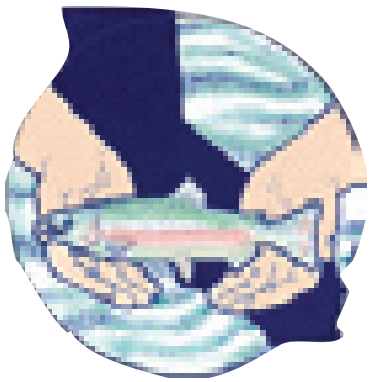
Salmonid Restoration Federation's

24th Salmonid Restoration Conference

February 22-25, 2006
Santa Barbara Veterans Center
Santa Barbara, California



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24th Annual Salmonid Restoration Conference Preface

Welcome to the 24th Annual Salmonid Restoration Conference entitled, *Rediscovering Urban Creeks and Creating Healthy Watersheds*. The theme of this conference is fitting given the constellation of urban creeks, water justice issues, and community-based restoration efforts in Southern California. The production and coordination of the annual conference is a genuine collaborative effort of Salmonid Restoration Federation's diverse Board of Directors, staff and co-sponsors who represent restorationists, fisheries biologists, educators, advocates, and agency personnel from the Tijuana Headwaters to the Klamath River, 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. The beginning of the conference planning for this year's conference began two years ago at a Ventura beach house with the SRF Board, the founder of Patagonia, Surfrider Paul Jenkin, and local fishhead David Pritchett.

During the summer, the SRF Board and a Steering Committee of restorationists who have expressed interest in helping to create the conference agenda gather around a picnic table by a river or stream to brainstorm about potential sessions, workshops, and field tours. The discussion and conference agenda building process is highly interactive. Last year this discussion took place after the Coho Confab in Prairie Creek State Park in a meadow encircled by redwoods.

SRF is a state-wide organization that is based on the North Coast, so it was a little intimidating to build an agenda and produce a conference in Southern California. Fortunately, the enthusiasm and dedication of Southern California agencies, non-profit organizations, individuals, and Southern steelhead champions buoyed our organizing efforts. SRF's primary conference co-sponsor, DFG, granted us funds from the Steelhead Report Card Fund. The Community Environmental Council decided to coordinate their inaugural Steelhead Festival to coincide with the conference. The Santa Barbara County Water Resources Agency offered to organize a local session and the City of Santa Barbara is a co-sponsor. U.S. Fish and Wildlife Service offered technical support and dozens of local organizations, consulting firms, and agencies are presenting at what promises to be a dynamic and informative conference. For the first time the Annual Salmonid Restoration Conference will feature the *Wild and Scenic* film festival and a focus on water justice issues.

The creation of the conference agenda and events is a labor of love, and persistence! I'd 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 the premiere salmonid restoration conference.

SRF hopes that you enjoy the conference and take the opportunity to join us for another event in the future. In 2006, SRF will offer field schools in Southern California, the Central Coast, and the North Coast focusing on road decommissioning, bioengineering techniques, and instream structures. SRF

will also cosponsor the Coho Confab this summer near Lagunitas Creek in Marin County. The Confab is a weekend-long symposium to explore watershed restoration and learn techniques to enhance recovery of salmon and steelhead. The Confab provides an opportunity for participants to learn about local restoration efforts and learn hands-on skills that can be applied in their home watershed. SRF is also hoping to offer a Spring-run Chinook watershed symposium in Butte Creek this June. SRF is planning on having the 25th Annual Conference in 2007 in Santa Rosa, California and we hope to have the 2008 Conference in the San Joaquin Valley.

SRF Board and staff gathers to brainstorm about the 24th Annual Salmonid Restoration Conference.

photo: Traci Bear Thiele

SRF realizes that California's once magnificent runs of wild salmon and steelhead will not be saved solely by restoration and education. Critical elements for recovery include advocating for protection of instream flows, wild stocks of salmon, and key refugia habitats. In the next year, SRF plans to advocate for using the best available science, applying the precautionary approach, and increasing restoration funding towards recovery of California's imperiled salmon and steelhead runs.

SRF continues to be dedicated to protecting wild salmon runs, restoring salmonid habitat, and offering affordable trainings to restoration practitioners. SRF is excited to be hosting the 24th Annual Conference in Santa Barbara, which is the furthest southern location where we have ever held the conference. It gives us hope to envision the annual migration of restorationists that come together to spawn new ideas and take them back to their ecoregions to incubate and proliferate the restoration techniques that contribute to the recovery of salmon, steelhead, and trout. The conference is an ideal place to become more informed about restoration issues and to network with other practitioners from all over the country. This year SRF will make the Conference Proceedings available online with a searchable database so restorationists who are not able to attend the conference will have access to this vital resource.

Thank you for your participation in Salmonid Restoration Federation's conference and for being an integral part of this emerging restoration field.

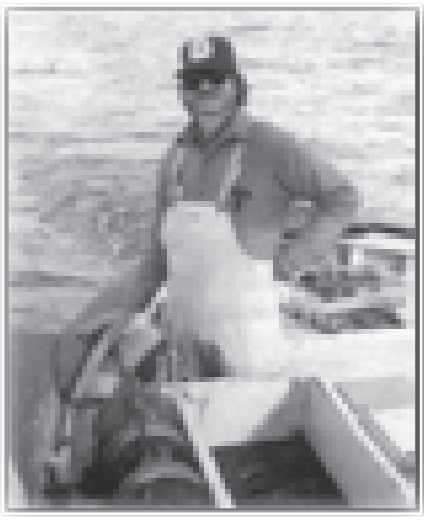
In the spirit of *Creating Healthy Watersheds*,

Dana Stolzman
Agenda Coordinator
Executive Director
Salmonid Restoration Federation

THE HISTORY OF THE NAT BINGHAM AWARD

& the Evolution of the Salmonid Restoration Federation

By Jud Ellinwood, former SRF President and Executive Director



Everyone has to be able to envision a future.
—Nat Bingham

The Bingham Award came into being in 1992 when the SRF Board decided to present an outstanding achievement award at SRF's annual conference. Back then, the general public, public officials and the media were essentially unaware of the restoration work being carried out by the pioneering non-profits, tribes, local agencies—such as RCDs—and a handful of for-profit contractors who were trying to make a livelihood in what was then an extremely arcane field of endeavor. And, there was no ceremonial recognition of the accomplishments of SRF's primary constituency—the men and women performing restoration work, often on a purely volunteer basis.

From its inception, SRF has made a conscious effort to ensure that the restoration community is directly involved in the planning and structuring of the annual conference, and that this annual gathering was used to maintain and deepen restoration practitioners' sense of community. So it made perfect sense to present the award as part of the conference banquet, which provided the restoration community with the means and setting to properly honor and to celebrate, once a year, the outstanding achievements of their peers. As a bonus, media coverage of the award presentation has promoted public awareness of the valuable work being done by the restoration community.

The award symbolizes both the value and unglamorous nature of restoration work as well as the key role played by citizen volunteers actively involved in the stewardship of the fishery resources in local watersheds. It has been gratifying for all of us who have been involved in the creation and presentation of the award to see the annual presentation become both an important ritual and a source of inspiration to the restoration community.

As the years passed, some changes have occurred in the nominating process that reflect more the diversity of the contributions made within both the public and private sectors. The kind of contribution that qualified prospective award recipients for consideration was broadened to include activities outside of project implementation, and the award was no longer limited to private sector candidates.

Following Nat Bingham's death in May of 1998, the SRF Board dedicated the award as a memorial to his extraordinary record as a conservation leader and spokesman, his remarkable spectrum of contributions to the conservation of California's salmon resources, and the pivotal role he played in the creation and development of the Salmonid Restoration Federation. Throughout his life, Nat was always at the forefront of efforts to protect and restore California's salmon runs, simply put, he was the most dedicated and effective advocate for what our salmon need to prosper. The award's name will hopefully continue to serve as a reminder that extraordinarily difficult challenges can be overcome by cooperative effort.

Nat was one of the ground-breaking restoration practitioners on the Pacific Coast. He operated what was the first small scale hatchbox incubator ever permitted by the California Department of Fish and Game, raising coho salmon fry for release into a tributary to Big River near his home outside the town of Mendocino.

Nat was one of the few private sector individuals—mostly commercial fisherman—who, along with sponsors U.C. Extension Sea Grant Program and the California Department of Fish and Game's Anadromous Program, were principally responsible for organizing and producing the very first and two

SRF Board member Jan Vaughn congratulates *2005 Restorationist of the Year* Mel Kreb, Director of the California Conservation Corps.

photo courtesy SRF archives

subsequent annual restoration conferences. The purpose then as it is today was to network, exchange knowledge, and build cooperative relationships. When cuts in Sea Grant's program budget eliminated the main source of conference funding, the ad-hoc planning group led by Nat managed to find the necessary resources to organize and produce the fourth annual conference in 1986. This intensely cooperative effort did two powerful things: it built a strong sense of group identity and it also raised awareness of what could be accomplished through a collaborative approach. Participants began talking about what a representative organization could accomplish in the future.

At the end of the conference a meeting was convened for the purpose of creating a formal organization that would produce subsequent conferences and have the ability to seek funding. The value of the conference was so great that there was an enthusiastic consensus to establish a formal organizing entity based on collaboration, an interim Board of Directors was formed, and organization representatives made commitments of resources and manpower. The organization was given the name the Salmon, Steelhead and Trout Restoration Federation, which was later shortened to the Salmonid Restoration Federation.

As the years passed, SRF evolved into more than a just a conference planning group as the demand for a broader set of services developed; SRF became increasingly involved in state and federal policy issues that affected the efforts of restoration practitioners and it also began expanding the scope of its education activities. Nat was one of the key individuals who helped convince the Board that advocacy was a vital and unique role that SRF could, and should, play. He persuasively contended that restoration practitioners needed an advocate organization that could influence the development of funding, represent contractors with legitimate grievances, and insure that the granting agencies developed and fairly applied an objective, standardized process for evaluating and scoring project funding proposals.

Nat also played a significant and ongoing role in SRF's efforts to develop and maintain public sector funding support for its educational activities. He was an unswerving advocate for CDFG funding of the conference and helped SRF win it's initial grant funding of the Field School. At that time, the idea of providing an intensive hands-on training experience over a period of several days with students and staff housed and fed at a central facility was a new, untried and unconventional approach to training in California; and SRF was proposing designing and developing the school from the foundation up. Nat's contribution didn't end there—the initial success of the school was attributable in part to the high enrollment of North Coast commercial salmon fishermen who were attempting to transition into careers in restoration. Nat was the guy who convinced many of the fishermen that we would deliver on our promise of an exceptional hands-on training experience.

Nat's support of SRF and its' programs was steadfast up to his untimely death. Naming the outstanding achievement award after Nat recognizes and acknowledges the importance he attached to nurturing the welfare of the restoration community, its self-reliance and cooperative spirit, its commitment to advancing its craft, and the role SRF has played in all of these areas.

Former *Restorations of the Year* award recipients.

Left to right: standing are Gary Flosi, Harry Vaughn, Gary Peterson, Richard Gienger, Bill Eastwood, Michelle Rose, Mike Cronin (standing in for his father Leo Cronin), Phillip LaFollette; sitting are Ann Riley, Danny Hagans, and Mike Kossow.

photo courtesy SRF archives

Editor's Note

I am pleased to present the Proceedings for the 24th Annual Salmonid Restoration Federation Conference, held February 22-25, 2006 in Santa Barbara, California. The abstracts that follow are intended to serve as a guide to a busy four days of learning and sharing, as well as a resource for future reference. These proceedings are the result of the hard work and dedication of many people whose names are found herein, including the many presenters and the coordinators/chairs and those who have doggedly pursued them. My personal thanks go to Dana Stolzman and Lindsay Righter of SRF for entrusting me with this project and guiding me through each step of the way. Having gotten an advance look at the content of this year's conference, it is not difficult to see that it promises to be another excellent conference. In their totality, the proceedings reveal a tremendous wealth of knowledge, energy and enthusiasm for salmonids and the human and ecological systems on which they are interdependent. Now we may all take a step back to appreciate what has been happening in our anadromous watersheds over the last years and to learn what needs to happen in the future to continue to get restoration done.

Jeffrey G. Blumenthal, Editor
Americorps*USA Watershed Stewards Project/Institute for Fisheries Resources

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7-10 pm—Hosted by Salmonid Restoration Federation & Community Environmental Council

Friday, February 24, 2006

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Wednesday Workshop 1:
Water Conservation Workshop

Rainwater Harvesting as a Means of Water Conservation

Brock Dolman, Occidental Arts & Ecology Center's WATER Institute

This workshop will address rainwater harvesting—from roofs to the broader landscape—as a strategy of water conservation. Speaker will expand on ideas of conservation hydrology, which emphasizes the need to shift human development designs from drainage to retainage. Instead of land use practices that, by design, capture and convey excess volumes of stormwater, discharging this often degraded water off-site, we will discuss ways in which landowners can spread, slow and sink stormwater on their property. Moving from run-off to run-on type land uses can result in multiple watershed benefits, such as reduced flooding, improved water quality, increased groundwater recharge, benefits to stream structure and function, enhanced instream and upland wildlife habitat, short-term and long-term economic benefits and improved localized aesthetics.

Brock Dolman demonstrating the construction of a simple A-Frame used for finding and marking a level contour line on a slope for rainwater harvesting projects.

photo courtesy of Joelle Geppert

Wednesday Workshop 1:
Water Conservation Workshop

Why it is Not Fish vs. People, We Can Have Both and be More Efficient!

Fran Spivey-Weber, Executive Director, Policy, Mono Lake Committee

Opportunities for increased efficiencies of urban water use can provide 30% water returned for the environment, here is how it worked with the one state precedent—the Mono Lake Experience.

There Are No Easy Answers: Not Ocean Desal, Not Transfers, Not the Environmental Water Account: How Do We Return Flows For Fish?

Conner Everts, Vice-Chair, Southern Steelhead Coalition, Desal Response Group

Promises of water for fish have failed, with an explanation of the past and a guideline for the future, how do we make existing programs work more effectively and what models do we have for the future.

The Council, 15 Years After, Where Do We Go From Here?

Mary Ann Dickinson, Executive Director, California Urban Water Conservation Council

The California Urban Water Conservation Council (CUWCC) was put into place to resolve differences between urban water suppliers and environmental groups. Now after 15 years where have we been and where do we plan to go? What are the obstacles to overcome in order to implement statewide water conservation equity?

Wednesday Workshop 1:
Water Conservation Workshop

From Mono Lake to a Progressive Utility, a Personal Perspective

Martha Davis, Inland Empire Utility Agency

After many years successfully negotiating the public trust victory for Mono Lake, trout, and the community groups in Los Angeles, Martha Davis now works for one of the most progressive water utilities in the nation. She will share her personal experiences working both sides, and what the long range plans of a modern utility of this issue look like.

The Role of Community-Based Organizations in Returning Water to Mono Lake

Ade Adeniji, ADRO and the LA Water Conservation Council

Urban water conservation didn't happen just because of incentives from MWD and the involvement of the Los Angeles Department of Water and Power. The coalition of Community-Based Organization (CBOs) and environmental organizations contributed to the four million Ultra low flow toilets exchanged and expansion of waste water reclamation. Ade Adajani, representing a CBO and the coalition, has worked with the California Urban Water Conservation Council and utilities to make this happen and expand the programs beyond Los Angeles.

Policy Challenges in Integrating Water Saved and Water Returned

BongHwen Kim,
Pasadena Housing Corporation and Board member, Environmental Justice Coalition for Water

The policy challenges to make state policy and integrate Community-based Organizationss and not the water utilities as the delivery mechanism for urban water conservation is not without controversy. The involvement of CBOs, urban and rural, continues to be the missing link to making effective programs work and provide economic development opportunites.

Wednesday Workshop 1: Water Conservation Workshop

When is it Time for Fish to Come First?

Eric Wesselmam, Executive Director, Tuolumne River Preservation Trust

After a long history of dewatering and abandonment there is now discussion of reoperating dams for fish and water supply. With serious discussions on the removal of Hetch Hetchy dam in Yosemite National Park, the discussion of where San Francisco's water comes from and how it is used and valued comes into play. Eric Wesselman was a convener of California Urban Water Conservation Council, with the Sierra Club and now runs the organization looking at the river from both sides.

