Salmonid Restoration Federation's

25th Salmonid Restoration Conference

March 7-10, 2007
Santa Rosa, California

Co-Sponsors:

Americorps Watershed Stewards Project, California Conservation Corps, California State Coastal Conservancy, Cal Trout, CalTrans, City of Santa Rosa—Creek Stewardship Program, Department of Fish and Game, Department of Water Resources, Eyak Preservation Council, Goldridge RCD, Forest, Soil, and Water, Inc., Humboldt Baykeeper, Marin County RCD, Marin Municipal Water District, Meadowbrook Conservation Associates, NOAA Restoration Center, Pacific Coast Fish Wildlife Wetlands Restoration Association, Pacific Coast Federation of Fishermen Associations, Pacific Watershed Associates, Prunuske Chatham, Inc., San Francisco Estuary Institute, Solano County Water Agency, Sonoma County Open Space District, Sonoma County Water Agency, Southern Sonoma County RCD, Sotoyome RCD, Stoecker Ecological Consultants, Sycamore Associates LLC, The Bay Institute, Trees Foundation, Trout Unlimited, USDA Natural Resources Conservation Services of Davis, Winzler and Kelly

25th Annual Salmonid Restoration Conference Preface

Welcome to the 25h Annual Salmonid Restoration Conference entitled, "*Celebrating a Generation of Salmonid Restoration and Recovery.*" As the Salmonid restoration field evolves and adapts to address California's changing landscape, demographics, development, and population growth it is more important than ever to gather together and envision a future with abundant wild salmon runs. A generation ago, restoration pioneers created this salmonid restoration conference to serve the needs of the fisheries and restoration community. Each year hundreds of fishheads migrate to participate in this premier salmon restoration conference where leaders, on-the-ground and in-the-creek restorationists, and watershed stewards spawn innovative ideas about how to save salmon, steelhead, and trout.

The production and coordination of the annual conference is a fluid, dynamic process that engages Salmonid Restoration Federation's diverse Board of Directors, staff and co-sponsors who represent restorationists, fisheries biologists, educators, advocates, tribal members, and agency personnel from the Pacific Northwest—all dedicated to habitat restoration and recovery of salmonids.

The planning for this conference is a year round event for our organization. It begins soon after the conference when SRF analyzes the evaluation forms that participants at the conference fill out. SRF relies on our members to inform us about what types of technical trainings, field tours, and educational workshops they would like to see offered at the conference and our other events. Next, SRF does outreach to the restoration community in the bioregion where we are interested in holding the conference. Last summer, the SRF Board gathered on the banks of Butte Creek and at Point Reyes National Seashore to brainstorm about potential sessions, workshops, and field tours.

Creating the conference agenda and events is a collaborative effort that involves hundreds of people and the support of our co-sponsors. I would like to thank all of the presenters, session, field tour and workshop coordinators for submitting abstracts in time for SRF to be able to offer the Proceedings at the conference. The quality and diversity of the speakers on the agenda has everything to do with the hard work, expertise, and dedication of the incredible session, workshop, and field tour coordinators. Thank you for being leaders in your field and for your tremendous volunteer contribution to make this such a high-caliber conference. I would also like to wholeheartedly thank the USDA Natural Resources Division for their wonderful contribution of printing the Proceedings. Thank you to all of our co-sponsors for your time, ideas, donations, and your invaluable contribution to help make this an outstanding salmonid restoration conference.

SRF is excited to be returning to Santa Rosa, to be featuring the *Wild and Scenic Environmental Film Festival* for the second year, and to be celebrating our silver anniversary with you. Thank you for your participation in Salmonid Restoration Federation's conference and for being an integral part of the emerging restoration field.

In the spirit of *Celebrating Salmonid Recovery*,

Dana Stolzman
Agenda Coordinator
Executive Director
Salmonid Restoration Federation

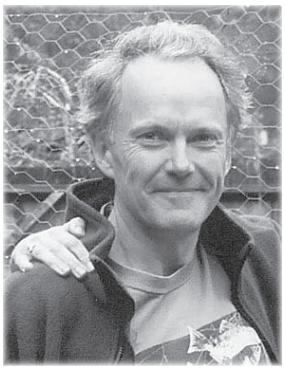
Celebrating a Generation of Salmonid Restoration and Recovery

By Don Allan, SRF Board President

In 1983, Chris Toole, Sea Grant Advisor in Humboldt County, organized a conference in Bodega Bay to bring together government resource agency representatives, fishermen, scientists, and private individuals interested in salmon restoration. The Salmonid Restoration Federation did not exist yet but there was a new life form spawning in the rural outposts of Northern California. This new life form was a nebulous movement of like-minded individuals dedicated to the restoration of watersheds and creeks in order to restore the habitat that would support healthy salmon populations. Attendees at that first conference agreed that such annual symposiums had an important role to play in the sharing of information and the generating of support for the fledgling salmon restoration movement. The meetings became an annual event and helped to spawn the Salmonid Restoration Federation.

In 1986, the fourth annual conference was held in Fort Bragg and at the end of the conference, a group met to discuss the creation of a non-profit organization that could take on the responsibility of organizing the annual conference and could provide a voice for the restoration movement. At that meeting, the California Salmon and Steelhead Trout Restoration Federation was formed. A board of directors was elected, and a non-profit corporation was born. The CSSTRF egg that had been incubating for three years was ready to emerge. But such an unwieldy name and a six letter acronym were not sustainable, and it wasn't long before the name was shortened to the Salmonid Restoration Federation, a reflection of our confidence that the general public knew what a salmonid was.

In the early days of salmon restoration funding was limited and it was done largely by volunteers who wanted to preserve this magnificent creature that was the cultural focal point for many of the coastal California Indian tribes, the main industry in many small coastal towns, and an obsession for many a sport fisherman. We assumed our good efforts would translate into good results, and that it was better to go out there and attempt to do something, even if we didn't always know the effectiveness of what we were doing. There was general agreement about one assumption—that habitat was suffering after many years of abuse from poorly regulated extractive industries. The runs were declining, and if we didn't do something, we would continue to see salmon runs disappear from our rivers. A lot of people complained that all anyone ever did was study the creek, they never tried to fix anything—so we went out of our way to try to do something to fix things. Some of our good efforts did translate into good results and some were learning experiences—mistakes we didn't want to repeat.



The annual meetings that brought the restoration community together were catalysts to the expansion of the science surrounding salmon and salmon habitat, a growing awareness among the general population of the importance of and plight of salmon, and public support for funding programs dedicated to restoring salmon. The restoration community co-mingled with the scientists and agency representatives who regulated salmon fishing and provided restoration funding. In the early 1980s, there were two or three funding sources with a small amount of funding. The mandate of the California Department of Fish and Game ended at the outer edge of the riparian zone. Restoration was limited to less than one percent of the watershed even though everyone knew that upslope management activities in the other 99% of the watershed could totally overwhelm any progress made in the streams where the restoration was attempted. Restorationists and agency representatives knew that efforts focused within this narrowly defined region were subject to being undermined by the activities occurring upslope—it didn't make much sense to stabilize an eroding stream bank or to install a log cover structure when there was a failing road system or stream crossing that threatened to inundate the project site with sediment when it failed.

Common experiences were shared and common frustrations were voiced and the annual meetings became an important aspect of peer training, information exchange, and identification of needs for the newly emerging field of habitat restoration. Identification of those needs helped garner the support needed to develop new legislation to provide funding for salmon restoration. The narrow focus of early restoration funding was expanded to include upslope erosion control and watershed planning. New funding was appropriated at the state and federal levels and the financial investment into salmon restoration was enough to identify watershed restoration as an industry. Funding sources and agencies managing the funding grew from two or three to dozens. The amount of funding grew from a few hundred thousand dollars annually to tens of millions. Fledgling watershed groups could find seed money to help them get off the ground. Education and outreach efforts brought salmon to the classroom and exposed a whole new generation to the salmon and its desperate need for us to restore its habitat, give it access to its former habitat, and for us as a society to adopt a stewardship ethic towards not only salmon but to the watersheds and natural processes that support those salmon.

Twenty-five years later, we are still in need, possibly even in greater need, of a continued coordinated effort to get the word out to the public at large, and to exchange information within the restoration community so we can use our funding resources efficiently and wisely, and to provide the communication forum where scientists, restorationists, regulatory and funding agencies discuss what we need in order to be effective in our pursuit of salmon recovery. At twenty-five years we are still young and we still have a lot of learning to do. But we have also matured and learned a lot in our 25 years and we are eager to apply what we have learned. As many of the early restorationists sail into the sunset of their careers, it is important that the lessons of the past are passed on to those who will carry the restoration movement into the future. And if we are successful in our efforts, our successors will one day no longer have the need for a restoration movement. But that's okay, because it means we will have restored what we have damaged, and we will be ready to move into the next phase—the phase of stewardship where we take care of what we have and make sure that we allow the forces of nature to work their magic unfettered by the mistakes and misguided efforts of human industry—like the Native Americans did before the European invasion. We still have a long way to go, but we are 25 years closer than when we started and we have a solid foundation to work from. As we celebrate the silver anniversary of the Salmonid Restoration Federation, let's think about how we as a movement have adapted, and how we will continue to adapt so our efforts continue to bear fruit 25 years into the future and beyond.

Some SRF Board and staff gather to brainstorm about the 25th Annual Salmonid Restoration Federation Conference.

photo: Traci "Bear" Thiele

Editor's Note

The Salmonid Restoration Conference is always a superb tribute to the progress made and trajectory established by those who have taken on the myriad challenges of salmon restoration work. However, this year's conference is especially meaningful. The 25th anniversary of this annual conference is an outstanding testament to the dedication, hard work and community spirit exhibited by many individuals with a strong conviction about their chosen work. I am pleased to present a distinguished selection of abstracts for this year's proceedings, which proved to be extremely interesting, throughout the lengthy process of proofreading and editing. My warmest thanks to Dana Stolzman for her concise guidance and amazing attention to detail while juggling all of the pre-conference tasks. I would also like to thank all of this year's presenters, volunteers, SRF staff and conference workers for their invaluable contributions. Finally, I would like to thank the AmeriCorps Watershed Stewards Project, particularly its enthusiastic and downright cool leadership team, Carrie Gergits, Director and Lindsay Righter, Project Manager. I enjoyed the opportunity to help prepare these proceedings for you, and look forward to witnessing the materialization of this work!

Natalie Arroyo, Editor

AmeriCorps*USA Watershed Stewards Project
Outreach Team Leader

The time will soon be here when my grandchild will long for the cry of a loon, the flash of a salmon, the whisper of spruce needles, or the screech of an eagle. But he will not make friends with any of these creatures, and when his heart aches with longing he will curse me. Have I done all to keep the air fresh? Have I cared enough about the water? Have I left the eagle to soar in freedom? Have I done everything I could to earn my grandchild's fondness?

—Chief Dan George

Design & layout by Trees Foundation

SRF gratefully acknowledges Natural Resources Conservation Service for generously printing the Annual Salmonid Conference proceedings.

NRCS
Natural Resources
Conservation Service

Salmonid Restoration Federation Board of Directors 2006-2007

Board of Directors

Don Allan, President
Redwood Community Action Agency
(707) 269-2063 (w)
(707) 445-0884 (fax)
don@rcaa.org

Allen Harthorn, Vice President
California Watershed Network
(530) 228-5342 (cell)
ahart@harpos.to

Connie O'Henley, Treasurer
Central Coast Salmon Enhancement
(805) 473-8221 (w)
(805) 473-8167 (fax)
connie@centralcoastsalmon.com

Steven A. Allen
Winzler and Kelly
(707) 443-8326 x 117 (w)
(707) 444-8330 (fax)
steveallen@w-and-k.com

Andy Baker
North Coast Regional Water Quality Control Board
(707) 576-2690 (w)
abaker@waterboards.ca.gov

Sean Carlson
Metropolitan Water District
(213) 217-6310 (w)
scarlson@mwdh2o.com

Rob Dickerson
Trout Unlimited
(707) 543-5877 (w)
tdickerson@tu.org

Joelle Geppert
North Coast Regional Water Quality Control Board
(707) 576-2346 (w)
jgeppert@waterboards.ca.gov

Josh Israel
University of California, Davis
(530) 752-6351 (w)
jisrael@ucdavis.ed

Jennifer Jenkins
Pacific Coast Fish Wildlife and Wetlands Restoration Association
(707) 839-5666 (w)
jiggityjenkins@gmail.com

Dave Kajtaniak
California DFG
(562) 342-7100
dave.kajtaniak@excite.com

Mike Lennox
UC Cooperative Extension
(707) 565-2621 (w)
mlennox@ucdavis.edu

Kent MacIntosh
Trout Unlimited
(707) 888-1393 (w)
kentmac@sonic.net

Zoltan Matica
Department of Water Resources
(916) 227-2904 (w)
zoltan@water.ca.gov

Margo W. Moorhouse
Lindsay Creek Watershed Coordinator
(707) 839-8967 (home office)
margofish@humboldt1.com

Will Pier
Sonoma Ecology Center
(707) 996-0712 ext. 101 (w)
will@sonomaecologycenter.org

Kent Reeves
East Bay Municipal Utility District
(209) 365-1096 (w)
Kreeves@ebmud.com

Staff

Dana Stolzman
Executive Director
PO Box 784
Redway, California 95560
707/923-7501 (w)
707/223-1770 (SRF cell)
707/923-3135 (fax)
srf@calsalmon.org

Heather Reese
Assistant Conference Coordinator
PO Box 784
Reway, California 95560
707/923-7501 (w)
heather@calsalmon.org

Table of Content

Wednesday, March 7

Field Tours

Wild & Scenic Environmental Film Festival

Friday, March 9

Plenary Session: The Evolving Salmonid Restoration Movement: Lessons from a Quarter-century of Adaptation

Friday Afternoon Concurrent Session 1

Friday Afternoon Concurrent Session 2

Friday Afternoon Concurrent Session 3

Friday Evening Poster Session

Saturday Morning Concurrent Session 1

Saturday Morning Concurrent Session 2:

Saturday Morning Concurrent Session 3

Coastal Watershed Planning and Restoration

Saturday Afternoon Concurrent Session 1

Fisheries Closures: The Economic, Cultural and Recovery Impacts

Saturday Afternoon Concurrent Session 2

North Coast Water Diversions: Can Coho Go with the Flow?

Saturday Afternoon Concurrent Session 3

Regional Land Use Planning and Implementation Strategies in Aquatic Conservation

Fish Passage Barrier Removal Tools Workshop

Workshop Coordinators*: Leah Mahan, NOAA Restoration Center and Darcy Aston, Program Director, FishNet 4C*

The array of fish barrier removal tools is constantly changing. This workshop will highlight developments in website databases, fish passage design innovations, barrier assessments, and unique implementation tools that can help you in your own projects, The group will also tour some local fish passage projects and share experience in tailgate discussions.

Fish Passage Barrier Removal Tools Workshop

The Passage Assessment Database: A Tool for Stream Habitat Connectivity Restoration

Martina Koller, Pacific States Marine Fisheries Commission

In recognition of the importance of restoring California's once-abundant salmon and steelhead populations, an inter-agency cooperative project was initiated by the State Coastal Conservancy, Department of Fish and Game, Pacific States Marine Fisheries Commission and others to inventory barriers to fish passage throughout the coastal watersheds of California.

The Passage Assessment Database (PAD) is an ongoing map-based inventory of known and potential barriers to anadromous fish in California. The PAD compiles data from more than one hundred agencies, organizations, groups and landowners throughout California. This data allows past and future barrier assessments to be standardized, stored in one place and made easily accessible.

The PAD enables the analysis of the cumulative impacts of barriers on salmonid migration in the context of overall watershed health, as well as the identification of barriers suitable for removal or modification. It is also an important tool for determining and tracking the outcomes of passage improvement projects. The PAD is publicly available via the CalFish website (*www.calfish.org*).

CalFish, a California Cooperative Fish and Habitat Data Program, is a multi-agency website and map viewer presenting fish and aquatic habitat data in California. The Calfish website was created to serve a two-fold mission: (1) To create, maintain, and enhance high quality, consistent data that are directly applicable to policy, planning, management, research, and recovery of anadromous fish and related aquatic resources in California; and (2) To provide data and information services in a timely manner in formats that meet the needs of users.

Fish Passage Barrier Removal Tools Workshop

Innovations in Approaches to Solving Fish Passage Problems

Michael Love, Michael Love and Associates

Since the Middle Ages, people have understood that maintaining a healthy salmon fishery requires providing unimpeded access to upstream habitat for spawning. Technical solutions have been widely applied to fish blockages for many years. Through learning from past experience combined with a new emphasis on providing upstream passage for juvenile salmonids (as well as many weaker swimming non-game fish and other aquatic organisms), there has been a transformation in the approaches and underlying philosophy applied to solving fish passage problems.

This presentation will describe and provide examples of where the state of the practice in fish passage design is, and where it is heading. Design techniques that will be covered will include:

- Simulation stream crossings for passage of fish and other aquatic species
- Retrofit of existing culverts using corner baffles to minimize debris clogging and allow for juvenile fish passage
- Use of roughened channels for controlling stream grade while mimicking the form and function of a natural channel
- Pool and chute fish ladders for overcoming tight spaces
- Consideration of turbulence in design of baffles, jump-pools, roughened channels and other types of fishways
- Including terrestrial wildlife passage features into fish passage projects

The presentation will conclude by providing updates on findings from recent fish passage research, a list of new and anticipated fish passage related publications, and links to online resources that can be useful to designers and those implementing fish passage projects.

Fish Passage Barrier Removal Tools Workshop

Design Methods for Improving Fish Passage and the Costs

Christine Jordan, Assistant Program Manager, Five Counties Salmonid Conservation Program

The Five Counties Salmonid Conservation Program's Migration Barrier Removal Program has completed 48 projects since 1998, restoring access to 119 miles of spawning and rearing habitat for coho and Chinook salmon, as well as steelhead and Coastal cutthroat trout. The approximate cost of this effort, to date, has been $9,078,920.00 for design and construction of projects. The program area includes Del Norte, Humboldt, Mendocino, Siskiyou, and Trinity Counties. The counties maintained stream crossings on anadromous reaches (see *www.5counties.org* for more detailed information on the program and the migration barrier inventory and projects). The rising costs of removing fish passage barriers has become a growing concern in the Five Counties region and in California overall. The total approximate cost per mile of restoration for Five Counties projects was estimated at $76,293.00, based on our project cost data. Compared to the cost per mile for the Klamath River dams ($833,333.00) or Santa Rosa Creek ($3,750,000.00), this seems low, however with counties that are poised to lose portions of their road funding, removing barriers has become a lower priority. Providing the counties with lower cost alternatives for improving fish passage barriers has become a priority within the program. Various treatments of the completed project sites included culvert retrofits through baffle installation and roughened riffle and weir placement; Conspan and Contech arch construction; and traditional bridge construction. The average cost of design and construction for a bridge structure in 2006 compared to 2000 has doubled. The costs associated with barrier removal include permitting, engineering, materials, construction, and monitoring. Several of the grant programs available for fisheries restoration have streamlined and lowered the costs of permitting, but engineering and construction costs continue to increase. The Five Counties Public Works and Transportation Department's engineers design approximately half of the projects that are constructed. Contracted design costs generally include geotechnical work and design assistance, especially for retrofits. Construction costs can be reduced if the work is done with county forces, however, departments are stretched for staff and most barrier improvement projects are contracted to local construction firms. The rising costs of construction have led the program to investigate what some of the counties are doing to reduce their overall project costs. These new methods and design options will be highlighted in the presentation.

Fish Passage Barrier Removal Tools Workshop

Horse Creek Damolition —A Case Study of Successful Dam Removal Using Explosives

Matt Stoecker, Restoration Ecologist, Stoecker Ecological Consultants and Thomas B. Dunklin, Fisheries Geo-Videologist

Want to see a dam get blown up? We thought so. That's why we built "bomb resistant" plexi-glass housings for our video cameras. Join us on a photo and video journey to the wild and scenic Sisquoc River in northern Santa Barbara County's Santa Maria River watershed. This visual journey will take us from the initial surveying of fish passage barriers and habitat, prioritizing fish passage projects, conducting a detailed dam site analysis, working with watershed stakeholders, and finally blowing up a small, obsolete dam (legally!).

For over 35 years a concrete dam measuring approximately nine feet tall and 62 feet wide completely blocked endangered southern steelhead to all but 850 feet of Horse Creek, a tributary to the Sisquoc River within the Los Padres National Forest. On October 18, 2006, a diverse group of agencies, non-profits, and individuals came together and sent concrete skyward, opening up almost 20 miles of former steelhead habitat. Join us for the first showing of this trailer video that will soon be produced into a more detailed "dam removal case-study". The presentation will also include some rare underwater views of southern steelhead from the Sisquoc River.

Fish Passage Barrier Removal Tools Workshop

Limiting Factors Analysis for Sonoma Creek and Tributaries

Lisa Micheli, Sonoma Ecology Center (Presenter) and Bill Dietrich[1]

We compiled over five years of monitoring data and conducted a season of gravel permeability, channel geomorphology, and low flow surveys to assess physical factors limiting salmonid populations in the Sonoma Creek Watershed. Data analyzed included California Department of Fish and Game (CDFG) habitat typing surveys that cover 80% of blue-line tributaries. This study was conducted in support of the Regional Water Board's sediment TMDL under preparation for the Sonoma Creek watershed.

Primary limiting factors include loss of summer and winter rearing habitat due to changes in physical habitat structure associated with channel incision. Changes include: loss of floodplain habitats, reduced channel complexity and associated in-stream shelter, and longer and shallower pools (particularly on the mainstem). Low densities of large woody debris (LWD) (less than one piece per mile) contribute to low shelter and are hypothesized to weaken pool structure and reduce retention of spawning gravels. A watershed-wide barrier survey indicates that 25% of potential fish-bearing stream length is cut-off from use, primarily due to incision below road-crossing culverts.

While measured suspended sediment concentrations did not reach lethal levels, during storm events levels reached those associated with "major physiological stress." Sedimentation of the streambed causes impacts that include loss of winter rearing habitat due to high embeddedness, particularly on high-sediment load streams draining Sonoma Mountain. Fine sediment is also hypothesized to reduce spawning gravel permeability, with estimated survival rates at only 30% basin-wide. Average observed pool filling by fine sediment was 8.5%, twice that observed in the Napa River watershed using the same "rapid V-star" technique.

Measurements of lengths of dry stream channel during summer low flow conditions (when flow typically falls below 1 cfs) show that on average approximately 40% of surveyed blue-line stream (below known or estimated barriers to fish migration) dry out, causing significant mortality to over-summering salmonids. Stream temperatures were generally below 68° F in tributaries (correlated with high percentages of riparian cover) but reached lethal levels in some summer seasons in lower reaches of mainstem Sonoma Creek. The effect of summer groundwater withdrawals on stream base flow and temperature remains open for enquiry.

Restoration recommendations fall into two classes. The first is treating physical symptoms of habitat loss, and by removing barriers to passage and directly increasing habitat complexity through log/boulder installation, cobble augmentation, and incorporation of riparian vegetation into bank stability projects. Additionally, this class would include restoring secondary channels and floodplains where feasible. The second class of recommendations aims to treat causes of imbalances between flow and sediment supply with criteria for new development to keep water and sediment on-site and measures to enhance groundwater recharge. While treating symptoms provides for some immediate improvement in habitat quality and quantity, getting to the systemic causes of channel incision and low base-flow provides a template for a long-term approach to watershed restoration.

1 UC Berkeley Department of Earth and Planetary Sciences, Stillwater Sciences

Fish Passage Barrier Removal Tools Workshop

House Creek Dam Removals: A Case Study and Lessons Learned

Leah Mahan, Marine Habitat Resource Specialist, NOAA Restoration Center

NOAA and Trout Unlimited removed two flash board dams from House Creek, tributary to the Wheatfield fork of the Gualala River, during the fall of 2006. Before the dams were removed, longitudinal profiles, cross sections, pebble counts and photo points were established at each dam site to characterize the channel elevations and substrate size. Surveys showed that significant quantities of gravel were trapped upstream of the dams, and the channel downstream of each dam consisted primarily of exposed bedrock with very little gravel substrate. Both dams, and a small portion of the aggraded gravel upstream of each, were removed using an excavator and ram arm attachment. Most of the accumulated gravel upstream of each dam was left in place to redistribute downstream. No grade control was installed at either site. As-built longitudinal profiles and cross sections were completed just after dam removal to compare the pre-dam removal channel shape and profile to conditions just after construction. An additional survey will be completed just before the SRF conference to quantify substrate and channel movement during the first winter of adjustment. This information will be helpful in estimating the potential rate of substrate movement and its impacts to the stream channel after dam removal.

Fish Passage Barrier Removal Tools Workshop

County Road Crossing Inventories: Priorities for Fish Barrier Removal

Darcy Aston, Program Director, FishNet 4C

Counties can play an important role in salmonid fisheries restoration through their responsibilities to maintain infrastructure and develop land use planning policy. FishNet 4C is a coalition of central California coastal counties working to implement fisheries restoration programs, and is comprised of Sonoma, Marin, San Mateo, Santa Cruz, and Monterey counties. Formed in response to the Endangered Species Act listings of coho salmon (1996) and steelhead trout (1997), FishNet 4C has provided a collaborative forum for the counties to work together and with federal and state agencies to implement fisheries restoration programs.

One of the first tasks accomplished by FishNet was a study to determine what actions the counties could take to protect and restore salmonid fisheries in their jurisdiction. This report, "Effects of County Land Use Policies and Management Practices on Anadromous Salmonids and their Habitats" (Harris et al, 2001) highlighted the areas in which the counties could be effective, and thus the foci for the FishNet 4C program. Based on the findings of the report, the FishNet program focuses on (a) implementing fish passage restoration projects on county facilities, (b) employing best management practices during maintenance activities, and (c) incorporating aquatic habitat protection into land use regulations and policies.

A high priority for FishNet is to address the fish passage barriers created by county facilities such as culverts, bridges, or low-water crossings. However, information on the actual number of barriers and their severity was incomplete, making it hard to devise an effective and efficient program for restoring these crossings. The first order of business for FishNet was to conduct stream crossing inventories on county-maintained roads to evaluate fish passage and prioritize treatments. These inventories, which were completed for each county, form the backbone of the FishNet counties' fish barrier removal/retrofit program.

