

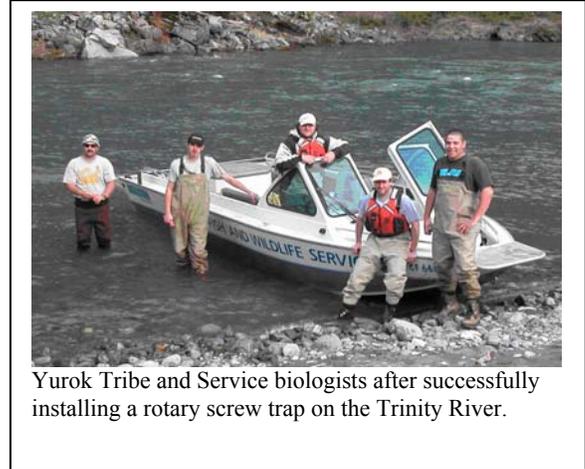


Quarterly Accomplishment Report, Winter 2007

In collaboration with State, Tribal, and Federal partners, our focus is to design and conduct investigations to guide and evaluate the success of aquatic habitat restoration efforts that will lead to the recovery and conservation of fish populations and fisheries in northern California, with current emphasis on the Klamath and Trinity rivers.

Partnerships and Accountability

In 2006, the Arcata Fish and Wildlife Office (AFWO) Fisheries Program successfully completed an array of investigations within northern California. Studies included carcass and redd surveys, out-migrant trapping, telemetry operations, water quality monitoring, and many more. To accomplish these studies, we relied heavily on the support, technical skills, and contributions of our many partners, including the California Department of Fish and Game, Hoopa Valley Tribal Fisheries Department, Humboldt State University, Karuk Tribal Natural Resources Department, Mattole Salmon Group, Oregon State University, Salmon River Restoration Council, US Bureau of Reclamation, US Forest Service, US Geological Survey, Yurok Tribal Fisheries Program, among others.



Yurok Tribe and Service biologists after successfully installing a rotary screw trap on the Trinity River.

Aquatic Species Conservation and Management

Survival and migration behavior of radio-tagged juvenile coho salmon relative to discharge at Iron Gate Dam



Service biologist tracking juvenile coho salmon smolts below Iron Gate Dam.

Since 2005, the Fish and Wildlife Service has worked cooperatively with the Geological Survey, California Department of Fish and Game, Bureau of Reclamation, and the Karuk and Yurok Tribes of California to determine the extent that spring Iron Gate Dam (IGD) flow regimes affect survivorship of coho salmon smolts during their out-migration. In spring 2006, survival and migration rates of 177 wild and 213 hatchery-origin radio-tagged juvenile coho salmon were estimated within five index flow reaches located between Iron Gate Hatchery (river kilometer 309) and the Klamath Estuary (river kilometer 13). We used mark-recapture methods to estimate apparent survival, and time-to-event analysis with Cox's proportional hazards regression to compare migration rates of hatchery and wild fish to gain insight on factors influencing survival and downstream travel times. Current data and models indicate little support for

a survival difference between hatchery and wild coho salmon in 2006, but considerable model uncertainty exists. Survival was lower in the reach from Iron Gate Hatchery to the Scott River than in reaches located farther downstream. The overall estimate of survival from Iron Gate Dam to river kilometer 33 was 68%. Tagged fish migrated at increased rates as they traveled downstream through reaches of increasing discharge. Wild coho salmon traveled faster than hatchery fish downriver from release sites to Indian Creek (river kilometer 107), but emigration rates of hatchery and wild groups within flow reaches below this point were similar. Improved understanding of the relationship between juvenile coho salmon survival and seaward migratory behavior relative to controlled river discharge will aid NOAA Fisheries in developing and implementing appropriate actions in recovery plans.

