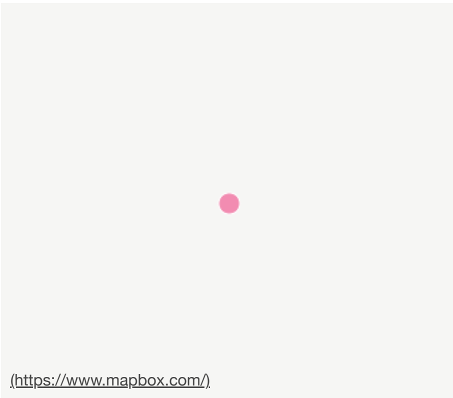
Country or Territory:
United States of America

Biome:
Temperate Forest

Ecosystem:
Temperate Forest - Coniferous, Temperate Forest - Mixed

Organization Type:
Governmental Body

Location



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TIMEFRAME

Project Stage:
Completed

Start Date:
1999-01-01

End Date:
2002-12-31

DEFINING THE PROBLEM

Primary Causes of Degradation

Fisheries & Aquaculture, Fragmentation, Invasive Species (native or non-native pests, pathogens or plants), Mining & Resource Extraction, Urbanization, Transportation & Industry

Degradation Description

Past mining, grazing, and logging exploits as well as other kinds of land uses and management practices have caused extensive unnatural disturbance in the forest and watershed. Logging disturbances and nearly a century of fire suppression policies have generated landscape conditions that are particularly dangerous with the rise of catastrophic wildfire events. Historic mining techniques, such as hydraulic mining activities directly disturbed over 1200 acres of land in the watershed, while generating an estimated 15 million cubic yards of sediment from 1870 to 1950. To the present day, historic mining continues to impact riparian function and quality as many large tailing piles remain. The damming, diversion and draining activities that were part of the history of mining in and around the Salmon and Klamath river basis left bare slopes and these tailings. Early timber harvesting occurred with both mining and homesteading in the area from the 1870s onward, but commercial harvesting did not begin until the 1950s and by the late 1980s tens of thousands of acres of original forest had been harvested. The replacement of these more open forests with more densely stocked managed plantations has greatly increased the intensity and frequency of fires in the region, and those areas greatly increase the chance that stand replacing fires will reach into adjacent areas. In many lower and mid elevation areas vegetation structure has been altered over the last 50 years in particular because of fire suppression policies, past management activities and wetter climatic conditions that have been the norm for much of this century. Species composition has been changing in many of these areas from the more open stands of conifers and hardwoods to mixed-conifer hardwood overstory, with denser vegetation. The encroachment of shade-tolerant conifers has created a multi-storied stand, while fire-adapted and shade-intolerant species are not regenerating because of increased shading and lack of fire to generate openings. Recently, noxious weeds have begun to be established in disturbed areas further threatening to displace native plant communities. All of this has greatly influenced the overall hydrology of the region's rivers, impacting the anadromous fish populations through the combination of altered sedimentation, river structure, more catastrophic wildfire, and water diversions. All of these influence the population structure of the fisheries and contribute to the significant declines that have been seen since the mid-1800s when Karuk and Shasta peoples relied on the fish to supply the primary subsistence food. The many modifications of the river's ecosystem have contributed to the conditions present today that threaten anadromous fish populations further, including the temperature rise that has accompanied the change in vegetation structure, the increased sedimentation, and the alteration of the river's hydrology.

PLANNING AND DESIGN

Reference Ecosystem Description

Historically, the forest of this area was much more open than it is today. Reflection on the role of Karuk peoples in the maintenance of the region through the use of fire generally supports a more consistent use of fire to thin out the forest. While denser stands no doubt found on north aspects, in areas of good soil and in drainages, the south aspects were more open with hardwoods. The areas that were most intensely modified generally were located within the canyons adjacent to the rivers. Historical accounts by the Karuk indicate that historically fire was seen as a critical element in the ecosystem

Project Goals

The Karuk Ecosystem Restoration Program focuses on two specific objectives: the elimination of old, unneeded roads; and the development of new revenues to provide critically needed watershed restoration.

Monitoring

The project does not have a monitoring plan.

Stakeholders

In 1979 the Karuk tribe gained sovereign status and began government-to-government protocols with the USDA Forest Service. While tribal participation in Forest Service planning efforts had been limited (advisory only), more recent efforts have been collaborative and the Tribe, the Klamath and Six Rivers National Forests have since entered MOUs that established a framework for both joint identification and planning of mutually beneficial projects and activities. The Karuk Tribe is interested in the long-term employment for Tribal members and the Tribe's perception is that the budgetary cutbacks in the Forest Sevice, and the reduction of staff that has led to, will not help to restore the region in an acceptable time frame. While a large portion of the affected area is considered tribal lands, there is still significant impact from the Forest Service lands that are managed outside of tribal control.

PROJECT ACTIVITIES

Description of Project Activities:

The start-up phase of the program focused on staff development and implementing the first priority restoration unit, which was the Steinacher Unit. The Steinacher Road was in the lower segment of the Salmon River sub-basin, specifically affecting the lower portion of Wooley and Steinacher Creeks. 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. 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. 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. 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; - 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. 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 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. 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 yd3 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 yd3. 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, 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. 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 throughcuts, and then shaped to specific slope and compaction requirements. Treatment specifications were designed with tentative grades and dimensions, which provide the basis for estimates of volumes to be excavated. As the work progressed, 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.) Decommissioning the 5.2 miles of Steinacher Road required three heavy equipment work seasons. 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 crossings 9 and 10, the work schedule incorporated complex end-hauling operations to manage the interspersed disposal sites.

PROJECT OUTCOMES

Ecological Outcomes Achieved

Eliminate existing threats to the ecosystem:

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. 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. 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. 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 were ultimately 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.

Factors limiting recovery of the ecosystem:

Decommissioning Steinacher Road presented more technical challenges than usual. Although project managers estimated a net disposal site volume surplus of 32,863 yd3 over the length of the entire project, the 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 yd3 of fill. Seven of those sites contained more than 10,000 yd3 and two sites contained more than 19,000 yd3. The largest excavation is estimated at 67,828yd3 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 yd3 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.

Socio-Economic & Community Outcomes Achieved

Economic vitality and local livelihoods:

The Steinacher road restoration was one of the largest road decommissioning projects in the Pacific Northwest to date. The project was seen as critical for maintaining viable fish populations in Wooley Creek watershed, and it contributed greated to the local economy through the training and eduction of tribal members in watershed restoration techniques. The creation of a central corps of trained individuals in the community dedicated to watershed restoration raised the overall viability of continuing this type of work over the long-term. The significant levels of unemployment and poverty among the Karuk were significantly lessened by the project and developed the viability of a restoration economy that has not only immediate income generating consequences but also long-term ecological benefits in the form of watershed restoration.

KEY LESSONS LEARNED −

LONG-TERM MANAGEMENT −

Long-Term Management

The central concern in the long-term management of these projects is not will. These communities have deep historical and personal connections to their land. Instead, it remains a critical problem to finance these restorations due to the lack of tribal revenue.

FUNDING

Sources and Amounts of Funding

3 million USD 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. The following funding providers who have made possible the progress to date: 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.

LEARN MORE

CONTACTS

Primary Contact

Organizational Contact