This presentation will describe the FishNet 4C stream crossing inventories and how they are used by the counties to prioritize and obtain funding to open their watersheds to migrating salmonids. It will also discuss other tools that might be helpful to local government agencies in addressing fish passage barriers, and ways to partner with private landowners.

Fish Passage Barrier Removal Tools Workshop

Promoting Natural Channel Evolution: A Solution to Fish Passage Issues in Willow Creek, Sonoma County

Lauren Hammack, Geomorphologist, Prunuske Chatham, Inc.

Willow Creek flows from an 8.7 square mile watershed into the Russian River approximately two miles upstream of its mouth at Jenner. It is a protected, wildland watershed (acquired by State Parks in 2005) and has been targeted as a priority watershed by the coho broodstock program. Fish passage through the lower 1.5 miles of the watershed is a limiting factor in salmonid restoration in the watershed.

Willow Creek has experienced rapid sediment accumulation in the lower one mile at least since the early 1940s. Recurrent dredging was necessary to maintain channel capacity and provide fish passage second bridge (RM 0.8). Dredging was curtailed in 1987 after State Parks acquired the property. Rapid aggradation ensued, and by 1995 the historic channelized reach had accumulated so much sediment that the channel no longer functionally exists. As of 2004, the completely aggraded channel section extended approximately 3,000 feet upstream of the second bridge.

The local community, landowners, and regulatory agencies have made restoring fish passage a priority. Thus, a project to evaluate the feasibility of designing and constructing a natural, self-maintaining, bankfull channel through lower Willow Creek was completed in 2005. Three physical constraints inherent to the setting were determined to be significant limiting factors to the design and success of a constructed channel.

- The continued high sediment yields and transport rates in the watershed.
- Backwater from the Russian River produces a highly effective sediment deposition environment at its upstream edge. The two to five year return interval floods inundate Willow Creek in the low gradient reach below second bridge.
- Low valley gradients (0.05%) below second bridge.

A bankfull channel could be constructed; however, it is highly probable that it would quickly suffer the same aggradation and loss-of-channel-capacity fate as the previously constructed and dredged channel. In addition, potential negative environmental impacts from constructing a bankfull channel through the aggraded reaches include the destruction of the ecologically significant tidal wetlands and altering the sediment volume and balance in the Russian River estuary. Thus, we determined that construction of a self-maintaining, bankfull channel is not a practical solution for managing sediment and enhancing fish passage in lower Willow Creek.

Modification of the second bridge road embankment is necessary to re-establish channel connectivity and the channel's ability to migrate laterally across the valley. The substantial modification or removal of the approach road embankment at the second bridge was found to be the only alternative to hold promise for a long-term, low-maintenance solution that ensures fish passage.

Sustainable Winegrape Growing Practices Along the North Coast Tour

Field Tour Leaders*: Kent Reeves, East Bay Municipal Utility District & senior author of the Ecosystem Management chapter for the "California Code of Sustainable Winegrowing Practices" and Ann Thrupp, Director of California Sustainable Winegrowing Alliance*

Livestock and winegrape production are two of the largest agricultural land uses in California and encompass over 38.5 million acres combined. These two forms of agricultural production have been an important component of California's economic and social fabric since the establishment of the first Spanish mission in San Diego in the late 1700's. Combined, livestock and winegrape production contribute over $50 billion annually to California's economy. Resource management professionals recognize the role of sustainable agriculture in the conservation of fish and wildlife. Therefore, understanding the sustainable management of livestock and winegrape production can contribute to an overall benefit for fish and wildlife influenced by these two forms of agriculture.

Implementation of Sustainable Winegrape Growing in California

California is one of the world's leading grape producers, accounting for 90 percent of U.S. production and more than nine percent of global output—fourth largest after France, Italy and Spain. Winegrapes are grown in 46 of California's 58 counties covering 513,000 acres and ranking among the state's top 10 agricultural products. Within the agriculture industry, California winegrape growers are considered leaders in the sustainable farming arena. However, how does one implement sustainable farming in their own vineyard? The classroom portion of the workshop will address the challenges of sustainable winegrowing, which are: (1) defining sustainability; (2) implementing sustainable winegrowing practices in the vineyard; and (3) measuring progress at the individual vineyard level. Examples of sustainable winegrape growing adjacent to riparian areas will be discussed.

Growing Practices along the North Coast

For this field tour on Wednesday, March 7th, we will visit three vineyards and a winery that are involved in sustainable winegrape growing practices in Sonoma and Mendocino counties. Fetzer and Bonterra vineyards have two major projects with the RCD and NRCS to restore watersheds, mainly for the purpose of salmonid habitat enhancement and restoration. We will visit these sites as well as Preston vineyards in Sonoma county, which features hedgerow plantings and creek protection practices. After the tour we will have an opportunity to taste wines at the Fetzer Winery in Hopland.

Impacts of Large Woody Debris Installation on Channel Morphology and Habitat, Sonoma Valley, California Tour

Field Tour Leaders*: Lisa Micheli, Restoration Program Manager, Will Pier, Fisheries Restoration Specialist, and Mark Newhouser, Riparian Restoration Specialist, Sonoma Ecology Center*[1]

This field tour will guide participants to a series of large woody debris and boulder installation sites in Sonoma Valley located on two major tributaries of Sonoma Creek. These projects were installed based on CDFG protocol with the aim of enhancing pool habitat. Participants will have the opportunity to see how these projects performed under the pressure of a rare flood event. These projects also display innovative approaches to enhancing the aesthetics of installations.

Topographic surveys before and after installation of large woody debris (LWD) provide a basis for evaluating implementation success and for refining our understanding of how these types of projects may perform in a range of environments. The Sonoma Ecology Center installed a number of LWD fish habitat structures in 2003. Creeks treated included the main stem of Sonoma Creek and two tributaries (Graham and Calabazas Creeks). Cross-sections and longitudinal profiles for these projects were resurveyed in 2006, following the flood of record on Sonoma Creek (at least a 50-year return interval event).

Sonoma Valley is a high sediment yield watershed largely due to volcanic parent material (the Sonoma Volcanics geologic unit). Project impacts on channel morphology were a function of resulting erosion or sediment storage on-site. While pool scour is the typical objective of projects following Department of Fish and Game protocols, we found that in some cases projects were quite efficient at trapping gravels and cobbles. The result was increased spawning habitat availability at affected project sites. This result strengthens our hypothesis (based on geomorphic surveys conducted for a Limiting Factors Analysis) that the paucity of spawning gravel availability in Sonoma Valley tributaries may be linked to low densities of large woody debris.

Some sites were modified due to landowner concerns about the aesthetics of LWD and boulder installations. Suburban/ rural streams of Sonoma Valley with highly visible habitat restoration sites require natural looking, lower impact designs. This requires working closely with landowners during design stage, greater care during installations, frequent irrigation of revegetation during dry months, and monitoring after high flow events to assess for LWD losses and changes.

1 Co-authors: Rebecca Lawton, Jessica Olson, Victor Flores, Will Pier, and Mark Newhouser, Sonoma Ecology Center

In-Stream Restoration and Bioengineering Practices Tour

Field Tour Leaders*: Mike Jensen, Prunuske Chatham, Inc., Evan Engber, Bioengineering Associates, and The Bay Institute, Students and Teachers Restoring a Watershed (STRAW) Project*

Learn about and tour local in-stream restoration and bioengineering projects with staff from Prunuske Chatham, Inc.; Bioengineering Associates; and The Bay Institute's "Students and Teachers Restoring a Watershed (STRAW) Project". This full day event will start with a slideshow of the project sites and an overview of project considerations and design details. Afterwards, we will tour each project.

The first site visited will be Beringer Blass Wine Estates in Asti to see a large-river bioengineering project designed and constructed by Bioengineering Associates Inc. This project repaired 900 critical feet of eroding bank on the Russian River. The Russian River drains 1,485 square miles and is approximately 112 miles long. Over a 10 year period, the project site lost up to 300 lateral feet of streambank along several thousand feet; removing large trees and threatening vineyard roads and historical buildings. Another 80 lateral feet of bank eroded during the two-year planning period. Construction of the bank stabilization required moving the river into a secondary channel. The eroding bank was re-sloped and then stabilized with a live willow brush mattress and three large boulder wing deflectors. Live willow siltation baffles were used to stabilize the toe of the newly shaped bank and to build a terrace. This project was completed in 2002.

Next, we will visit a stream stabilization project along a headwater tributary to the Laguna de Santa Rosa. The Laguna is a 254 square mile watershed and the second largest tributary to the Russian River. Participants will examine how a small, severely eroded stream was completely reconstructed and discuss the process from design through construction. The small stream flows through highly erodible soils and had severely incised in the last five years creating steep, undercut banks leading to multiple bank failures and slumps, which would ultimately threaten the stability of a reservoir and create severe sedimentation in the Laguna downstream. The streambed and reservoir were stabilized by reconstructing the natural bed elevation of the stream on 10 feet of engineered fill allowing for appropriate channel geometry widths and flood-prone meadow creation. The 800 linear feet of streambed was built using boulder step pools, roughened riffles, and boulder cascades for grade controls. Streambanks and created floodplain areas were stabilized using coir blankets along with an aggressive transplanting and revegetation effort. Isolated slips and headcuts were stabilized using various bioengineering techniques including brush layering, willow wattles, straw wattles, live staking and fabric reinforced earth fills with brush layers.

Stemple Creek projects highlight restoration work completed by students in the STRAW Project in partnership with the Marin and Southern Sonoma RCDs and NRCS. The STRAW Project works with K-12 classes and technical professionals in the North Bay to restore the watersheds through action and education. Participants will visit a multi-phase riparian restoration project on four ranches along Stemple Creek, first started in 1993 by students working with a rancher to help the endangered freshwater shrimp (*Syncaris pacifica*). Stemple Creek flows west of Petaluma through family farms and ranches to the Estero de San Antonio, north of Tomales Bay. We will examine some of the revegetation and biotechnical projects completed by students and AmeriCorps volunteers and hear from STRAW staff about the successes and challenges of watershed education and restoration during the 15 year history of the program.

Estuary and Lagoon Restoration Workshop

Workshop Coordinators*: Leah Mahan and Gillian O'Dougherty, NOAA Restoration Center*

Estuarine habitat in California is comparatively sparse and where it does exist is under pressure from a growing population of coastal dwellers as well as invasive species, pollution and sedimentation and erosion. Estauries are among the earths most productive ecosystems, providing critical habitat for various life stages of commercial fish and shellfish including salmonids. Steelhead trout and Chinook salmon in particular benefit from estuarine habitat and as such estuaries are increasingly becoming the focus of salmonid research and restoration planning efforts. Currently in California, there are efforts underway to assess the status of coastal estuaries and lagoons and to develop standard monitoring protocols that will help us compare their response to particular restoration actions. Limiting factors to ecological functioning and salmonid usage are being identified and communities and researchers are accomplishing restoration projects that restore more natural conditions to these highly altered systems. As recovery and restoration plans are moved from planning to implementation there is a need to improve communication between practitioners and provide feedback on best practices in order to achieve consistently effective results.

This workshop will bring together researchers, planners and restoration practitioners to discuss estuarine restoration at an ecosystem level and as it specifically relates to salmonid restoration and recovery. Speakers will cover a variety of topics from research to planning to implementation and post-project monitoring.

Estuary and Lagoon Restoration Workshop

The Dynamic Dance: Habitat Understanding and Enhancement of the Mattole Estuary

Drew Barber, Project Coordinator, Mattole Salmon Group

The Mattole River is 63 miles long and is located at the north end of California's Lost Coast. The nearby Mendocino Triple Junction makes the Mattole the most seismically active area in the lower 48 United States. This fact, combined with the Mattole's erosive soils and high annual rainfall, make this river system susceptible to erosion-related impacts.

The Mattole Estuary, a vast, low-gradient plain is affected by virtually all cumulative impacts in the watershed. The very nature of the estuary is change as it is affected daily by tides and seasonally by wind, river volume and sediment loads. This delicate and dynamic system is a historic essential over-summering nursery for juvenile Chinook salmon. Today, surveys show consistent and total disappearances of the thousands of juvenile Chinook that take summer refuge in the estuary. It appears that maintaining the habitat value of the estuary will be key to the long-term survival of the Mattole Chinook.

This presentation will describe the context and changes of the Mattole Estuary in the last 100 years and discuss what Mattole restoration groups are doing to return the estuary to a habitat that supports Mattole salmon.

Mattole projects were designed and built in cooperation with Matt Smith, Environmental Restoration Services, owner and funded by the California Department of Fish and Game, Fish America Foundation, Bureau of Land Management, California State Coastal Conservancy.

Estuary and Lagoon Restoration Workshop

Tidal Marsh and Creek Restoration on Diked Former Tidelands Surrounding Humboldt Bay, California

Darren Mierau (presenter), McBain & Trush, Inc., John Bair[1] and Jeff Anderson[1]

The bottomlands surrounding Humboldt Bay were once a huge tidal and freshwater wetland complex. Estimates from 1854-55 township plat and meander survey maps suggest approximately 9,623 acres of marsh were converted to agricultural use. Only 880 acres (8%) of the original marshes remain today. In addition to this dramatic loss of wetlands, extensive networks of tidal slough and creek channels were cutoff from their connection to the estuary. These tidal channels provided habitat for a multitude of invertebrate, fish, bird, and wildlife assemblages. Within one segment of the bottomlands, we estimated conversion of 815 acres of marsh, loss of 5.2 miles (equating to 57 acres) of 3rd order tidal sloughs, and as much as 67 miles of 1st and 2nd order tidal creeks. Several restoration projects have been completed or are underway to reconnect tidal channels to the estuary and restore fish passage so salmon and steelhead can reach their ancestral spawning grounds and other native fishes can access high quality rearing habitat. The Rocky Gulch project completed in 2005 (with funding from CDFG and FWS) rehabilitated 4,000 ft of tidal and stream channel, installed a fish-friendly tidegate that also maintains a 20-acre brackish marsh, and brought back coho salmon for the first time since the early 1960s. Pastures behind the dikes were also protected. The Wood Creek project, planned for 2007, will remove a tidegate, restore tidal channels, and restore 35 acres of Lyngbye's sedge (*Carex lyngbyei Hornem*.) and Tufted Hairgrass (*Deschampsia caespitosa L. ssp. holciformis C.Presl.*) marsh.

1 Jeff Anderson and Associates

Estuary and Lagoon Restoration Workshop

Estuary Restoration in the Humboldt Bay Region of California Design and Permitting Challenges

Don Allan, Co-Director, Natural Resources Services Division, Redwood Community Action Agency

Salmon restoration has moved its focus around over the years. In the 1980s it was largely focused on the stream channel and riparian corridor. In the late 1990s, funding became available for a wide variety of projects including watershed planning, organizational support, instream restoration, and upslope erosion control. Fisheries restoration became watershed restoration. With the upslope and middle portions of the watersheds being addressed, attention started focusing on the lower end of the system—the estuaries where the fresh water meets the salt water.

Estuaries are essential components of salmon habitat that serve several important purposes. A key estuary function for salmon is the osmotic regulation that anadromous fish undergo in the estuary as they transition from freshwater to saline water and vice versa. Estuaries are also some of the most productive biotic environments and juvenile salmonids that have good estuary habitat can spend the summer fattening up in this food rich environment. Large size translates into increased survival once the fish does migrate to the ocean.

The location of estuaries—next to the ocean, close to ports and harbors, has resulted in them being some of the first areas developed for urban and agricultural uses. The Swamp and Overflowed Lands Act encouraged farmers to turn these areas into "productive" land by building dikes to keep out the tide waters, and draining the area with ditches. The tide gates installed to keep out the tide water also proved effective at restricting salmonid access to the upstream habitat.

With our attention turning to this brackish water environment, we have faced a number of challenges in designing and permitting estuary restoration projects. This presentation will cover four estuary restoration efforts that the Natural Resources Services Division of Redwood Community Action Agency is involved in around Humboldt Bay. Common to all projects are the design challenges of working within areas that have been diked off for decades and in some case a century or more. Channel dredging, filling old slough channels, clearing vegetation to accommodate human uses, and the exclusion of tidal influence, have reduced the extent of these habitats and in most cases degraded the habitat to the point where it is marginal at best. Yet these areas have immense potential for restoration.

Common to most of the ongoing estuary restoration projects are the restrictions based on the desire to retain existing land uses. Also common to these projects is the multitude of permits needed. Similarly, the design issues have a common theme of how to allow enough tidal restoration to restore habitat, while minimizing the impacts on the adjacent land uses.

This talk will be a case study of four ongoing projects, discussing the design challenges, working with landowners, and a discussion of the common permitting issues.

Estuary and Lagoon Restoration Workshop

Are Physical Changes in Small Estuaries Limiting Salmon and Steelhead Production in Northern California: Clues and Enhancement Opportunities from Salmon Creek

Lauren Hammack, Geomorphologist. Prunuske Chatham, Inc.

A two-year study of the Salmon Creek estuary in western Sonoma County was completed in June 2006. Salmon Creek, like many of California's coastal streams, has lost its coho salmon run in the last 10 years and is left with a dwindling steelhead trout population. The project, funded by the State Coastal Conservancy, was designed to (1) investigate both the historic and current physical condition and functioning of the Salmon Creek tidal estuary including how it is used by salmon and steelhead, (2) assess upstream factors that directly affect critical habitat in the estuary, (3) collect and document pertinent historical information, and (4) develop recommendations to enhance the estuary for salmonid habitat.

Dramatic reductions in the size and depth of the Salmon Creek estuary have occurred since European settlement of the area in the mid 1800s. Areas of open channel have filled in, side channels have disappeared, the channel has aggraded and coarsened, and tidal wetlands have transitioned to upland communities. Continued high rates of sediment delivery to the estuary are contributing to annual depth and volume reductions.

Good quality rearing habitat in coastal estuaries is achieved in either bar-open conditions with full tidal mixing or if full conversion to a freshwater lagoon occurs after bar closure (Smith, 1990). Water quality profiles indicate that, during closed-bar conditions, the lower lagoon near the beach is well-mixed all summer, while pools in the middle and upper zones are strongly stratified with near-bottom saline layers remaining anoxic and too hot for salmonid survival. The areas of adequate water quality are devoid of cover and shade.

Spring—but not winter—rainfall appears to be a major determinant of estuary habitat quality in the following summer. Summer streamflows determine the late summer lagoon volume and govern the quality and extent of rearing habitat for juvenile salmonids, and thus the annual juvenile production and survival. It is estimated that in 2004 very low, if no, steelhead smolts were produced by the estuary. High spring rainfall in 2005 led to better water quality and higher water levels in the lagoon. Correspondingly, smolt production was significantly greater. Without significant increases in summer freshwater flows, channel depths, side channels, and large woody debris for cover and predation protection the Salmon Creek estuary/lagoon will continue to be marginal salmonid habitat.

Recommendations call for improving habitat diversity in the Salmon Creek estuary through woody debris structures and possible restoration of side channels and pond connectivity; maintaining beneficial summer freshwater flows through water conservation and better management of diversions; expanding erosion control, riparian protection, and stormwater management practices in the upper watershed; and enhancing upstream rearing habitat to provide alternatives to poor-quality estuarine habitat. The full Salmon Creek estuary report can be found at *http://www.bodeganet.com/SalmonCreek/*.

Estuary and Lagoon Restoration Workshop

Working with Landowners, Multiple Partners and Natural Processes to Enhance Off-channel Estuarine Habitat, Smith River, Del Norte County, California

Zachary S. Larson, Smith River Watershed Coordinator and Rocco Fiori, Fiori GeoSciences

Reservation Ranch in the Smith River estuary has provided an excellent opportunity to investigate the response of fish, wildlife, and vegetation to manipulations of off-channel estuarine habitat. A three-acre area at the lower end of a prominent point bar was enhanced by removing less than 7,000 cubic yards of river sediments and installing 10 large redwood rootwads. The elevation of the site was made equal to the elevation of an adjacent marshland. A channel (400'Lx12'Wx 3'D with a concave bottom) was created between these areas and rootwads were keyed into the channel margin substrate. We anticipate emergent marsh colonization of the modified bar area, and the channel to become self-maintaining. Ongoing fisheries and geomorphological monitoring will accompany spring plantings of marsh and riparian plant species. We will discuss experiences with planning, permitting, implementation, and monitoring. Project partners include the Del Norte Resource Conservation District, Department of Fish and Game, National Marine Fisheries Service, Reservation Ranch, Smith River Advisory Council, National Fish and Wildlife Foundation, and the US Fish and Wildlife Service.

Estuary and Lagoon Restoration Workshop

Salt River Estuary Enhancement: Enhancing the Eel River Estuary by Restoring Habitat and Hydraulic Connectivity to the Salt River

Michael Bowen, California State Coastal Conservancy
and Greg Kamman, Kamman Hydrology & Engineering, Inc.

Located in Humboldt County, California, the Salt River runs through the southern portion of the low-gradient Eel River delta. The river enters the Eel River estuary via its southwestern finger. Once a shipping and port channel in the late 1800s, the Salt River has aggraded along the majority of its length, severely impacting fish passage and salt marsh habitat (Coho salmon yearlings were observed in a tributary, Francis Creek, during the summer of 2005. Though steelhead are reported to have historically spawned in tributaries draining the south side of the watershed, these coho were the first salmonids seen in many years). Sedimentation has also substantially increased flooding, causing extensive property damage and frequently placing Ferndale's sewage treatment plant out of compliance with permitted discharge standards.

Sediment deposition in the river has been so severe that it has plugged the channel and formed a drainage divide, effectively segregating the upper 40 percent of the Salt River watershed from the lower 60 percent. In addition, approximately 90 percent of the former estuarine salt marsh has been diked and drained over the last century. Increased erosion associated with land use changes of naturally erosive upland terrain, and "reclamation" of wetlands, principally for dairy farming, are the chief causes for channel in-filling.

The community of Ferndale and species dependent upon the Salt River and estuary have endured more than a century of adverse effects. Although some enhancement planning has occurred, project implementation of any kind has been limited by lack of a comprehensive, enhancement plan including available enhancement sites. Now, following feasibility level investigations funded by the Coastal Conservancy and the Department of Fish and Game, the Humboldt County Resource Conservation District and the Salt River Advisory Group have launched an ambitious Salt River Restoration Project. This new enhancement phase is made possible and more promising by the potential acquisition of a sizable ranch located at the confluence of the Salt River and the Eel River estuary. This 450-acre site will serve as the keystone of the Salt River Restoration Project. The project is now undergoing initial design and environmental compliance.

The chief restoration components for the project include: main channel expansion and riparian corridor enhancement; increased tidal exchange and estuarine habitat; reconnection of the upper and lower watershed; and upslope erosion control measures. The project should significantly improve fish passage through the lower river to upstream spawning grounds. Brackish and salt marsh expansion in the lower river and estuary will improve seasonal rearing and foraging habitat, and floodplain/riparian corridor expansion will improve salmonid refugia habitat. The project will also offer many benefits to migratory birds and many other species. The expansion of tidal marsh will also sustain channel improvements through locating strategic connections to the mainstem and increased channel scour associated with the increased tidal prism, thus alleviating chronic flooding in the area. The Salt River Advisory Group members anticipate that the Salt River Restoration Project will combine benefits to fish and wildlife populations with improved flood protection well into the future.

Estuary and Lagoon Restoration Workshop

Limiting Factors to Salmonid Production in Estuaries and Lagoons

Steve Cannata, Department of Fish and Game

Cumulative effects from modifications to estuarine channels and their parent watersheds often result in environmental alterations that may limit or impair salmonid use of estuaries and lagoons. A common issue of concern for many estuaries and especially for lagoons is suitable water quality. Suitable water quality in lagoons is often related to the quantity and quality of freshwater inflows, channel connectivity, channel morphology, land use and the status of the parent watershed. Results from studies of the Navarro River estuary/lagoon provide relationships between freshwater inflows, temperature, dissolved oxygen and length-weight relationships developed for steelhead. These data show that steelhead condition factors were greater in years with higher freshwater inflows than in years of low inflows. In addition, opportunities to increase salmonid production in other estuarine systems will be reviewed.

Dam Removal and FERC Relicensing Workshop

Workshop Coordinator*: California Hydropower Reform Coalition*

The FERC Relicensing Process and Dam Removal

Keith Nakatani, Director, California Hydropower Reform Coalition

Most hydropower dams were constructed prior to the enactment of our nation's environmental laws and have therefore been operating under antiquated terms for decades. These state- and utility-owned dams receive federal operating licenses that last from 30 to 50 years. During this license term, dam owners are not expected to modify projects in order to meet evolving environmental laws. Not until the license expires is there an opportunity to evaluate how a project has impacted the natural environment and the public's right to clean, accessible rivers. New licenses may require dam owners to incorporate measures that improve habitat for fish and wildlife, reduce impacts to water quality, and increase opportunities for public recreation. In some cases, when hydropower operations produce a small amount of energy with respect to the harm caused to rivers, the most economical and environmentally sound decision may be dam removal.

During this discussion we will take a look at:

- What the FERC relicensing process is
- Who is involved in the process
- Restoration opportunities
- What the key opportunities for public involvement are
- Upcoming projects in California
- Examples of dam removal through the FERC process

Dam Removal and FERC Relicensing Workshop

Removing Dams on the Mokelumne: A Case Study of the FERC Relicensing Process

Pete Bell, Co-founder & Vice President, Foothill Conservancy

Learn how Pete Bell, who began not knowing anything about the FERC process, got involved and played an integral role in restoring the Mokelumne River. The Mokelumne River relicensing was the longest-running FERC relicensing process in the nation before settlement in the summer of 2000. After nearly thirty years, the Mokelumne relicensing became the poster child for a process gone astray. Finally, when FERC buckled down, PG&E entered into a year-long intensive negotiation with conservation groups and resource agencies. One of the many restoration successes was a decision to increase river flows, which resulted in breaching diversion dams on East and West Panther creeks, tributaries to the Mokelumne.

Although the process was long and arduous, in a way, the Mokelumne settlement paved the way for many future relicensings. We will examine some of the most noteworthy lessons learned in an effort to better prepare stakeholders for current and future hydropower relicensings.