Tidewater Goby Surveys



Tidewater Goby (*Eucyclogobius newberryi*)

Tidewater goby enthusiasts with the AFWO Endangered Species and Fisheries programs have been busy recently. In a tidewater goby planning meeting early this December, the group discussed the current status of the species on the north coast, and looked ahead in prioritizing projects and tasks for the upcoming year. Fishery Biologist, Charlie Chamberlain, recently finished a technical report titled: "Environmental Variables of Northern California Lagoons and Estuaries and the Distribution of Tidewater Goby (*Eucyclogobius newberryi*)."

Fish and Wildlife Biologist, Lynn Roberts, developed a draft status/baseline document on the tidewater goby in cooperation with other group members. Biological Science Technician, Adam Frimodig, compiled several years of tidewater goby sampling data beginning in 2003 through this past summer, and incorporating it into a multi-year report titled: "Status and Distribution of the Tidewater Goby (*Eucyclogobius newberryi*) in Northwestern California (Del Norte, Humboldt, and Mendocino Counties), 2003-2006." We are excited about building a better base of information surrounding this federally endangered fish species and what upcoming studies will reveal and how these data can be used to aid recovery efforts.

Juvenile Fish Health

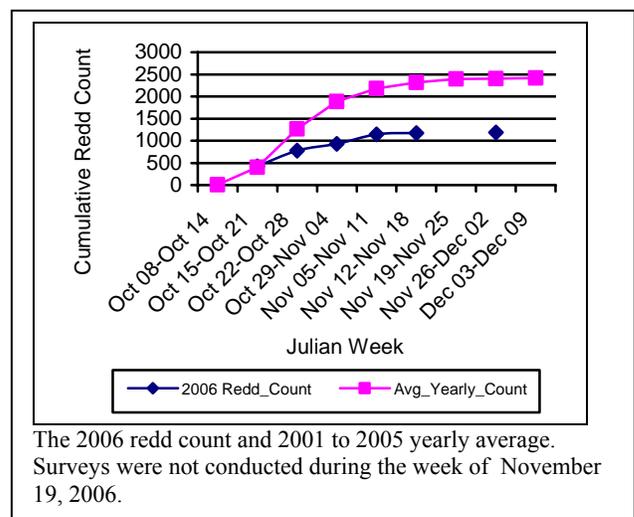
In recent years, *Ceratomyxa shasta*, a microscopic myxosporean protozoan parasite native to the Klamath River Basin has been documented as a leading cause of mortality of juvenile salmonids emigrating to the Pacific Ocean during the spring. The impact of this disease has led to considerable study, including the use of quantitative polymerase chain reaction (QPCR) assays to identify the infectious spores of this parasite in filtered water samples. The AFWO, in cooperation with the Hoopa Valley Tribe, and Oregon State University, conducted a study in the spring of 2005 to examine the variability in densities of infectious spores along transects across the Klamath River. The study was designed to provide baseline information to guide future monitoring programs on where and how many samples to collect. Study findings are undergoing statistical review and will be submitted to a scientific journal for publication in the spring of 2007.

Public Use

Adult salmonid population surveys conducted by the AFWO Fisheries Program contribute to establishing future harvest rate management for commercial fishing, sport fishing, Tribal net harvest, and in river harvest. Data and analysis is submitted to the California Department of Fish and Game and several Tribal agencies.