Wednesday Workshop 2:
Fisheries and Wildlife Friendly Agriculture:
A Workshop & Tour in Sustainability

Fisheries and Wildlife Friendly Agriculture: A Workshop and Tour in Sustainability

Session Chair*: Kent Reeves*[1]

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 agriculture 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 1700s. 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.

Instructor Kent Reeves has worked throughout California and the southwest with ranchers and farmers developing sustainable management and restoration plans to benefit fisheries and wildlife. Clif Ohmart has helped Lodi winegrape growers implement sustainable farming practices in their vineyards.

photo: courtesy of Kent Reeves

[1] **East Bay Municipal Utility District and California Native Grasslands Association**

Wednesday Workshop 2:
Fisheries and Wildlife Friendly Agriculture:
A Workshop & Tour in Sustainability

Using Planned Grazing in the Management of Native Grasslands

Kent Reeves, East Bay Municipal Utility District and California Native Grasslands Association

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. Selecting an appropriate herbivore, timing 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.

Implementation of Sustainable Winegrape Growing in California

Cliff Ohmart, Lodi-Woodbridge Winegrape Commission

California is one of the world's leading grape producers, accounting for 90 percent of U.S. production and more than 9 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.

Wednesday Field Tour A:

Nicholas Canyon Chumash Demonstration Village and Stream Restoration Program

Mati Waiya[1]

Wishtoyo Foundation is distinct in the work that we do because we bring a much needed, and unfortunately all too often overlooked, indigenous perspective to environmental issues. In this same way our field trip is unique, because through this visit to the Nicholas Canyon site, participants will have the rare opportunity to gain an understanding of the land from an indigenous, Chumash environmental perspective. The site visit to Nicholas Canyon will begin with a full tour of the site, followed by a stream restoration discussion with project lead Damon Wing; presentations by noted Chumash cultural practitioners and artists; an opportunity for participants to create their own version of a traditional Chumash musical instrument, the gourd rattle; and an artifact display and presentation in the ceremonial circle by Wishtoyo's Executive Director and Chumash ceremonial leader Mati Waiya. Mr. Waiya's presentation will include a discussion on environmentalism from an indigenous perspective, environmental justice issues, an overview of the work of the Foundation, and a discussion on Chumash traditional, cultural, and ecological practices. The field trip will conclude with a walk down to the ocean and a cultural presentation by members of the Chumash community.

Nicholas Canyon near Malibu Creek will be the site a Chumash demonstration village and stream restoration.

photos courtesy of Wishtoyo Foundation

Wishtoyo's Executive Director and Chumash ceremonial leader Mati Waiya dancing a traditional dance

1 Wishtoyo Foundation & Ventura Coastkeeper

Wednesday Field Tour B:

Fish Passage and Restoration Tour on the Santa Clara River

Jim Kentosh[1], Murry McEachron[1], E.J. Remson[2]

United Water Conservation District operates a fish ladder at its Freeman Diversion on the Santa Clara River. The fish ladder is used by endangered southern California steelhead and by Pacific lamprey. Upstream of the Freeman Diversion are two other fish ladders on Santa Paula Creek, a tributary to the Santa Clara River. One, the Harvey Dam fish ladder, is operated by Canyon Irrigation Company and the other by the U.S. Army Corps of Engineers.

The Nature Conservancy has purchased large tracts of land along the Santa Clara River. Habitat restoration on these important reaches of the river could improve steelhead migration.

The tour will begin with a presentation on the operation of United's fish passage facilities, covering the following topics:

- Description of the fish passage facilities
- How the facilities are operated to accommodate steelhead migration
- Results of monitoring upstream steelhead migration
- Results of trucking and trapping downstream smolts
- What we have learned about steelhead in the Santa Clara River
- What (little) we know about Pacific lamprey

The presentation will be followed by a tour of the Freeman diversion and its fish passage facilities. The Freeman tour will be followed by a tour of the two fish ladders on Santa Paula Creek.

The fish passage tours will be followed by a visit to Santa Clara River habitat sites recently purchased by The Nature Conservancy. The Nature Conservancy's long-range program for habitat restoration will be discussed.

Participants will visit the Freeman Diversion which is a fish passage facility on the Santa Clara River.

photo courtesey of United Water

1 United Water Conservation District
2 The Nature Conservancy

Thursday Workshop 3:
Removing Coastal California's Fish Passage Barriers: From Prioritization to Implementation

Removing Coastal California's Fish Passage Barriers: From Prioritization to Implementation

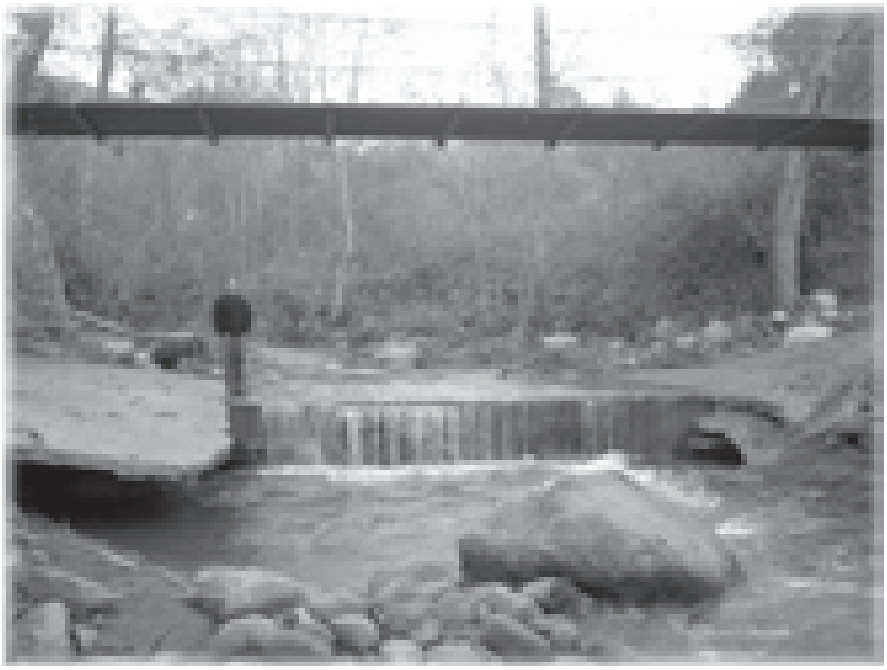
Session Chair*: Michael Love*[1]

Barriers blocking adult and juvenile salmonids from accessing spawning and rearing habitat are a significant limiting factor in the recovery of wild salmon and steelhead stocks throughout California. Reopening these inaccessible stream reaches to anadromous salmonids is one of the most direct and cost effective means of improving the health of the fishery. With this realization, broad-scale inventory and assessment of existing fish passage barriers throughout coastal California began in the late 1990s. From the results of these assessments, regional planning efforts have been made to prioritize identified barriers for treatment, leading to systematic design and implementation of fish passage improvement projects. Typically, improving fish passage at these sites is filled with site constraints and socioeconomic challenges, requiring an innovative approach to design.

This workshop will present fish passage case examples of:

- Inventory and assessments
- Regional planning efforts to prioritize barrier treatments
- Design and construction

The workshop will be composed of a wide variety of speakers from throughout coastal California sharing their first-hand experiences. Presentations will emphasize approaches used to overcome challenges and lessons learned.



Fish Passage project on Carpinteria Creek.

photo courtesy of Michael Love

1 Michael Love & Associates

Fish Migration Barriers Assessment on the Calaveras River

Margie Caisley[1] (presenter) and Michael Hendrick[1]

The goal of the Fish Passage Improvement Program (FPIP) is to collect data to identify and evaluate the potential to modify or remove manmade structures in waterways that impede migration and spawning of anadromous fish species. The Calaveras River is in the range of historical and essential fish habitat for fall-run Chinook salmon, and part of the historical distribution of Central Valley steelhead trout. The Calaveras River immediately downstream of New Hogan Dam provides excellent spawning and rearing habitat for anadromous salmonids. FPIP staff identified over 100 potential barriers to fish passage on the Calaveras River system downstream of New Hogan Dam. Most potential barriers were of five types: permanent dams and weirs, bridges, low-flow crossings with culverts, low-flow crossings without culverts, and flashboard dam bases. A point system was developed to rank structures of different types against each other. Points were assigned based on structure length, width, drop to channel bottom, and the presence of an apron and/or riprap at the structure. The point system was tested by developing hydraulic models of a number of barriers of varying point scores. The results of the ranking, along with other watershed information, can be used for planning and prioritizing modifications to the barriers on the Calaveras River system. The hydraulic models can also be used to identify the degree of impediment to fish passage a structure presents and to pinpoint the features of a structure that impair fish passage most. This information helps in determining what solutions may work best for improving fish passage at a structure.

1 Fish Passage Improvement Program of the California Department of Water Resources

Thursday Workshop 3:
Removing Coastal California's Fish Passage Barriers:
From Prioritization to Implementation

Regional Prioritization of Fish Passage Barriers: Project Methods and Challenges

Brian B. Stark[1]

Regional prioritization of fish passage barriers is a relatively new idea along the Central Coast. Initiated through grants from the California Coastal Conservancy, efforts are underway in San Luis Obispo County as well as in Santa Barbara and Ventura Counties. This presentation describes the methods and challenges to the program in San Luis Obispo County.

Watershed groups traditionally work in individual drainages in order to maximize their local affects on fisheries. Regional prioritization of project presents a new challenge as multiple groups begin to work together to assign priorities. Naturally, it is difficult to subordinate individual group goals for regional scale efforts. The project managed by the Land Conservancy of San Luis Obispo County relied on a regional fisheries interest group, the Steelhead Recovery Coalition of the South Central Coast. This group provided a loose framework for coordinating the effort. The San Luis Obispo example also depended heavily on technical experts and a steering committee consisting of resource agency experts and barrier owners.

The priority setting process in San Luis Obispo County was generally accepted and efforts are now underway to design and permit the highest priorities. Many difficult decisions need to be made in this process and it has become clear that it cannot be successful without the efforts of individual watershed groups and a high level of cooperation from public agencies.

1 Land Conservancy of San Luis Obispo County

Thursday Workshop 3:
Removing Coastal California's Fish Passage Barriers:
From Prioritization to Implementation

A Watershed Approach: Restoring Steelhead Passage throughout Carpinteria Creek Watershed

Mauricio Gomez[1]

Planning the recovery of the endangered steelhead trout on a regional scale along the South Coast of Santa Barbara County is an extremely difficult task. With over 500 mapped barriers along the South Coast, efforts for recovery would be very difficult without a plan. Addressing the recovery on a watershed approach is a much simpler task. Carpinteria Creek watershed is a typical watershed along the South Coast with an area of approximately 15 square miles and approximately 35 miles of stream habitat. In 2002, 16 anthropogenic barriers were surveyed by Stoecker, et al. Of these, 12 are on private property and four are either city, county or federally owned. This report ranked Carpinteria Creek as number one for the recovery of steelhead among all surveyed creeks along the South Coast. With the formation of the Carpinteria Creek Watershed Coalition, the recovery efforts of steelhead along Carpinteria Creek have been greatly facilitated. The Coalition is a unincorporated, community-based partnership of local landowners and other residents, non-profit organizations, and city, county, state and federal resource agencies. The participation of these partners is essential in the recovery of steelhead trout in the Carpinteria watershed.

1 Community Environmental Council

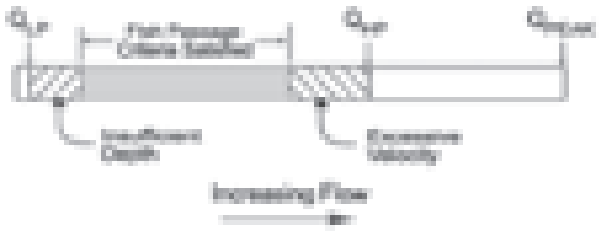
Thursday Workshop 3:
Removing Coastal California's Fish Passage Barriers: From Prioritization to Implementation

FishXing 3: Software for Modeling Fish Passage and Culvert Hydraulics for the Assessment and Design of Stream Crossings

Antonio Llanos[1] (presenter), Michael Love[1], Susan Firor[2], Michael Furniss[3], Kathleen Moynan[4], Jeffrey Guntle[5]

Assessment and design of culverts for fish passage is a flow-dependent problem involving knowledge of both hydraulics and fisheries biology. The newly developed FishXing Version 3.0, is a unique model for use in culvert design and assessment of fish passage conditions. It predicts hydraulic conditions within culverts and compares them to the swimming and leaping abilities of fish to identify the types and locations of potential barriers across a range of flows. FishXing also accommodates the iterative process of designing new culverts that provide passage of fish and other aquatic species. Hydraulic conditions are modeled using steady state, one-dimensional, gradually varied flow equations. Results are reported in customizable tables and graphs. Additional hydraulic features of the model include: multi-culvert analysis using a flow splitting algorithm; estimation of inlet contraction velocities; water depth at free-surface outlets; and three methods for determining tailwater conditions—constant elevation, user defined rating curve, and cross section method.

FishXing reports passage conditions for each culvert in a unique and insightful manner. It identifies flows in which various barrier types occur and reports the proportion of flow between the lower and upper fish passage design flows (QLP and QHP) meeting fish passage criteria.



FishXing can also be used in the design of stream simulation or embedded culverts. The software allows for embedding the culvert and specifying the roughness of the bed material. Included in the suite of hydraulic parameters is a set of output variables used for design of stream simulation culverts, including: composite roughness, shear stress, stream power, and energy dissipation factor. This presentation will give an overview of the model algorithms and capabilities included in the new FishXing 3.0 and associated multimedia user manual. It will also give examples of projects that have used FishXing. The software, developed for the USDA Forest Service, is free and available for download from the FishXing website: *http://www.stream.fs.fed.us/fishxing/*

1 Michael Love & Associates
2 TerraGraphics
3 Aquatic & Land Interactions Forestry Sciences Lab
4 U.S. Fish and Wildlife Service
5 Workshed Web

State Highway Culvert Assessment for Fish Passage Improvements

Tracy Middleton[1], Leslie Pierce[1] (presenter), Deborah McKee[2]

Since 2001, the California Department of Water Resources (DWR) has been conducting fish passage assessments of culverts along state highways in Caltrans District 4 and 5 using the California Department of Fish and Game California Salmonid Stream Habitat Restoration Manual, as modified by Caltrans. The objective is to complete fish passage assessments for all culverts on a given route at one time. Field assessments were performed in Marin, Napa, Santa Clara, San Mateo, Sonoma, Santa Barbara, Monterey, San Benito, and Santa Cruz Counties. A first pass was performed to determine if a natural stream channel had potential to support salmonids and to note key concerns that may pose barriers to fish passage. The data collected were the following: presence of definable channel, average active channel width, stream gradient less than twenty percent, outlet drop, substrate presence in culvert, and presence of baffles or weirs. We ran site characteristics through an initial passage assessment filter to identify sites with impaired passage. In the nine counties surveyed, there are 24 impaired sites on anadromous waterways on 10 routes. Counties with the highest number of impaired sites were Santa Cruz and Santa Barbara Counties. The next steps for this project are to determine site and route priorities based on fisheries presence and agency priorities, and to perform additional field surveys to gather data necessary for running Fish Xing. Survey results will be used by Caltrans to develop and implement corrective actions for these passage barriers.

1 Fish Passage Improvement Program of the California Department of Water Resources
2 California Department of Transportation

Thursday Workshop 3:
Removing Coastal California's Fish Passage Barriers: From Prioritization to Implementation

Gobernador Debris Basin Modification Project

Larry Fauset[1]

Gobernador Debris Basin was built by the U.S. Army Corps of Engineers in 1971 following the Romero Fire, which burned over 14,500 acres. After the basin was constructed, the Flood Control District entered into an agreement with the Army Corps to maintain the basin in exchange for the federal funds expended to build it. Because a burned watershed can produce twenty times more debris for a given rainfall event than an unburned watershed, basins are built to catch the debris above the urban area. There are many examples of debris flowing off of our geologically young, steep watersheds, filling in the creek channels and then sweeping through homes, schools, and business areas causing widespread destruction after fires, as well as from fully recovered watersheds.

Recently, the District began to look at the feasibility of modifying the Gobernador Basin embankment (dam) to allow fish passage while preserving the original purpose of catching large debris. The current embankment has a culvert pipe at its base that is designed to allow low flows to pass through such that it does not impound water. In heavy rainfall events the debris that comes down the creek plugs that pipe, and the entire basin can, and frequently has filled in completely. When the outlet becomes plugged, the basin not only catches the large debris which is the target material, but also traps the fine sediment, sand, and cobble that would not necessarily pose any downstream threat.