We will look at:

- How we decided to ask for removal
- Negotiating in the settlement process
- Finances of dam removal and leveraging funds
- Physical removal of the dams
- Post removal: Monitoring the recovery of an ecosystem

Dam Removal and FERC Relicensing Workshop

Stakeholder Conflict in Adaptive Management

Dave Steindorf, California Stewardship Director, American Whitewater

All restoration projects are limited by the knowledge available at the time the project is initiated, and by the resources available to a particular project. One thing we do know is that our knowledge will change over time and our resources will always be limited. This is particularly important with projects that will take years or decades to implement. Adaptive management holds the allure of being able to adapt to new information in the future. Just having information is not enough to initiate a new direction—we must also have the programmatic structure that allows change to happen.

The history of environmental restoration is full of projects that seemed like good ideas at the time, that now leave us scratching our heads wondering, "Did they really think this would work?" Worse yet are the projects that were known to have little viability at the time, and yet because of simple inertia they went forward anyway. Setting up a structure that anticipates changes in the future will reduce anxiety and future conflict. Stakeholders must know that changes in direction benefit, or least do not hurt their interest, if they are to accept change. Uncertainty breeds anxiety, and anxiety breeds bad behavior. The goal is to structure agreements that encourage good behavior.

This session will discuss ways to structure agreements that allow flexibility and certainty, particularly through mitigation funds. We will discuss how they can be used correctly and incorrectly.

Dam Removal and FERC Relicensing Workshop

Visualize the Klamath River Un-Dammed: Using an Interactive Model to Envision Dam Removal

Steve Rothert, Director, California Field Office, American Rivers

Decommissioning large dams is a scientifically, technically and politically complex process. Many models have been developed to better understand the potential effects of dam removal on sediment transport and deposition, aquatic habitat, water quality, fishery resources, and other issues. These tools do not address the many questions regarding how the former reservoir area will evolve after a dam is removed and the reservoir drained. Uncertainty about the visual impacts of dam removal and the time required to restore aesthetic values can increase opposition to dam removal efforts.

Community Viz, an interactive computer model, has been developed to assist communities in visualizing significant modifications to their landscape, including the removal of large dams. American Rivers has applied the Community Viz software to the Klamath River dam removal effort, allowing stakeholders an opportunity to see how the river might look after the dam is removed, how vegetation will evolve over time, and whether local residents will have a view of the restored river.

This presentation will demonstrate the use of Community Viz in the Klamath Dam removal effort, including still images and "fly-throughs" of the landscape before, immediately after and several years after dam removal.

Dam Removal and FERC Relicensing Workshop

Moving the Message: Effective Media and Grassroots Outreach

Dr. S. Craig Tucker, Klamath Campaign Coordinator, Karuk Tribe

Good science, policy, and legal teams are necessary but insufficient resources needed to move large restoration efforts forward. Media and grassroots strategies are also necessary. In this session, I will describe the fundamental components of a winning media and grassroots strategy, using the "Bring the Salmon Home" campaign as an example. This campaign is still in progress and, if successful, will result in the largest dam removal effort in history.

We will discuss:

- Developing a coalition
- Developing a message
- Delivering a message
- The importance of grassroots activists

Dam Removal and FERC Relicensing Workshop

Fuel for the Fire: Does Science Provide the Answers Sought by Participants of a License Proceeding Involving Dam Removal?

Eric Ginney, PWA, Ltd. Environmental Hydrology

Dam removal is increasingly gaining attention and recognition as a potentially viable river restoration tool. Restoration of an unregulated flow regime can result in increased biotic diversity by returning riverine conditions and sediment transport to formerly impounded areas. This renews preferred spawning grounds or other habitat types, while simultaneously increasing biotic diversity.

Fish passage is another important potential benefit of dam removal. However, the disappearance of the reservoir may also affect certain publicly-desirable fisheries and reservoir-based economies. Additionally, potential short-term ecological impacts of dam removal include an increased sediment load that may cause adverse effects to various biota and habitats. The increasing possibility of dam removal in FERC license proceedings makes a critical examination of the potential ecological benefits, adverse effects, and costs an essential part of the complicated calculus of negotiating an FERC license.

This session of the workshop will provide an overview of the scientific issues and concerns involved in exploring the removal of a dam, with particular emphasis on the scientific process within an FERC licensing proceeding. The session will highlight how science and negotiations have occurred in the past and how they may change in the future in response to the relatively untested Integrated Licensing Process (ILP). One possible future we explore entails NGO and agency-generated science becoming increasingly important within FERC proceedings, setting the course for how proceedings develop and how a license is issued.

Dam Removal and FERC Relicensing Workshop

Trials on Fishways and other Mandatory Conditions in Hydropower Licenses

Richard Roos-Collins, Director of Legal Services, Natural Heritage Institute

The Energy Policy Act of 2005 (EPAct) establishes two new procedures so that parties may challenge (or defend) the mandatory conditions which federal resource agencies adopt for incorporation into hydropower licenses. These conditions govern fish passage and protection of federal reservations, such as National Forests. The first new procedure is a trial hearing on disputed issues of material fact before an Administrative Law Judge of the agency which proposed the condition. In such a trial, experts testify and are cross-examined on the disputed issues. FERC no longer holds such hearings on other issues. Under the second new procedure, a party may propose an alternative condition to provide the same level of protection in a more cost-effective manner. Both procedures create significant opportunities to improve agency conditions for the protection of fish habitat and federal reservations. They also create significant risks, in part because of the high expense for any participating party. This presentation will draw upon the first EPAct hearing (which occurred in August 2006 for PacifiCorp's Klamath River Project) to describe strategies for effective participation.

Dam Removal and FERC Relicensing Workshop

Incentives, Costs, and Processes Involved in FERC Relicensing Proceedings: A Cautionary Perspective

Guy Phillips, PhD Economics

The FERC relicensing process operates within a collection of institutional practices, rules, and incentives. In order to understand FERC's procedures and treatment of "science", one must understand both the apparent and the subtle ways in which those practices and incentives operate. This presentation will focus on some of the subtle ways that FERC's procedures affect science, cost, sense of urgency, and use of FERC, NEPA, and ESA procedures. Understanding these subtleties is essential for "science" and "data" to be used effectively in FERC proceedings. Four specific factors will be considered:

1. The role of Congressional direction and lack of direction.
2. The role of precedent and institutional momentum.
3. The role of the delegated responsibility to the states for water quality.
4. The role of the imbalance in time horizons between FERC, the licensee, and the "public interest"— and the impact of the prospect for an annual operating license on people's sense of urgency.

Similarly, those institutions—public and private—that hold FERC licenses operate within incentives and practices that can be understood in a context that has relatively little to do with FERC's own practices, rules, and incentives. This presentation will focus on two of the subtle incentives that investor owned electric utilities (IOUs) have as they approach and proceed through an FERC relicense application.

1. The "real" customer of the IOU and the role of that customer in the FERC process.
2. The financial incentive(s) of the IOUs.

Ultimately, one would like to believe that federal processes, including FERC's, will be transparent, rational, and based on an analytic interpretation of the "science" and "data". Similarly, one would like to believe that the relicensing process will discover the public's interest in, and values about, those river and riparian resources that are owned by the public, which were handed over decades ago to the present FERC license holder.

From the perspective of this economist who has been involved on-and-off, depending on his personal tolerance, in FERC relicensing and water resource issues for more than 30 years, the deck is stacked against the public's interest in the public's own water resources. The process and reward structure, and therefore, the incentives, work against reclaiming our own rights in our own water resources.

Rivermouth to Ridgeline Tour of Dutch Bill Creek Watershed Restoration Projects

Tour Leaders*: Brock Dolman, Occidental Arts and Ecology Center,* Doug Gore, Dragonfly Stream Restoration, and Gold Ridge RCD staff

This exciting field tour will focus on the Dutch Bill watershed in Western Sonoma County, which is a tributary of the lower Russian River. Within the 1500 square mile Russian River basin, the 11 square mile Dutch Bill watershed is considered to be one of the most critical watersheds for the recovery of endangered coho salmon and steelhead. Dutch Bill Creek has been a key source of genetically unique fish for the historic coho broodstock recovery and monitoring programs. From rivermouth to ridgeline, this field tour will comprehensively offer an eco-smorgasbord of applied watershed restoration techniques. There may be no other watershed in the region in which you can witness such a plethora and diversity of implemented watershed restoration tools and ideas within a seven-mile drive.

We will be able to view and discuss numerous instream projects such as digger logs, vortex weirs, boulder clusters, and biotechnical willow bank stabilization, as well as fish passage projects such as culvert-to-bridge replacement, boulder step weirs and concrete fishway renovation. We will also discuss fish passage issues associated with the engineering, planning and funding of (1) mitigating for a large county road box culvert, and (2) the pending removal of the 60+ year old Camp Meeker dam. Continuing upstream to the headwaters, we will visit a proposed residential/ commercial development site and discuss a number of stormwater Low Impact Development ideas. We will view our educational watershed road signs and interpretive watershed divide display in downtown Occidental.

The second half of the day will be spent touring demonstration projects of upland watershed restoration tactics. For lunch, we will head uphill to California's eighth oldest certified organic farm at the Occidental Arts and Ecology Center's 80-acre campus. Numerous regenerative watershed projects have been implemented on this land to help inspire ideas for watershed-friendly human settlement patterns. We will observe newly constructed "PWA" style road renovation projects, such as culvert replacements and repair, sediment basins, outsloping, rolling and critical dips. We will walk and talk about numerous applications of stormwater infiltration devices that slow, spread and sink surface flows to help reduce sediment and increase groundwater recharge. Discussions will be had concerning OAEC's forest management, fire and fuel load reduction projects, use of controlled burns and mowing for coastal prairie restoration, Sudden Oak Death treatments, invasive plant species control, small woody debris headcut mitigation projects, wildlife habitat enhancements, rainwater harvesting irrigation pond and much more! Discussions will also include community based watershed organizations as part of the solution, based on OAEC's experience with supporting the organization of citizen based watershed councils through its Basins of Relations training over the past seven years. All in all, this tour will truly provide many diverse and thought provoking opportunities to think, see and act like a watershed moving towards a vision of salmonid restoration.

Using Planned Grazing in the Management of Native Grasslands and Riparian Areas Tour

Tour leaders*: Kent Reeves, East Bay Municipal Utility District and Instructor for California Native Grasslands Association and Stephanie Larson, UC Cooperative Extension*

Although there are gaps in research-based knowledge in regards to managing for California's native grasslands, the initial grazing/classroom portion of this workshop will discuss planning a livestock grazing program which seeks to control annual invasive species while enhancing native perennial species. How to select an appropriate herbivore, timing of grazing and intensity of grazing, managing riparian areas, grazing system and tools needed for a successful grazing regime will be explored. Real life experiences, successful and less successful, will provide context for the discussions.

We will visit three sites to view grazing management practices that benefit native grasslands, riparian areas, and ultimately fish and wildlife. We will visit the Walker Creek and McDonald Ranches in western Marin County. The McDonald Ranch was featured in the California Cattlemen's Association publication Grazing for Change. We will then turn our attention to the Point Reyes National Seashore and the range management program that includes livestock and reintroduced tule elk.

Restoration from Headwaters to Mouth: A Tour of Cooperative Approaches to Restoration in the Austin Creek Watershed

Field Tour Leaders*: Sierra Cantor, Sotoyome RCD, John K. Green, Geomorphologist, Pacific Watershed Associates, Inc. and Bob Coey, Fisheries Management Program Supervisor, Central Coast Region, DFG*

Located in the lower Russian River watershed, Austin Creek is home to a number of federally listed threatened and endangered species, including coho salmon, steelhead trout and freshwater shrimp. The Austin Creek watershed has undergone extensive land disturbance due to logging and rural residential development, and is considered impaired due to excessive fine sediment.

Upslope erosion can severely impair downstream aquatic habitat. Fine sediment delivered to even the smallest class three tributary streams is transported to class one habitat streams, increasing water turbidity and filling pools and gravel interstices. The Sotoyome Resource Conservation District (SRCD) and Pacific Watershed Associates, Inc. (PWA) have partnered for over a decade to identify and repair upslope sediment sources.

Roads, as they have traditionally been constructed, are significant contributors of fine sediment to stream systems. To address existing and potential future road-related sediment delivery to streams, PWA performs assessments of rural road systems to produce erosion control plans for upgrading and decommissioning rural roads in a variety of ownerships and settings.

The first half of the field tour will highlight a road-related erosion control and prevention project completed by PWA in 2005 in the Ward Creek sub-watershed of Austin Creek. In this watershed, PWA has upgraded or decommissioned over 50 miles of rural access roads under the California Department of Fish and Game Fisheries Restoration Grants Program. The tour will highlight road upgrade sites, with emphasis on project goals and the erosion control methods employed in road upgrading and decommissioning.

The second portion of the field tour will examine a localized erosion control and riparian enhancement project to revegetate the banks of two headwaters creeks in the upper Ward Creek watershed. Following PWA's road improvement work, SRCD partnered with Circuit Rider Productions, Inc., to plant 982 linear feet of stream bank and 32,800 square feet of streamside area. Sources of ongoing and potential future sediment delivery had been stabilized using heavy equipment during the road improvement project. After the December 2005 storm events, localized erosion control measures were installed by hand to reduce the erosion as the native plants become established. This project illustrates the use of native plant material to control sediment by stabilizing the banks and creating a riparian sediment filter for runoff as well as establishing canopy cover.

The tour will then move downstream to highlight the Lower Austin Creek Migration Improvement Project (LACMIP). This project is a unique partnership between Bohan and Canelis, a family-owned gravel mining company that has been working in the watershed for nearly four decades, the Department of Fish and Game, NOAA Fisheries, Sonoma County Water Agency, Trout Unlimited and the California Conservation Corps. The LACMIP was implemented to address the aggradation of the lower main stem of Austin Creek by improving 4,000 feet of juvenile and adult steelhead and coho salmon habitat. A series of in-stream structures were installed to recruit and sort spawning gravel and provide pool habitat.

Prince Memorial Greenway Tour: The Benefits and Constraints of Urban Creek Restoration

Field Tour Coordinator*: Alistair Bleifuss, Creek Stewardship Program Coordinator, City of Santa Rosa*

In the late 1980s a handful of citizens dreamed of restoring Santa Rosa Creek in the heart of downtown for public use and benefits including: a more natural creek environment, a bicycle and pedestrian path, maintaining flood control, and removing toxic materials along the creek.

Today, the dream is being realized as riparian vegetation provides shade and wildlife habitat. Deep pools and gravel riffles enhance juvenile rearing and adult migration for steelhead trout and Chinook salmon. Pathways provide recreation, a venue for public art, and alternative transportation routes as part of the 35 miles of creekside trails within the City. The dream continues as strong community support led to creation of the Santa Rosa Creek Master Plan and recently the Draft Citywide Creek Master Plan.

Numerous local, state, and federal funding sources contributed to the Prince Memorial Greenway becoming a model of urban creek restoration that addresses social as well as environmental and economic goals. This award-winning project has increased the public's awareness of the entire creek system in Santa Rosa.

On a walking tour, discover how citizens sparked the transformation of a concrete lined channel into an urban greenway that provides many benefits to the community. Discussion of contaminated soils, flood protection, limited right-of-way, funding, and other obstacles to creek restoration in the urban environment. Tour leaders include former Santa Rosa City Councilmember and one of the original creek dreamers Steve Rabinowitsh; Steven Chatham, Principal of Prunuske Chatham, Inc.; Supervising Engineer Dave Montague and Environmental Specialists Steve Brady and Alistair Bleifuss of the City of Santa Rosa Public Works Department.

patagonia presents the

7-10pm, Thursday, March 8

Wild & Scenic ENVIRONMENTAL FILM FESTIVAL *on tour*

Hosted by

Salmonid Restoration Federation
& Coastwalk

South Yuba River Citizens League's (SYRCL, pronounced 'circle') famous *Wild and Scenic Environmental Film Festival* will be an exciting part of the 25th Annual Conference. Whether it is the struggle for environmental justice, a whitewater adventure, or an educational documentary about dam removal, these films will expose audiences to current water issues and inspire action.

SYRCL has partnered with Patagonia to bring you the festival On Tour. We want to share the powerful messages of these films with a larger audience. Check out *www.wildandscenicfilmfestival.org*. For more information about SYRCL and the Yuba Watershed, visit *www.yubariver.org* For more information about Patagonia, visit *www.patagonia.com*

Down the Copper River

by Thomas Dunklin

Take a journey down the Copper River, with featured musician and raft captain, David Lynn Grimes. Also featured in the clip are aerial and raft based views of the Copper River and sea otters, salmon, eagles, and grizzly bears. The music video is one chapter from a 4-chapter DVD, entitled "Copper River Perspectives." (US, 2004, Music Video, 3:12 min.)

Down the Copper River with David Lynn Grimes.
photo: Courtesy David Grimes

Birdsong & Coffee: A Wake Up Call

By Anne Macksoud

What is the natural organic connection between coffee farmers, coffee drinkers, and birds? Coffee drinkers will be astonished to learn that they hold in their hands the fate of farm families, farming communities, and entire ecosystems in coffee-growing regions. In this film we hear from experts and students, from coffee lovers and bird lovers, and the coffee farmers themselves. We learn how their lives and ours are inextricably linked, economically and environmentally. (US, 2006, Documentary, 56 min)

Glenn Brackett inspects bamboo for a fly fishing rod in Trout Grass.
photo: Volcano Motion Pictures

Trout Grass

by Andy Royer

For many anglers, a fly rod is more than a fishing instrument. It's an antenna, capturing signals of the natural world. But what of the process that turns ordinary materials into extraordinary tools? And why do people around the world continue to spend their days happily wading in rivers if they do not keep what they capture? Unveiling the magic of international camaraderie, fine craftsmanship, and flowing water, Trout Grass tracks the 10,000-mile journey of bamboo around the world. From a lush forest in China's Guangdong Province to a rustic workshop in Montana this film follows the transition of bamboo from a living plant to a finished fly rod. (US, 2005, Documentary 47:48 min.)

Nomads: Wandering Woman of the Whitewater Tribe

By Polly Green, Chris Emerick

Follow the travels of three whitewater kayaking women as they paddle the Zambezi and White Nile Rivers of Africa. Along the way they are unexpectedly touched by a small village in Uganda struggling with the realities of malaria. The river has empowered these women to make a difference. (US, 2004, Adventure Documentary, 21 min.)

Plenary Session: The Evolving Salmonid Restoration Movement: Lessons from a Quarter-century of Adaptation

Taking Wood Out and Putting it in Again: A Generation of Salmonid Restoration in Marin and Sonoma Counties

Liza Prunuske, Prunuske Chatham, Inc.

We have learned a tremendous amount in the past twenty years in Marin and Sonoma Counties, with humility being not the least of the lessons. In the early 1980s, "plan" was a four-letter word. We figured out quickly that we needed plans and real engineering, but getting them funded was extremely difficult. The DFG warden or biologist came out to your site with his handy permit pad, and gave out a 1600 agreement on the spot. The Army Corps of Engineers built dams and channelized rivers, and CEQA was for shopping developments. Meanwhile, in most of our streams, the coho populations kept dwindling or even vanished, and steelhead were added to both state and federal threatened species lists.

Yet we took action under dire circumstances. We shared our results, fought for funding, trained a whole new generation of excellent scientists and restoration ecologists, and secured a relatively stable mandate from the public. The passage of Proposition 84 and California's leadership on climate change are recent measures of public support for expensive, ongoing environmental stewardship.

Among the lessons learned, I believe the following have had the deepest and most lasting impacts:

1. Citizen-driven, locally controlled projects create enduring change. Lagunitas Creek is one of the best examples of how a dedicated public, through every means at their disposal—legal action, appointment to local boards, enlisting expert help, hands-on restoration activities, community education—probably saved the coho run. Except for the National Park Service lands in Marin County, the vast majority of both counties is in private ownership and under local government control. Once patterns of land management can be shifted, they become institutionalized in the culture. The essential tools of persuasion, education, patience and the perception of landowner-as-partner have been well-honed in this region.
2. The entire watershed matters. One of the greatest improvements over the last generation has been the implementation of assessments, monitoring and the focusing of restoration activities to where we believe, to the best of our knowledge, that they will best reach project goals. The Gualala River's woody debris program, limiting factors work in Sonoma Creek, and estuary analysis in Salmon Creek are among the many examples that are creating more effective projects. Scientific targeting is only one benefit of a watershed approach. The opportunity to allow everyone to contribute to helping their local fish, even if just by regrading their driveway or capturing roof runoff, has built long-term community support.
3. Don't give up. In December of 2002, after at least 40 years, four coho swam back into Dutch Bill Creek, and the community was ready for them. Woody debris structures were in place, a road assessment was underway, and several fish passage improvement projects were in the works. Many, many miles of riparian fencing have been built voluntarily in grazing lands throughout both counties. County road maintenance has become a model of good practices in some neighborhoods. Things do change, and the agents of change may surprise us all.

Plenary Session: The Evolving Salmonid Restoration Movement: Lessons from a Quarter-century of Adaptation

Coho Habitat Restoration in Urbanizing Watersheds: Beware Non-point Source Pollution

Nathaniel L. Scholz, Ph.D., Research Zoologist and Manager, Ecotoxicology and Environmental Fish Health Program, Northwest Fisheries Science Center

Human population growth is increasingly concentrated along the margins of the western United States. Urbanization and other forms of coastal development increase the runoff of pollutants from terrestrial landscapes to coastal aquatic ecosystems. For at-risk aquatic species, the conservation challenges associated with toxic runoff are extensive, complex, expanding, and poorly understood. This is particularly true for wild salmon populations in the Pacific Northwest, many of which have undergone steep declines in recent decades. This presentation will highlight the results of five years of research on restored urban streams in the greater Seattle area. Post-restoration monitoring has consistently shown a high rate of pre-spawn mortality (~25-90%) among adult coho returning to streams that receive urban stormwater runoff. Affected fish show a similar suite of symptoms (disorientation, lethargy, loss of equilibrium, gaping, and fin splaying) that rapidly lead to death. The evidence to date suggests that coho, which enter small urban streams following fall storm events, are acutely sensitive to non-point source runoff containing pollutants that originate from highly developed landscapes. Using GIS-based analyses, we show that the severity of adult pre-spawn mortality is closely correlated with specific indicators of urbanization (i.e., roads and cars). Other coho life stages are also affected by degraded water quality. For example, coho embryos exposed to urban runoff in situ show high rates of developmental abnormalities and mortality. By incorporating these cumulative effects into population models, we show that urban runoff can potentially cause steep declines in the abundance of local coho populations. These findings have important implications for restoration and conservation efforts in urban and urbanizing watersheds, respectively.

Plenary Session: The Evolving Salmonid Restoration Movement: Lessons from a Quarter-century of Adaptation

Climate Change in the Context of Watersheds: Lessons Not Yet Learned

Freeman House, author of **Totem Salmon**

Climate change models currently available are projected on a global scale with an infinitude of possible local variations. Watershed restoration is by definition a local effort. How can community-based watershed groups include the unknown variables that face us as we make our strategic plans?

Response to climate change at the watershed level might be broken into three categories:

1) Amelioration of effects: localism including food security, locally based economies, and distribution of an assumedly diminished water supply, and transportation strategies.
2) Preparation for anticipated changes: water conservation, fuel load reduction, considerations of potential vegetation.
3) Adaptation: James Lovelock claims that contemporary humanity is selected from among the survivors of six or seven climates changes of the magnitude we face. In other words, we are programmed for inventive adaptation to changing conditions. What contemporary social, economic, and relational changes might be in the best interest of all species?

It may be within the scope of interest of SRF to convene ongoing regional forums for the discussion of these issues.

Plenary Session: The Evolving Salmonid Restoration Movement: Lessons from a Quarter-century of Adaptation

Climate Change and the Future of Coastal Salmonids in California

Peter B. Moyle, Center for Watershed Sciences, University of California, Davis

California contains the southernmost populations of anadromous salmonids of six species: steelhead and cutthroat trout, and Chinook, coho, pink and chum salmon. These populations are all vulnerable to climate change, which will result in warmer temperatures, changed ocean conditions, and, perhaps, less precipitation. In this talk, I review the status of these species in coastal streams and discuss their likely future under the most widely accepted climate change scenarios. I will also discuss the possible importance of these southern populations to the future of salmonids in more northerly areas.

The Future of California Salmon: Water Quality and Quantity Issues Downstream of Large Reservoirs

Session Chair*: Tom Stokely, Trinity County Planning Department*

Many of California's major salmon rivers have been dammed by the Bureau of Reclamation (BOR) for the Central Valley Project (CVP), the California Department of Water Resources (CDWR) for the State Water Project (SWP), or local agencies such as the Yuba County Water Agency. The Klamath, Trinity, Sacramento, American, Stanislaus, San Joaquin, Yuba and Feather Rivers all have dams, to name a few. As plans by CaliforniaLFED, BOR and CDWR to increase water deliveries to Southern California and the San Joaquin Valley through the Sacramento-San Joaquin Delta begin to take shape, serious questions about how much cold water will be available for protection of salmon and steelhead during the next major drought remain. Is there enough cold water for fish and people to last through another multi-year drought? Is the water supply being oversold, to the detriment of the public at large, for the benefit of a few? Is the Biological Opinion on the CVP/SWP Long-Term Operations Plan and Criteria adequate for protection of California's salmon fisheries? How much have politics influenced science-based decisions? How do California's water rights and water quality laws mesh with federal laws and decisions?

A panel of experts representing water agencies, fishery agencies, Indian Tribes and non-government organizations will be convened to discuss the policies, politics, science and economics of water deliveries, salmon cold water fisheries and water rights law.