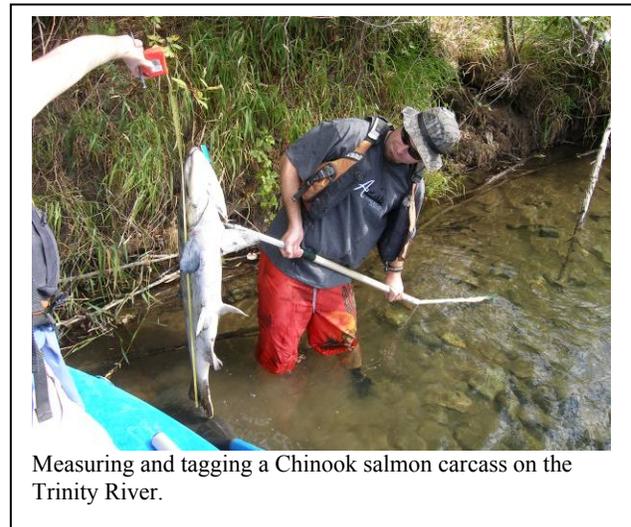
Klamath Redd Survey

The 2006 Klamath River fall Chinook salmon (*Oncorhynchus tshawytscha*) redd survey was conducted from October 15th to November 29th by the AFWO Fisheries Program and Karuk Tribal Natural Resources Department. The survey covers a distance of 135.9 river kilometers from Iron Gate Dam to the confluence of Indian Creek in Happy Camp. A total of 1,186 redds were observed in 2006 representing a 48% decrease from the 2001-2005 average (Figure 1) and is the fourth lowest number of redds observed since 1993. A majority of the documented spawning occurred in the upper river from Iron Gate Dam to the Shasta River and between China Point and Indian Creek with redd frequencies (#/km) of about 38% and 30% respectively.



Klamath Carcass Survey

In cooperation with the Geological Survey and the Yurok Tribal Fisheries Program, Chinook salmon carcass surveys have been conducted on the mainstem Klamath River from Iron Gate Dam to the Shasta River confluence since 2001. The purpose of these surveys is to estimate escapement of fall-run Chinook salmon using carcass mark-recapture methods and to characterize the run in terms of age and sex composition and spawning success. Surveys for the 2006 season were conducted from October 11 to November 21. A total of 1,492 adult carcasses and 203 (12%) jack (males ≤ 60 cm FL) carcasses were collected. Carcass density was highest in the upper reaches of the study area. Adult carcass mark-recapture estimates from combined Petersen, weekly Petersen, and Schaefer methods were 2,953, 4,601, and 3,320, respectively. Overall adult recapture rates for the three methods were about 50%, 36%, and 48%, respectively. The combined Petersen method is believed to have produced the best estimate since it appears to include the fewest sources of bias. Adjusting the combined Petersen estimate by the adult:jack ratio yields a jack estimate of 402. Scale readings revealed an age composition of about 14 % age two fish, 31% age three, 52% age four, and 3% age five. The adult male:female ratio percentage was 48:52. Overall female spawning success based on fresh (F1) and decayed (D2) condition carcasses was 92%, with most prespawn mortalities occurring early in the season. Based on the combined Petersen estimate and redd counts from concurrent redd surveys in the study area, there were 3.09 successfully spawned females per observed redd. Mean fork lengths of adult males, females, and jacks were 84.0 cm, 73.8 cm, and 51.5 cm, respectively.



Measuring and tagging a Chinook salmon carcass on the Trinity River.

Cooperation with Native Americans

Klamath River Fish Habitat Assessment Program

The Hoopa Valley, Karuk, and Yurok Tribes have relied on the Klamath’s abundant fisheries for food, cultural, and ceremonial, purposes for centuries, and more recently as an important commercial endeavor. However, recent declines in fish runs, coupled with competing interests for water, have created the need for a scientifically credible and comprehensive study of mainstem Klamath River flows and their relation with fish habitat condition and availability. This study is a critical component in resolving controversial water issues in the Klamath Basin. Despite historic declines in fish numbers, there is great potential for recovery, as nearly 200 miles of the Klamath River below Iron Gate Dam is currently accessible to salmon and steelhead.

Technical expertise and local knowledge has been provided to the AFWO Fisheries Program by the Flow Study Technical Advisory Group (FSTAG). The FSTAG, representing Federal, State, Tribal, and County governments, Watershed Councils, and Agriculture Interests was tasked with developing flow study priorities. The AFWO administers funds and provides oversight for on-the-ground projects. Program studies are providing data necessary to identify factors contributing to the decline of Klamath River salmonid populations and will guide future restoration efforts. Completion of the Flow Study requires annual prioritization of study efforts and ongoing coordination and collaboration with partner agencies, Tribes, and stakeholders.