This presentation will address the engineering challenges of designing a structure that will allow for fish passage under a variety of flow conditions, trap large debris, allow small debris and sediment to pass, and not require maintenance intervention to maintain fish passage following a debris-causing event.

1 Santa Barbara County Flood Control and Water Conservation District

Conceptual Design of Natural Fishway within the Alameda Creek Flood Control Channel, Fremont, California

Roger Leventhal[1]

Alameda Creek represents one of the best opportunities to restore steelhead in this tributary to San Francisco Bay. In most years, the creek, with the largest watershed in the Bay region, continues to attract steelhead into its lower, channelized reaches. Migrants encounter the so-called "BART weir," a bank-to-bank concrete apron, several miles upstream from the mouth of the creek. The weir produces flow velocity and depth conditions unsuitable for fish passage at all discharge levels and constitutes a total migration barrier.

This talk presents a conceptual design for an instream natural fishway at the BART weir site and an analysis of its feasibility. The design was developed with a combination of analytical and numerical tools. Our goal was to provide fish passage at a range of flows while minimizing impacts to channel stability, flood carrying capacity, and water supply. The natural fishway represents an alternative to a traditional engineered fishway bypass. Two types of natural fishways were evaluated: pool-weir and roughened channel. Each design was evaluated for fish passage in terms of velocity, depth, turbulence and contractibility. We also estimated costs, modeled impacts to water surface elevations, and determined new facilities to replace foregone water diversions necessary to construct the fishway.

1 FarWest Restoration Engineering

Thursday Workshop 3:
Removing Coastal California's Fish Passage Barriers: From Prioritization to Implementation

Salmonid Habitat Restoration and Fish Passage Improvement in an Urban Creek: A Case Study of a Recently Completed Project on San Pedro Creek, Pacifica, California

Syd Temple[1]

An extensive salmonid habitat restoration and fish passage improvement project was recently completed (fall 2005) on 1,500 feet of San Pedro Creek, Pacifica, California. San Pedro Creek is coastal stream which supports a small but resilient run of steelhead trout (*Oncorhynchus mykiss*).

In the 1800s, the valley bottom was extensively farmed and the stream course was utilized for irrigation. In the late 1800s, over a mile of ditches were constructed to irrigate crops. In the early 1950s, suburban development began and sections of the creek were channelized once again. Since urbanization, the channel bed has degraded and become more entrenched and encroached upon as residential properties were constructed near or at the top of the banks. By 2003, downcutting had perched the bottom entrance to a bridge at Capistrano Avenue approximately nine feet above the downstream channel invert, rendering a 1960s Denil fish ladder ineffective and creating a significant salmonid migration barrier.

The project involved the placement of fill within the degraded streambed to reestablish and stabilize the 1950s gradient, thus improving fish passage through the Capistrano Avenue bridge. An increased channel gradient was established using fill soil and 20 gradient control structures. Significant bank reconstruction was completed along with the fill placement. The presentation examines the real world context in which urban stream restoration must be completed and provides insight into design issues and observations. Issues that will be examined include alterations in geomorphic relationships, the placement and construction of woody debris structures, the use of large logs as grade control, construction techniques, and recent channel evolution and performance.

1 Questa Engineering Corporation

Thursday Workshop 3:
Removing Coastal California's Fish Passage Barriers: From Prioritization to Implementation

Case Study of Two Recently Completed Roughened Rock Channels to Provide Fish Passage

Michael Love[1] and Antonio Llanos[1]

Roughened rock channels are designed to provide grade control and accommodate passage of fish and other aquatic organisms through construction of an oversteepened but stable channel geomorphically resembling a steep natural stream channel. Unlike traditional fishways or discrete boulder weirs, a roughened rock channel creates a diverse range of water velocities and depths with numerous suitable pathways that different species and age classes of fish can swim through. The use of roughened rock channels has grown widely in recent years. However, there persists a lack of sufficient guidance in methods for designing and constructing these fish passage structures.

This presentation will be a case study focusing on two roughened rock channels that were constructed in the summer of 2005 in coastal northern California. Both projects were built to provide juvenile coho access over low-head dams and into marshy rearing habitat. Although both projects had design slopes of nearly five percent, the designs deviated from one another by using different types of rock structures. Additionally, to accommodate the small ($15,000) construction budget for one of the projects, the design experimented with minimizing the amount of imported materials.

We will cover the design methods used for each project, construction specifications developed for the engineered streambed mixtures, challenges faced during construction, and initial performance. The presentation also will compare and contrast the two projects and highlight the pitfalls encountered and lessons learned.

1 Michael Love & Associates

Thursday Workshop 3:
Removing Coastal California's Fish Passage Barriers: From Prioritization to Implementation

Santa Clara River Steelhead Trout: Assessment and Recovery Opportunities

Matt Stoecker[1] (presenter) and Elise Kelley[2]

The Santa Clara River watershed, located primarily in Los Angeles and Ventura Counties, was an important steelhead fishery into the mid 1900s. Construction of dams and other migration barriers on the mainstem, Santa Paula Creek, Sespe Creek, Piru Creek, and other tributaries during the mid-1900s appears to be correlated with the demise of the steelhead run as habitat availability decreased and surface flows became highly manipulated. Surface water diversions and groundwater pumping on the Santa Clara River have reduced the river's flows, and barriers to migration in the form of diversion dams, grade control structures, road crossings, and channelization projects impact access to the river's critical spawning and rearing habitat in the tributaries. Adult steelhead have continued to attempt to migrate up the Santa Clara River into recent times with an adult trapped at the Vern Freeman Dam in 2001. A wild, self-sustainable rainbow trout population still exists in the headwaters of the Santa Paula, Sespe, Hopper, and Piru Creek tributaries and is producing out-migrating steelhead smolts bound for the Pacific.

The purpose of this project was to analyze the habitat conditions, population status and barriers to migration for steelhead in the lower Santa Clara River watershed from the Piru Creek tributary downstream including significant tributaries. In order to assess the impacts of steelhead migration barriers and prioritize fish passage improvement projects, this study identified barriers, assessed migration severity, and prioritized potential fish passage improvement projects at these sites by utilizing a ranking methodology that incorporates collected data about habitat quality, habitat quantity, and the observed salmonid population. Providing improved fish passage within the main tributaries of the lower Santa Clara River is a high priority to ensure that steelhead have adequate access between the critical headwater habitats and the ocean. This report outlines the specific, prioritized barriers in detail within the priority tributaries and habitat areas.

Recommended fish passage priorities were:

1) Improved fish passage at the Vern Freeman Diversion Dam that is effective over a wider range of flows and utilizes by-pass flows more effectively to allow unimpeded upstream and downstream migration independent of water diversion operations, maintenance, debris blockage, or fish ladder damage;
2) Removal or modification of gray and red barriers in the Santa Paula, Sespe, and Hopper Creek drainages;
3) Identification and implementation of dedicated fish passage flows for the mainstem of the Santa Clara River and those reaches on Santa Paula Creek, Sespe Creek, and Piru Creek downstream of Harvey Diversion Dam, Fillmore Irrigation Diversion, and Santa Felicia Dam respectively.

1 Stoecker Ecological Consulting
2 University of California, Santa Barbara

Surcharging Lake Cachuma, the History and Success of this Management Action

Tim Robinson[1]

Mainstem steelhead population data are being compiled to characterize the results and define the success of the Lake Cachuma Surcharge Program. Key elements of the program will be presented such as: historical, current, and proposed number of passage days for migrating steelhead; as well as storm flows that trigger passage flow releases from Lake Cachuma following spill years. Part of the decision-making criteria are whether the sandbar at the outlet lagoon is breached, if flows are sufficient for riffle bar passage, and if there are connective tributary flows to the mainstem. Population structure of juvenile and adult steelhead in the mainstem during the dry season will be considered. A further metric for gauging success will be evaluation of capture rates during passage flow supplementation. Duration, magnitude and frequency of storms will be evaluated in relation to steelhead size class, abundance, and migration patterns.

1 Cachuma Conservation and Release Board

Thursday Workshop 4:
Reestablishing Salmonids in Cities, Workshop & Tour:
The Next Generation of Urban Stream Restoration

Design and Construction of Habitat in Difficult Urban Settings in the North Bay

Steven Chatham[1]

Design and construction of salmonid habitat in the urban setting of Santa Rosa Creek will be presented. The difficulty of habitat design and construction in the urban setting includes not only frustratingly constrained geographic boundaries, but also the procedural challenges of public works construction.

Design vision for salmonid habitat in urban settings arises from the objective of creating urban creeks that mimic the geomorphic and ecologic processes occurring in wilderness creeks, with two fundamental exceptions: we do not want geomorphic adjustments of the channel boundary, and we do not want flooding outside the channel boundary. We will examine design steps and roles from envisioning urban salmonid habitat possibilities to preparing plans and specifications.

Construction of urban salmonid habitat is done mostly in the public domain. It looks like public works construction has thus far been administered within the standard public works procedures. Given the immature stage of creating urban salmonid habitat, the public works administration process is prone to producing weak results. A simple adjustment in public works administration procedure would make a significant contribution to improving construction of habitat in urban settings. We will briefly review the proposition that public construction administrators should be allowed the option to use 'most qualified' procurement procedures for acquisition of salmonid habitat construction services.

Southern Steelhead in Mission Creek, downtown Santa Barbara.

photo courtesy of David Pritchett

1 Prunuske Chatham, Inc.

Thursday Workshop 4:
Reestablishing Salmonids in Cities, Workshop & Tour:
The Next Generation of Urban Stream Restoration

Mission Creek, Santa Barbara: An Urban Stream by the Sea on an Alluvial Fan

E.A.Keller[1] (presenter), Lee Harrison[1], Garret Bean[1]

Understanding the history of an urban creek is critical in evaluating potential for restoration or naturalization. Mission Creek has a small estuary, which is a fraction of its prehistoric extent. There are several deep pools in the heart of the city, frequented by steelhead in recent years because they have a limited time to migrate through an upstream-channelized reach. Further upstream, but still in the city, the stream normally has a dry bed in the summer. Perennial flow occurs upstream forming low-flow refuge for fish.

When Mission Creek emerges from the mountains to the piedmont, it slowly moves back and forth, forming an alluvial fan. The head of the ancient alluvial fan that the city of Santa Barbara is built on is located at the historic Santa Barbara Mission. However, Mission Creek no longer flows between the Mission and the valley to the immediate east because it has been blocked by the uplift of the Mission Ridge anticline. As Mission Creek emerges from the mountains, some of the rocks and materials it is carrying are deposited. During large floods, boulders up to a meter or more in diameter may be transported, but the truly gigantic boulders are delivered from more catastrophic processes.

The alluvial fan of Mission Creek is constructed of alternating layers of stream deposits and debris flow deposits. Debris flows may be small events within a channel, or cover part of the alluvial fan surface with boulders as large as three to five meters in diameter. These large boulders are transported in the debris flow because the flow contains a fine-grained matrix, and the densities of the boulders and matrix are about the same. The boulders simply bob and float along in the debris flow. Thanks to these larger boulders and rocks, we have many beautiful rock walls in Santa Barbara, and in fact, some streets are named after the abundance of the boulders.

As a result of the Mission Creek alluvial fan we also have associated alluvial fan floods. Alluvial fans are highly unstable in terms of the position of channels. The active channel tends to move back and forth, and when floods occur they can be wide-shallow events that cover much of the fan. As a result, Santa Barbara doesn't have much of a floodplain; during floods, Mission Creek breaks out and flows across the fan surface. Mission Creek has a notorious flood history, and we still struggle to find a solution to our flood hazard.

1 University of California, Santa Barbara

Thursday Workshop 4:
Reestablishing Salmonids in Cities, Workshop & Tour:
The Next Generation of Urban Stream Restoration

Santa Rosa Creek from Concrete Flood Control Channel to Fish Habitat

Mike Sheppard[1]

The Santa Rosa Creek restoration has involved the restoration of a 1960s federally-funded trapezoidal flood control channel. This flood control channel is located in the historic Santa Rosa Rail Road Square, centrally located near downtown Santa Rosa. The project began through the efforts of the Committee for Restoring Santa Rosa Creek, in addition to private funds, and received city and business community support to sponsor an integrated project of environmental restoration, flood damage reduction, recreation, toxics clean up, and economic revival of the historic district. The project removed concrete to create a functioning bankfull channel. Point bar and floodplain development is occurring and riparian vegetation is establishing itself in the bottom of the trapezoidal channel. The upper banks are terraced with short retaining walls and provide for public access. This is a model project for difficult urban areas which are saddled with old, outdated flood control channels but want to recreate functioning bankfull channels and floodplains. The channel is used by migrating salmonids, and they are greeted by a large mural of a salmon busting through concrete.

1 City of Santa Rosa

Thursday Workshop 4:
Reestablishing Salmonids in Cities, Workshop & Tour:
The Next Generation of Urban Stream Restoration

Incorporating Fish Friendly Features into Urban Creek Restoration

Mike Vukman[1] and Josh Bradt[1]

The Urban Creeks Council (UCC), a non-profit stream education and restoration organization, has been supporting and building multi-objective projects for over 20 years. Our design approach promotes bank stability, floodplain restoration, flood damage reduction, soil bioengineering, and establishing native riparian vegetation—all important features in protecting water quality, enhancing neighborhoods, and improving aquatic/terrestrial wildlife in general. Increasingly our projects are factoring in another specific constituency—resident and migratory fish. Steelhead and rainbow trout continue to bless many of our urban waterways in the San Francisco Bay Area. Mike Vukman and Josh Bradt will discuss the incorporation of fish habitat considerations at restoration sites in San Pablo and Martinez, California, which were designed primarily as bank stabilization and revegetation projects. They will also present a daylighting project which restored fish passage within the upper watershed of coastal Pacifica, California.

1 Urban Creeks Council

Dam Removal for Fish Passage in Sausal Creek, Oakland, California

Drew Goetting[1]

Sausal Creek is an urban creek situated in the heart of Oakland in the East Bay. In 2000-2001, a collaboration of the Waterways Restoration Institute, Wolfe-Mason Associates, Friends of Sausal Creek and the City of Oakland resulted in the removal of low head dams to remove barriers to fish migration. Sausal Creek supports a steelhead/rainbow trout population in the middle of Oakland, and there are future plans to extend the habitat even further. This presentation describes the design and construction process and costs to remove the dams, increase channel sinuosity, and restore the channel slope while avoiding a sewer line and accommodating a trail. A volunteer project of remarkable scale resulted in the establishment of a native plant nursery in the park adjacent to the creek and the replanting of the creek corridor.

1 Restoration Design Group

Thursday Workshop 4: Reestablishing Salmonids in Cities, Workshop & Tour: The Next Generation of Urban Stream Restoration

A Dirt and Concrete Ditch Restored to a Functioning Ecological System for Coastal Salmonids on Codornices Creek in Albany, California

Roger Leventhal[1]

Codornices Creek flows from the Berkeley Hills through the highly urbanized cities of Berkeley and Albany in the San Francisco Bay Area. The creek flows through over 25 culverts and has been straightened and channelized through much of its lower reaches. Codornices Creek has a potential anadromous salmon run from San Francisco Bay, which is an extremely valuable resource for endangered central coast steelhead. Beginning around 1997, the Waterways Restoration Institute (WRI) started negotiating with the University of California, Berkeley (UCB) to include an expanded creek right of way in their new student housing development plans. The long and sometimes painful negotiations with UCB, the downstream railroad, adjacent property owners and local sports clubs culminated in a three phase project consisting of restoration plans for almost 3,000 feet of degraded creek. Phase I construction of the project was completed in 2004 and finally planted in 2005. This reach contains the widest floodplain and potential habitat benefits for the project. This talk will describe the design process and initial monitoring results for the first phase of the project for physical, chemical and biological processes. Phase II is scheduled to begin construction in 2006. Timing on the construction for the final phase of the project is currently unknown and depends on the redevelopment plans of UCB.