The Future of California Salmon: Water Quality and Quantity Issues Downstream of Large Reservoirs

Assessing Effects of Groundwater Accretion on Scott River Water Temperatures, Scott Valley, California

Bryan McFadin P.E., Water Resource Control Engineer, North Coast Regional Water Quality Control Board

The Scott River drains an 813 square mile watershed in the Klamath Mountains of northern California, and is one of the main tributaries of the Klamath River. The valley bottom is filled with sediments, mostly sand and gravel. These deposits comprise a high capacity aquifer used extensively for irrigation. Linkages between surface water flow and groundwater conditions have long been recognized in this watershed. In fact, the Scott River adjudication specifically includes an area of interconnected groundwater as part of the adjudication. The analytical approach developed by Regional Board staff recognized the potentially significant impact of groundwater discharge (accretion) on surface water temperatures. The Scott River is listed as impaired for temperature, a parameter for which the most sensitive beneficial uses in the watershed are those related to cold water fish (e.g. salmonid species). The analysis explicitly addressed groundwater accretion as a parameter subject to human influence. Results of the analysis indicate that changes to groundwater accretion rates can have a significant effect on surface water flows and on surface water temperatures, predicting decreases in mid-day temperatures of as much as 3-5 degrees Celsius with increased groundwater accretion rates.

The Future of California Salmon: Water Quality and Quantity Issues Downstream of Large Reservoirs

How Flow Effects Temperature: Shasta River Temperature TMDL

Matt St. John, Water Resource Control Engineer, Acting Lead TMDL Unit, North Coast Regional Water Quality Control Board

The Shasta River, tributary to the Klamath River, drains a 795 square mile basin, fed by snow melt and spring flows originating from Mount Shasta, the Eddy and Klamath Mountains, and Cascade Range. Key characteristics of the basin include year-round cold spring flows, a low summer rainfall, high desert environment, and surface water diversions to support irrigated agriculture and cow-calf operations. Temperatures of the Shasta River do not meet the narrative temperature objective: "the natural receiving water temperature… shall not be altered unless… such alteration in temperature does not adversely affect beneficial uses". Temperatures regularly exceed chronic temperature thresholds for salmonids, and it is well accepted that these temperature conditions contribute to salmonid population decline in the basin. TMDL analysis demonstrates that surface water diversions cause alteration of Shasta River temperature, and therefore alter the natural receiving water temperature. Additional factors affecting temperature of the Shasta River watershed include reduced riparian shade, irrigation tailwater return flows, and presence of minor impoundments. The Tennessee Valley Authority's River Modeling System was the primary analytical tool applied to develop the TMDL and load allocations. A water quality compliance model scenario was applied, which included a 50% increase in instream flow from Big Springs Creek, a significant cold water source. The water quality compliance scenario also included increased riparian shade and reduced irrigation tailwater return flow temperatures. Temperature TMDL allocations for flow were attributed to reductions in maximum daily temperatures at temperature compliance locations. The TMDL Action Plan requires water diverters to employ water management practices and activities that result in increased dedicated cold water instream flow in the Shasta River and its tributaries, and includes a goal to increase such flows by 45 cfs.

The Future of California Salmon: Water Quality and Quantity Issues Downstream of Large Reservoirs

Addressing Low Flows in California TMDLs

Samantha K. Olson, Staff Counsel, North Coast Regional Water Quality Control Board

This presentation will provide an overview of administrative jurisdiction over water quality and water supply, and outline tools available for the California Regional Water Quality Control Boards to address low flows in its TMDL process. I will briefly describe the Division of Water Rights structure and purpose, and a few cases where the administration of water quantity and quality intersected, including Lake Shasta temperature control and the Bay-Delta decision. These cases help highlight the jurisdictional framework from a Regional Board perspective. I will cover flow in the technical portion of the TMDL but plan to focus more specifically on implementation planning. There is a range of options for flow-related water quality implementation, from providing information or making recommendations, to adopting specific instream flow requirements. We will discuss factors to consider when choosing an approach and finish with some pragmatic considerations.

The Future of California Salmon: Water Quality and Quantity Issues Downstream of Large Reservoirs

Inter-Relationships between Water Quality and Quantity in Klamath, Trinity and Sacramento Systems

Michael Deas, Ph.D, P.E., Principal, Watercourse Engineering, Inc.

The Sacramento and Klamath Basins contain the two largest rivers in California. Historically, these two rivers were also the largest salmon producing streams in the state. Today, through various levels of water resources development on the mainstem and tributaries, these river systems represent some of the most highly modified basins in California from a hydrology and water quality perspective. As a result of these developments, specifically the diversion of Trinity River waters into the Sacramento River, the Klamath and the Sacramento Basins are no longer distinct basins (although their salmon stocks commonly intermingle at sea). Further, the challenges in the basins extend beyond simply water quantity. Temperature is the primary water quality parameter of concern in the Sacramento and Trinity River, while temperature and eutrophication (e.g., nutrients, primary production, dissolved oxygen) water quality conditions are of concern in the Klamath River basin. Operations on the Sacramento River also have ramifications for flow and quality in the Sacramento-San Joaquin Delta. Thus, reach specific or even basin specific assessments are insufficient to characterize and assess these regional issues that face decision-makers today in managing these systems for anadromous fish maintenance and recovery, as well as water supply and a myriad of other uses. The tools that we have at our disposal range from detailed to general, and all scales will be required to make headway, but that is putting the cart in front of the horse. The primary "tool" that will be required to tackle these big picture, regional issues is a conceptual model of the basins. The purpose of this talk is to discuss potential quantity and quality elements and their inter-relationships within the framework of a conceptual model.

The Future of California Salmon: Water Quality and Quantity Issues Downstream of Large Reservoirs

Water Quality Concerns for Human Health and Traditional Lifeways: Tribal Water Quality Programs Raising the Bar and Dispelling Myths with Sound Science

Kevin McKernan, Director, Yurok Tribe Environmental Program

The Klamath Basin has been home to many distinct tribal cultures from its headwaters to the ocean since time immemorial. All of these tribes consider the rivers, lakes and ocean to be central to their cultures, traditions, religions and economies. For the last 100 years, they have seen their fisheries resources diminish, culminating in a massive fish kill in 2002. A lack of government trust responsibility to tribes, omission and manipulation of science for political agendas, and a lack of authority under current federal and state statutes caused this avoidable tragedy.

The Yurok Tribe's water quality monitoring program has played a significant role in gathering high quality data used in the analysis of causative factors, baseline data and TMDL development. However, despite this exhaustive effort, the tribe's experience thus far in the participation of various regulatory processes in order meet Tribal needs has generally been disappointing. The science in the Klamath is constantly under attack by industry and even the federal and state governments, thus the Tribe's water quality and fisheries programs are required to be better than the standard.

The Future of California Salmon: Water Quality and Quantity Issues Downstream of Large Reservoirs

Scott River Instream Flow Enhancement Programs and Progress

Gary Black, Senior Project Coordinator, Siskiyou Resource Conservation District

The Scott River is a free-flowing tributary to the Klamath River located in inland northern California. Its 812 square mile watershed receives most of its precipitation (snow and rain) from October through April. Like most snow-fed systems, stream flows are high in the winter and spring months and low in the hot arid summer and fall due to the precipitation pattern. The summer stream flow volumes are dependent on the volume of the previous winters' snow pack and precipitation levels in the mountains surrounding Scott Valley, plus the groundwater storage in the alluvial valley.

Anadromous fish that use the Scott River and its tributaries include: Chinook salmon, coho salmon and steelhead trout. In Scott Valley, stream flow from the tributaries and the Scott River are also used for agricultural purposes (all diversions are adjudicated in Scott Valley). The communities of Scott Valley depend on the vital agricultural economy. Competition between agriculture diversion of water and instream needs has been a contentious issue for decades. In the Scott River, the agricultural use of stream flow can impact the over-summering habitat of juvenile anadromous fish, and the migration of returning adult Chinook in the fall.

The intent of the Instream Enhancement Program is to use multiple instream flow enhancement and water conservation methods to increase flows in critical rearing and spawning streams. Priority areas are identified through ongoing monitoring programs and limiting factors analysis. Depending upon the opportunity and scenario at each participating diversion, the Siskiyou RCD uses different project types to increase stream flows. Project types include irrigation conservation systems with a defined instream dedication, water delivery efficiency projects with a defined instream dedication, and options within the Scott River Water Trust with a defined instream dedication.

In order for an instream enhancement project to be successful, the flow rate and period of the transaction must be defined and verified. Water rights changes are appropriate for long term transactions to ensure protection of water rights and instream uses. The process of memorializing the agreed upon transaction can be the most difficult to define and verify. Gary Black of the Siskiyou Resource Conservation District will provide an overview of the program need and intent, including examples of ongoing instream enhancement project types and their progress.

The legal review of such projects has been led by Robert Donlan of Ellison, Schneider & Harris L.L.P. Ellison, Schneider & Harris developed a report analyzing various legal methods and transaction types that may be available to the Scott River Water Trust and other instream dedication efforts in the Scott River. Robert will focus on the administrative process and legal issues associated with securing the various types of instream flow transactions.

Coho Recovery in California

Session Chairs*: David Lewis, University of California Cooperative Extension and Paul Olin, California Sea Grant Program*

Coho salmon are listed as endangered by both the State of California and the United States. This designation required recovery planning and implementation in an effort to prevent the extinction of the species. This session will cover agency-level planning for California and the Central California Coast Evolutionary Significant Unit by both California Department of Fish and Game and NOAA's National Marine Fisheries Service. Building upon this planning framework and its goals and objectives, presenters will share ongoing efforts and results of habitat restoration and population recovery in selected watersheds. These presentations will include a description of the respective partnerships, methods being used to conserve and enhance coho habitat, and programs to increase the number of coho rearing and returning to California watersheds. The session is designed to give attendees a fuller perspective of coho recovery in California, from state and regional planning to on-the-ground watershed initiatives.

Coho Recovery in California

National Marine Fisheries Service Salmonid Recovery Plans

Charlotte Ambrose, Recovery Coordinator,
National Marine Fisheries Service North-Central California Coast

The National Marine Fisheries Service is the federal agency with regulatory jurisdiction over anadromous salmonids listed as threatened or endangered under the Federal Endangered Species Act. Once a species is listed, the listing agency is responsible for developing a plan for species recovery. Recovery plans for salmonids in California are currently under preparation. Key components of recovery plans include: (1) criteria for population/species viability; (2) assessment of population-based and habitat-based threats; (3) recovery criteria and site-specific management actions that will reduce or eliminate identified threats; and (4) an assessment of costs. Draft recovery plans for California's listed salmonids are due June 2007, with final plans due December 2007. Public workshops have been held in several areas in the Central Valley and Santa Cruz to give the public an opportunity to participate in the process. Additional workshops are forthcoming and information will be posted at the website.

Web address: *http://www.abag.ca.gov/abag/salmon/recoveryworkshops/*

Coho Recovery in California

An Overview of the Department of Fish and Game's Recovery Strategy for California Coho Salmon

Manfred Kittel and Joe Pisciotto, Recovery Planners, California Department of Fish and Game

In response to a petition by the Salmon and Steelhead Recovery Coalition, coho salmon north of San Francisco were listed under the California Endangered Species Act (CESA) by the California Fish and Game Commission (Commission) in 2004. The Commission took the California Department of Fish & Game's recommendation and split the coho salmon listing along the federal Evolutionarily Significant Unit (ESU) boundaries. Thus, the CESA listing conforms to the federal ESA listing: threatened in the Southern Oregon/ Northern California Coast (SONCC) Coho ESU and endangered in the Central California Coast (CCC) Coho ESU. The Department worked closely with stakeholder groups to successfully complete the Recovery Strategy for California Coho Salmon (Recovery Strategy) within the allotted eighteen-month time frame. The Recovery Strategy is organized on three scales: a range-wide scale; a large watershed scale (hydrologic unit); and a sub-watersheds scale (hydrologic sub-area). Within this framework recovery goals and implementation strategies were delineated. Two objectives were stated, the primary being to restore coho to sustained viability and the secondary, to achieve harvestable populations. Five goals were identified for the primary objective and one for the secondary objective. The finished document contains over 85 range-wide recommendations, 465 watershed recommendations for the SONCC ESU and 205 watershed recommendations for the CCC ESU.

Coho Recovery in California

The Russian River Coho Salmon Captive Broodstock Program: Broodstock Management and Juvenile Production

J. Louise Conrad[1], Pacific States Marine Fisheries Commission

The Russian River Coho Salmon Captive Broodstock Program (RRCSCBP) works in cooperation with habitat restoration efforts led by several agency and non-profit groups, and private landowners to restore self-sustaining coho salmon populations to the Russian River watershed. The approach of the broodstock program is to maintain the genetic resource of the wild populations while reintroducing progeny of a captive broodstock population to extirpated locations within the watershed. The California Department of Fish & Game's Recovery Plan for coho salmon recognizes that recovery hatcheries such as the RRCSCBP are "…unproven last-chance efforts to protect and recover severely reduced and imperiled populations." Along these lines, the low abundance and fragmented distribution of coho salmon in the Russian River basin at the beginning of the decade warranted implementation of captive broodstock techniques to prevent local extinction. In 2001, the first wild coho salmon were captured to initiate an experimental supplementation program in which wild juveniles are raised to maturity in captivity and are spawned as adults to produce juveniles for reintroduction. The first three years of collection resulted in the capture of 815 wild salmon from Russian River tributaries, which have been the foundation for the production of juvenile fish for supplementation. However, since 2004, limited numbers of wild fish (fewer than 50 each year) have been available for collection and the broodstock population is now comprised mainly of progeny from the first three years of collection. Broodstock rearing and maturation success have been significant challenges to juvenile production, though broodstock reproductive success has improved with each spawning season. Efforts to improve broodstock health continue in the form of experimentation with alternative broodstock diets, facility improvements, and monitoring variation in individual reproductive success. Progeny are raised at low densities and feeding rates are controlled in order to achieve average release body sizes that are comparable to wild juvenile coho of the same age. Progeny are released into tributaries to the Russian River with adequate juvenile rearing habitat that have been a focus of restoration efforts. The release occurs in two stages corresponding to the spring and fall after hatching, such that seasonal survival can be monitored and compared among release streams.

1 Co-authors: Brett Wilson, California Department of Fish and Game; Manfred Kittel, California Department of Fish and Game; Benjamin White, Pacific States Marine Fisheries Commission; Rory Taylor, Pacific States Marine Fisheries Commission

Coho Recovery in California

Coho Response to Habitat Restoration in the Lagunitas and Olema Creek Watersheds

Brannon Ketcham, Hydrologist, Point Reyes National Seashore

Extensive monitoring of coho salmon in coastal Marin County watersheds has been ongoing since the early 1990s. Based on findings of multiple monitoring entities, the local populations of coho salmon in coastal Marin are responding to regional factors. For the past decade there have been concerted efforts on the part of agencies and the local community to protect, enhance, and restore stream and riparian habitat to support coho salmon and other aquatic species. Projects, including riparian protection fencing, fish passage, and bank stabilization have been conducted to restore habitat and fish passage within National Park Service (NPS) watersheds, including Lagunitas and Olema Creek. As part of our long-term fisheries and water quality monitoring efforts, the NPS has documented response of coho salmon to many of these restoration activities. An overview of the local restoration efforts within coastal Marin, highlighting documented response to NPS fish passage, riparian habitat restoration projects at specific sites within Olema Creek will be presented.

Coho Recovery in California

Monitoring and Assessment of the Russian River Coho Salmon Captive Broodstock Program

Mariska Obedzinski (Presenter), David Lewis, Paul Olin, University of California Cooperative Extension

In 2001, a multi-agency partnership initiated the Russian River Coho Captive Broodstock Program (RRCSCBP) with the goal of reestablishing self-sustaining runs of coho salmon in tributary streams within the Russian River basin. Under this program, offspring of wild captive-reared coho are stocked as juveniles into streams within their historic range. University of California Cooperative Extension (UCCE) and Sea Grant are working with California Department of Fish and Game, NOAA Fisheries, U.S. Army Corps of Engineers, Sonoma County Water Agency, Bodega Marine Lab, and private land owners to develop and implement a monitoring and evaluation component for the program. The primary monitoring goal is to evaluate the outcome of the RRCSCBP and determine the optimal coho stocking strategy for successfully restoring coho to the Russian River drainage. Alternative strategies include stocking at different times of the year (spring or fall after hatching) and into different streams. Juvenile oversummer and overwinter survival rates and juvenile to adult survival rates are (or will be) compared among stocking strategies.

During our first year of monitoring, young of the year were released at a single time (fall 2004) into three tributaries. In 2005 and 2006, juvenile coho were released at two different times (spring and/or fall) into five or seven tributaries, respectively. In addition to comparing survival rates, we are monitoring relative food abundance, stream flow and temperature in several of the stocking streams. Results thus far reveal differences in coho survival between release times, and among streams and years. Differences were also observed in environmental characteristics among streams. Monitoring will be continued for at least two more years and findings will be used to modify our monitoring approaches and release strategies as appropriate.

Coho Recovery in California

Coho Salmon Recovery in Santa Cruz County

Erick Sturm and R. Bruce MacFarlane, National Marine Fisheries Service

Coho salmon (*Oncorhynchus kisutch*) in Santa Cruz County are part of the Central California Coast Evolutionarily Significant Unit and were recently downgraded from Threatened to Endangered under the U. S. Endangered Species Act. Coho in Santa Cruz County represent the southernmost stocks in North America. Currently, Scott and Waddell Creeks support consistent runs of coho salmon, but in the past few years several other streams have been found to have spawning coho. In most years, coho in Santa Cruz County conform to a three-year life cycle: 1.5 years in freshwater followed by 1.5 years in the ocean. New data suggest that in years of strong reproduction, along with greater abundance of steelhead, coho juveniles may stay in the stream for an extra year before smolting and migrating to sea. Of the three runs (yearclass lineages) in Scott Creek, one appears self-sustaining and the other two vary in strength annually but are closer to extinction. The Waddell Creek runs have been very weak and near extirpation. To augment extant wild stocks and to restore coho salmon to streams that historically supported runs, the National Marine Fisheries Service (NMFS) and the Monterey Bay Salmon and Trout Project (MBSTP), a local non-profit group, collaborated in a coho salmon captive broodstock program, which started in 2002. Progeny of wild coho spawned at the MBSTP Kingfisher Flat Hatchery are held at a seawater facility at the NMFS laboratory in Santa Cruz and in freshwater at the hatchery until mature. Gametes from the captive broodstock are used to supplement those from returning wild adults that are spawned at the hatchery. All captive broodstock and most returning wild coho are genotyped using microsatellite DNA analysis prior to spawning. Based on these analyses, spawning matrices are constructed to maximize genetic diversity, without eliminating rare but potentially adaptive alleles. To date, coho smolts produced in this program have been planted in Pescadero Creek (San Mateo County); Scott, Waddell, and Aptos Creeks (Santa Cruz County) under authorization from NMFS and California Department of Fish & Game. The initial Pescadero Creek planting of coho salmon smolts occurred in 2003, and in the summer of 2005 a joint NMFS/CDF&G survey team found coho fry in this stream, suggesting that this first planting may have succeeded. In addition to stock enhancements, the captive broodstock program is also conducting physiological and behavioral studies to determine environmental preferences and limits of southern coho salmon.

Salmonid and Watershed Education

Session Coordinator*: Stephanie Lennox, Envirichment*

Success of salmon recovery and environmental restoration efforts can be enhanced and fortified through education and outreach. According to the Environmental Literacy In America 2005 report by The National Environmental Education and Training Foundation, "Evidence abounds that people respond positively on the environment when they know what to do". Providing the human community with an opportunity to learn about and engage with current restoration and recovery efforts in their surrounding watershed is a key component to achieving long-term project and watershed environmental successes.

Environmental education efforts connecting human communities with Pacific salmon and watershed topics have been growing since the 1990s. This session will give an overview of currently successful programs being delivered in support of salmon and watershed education, conservation and restoration. Individual presentations will focus on providing a complete overview of their program's goals and structure in addition to discussing current successes and challenges of facilitating these programs.

Salmonid and Watershed Education

The STRAW Project (Students and Teachers Restoring a Watershed)

Brita Dempsey and Laurette Rogers, STRAW of the Bay Institute

The Bay Institute's STRAW Project coordinates and sustains a network of teachers, students, restoration specialists and other community members as they plan and implement watershed studies and restoration projects in Marin, Sonoma, and Napa counties. STRAW provides teachers and students with the scientific, educational and technical resources to prepare them for hands-on, outdoor watershed studies, including ecological restoration of riparian corridors. Since 1993, more than 10,000 students have participated in 185 STRAW restorations on rural and urban creeks, planting over 18,000 native plants and restoring approximately 46,000 linear feet or almost 39 acres of creek banks.

Salmonid and Watershed Education

Creating the Cultural Conditions for Restoring the Lost Fish of the Yuba

Jason Rainey, Executive Director and Jeff Martinez, River Teachers Director, SYRCL

In the book Totem Salmon, Freeman House writes of the "ghosts" who frequent rivers that have lost their salmon. When fish have been lost in a river reach—such as the entire upper Yuba watershed—for a time period spanning multiple human generations, the challenge of salmonid restoration can be more about a human community re-envisioning these salmon spirits, as it is about re-engineering barriers, water flows and spawning gravels.

Founded in 1983, the South Yuba River Citizens League (SYRCL) is a grassroots river advocacy organization with a mission to protect and restore the Yuba watershed, a 1,300 square mile drainage on the west slope of the Sierra Nevada. The lower Yuba River supports 24 miles of salmonid habitat, providing some of the last remaining runs of wild (non-hatchery) Central Valley Chinook and steelhead. Furthermore, an on-going CaliforniaLFED-sponsored study is investigating the feasibility of fish passage at Englebright dam, which if decommissioned would re-introduce spring-run Chinook into the upper Middle and South Yuba Rivers, marking the upper-most migration of salmonids in the Sierra.

SYRCL has achieved many short-term successes in salmonid protection and restoration through the tools of litigation, grassroots advocacy, scientific research and collaborative policy development. Our RiverTeachers education program, coupled with community celebrations, buttress our long-term goal of reclaiming the upper Yuba as part of "Salmon Nation."

With a bold vision to educate 20% of all students from the Yuba's "source to sea," the RiverTeachers program has reached over 130,000 students with its two assembly programs, "The Great Water Mystery" and "Journey of the Salmonids" since launching in 2002. These two assemblies provide an interactive and engaging format for grades K-8 to develop a comprehensive core knowledge of watershed features, aquatic ecosystems, and salmon lifecycle concepts.

RiverTeachers has recently piloted a "Full SYRCL Education" program that provides a hands-on expeditionary learning approach that builds upon the concepts through the assembly presentations. The program took place over a three-week period during the height of the Chinook salmon fall-run on the lower Yuba River. Over 130 students in grades 1-5 participated in the program. Structured, standards-aligned, lessons were conducted over a 6 mile section of river, giving students a truly unique hands-on experience with the Yuba watershed, its aquatic ecosystem, and its resident native Chinook salmon.

In this session we will explore the effectiveness of in-school curriculum in fostering youth allegiances for salmonid species protection, and its prospects for transforming a citizenry from awareness to advocacy. We will also highlight SYRCL's "Calling Back the Salmon" efforts with the community-at-large to "re-envision" salmon in the upper watershed through crucial partnerships between environmental advocates, "cultural creatives" local schools, and the indigenous people of the Yuba watershed.

Salmonid and Watershed Education

Students In Action —Helping Students Plan and Implement an Environmental Project

Connie O'Henley, Executive Director, Central Coast Salmon Enhancement

Tomorrow's environmental leaders are elementary, middle school and high school students today. Using Project WILD's Taking Action Guide, Central Coast Salmon Enhancement works with students to create awareness and motivate action in solving environmental challenges in our community. While the students are identifying the problem, creating the action plan and implement a project, they are building confidence and self-esteem, exercising critical thinking, and engaging in their community.

In San Luis Obispo County, students have implemented a storm drain stenciling program, developed an education program about nitrates in the water, adopted a monthly water quality monitoring site and are selling reusable shopping bags.

Presentation will include case studies of several projects as well as tools to start a program of your own.

Salmonid and Watershed Education

The Salmon Camp Research Team

Dan Calvert, Program Coordinator, Salmon Camp Research Team

Oregon Museum of Science & Industry's Salmon Camp Research Team, a youth-based National Science Foundation, Information Technology Experiences for Students and Teachers program, is an advanced technology and natural science career exposure and training program offered in a year-round, multi-year format. It annually serves 60 reservation, rural and urban secondary school students with Native American community affiliations and very low representation in Information Technology (IT) related career fields. The students work with researchers on computer modeling of complex ecological, hydrological, and geological problems. This residential program includes four weeks and seven weekends of field research for 30 high school students (at least 460 hours of instructional and research contact time per student), and two weeks and seven weekends of field research for 30 middle school students (at least 330 hours of contact time). Each student has an academic and a professional mentor. The students' families are involved in the program and receive full museum memberships. The students work directly with university, tribal, and agency scientists, researchers, and natural resource managers using advanced technologies to facilitate salmon recovery efforts and mitigation of geologic hazards that may significantly impact salmon and human populations. This is a reproducible model for student programs that can provide a direct pipeline into internships and jobs, college, and professional IT-dependent science careers. The program's intellectual merit can be found in its multidisciplinary, large-scale resource management approach to salmon recovery efforts and other science endeavors. The program demonstrates broad impact by serving underrepresented groups directly, and involves students in experiential learning focused on IT intensive science career exposure, while bringing cultures together via common values.

Salmonid and Watershed Education

Place-based Education at Salmon Creek School

Laurel Anderson, Environmental Education Coordinator, Salmon Creek School, accompanied by two middle school student co-presenters

Located on 50 acres in rural Sonoma County, Salmon Creek School (K-8) is uniquely poised to fulfill its mission "to inspire our school and the greater community to become responsible, educated, and compassionate stewards of the environment". The ecologically diverse school campus, with its redwood forest, wetland, coastal creek and thriving school garden, is a living text for student learning in ecological literacy. The school has recently embarked on the development of an environmental education program inspired by the concepts of place-based learning and linked to the California State Science standard. The new program utilizes guidance from local professionals in land management projects, including watershed restoration projects and water quality monitoring.

Additionally, the school has embarked on an exciting collaboration with the community in the creation of the Salmon Creek Falls Environmental Center, a regional resource for watershed education for the community and county schools. The center will also provide office space and a resource library for local watershed councils. This is an Leadership in Energy and Environmental Design registered "green building" project designed to be an educational tool in and of itself, featuring passive solar design, partial living roof, storm water harvesting and green materials.