Leadership in Science and Technology

Database Development

The AFWO Fisheries Program develops database applications to efficiently store, summarize, and analyze diverse datasets. In 2006, database applications, training, and support were provided to the California Department Fish and Game, Hoopa Valley Tribal Fisheries Department, Karuk Tribal Natural Resources Department, Mattole

Salmon Group, Salmon River Restoration Council, US Forest Service, and Yurok Tribal Fisheries Program. In particular, copies of the outmigrant trapping database have been distributed to partners working on the Klamath and Trinity Rivers, as well as the Service's Klamath Falls and Red Bluff Fish and Wildlife Offices. The outmigrant trapping database standardized the storage format for most trapping data collected in the Klamath Basin and has greatly reduced potential sources of error and the time required to summarize and report the findings of these important studies.

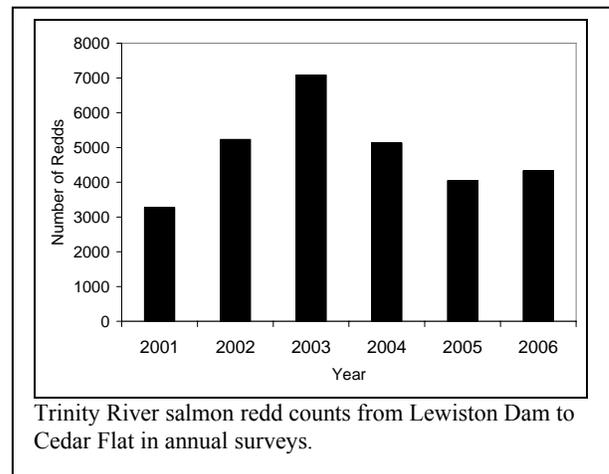
Aquatic Habitat Conservation and Management

Klamath River Water Quality Assessments

The Klamath River has long been recognized for having impaired water quality. From 2001 to 2006, the AFWO funded a program to monitor and assess water quality conditions in the Klamath River Basin. During this time, the Fisheries Program, in cooperation with the Yurok and Karuk Tribes, conducted studies that evaluated dissolved oxygen, water temperature, specific conductance, pH, and nutrient concentrations at seven mainstem River sites from Iron Gate Dam to Terwer, a distance of approximately 290 km. Additionally, the Program evaluated the same water quality parameters in four major tributaries to the Klamath River – the Shasta, Scott, Salmon, and Trinity. Monitoring results for these six years of study are currently undergoing a rigorous review and analyses, with assistance provided by expert technical consultants from the University of Texas, Austin. Reports on nutrient concentrations and other water quality parameters are expected to be released for external review by summer 2007.

Trinity River Redd and Carcass Survey

The Trinity River is the largest tributary to the Klamath River, providing more than 182 kilometers (km) of anadromous salmonid habitat from the confluence to Lewiston Dam. The Trinity River carcass and redd survey is a collaborative effort to monitor Chinook salmon reproduction and includes participants from the California Department of Fish and Game, US Forest Service, Yurok Tribe, AFWO Fisheries Program, and many volunteers. Surveys are conducted every fall, covering over 103 km downstream of Lewiston Dam to monitor adult Chinook salmon escapement. The surveys are designed to collect information on the total number of carcasses and redds and the temporal and spatial distribution of spawning activity. In 2006, 4,329 redds were counted representing 90% of the six-year average. Sixty percent of redds observed in 2006 occurred in the first 5 km downstream from Lewiston Dam.



Yurok Tribe and USFWS biologists work cooperatively to collect information on fish use of Trinity River channel restoration sites and to validate outputs for various habitat modeling efforts.