1 FarWest Restoration Engineering

Thursday Workshop 4:
Reestablishing Salmonids in Cities, Workshop & Tour:
The Next Generation of Urban Stream Restoration

Mission Creek Channel:
Freeway to Fishway Proposed in a Santa Barbara Trapezoid

Ed Zapel PE[1]

In downtown Santa Barbara, a wide bend of Mission Creek was cut off by the freeway (U.S. Hwy. 101) construction in the 1960s. To convey the creek flows by connecting the natural channels upstream and downstream, CalTrans built a large open trapezoidal concrete channel along the freeway. Dubbed by locals as the "CalTrans Channel", this new artificial channel—in two reaches totaling one mile—became the new Mission Creek and formed a severely impassible barrier to steelhead trout swimming upstream. In April 2000 and January 2005, steelhead were observed building a redd or spawning only slightly below the downstream end of the CalTrans Channel, implying strongly that the fish could not get any further upstream and were making due with the available habitat in the urbanized remnants of the natural channel.

As part of a public-inspired initiative to make Mission Creek friendly to fish and function as a natural bluebelt in downtown Santa Barbara, NHC was engaged by private conservationists to prepare conceptual and intermediate-level designs and cost estimates for establishing fish passage through the mile-long CalTrans Channel. NHC was the engineering consultant for the design, working closely with City and County authorities and a consortium of steelhead recovery advocates, including Environmental Defense Center, Community Environmental Council, Santa Barbara Urban Creeks Council, Southern California Steelhead Coalition, and other local groups and individuals.

Three intermediate cost alternatives for modification of the CalTrans channel were developed or evaluated by NHC in late 2005. Previous work by the Corps of Engineers and the City of Santa Barbara developed concepts for a lowest cost alternative with limited potential for successful fish passage through a design for a small notch in the bottom of the concrete channel. At the other end of the cost range, a much high-level alternative was conceived to remove the entire trapezoidal concrete channel and some adjacent structures, thereby restoring a completely natural channel and overbank floodplain along the freeway corridor.

This design by NHC focused on developing intermediate alternatives that would provide greater chance for successful fish passage and yet continue to provide at least the existing level of flood protection in the concrete channel. Working with the original numerical hydraulic computer model developed by the Corps, a more detailed model was developed to simulate 3 alternative designs, and to determine anticipated water surface profiles and velocities throughout the CalTrans channel reach. In addition, a sediment transport model was developed for the reach to assess the potential for adverse effects on sediment transport capacity, and to identify zones where potentially increased sediment removal maintenance efforts might be needed. Preliminary feasibility-level construction costs were also developed for the 3 intermediate alternatives, based on the refined designs developed by NHC.

These 3 intermediate-level alternatives essentially are variations on designs that remove cross-sectional portions of the channel bottom and 1 side (the left streambank) of the trapezoidal concrete channel. This design allows for the streamflow conveyance capacity of the channel to be maintained even though substantially higher roughness elements, which slow down flood flows, are added to the channel as a major improvement for fish passage. The roughness elements mainly consist of a soft-bottom, cobbly streambed inspired by the natural channel of Mission Creek just slightly upstream of the CalTrans channel. These fish passage enhancements would slow down flow velocities, provide resting refugia for fish swimming upstream, and increase the fish-swimmable window period following rainstorms.

1 Northwest Hydraulic Consultants Inc

Thursday Afternoon Urban Creek Tour:

Urban Creek Tour of Mission Creek—The Mission Possible

David Pritchett[1], Eddie Harris[2], Brian Trautwein[3]

This field tour will visit several urban sites where projects are planned along Mission Creek in downtown Santa Barbara. Participants will visit a constrained and under-appreciated lagoon, and witness historic and inextricable urban encroachment into the floodway and stream channel, fish passage through concrete flood control channels, and fish passage at bridges and grade control structures.

The tour also will feature the sites where Ed Zapel of Northwest Hydraulic Consultants has designed a new engineering plan to convert a mile of concrete trapezoidal channel into a naturalistic and fish-passable creek. In addition, the tour will include a stop where steelhead spawned in the lower creek during high flows in 2000 and early 2005. A video of redd building in January 2005 can be seen at the Community Environmental Council (CEC) web site via their Water Programs link (*www.communityenvironmentalcouncil.org*).

Local steelhead boosters Moe Gomez of CEC, Eddie Harris of Santa Barbara Urban Creeks Council, and Brian Trautwein of Environmental Defense Center also will help to guide the tour. Much of their work supports a locally generated proposal called the *Mission Possible Initiative* (*www.sb-urbancreeks.org/missioncreek.html*), which outlines how to make Mission Creek friendly to fish and function as a natural bluebelt in downtown Santa Barbara. As a comprehensive vision for the whole creek from the mountains to the sea, this proposal or initiative was recognized and praised by the City Planning Commission when it debuted in 2001. All of the Mission Creek efforts are striving to reach public, political, and technical consensus to integrate the creek as a natural habitat, urban bluebelt, and floodwater conveyance facility that the creek has become as an urban necessity.

Aptly called *Arroyo Pedregosa* ("stony creek") by the Spanish colonizers, Santa Barbara as a city was founded around the Spanish presidio built in 1782 and the Old Mission and its aqueduct system built a few years later. Accordingly, the modern city owes its existence to the water supply provided by Mission Creek. Severe encroachment into the channel occurred from the mid-19th Century to the mid-20th Century. More than 50 years later, ambitious restoration plans and concepts now are gaining traction in the public discourse for steelhead recovery, creek restoration, and urban renewal.

1 Southern California Steelhead Coalition
2 Santa Barbara Urban Creeks Council
3 Environmental Defense Center

Thursday Field Tour C:

Ventura River Watershed and Matilija Dam Tour

Paul Jenkin[1]

On this field tour we will visit the key areas of focus associated with the Matilija Dam Ecosystem Restoration project. The tour will begin at the estuary and rivermouth where we will observe beach erosion and fisheries issues. Working our way upstream, we will see points of water diversion, bridges, and levees that will require modification with the removal of Matilija Dam. Finally, we will visit the dam itself and see the extent of sedimentation that has occurred since its construction.

Give a Dam, Free the Sand, Grow the Beach. The Matilija Dam Ecosystem Restoration project includes dam removal and watershed management to restore fish passage to the upper watershed and restore the natural sediment transport that nourishes coastal beaches. Constraints include water supply and floodplain management. With continued funding, deconstruction of Matilija Dam will begin in 2009 and will be one of the highest dams ever removed.

photo courtesy Matilija Coalition

1 Surfrider Foundation and Matilija Coalition

patagonia presents the

Wild & Scenic ENVIRONMENTAL FILM FESTIVAL ON TOUR

7-10pm, Feburuary 23

Hosted by
Salmonid Restoration Federation
& Community Environmental Council

South Yuba River Citizens League's Famous Wild and Scenic Environmental Film Festival will be an exciting part of the 24th 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.

Hosting the first environmental film festival in Nevada City, California, in 2003 was yet another avenue for the South Yuba River Citizens League (SYRCL, pronounced 'circle') to promote community-building within the Yuba Watershed, as well as a way to explore environmental issues within a larger, global scale through an exciting and influential medium. The first four festivals of the 23-year-old grassroots organization have proved wildly successful, bringing in award-winning international films, filmmakers, celebrities, activists, and filmgoers from all over the western United States. Due to the overwhelming response, 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. SYRCL will share the magic of the Wild and Scenic Film Festival with your community and hopefully inspire a sense of activism that the festival promotes. 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*

The Santa Barbara Wild and Scenic Film Festival will feature the films Discover Hetch Hetchy, Tales of the San Joaquin, Coastal Clash, and Bigger than Rodeo. Tickets are $10 or $5 for Conference goers and students.

Discover Hetch Hetchy by David Vassar

An epic and historic battle of conservation exists in one of the nation's most spectacular parks, Yosemite. Hetch Hetchy was once an area described as a twin Yosemite Valley. But Hetch Hetchy is buried beneath 300 feet of water, dammed by San Francisco in 1923 for use as a reservoir. Now an opportunity exists to bring the valley back to life and meet the water needs of the Bay Area. (United States, 2005, 18:56 min)

Tales of the San Joaquin by Christopher Beaver

The San Joaquin River has been called the hardest working river in America and also the most abused. Follow filmmaker Christopher Beaver down the 350 miles from the source near Yosemite National Park, to the point where its waters flow into San Francisco Bay. Once the birthplace of hundreds of thousands of salmon, the river now runs completely dry year round. Yet, dedicated people surround this river and are working to bringing it back to life. (United States, 2005, 27 min) *www.cbfilms.net*

Coastal Clash by Elizabeth Pepin and Christa Resing

"Let's go to the beach" has always been an entitlement of California living, with 80 percent of Californians living within 30 miles of the water's edge. But as urbanization continues to encroach on the 1,100-mile-long coast, our shoreline has come under siege. Development is swallowing up miles of coastline; access to beaches is being cut off; and seawalls may be causing beaches to disappear. A battle is raging around the fundamental question: Whose coast is it anyway? (United States, 2004, 60 min)

The Wild and Scenic Film Festival Director, Kathy Dotson and potentially some of these filmmakers will be at the film festival to introduce the films.

drawing: courtesy Restore Hetch Hetchy

Bigger Than Rodeo by Tripp Jennings and Karl Moser

Combining equally the burliest waterfalls ever seen on video and the biggest aerial freestyle ever shot, Bigger Than Rodeo is an instant jaw dropper. Follow the crew and top paddlers in their search for the sickest whitewater imaginable. They find something more meaningful and truly bigger then they imagine—Ed Lucero's 105-foor record-breaking waterfall.

Waterspread Restoration: Mitigating Cerebral Imperviousness

Brock Dolman[1]

This presentation will address issues of human development patterns on watershed resiliency, biodiversity, and endangered salmonids. Brock is a co-founder and Director of Occidental Arts and Ecology Center's WATER Institute and Permaculture Program. He is a Sonoma County Fish & Wildlife Commissioner and a watershed educator. Brock's community based Basins of Relations, perspective asserts that the dominant challenge facing salmonid restoration is first and foremost Ego-system restoration. Slides will be used to illustrate central themes of Conservation Hydrology and Waterspread Restoration. Can we envision and enact a transformation of all development currently based on dehydration and degradation towards development patterns designed to rehydrate and restore our parched watersheds? Water, the fundamental element of life, is begging that question!

1 Occidental Arts and Ecology Center's WATER Institute

California Ocean Protection Council: Why Should You Care?

Pedro Nava[1]

Enacted only in September 2004, the California Ocean Protection Act (SB 1319) already is benefiting salmon and steelhead through the work of the new California Ocean Protection Council. Detailed information is available at the Council web site (*http://resources.ca.gov/copc*).

The Ocean Protection Council is tasked with the following responsibilities regarding conservation of salmonids: coordination of activities of ocean-related state agencies to improve the effectiveness of state efforts within existing fiscal limitations; establishment of policies to coordinate the collection and sharing of scientific data related to coast and ocean resources among agencies; and identification and recommendation to the Governor and Legislature changes in state and federal law and policy.

The council initially was funded with a $1.2 million budget appropriation and $10 million in tideland oil royalties. Also, the State Coastal Conservancy Board has agreed to fund projects approved by the Council with $5 million of the Conservancy's Proposition 40 and 50 bond funds. In addition, the State Water Resources Control Board has agreed to designate $10 million of Proposition 50 funds for ocean protection projects.

Activities eligible for funding include projects that: eliminate or reduce threats to coastal and ocean ecosystems, habitats, and species; foster sustainable fisheries; improve coastal water quality; increase public access to ocean and coastal resources; improve management, conservation, and protection of coastal waters and ocean ecosystems; provide monitoring and scientific data to improve state efforts to protect and conserve ocean resources; acquire, install, or initiate monitoring and enforcement systems; purchase vessels, equipment, licenses, harvest rights, permits, and other rights and property to reduce threats to ocean ecosystems and resources; and address coastal water contamination from biological pathogens.

To benefit salmonids, some actions by the Council so far have included: approval of funding for a sediment study of Klamath River dams to develop management recommendations for restoring wild salmonid habitat; authorization of a $2 million expenditure of state funds for the public/private partnership focused on the deconstruction of Matilija Dam and restoration of Ventura River; funding of a planning grant over $100,000 to develop a revolving loan fund for sustainable fisheries; opposition efforts to lift the moratorium on offshore oil and gas development; support of the re-authorization of the federal Coastal Zone Management Act; support of the U.S. ratification of the U.N. Resolution on Law of the Sea; dedication of $1 million to ocean and coastal research through a partnership with California's Sea Grant programs; becoming the major sponsor of the *California and the World Ocean Conference* 2006 to be held September 17th to 20th in Long Beach, California.

1 State Assemblymember, 35th District

Salmonid Conservation and the Legislative Process

Julia McIver[1]

SB 857, which became law in the last legislative session, is a first step in requiring the Department of Transportation to include fish passage considerations in planning and retrofitting state and federally funded transportation projects. SB 857 requires that for any project using state or federal transportation funds programmed after January 1, 2006, the Department shall insure that:

1) If the project affects a stream crossing on a stream where anadromous fish are or were historically found, an assessment of potential barriers to fish passage is done prior to commencing project design, submitted to the Department of Fish and Game and added to the CALFISH database;
2) If any structural barrier to passage exists, remediation of the problem shall be designed into the project by the implementing agency. New projects shall be constructed so that they do not present a barrier to fish passage. When barriers to fish passage are being addressed, plans and projects shall be developed in consultation with the Department of Fish and Game; and,
3) For any repair or construction project using state or federal transportation funds that affects a stream crossing on a stream where anadromous fish are or were historically found, the Department shall perform an assessment of the site for potential barriers to fish passage and submit the assessment to the Department of Fish and Game.

The bill also requires an annual report to the Legislature on Caltrans' fish passage activities.

There is a strong need for increased education of policy and budget makers in state government about fish passage in general and about the role infrastructure plays in creating barriers to fish passage. Particularly in light of the current political discussions about the need for investing in California's infrastructure, it is imperative that those interested in restoring healthy anadromous fisheries in California educate decision makers about the critical need for any investments in infrastructure to include both data gathering on passage problems related to infrastructure and remediation of known existing passage problems.

1 Director of Parks and Natural Resources for Yolo County, formerly Principal Consultant to the State Senate Committee on Natural Resources and Water

Steelhead in Southern California: Restoration and Recovery near the End of the Range

Lisa Thompson[1]

Southern steelhead persist at the end of environmental gradients of temperature and precipitation stretching from Alaska to Mexico. Furthermore, the recovery of southern steelhead and restoration of their habitat will take place at the end of a cultural gradient that may rival the environmental gradient in magnitude. As the southern end of the steelhead range is approached, air and water temperatures increase while precipitation declines, yet water flow changes dramatically in storm events. Responding in part to these same factors, human population density in urban southern California vastly outweighs that of centers to the north. People in the Pacific Northwest tend to be aware that salmonids live in their midst, and the term "Salmon Nation" has been coined to portray the important place that salmon hold in the cultural and environmental landscape. However, people in southern California tend to be less aware of steelhead, perhaps due to the great technical modification of many waterways, and the lower probability of seeing steelhead carcasses in streams after spawning since they may survive to spawn again.

Is recovery of southern steelhead even possible, given factors such as extreme habitat modification, human population growth, water shortages, impending impacts of global warming, and lack of awareness of steelhead in southern California? I will argue that recovery is, indeed, possible but that it will require public education on a grand scale in order to develop the socio-political will to make the changes necessary to conserve and recover steelhead. Ideally, this will produce a sustained sense of cultural identification with the local aquatic environment and steelhead, a "Steelhead State."

What might the recovery process look like? The steelhead crisis is an opportunity to expand the efforts of stakeholders to restore habitat and to link the efforts of stakeholder groups that may be at odds. Scientists will need to work with social/cultural specialists to communicate with decision makers and the public. Local Native American groups could demonstrate the initial link between people and steelhead. Urban creek restoration may be a catalyst for a "Steelhead State," offering the chance to educate urban voters about their natural environment and about the need to support funding for restoration. People may come to see steelhead as an indicator species for the health of southern California from mountain to sea. The path to recovery will be uncertain, but as a society we have a number of tools to assist with the task. Case studies from more northern areas may be adapted to suit southern conditions. Adaptive management techniques can be used to set up management actions as replicated experiments across multiple watersheds. The new California coastal salmonid monitoring program will provide a framework for assessing progress toward recovery goals. Programs to motivate private landowners to restore habitat will promote recovery in the many areas where private ownership dominates. The recovery of southern California steelhead will in many aspects encompass the conference theme, "Rediscovering Urban Creeks and Creating Healthy Watersheds."