Salmonid and Watershed Education

Evolving Towards Effectiveness: Eight Years of Bioassessment, Bugs and Human Behavior in Santa Rosa, California

Stephanie Lennox, Envirichment and Steve Brady, City of Santa Rosa

The City of Santa Rosa's Aquatic Macroinvertebrate Bioassessment Program originated in 1998 as an outreach effort for compliance with requirements of the National Pollution Discharge Elimination System Permit (NPDES) for storm water discharges. Since the program's creation, a total of 1,548 students from Elsie Allen, Maria Carrillo, Montgomery, Piner, Ridgeway, and Santa Rosa High Schools have participated. This experiential education program is provided to high school science classes with ranging academic levels from elective zoology courses to Advanced Placement classes.

Each high school monitors a Santa Rosa Creek tributary closest to their campus, with a total of six creeks being assessed. Participants use the Citizen Monitoring Level of the California Stream Bioassessment Protocol (CSBP) to guide their sampling. Students first learn key ecological concepts and receive training in the protocols, then collect and identify an aquatic macroinvertebrate sample, test water quality, and conduct a habitat assessment. After the monitoring is complete, students compile their data and analyze their creek's health over time.

During the program's eight years, the project team has observed that successful stream bioassessments do not automatically result in participants understanding their life-long role in preventing storm water pollution. This evolving program is trying to engage students in a local creek assessment while also informing and inspiring them to act in support of healthy Santa Rosa streams. Program adjustments aim to increase student motivation and efforts for positively impacting local waterways. A recent change has been to add a "Culminating Activity" which is a student-created and implemented creek education project. This presentation will detail the program and the changes made in an effort to encourage human behaviors that positively influence water quality and creek health.

Salmonid and Watershed Education

Education and Grassroots Action: Two Integrally Linked Pieces of the Puzzle for Coho Recovery in the Lagunitas Watershed, Marin County, California

Paola Bouley and Todd Steiner, SPAWN

SPAWN, the Salmon Protection And Watershed Network, is a non-profit based in Marin County. For over 10 years the organization has been dedicated to the protection and recovery of endangered coho salmon and watersheds in Marin County. Our programs strive to both educate as well as activate the community in recognition of the fact that education without action does not achieve measurable conservation impact. During our presentation we will focus on SPAWN's local programs within the San Geronimo Valley, a sub-watershed region in the Lagunitas Creek Watershed that >50% of endangered coho call home, and where the bulk of impacts from adjacent developed areas occur. We will highlight successful, grassroots based efforts to bring visibility to the endangered salmon that run right through residential areas, as well as to raise awareness about ways to live more creek-friendly lifestyles. Our program as a whole is multi-faceted and includes programs in habitat restoration, stream and salmonid monitoring, sustainable design, advocacy and eco-literacy. Visit our website for more information, *www.SpawnUSA.org*

Recommended Treatments to Reduce Chronic Sedimentation and Sediment Delivery to Streams from Road Related Sediment Sources

Todd Kraemer, Pacific Watershed Associates

Unpaved roads suffer from long term road surface erosion and erosion of ditches and cutbanks. Where these road surfaces and ditches are hydrologically connected to nearby stream channels, the chronic surface erosion results in fine sediment delivery to streams, consequent impacts to aquatic resources and fish habitat. Fine sediment negatively impacts salmonids by reducing habitat availability and affecting juvenile growth rates. Road upgrading reduces road-related sediment delivery to streams and produces immediate benefits for salmonid habitat restoration.

Road surface erosion and gullying is an anthropogenic sediment source, and results in increased fine sediment production and delivery in watersheds. Surface erosion initiates in bare soil areas from road surfaces, ditches, and cutbanks. Road-related gullies are formed by fluvial erosion from concentrated runoff. During rainfall events, roads deliver eroded sediment to streams from discrete points of discharge (i.e. ditch relief culvert outlets, rolling dips, and/or berm breaks), or by direct runoff though inboard ditches. A hydrologically connected road segment has a continuous flow path between the road prism and the stream channel.

Upgrading roads using road drainage techniques, such as road surface outsloping and the installation of rolling dips and ditch relief culverts, will reduce the length of hydrologic connectivity and the consequent volume of chronic sedimentation and delivery to stream channels. Altering road shapes along road alignments and discharging road surface runoff onto stable hillslope locations will reduce the amount of concentrated runoff and length of connected road segments. Dispersed road runoff must be discharged onto hillslopes far enough from streams so that the fine sediment deposits on hillslope, within a buffer zone, prior to delivering to the stream. Reducing the connectivity length or maximizing the filtering of runoff are the most effective treatments for road-related sediment sources. Altering road shapes by outsloping, insloping, or crowning must be supplemented by the installation of rolling dips, ditch relief culverts or total to partial berm removal to ensure proper and complete dispersal of road runoff.

On roads with dry cutbanks, essentially the year around, the best treatment to ensure runoff dispersion is by outsloping the road surface with a three to five percent slope gradient, filling the ditch and installing rolling dips. On wet segments of road with springs and seeping cutbanks; the most effective management practice is to outslope the road surface while retaining the inboard ditch to drain clear spring flow. Frequent ditch relief culverts are then installed to drain the ditch onto nearby hillslopes. On steep road grades between 14 to 25 %, the most effective management practice is to crown the road with one third of the road draining to the inboard ditch and two-thirds of the road draining to the outboard edge of the road and install frequent ditch relief culverts.

For the landowner, such treatments also extend the life of the road surface and reduce annual maintenance costs. Understanding where to install road surface drainage structures is important to ensure runoff dispersion, ensure drivability, driver safety and reduce surface erosion and sediment delivery to stream channels.

Friends of the Eel River

Nadananda, Friends of the Eel River

Friends of the Eel River (FOER) is a paid membership organization of over 2,000 members, that has just celebrated it's twelveth year as an advocacy organization dedicated to restoring the Eel River to its former state of health and abundance, wild and free. This effort includes the removal of the two antiquated PG&E water diversion dams that block hundreds of miles of prime spawning and rearing habitat.

Having formed originally as a study group in 1994 it became a non-profit organization to raise funds to defend the Eel River from a threatened lock down of the status quo for PG&E's Potter Valley Hydro-project by the Sonoma County Water Agency (SCWA). At this project half of the headwaters flows of average 440,000 acre-feet of water are diverted to the Russian River in the guise of being a power plant in order to continue this massive removal of water so vital to the health of the Eel River and its fisheries. Winning the legal action to stop SCWA from their effort to continue this diversion for ever has propelled the FOER as a major stakeholder in the on going saga, fighting for the return of this water so necessary to the Eel.

Currently FOER is working on bring all the known science on the Eel River together so it can be analyzed and a prescription can be put together to save the Eel. FOER is working with UC Davis's Dr. Peter Moyle on this effort.

Additonally FOER is working with a basin-wide Citizen Monitoring project, publishing a magazine on Eel River issues with distribution from the Bay area through Marin, Sonoma, Mendocino, Lake and Humboldt counties. Our headquarters are in Garberville, with a satellite offices opening in February in Fortuna and soon in Willits and Upper Lake.

For more information please visit our website, *www.eelriver.org*

Scott River Sediment TMDL: Technical Project and Public Process

Richard Fadness and Donald A. Coates, North Coast Regional Water Quality Control Board

The Scott River, which is listed for sediment impairment under Section 303(d) of the Clean Water Act, drains a watershed of 813 square miles as it flows northward into the Klamath River. About 11 percent of the Scott watershed is agricultural land in the bottom of Scott Valley and the lower reaches of tributaries; most of the remaining area is mountains. Slopes are steep and tend to be unstable. The Regional Water Board was charged with producing a Staff Report to define the Total Maximum Daily Load (TMDL) for sediment along with the Action Plan and Basin Plan Amendment to define the actions required to achieve the needed sediment load reduction. This study and resulting plan were considered and passed by the North Coast Regional Water Quality Control Board and the State Water Control Board then forwarded to U.S. EPA, which approved them.

Technical Project:

- A sediment source analysis estimates sediment from both natural and human-caused sources.
- Roads, timber harvest, and agriculture are the largest individually-definable anthropogenic sources of sediment.
- Road-generated sediment delivery estimated in the South Fork Scott River watershed from road inventories and modeling was extrapolated to other parts of the Scott River watershed.
- Areas of decomposed granite soils, which erode extensively when disturbed, were considered separately in the road-generated sediment estimates.
- Large mass-wasting features—landslides, debris flows, etc.—were inventoried for the entire Scott watershed from aerial photos and selectively field-checked.
- Sediment delivery rate from streamside sources was estimated using a basin-wide stratified random sample inventory based on by underlying geology. The results were extrapolated to other stream reaches on the basis of underlying geology.
- The largest sediment sources are from streamsides and are the result of cumulative watershed effects (effects of multiple interacting human activities).
- Results estimate current sediment delivery to be 172% of natural sediment delivery.
- The TMDL is set at 125% of natural sediment delivery or 550 tons of sediment per square mile per year.

Public Process:

Staff initiated a Technical Advisory Group (TAG) of stakeholders early in the procedure as a forum for public participation and education. This group provided input over a period of more than two years. The poster summarizes advantages and difficulties of working with this group, of whom many were helpful and others promoted personal agendas or had interests in conflict with each other and with our goals. A number of significant public process issues emerged:

- What are the most appropriate means for engaging stakeholders in development of implementation actions? How is this phase best handled?
- How can the Regional Board integrate public participation in final decision-making without loss of authority or effectiveness of the Regional Board?
- Out-of-basin stakeholders, in this case downstream communities, professional and sport fishers, and tribes, are affected by upstream water quality. How can we best engage these people?

Managing Streams Toward Equilibrium Conditions: A Case Study of the Vermont River Management Program

Kari Dolan, River Scientist (Presenter), River Management Program, Vermont Agency of Natural Resources, Mike Kline, Staff Ecologist, Barry Cahoon, PE, Chief (VRMP)

The Vermont Agency of Natural Resources' River Management Program (RMP) promotes the planning, designing, and protecting of river corridors that will accommodate stream meander and floodplain processes as the most economically and environmentally sustainable river management alternative. The RMP is analyzing the reference fluvial processes and geomorphic condition and documenting the current physical condition of rivers throughout the state using a set of three fluvial geomorphic assessment protocols. The RMP is also assessing the erosion hazards and habitat impacts associated with watershed and channel modifications. Assessment data show that berming, armoring, and dredging have modified the hydraulics of streams and have led to the systemic channelization of stream networks. Channelizing rivers into a straightened condition was to hasten runoff and maximize the use of valley-bottom land for railroad and road networks, agriculture, and development. The systemic channelization and extensive use of structural measures such as rock riprap and other revetments have created the public perception that rivers should not move. Moreover, after a century or more of channelization with structural measures, erosion hazards have increased, aquatic and riparian habitat remain degraded, and nutrient loading from erosion is still increasing. Repeated and costly efforts to control long lengths of rivers as static, straightened channels is proof that channelization with structural measures is unsustainable public policy. This is particularly the case if channelization practices keep rivers in an unstable evolutionary process, such as incision. Some measures of structural control to protect public and private property will be necessary. Nevertheless, by not intervening on every eroding stream bank, discouraging river corridor encroachments, and accommodating stream meander and floodplain processes, the RMP is allowing streams to evolve back to equilibrium conditions. The RMP is using the assessment data to identify the watershed and reach-scale stressors which explain the departure (from reference) and sensitivity of existing conditions. Mapping the departure and sensitivity of reaches in the context of vertical and lateral channel constraints throughout the stream network can explain the type and rate of channel evolution processes underway and how adopting certain management practices can accommodate, preserve, or restore equilibrium over time. The RMP is partnering with state and federal resource agencies to provide private landowners and local governments a consistent message about the problems that arise from channelization practices in order to build support for actions that can lead to sustainable and healthy river systems.

Upcoming TMDLs in the Russian River Watershed

Bruce A. Gwynne, Donald A. Coates, Bryan McFadin, Matt St. John, Katharine Carter, Richard Fadness, Carey Wilder, North Coast Regional Water Quality Control Board

In the Russian River watershed, several water quality objectives are not being met and some beneficial uses are not fully supported. The Russian River watershed is on the Clean Water Act Section 303(d) list for sediment and temperature, and portions of the watershed are on the list for mercury, pathogens, low dissolved oxygen, and nitrogen and phosphorous. In response, the North Coast Regional Water Quality Control Board has initiated development of several Total Maximum Daily Loads (TMDLs) for the watershed. A TMDL is a framework for evaluating and quantifying the factors that contribute to water quality problems in a waterbody or watershed. A TMDL Action Plan outlines a strategy to attain and maintain water quality standards.

- Mercury impairment is documented and 303(d) listed in Lake Mendocino and Lake Sonoma. In addition, Lake Pillsbury, in the upper Eel River watershed is 303(d) listed and is included in this study because much of the year large quantities of water are diverted from below this reservoir through the Potter Valley Project into the Russian River. Lake Pillsbury has a mercury Health Advisory in effect, and such an advisory is in review for Lakes Mendocino and Sonoma and likely will be in effect by the time of this meeting. A mercury TMDL is in the work plan stage, and will be developed over the next few years.
- Pathogens impairment is documented and 303(d) listed in reaches of the Russian River at Healdsburg, Guerneville, and Santa Rosa Creek. Data suggest that these impairments may be in part related to untreated sewage reaching the river. A TMDL is in the work plan stage, and will be developed over the next few years.
- Sediment impairment is 303(d) listed in the Russian River watershed (mainstem and tributaries). Factors include agriculture, road use and maintenance practices, and probably other sources not yet identified. A TMDL is to be developed over the next several years.
- Temperature impairment is 303(d) listed in the Russian River watershed (mainstem and tributaries). Factors include decrease of vegetation in riparian corridors, sedimentation filling pools in some areas, stream diversions, and possibly other factors. A TMDL is to be developed over the next several years.

The Laguna de Santa Rosa, a large southern tributary, has several independently listed impairments:

- Nitrogen and phosphorous, possibly related to sewage discharge from Santa Rosa and nonpoint sources, including agriculture.
- Low Dissolved Oxygen, possibly related to excess nutrients as well as invasive species.
- Sediment, possibly related to agricultural practices and roads.
- Temperature, possibly related to several factors.

TMDLs addressing these impairments in the Laguna de Santa Rosa are in the work plan stage and will be developed over the next five years.

The Regional Water Board TMDL Unit, as it nears completion of Consent Decree TMDLs in the northern part of the Region, is shifting priorities to address Russian River watershed TMDLs.

Regional Land Use Planning and Implementation Strategies in Aquatic Conservation

Garcia River Sediment Total Maximum Daily Load Progress

Jonathan W. Warmerdam, Environmental Scientist, North Coast Regional Water Quality Control Board

In the 1990s, the Garcia River watershed was designated as impaired on the Clean Water Act Section 303(d) list because of excessive sediment and high temperatures. Land use activities associated with logging, gravel mining, roads, and agricultural activities over the past century are identified as the major sources of impairment. These pollutants continue to affect the overall health and beneficial uses of the watershed. As a result, the wildlife that depend upon the health of the watershed have been directly affected and the populations of several salmonid species that once filled the watershed have been greatly reduced.

In order to restore and protect the beneficial uses of the waters in the Garcia watershed, the Regional Water Board adopted the Action Plan for the Garcia River Watershed Sediment Total Maximum Daily Load (Garcia TMDL Action Plan) into its Water Quality Control Plan for the North Coast Region (Basin Plan); on January 3, 2002, the Garcia TMDL Action Plan became State law. The Garcia TMDL Action Plan is intended to prevent and minimize sediment discharges into the watershed from current and future land uses, and to reduce discharges from past land uses.

Landowners throughout approximately 75% of the total area of the watershed have begun developing and implementing TMDL compliance strategies. The majority of those landowners have already received approval for their compliance documents and are currently working on addressing their sediment sources and managing their properties to reduce and minimize further sediment delivery to the watershed. Regional Water Board staff are working cooperatively with many private agricultural landowners, private timberland owners, industrial timberland owners, restoration groups, resource conservation district, non-profit organizations, other state and federal agencies, and County road officials in their efforts to comply with the TMDL.

Measuring Watershed Condition and Management Performance

Session Coordinator*: Fraser Shilling, University of California, Davis*

Many human activities occur that impact terrestrial and aquatic conditions and processes, without any measure of the degree, type, or extent of these impacts. At the same time, there are many state and federal regulations that preclude permitting these activities if they are excessive, which usually means that, individually or cumulatively, they harm ecosystems. The combination of continuing to permit activities while lacking an understanding of the impacts of the activities is not sustainable. Many countries and states have begun to address this disconnect using science-based "indicators" of ecosystem and social well-being. Often these indicators are combined into an index for reporting condition and trajectory of condition change. The term "indicators" here implied means features or processes that you can measure to determine condition and/or change, many of which are discussed in other talks at this conference. We can tailor these science-based indicator systems and relevant indicators to measure the condition of natural features and systems. We can also measure the performance of management actions—both restoration and permitted uses/discharges. This presentation and this session describe an integrated approach to this problem, including consideration of habitat, water quality, social systems, and major drivers (e.g., climate change). Integration is achieved through a robust and broadly-applicable system of indicator categories and the establishment of a common currency of condition, allowing comparison among ecosystem attributes (i.e. comparing apples to oranges) and among watersheds. The system is scalable from reach to region and can be applied to watershed conditions and to the effectiveness and effects of human actions.

Measuring Watershed Condition and Management Performance

Aligning Socio-Economic and Ecological Condition Valuation

Rainer Hoenicke, Ph.D, Deputy Director, and Josh Collins, San Francisco Estuary Institute

While we are now increasingly planning salmonid recovery in a watershed context, the tendency is still strong to focus on desirable geomorphic and ecological attributes for salmon without equal regard for people and their activities that continue to impact watershed conditions. Only in a few watersheds have the majority of residents and landowners moved beyond the conventional dichotomy of "man vs. nature" and "natural resource protection vs. economic development". Without having effective communication tools that help day-light inevitable tradeoffs between ecological and economic alternatives, the hard choices are postponed in favor of short term "win-win" isolates that can memorialize disconnects between onsite environmental problems and their off-site causes, and between land use regulation and watershed management, while cumulative impacts are ignored. We are presenting a preliminary framework based on case studies in the San Francisco Bay Area for incorporating a parallel set of quantifiable socio-economic attributes, indices, and indicators into the broadly accepted EPA framework for assessing and reporting on ecological condition.

Measuring Watershed Condition and Management Performance

Linking Indicators to Program Goals: Update on the Development of Water Quality Indicators for the CALFED Bay-Delta Program

Lauma Jurkevics, Senior Environmental Scientist and Watershed Management Coordinator, Regional Programs, Division of Financial Assistance, State Water Resources Control Board

One of the struggles facing public agencies these days is documenting that resources spent on activities, projects, and programs result in measurable outcomes—outcomes that demonstrate results and, ultimately, improvements. Improvements may be in a process, a service, or the physical environment. Documenting an environmental change is a challenge to public agencies because such change is more often gradual or not easily recognizable when one seeks to quantify improvements. In addition, scientists at public agencies face the challenge of determining the appropriate indicators of change that will link with these environmental improvements, as well as with the resources spent. On the other hand, agencies themselves experience rapid fluctuation of internal managerial or external legislative changes that require quicker results to inform on progress. The key is in identifying measures that help inform decision-makers while maintaining a balance with scientific integrity.

The need for documenting progress towards environmental improvements is readily seen in the CaliforniaLFED Bay-Delta Program. The Program's mission is to "develop and implement a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta System." While much work has already been done to help accomplish the Program's mission, it was recognized that indicators and performance measures were needed to report on the progress towards meeting the objectives of the Program. Although there were several efforts to develop performance measures early in the Program, these activities had minimal funding to continue the work.

During the past year, the CaliforniaLFED Bay-Delta implementing agencies (both state and federal) began a more concerted effort to develop performance measures for four program objectives: water supply reliability, levee system integrity, water quality, and ecosystem restoration. The presentation will focus on the water quality work that has been done for the program with respect to indicators and performance measures, and on the lessons learned so far from this ongoing collaboration amongst the agencies.

Measuring Watershed Condition and Management Performance

Coastal Watershed Planning and Assessment Program (CWPAP) Approach to Identifying Salmonid Refugia

Scott Downie, Senior Biologist Supervisor, California Department of Fish and Game Coastal Watershed Planning and Assessment Program

The California Department of Fish and Game's (CDFG) Coastal Watershed Planning and Assessment Program (CWPAP) identifies and characterizes refugia habitat by using expert professional judgment and criteria developed for north coast watersheds. The criteria considers different values of watershed and stream ecosystem processes, the presence and status of fishery resources, forestry and other land uses, land ownership, potential risk from sediment delivery, water quality, and other factors that may affect refugia productivity. Ratings are determined by combining the results of air photo analyses, decision-support model results, and field data from CDFG tributary reports. The expert, multi-disciplinary rating team encourages specialists or residents with local knowledge to participate in the refugia identification and rating process.

The rating system uses a tributary scale refugia rating worksheet. The worksheet has 21 listed attributes that are rated on a sliding scale from high quality to low quality. The 21 factors are organized into five categories: (1) stream condition; (2) riparian condition; (3) native salmonid presence and distribution (status); (4) native salmonid abundance; (5) management impacts (disturbance to terrain, vegetation, and the biologic community). The five summary ratings are combined to determine an overall tributary rating on a scale from high quality to low quality. The tributary ratings can be aggregated on larger watershed scales and expressed as a general estimate of assessment area refugia status.

Attributes with limited or missing data are noted. Typically there are data limitations on 1-3 of the 21 factors. These are identified for further investigation and inclusion in future analysis. Additionally, some non-anadromous reaches are identified as critical contributing functions; for example, high quality water discharged from headwater reaches. This system identifies weak and strong refugia attributes at the tributary scale that can be used for land use and restoration planning.

Measuring Watershed Condition and Management Performance

Riparian and Aquatic Habitat Trajectory on North Coast Ranches

Michael Lennox, University of California Cooperative Extension

We are researching the efficacy and trajectory of riparian restoration on the north coast of California. We measured biophysical attributes at 102 riparian project sites located along tributary stream reaches in Marin, Sonoma, and Mendocino Counties of California ranging from four to 40 years since restoration. A common riparian management objective was the establishment of tree cover to sustain watershed functions that are resistant to hydrologic disturbance and stochastic events. Measured outcomes at project sites are being analyzed for correlations with restoration methods, which primarily included conservation, enhancement, and rehabilitation.

What is the long-term fate of these efforts and how do sites change over time? Preliminary results indicate improvements in aquatic habitat metrics over time. For example, woody debris, stream shade, and pool depth increased while bankfull width-to-depth ratio decreased over time. Plot scale results show significant effects of restoration method by tree species. Nine tree genera were similarly analyzed utilizing negative binomial regression models. Individual tree abundance was affected by revegetation method treatments which included herbivore management, the decision to plant, and bioengineering. Other predictor variables included were landform class or similar geomorphic feature, bank height, project age, herbivore access, ambient temperature, summer flow, and the presence of relict seed source at the project site. Patterns in the response of different genera to restoration treatments will be discussed.

The validation of restoration method effectiveness is challenging in disturbance-dependent communities. North coast stream restoration practitioners may take pride in documented metrics from old project sites because they have passed the test of time. Monitoring long-term project outcomes offers another tool for documenting restoration performance, adapting revegetation design, and establishing quantified project objectives. A side benefit of this research may be another means of conveying salmonid restoration to the public. These intended products need to be balanced with unanticipated results such as an increase in exotic shrub cover over time. Vegetation management over multiple decades may be necessary to encourage further participation in projects and support for restoration efforts by agricultural producers and other private landowners.

Measuring Watershed Condition and Management Performance

Evaluating and Managing for the Effect of a Changing Climate on Stream Temperatures

Peter Miller, Department of Landscape Architecture and Environmental Planning, University of California Berkeley

Climate change can be expected to increase stream temperatures and reduce the extent of viable cold water habitat for salmonids. New planning approaches must be developed that can allow for effective planning in a changing climate.

In this presentation, I describe a new quantitative framework for evaluating the impact of climate change on stream temperature regimes. The framework requires minimal analytical resources and has modest data requirements. This framework allows planners to evaluate the relative vulnerability and resilience of streams and to assess adaptive opportunities that reduce the sensitivity of stream temperature to climate change. Quantitative validity of the framework is evaluated using a database of over 1,000 stream temperature monitoring sites across northwest California. Adaptive measures addressed include riparian shading, increases in hyporheic and groundwater flows, and prioritization of site selection, protection and restoration efforts across sites. I conclude with an overview of potential applications and management implications for salmonid conservation.

Measuring Watershed Condition and Management Performance

State Framework to Measure Programmatic Performance

Stefan Lorenzato, Statewide Watershed Coordinator, Department of Water Resources

The state's interest, expressed in the missions of multiple agencies and departments, is to protect and restore watershed functioning where needed to provide ecosystem and other services. Because of the diversity and complexity of the state, a scaleable and comprehensive framework for assessing watershed condition and the performance of state actions to protect and restore condition is desirable. Recently, a technical sub-committee of the Steering Committee for the California Watershed Action Plan recommended the use of an indicator framework developed by the US EPA Science Advisory Board. This recommendation was adopted by the Steering Committee. The SAB assessment framework has the advantage of being previously vetted for its scientific basis. It is also useful across geographical scales, provides a consistent and straightforward reporting system, and provides a mechanism for jointly considering watershed condition and stresses/influences on condition. We propose the use of this assessment framework in evaluating watershed condition in the context of measuring performance of watershed management. This framework and its component categories and indicators will provide links amongst watershed assessment, monitoring, restoration, and adaptive management.

Enhancement, Rehabilitation and Restoration: What's the Difference and Why Should the Fish Care?

Session Coordinator*: Eric Ginney, Philip Williams and Associates, LTD, Environmental Hydrology*

There is disagreement in the scientific community over the definition of restoration and the various types of restoration. The impetus for certain professionals proposing numerous divisions and definitions for something that is viewed by the public and many decision-makers as singular and all-encompassing, stems largely from the different levels of substantive change in ecosystems that is realized by implementation of different "restoration projects." Despite the misnomer of 25 years of various physical habitat projects being labeled as "restoration projects," the session does not focus on crafting new definitions for projects undertaken on California waterways. For the purposes of discussion, we do adopt three broad categorical definitions of "enhancement," "rehabilitation," and "restoration," each with inherently different levels of initial human expenditure (i.e. planning, implementation, and ongoing maintenance). Further, over the long term, each type of restoration has very different success in enabling the processes that create and maintain aquatic ecosystems. Taken in sum, these factors add up to the sustainability of each type of restoration, a theme that is frequently absent from the watershed planning and funding calculus.