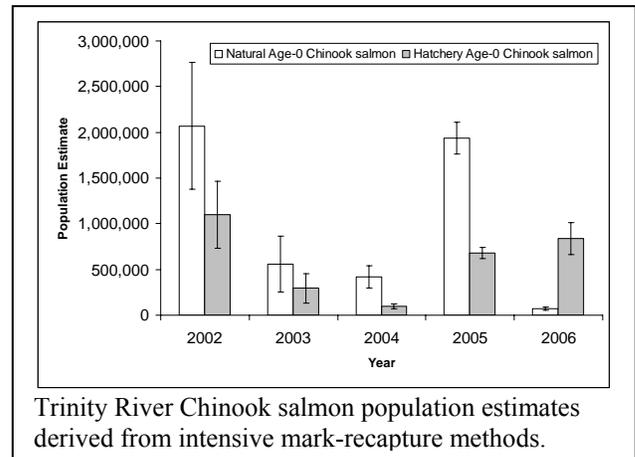
Trinity River Habitat Restoration Program

The Trinity River below Lewiston Dam is the focus of one of the most comprehensive river restoration programs on the Pacific Coast of North America. The restoration program is a cooperative effort including participation from the California Department of Fish and Game, Hoopa Valley Tribal Fisheries Department, Trinity River Restoration Program, US Forest Service, AFWO Fisheries Program, Yurok Tribal Fisheries Program and others. Efforts to improve the Trinity River ecosystem include over 44 planned restoration sites, experimental flow releases, and riparian vegetation restoration. To evaluate the effectiveness of these restoration efforts, various biological and habitat evaluation methodologies

are being applied. During 2006, data was collected and compiled to develop a two-dimensional hydraulic model. Habitat availability was assessed for several life stages and species of salmon, lamprey, frogs and turtles over 13 km including current and future restoration sites using judgment-based habitat mapping. Information on fry and juvenile salmon habitat utilization and distribution were collected on over 11,100 fish. The AFWO Fisheries Program lends support to many aspects of these efforts from support for project development to technical field efforts and report generation.

Trinity Smolt Trapping

The Trinity River Juvenile Salmonid Emigration Project is a collaborative effort between AFWO, the Yurok Tribal Fisheries Program and the Hoopa Valley Tribal Fisheries Department. Juvenile outmigrant monitoring provides the Trinity River Restoration Program with information on the abundance and outmigration timing of anadromous salmonids, hatchery/natural stock production, condition of emigrating salmonids, and basic biological information needed to assess success of flow management and habitat restoration actions. Sampling in 2006 was conducted from March 22 to September 6, and occurred on 88% of the days during this time period. Missed sampling days were due to extremely high discharge during the spring. Population estimates of natural (wild) spawned age-0 Chinook salmon in 2006 were the lowest numbers calculated since mark-recapture estimates were initiated in 2002, even when accounting for missed sampling days.



Herpetofauna work in the Trinity River Basin



In 2006, the fourth year of collaboration between the AFWO Fisheries Program and the US Forest Service's Redwood Sciences Laboratory for studying impacts of flow management and restoration efforts by the Bureau of Reclamation's Trinity River Restoration Program. A third year of foothill yellow-legged frog egg mass surveys was conducted in 2006 on the mainstem, South Fork and North Fork Trinity Rivers. The second year of a three-year western pond turtle (*Clemmys marmorata*) demographic survey was completed for the comparison of population size and structure on the mainstem and South Fork Trinity Rivers. Also, a third year of research was completed on the basking behaviors of the turtles on the dammed Mainstem and un-dammed South Fork Trinity Rivers. The Mainstem Trinity River has water temperatures that are 10° C colder than the un-dammed control river due to

hypolimnetic releases from the bottom of the Trinity and Lewiston Reservoirs. Turtles are significantly changing their basking behavior based on the river temperature regime they reside in. Understanding the influences of altered river ecosystem management impacts these native amphibians and reptiles may assist in adaptive management decisions to improve the restoration activities along the Mainstem Trinity River.