1 University of California Cooperative Extension and University of California, Davis

Friday Morning Plenary Session:

King of Fish: The Thousand-Year Run of Salmon

David R. Montgomery[1]

The stories of declining salmon runs are remarkably parallel across the English-speaking world, from Europe to New England and western North America, yet the similarities are not well known even by people running salmon recovery efforts. The history of the Atlantic and Pacific salmon fisheries shows how valuable public resources can gradually decline despite high-profile concerns over conservation. As knowledge of the salmon, their amazing life history, and their basic habitat requirements grew, the human impacts on salmon and their environment accelerated even faster. We now know more about the natural history of salmon than about how to save them.

Salmon are not in trouble because people didn't know about the impacts of human actions on salmon runs. Forty years ago, in his opening speech to the Second Governor's Conference on Pacific Salmon in Seattle in January 1963, Washington state governor Albert D. Rosellini declared that: "We are presently faced with a desperate situation on salmon. … [T]he ugly truth is that if we continue as we have during the past few years, our salmon stocks are doomed to extinction!" Ignorance was not the primary problem; neither was an incomplete knowledge of the natural history of salmon. The King of Fish is not in trouble because people didn't care about salmon. Laws to protect salmon have been on the books for over a century in the Pacific Northwest, and attempts to save salmon date back hundreds of years in England. Efforts to save the Columbia River salmon began well before the first dam spanned the river. The biggest problem for salmon lies in the way we make decisions and in the mismatched time scales over which societal processes operate, as well as the slow accumulation of little changes into large impacts that, over time, can radically alter natural systems. Under human influences, the landscape gradually evolved right out from under salmon.

Many writers over the past century and a half have remarked that salmon and civilization appear to be mutually exclusive—that the development of the landscape for the use of modern societies must inevitably banish salmon to shrinking refuges uninhabited by people. I reject this argument. Although past experience certainly endorses this view, it is based on the faulty premise that we lack the ability to adapt our behavior to accommodate salmon. Salmon and civilization can co-exist, if we so choose. I hope that this book brings some longer-term perspective to current debates over how to accommodate salmon in the changing landscape of the Pacific Northwest, where the next several decades will be pivotal in determining whether salmon survive in significant numbers. It simply would be tragic to lose wild salmon in the Pacific Northwest because we failed to learn the lessons of Scotland, England, and the Northeast. Moreover, those lessons tell us as much (or more) about our societies and ourselves as they do about salmon.

1 Quaternary Research Center and Department of Earth and Space Sciences, University of Washington, Seattle

Friday Afternoon Concurrent Session 1:
The Local Perspective:
Science, Structure, Streams and Steelhead in Santa Barbara County

The Local Perspective: Science, Structure, Streams and Steelhead in Santa Barbara County

Session Chair*: Helena Wiley*[1]

Over the past 15 years, watershed planning and steelhead restoration efforts have begun on many fronts and by many people and organizations in the Santa Barbara County region. These efforts are varied in focus, in agency participation, and in political structure. This session, focusing on the Santa Barbara County region, will provide insight into the overlap and/or gaps among efforts, integration of science, interface and communication with the public and decision makers on key issues, and congruence and cooperation on projects. The complex nature of watershed planning and fish restoration in the region provides a real world perspective on how to accomplish regional and local objectives while balancing funding issues, community priorities, and emerging issues in a dynamic scientific and political landscape. Examples of individual projects and plans, like the Lower Santa Ynez Fish Management Plan, as well as organizations like the Tri-County Fish Team will be presented. A description of the effort as well as its challenges and accomplishments will be discussed. The session will end with a presentation evaluating the current regional organizational structure for watershed planning. Time for discussion of the various efforts and how they fit together will be built in to the session.

1 Santa Barbara County Water Agency

Friday Afternoon Concurrent Session 1:
The Local Perspective:
Science, Structure, Streams and Steelhead in Santa Barbara County

Tri-County FISH Team: Inventories, Education, BMPs, and Permit Streamlining

Robert Almy[1] (presenter), Kate Rees[2], Rory Lang[3], Helena Wiley[1]

As local agencies have responded to environmental regulations such as endangered species listings, the regional scope of many issues has become apparent. So have funding constraints. Interests in three central California counties have formed a memorandum of understanding (MOU)-based organization to share information, lobby for funding and move mutually beneficial projects forward. This organization, called the Tri-County FISH[4] Team (TCFT), is comprised of two local agencies and one not-for-profit organization in its organizational structure. Its meetings are public; its funding is from public agency grants. The organization has emerged as the clearing-house for regional steelhead recovery issues.

The TCFT is managed by an executive committee with nine members, three from each county. The technical work is performed by a consultant under contract with one of the participating counties acting as the administrator for the TCFT. The TCFT has provided an inventory of barriers to fish migration in the Tri-county area to the Coastal Conservancy. In addition, the TCFT has identified best management practices, currently employed by local agencies during work performed in or near streams. This information is available publicly on the TCFT website (*www.tcft.org*).

Future work is focused in permit streamlining for projects of potential benefit to fish. The initial focus is on bank stabilization, barrier modification and removal of invasive non-native plants. These classes of projects were selected because there are significant opportunities for such work and because permitting complexity is a barrier to long-term habitat improvement. TCFT members believe that their efforts will lead to the development of a strategy for fish recovery in each sub-region in the Tri-counties which do not already enjoy fish management plans. Demonstration of specific benefit to TCFT projects and funding are the principal challenges expected during the next few years.

1 Santa Barbara County Water Agency
2 Cachuma Conservation and Release Board
3 Private Consultant
4 Funding for Improved Salmonid Habitat Friday Afternoon Session 1

A Managerial Perspective of the Physical and Biological Resources of the Lower Santa Ynez River

Scott Engblom[1]

An overview will be given of the catchment characteristics, hydrology, and water quality of the Santa Ynez River relative to management strategies for the enhancement and restoration of steelhead on the Lower Santa Ynez River (LSYR). Adaptive management actions to improve the fisheries on the LSYR will be presented, such as barrier and impediment modifications, fish ladders, streambank stabilization, erosion controls, fish passage and mainstem rearing flows, and techniques to improve pool habitat water quality. The Hilton Creek watering system was the first management project completed in December 1999. Since its inception, there have been positive results in phreatophyte growth and fish abundance given trapping and observational surveys. Spawning activity has been consistent regardless of annual rainfall and, in effect, has resulted in a positive boost in steelhead population in the LSYR.

1 Cachuma Conservation and Release Board

Santa Barbara County Fish Passage Project Development Program

Rob Almy[1] (presenter), Rory Lang[2], Helena Wiley[3]

In December 2003, Santa Barbara County Water Agency was awarded grant funding from the California Coastal Conservancy for the Santa Barbara County Fish Passage Project Development Program. The funding was provided to expedite the planning, design and permitting of local fish barrier modification projects and to help relieve the bottleneck in project planning and design that impedes completion of on-the-ground fish passage improvement projects on the South Coast of Santa Barbara County. The Santa Barbara County Water Agency worked with local fisheries restoration advocacy groups and private landowners to develop a prioritization strategy for the local fish passage improvement project inventory and to select six or more projects from this list that would then be planned, designed, and permitted with this grant funding. A variety of barrier types were selected in an effort to provide demonstration projects for the passage improvements selected. In order to provide the most benefit to anadromous fish species, projects were selected within a single watershed. This approach is intended to open up an entire system to steelhead migration.

Water Agency staff began the process of project selection with a workshop in December 2003 with interested members of the public, including landowners, and developed a Technical Advisory Committee to finalize the projects selected during the public meeting process. The Water Agency hired an outside contractor to provide technical support on the planning, design and permitting for those projects. County staff conduct the planning, design and permitting of projects on county-owned properties. Three categories of barriers were identified: dry weather road crossings, grade control structures, and debris basins. As potential projects were evaluated, opportunities to address issues besides fish migration were identified. As a result, several projects also address issues such as improved emergency access, reduced operation and maintenance costs, and other environmental benefits.

As one example, this effort has resulted in an ongoing project to modify Gobernador Debris Basin. The goal of this project is to re-establish fish passage for steelhead in Gobernador Canyon Creek, a tributary to Carpinteria Creek in Santa Barbara County. The objective is to provide access to habitat while allowing for the passing of fine sediment downstream to increase the functionality of the Gobernador Debris Basin. Following the completion of the planning, design and permitting under this grant, funding for construction of the projects on private land was pursued by the landowner and funding for publicly owned projects was pursued by the appropriate public agency.

1 Santa Barbara County Water Agency
2 City of Baytown
3 Santa Barbara County Water Agency

City of Santa Barbara Restoration Projects Watershed Management: Bringing Science and the Public Together to Evaluate Opportunities to Improve Water Quality and Restore Urban Watersheds

Jill Zachary[1]

In October 2004, the City of Santa Barbara's Creeks Restoration and Water Quality Division (Creeks Division) initiated a three-year planning and public outreach process to develop Watershed Action Plans for four major watersheds: Arroyo Burro, Mission, Laguna and Sycamore. The project methodology includes the preparation of a comprehensive existing conditions study of the watersheds, community workshops to gauge public interest and establish priorities for watershed improvements, development of a citizen guide to inform the general public about watershed issues, and the completion of a watershed action planning document for integration into the City's General Plan, and a city-wide strategic plan to improve creek and coastal ocean water quality and establish healthy riparian and aquatic habitats. With the existing conditions study complete, the City faces a number of challenges with communicating its results to the public and fostering community dialog about constraints and opportunities as well as setting priorities for watershed action. With watershed land ownership largely private, key considerations for restoring stream environments and riparian areas, as well as implementing water quality improvement programs, require more than scientific and technical solutions and will demand significant public policy decisions.

Existing conditions results will be reviewed, including the opportunities and constraints for addressing water-related issues and resources, such as flooding, bank stability, groundwater, creek restoration, fisheries and stream habitat enhancement, and water quality.

1 City of Santa Barbara, Creeks Restoration/Water Quality Division

City of Santa Barbara Restoration Projects: Multi-Objective Projects in an Urban Environment

George Johnson[1] (presenter) and Jill Zachary[1]

The City of Santa Barbara's Creeks Division is responsible for implementing creek restoration projects on city-owned public land. Over the last four years, the Creek Division has constructed one major restoration project and designed a second major project that will be constructed in the summer of 2006. In addition, the Creeks Division has conducted various small community-based restoration projects throughout the city, which include removal of trash, debris and non-native plants and replanting with native trees and bushes. Through implementation of these projects, the Creeks Division has identified a number of challenges and opportunities for creating healthy, accessible, and sustainable restoration projects on public lands. Some of these challenges and opportunities include non-native plant and tree removal, enhanced habitats for endangered species such as steelhead and the tidewater goby, weeds and herbicide use, active versus passive recreation, managing high-use areas near creeks, trash and water quality, community involvement, working with private landowners, and managing long-term maintenance costs. The discussion will focus on these challenges and opportunities and will provide valuable lessons for conducting restoration projects in an urban environment.

1 City of Santa Barbara, Creeks Restoration/Water Quality Division

Carpinteria Creek Watershed Plan: Grassroots, Agencies, and Success

Mauricio Gomez[1]

The Carpinteria Creek Watershed Plan was recently completed by the Carpinteria Creek Watershed Coalition to help restore the Carpinteria Creek Watershed. The Coalition was formed in 2001 to promote the restoration of anadromous steelhead trout habitat in the creek and to address concerns that adversely impact the ecological health of the watershed. The Coalition includes a wide range of stakeholders including representatives from the county, city, state and federal agencies as well as the community. Through the efforts of the Coalition, the Watershed Plan has facilitated restoration projects in the Carpinteria Creek Watershed to improve habitat for steelhead trout. The Coalition is now working to implement the recommendations of the plan to improve the conditions of the watershed.

1 Community Environmental Council

Watershed Planning and Steelhead Habitat Restoration in the Rincon Creek Watershed, Santa Barbara and Ventura Counties

Michelle Gibbs[1] (presenter), Mauricio Gomez[2], Michelle Bates[3]

Rincon Creek drains a watershed of approximately 15 square miles in both Santa Barbara and Ventura counties. The watershed begins in the Santa Ynez Mountains in the Los Padres National Forest and drains steep hillsides and canyons before flowing through orchards, agricultural fields, and pockets of residential areas. The mouth of Rincon Creek empties into the well known surf spot, Rincon Point. Rincon Creek has been identified as a priority watershed for steelhead restoration by the *South Coast Steelhead Assessment and Recovery Project* (Stoecker et al, 2002). According to the study, Rincon Creek offers the fourth highest score for habitat value along the south coast of Santa Barbara County. The study, however, identified 13 full to partial artificial barriers to steelhead migration. Two of the barriers—the Highway 101 culvert and apron and tailings from an abandoned rock quarry—are completely impassable to steelhead. Other major issues in the watershed include erosion and sedimentation, *Arundo*, and pathogens.

The Santa Barbara County Water Agency has contracted with a consultant team comprised of Tetra Tech, Inc. and Philip Williams and Associates (PWA) to prepare a Watershed Plan for the Rincon Creek watershed. The Community Environmental Council (CEC) in Santa Barbara is also facilitating a Rincon Creek Watershed Council comprised of local landowners, the Central Coast Regional Water Quality Control Board, the California Department of Fish and Game, the Agricultural Watershed Coalition of Southern San Luis Obispo and Santa Barbara counties, among other stakeholders, to address the major issues in the watershed and to guide watershed planning efforts.

Completion of the Watershed Plan will include: (1) summarizing in-stream and riparian corridor conditions for steelhead and other beneficial uses of the stream system; (2) conducting a geomorphic assessment of key stretches of Rincon Creek to evaluate its stability, identify major sediment sources, determine the relative significance of each major sediment source, and determine opportunities and constraints for removal of steelhead barriers; (3) identifying other sources of stress to the stream system (i.e. major sources of exotic plant species, sources for pathogens). The main objective of the Watershed Plan is to identify key restoration sites and restoration methods for improvement of steelhead habitat and water quality, and to prioritize those projects for implementation. The Plan will identify potential funding sources, permit requirements, and performance measures for each restoration project identified in the Plan to better enable the individual projects to get off the ground.

1 Santa Barbara County Water Agency
2 Community Environmental Council
3 Tetra Tech, Inc.

Exploring Options for Institutionalizing Watershed Management within County Government: A Case Study from the County of Santa Barbara

Darcy Aston[1] (presenter), Rachel Couch[2], Robert Thiel[3]

Watershed management is an integrated strategy for managing resources. Every watershed is unique, with its own conditions, benefits, challenges and stakeholders. A watershed perspective is an effective approach because it recognizes the interrelated processes in watersheds, and encourages partnerships among local interests as well as state and federal regulatory agencies to address watershed issues.

In Santa Barbara County, a number of recent developments suggest that a review of the County's approach to watershed planning and management is appropriate. State and federal regulatory initiatives have changed public expectations of local agencies and their activities relating to creeks in particular and watersheds in general. Local agencies are required to perform flood control activities, improve water quality, manage water supply and improve habitat for endangered species such as steelhead trout. The watershed perspective suggests that all of these activities could be performed more efficiently and effectively through an integrated approach.

Currently, within the County of Santa Barbara, responsibility for the many issues relating to watershed planning and large-scale restoration projects is not centralized. At least four departments have significant roles in watershed issues, including Public Works, Planning and Development, Parks, and Public Health. In addition, the County lacks a coordinated information sharing system, and a clear policy for regional watershed planning.

The goal of this paper is to address these and other issues through the following process:

- Identify the gaps in watershed planning and management that exist in the current county structure;
- Examine examples of other organizational structures throughout California that facilitate watershed management efforts;
- Make recommendations for options to restructure the County of Santa Barbara's approach to watershed issues.

The ultimate objective of this analysis is to create an organizational structure within county government to develop and manage watershed assessments, fish passage or habitat enhancement efforts, management plans and other watershed programs, and to provide the staff support and tools that would also allow others to develop and manage such projects.