The session begins with an overview of California restoration projects to date (with special emphasis on the Russian River), highlighting the spectrum of restoration project types, successes, failures, and costs. The initial presentations also examine the role of post-project monitoring and setting project-specific goals as means to alleviate limiting factors. Subsequent presentations provide examples of each of the three types of restoration, enabling a basis for later discussion of the role of each in finding solutions in salmonid species recovery that are successful and sustainable.

Next, we examine efforts to achieve formative change of our river ecosystems, focusing on the rehabilitation of physical processes that create the foundation of aquatic ecosystems: re-regulation of flow regimes, reconnecting rivers to floodplains, and scaling channels and their floodplains to meet altered flow regimes. While not as sustainable as complete "restoration" of physical processes, rehabilitating physical process in aquatic ecosystems is perhaps the most viable (and politically feasible) option for many threatened salmonid populations in California.

Finally, we examine the current restoration paradigm in California and encourage discussion and comment from the audience. Amongst others, we wish to engage the following topics and questions:

- Form follows funding: Do funding structures drive restoration in directions counter to species recovery?
- How have 25 years of the three types of restoration projects influenced the long-term success of salmonid species recovery efforts?
- Given variables such as climate change, cyclic funding opportunities, exponentially increasing population & concomitant pressure on water and natural resources, etc, where should the salmonid conservation community focus their efforts in the next 25 years?
- How important is the formulation of limiting factors-based restoration goals in recovering salmonid populations?
- Is accurately defining the type of restoration project (enhancement, rehabilitation, or restoration) important in setting up criteria for success? Do funders need to stress that distinction? Is the distinction important for public perception?
- Can one restoration type/approach preclude later success with another?

Enhancement, Rehabilitation and Restoration: What's the Difference and Why Should the Fish Care?

An Overview of California River Restoration to Date: The Big Picture via the National River Restoration Science Synthesis (NRRSS)

Shannah Anderson (presenter) and Matt Kondolf, University of California, Berkeley

Streams and rivers are vital ecological, educational, and economic resources, therefore restoration of these ecosystems has received nationwide interest and financial investment. The development of restoration ecology as a science and the success of restoration projects depend on linking the practice with the science. Nevertheless, thousands of stream restoration activities take place annually, only a fraction of which benefit from the integrated insights of practitioners and scientists.

To address these issues, the University of California at Berkeley joined the National River Restoration Science Synthesis program (NRRSS). The goal of the combined effort is to compile information on river restoration projects throughout the nation in order to (1) characterize the practice of river restoration, and (2) identify common elements of successful river restoration projects. The results of our work will be made available to river restoration practitioners in the hope of furthering knowledge in the field.

In the first phase of the study, we gathered information and developed a database for ~4,000 California river restoration projects, including contact and sponsor, scope of project, cost, and monitoring component. In the second phase of the study, we conducted interviews of practitioners for a subsection of randomly selected projects, under the areas of in-stream habitat improvement, riparian management, channel reconfiguration, and water quality management. Questions addressed project goals and activities, design elements (including watershed planning, prioritization factors, and knowledge sources), as well as monitoring and evaluation components. A sampling of data analyzed as a result of these surveys include the types of common design criteria used in stream restoration, the number of projects incorporating pre- and post-monitoring, and typical limitations on project evaluation.

In August 2005, we launched the final stage of the project—post-project appraisals (PPAs) of California streams that were restored within the last decade, analyzing if and how the projects incorporated and integrated success criteria, design elements, and ecological functions. The PPAs involved collection and review of existing design and monitoring documents, field surveys, analysis, and reporting. Field measurements were based on the project's objectives, and could include cross-section and long-profile surveys, channel width-to-depth ratios, channel roughness estimation, flow depths, pool-riffle composition, bed material composition, bed material size sampling (pebble counts), percent of vegetative cover, and vegetative composition.

This presentation will discuss lessons learned from the summary database, telephone interviews, and the preliminary results of post-project appraisals conducted in 2005 and 2006.

Enhancement, Rehabilitation and Restoration: What's the Difference and Why Should the Fish Care?

Changing Restoration Paradigms: Research from the Russian River

Adina Merenlender, University of California, Berkeley

Certain restoration practices have become institutionalized through the policies and funding priorities of resource agencies that can change over time. We quantify changing trends in the dominant on-the-ground practices associated with restoration over time using data from the Russian River basin, California. This research demonstrates that an abundance of site-specific work designed to address riparian vegetation regeneration, bank stabilization, road improvements, fish surveys, in stream structures, and barrier removal has been implemented. More recently, monitoring and planning have been added to the mix, and the public investment in restoration continues to climb. We argue for more transformative change to increase ecosystem resilience and the probability of salmonid recovery through changes in water management, land conservation, and education. Examples of landscape level analysis and water management assessment tools are presented that can help decision-makers plan for a more sustainable future through better land and water use.

Enhancement, Rehabilitation and Restoration: What's the Difference and Why Should the Fish Care?

Ecologically Meaningful Restoration and Rehabilitation: Considerations of Floodway Width

Scott McBain, McBain & Trush

Prior to water development and reclamation of river bottomlands in the mid 1850s, Central Valley rivers tended to have extensive floodways, increasing in width progressing from their exits from the foothills of the Sierra Nevada and Coast ranges to the San Joaquin—Sacramento Bay Delta. Cumulative water and land development has drastically reduced floodway width of most Central Valley rivers to a mere remnant of their prior extent, with substantial changes to channel morphology, river processes, habitat quantity and quality, and ultimately the fish and wildlife that depended on these attributes. With the advent of large restoration programs (e.g., CaliforniaLFED, AFRP), planning, design, and restoration efforts have begun to address the issue of floodway width, beyond just hydraulic conveyance objectives (e.g., how wide of a floodway do we need to convey a flood of "X" cfs). Meander belt width, riparian patch size, multiple channels, mining pit filling, and other features are now being considered in channel restoration designs. However, with each additional foot of increased floodway width come very large additional implementation costs. In cases where setback levees are being moved into gravel mining pits, each foot of additional floodway width may cost tens of thousands of dollars. While we intuitively know that a wider floodway equals improved conditions for the river ecosystem, funding agencies, policy makers, managers, and the public request assurance that the benefit achieved by these projects is worth the high cost, and restoration practitioners have had difficulty developing tools to develop ecologically meaningful size thresholds and predicting benefits. This presentation discusses some ideas developed to identify ecologically meaningful thresholds developed for application to large-scale restoration projects on the Tuolumne and San Joaquin Rivers.

Enhancement, Rehabilitation and Restoration: What's the Difference and Why Should the Fish Care?

Restoring the Lower San Joaquin River: Is it Reasonable?

John R. Cain, Natural Heritage Institute (presenter), and G. Mathias Kondolf[1]

After completion of Friant Dam and related infrastructure in the 1940s, some reaches of the San Joaquin River downstream were completely dried up (seasonally) because of operation of the dam, diversions from the river, and groundwater pumping. Not surprisingly, this led to the extermination of the previously abundant Spring-run Chinook salmon (*Oncorhynchus tshawytscha*) in the river. In 1988, environmental groups filed a lawsuit against the U.S. Bureau of Reclamation (USBR) under the state fish and game code, which requires that operators of dams and diversions release sufficient water to maintain fish downstream in good condition. After a long sequence of legal battles, settlement negotiations and studies, the parties have reached an agreement to restore salmon to the Lower San Joaquin by releasing flow and undertaking other actions. One of the key issues in the legal dispute centered around whether releasing flows to restore salmon in this river was a 'reasonable' use of water. Experts for the USBR and its co-defendant, the Friant Water Users Association, contended that enormous volumes of water would be needed to provide suitable conditions for salmon, while experts for the plaintiffs argued that smaller flow releases—more in line with the flows that currently support salmon on the Merced, Tuolumne, and Stanislaus Rivers—would be sufficient to maintain salmon runs on the San Joaquin. We review the scientific issues and evidence available, and describe how we developed the flow regime that was eventually accepted as the basis for restoration of the river's salmon.

1 University of California, Berkeley

Enhancement, Rehabilitation, and Restoration: What's the Difference and Why Should the Fish Care?

Dynamic Geomorphic Processes, Human Impacts, and Floodplain Restoration

Joan Florsheim, University of California, Davis

In lowland floodplain river systems, dynamic processes such as flooding, erosion and sedimentation promote the lateral transfer of water, sediment, nutrients, and aquatic species between channels and floodplains. In these systems, human impacts, such as levees, concentrate flow into single channels, hinder channel migration, physically isolate floodplains from rivers, and thereby limit dynamic ecological processes. Restoration of channel-floodplain linkages supports construction of floodplain topography—the relief and morphology of sediment deposits—that provides the physical structure of habitat. Because floodplain processes are dynamic, and because the most successful restoration projects accommodate this fundamental characteristic of natural systems, a science-based monitoring framework based on exceedance of hydrogeomorphic thresholds helps advance restoration science in lowland floodplain river systems.

Coastal Watershed Planning and Restoration

Session Chairs*: Karen Gaffney, Restoration Ecologist, West Coast Watershed and Paola Bouley, SPAWN*

Integrated Watershed Planning in North Coastal California

Karen Gaffney, Restoration Ecologist, West Coast Watershed

The ecological restoration community has evolved over the last thirty years, and has diversified to include academics, landowners, watershed groups, students and long term practitioners. Increased sophistication of the practitioner community, as well as the development of technological tools for watershed planning, restoration and monitoring, have resulted in the enhancement of ecosystems and improved information sharing among restorationists. However, many stream restoration projects are still planned and implemented in a relative vacuum, not taking into account large water infrastructure, policy, and spatial/temporal scale issues. This often results in the expenditure of public funds on site-specific, symptomatic projects, or projects that conflict with infrastructure development or local community goals. In both cases, the return on public investment may be compromised by restoration objectives that are implemented without consideration of the larger geographic or socio-economic context. The State of California, via the Department of Water Resources and the State Water Resources Control Board, has initiated the Integrated Regional Water Management (IRWM) Program. The IRWM program emphasizes the integration of all features and processes within a substantial geographic region, addressing natural ecosystem functions and socio-economic aspects of the landscape. The North Coast Integrated Regional Water Management Plan (NCIRWMP) includes seven north coast counties, and emphasizes the beneficial uses of water in the context of viable salmonid populations. The NCIRWMP uses both watershed and jurisdictional boundaries as its planning framework, and reflects statewide priorities for ecosystem and human community vitality. Local watershed planning and general planning efforts are hierarchically connected via the larger NCIRWM—ensuring local knowledge and autonomy, yet allowing for regional integration and data sharing. The local leadership of the NCIRWMP emphasizes transparency, community outreach and the full inclusion of all stakeholders, with a focus on technical assistance to disadvantaged communities. Watershed planning at large temporal and spatial scales—taking into account all ecological and socio-economic features in the landscape and region—is a positive new paradigm that promises a good return on public investment.

Coastal Watershed Planning and Restoration

A Search for Better Tools to Measure Impairment or Recovery of Salmonid Populations

Charley Dewberry, Ecotrust

The question of how we measure impairment or recovery of salmonid populations and their associated watersheds remains with us. We have developed a new set of spatially explicit diagnostic tools from a landscape process perspective for evaluating the response of biological organisms to environmental conditions within basins. We use three data sets to develop and examine effectiveness of the tools: Knowles Creek, Oregon (juvenile salmonid surveys-13 years); Siuslaw Basin, Oregon (juvenile salmonid surveys- five years); and Napa basin, California [macro-invertebrates (five years) and salmonid surveys (two years)].

The foundation of the new tools is the assumption from the River Continuum Theory that biological populations make predictable changes in their distribution from the headwaters to the mouth. The starting point is an analysis of the 13-year Knowles Creek record. In years when populations of coho salmon are low, over 80% of the fish will be in less than 20% of the stream network. However, when population numbers are high, the center of their distribution is lower in the watershed. If these patterns hold at the landscape level, then both the number of juveniles and the center of their distribution are important measures of the population response to environmental conditions within the basin.

Secondly, we will use the surveys of juvenile salmonids from the Siuslaw and Napa basins to examine the spatially explicit abundances of salmonids at the landscape scale (information from the 2006 Siuslaw surveys will be included in the analysis). Preliminary analysis suggests that cumulative basin area is a more useful estimator of the center of distribution than is downslope distance from the ridge top.

Finally, we use the macro-invertebrate information from the Napa basin surveys to examine whether a macro-invertebrate community measure or combination of metrics can provide a similar signal to the abundance and distribution of salmonids. Preliminary analysis suggests that some macro-invertebrate community measures show the same patterns as the salmonids. This suggests that analyzing macro-invertebrates or juvenile salmonid survey information in a spatially explicit manner holds promise as an important tool for measuring the impairment or recovery of populations and their associated watersheds.

Coastal Watershed Planning and Restoration

Wild and Working Forest Restoration in the Mattole River Watershed

Chris Larson, Executive Director, Mattole Restoration Council

Throughout the watersheds of the California coast, riparian and upslope forests influence salmonid habitat via stream temperature, hydrology, and key hillslope processes (e.g. large wood recruitment). Increased fire severity, Sudden Oak Death Syndrome, and climate change will likely change forest extent and species composition dramatically, augmenting the challenges of recovering watersheds and salmonids. This presentation will focus on how these forest restoration issues are being addressed within the north coastal Mattole River watershed (Humboldt, Mendocino counties, California). A variety of approaches will be described as a case study of community-led forest restoration within a mixed-ownership landscape (ranches, non-industrial forestland, industrial forestland, conserved lands, and rural residential subdivisions):

- riparian ecosystem restoration successes and failures,
- working with private landowners to reduce hazardous fuels
- Sudden Oak Death Syndrome in a wildlands context
- watershed-based forestry permitting and community forest ownership
- climate change scenarios: fire, invasive species, forest composition
- working with timberland owners large and small to improve practices

The presentation will also address planning/ inventory, monitoring, restoration challenges, administrative, funding, and workforce issues related to forestry projects.

Coastal Watershed Planning and Restoration

Highly Impacted Tributaries of the Upper Lagunitas Watershed: Most Important Coho Spawning and Rearing Habitat?

Todd Steiner and Paola Bouley, Salmon Protection and Watershed Network (SPAWN)

The upper portions of the Lagunitas Creek watershed (the San Geronimo sub-watershed) contain the vast majority of human development, including 1500 residential parcels, with many developed right up to (and over) the creek, failing septic systems, vast areas of impervious surfaces, lack of woody debris, migration barriers (for both spawners and juveniles), water removals, pesticide use, invasive species and other human-induced impacts commonly associated with urbanization.

Nevertheless, this sub-watershed still supports more than 50% of the total spawning coho population in the Lagunitas Creek watershed. Additionally, the smaller tributaries to San Geronimo Creek support 25-30% of the total spawning population, even though they represent a disproportionately small percentage of available stream area compared to the mainstem of San Geronimo and Lagunitas Creeks.

While the rearing potential of these smaller tributaries is not well understood, they are likely critical winter refuge habitats for juvenile salmon. These smaller tributaries have long been overlooked as important habitat and are being impacted from ongoing development pressures that are effectively reducing habitat quality and compromising recovery efforts for this endangered run of coho salmon.

The authors will discuss the current understanding of conditions on these tributaries in detail, while highlighting current and future studies that seek to answer vital questions about coho salmon productivity in these reaches. Lastly, the authors will offer recommendations for regulatory and educational efforts that will be needed to protect and restore coho habitat in these headwater regions.

Coastal Watershed Planning and Restoration

Rincon Creek Watershed Plan

Michelle Bates, Tetra Tech, Inc. and Mauricio Gomez, Community Environmental Council

A watershed plan was recently developed for Rincon Creek, which is located on the border of Santa Barbara County and Ventura County. A key aspect of the project was coordination with the Rincon Creek Watershed Council, a watershed stakeholder group which is organized by the Community Environmental Council (CEC).

Main issues within the Rincon Creek watershed include the presence of invasive species, steelhead passage barriers, and erosion/sedimentation. The development of a watershed plan is the first step in identifying problems, developing solutions, and focusing efforts to restore, sustain, and enhance the watershed. Key objectives of the watershed plan are to:

- Restore, protect, and enhance water quality and associated aquatic resources
- Identify, protect, and enhance significant beneficial uses of the watershed
- Identify and prioritize opportunities and projects to improve the riparian corridor
- Evaluate the severity of sedimentation and identify and prioritize solutions

A field survey was completed in May of 2006 to establish baseline conditions by assessing steelhead habitat, invasive plant species, water quality parameters, the geomorphology of the creek, and riparian function of the watershed. The results of the field survey were incorporated into the watershed plan and restoration projects were identified. A GIS application was also developed in support of the project.

Coastal Watershed Planning and Restoration

Homeless in the Creek? Do LWD Structures Work to Improve Coho Habitat: A Comparison Between Lagunitas Creek (Marin County) and the Pacific Northwest

Leslie Ferguson, M.S. UC Davis, Ecology

Habitat loss and simplification are a major cause of the decline of coho (*Oncorhynchus kisutch*). In-channel placement of large woody debris (LWD) has become a common technique for improving coho rearing habitat complexity. While there has been monitoring of the physical effects of these structures, biological monitoring is uncommon and primarily limited to the Pacific Northwest. Lagunitas Creek is in the Central California Coast ESU (CCCESU) for coho salmon which is the southernmost extent of the species range. In this talk, I will present the results of a study of summer juvenile coho use of man-made and natural LWD structures in Lagunitas Creek, Marin County.

These study results support the findings of Pacific Northwest studies (Roni and Quinn 2001; Nickelsen et al.1992) indicating that increased LWD loading and complexity lead to significant increases in summer juvenile densities at the pool scale. This research indicates that man-made LWD structures can create high complexity summer rearing habitat comparable to pools with natural high complexity in Lagunitas Creek. Further, it suggests that there are large differences in the magnitude of juvenile coho response depending on LWD structure size, and number of pieces of wood. Relatively minor density increases can occur as the result of a moderate increase in LWD, but the highest density increases require a relatively large increase in LWD. Further, trees with rootwads provided higher quality habitat than trees without. This is particularly important in simplified structures with only one or two pieces of LWD.

Specifically, in Lagunitas Creek, the highest summer coho density increases required at least three pieces of LWD. This led to the management recommendation for summer rearing habitat that structures should be built with greater than three pieces in Lagunitas Creek, or if structures are built with less than three logs, they should be built specifically to entrain additional LWD.

Lagunitas Creek has an average bankfull width of 17 meters. The ability of a LWD structure to create complex habitat is probably related to this and other geomorphic attributes of the stream. These results may be applicable to other streams with similar bankfull width and geomorphology, however they may not apply to streams that are geomorphically different. This points to the necessity of biological monitoring in habitat restoration programs. Without this monitoring it is not possible to determine if habitat structures are successful in achieving habitat restoration goals.

Coastal Watershed Planning and Restoration

Coastal Marin Watershed Planning and Ecological Restoration

Brannon Ketcham, Hydrologist, Point Reyes National Seashore

Coastal Marin County includes extensive public lands, including federal and state parks, county open space lands, and water supply lands and reservoirs, and is internationally recognized for its ecological significance. In 2000, the Tomales Bay Watershed Council (TBWC), representing local stakeholders and agencies with interest in water quality protection, habitat conservation, and ecological restoration in the Tomales Bay Watershed, was formed. Protection water resources to support threatened and endangered anadromous salmon populations, water quality (including a pathogen TMDL process) and water supply has necessitated an Integrated Coastal Watershed Management Planning process, currently led by the TBWC. In addition to the pursuit of this planning process, members of the TBWC have been working to preserve and restore the ecological integrity of the stream and estuarine systems in the area. Projects to address multiple watershed protection and restoration goals include the Giacomini Wetland Restoration Project, a 560 acre tidal marsh restoration at the head of Tomales Bay. This presentation will provide an overview of the planning and restoration efforts to preserve the unique characteristics of this area.

Coastal Watershed Planning and Restoration

Evaluating San Francisco Estuary and South Coast Watersheds for Steelhead Restoration

Gordon Becker, Senior Scientist (presenter) and Andrew Gunther, Ph.D., Executive Director, Center for Ecosystem Management and Restoration (CEMAR)

In two separate reports, the authors and their collaborators analyzed steelhead distribution in tributaries to the San Francisco Estuary and coastal watersheds south of the Golden Gate. The studies re-affirmed previous researchers' findings of substantial population declines over time and, for the first time, estimated the number of streams and watersheds (i.e., drainages contacting the ocean) in the study areas that formerly supported steelhead's anadromous life history. While steelhead have been extirpated from a substantial number of streams, they persist in approximately 80 percent of the watersheds comprising the historical range. In other words, *Oncorhynchus mykiss* is present in at least one tributary of the vast majority of watersheds in which the species occurred in the past.

Our current work involves synthesizing distribution data, information from watershed plans and limiting factors studies, and the knowledge base of resource professionals, academics, and other local experts in order to evaluate restoration opportunities in the Bay Area and the nine counties of the southern California coast. The product provides recommendations for expenditures on projects and studies in specific watersheds, along with the basis for the conclusions. Our process is intended to be entirely transparent, including documenting data limitations, logical assumptions, and the use of "best professional judgment".

The evaluation relies on several criteria to distinguish between, and within, watersheds with potential for steelhead restoration activities. In particular, we note the extent to which watersheds and key tributaries have the following:

1. Reproducing *O. mykiss* populations—This criterion indicates functioning spawning and rearing habitat
2. Substantial available habit—The amount of habitat, particularly for rearing, that is accessible or would be accessible through highly likely modifications
3. Passage barrier programs—Such programs have identified important barriers, and engineered designs have been developed to modify or remove them
4. Cooperative restoration planning—The watershed has an effective regulatory or stakeholder process in place to "drive" restoration
5. Land use restrictions—This criterion reflects the importance of watershed areas in public ownership or otherwise protected from adverse land use effects

Based on the results of screening with these criteria, a number of "anchor watersheds" and "essential streams" are identified that are likely to represent habitat resources of regional importance. Ongoing restoration processes and additional critical activities are described for these streams.

Draft results indicate that a wide range of restoration actions will be recommended in the study area. Our analysis supports implementing at least four major dam removal projects currently in various stages of planning. In an additional four (and likely more) anchor watersheds, flows studies are needed to address migration between the ocean and spawning and rearing habitat. We also expect our evaluation will lead to a proposal to develop a trap and haul program in a major southern California stream. Other smaller-scale projects will be recommended that focus chiefly on passage, sediment control, and maintenance of adequate instream flows.

Fisheries Closures: The Economic, Cultural and Recovery Impacts

Session Coordinator*: Zeke Grader, Pacific Coast Federation of Fishermen Associations*

Economic Impacts of Fisheries Closures —The 2006 Story From The California North Coast

Guy Phillips, PhD. Economics

The 2006 fishing season continued the "revolving crisis" phenomenon that has come to characterize commercial and sport fishing on the Pacific Coast. Considering the global crisis in fisheries, the Pacific Coast revolving crisis is likely to spread globally or, if it doesn't, fisheries collapses are on the horizon across the planet. Each year the underlying question facing fisheries management groups and regulatory agencies is: "who is going to bear the brunt of this year's problems—fishermen, tribes, water users, etc.?" The question is not really whether there will be a crisis, but who will bear the burden.

The fishing closures on the Pacific Coast in 2006 also brought the annual request to Congress for emergency relief. This year the request was for the fishermen and tribes who were left to bear most of this year's burden. Other years, it is other parties. This year the estimate placed the direct financial loss at $80-plus million. The indirect consequences are not quantified, but are expected to be quite large.

The social and economic impacts of fishery closures are not well known and are generally not part of any public calculus when decisions are being made that will have adverse effects on commercial and non-commercial fish species in the near or long term. For example, little or no consideration is given to the economic impacts on fisheries when logging projects are undertaken—or even rules about acceptable logging practices. Similarly, decisions about water development projects or hydroelectric projects give scant substantive attention to near term or long term adverse effects on fisheries.

So, instead the losses continue to accrue—and grow. We spend tens of millions of dollars in emergency assistance or recovery efforts here and there, region by region, one year at a time without adding it up. Public and private sector decision makers make decisions almost every day without incorporating these direct and indirect costs and in doing so set the stage for future emergency assistance or huge recovery/restoration costs.

This workshop will focus on the direct and indirect economic impacts of the 2006 Chinook Pacific Coast fisheries closure. These impacts are important in their own right, but as the revolving crises spread to more fisheries areas and to the globe as a whole, we must do better to understand the impacts, the need for prevention, and the need for decision makers to use this information when they make decisions.

Fisheries Closures: The Economic, Cultural and Recovery Impacts

2006 Pacific Coast Salmon Fishing Disaster Ushers in Put-up-or-Shut-up Time on the Klamath River

Bill Kier, Principal, Kier Associates, Fisheries and Watershed Professionals

The 2006 federal closure of the Pacific Coast salmon fisheries, with its highly-publicized $100 million economic blow to the coastal communities of California and Oregon to spare the Klamath River's precarious salmon stocks, drove into the reauthorization of the federal Magnuson-Stevens Fishery Conservation and Management Act, as solidly as a spike into a railroad tie, a mandate that the Secretary of Commerce produce a Klamath River coho salmon recovery plan.

Such a congressional mandate directing the recovery of a specific Pacific salmon stock is unprecedented. That the mandate came from the hapless 109th Congress is astounding.

The new congressional Klamath River mandate requires that the Secretary deliver his coho recovery plan "no later than six months after the date of enactment of this Act"—that is, no later than May 9, 2007.

For the parade of federal agencies now impacting the health of coho salmon in the Klamath River basin, including those funding activities presumed to benefit the species, it is, finally, put-up-or-shut-up time on the river.

This recovery plan will not be like earlier efforts Commerce's National Marine Fisheries Service has attempted under the "consultation" section, Section 7 of the Endangered Species Act, to tack coho salmon protections onto the begrudging coattails of other agencies' projects (like the annual operations of the Klamath Reclamation Project). Nor will it be quite so easy for those skilled in interagency politics to "roll" the new Klamath coho recovery plan's authors, as appears to have happened to the authors of NMFS' 2002 biological opinion concerning the Reclamation Project's operations.