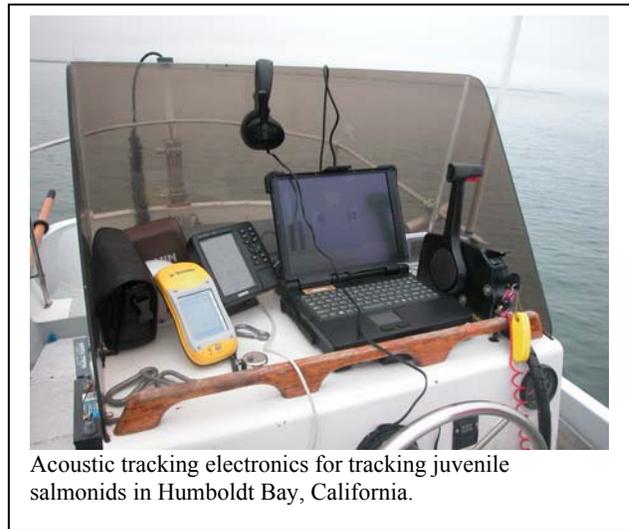
Pilot Egg Survival Study

Egg development and alevin emergence are critical life-history stages for salmon. Little is known about the success of these life stages for Chinook salmon in the Klamath River. Anthropogenic alterations to the river (i.e. dams, dredging) may be causing adverse effects on egg survival and alevin emergence by affecting water quality

and substrate composition on spawning grounds. A pilot study to examine Chinook salmon egg survival in the mainstem Klamath River below Iron Gate Dam was conducted in December 2006 to test assumptions used in the USGS SALMOD component of the Systems Impact Assessment Model (SIAM). One hundred to 200 eggs were excavated from a small number of redds to determine survival percentage. The survey was performed too late in the season to acquire adequate egg samples for quantitative analysis. However, a large portion of dead eggs were encountered. If this project is to be repeated, a number of changes and enhancements should be implemented. Individual redds should be designated for sampling earlier in the season, the target number of eggs should be collected from the entire egg pocket, water quality (dissolved oxygen, temperature, pH) should be monitored, and substrate samples or permeability should be analyzed.

Humboldt Bay Juvenile Salmonid Telemetry

William Pinnix worked to secure funding from various sources to conduct an acoustic tagging study of juvenile salmonids, with a focus on coho salmon, in Humboldt Bay in spring 2007. The study will attempt to answer the question of how long juvenile salmonids reside in Humboldt Bay and what habitats they use while in the Bay. The project will be a collaborative effort between USFWS, CDFG, Humboldt Bay Harbor Recreation and Conservation District, California Sea Grant, and Coast Seafoods. Potential funding was earmarked from the Humboldt Bay Harbor, Recreation and Conservation District, CDFG, and material support from Coast Seafoods. In addition, California Sea Grant will provide funding and assistance in conducting a tag assessment study and swimming performance experiment with acoustically tagged coho salmon from Iron Gate Hatchery. Tagging of juvenile salmonids is expected to begin April of 2007, and continue through summer of 2007.



Acoustic tracking electronics for tracking juvenile salmonids in Humboldt Bay, California.

Workforce Management

Recruitment

Ranks of the AFWO fisheries program swell every spring in preparation for the upcoming intensive field season. Fish program supervisors annually rely on the outstanding help of Kristy Jenkerson and other excellent Human Resources staff in the Portland Regional Office to fill these critical positions in a timely manner. We wish to extend an enormous ‘thank-you’ for their support!

Safety training



Swiftwater rescue training on the Trinity River.

We have no higher priority for our field projects than the safety of our staff. Because of the swift river environments many of our projects occur in, we’ve worked closely with the owners of *Sierra Rescue* (a water-safety training organization) to tailor a swiftwater and wilderness first-aid/CPR course specifically for our environmental working conditions, and they have conducted this custom course for us for four years. Personnel from many of our partner agencies and tribes typically participate as well.

Developmental training

Fish Biologist Charlie Chamberlain was one of two CNO employees selected to attend Session 13 of the Service's Stepping-up-to-Leadership program. Initiation began at NCTC in October 2006. The program kept Charlie busy completing many interim team and individual projects, including a week-long shadow assignment carried out in Region 1 with Vicky Finn (Fisheries Restoration and Recovery Team Leader), Howard Schaller (Project Leader, Columbia River Fisheries Program Office), Paul Heimowitz (Aquatic Invasive Species and Research Coordinator), and Judy Gordan (Director of the Abernathy Fish Technology Center). The session culminated with graduation the last week of March.



Stepping Up to Leadership 13