1 FishNet 4C (formerly of Santa Barbara County Water Agency)
2 County of Santa Barbara, Second District Office
3 Southern California Wetlands Recovery Project

Friday Afternoon Concurrent Session 2: Linkages Between Physical and Ecosystem Processes in Salmonid Restoration

Linkages Between Physical and Ecosystem Processes in Salmonid Restoration

Session Chairs*: Edward Keller[1] and Lee Harrison[1]*

Efforts to restore the ecological integrity of impaired rivers involve the interplay between physical (hydrologic and geomorphic) and biological processes. Restoration thus requires assessment, and to the degree possible, prediction of the key physical processes that form and maintain aquatic habitat. Physical and ecological linkages occur over a range of spatial scales including: watershed (geology, landslide location, baseflow), channel length (channel-floodplain interaction, riparian habitat) and the reach-scale (pool-forming mechanisms, large roughness elements). Restoration projects aimed at improving habitat for anadromous species must therefore assess the degree to which restoration strategies (modifying water/sediment fluxes, fish passage/dam removal, creation of habitat structures) will provide long-term benefits over a range of spatial scales. This session will include presentations that address selected physical and ecological linkages as well as processes important in finding sound ecological solutions to the problem of salmonid ecosystem restoration.

1 Department of Earth Science, University of California, Santa Barbara

Rehabilitating Physical and Biological Process Linkages in a Regulated, Dredged, River-Floodplain: Lower Merced River, California

Peter W. Downs[1]

The Merced River, as it exits in the Sierra Nevada foothills, was formerly part of an anastomosing alluvial complex up to seven kilometers in width, with a bankfull flow of 286 m3/sec and a sediment supply of 10,000–19,000 t/yr. Since the 19th century, the 11 km 'dredger tailings reach' has been subject to significant ecosystem alteration as a consequence of dams and flow regulation, flow diversion, gold mining, floodplain conversion, and loss of riparian vegetation. These stressors have markedly reduced the quality and extent of habitat for native vegetation, fish, invertebrates, birds, and mammals. Restoring the ecological integrity of the reach through rehabilitating physical-biological process linkages is challenging because the stressors are long-lived and do not allow for assisted recovery. Instead the emphasis is on reconstructing the channel-floodplain and providing periodic sediment augmentation to create a channel morphology that is functional rather than historically-inspired. Functional channel design requires knowledge both of hydrosystem dynamics and habitat factors constraining the populations of multiple target biological species. Goals for the restored system include the accumulation of gravels suitable for fall-run Chinook salmon and steelhead spawning, and an increased channel complexity and floodplain connectivity to benefit juvenile salmonids and riparian habitats for native flora and fauna.

To match the project to its watershed boundary conditions, baseline data has been collected at several spatial scales, including at the Merced River Ranch, the first proposed restoration site encompassing 1.3 km of the 11 km of channel bordered by dredger tailings. Site-level data collection has included determining the volume and texture of dredger tailings to ascertain their suitability for in-channel placement, assessment of the potential for methylmercury release, and a native tree-growth experiment. These data are complemented by reach-scale baseline surveys of fish habitat extent and utilization, macroinvertebrate and avian species composition and abundance, and geomorphic processes and attributes. Numerical models have been constructed of reach hydrology, hydraulics, and sediment transport. Upstream processes are either effectively disconnected or can be summarized as outputs from the dam.

Locally modifying fluxes of water, sediment and organic matter should improve aquatic and riparian habitats suitable to support viable populations of native plants and animals despite continued constraints on natural processes. Regionally, this should increase the abundance, distribution and resilience of species that have been long compromised by habitat loss and degradation in California's Central Valley. Baseline data collection was designed to allow other restoration schemes in the dredger tailings reach to be implemented without significant additional effort, and some data may be transferable to other dredger-mined rivers. Monitoring and evaluation of the implemented restoration elements based on conceptual models of ecosystem operation should help maximize learning about restoration best-practice. If implemented, the project will be an experiment both in re-establishing functional physical and biological process linkages through floodplain re-connection, and in re-scaling a river-floodplain to match its regulated flow regime, and will help inform whether best-practice restoration practices can succeed without significant additional river flow.

1 Stillwater Sciences

Friday Afternoon Concurrent Session 2: Linkages Between Physical and Ecosystem Processes in Salmonid Restoration

Matching Restoration Strategy to the River and Management Objectives

G. M. Kondolf[1]

Many rivers have potential for self-restoration if flow and sediment supply are adequate, yet attempts are often made to restore these to preferred forms (stable, single-thread meandering channels in place of unstable (often braided) channels) or by creating artificial salmonid spawning areas. In many cases these projects have failed because the dynamic nature of gravel-bed rivers has not been recognized, or there has been inadequate consideration of natural sediment supply from the catchment or changes in sediment supply due to human activities (e.g., increases due to land use changes, or decreases due to upstream dams). For gravel-bed rivers, the restoration strategy of first choice should be *process-based prompted recovery*, whereby we remove constraints (such as removing bank protection to permit channel migration) and restore processes (such as injecting gravel below dams to mitigate sediment starvation). Under this approach, the river is free to create a channel geometry that is consistent with the independent variables of flow and sediment load. Where these independent variables have changed (such as reduced flood magnitudes below dams), the dimensions of the restored channel may be smaller than before human disturbance, in equilibrium with the new conditions.

We must also recognize the scale of our restoration efforts in light of the extent of human modification, and accept that for many settings, our restoration efforts will be at best enhancement of a highly degraded system. In such situations, such as the Central Valley of California, the question becomes how to best allocate the (always limited) available resources strategically to achieve realistic restoration goals. For example, is it better to make small investments in many rivers or concentrate on larger projects in one or a few? An overall conceptual model on a basin scale and over a long time period is needed as a framework in which to evaluate the cumulative contributions of different possible projects.

1 University of California, Berkeley

Will Deconstructing Dams "Restore" Rivers? The Geomorphic Response of Rivers to Dam Removal

Gordon E. Grant[1] (presenter), Greg Stewart[2], Chris Bromley[3]

Dam removal is emerging as one of the key "tools" in the river restoration toolbox, yet the long-term geomorphic and ecologic response of rivers to dam removal remains an open and active arena of scientific inquiry. Compared to where we were only a few years ago, there are now a number of well-documented and studied examples of removal of small dams involving relatively small releases of sediment on small rivers. These studies provide some basis for predicting likely trajectories for other rivers following dam removal. In particular, we have observed that where only modest amounts (~ 103 to 104 m3) of stored sediment representing one to several years of basin sediment yield are released following removal of a dam, energetic rivers are able to "digest" such increased volumes with only minor geomorphic adjustments.

Much less well understood are the geomorphic responses likely to accompany release of large volumes of sediment representing decades of accumulation, which up to now no dam removals have involved. As we are likely to witness such removals in the next few years in the Pacific Northwest (e.g. on the Sandy and Elwha Rivers), here we draw on theoretical, experimental, and empirical studies that shed light on likely ranges of both upstream and downstream adjustments. In terms of upstream changes, studies focusing on removal of small dams highlight the importance of knickpoint retreat as a dominant mechanism driving sediment release. Experimental drawdowns of large dams, a useful analog for dam removal, reveal that sediment release proceeds from a combination of knickpoint retreat, channel incision, lateral widening, and delta progradation. Small-scale modeling experiments further reveal that one of the key controls on the rate of delta progradation is the rate at which the dam is removed, providing river managers with some measure of control over a complex geomorphic process.

Geomorphic response of rivers downstream of removed dams is closely coupled to the rate of excavation of the stored sediment. One, two and three-dimensional modeling of hydraulics and sediment transport in downstream channels provides some basis for predicting the fate of sediment released during dam removal, but actual trajectories of channel change await real-time observations. A major problem in advancing understanding of dam removal is the difficulty in implementing well-designed monitoring schemes that could provide needed information on rates and mechanisms of change. We outline some of the design strategies for such programs.

1 USDA Forest Service, Pacific Northwest Research Station
2 Department of Geosciences, Oregon State University
3 Department of Geography, University of Nottingham (UK)

Friday Afternoon Concurrent Session 2: Linkages Between Physical and Ecosystem Processes in Salmonid Restoration

Restoration of Floodplain Topography and Hydrogeomorphic Channel-Floodplain Linkages

Joan Florsheim[1] (presenter) and Jeffrey Mount[1]

In many lowland river systems, levees concentrate flow into single channels, hinder channel migration, physically isolate laser-leveled agricultural floodplain fields from channels, and thereby limit the lateral transfer of water, sediment, nutrients, and aquatic species. In such systems, restoration of floodplain topography through rehabilitation of channel-floodplain linkages provides the physical structure of habitat required by riparian species. Field-based hydro-geomorphic investigations at the Cosumnes River Preserve document evolution of floodplain changes following intentional levee breaches for habitat restoration in an area adjacent to the river that was dominated by agriculture since about the time of the gold rush. Restoration of lateral connectivity re-introduces flow to the floodplain when discharge exceeds a connectivity threshold Q/Qc, where Q is the discharge during a particular flow and Qc is the discharge that rises overbank to inundate the floodplain. Higher flows that exceed a threshold of sediment transport from the channel onto the floodplain are about four times Q/Qc. Flow of water and sediment onto the floodplain following the levee breach restoration project at the Cosumnes River Preserve initiated rapid development of sand and channel splay complexes on the formerly level field. Monitoring and assessment of these dynamic geomorphic features illustrate the role of physical processes in creating and maintaining variability in floodplain habitat that supports species diversity.

1 University of California, Davis

How Riverbeds Become Structured under Low-Sediment Supply Conditions: Implications for Restoring Dam-Impacted Rivers

M.A. Wydzga[1] (presenter), J.G. Venditti[2], M.A. Hassan[3], T. Dunne[1]

Coarse, degraded river reaches are commonly observed downstream of dams across the western United States. In response to the cut-off in gravel supply that occurs following dam closure, the downstream riverbed typically becomes coarse and immobile. The immobile bed conditions lead to a significant degradation of both spawning and rearing salmonid habitat. We propose that in addition to the riverbed surface coarsening, the structure of the riverbed surface (i.e. the way the grains arrange themselves on the surface of the bed) is fundamentally different under post-dam closure conditions. This surface bed structure takes the form of both grain clusters and grains interlocking with one another. A series of physical modeling experiments are being undertaken to examine the following: 1) how a gravel riverbed becomes structured in response to a reduction in coarse sediment supply; 2) how a structured riverbed increases the bed's resistance to erosion; and 3) how a coarse, structured riverbed interacts with pulses of injected gravel (i.e. gravel augmentation) that are intended to restore basic sediment transport processes by remobilizing the bed.

1 University of California, Santa Barbara
2 University of California, Berkeley
3 University of British Columbia, Vancouver, Canada

Friday Afternoon Concurrent Session 2: Linkages Between Physical and Ecosystem Processes in Salmonid Restoration

Geospatial Geomorphology: Remote Sensing and Geostatistical Methods for Characterizing River Channel Morphology and In-stream Habitat

Carl J. Legleiter[1]

Current research at the interface between geomorphology and ecology emphasizes linkages among geomorphic complexity, habitat heterogeneity, and biodiversity. Reestablishing these connections in streams degraded by anthropogenic influences has become a primary objective for many resource management agencies. Their efforts to conserve endangered salmonid populations thus focus on restoring natural fluvial processes to improve in-stream habitat conditions. Although the success of these projects depends on effective monitoring and adaptive management, obtaining even sparse data via traditional methods is laborious and expensive. The difficulty of collecting these data tends to restrict studies to short, isolated reaches, with little consideration of their watershed context. A conjugate problem is the lack of objective criteria for assessing project performance; while 'geomorphic complexity' is generally agreed to be desirable, an appropriate means of quantifying progress toward such a nebulous goal has yet to be identified. Improved methods of characterizing river channel morphology and in-stream habitat across an appropriate range of spatial scales would yield novel insight on biophysical process linkages and facilitate river restoration and management.

Such a methodological advance could be achieved by adopting recently developed geospatial techniques to the unique challenges of the fluvial environment. More specifically, this presentation describes the application of remote sensing and geostatistics to both natural and restored gravel-bed rivers. Used in tandem, these tools provide a framework for spatially distributed, high-resolution measurement and analysis of river channel morphology and the corresponding physical habitat template. Previous research has confirmed that the physical basis for remote sensing of rivers is theoretically sound and has demonstrated that relatively simple algorithms applied to readily available image data can provide reliable estimates of water depth. Ongoing studies focus on developing flexible methods for calibrating image-derived estimates and assessing the feasibility of identifying different benthic cover types via remote sensing. The increasing availability of remotely sensed data implies that these techniques could become a powerful tool for characterizing rivers at watershed rather than reach scales, with a level of detail that would be impractical to achieve via traditional ground-based survey. Similarly, geostatistics provides a useful suite of tools for spatially explicit analyses of these data. By incorporating not only data values but also their locations, geostatistical methods can be used to quantify the spatial variability of habitat descriptors such as depth, velocity, and sediment grain size. This type of geostatistical model can serve as a metric of habitat heterogeneity and could become a useful tool for monitoring and assessment. These techniques and concepts are illustrated with examples from pristine channels in Yellowstone National Park and a large-scale restoration project on the lower Merced River.

1 University of California, Santa Barbara

Geologic Controls on Pool Formation and Low-Flow Habitat: Rattlesnake Creek, Santa Barbara, California

Garret Bean[1] (presenter) and Edward Keller[1]

Pool morphology plays a critical role in the spawning and rearing of steelhead trout in steep boulder-bed mountain streams. Therefore, it is imperative to understand what factors control and maintain pools. Previous work in boulder-bed streams has attributed channel and pool morphology to boulder and bedrock constrictions. Rattlesnake Creek, a boulder bedrock stream in the Santa Ynez Mountains, Santa Barbara, California, was studied to determine the geologic influence on the quality and quantity of steelhead trout habitat.

The goals of this study were to: 1) evaluate the geologic influence on the pool morphology and spacing; and 2) examine the role of geology on low flow habitat of endangered southern steelhead trout. Three hypotheses were tested: 1) lithology can be used to determine characteristic pool morphology; 2) pools in sandstone are larger and deeper than pools on shale; and 3) geology and specifically hydrogeology are linked to providing low flow in pools. To test these hypotheses, three reaches with different rock types including sandstones and shale were surveyed. Morphologic characteristics such as pool length, depth, width, and spacing were measured. Geologic influence on low-flow habitat was examined by identifying aquifer recharge and discharge zones.

Results of the morphologic survey suggest that sandstone pools are longer, wider, and spaced further apart; however, shale pools tend to be deeper. It was found that the pools in Coldwater Sandstone contain springs that create an important refuge for trout in the extreme dry summer years; and in general sandstone units maintain flow longer than pools in shale. Further work will include statistically testing differences between pool morphology and rock type. By understanding the geologic influence on pool morphology and low flow habitat this research is useful both in identifying refuge for steelhead trout and in the selection of channel reaches for restoration or naturalization.

1 Department of Earth Science, University of California, Santa Barbara

Pool Response to Sediment Pulses in Mountain Rivers

Lee Harrison[1] (presenter) and Edward Keller[1]

In mountain streams, increased sedimentation often occurs following landslides, debris flows and flushing events below dams. The introduction of a sediment pulse typically creates decreased pool volume, in turn reducing the quality of available fish habitat. The majority of the previous work has focused on trying to understand the behavior of sediment pulses by using one-dimensional sediment routing models. While this approach offers valuable insight on the large-scale movement of the sediment pulse, the channel response is a three-dimensional problem that requires an understanding of the reach-scale patterns of erosion and deposition. The goal of this work was to determine the processes involved in reach-scale channel adjustment following increased sediment supply using field, flume and modeling data.

A series of detailed experiments were conducted on flume channels at the Sierra Nevada Aquatic Research Laboratory (SNARL). These channels were designed with alternate pool-riffle sequences, thus greatly improving the approximation of natural field conditions. To examine pool response to a sediment pulse, we introduced 800 kg of mixed sand with a median grain size of 0.5 mm over a bed of 50 mm gravel. The pulse was allowed to deposit into three pool-riffle sequences downstream. Three-dimensional point velocity readings were collected on several pool-riffle sequences, using an Acoustic Doppler Velocimeter (ADV). Bed load was measured using a Helly-Smith bed load sampler. Channel change was monitored through repeat surveys of cross-sectional and longitudinal transects.

Experimental results found that the patterns of erosion and deposition closely follow the hydraulics. The pulse was transported through the riffles and deposited primarily in pools. The pool thalweg was reestablished as the pulse dispersed laterally in flow separation zones, resulting in substantial bar growth. The bars became relatively stable zones of sediment storage within the channel, while the pool head, center and tail were eroded to ambient conditions. Current research is underway to test the ability of a two-dimensional sediment transport model to predict results from the flume study. With the expectation that the model predictions are in agreement with the flume experiments, the results will be applied to a field site on the Kern River to predict how pools and, ultimately, fish habitat will respond to sediment pulses.