The May, 2007 Klamath River coho salmon recovery plan will draw from a very large body of well-settled Klamath River fisheries, water quality, and watershed condition science and species recovery proposals, including the findings and species recovery recommendations advanced in 2004 by the National Academy of Sciences.

It goes without saying that the Secretary's May, 2007 Klamath River coho salmon recovery plan will be controversial. Its value will be found in the veracity of its scientific underpinnings.

Fisheries Closures: The Economic, Cultural and Recovery Impacts

Responding to Disaster: Fishermen Actions to Address Fish Kill and its Impacts

Zeke Grader, Executive Director, Pacific Coast Federation of Fishermen's Associations

The near total closure of the Pacific salmon fishery from the Columbia River to Monterey Bay in 2006 resulted in economic losses estimated well in excess of $100 million to the fishing fleet and coastal economies with catches off 90 percent or more. It was not the first disaster salmon fishermen have encountered in recent years. Federal disasters were declared following the 1982-83 El Nino and the 1986-91 drought. Unlike the two earlier disasters, the closures imposed in 2005 and 2006 (and anticipated for 2007) were for the protection of one stock only—Klamath River fall-chinook; other stocks fishermen would have otherwise caught were relatively abundant. And, the financial impact of the 2006 closure was far more extensive than the monetary losses suffered during the earlier disasters.

The closure was the direct result of restrictions imposed on the fishing to save as many of the Klamath chinook as possible whose populations were affected by a series of fish kills in the river beginning in 2002 and thereafter. Fishing was not the cause of the declines, yet it was fishermen and fishing communities that bore the brunt of government's failed water policies in the Klamath and the inaction that followed to prevent further fish kills.

Fishermen, represented by the PCFFA, brought suit in 2002 against the federal government—which had overruled its own fishery scientists, seeking, unsuccessfully, that adequate flows be released into the Klamath that spring to protect the fish. The fishermen lost and soon thereafter there occurred a large fish kill of outmigrating juvenile fish followed late the summer of 2002 by a major kill of returning adult spawners. Since that time the Klamath has been racked by parasites – that have thrived in the Klamath's low flow and poor quality water conditions—infecting upwards of 80 percent of juvenile salmon with a near 100 percent rate of mortality.

In 2004, after the magnitude of the kills became apparent, the PCFFA warned the Bush Administration that urgent action was needed to protect fish and fishermen alike. That warning went unheeded. In 2005 severe restrictions had to be imposed on fishing to address low numbers of Klamath chinook and in 2006 most fishing was closed. Fishermen responded to the 2006 disaster with a series of actions, including: 1) requests for federal financial disaster help to save the fleet and dependent communities; 2) the development of measures aimed at providing interim relief for fish and fishermen—including a) proposals aimed at dealing immediately with the fish kills, b) genetic stock identification to better protect fish stocks and potentially allow for greater fishing , and c) development of a better fishery management structure; to 3) long-term efforts in the Federal Energy Regulatory Commission relicensing process for removal of four Klamath hydropower dams and increasing flows in the river.

Fisheries Closures: The Economic, Cultural and Recovery Impacts

Toxic Cyanobacterial Blooms in Copco and Iron Gate Reservoirs and the Klamath River

Susan Corum, Karuk Tribe Department of Natural Resources (presenter) and Jacob Kann, Ph.D.[1]

Toxic cyanobacterial blooms are common in eutrophic water bodies worldwide. Cyanobacteria, also known as blue-green algae, are especially suited to blooming in reservoirs, lakes, ponds, and slow-moving waters. When given the right conditions such as warm, still or slow, and nutrient-rich water, cyanobacteria can form vast blooms in the water. *Microcystis aeruginosa* is a cyanobacteria that has been found in the Klamath Basin. It produces the toxin microcystin, a potent liver toxin capable of causing chronic liver damage and acting as a tumor promoter.

In 2004, a sample from Copco Reservoir (part of Pacificorp's Klamath Hydroelectric Project-KHP) first documented a toxic algae bloom of *Microcystis aeruginosa* in Copco. In 2005 and 2006 the Karuk Tribe sampled Copco and Iron Gate Reservoirs and the Klamath River above and below the reservoirs to determine the magnitude and duration of the toxic algae blooms. Surface grab samples were collected for algal cell density and biovolume and microcystin concentration. Samples were collected from a variety of shoreline and open-water sites, focusing on areas used for recreation.

In both 2005 and 2006, the *Microcystis aeruginosa* bloom was first identified in July and lasted through the beginning of November. Levels of the toxic algae and associated toxin in all years (2004-2006) exceeded the World Health Organization (WHO) guideline for moderate probability of adverse health effects from 10 to over 1,000 times. *Microcystis aeruginosa* was not detectable in samples from the Klamath River above Copco Reservoir. It was detected in the Klamath River below Iron Gate at lower concentrations than in the reservoirs but following a similar seasonal trajectory as the reservoirs.

While the WHO, Australia, and Oregon currently have guidelines for *Microcystis aeruginosa* and microcystin in regards to public health, California does not. Copco and Iron Gate Reservoirs are located in California and have had toxic algae blooms that pose a clear threat to human health. Monitoring data from 2005 and 2006 show that the conditions in 2004 were not anomalous and that toxicgenic blooms are likely to be a recurring phenomenon.

1 Aquatic Ecosystem Sciences, LLC

Fisheries Closures: The Economic, Cultural and Recovery Impacts

Bring the Salmon Home

Troy Fletcher, Tribal Fisheries Manager, Yurok Tribe

The Bring the Salmon Home campaign seeks to restore the Klamath Basin anadramous fishery through several restoration actions, the most important of which is the removal of the lower four klamath dams.

The campaign has built a coalition of Indian Tribes, fishermen, and environmentalists. Today we are working with agricultural interests to address their needs and reach agreement on how we can restore the Klamath Basin together.

The Klamath Basin was once a naturally functioning, healthy ecosystem from the headwaters to the ocean. A fundamental element of this ecosystem was the communities of Native People scattered throughout the basin, whose lives were intertwined with the bounty of resources available. Their sustenance, culture, religion, and commerce all evolved around the resources provided by the healthy ecosystem that their Creator had provided. Klamath Basin Natives were wealthy by all standards of the time, as they and the ecosystem had adapted to function as one.

Since the basin was settled by non-natives in the mid-1850's, the ecosystem has been altered dramatically. Resources have been extracted from one part of the basin with no consideration given to the rest of the ecosystem. Nutrients from the ocean no longer migrate to the headwaters. Water from the headwaters no longer flows to the ocean in its historic abundance or quality. Instead, resources have been extracted as independent endeavors; such as timber harvest plans, dams and water diversions. Individuals benefit at the expense of all of us that depend upon a healthy functioning ecosystem.

Laws such as the Endangered Species and Clean Water Acts have been passed that are designed to protect ecosystems, however their effectiveness is often compromised by politics. These political influences are motivated to protect the economic interests of select groups while sacrificing the broader benefits that would result from a healthy ecosystem. The tools designed by laws such as the ESA are often implemented to give minimum protection to the resources while maximizing benefits from resource exploitation. When water flows and other resource protections are managed for the minimum, it inevitably results in minimum abundance of resources, such as fish populations. Fundamental changes in governance structures are needed to ensure that land and water management decisions address the needs of the entire ecosystem.

Fisheries Closures: The Economic, Cultural and Recovery Impacts

Native American Cultural Aspects of Salmon Closures in Northwest California and Southern Oregon: One Yurok Perspective

Jene L. McCovey, Yurok Tribe, Poet, Storyteller

Salmon are a pivotal point of the continuation of native culture in Northwest California. In the past and now, the World Renewal religion has not changed very much. All though the Wiyot and Chulula Tribes were nearly wiped out the first five years of white contact, the Wiyot have recently begun making plans to revive the dances. Many of the Chululah were absorbed into the Hupa people. In the recent past, the Yurok and the Karuk have begun dancing the White Deer Skin Dances and the Jump Dances again. What is the significance of the dances? It signifies the spirituality of the community. It is the wherewithal and strength our ancestors instilled in us. It is a chosen pathway back to creator

The "World Renewal Religion" involves the Karuk, Yurok, Hupa, Chululah and the Wiyot. They recite the forulas, do the rituals and dance the dances and the people come to watch the dances and eat the food and take the good luck with them when they leave the dance grounds.

One dance balances the world between good and evil. Another rebuilds the world anew. The Brush Dance is the healing of a child, its family and its community. The term "World Renewal Religion" does not tell how the flint carrirer in the White Deerskin Dance cuts open the world and sends the evil out to the end of the universe. It does not convey the knowledge that the medicine man of the Jump Dance barrows the dance from the spirit world. Because they don't dance in the spirit world during this powerful time, they come to earth and watch the dance behind the dancers.

Our people come to the dance to honor tradition, to eat the food and take home with them the good luck and memories that will connect them to the dances through out the year. The salmon is honored, the deer, the acorn, the fruits of the earth are all accepted as gifts from Creator.

It is not right for a government or a government agency to create an endangered species. Our future involves educating the masses about the river ecosystem, the connection to the ocean, and the need for clean water- for man and animal alike. The Klamath River water war, the sacred high country of the Siskiyou Mountain wilderness, and the need for sustainable appropriate technology are three issues that bring together the diverse stakeholders of the Klamath Basin. My presentation is based on one Yurok warrior poet's perspective on how the diminishing salmon runs affects the river people of the Klamath.

North Coast Water Diversions: Can Coho Go with the Flow?

Session Coordinator*: Rob Dickerson, Trout Unlimited*

Invasive Plant Species: Landscape Scale Impacts to Aquatic Habitat, Water Quality & Quantity

Karen Gaffney, Restoration Ecologist, West Coast Watershed

Invasions by exotic plant species present a major threat to the long-term health of stream ecosystems, negatively impacting physical and biotic processes, plant and animal communities, and stream corridor water availability. Research at multiple spatial and temporal scales indicates that invasive plants may substantially compromise salmonid recovery, having direct and profound impacts on in-stream and riparian habitat and water supplies, as well as physical and biotic processes. Plant invasions are expanding exponentially. To be successful, salmonid restoration programs must use a science-based approach to address invasive plant species management.

North Coast Water Diversions: Can Coho Go with the Flow?

Like Water for Coho: Solutions for Managing Water Diversions and Maintaining Instream Flows in Salmon and Steelhead Tributaries

Brian J. Johnson, Staff Attorney and Project Manager, California Water Project, Trout Unlimited

As Californians, our future will be defined by water, the state's most precious resource. Unfortunately, as Marc Reisner observed, "where water is concerned, logic and reason have never figured prominently in the scheme of things." As a result, we have more imperiled species of fish than any other state.

Although salmon and steelhead need many things to thrive, water surely tops the list. Yet along California's north central coast, there are hundreds of applications for pending water rights, and most are for projects that have already been built. Indeed, more than half of all pending applications in the entire state are for existing, unauthorized diversions in areas occupied by the central coast population of coho salmon. In some watersheds, upwards of 75% of all surface water diversions may be illegal. To make matters worse, the existing regulatory system has proven incapable either of processing water right applications or protecting fish.

For two decades, Trout Unlimited (TU) has been working to solve this problem. First, TU championed for and secured passage of state legislation (A.B. 2121) which mandates that State Water Resources Control Board must produce guidelines and principles to maintain instream flows in coastal streams in northern California, from the Mattole River to San Francisco Bay. Sponsored by Senator Kuehl and signed by Governor Schwarzenegger, the statute goes beyond previously developed fish flow "guidelines" and requires the Board to put in place a comprehensive system for protecting instream flows as it administers water rights.

Then, TU and the Peregrine Chapter of the National Audubon Society (in Mendocino County) (PAS) filed a formal Petition with the SWRCB and other regulatory agencies to demand changes to the water rights system from start to finish, including compliance, monitoring, and enforcement. The geographic scope of A.B. 2121 and the TU Petition, which roughly coincides with the area occupied by the central coast coho, has been estimated to encompass about 5,900 stream miles and 3.1 million watershed acres in Marin, Napa, Sonoma, Mendocino, and Humboldt Counties.

Finally, TU convened a stakeholders' group to work through the issues presented by A.B. 2121 and the Petition. The effort brought together agricultural trade associations, consultants, and attorneys, urban water users, other conservation groups, state and federal water agencies, and local governments in an effort to work out practical solutions to these complicated problems. The stakeholders have dedicated hundreds of hours toward collaborative recommendations on SWRCB procedures, substantive standards for instream flows, and monitoring, compliance and enforcement. Recently, the stakeholders have focused their attention beyond reforms to the existing system, and onward to entirely new ways of making water use decisions.

"Like Water for Coho" presents a brief history of efforts to protect instream flows for salmon and steelhead along the north central coast of California, describes the current status of A.B. 2121, the TU/PAS Petition, and the stakeholder effort, evaluates their prospects for success, and sets forth Trout Unlimited's proposals for further action.

North Coast Water Diversions: Can Coho Go with the Flow?

Russian River Watershed Adaptive Management Plan

Dan Smith, USACE Engineering Research and Development Center

The Russian River Watershed Adaptive Management Plan (WAMP) is being developed by the U.S. Army Corps of Engineers (USACE), in partnership with the California Department of Fish and Game, Sonoma and Mendocino Counties and the Russian River Watershed Council. The USACE Engineering Research and Development Center (ERDC) will develop a model and plan to ensure the WAMP is an effective tool for future resource protection.

The WAMP development process consists of two Components:

- Component 1 is the Watershed Adaptive Management Plan
- Component 2 is Research Studies.

ERDC is currently completing Task 1, which is to conduct a baseline assessment of the Russian River watershed describing watershed conditions for restoration and protection potential, and synthesizing this information into a format that is accessible to the general public, local government, and other stakeholders. ERDC has compiled existing information into the Russian River Baseline Conditions Database (RRBCD) Part 1 (Metadata) and Part 2 (Actual Data Values).

ERDC has subdivided the Russian River Watershed into "Watershed Assessment Units". Each of these units represents relatively homogenous stream reaches in terms of geology, geomorphology, channel morphology, habitat, upland land use, disturbance, and other factors. These Watershed Assessment Units will be the spatial entities assessed to describe watershed conditions for restoration and protection potential. Since the spatial scale at which ranking criteria will be developed is unknown at this time, the Technical Review Committee has agreed that data should be compiled at the smallest appropriate spatial scale.

ERDC identified each Watershed Assessment Unit by using a wide variety of sources, indictors and metrics with the potential to assess and rank the condition, vulnerability, and restoration potential of upland, riparian, and stream channel components.

- "Indicators" are defined as the characteristics, attributes, or processes that influence condition. For example, stream flow, water temperature, dissolved oxygen, etc. as indicators for evaluating the condition of anadromous fish habitat.
- "Metrics" are the specific way in which an indicator is measured.
- "Condition" is defined as the degree to which a Watershed Assessment Unit approximates an unaltered, natural condition (e.g., extent of natural vegetation communities, and lack of roads, stream channel modifications, development, agriculture, etc.).
- "Vulnerability" refers to the susceptibility of the watershed assessment unit to future alteration.
- "Restoration potential" refers to the likelihood that active restoration measures will significantly improve the condition of the watershed assessment unit.

ERDC determined that the Ecosystem Management Decision Support 3.1 (EMDS) provided the most suitable framework. The EMDS is a mature ArcGIS extension that integrates GIS, knowledge based model development and testing, scenario simulation, and priority analysis into a single framework (Reynolds and Hessburg 2005).

The draft baseline assessment of the Russian River watershed is expected to be complete in January 2007. Mendocino County Resource Conservation District has begun Task 2, the development of the Draft Russian River Watershed Adaptive Management Plan. ERDC will assist the Mendocino County Resource Conservation District with the development of Task 2.

North Coast Water Diversions: Can Coho Go with the Flow?

Russian River Conditions and Future

Dave Hope, Senior Environmental Scientist, North Coast Regional Water Quality Control Board

The Russian River had a simple past as a moderately-sized river with little flow in the summer. This river has been converted to a very complex system with very high summer flows. The river now is used to transport water from the Eel River to major city centers and experiences severe impacts from gravel mining, removal of riparian vegetation, development of the floodplain and a very overdeveloped use of its waters. This has all led to a river system that has complex interwoven problems and a very questionable future for fisheries. Some of the main issues facing the fisheries include degraded habitat in general with high water temperatures, long duration high turbidity, and a highly disturbed fluvial morphology. The river has interesting juxtapositions that create unique impacts to the river. There are limited flows due to over-allocated pumping of the tributaries which have the best habitat, and too much flow in the degraded mainstem which now serves only as a transportation corridor. The opposite is true for sediment, as tributaries have too much bedload from disturbance, while the mainstem is severely lacking bedload due to dams and gravel mining. The mainstem below Lake Mendocino and Lake Sonoma have severe flow impacts that are difficult to address. This all has led to an almost complete loss of coho salmon, severe impacts to steelhead population, and a questionable run of Chinook. The Russian River may still may have a future if a management plan is implemented that considers the present impacts, the inherent limitations and ongoing uses that will not be changed while humans are present. What can be restored and maintained is the real question. The past and present conditions of the Russian River are covered in this presentation along with several possible scenarios for the future for the Russian River.

North Coast Water Diversions: Can Coho Go with the Flow?

Stream Flow and Habitat Scaling Along a Spatial Gradient: Do Current Management Policies in Northern Coastal California Offer the Same Protections to Anadromous Salmonids Throughout the Drainage Network?

Matthew Deitch (presenter), G. Mathias Kondolf, and Adina Merenlender, UC Berkeley

Federal and state mandates to protect anadromous salmonids and other aquatic resources in the wine country of northern coastal California have resulted in new water management policies designed to curb surface water abstraction at ecologically sensitive times. Most significantly, the State Water Resources Control Board has developed guidelines to assess whether a water right should be granted, given its potential ecological impacts and the impacts of pre-existing water rights in the basin. Two assumptions about the relationships of stream flow and instream habitat along a spatial gradient are embedded within theses guidelines that allow guideline parameters to be scaled from downstream locations (where data needed to make assessments have been collected) to upstream headwater reaches (where water rights are increasingly requested). We collected data describing stream flow and an environmental flow threshold, specifically the discharge required for upstream salmonid bypass, to evaluate whether assumptions of flow and habitat proportionality along a spatial gradient are valid. To collect data, we established stream flow gauges at eight locations in the Maracama Creek catchment in eastern Sonoma County in a networked design ranging from 2.5 km^2 to 100 km^2. Stream flow data indicates that high flows at headwater reaches tend to be greater, per area, than flow at downstream reaches, and winter base flows tend to be lower, per area, than base flows at downstream reaches. Flows necessary for upstream salmonid bypass (which serves as the threshold for surface water diversion) were also disproportional from upstream to downstream: though headwater catchments comprised only 2.5% of the gauged downstream catchment, the bypass flow magnitude at upstream reaches was approximately 50% of the bypass flow magnitude at the downstream reach. Combining stream flow and habitat threshold data at our study sites, our study indicates that the duration of actual bypass flow exceedence (and thus the amount of time that water users may divert water from streams) varies wildly along a spatial gradient, from between 80 to 100 days per year at downstream sites, to as few as three to seven days at upstream sites. These data have important implications for water management policies in the north coast wine country. Based on proposed methods of flow and habitat scaling currently employed in the region, water users in headwater tributaries may operate diversions over large periods of time when actual bypass flow criteria are not met.

North Coast Water Diversions: Can Coho Go with the Flow?

Upslope Sediment Reduction and Water Storage in the Mattole Headwaters for Streamflow Improvement and Coho Recovery

Tasha McKee, Sanctuary Forest and Todd Kraemer, Pacific Watershed Associates

Sanctuary Forest, Pacific Watershed Associates (PWA) and other restoration partners completed a basin-wide sediment source investigation and sediment reduction project in the 6000-acre Upper Mattole River and Forest Cooperative (UMRFC) during the summers of 2002 through 2006. This project is part of the salmon restoration work of the UMRFC, Mattole restoration groups, and the Mattole communities. Erosion control and prevention of road- related fine sediment from abandoned logging roads and rural residential roads benefits salmonid habitat and population recovery. A total of 14.43 miles were decommissioned and 7.79 miles of roads in use were upgraded with a total of 307 sites treated and sediment savings of 76,400 cubic yards. The hydrologic benefits of the project are significant, particularly in light of the severe summer low flow problems of the past eight years. Road decommissioning and upgrading improve summer flows by restoring the hill slope natural flow regime and groundwater recharge. Techniques such as ripping and cross road drains allow surface water intercepted by the road to penetrate the road surface and become groundwater. It is the groundwater that keeps the river flowing months after the rain has stopped. Reduction of road-related sediment delivery also helps restore the natural balance of sedimentation and scour, and improves hydrology by allowing historic pools, now filled with sediment, to flush and form again. The pools provide shelter, cold water, and macroinvertebrate habitat for juvenile salmonids in low flow seasons, as well as water storage to help keep downstream reaches flowing. The problem of seasonally low instream flows is not unique to the Mattole River headwaters. For many other California rivers, low summer flows have become a significant threat to salmonid survival. Sanctuary Forest and PWA will discuss upslope sediment reduction techniques and water storage projects that provide immediate benefits for improving seasonal streamflows, salmonid habitat and juvenile survival. Results from several studies performed in the Mattole Headwaters and Redwood National Parks will be presented that document the effectiveness of basin-wide upslope restoration techniques for improvement of water quality and salmonid habitat.

North Coast Water Diversions: Can Coho Go with the Flow?

Summer Flow Variability and Juvenile Steelhead Survivorship in Russian River Tributary Streams

Ted Grantham, Ph.D. (presenter), Matthew Deitch, Adina Merenlender, UC Berkeley, and David Newburn Assistant Professor, Department of Agricultural Economics, Texas A&M University

Upland tributary streams to the Russian River provide important spawning and rearing habitat for central California coast steelhead trout (Oncorhynchus mykiss). During the summer months, flows in these small streams decrease substantially, limiting suitable habitat available for juvenile steelhead. Tributary flows may be further reduced by agricultural and residential developments that meet their water needs by pumping directly from streams or from shallow wells adjacent to stream channels. While the summer habitat requirements of juvenile steelhead have been documented, the effects of flow variability on the species are not well understood. In order to evaluate the relationship of summer flow conditions and juvenile steelhead survivorship, we analyzed a 10-year record (1993-2002) of fish surveys conducted at multiple tributary streams sites in the Russian River watershed in Sonoma County, California. Multiple regression models indicate that juvenile steelhead survivorship decreases along a gradient of high to low flows in the summer months. Substantial inter-annual variation in recruitment and survivorship highlights the need for long-term population data. Although site location and habitat variables are significant factors controlling the distribution of juvenile steelhead, the decline in survivorship with decreasing summer flows indicates that water quantity may be an important limiting factor. In recognition of the growing regional demand on water resources, these findings suggest that protections of tributary flows during the dry season are critical to salmon recovery efforts in the Russian River watershed.

Regional Land Use Planning and Implementation Strategies in Aquatic Conservation

Session Coodinators*: Bill Weaver and Danny Hagans, Pacific Watershed Associates*

Setting Regional Priorities for Watershed Restoration

David Bayles, Executive Director, Pacific Rivers Council

High quality freshwater habitats are among the most endangered ecosystems on earth, being lost at a much higher rate than tropical rainforests, for example. Many formerly widespread and abundant freshwater species are now limited to headwater refugia which are exceptionally sensitive to watershed disturbance. A sound regional freshwater conservation program should identify refugia watersheds and eliminate threats of watershed disturbance in these high-integrity, highly vulnerable places. A watershed restoration approach that prioritizes reducing watershed effects in the best remaining places is likely to be the most biologically and fiscally-efficient strategy.

Regional Land Use Planning and Implementation Strategies in Aquatic Conservation

California Water Law Can Help Salmon—A Short "How To" Guide

Alan Levine, Coast Action Group

One can not assume that salmon can be recovered through restoration alone. Recovery of salmon depends on the ability to combine all available tools to restore and protect the species. It is necessary for salmon resource-based concerned parties to be well-versed in the application of all regulatory regimes and strategies in order to be successful in the goal of salmon recovery.

"Well versed" means that the regulatory framework (and related strategies including restoration) must be understood and used to comply with the law and whatever protections and/or restorative processes are mandated by law. This work includes developing relationships with agency staff, requesting notice on projects of interest, and participating in project environmental review and policy development processes. Venues for citizens to engage in water policy include Regional and State Water Board rulemaking, TMDL Action Plans, permitting process including water rights, and Basin Plan Amendments. Water quality issues fall into other agency regulatory mandates: including Fish & Game Code (1600 permitting process and pollution sanctions, Coho Recovery Guidelines), and Forest Practices (Board of Forestry rule making—anti-pollution regulations, Threatened and Impaired Rules).

Regulatory Utilities/Tools that can help aid salmon recovery include: California Water Code (pollution and flow law), Basin Plan for the North Coast (Water Quality Objectives, pollution standards, TMDL Action Plans, anti-degradation language), Fish & Game Code, Forest Practice Act, and other aspects of Cal Resources Code including the California Environmental Quality Act.

Resources and Tools for Citizen Monitors include:

Books by Solano Press: Forest Practice Act and Related Laws, California Water, Wetlands, Streams and Other Waters, Guide to the California Environmental Quality Act (CEQA), (800) 931-9373 *www.solano.com*

Sites for more info:

KRIS Coho (good science bibliography): *http://krisweb.com*

EPA TMDL sites: *www.epa.gov/OWOW*

EPA Region 9—TMDLs and other programs: *www.epa.gov/region9*

State Water Resources Control Board: *www.swrcb.ca.gov*

Regional Water Quality Control Board, North Coast: *www.swrcb.ca.gov/rwqcb1*

Department of Water Resources (DWR)—Water Data Library (WDL): *http://wdl.water.ca.gov/*

"Riparian Setbacks: Technical Information for Decision Makers:" *http://www.crwp.org/pdf_files/riparian_setback_paper_jan_2006.pdf*

"Riparian Buffer Width, Vegetative Cover, and Nitrogen Removal Effectiveness: A Review of Current Science and Regulations:" *http://www.epa.gov/ada/download/reports/600R05118/600R05118.pdf*

Regional Land Use Planning and Implementation Strategies in Aquatic Conservation

Land Use, Water Quality and Stream Habitat: Is a New Strategy Needed in Rural Counties?