1 University of California, Santa Barbara

Friday Afternoon Concurrent Session 3: Finding Watershed Justice in Your Watershed: Creating Healthy Watersheds and Healthy People

Finding Water Justice in Your Watershed: Creating Healthy Watersheds and Healthy People

Session Chair*: Amy Vanderwarker*[1]

Healthy watersheds are not only required for healthy fish, but also healthy people. Salmon will only be restored once the riverbeds, wetlands and marshes that sustain their habitat are also restored. This is true of many communities throughout California—healthy, sustainable communities need healthy, sustainable watersheds to thrive.

Unfortunately, many low-income communities and communities of color lack access to healthy watersheds. In California, Native American groups have suffered genocide and discrimination and have been especially harmed by the dams that impound the majority of the water delivered through public water projects. Their exclusion from water development continues to affect Native American's cultural, economic and spiritual well-being. For many tribes, the wildlife that thrives off rivers, wetlands, lakes and estuaries provide food and economic livelihoods. Healthy watersheds and wildlife populations are necessary to preserve spiritual and cultural practices. The poverty facing many tribes in California is a direct result of institutional imperialism in water development.

Additionally, urban communities have been historically cut off from open space and healthy watersheds through exclusionary zoning practices. Today, these communities, often low-income people of color, lack access to uncontaminated lands for fishing, recreation, and swimming. Urban communities that rely upon fishing as a source of recreation and as a nutritional supplement are heavily impacted by fish contamination. Redevelopment and gentrification have exasperated inequalities in urban land-use planning and development, leaving many communities of color shut off from waterfront areas.

This panel will explore the many ways communities interface with their watersheds. Presenters will not only discuss how many people are denied the benefits of healthy watersheds and how this impacts their health and wellbeing, it will also address the many communities and organizations that have sought creative ways to remedy this injustice. Tribal members have pulled together broad alliances of organizations to protect their watersheds; community programs in Monterey have created bilingual watershed training programs, and organizers in San Diego have taken data collection in their own hands to assess the health impacts of contamination on low-income anglers.

In examining the ways different communities have struggled to overcome the health and quality of life impacts from devastated watersheds, our presenters will also explore the many meanings that watersheds have to different communities. An urban watershed may be half a sunshined creek. For communities along San Francisco Bay, Yosemite Slough and the surrounding power plants are just as much a part of the local watershed as a restored river in a national forest may be part of the watershed. For some commuities, the people in the watershed are just as important to the natural landscape as are the wetlands or the fish—you cannot separate watershed restoration from community restoration.

"Finding Water Justice in Your Watershed" will examine how lack of access to a healthy watersheds is an issue of environmental justice and how it impacts the economic well-being, health and quality of life for many people. It will explore community responses to these inequalities that many low-income communities and communities of color face and show how many different approaches to watershed restoration are possible.

1 Environmental Justice Coalition for Water

Friday Afternoon Concurrent Session 3: Finding Watershed Justice in Your Watershed: Creating Healthy Watersheds and Healthy People

Environmental Justice and Watershed Issues in the Tijuana Estuary

Oscar Romo[1]

Many of the ecological problems faced by the Tijuana River National Estuarine Research Reserve (TRNERR) originate in the 1,700-square mile, binational, Tijuana River watershed—an area that stretches well beyond the Reserve's borders. The TRNERR is located at the terminus of this 1,700-square mile binational watershed, and encompasses approximately 2,531 acres of tidally flushed wetland, riparian, and upland habitats lying immediately north of the United States/Mexico border. Since over three-quarters of the Tijuana River Watershed are in Mexico, management, education, and research issues involve a binational perspective. Critical issues confronted by the TRNERR must be looked at through the lens of a region with two unique political, cultural, economic and geographic settings.

Within our shared watershed, many communities in Mexico face challenges in providing the same quality of environmental services as those in the United States, as well as other areas in Mexico. While affluence is a reality for many in the region, it is mirrored by environmental, social, and economic inequalities for others. Facing problems such as access to clean water, proper sewage systems, and erosion control, factors in these communities —unplanned urbanization, erosion, pollution, and other factors—directly generate negative effects on these communities and downstream Reserve resources.

Recognizing the need to address these complicated and intertwined issues from a watershed-wide perspective, the TRNERR's Coastal Training Program (CTP) has been working directly with officials from the academic, governmental and non-governmental sectors, as well as directly with communities in Mexico, on projects and trainings that attempt to address these pressing needs. The CTP is a National Oceanic and Atmospheric Administration (NOAA)-funded program within the National Estuarine Research Reserve System and is an effort to provide accurate science-based information and skill-building opportunities for those individuals and organizations whose daily decisions affect the health of our estuary and surrounding coastal region. The Coastal Training Program presents an exciting opportunity to improve resource management for the TRNERR through a progressive program of partnerships, collaboration and high quality "cutting-edge" information exchange. Never before having been achieved, the CTP has been instrumental in promoting projects and building working relationships and collaborations within the watershed, particularly for underserved communities in Tijuana. Utilizing a new and progressive approach, the CTP has managed to improve the quality of life, both socially and environmentally, for communities in Mexico, while in turn improving the ecological services offered by the Reserve.

The TRNERR lands are owned and managed cooperatively by the California Department of Parks and Recreation, U.S. Fish and Wildlife Service, the City of San Diego, the County of San Diego, and the U.S. Navy. The TRNERR is linked to two federal land preservation networks: the National Estuarine Research Reserve System, administered by the National Oceanic and Atmospheric Administration, and the National Wildlife Refuge System, administered by the U.S. Fish and Wildlife Service.

1 Tijuana River National Estuarine Research Reserve

Friday Afternoon Concurrent Session 3: Finding Watershed Justice in Your Watershed: Creating Healthy Watersheds and Healthy People

Traditional Maidu Watershed Stewardship

Lorena Gorbet[1]

Lorena Gorbet will be speaking about the efforts of the Maidu Cultural and Development Group (MCDG) to foster native watershed management practices. MCDG is an Indian non-profit organization, not a tribal affiliated group. MCDG does have two recognized Indians on its Board but most are unrecognized California Indians. MCDG has taken an innovative approach to integrating traditional Maidu watershed management practices into county and state level watershed programs. MCDG has worked with government agencies and other environmental groups on outreach to native communities and restoration projects. Ms. Gorbet will be discussing her community's perspective on watershed management and the challenges and benefits of integrating these management practices into other programs. She will also discuss the importance of honoring these traditional methods as an issue of environmental justice.

1 Maidu Cultural and Development Group

Friday Afternoon Concurrent Session 3: Finding Watershed Justice in Your Watershed: Creating Healthy Watersheds and Healthy People

Tujunga Watershed Project

Miguel A. Luna[1]

The Tujunga Watershed is a special place. Covering over 225 square miles, it has both some of the most densely urban and undisturbed natural lands in Los Angeles. Its habitats range from conifer and hardwood forests, to rare alluvial fan scrub, to the common asphalt jungle. Because it also includes dynamic streams and lands atop the San Fernando Valley aquifer, it has the potential—if managed differently—to provide us with a roadmap for a more sustainable future in Los Angeles. With funding from the CALFED Bay-Delta Watershed Program, The River Project is developing a stakeholder-driven Tujunga Watershed Management Plan.

1 The River Project

Friday Afternoon Concurrent Session 3: Finding Watershed Justice in Your Watershed: Creating Healthy Watersheds and Healthy People

Struggling to Maintain a Watershed: The Fight for Breuner Marsh

Whitney Dotson[1]

The Breuner Marsh is a marsh located along the San Francisco Bay in Richmond. It has long been used by local residents as a place of recreation in a highly industrialized city. Recently, community activists such as Whitney Dotson have been engaged in a long struggle to fight off private development along this beautiful piece of shoreline. A local advocacy group has developed a community-based vision for restoring and preserving a corridor of open space along the Richmond Shoreline. Mr. Dotson will explain the historical significance of the marsh to local residents and give an overview of the history of the struggle to maintain this important watershed. Mr. Dotson will discuss the importance of healthy watersheds to his community and why this is an issue of environmental justice.

1 Parchester Village Neighborhood Council

Justice for the Salmon and Salmon People

Mark Franco and Caleen Sisk-Franco[1]

It began before California was a state. It was small, hardly noticeable: the monopolization of water and the exploitation of natural resources. Then came the state of California, gold, and the realization of a vast wealth of natural resources. It has been downhill ever since. Greed, power, thoughtlessness, and waste have brought the salmon and the salmon people close to the brink. It is time for justice—justice for the salmon and salmon people.

1 Winnemem Wintu Tribe

Friday Afternoon Concurrent Session 3: Finding Watershed Justice in Your Watershed: Creating Healthy Watersheds and Healthy People

Fish Contamination and Environmental Health in San Diego

Laura Hunter[1]

Diego Bay suffers from high levels of toxic contamination of sediments. Five health risk studies on the safety of eating Bay fish in the past 10 years have all demonstrated significant risks to frequent or high-risk consumers from mercury, PCBs, and arsenic in the fish. Environmental Health Coalition (EHC) an environmental justice organization based in the San Diego Tijuana region conducted a community based Pier Fishers Survey and found that a significant proportion of the fishers frequenting the public piers closest to contaminated area were catching and consuming bay fish and feeding to their families with it. EHC has also produced a Guidance Document for Regional Water Qualtiy Control Boards on the methods they should use to reflect environmental justice and precaution in their decision-making processes.

1 Environmental Health Coalition

Development of Nutrient and Toxic Algae Criteria for the Lower Klamath River on the Hoopa Valley Indian Reservation

Eli Asarian[1] and Patrick Higgins[2]

On behalf of the Hoopa Valley Tribe, Kier Associates recently developed draft nutrient criteria for a short reach of the Klamath River that passes through the Hoopa reservation. The proposed criteria are currently undergoing review by the Hoopa Valley Tribe and the United States Environmental Protection Agency (EPA). The setting of nutrient criteria is a relatively new concept, and the EPA has not yet approved any nutrient standards for rivers and streams on the west coast of the United States for the purpose of protecting the coldwater fisheries beneficial use.

Due to high concentrations of nutrients, water quality in the Klamath River is extremely impaired during the summer months with pH rising above 8.5 and dissolved oxygen dropping below 8.0 mg/L on a daily basis at most sites. These poor water quality conditions contribute to stress and immunosuppression in juvenile and adult salmonids, increased disease rates, and reduced survival.

Nutrients impact salmonids indirectly by stimulating the growth of algae and aquatic macrophytes to nuisance levels that can adversely impact dissolved oxygen and pH levels in streams. The concentration of nutrients required to cause nuisance levels of periphyton varies widely from one stream to another. In 2000, the EPA issued guidelines that provide several possible approaches for states and tribes to follow in developing nutrient criteria. The preferred approach is to conduct detailed analyses using local data to develop quantitative relationships between nutrients and response variables such as periphyton (benthic algae), pH, and dissolved oxygen.

Analyses of a rich existing dataset of Klamath River nutrient and automated multi-probe data yielded significant relationships between nutrient concentrations, pH, and dissolved oxygen. The periphyton dataset was quite limited and no significant relationships between nutrients and periphyton biomass were found, though there were significant relationships between periphyton biomass and pH and dissolved oxygen.

Microcystis aeruginosa, a blue-green algal species (cyanobacteria) capable of producing the potent liver toxin (hepatotoxin) microcystin, was recently detected in the lower reservoirs of the Klamath Hydroelectric Project and below in the Klamath River all the way down to the estuary. Standards for *Microcystis aeruginosa* and its toxins were recommended based on human health concerns, rather than ecological effects.

1 Kier Associates
2 KRIS Project

Fish Passage Issues in Yolo Bypass

Randy Beckwith[1], Trevor Greene[1], Marianne Kirkland[1]

The Department of Water Resources has been conducting baseline aquatic monitoring and research in the Yolo Bypass, a floodway for the Sacramento River, since 1997. The research has exposed that migrating adult fish (Chinook salmon, steelhead, and sturgeon) can be attracted into the bypass when connectivity to spawning habitat is limited. Specifically, the four main fish passage issues in Yolo Bypass are: (1) limited and poor fish passage at Fremont Weir, (2) undesirable fish migration up Knights Landing Ridge Cut, (3) blocked fish passage into west side tributaries, and (4) fish passage barriers within the bypass.

Fremont Weir typically prohibits upstream fish migration except for a very short time period during high stage events in the Sacramento River. Improving passage at the weir, possibly via a multi-species fishway, would greatly increase the likelihood that adult migrating fish will reach spawning habitat by more frequently allowing a direct connection to the Sacramento River. When the weir is not overtopping, the fishway would also allow for small attraction flows to draw fish towards the Sacramento River and away from Knights Landing Ridge Cut. Knights Landing Ridge Cut is an undesirable migration route because there is no spawning habitat in or upstream of the channel. Constructing a barrier to fish migration at the mouth of this channel and providing attraction flows from Fremont Weir would improve chances that migrating fish would find the Sacramento River.

The two major west side tributaries to the bypass, Cache and Putah Creeks, both offer potential salmonid spawning habitat. Unfortunately, adult migrating fish are blocked from entering Cache Creek by a large concrete weir. Cache Creek has abundant spawning gravel and could support salmon and steelhead runs if passage were provided past the weir. Adult migrating fish are delayed from entering Putah Creek by a wooden flashboard dam that is not removed until late fall. Putah Creek supports a small, intermittent run of salmon that might possibly fare better if passage were provided earlier, so that the next generation spawned could emigrate before the dam was replaced in the spring. Finally, improving fish passage through the interior perennial channel of the Yolo Bypass by modifying earthen road crossings and modifying a canal crossing would further increase the chances of fish reaching the Sacramento River and western tributaries. Currently there is not connectivity along the perennial channel except when the crossings are overtopped. Together, these fish passage improvements would improve the chances of adult migrating salmonids—as well as other native species —reaching viable spawning habitat.

1California Department of Water Resources, Aquatic Restoration Planning & Implementation Section

Ecological Evaluations and Habitat Restoration in the Yolo Bypass Floodplain

Zoltan Matica[1] and Bill Harrell[2]

In the Yolo Bypass, a 59,000 acre multi-use floodplain, the Department of Water Resources, in cooperation with other state and federal agencies, has been conducting baseline aquatic monitoring and research since 1997. Our research emphasis has focused on floodplain ecology and on native species such as juvenile Chinook salmon and splittail. The area has formidable sampling challenges due to its large size and hydrological variability, requiring diverse methods to address different biological questions. Our research has revealed that flood pulse flows may attract migrating adult fish (Chinook salmon, steelhead, and sturgeon) into the Bypass when connectivity may be limited; fish passage at the Bypass's control structure, Fremont Weir, is limited to a narrow window of flows; and west side tributaries may be blocked by man-made structures. In an effort to address these challenges, we are using the information learned from our monitoring and research to develop conceptual designs for improvement of the floodplain's aquatic habitat, to guide restoration and passage designs, and to evaluate the effects of project implementation.

1 Department of Water Resources, Aquatic Restoration, Planning & Implementation Section
2 Department of Water Resources, Estuarine Studies & Aquatic Ecology Section

Analysis of Salmonid Habitat Potential in the Pacific Northwest Using Ecosystem Diagnosis and Treatment

Willis E. McConnaha[1], Greg Blair[1], and Lawrence C. Lestelle[1]

Restoration of habitat is a major focus of salmon recovery throughout the Pacific Northwest and California. Natural resource managers recognize that high quality habitat is essential to the sustainability of salmon populations. However, habitat restoration for salmon recovery has, for the most part, focused on non-urban streams. This is changing, however, as managers have realized the importance of streams within urban areas to salmon recovery. ESA imposes significant obligations on many cities because cities are often located on major rivers,. Further, planners are focusing on restoration of urban streams to contribute to quality of life within cities.

Effective restoration is based on a systematic approach to problem solving. This means a logical, science-based approach that explains how actions will be transferred to desired outcomes. This is even more critical in urban areas, where habitat restoration is expensive and likely to have significant social impacts. Natural resource planners require a scientific framework for identifying habitat restoration needs and prioritizing actions. Species-habitat models provide the ability to assess stream functions and habitat potential within an analytical framework that provides accountability to stakeholders and funding agencies.

Ecosystem Diagnosis and Treatment (EDT) is the most widely used tool for salmonid habitat analysis in the Pacific Northwest. EDT is a rule-based model that provides a reach-level diagnosis of habitat conditions for most salmonid species. Habitat quantity and quality in a stream are assessed for their potential to support a salmonid species. After over a decade of use, EDT has been applied to nearly every salmon-bearing stream in the Columbia Basin and Puget Sound and is the technical basis for the development of many ESA recovery plans. EDT helps managers develop a working hypothesis for habitat restoration as part of an adaptive management program of action and monitoring.