Sandra Pèrez and Mark Lancaster, Five Counties Salmonid Conservation Program, Trinity County Natural Resources Division

The Five Counties Salmonid Conservation Program is a conservation strategy formed by Del Norte, Humboldt, Mendocino, Siskiyou and Trinity Counties in response to the 1997 listing of coho salmon as a federally threatened species. To date, it has largely targeted improvements in county policies, practices, and infrastructure to achieve restoration of salmonid populations and protection of water quality. While it and the individual counties work has contributed to restoring over 118 miles of habitat, there has been less work done with county planning departments. Land use development has increased dramatically over the past decade at the same time that planning department staff levels have remained flat or declined. High land values and shifts in reduced income from natural resources have led to conversion of forests, range and riparian areas.

As a result of meetings with each County's planning department staff, it was clear that nearly all of the five Counties planning departments are understaffed. This not only hampers their ability to review projects within statutory timeframes; it also means that planners may not have the time to identify and consider less conventional opportunities to minimize project impacts in a variety of areas (e.g., stormwater runoff, increased riparian protections through flexible design incentives).

The 5C Program has recently expanded its focus beyond County infrastructure and practices to assist counties in addressing planning policies and issues. The impacts of development to stream systems, water quality, and salmonid habitat can be potentially adverse. At the same time, steps can be taken to minimize these impacts through: improved County review and processing of development projects; training for planners and consultants/ surveyors; collaboration with regulatory agencies; educational public outreach; and development of incentive based tools to facilitate better project design and protection of natural resources. Two tools identified and developed to help achieve quicker and more thorough project reviews are: an expanded development application and environmental questionnaire for project applicants.

Another component of the 5C Land Use Planning efforts is training for planners, consultants, and planning commissioners. This would consist of providing them with resources such as enhanced mapping (e.g., geology, wildlife habitat) and training on topics such as basic geology, road ecology, and stormwater runoff. Resources provided to planners will include an expanded environmental checklist and library of standard mitigation measures.

The 5C has begun regular meetings with regulatory agencies to discuss planning related issues and regulations. The goal is that policies from each agency will be as uniform and consistent as possible to help clarify and streamline the project review process.

The 5C, working with the counties, will develop programs at all levels to try to influence and balance the complex factors of land use development, water quality, fish and wildlife habitats. The 5C will be looking at the local government tools that exist today as well as proposing model ordinances for design incentives. On a state-wide scale, the 5C is exploring the creation of land use programs to encourage restoration and retention of critical habitat areas by using tax and labor based incentives.

Regional Land Use Planning and Implementation Strategies in Aquatic Conservation

First Priority Implementation Strategies for Sediment Control in Ecologically Valuable Watersheds

Todd Kraemer (presenter), William Weaver, and Danny Hagans, Pacific Watershed Associates

Historically, the restoration and protection of biologically important watersheds has been undertaken in a piecemeal and ineffective fashion. Watershed restoration and sediment control has typically been undertaken by one of four methods, each of which is biologically flawed and/or inefficient: 1) the "shotgun" technique; 2) the "eyesore" treatment; 3) the "reactive" or "emergency" treatment strategy; and 4) the "barter" approach where restoration is used to compensate or mitigate for proposed land management. These flawed strategies or modes of "restoration" are not likely to provide timely, effective biological protection to most watersheds. In fact, they are more likely to result in further declines of salmonid populations that are already in a vulnerable condition.

Watershed scientists have identified excess sediment production and delivery to stream channels from road systems as one of the most significant and controllable factors affecting the salmonid populations. Roadbeds are a primary source of annual fine sediment delivery to streams during normal water years. During large magnitude storm events, roads still produce chronic sediment, but episodic road stream washouts, stream diversions, and fill failures frequently generate much larger volumes of sediment. Experience has shown that preventing stream crossing failures and fill failures is usually far more expensive than addressing road bed derived sources of fine sediment.

Because of limited funding, we believe most salmonid recovery programs will fail to protect and recover the species or their habitat because the regional pace of implementation is too slow. As a remedy to this, we propose developing watershed-wide "streamlined" implementation programs that emphasize the control of chronic road sediment sources, while still implementing the most critical treatments at more costly stream crossing and landslide sites. As funds become available, the more expensive, critical treatments can be undertaken according to their identified priority.

Utilizing a rapid forward-looking sediment inventory (CDFG, 2004) the relative importance of erosional processes and limiting factors occurring in the watershed can be readily identified. This analysis leads to a rapid prioritization of treatments throughout the watershed and allows an aggressive "streamlined" implementation program.

In watersheds where sediment is a limiting factor and restoration funds are limited, early implementation strategies should focus on eliminating barriers to salmonid migration, as well as reducing annual fine sediment delivery and the greatest threats to episodic failures. Thus, if long lengths of road are hydrologically connected to streams, an aggressive program to disperse road runoff should be undertaken. Likewise, inexpensive critical dips can be constructed basin-wide to prevent stream diversions that might otherwise cause significant hillslope gullying and catastrophic hillslope landslides. Rather than immediately replacing and upgrading all undersized stream crossing culverts, overflow culverts can be installed higher in deep fills to temporarily avert overtopping and failure. Similarly, trash barriers can be selectively installed to protect the most vulnerable culverted stream crossings until the preferred long term culvert upgrade can be applied. By focusing on implementing these protective treatments, rather waiting for sufficient monies for the much more costly stream crossing upgrades that are eventually needed, biologically valuable refuge watersheds can be protected.

Directory

Donald Allan
Redwood Community
Action Agency,
904 G Street
Arcata, California 95501
(707) 269-2063
don@rcaa.org

Charlotte Ambrose
NOAA Fisheries
777 Sonoma Ave., Suite 325
Santa Rosa, California 95404
(707) 575-6068
Charlotte.A.Ambrose@noaa.gov

Shannah Anderson
Center for Environmental
Design Research, University of
California, Berkeley
390 Wurster Hall #1839
Berkeley, California 94720
(510) 642-2904
shannahanderson@yahoo.com

Laurel Anderson
Salmon Creek Middle School
1935 Bohemian Highway
Occidental, California 95465
(707) 874-1205
laurelmalin@earthlink.net

Betty Andrews
Philip Williams & Associates, Ltd
720 California Street, Suite 600
San Francisco, California 94108
(415) 262-2300 x315
e.andrews@pwa-ltd.com

Darcy Aston
FishNet 4C
3820 Cypress Drive #11
Petaluma, California 94954
(707) 762-1336
darcya@sonic.net

Drew Barber
Mattole Salmon Group
P.O. Box 188
Petrolia, California 95558
(707) 629-3433

Michelle Bates
Tetra Tech, Inc.
3475 East Foothill Boulevard
Pasadena, California 91107
(805) 681-3100
michelle.bates@tetratech.com

David Bayles
Pacific Rivers Council
P.O. Box 10798
Eugene, OR 0
(541) 345-0119
david@pacrivers.org

Gordon Becker
Center for Ecosystem
Management and Restoration
4179 Piedmont Avenue,
Suite 325
Oakland, California 94611
(510) 420-4565
becker@cemar.org

Pete Bell
Foothill Conservancy
P.O. Box 1255
Pine Grove, California 95665
(209) 296-5734
pbell@cdepot.net

Gary Black
Siskiyou Resource
Conservation District
P.O. Box 268
Etna, California 96027
(530) 467-3975
sisqrcd@sisqtel.net

Alastair Bleifuss
City of Santa Rosa, Creek
Stewardship Program
69 Stony Circle
Santa Rosa, California 95401
(707) 543-3845
ABleifuss@ci.santa-rosa.ca.us

Paola Bouley
Salmon Protection and
Watershed Network
P.O. Box 400
Forest Knolls, California 94933
(415) 488-0370 x102
Spawn@Spawnusa.org

Michael Bowen
State Coastal Conservancy
1330 Broadway, 11th Floor
Oakland, California 94612
(510) 286-0720
mbowen@scc.ca.gov

Steve Brady
City of Santa Rosa,
Public Works Department
69 Stony Circle
Santa Rosa, California 95401
(707) 543-3800
sbrady@srcity.org

John Cain
Natural Heritage Institute
100 Pine Street, Ste. 1550
San Francisco, California 94111
(415) 693-3000
jcain@n-h-i.org

Dan Calvert
Salmon Camp Research Team
16125 Skyliners Road
Bend, OR 97701
(503) 791-3657
dcalvert@omsi.edu

Steve Cannata
California Department
of Fish and Game
1487 Sandy Prairie Ct., Suite A
Fortuna, California 95540
(707) 725-1015
scannata@dfg2.ca.gov

Sierra Cantor
Sotoyome RCD
PO Box 11526
Santa Rosa, California 95406
(707) 569-1488 x107
scantor@sotoyomercd.org

Steve Chatham
Prunuske Chatham, Inc.
P.O. Box 828
Occidental, California 95465
(707) 874-0102 x33

Donald Coates
North Coast Regional Water
Quality Control Board
5550 Skylane Blvd, Ste A
Santa Rosa, California 95403
(707) 566-3882
dcoates@waterboards.ca.gov

Bob Coey
California Department
of Fish and Game
P.O. Box 47
Yountville, California 94599
(707) 944-5582
BCoey@dfg.ca.gov

J. Louise Conrad
Pacific Marine States
Fisheries Commission
Warm Springs Hatchery, 3246
Skaggs Spring Road
Geyserville, California 95411
(707) 433-6054
ccrwshbio@dfg.ca.gov

Susan Corum
Dept. of Natural Resources,
Karuk Tribe
PO Box 282
Orleans, California 95556
(530) 469-3456
scorum@karuk.us

Michael Deas
Watercourse Engineering, Inc
133 D Street, Suite F
Davis, California 95616
(707) 265-6560
mike.deas@watercourseinc.com

Matthew Deitch
UC Berkeley
137 Mulford Hall, #3110,
UC, Berkeley
Berkeley, California 94720
(510) 299 1359

Brita Dempsey
Students and Teachers Restoring
a Watershed (STRAW)
500 Palm Drive, Suite 200
Novato, California 94949
(415) 506-0150 x29
dempsey@bay.org

Charley Dewberry
Ecotrust
Jean Vollum Natural Capital
Center, Suite 200,
721 NW Ninth Avenue
Portland, OR 97209
(541) 997-9360
cdewberr@presys.com

Rob Dickerson
Trout Unlimited
1120 College Ave
Santa Rosa, California 95404
(707) 543-5877
rdickerson@tu.org

Kari Dolan
River Scientist, Agency of
Natural Resources River
Management Program
10 North Building
103 South Main Street
Waterbury, VT 05671-0408

Brock Dolman
Occidental Arts and Ecology
15290 Coleman Valley Road
Occidental, California 95465
(707) 874-1557 ext.206
brock@oaec.org

Scott Downie
California DFG
Coastal Watershed Planning
and Assessment Program
1487 Sandy Prairie Court, Suite A
Fortuna, California 95540
(707) 725-1070
sdownie@dfg.ca.gov

Thomas Dunklin
Thomas B. Dunklin Photography
and Videography
dunklin@northcoast.com

Evan Engber
Bioengineering Associates
P.O. Box 1554
Laytonville, California 95454
eengber@mcn.org

Richard Fadness
North Coast Regional Water
Quality Control Board
5550 Skylane Blvd, Ste A
Santa Rosa, California 95403
rfadness@waterboards.ca.gov

Leslie Ferguson
San Francisco Regional Water
Quality Control Board
1515 Clay St. Suite 1400
Oakland, California 94612
compostbe@aol.com

Rocco Fiori
Fiori GeoSciences
PO Box 387
Klamath, California 95548
rfiori@verizon.net

Troy Fletcher
Yurok Tribe
PO Box 1027
Klamath, California 95548
troy_fletcher@earthlink.net

Joan Florsheim
Geology Department, UC Davis
Davis, California 95616
(530) 752-0350
florsheim@geology.ucdavis.edu

Karen Gaffney
West Coast Watershed
PO Box 262
Healdsburg, California 95448
(707) 433-7377 x 2
kgaffney@westcoastwatershed.com

Eric Ginney
PWA, Ltd.,
Environmental Hydrology
928 Second St. Suite 300
Sacramento, California 95814
(916) 444-9407
e.ginney@pwa-ltd.com

Mauricio Gomez
Community Environmental Council
26 W Anapamu St, 2nd Floor
Santa Barbara, California 93101
(805) 963-0583
mgomez@cecmail.org

Doug Gore
Dragonfly Stream Enhancement
12421 Bodega Hwy
Sebastopol, California 95472
(707) 632-517
trouthab@sonic.net

Robin Grossinger
San Francisco Estuary Institute
7770 Pardee Lane, 2nd Floor
Oakland, California 94621
(510) 746-7380
robin@sfei.org

Zeke Grader
Pacific Coast Federation of Fisherman's Associations
P.O. Box 29370
San Francisco, California 94129
(415) 561-5080
zgrader@ifrfish.org

Ted Grantham
UC Berkeley
137 Mulford Hall, #3110,
UC, Berkeley
Berkeley, California 94720
(510) 643-1136
tgrantham@nature.berkeley.edu

John Green
Pacific Watershed Associates
(707) 773-1385
johng@pacificwatershed.com

Bruce A. Gwynne
North Coast Regional Water Quality Control Board
5550 Skylane Blvd.
Santa Rosa, California 95403
bgwynne@waterboards.ca.gov

Danny Hagans
Pacific Watershed Associates
PO Box 4433
Arcata, California 95518
(707) 839-5130
dannyh@pacificwatershed.com

Lauren Hammack
Prunuske Chatham Inc.
P.O. Box 828
Occidental, California 95465
(707) 874-0100
lauren@pcz.com

Rainer Hoenicke
San Francisco Estuary Institute
7770 Pardee Lane
Oakland, California 94621
(510) 746-7381

Dave Hope
North Coast Regional Water Quality Control Board
5550 Skylane Blvd. Suite A
Santa Rosa, California 95403
dhope@waterboards.ca.gov

Freeman House
Author
lfhouse@frontiernet.net

Mike Jensen
Prunuske Chatham, Inc
PO Box 828
Occidental, California 95465
(707) 874-0100
mike@pcz.com

Brian J. Johnson
Trout Unlimited
1808B 5th St
Berkeley, California 94710
(510) 528-4772
bjohnson@tu.org

Christine Jordan
Five Counties Salmonid Conservation Program
PO Box 2819
Weaverville, California 96093
(530) 623-1351 x9
cjordan@trinitycounty.org

Lauma Jurkevics
State Water Resources Control Board
P.O. Box 100
Sacramento, California 95812
(916) 341-5498
ljurkevics@waterboards.ca.gov

Brannon Ketcham
Point Reyes National Seashore
Point Reyes Station, California 94956
(415) 464-5192
Brannon_Ketcham@nps.gov

Bill Kier
Kier Associates
P.O. Box 915
Blue Lake, California 95525
(707) 668-1822
kierassociates@cox.net

Manfred Kittel
California Department of Fish and Game
7329 Silverado Trail
Napa, California 94558
(707) 944-5522
mkittel@dfg.ca.gov

Martina Koller
Pacific States Marine Fisheries Commission
830 S Street
Sacramento, California 95814
(916) 327-3937
mkoller@dfg.ca.gov

Todd Kraemer
Pacific Watershed Associates
P.O. Box 4433
Arcata, California 95518
(707) 839-5130
toddk@pacificwatershed.com

Mark Lancaster
Five Counties Salmonid Conservation Program
P.O. Box 2819
Weaverville, California 96093
(530) 623-1351 x8
mlancaster@trinitycounty.org

Chris Larson
Mattole Restoration Council
PO Box 160
Petrolia, California 95558
(707) 629-3514
chris@mattole.org

Stephanie Larson
UC Cooperative Extension
133 Aviation Blvd., Suite 109
Santa Rosa, California 95436
(707) 565-2621
slarson@ucdavis.edu

Michael Lennox
UC Cooperative Extension
133 Aviation Blvd., Suite 109
Santa Rosa, California 95436
(707) 565-2621
mlennox@ucdavis.edu

Stephanie Lennox
Envirichment
P.O. Box 21
Forestville, California 95436
(707) 206-5147
envirichment@comcast.net

Alan Levine
Coast Action Group
PO Box 215
Point Arena, California 95468
(707) 542-4408
alevine@mcn.org

David Lewis
UC Cooperative Extension
133 Aviation Blvd., Suite 109
Santa Rosa, California 95403
(707) 565-2621
djllewis@ucdavis.edu

Stefan Lorenzato
California Department of Water Resources, Watershed Program
P.O. Box 948236
Sacramento, California 94236
(916) 651-9617
stefanl@water.ca.gov

Michael Love
Michael Love and Associates
427 F St., Suite 223
Eureka, California 95501
(707) 476-8938
mlove@h2odesigns.com

Leah Mahan
NOAA Restoration Center
777 Sonoma Avenue
Santa Rosa, California 95404
(707) 575-6077
Leah.mahan@noaa.gov

Jeff Martinez
South Yuba River Citizens League
216 Main Street
Nevada City, California 95959
(530) 265-5961

Scott McBain
McBain and Trush
P.O. BOX 663
Arcata, California 95521
(707) 826-7794
scott@mcbaintrush.com

Jene McCovey
jlmwesaw@northcoast.com

Bryan McFadin
North Coast Regional Water Quality Control Board
5550 Skylane Blvd. Suite A
Santa Rosa, California 95403
bmcfadin@waterboards.ca.gov

Tasha McKee
Sanctuary Forest
PO Box 166
Whitethorn, California 95589
(707) 986-1087
tasha@sanctuaryforest.org

John McKeon
National Marine Fisheries Service
3740 View Ct.
Santa Rosa, California 95403
(707) 575-6069
john.mckeon@noaa.gov

Kevin McKernan
Yurok Tribe
Environmental Program
190 Klamath Boulevard
Klamath, California 95548
(707) 482-1350 x355

Adina Merenlender
UC Cooperative Extension
4040 University Rd.
Hopland, California 95449
(707) 744-1424
adina@nature.berkeley.edu

Lisa Micheli
Sonoma Ecology Center
P.O. Box 1486
Eldridge, California 95431
(707) 996-0712 x107
sec-micheli@vom.com

Peter Miller
Dept. of Landscape Architecture and Environmental Planning,
UC Berkeley
202 Wurster Hall, #2000,
Berkeley, California 94720
(510) 847-5161
pmiller@nature.berkeley.edu

Darren Mireau
McBain and Trush, Inc
PO Box 663
Arcata, California 95518
(707) 826-7794
darren@mcbaintrush.com

Dave Montague
City of Santa Rosa, Public Works Department
69 Stony Circle
Santa Rosa, California 95401
(707) 543-3800

Peter Moyle
UC Davis
University of California, Davis
1 Shields Ave.
Davis, California 95616
(530) 752-6355
pbmoyle@ucdavis.edu

Keith Nakatani
California Hydropower Reform Coalition
2140 Shattuck Ave, Suite 605
Berkeley, California 94704
(510) 868-1054
knakatani@calhrc.org

Mark Newhouser
Sonoma Ecology Center
205 First St W
Sonoma, California 95476
(707) 996-0712
mnewhouser@vom.com

Marishka Obedzinski
UC Cooperative Extension
133 Aviation Boulevard, Suite 109
Santa Rosa, California 95403
(707) 565-2621
mobedzinski@ucdavis.edu

Gillian O'Dougherty
NOAA Restoration Center
777 Sonoma Avenue, Room 219
Santa Rosa, California 95404
(707) 575-6095
gillian.odoherty@noaa.gov

Connie O'Henley
Central Coast Salmon Enhancement
592 South 13th
Grover Beach, California 93433
(805) 473-8221
SalmonFix@aol.com

Paul Olin
Sea Grant
133 Aviation Blvd., Suite 109
Santa Rosa, California 95403
(707) 565-2621
pgolin@ucdavis.edu

Samantha Olson
North Coast Regional Water Quality Control Board
5550 Skylane Blvd. Suite A
Santa Rosa, California 95403
(916) 327-8235
SOlson@waterboards.ca.gov

Sarah Paddack
Central Coast Salmon Enhancement
592 South 13th
Grover Beach, California 93433
(805) 473-8221
salmonfix5@aol.com

Sandra Perez
Five Counties Salmonid Conservation Program
P.O. Box 2819
Weaverville, California 96093
(530) 623-1351 x 8
sperez@trinitycounty.org

Guy Phillips
Economist
Box 740
Nicasio, California 94946
(707) 338-0793
guyphil@ix.netcom.com

Will Pier
Sonoma Ecology Center
205 First Street
Sonoma, California 95416
(707) 996-0712
will@sonomaecologycenter.org

Joe Pisciotto
California Department of Fish and Game
830 S Street
Sacramento, California 95814
(916) 324-6902

Liza Prunuske
Prunuske Chatham, Inc.
P.O. Box 828
Occidental, California 95465
(707) 874-0102 x33
liza@pcz.com

Steve Rabinowitsh
Santa Rosa City Council
P.O. Box 1678
Santa Rosa, California 95402
(707) 535-0407
srabinowitsh@ci.santa-rosa.ca.us

Jason Rainey
South Yuba River Citizens League
216 Main Street
Nevada City, California 95959
(530) 265-5961 x207
jason@syrcl.org

Kent Reeves
East Bay Municipal Utility District
1 Winemaster Way, Suite K2
Lodi, California 95240
(209) 365-1096
kreeves@ebmud.com

Laurette Rogers
Students and Teachers Restoring a Watershed (STRAW)
500 Palm Drive, Suite 200
Novato, California 94949
(415)506-0150 x29
rogers@bay.org

Richard Roos-Collins
Natural Heritage Institute
100 Pine Street, Ste. 1550
San Francisco, California 94111
(415) 693-3000 x103
rrcollins@n-h-i.org

Steve Rothert
California Field Office, American Rivers
PO Box 559
Nevada City, California 95959
(530) 478-5672
srothert@amrivers.org

Nathaniel Scholz
Northwest Fisheries
Science Center
2725 Montlake Blvd. E.
Seattle, WA 98112
(206) 860-3454
Nathaniel.Scholz@noaa.gov

Fraser Shilling
Dept. of Environmental Science
and Policy, UC Davis
University of California
Davis, California 95616
(530) 752-7859
fmshilling@ucdavis.edu

Dan Smith
USACE Engineering Research
and Development Center
3909 Halls Ferry Road
Vicksburg, MS 39180
(601) 634-2718

Matt St. John
Acting Lead TMDL Unit,
North Coast Water Quality
Control Board
5550 Skylane Blvd. Suite A
Santa Rosa, California 95403
(707) 570-3762
MStjohn@waterboards.ca.gov

Dave Steindorf
American Whitewater
1325 Deodara Way
Paradise, California 95969
(530) 876-1335
dave@amwhitewater.org

Todd Steiner
Salmon Protection and
Watershed Network
P.O. Box 400
Forest Knolls, California 94933
(415) 488-0370 x102
Spawn@SpawnUSA.org

Matt Stoecker
Stoecker Ecological
P.O. Box 2062
Santa Barbara, California 93120
(650) 380-2965
matt@stoeckerecological.com

Tom Stokely
Trinity County Planning
Natural Resources
PO Box 2819, 60 Glen Rd
Weaverville, California 96093-
2819
(530) 623-1351 x3407
tstokely@trinitycounty.org

Eric Sturm
National Marine Fisheries Service
110 Shaffer Road
Santa Cruz, California 95060
(831) 420-3964
Erick.Sturm@noaa.gov

Ann Thrupp
California Sustainable
Winegrowing Alliance
PO Box 611
Hopland, California 95449
707) 272-1152
ann_thrupp@b-f.com

S. Craig Tucker
Karuk Tribe of California
39051 Highway 96
Orleans, California 95556
(530) 627-3446 x3027
ctucker@karuk.us

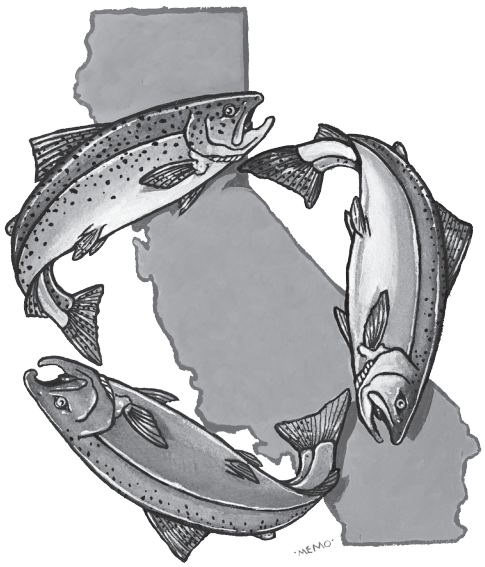
Jonathan Warmerdam
North Coast Regional Water
Quality Control Board
5550 Skylane Blvd. Suite A
Santa Rosa, California 95403
(707) 576-2468
JWarmerdam@waterboards.ca.gov

Bill Weaver
Pacific Watershed Associates
P.O. Box 4433
Arcata, California 95518
(707) 839-5130
billw@pacificwatershed.com

Seth Zuckerman
Mattole Restoration Council
PO Box 159
Petrolia, California 95558
(707) 629-3663
szuckerman@igc.org

SRF Mission Statement

The Salmonid Restoration Federation was formed in 1986, to help stream restoration practitioners advance the art and science of restoration. Salmonid Restoration Federation promotes restoration, stewardship, and recovery of California native salmon, steelhead, and trout populations through education, collaboration, and advocacy.



SRF Goals & Objectives:

1. **To provide affordable technical and hands-on trainings to the restoration community.**
2. **Conduct outreach to constituents, media, and students to inform the public about the plight of endangered salmon and the need to preserve and restore habitat to recover the species.**
3. **Advocate on behalf of continued restoration dollars, protection of habitat, and recovery of imperiled salmonids.**

SRF PO Box 784 Redway, California 95560
Office: 707/923-7501, Fax: 707/923-3135, Mobile: 707/223-1770
srf@calsalmon.org *www.calsalmon.org*