Two analyses are presented as case studies of the use of EDT in salmon habitat analysis. First, we display results from an analysis of aquatic habitat in the Nisqually River. The Nisqually is a major Puget Sound river that retains many of its natural features while struggling with increasing levels of development in the Seattle-Olympia metropolitan corridor. The State of Washington and the Nisqually Indian Tribe have used EDT to understand habitat limitations in the stream for salmonids and to prioritize restoration efforts. Second, we contrast the Nisqually application with the analysis of habitat potential in urban streams and rivers in Pierce County and the City of Tacoma, Washington, a major metropolitan area. Pierce County has used EDT to facilitate a broad, citizen based effort to restore and manage streams in an intense urban environment. In both cases, EDT has allowed managers to develop a scientific basis for habitat management in a variety of aquatic systems and provided important insights into the use of freshwater and marine habitats by Pacific Salmon.

Information will also be available on other urban applications of EDT in Portland, Oregon and the Seattle metropolitan area (King County).

1 Jones & Stokes

Ojai Streams Characterization Study and Restoration Plan

Cher Batchelor[1] and David Magney[1] (presenter)

The City of Ojai received a grant from the California Department of Fish and Game (CDFG) to prepare a comprehensive assessment and restoration plan for the watersheds that drain through the city limits. David Magney Environmental Consulting (DMEC) was contracted by the City to conduct the Ojai Basin streams characterization and assessment, and to make recommendations on how stream habitats within the City could be protected or restored. The objectives of this assessment and restoration plan were to: (1) conduct a baseline assessment of the City of Ojai urban watershed; (2) identify and prioritize limiting factors to increasing Southern Steelhead populations; (3) determine and analyze the root causes of these limitations; and (4) develop specific recommendations for restoration actions.

The Ventura River system is ranked as the third most endangered river in the United States and is designated as critical habitat for Southern California Steelhead Trout (Oncorhynchus mykiss irideus), a federally listed endangered species. The river once had a large Steelhead population spawning in the upper reaches of its tributaries, including the larger San Antonio Creek watershed in the foothills of the Ojai Valley; however, Steelhead populations declined over the years, largely due to the impact of human activities.

The predominant known problems, in regard to Steelhead habitat within the City's streams, include the following: fish passage, water quality, spawning habitat, and deficient stream flows. A primary purpose of the assessment and restoration plan was to identify specific problems of the Ojai creeks relevant to Steelhead Trout, and develop a plan to restore fish habitat and to address the land use issues that adversely affect that habitat and the ecological health of the watersheds.

Actions that can be taken to restore and enhance Steelhead habitat conditions include the following:

- Remove barriers to fish migration where feasible;
- Establish minimum-width buffers between urban land uses and streams;
- Restore native riparian vegetation along streams;
- Preserve upland portions of the watershed;
- Eradicate invasive exotic plants and aquatic animals;
- Follow NOAA and CDFG fish passage guidelines at stream crossings;
- Minimize impervious surfaces on all parcels;
- Educate land owners; and
- Establish regular water quality monitoring stations.

1 David Magney Environmental Consulting

Matilija Dam Ecosystem Restoration Project

Paul Jenkin[1]

In 1994, the Ventura County Chapter of the Surfrider Foundation printed a bumper sticker stating, "Give a Dam, Free the Sand, Grow the Beach." A decade later this grassroots movement resulted in the completion of a federal feasibility study that outlines a plan for removing the 200-foot high Matilija Dam from the Ventura River watershed. The study demonstrates how the presence of the dam has adversely impacted the ecosystems of Matilija Creek and the Ventura River. The dam obstructs the natural flow of sand and sediment from the mountains to the beaches, resulting in long-term coastal erosion. It also prevents the endangered steelhead trout from swimming to their ancestral spawning and rearing grounds, found only in the upper reaches of the watershed. Today, almost half the historic steelhead spawning habitat within the Ventura River watershed lies behind Matilija Dam, and the State of California recognizes this project as the keystone to recovery of the endangered southern steelhead.

The Matilija Dam Ecosystem Restoration project includes dam removal and watershed management to restore fish passage to the upper watershed and restore the natural sediment transport that nourishes coastal beaches. Constraints include water supply and floodplain management. With continued funding, deconstruction of Matilija Dam will begin in 2009 and will be one of the highest dams ever removed.

1 Surfrider Foundation and Matilija Coalition

Southern Steelhead Trout Restoration in Solstice Creek —Cooperation, Planning, Implementation, and Lessons Learned

Gary T. Busteed[1]

Southern steelhead trout are unique and rare in southern California. These sub-species are especially adapted to the extremely ephemeral nature of southern California streams. However, urban development resulting in pollution, culverts and dams are the cause of the loss of habitat and the decline of this species. In the Santa Monica Mountains a history of road culverts, stream crossings and check dams have prevented steelhead trout migration and extirpated the species in this watershed. Planning to restore the creek and re-establish steelhead runs began in 1999 with a habitat assessment from NOAA-Fisheries. For the next six years National Park Service (NPS) staff coordinated efforts with several state, local and federal agencies to bring together fisheries experts, funding, planning and engineers to design and implement a restoration of the creek that will allow for the re-establishment of this endangered sub-species. The National Park Service has completed the first task of removing barriers in the upper watershed and is restoring the riparian habitat. Along the way NPS staff met with several funding, planning and implementation obstacles and met those challenges with the help of their cooperators and a little creative thinking. Currently, NPS staff are working in cooperation with Caltrans and the City of Malibu to remove or retrofit two other fish barriers downstream, which are scheduled for this summer (2006). Once complete, 1.8 miles of habitat will be accessible to southern steelhead trout.

1 National Park Service

Dam Removal as a Result of FERC Licensing

Laura Norlander[1]

The federal licensing process offers a powerful opportunity to reduce the impacts of hydroelectric generation on the state's aquatic resources. Hydropower dams, in the course of generating electricity, divert significant amounts of water out of the river's natural channel, block fish passage and fragment ecosystems, alter water temperatures and sediment transport, and block access to public recreational opportunities. The federal process to grant hydropower dams new operating licenses provides public stakeholders with the opportunity to influence decisions regarding project operations and restoration efforts that will shape a river's health and productivity for the life of the new license, another 30 to 50 years.

Unlike any other energy sector, hydropower utilities have been able to operate projects for decades without complying with current environmental laws. Most of the 150 dams that will expire in the next 15 years received their previous license in the 1950s. As facilities age and regulators gain additional knowledge about the environmental consequences of damming rivers, the federal licensing process has become an increasingly appropriate forum to discuss the benefits and feasibility of dam removal. Currently, a case for removal can be made for a number of hydropower dams in the West that present high environmental costs with relatively low contributions to energy supply. In California, dam removal is being discussed for PacifiCorp's five-dam hydropower project on the Klamath River and PG&E's two-dam project on Cow Creek. Of course, any decision to remove a dam must include a thorough analysis of the both costs and benefits. That said, establishing costs and benefits may be difficult due to the challenge of placing quantifiable values to a functioning ecosystem or additional miles of salmonid habitat.

1 California Hydropower Reform Coalition

Rindge Dam Removal: A Review of Regional Ecologic and Economic Benefits and Options for Removal

Jim Edmondson[1]

Rindge Dam, located on Malibu Creek, has been an obsolete facility for over forty-five years. It serves no beneficial functions, such as flood control, water supply, or hydropower generation, because it is completely filled with sediment. In 1997, the southern steelhead trout was listed as endangered by National Marine Fisheries Service, under the federal Endangered Species Act. The key to restoring southern steelhead in Malibu Creek is removal of the Rindge Dam to allow these fish, for the first time since 1926 when the dam was completed, access to their historic spawning and rearing habitat.

Recent research has determined:

- Malibu Creek steelhead are tolerant of high sediment loads in the stream, and such events following a large wildfire in the watershed do not degrade the species or the creek's vegetation and instream habitat (Spina and Tormey 2000).
- Water quality monitoring in the upper sections of Malibu Creek demonstrate good conditions for steelhead once they arrive (Heal the Bay 2001).
- Traffic restrictions and increasing congestion on Malibu Canyon Road may render infeasible the Bureau of Reclamation's recommendation to excavate the sediment behind the dam and transport elsewhere by trucks.
- In an analogous case, removal of San Clemente Dam on the Carmel River, the short-term risks to steelhead of dam removal are outweighed by the long-term benefits (NMFS 2001).

The United States Army Corps of Engineers (Corps) has begun exploring ways to address fish passage issues by launching the *Malibu Creek Environmental Restoration Feasibility Study*, in partnership with California Department of Parks and Recreation. The purpose of this paper is to provide this additional information for the Corps to consider as it begins its feasibility study and to provide five evaluation recommendations. If these recommendations are followed, a no-cost or "win-win" dam removal project may be realized through partnerships with local, county, state and federal agencies dedicated to recovering the fish, enhancing the beaches, and protecting the area's economy.

1 Cal Trout

Sketchy about Hetchy: Hetch Hetchy Restoration Proposal

John Andrew[1]

The restoration of Hetch Hetchy Valley in Yosemite National Park has once again captured the public's attention. The 2000-acre valley on the upper Tuolumne River is located about 20 miles north of Yosemite Valley, to which it is often compared. Currently though, Hetch Hetchy is inundated by up to 360,000 acre-feet of water impounded behind 312 foot high O'Shaughnessy Dam. It supplies an average of 220 million gallons per day of exceptionally high-quality water that meets all drinking water standards—without filtration—to over 2.4 million people in San Francisco, on the San Francisco Peninsula, in Santa Clara Valley, and in southern Alameda County. In addition, the entire Hetch Hetchy water and power system generates an annual average of 1.7 billion kilowatt-hours of clean and relatively inexpensive hydroelectricity for municipal agencies of the City and County of San Francisco, as well as for the Modesto and Turlock Irrigation Districts (MID and TID). Prompted by recent studies by Environmental Defense and UC Davis, in late 2004 California State Assembly Members Lois Wolk and Joe Canciamilla asked Governor Arnold Schwarzenegger to study the feasibility of restoring Hetch Hetchy Valley and to outline the necessary actions the state must take to achieve this restoration. In response, Resources Agency Secretary Mike Chrisman directed the Department of Water Resources (DWR) and the Department of Parks and Recreation (DPR) to review and summarize the growing body of studies and analyses prepared over the last 20 years on this subject. DWR and DPR have now reviewed these existing Hetch Hetchy restoration reports, along with applicable local, state, and federal resource plans, in order to provide an objective evaluation of the pertinent water supply, water quality, flood management, recreation, environmental, economic, and energy issues. This presentation will provide a summary of the Resources Agency's findings, including an evaluation of the options for, and likely costs of, replacing water and energy supplies, increased water treatment, removal of O'Shaughnessy Dam, and recreational opportunities in and restoration of Hetch Hetchy Valley.

1 California Department of Water Resources

Operation of the Klamath River Hydroelectric Project and Impacts on Water Quality and Fisheries

Patrick Higgins[1]

There are six dams on the Klamath River from Link River Dam at the outlet of Upper Klamath Lake in Oregon to Iron Gate Dam in California, 62 miles downstream. These comprise the Klamath River Hydroelectric Project (KHP) and do not supply an appreciable amount of agricultural water, but do generate electricity. Copco Dam blocked salmon runs into Oregon beginning in 1918 and other dams have continued to be built through the late 1960s. Their license from the Federal Energy Regulatory Commission (FERC) is set to expire in 2006 and state and federal agencies reviewing PacifiCorp's license application have called for examination of dam removal or decommissioning.

The Karuk tribe of the Lower Klamath River acquired and analyzed water quality information from the river and the Iron Gate and Copco reservoirs. Their findings indicate that the reservoirs are periodically major sources of nutrient pollution, not supporting PacifiCorp's broad assertion that they are nutrient sinks that settle organic matter and improve water quality. Data show that the massive blooms of blue green algae such as *Aphanizomenon flos-aquae* occur in KHP reservoirs. In 2002, several pulses of nutrients from Iron Gate Reservoir were detected entering into the Lower Klamath River associated with summer algae blooms and over-turn of the reservoir in fall.

Phosphorous is not likely limiting algal growth in the Klamath River, as in many aquatic ecosystems, because of the abundant supply from Upper Klamath Lake. Thus, as blue green algae fix nitrogen from the air, they fuel tremendous biological activity in the reservoirs and in the Lower Klamath River. Blooms of benthic algae and periphyton from Iron Gate to Weitchpec cause a substantial increase in alkalinity, with a pH of 8.5 routinely attained and values as high as 9.6 recorded. High pH and high water temperature (>25˚C) typical of the Klamath River in summer also cause a conversion of the plant nutrient ammonium ion to dissolved or un-ionized ammonia, which is highly toxic to fish. Depressed dissolved oxygen levels associated with nocturnal respiration of algae further contribute to stress of migrating juvenile and adult salmon. Fish health surveys by the U.S. Fish and Wildlife Service (USFWS) in 2004 found epidemic levels of disease in Klamath River juvenile salmonids. They estimated the impact of associated mortality on future adult salmon escapement (2006-2007) to be equivalent to direct losses from September 2002 fish kill. According to the California Department of Fish and Game and USFWS, more than 30,000 adult salmon and steelhead died as a result of low flows, warm temperatures and crowding.

A recent analysis of the relationship between nutrients, pH, and D.O. in the Lower Klamath River nutrients funded by the Hoopa Tribe found that North Coast Regional Water Quality Control Board Basin Plan standards for pH and D.O. are routinely exceeded due to high nutrient concentrations. Reservoirs may be exacerbating already high nutrient concentrations. It is unlikely that effects of the dams can be mitigated through operational changes, and, therefore, meeting water quality standards will likely require dam removal.

See *www.klamathwaterquality.com*.

1 KRIS Projects

Saturday Morning Concurrent Session 2: Building Community Support for Steelhead Education

The ABC's of Starting a Salmonid Education Program

Carlyle Holmes[1]

Since the spring of 2002, the South Yuba River Citizens League (SYRCL) has established a successful regional Salmonid Education Program that has already reached over 20,000 students. Each element of this program is linked with California and National Science Content Standards to fit seamlessly with school curriculum across counties.

Program Elements

1. An in-school assembly program called "Journey of the Salmonids," which is adaptable for kindergarten through eighth graders.
2. A full-color 3rd–6th grade student booklet, "Salmonid Savers," developed by SYRCL in partnership with NOAA Fisheries and California Department of Fish and Game.
3. A Teacher's Activity Packet with lessons that give teachers a fun and easy way to expand on the concepts covered in the assemblies and booklets.
4. Handouts for students of all ages with information about how to participate in local salmonid restoration efforts.
5. Local follow-up projects, such as storm drain labeling or field trips to the local hatchery, for selected classrooms whose teachers are inspired to delve deeper into salmonid education.

These five distinct elements form a comprehensive program that reaches students on several levels. The highly polished assembly programs require minimal time commitment and effort from teachers, so they make the perfect "hook" to reel in teachers who would not otherwise include salmonid education in their classroom.

Once teachers have signed up to host the assembly program, the Student Booklets and Teachers Manual/Activity Packets offer an easy way to expand on the concepts covered in the assembly and further incorporate salmonid education in their classroom. Additionally, the "Salmonid Savers" booklet and student handouts extend the influence of the assembly program beyond the school. When students take these engaging materials home, they will share them with their parents, widening the sphere of influence of the program.

The follow-up projects, offered through partnerships with local organizations and agencies, involve students in local salmonid restoration efforts and provide the opportunity for several of the participating classrooms in each county to delve even deeper into salmonid education. These projects take advantage of the fact that some teachers are willing to invest more time and energy into the salmonid education program and will give the students a chance to further their understanding of, and connection to, local salmonid restoration efforts.

1 South Yuba River Citizens League (SYRCL), RiverTeachers Program Director

Agua Pura Pescadores: Exploring Salmon and Steelhead in California Communities

A. Michael Marzolla[1]

Many Californians are surprised to learn that salmon and steelhead may be living right in their neighborhood creek. In fact, five species of Pacific salmon, as well as steelhead populations, are native to California, were once abundant here, and were a significant part of the indigenous cultures. And while dams, fishing, development, pollution, and erosion have taken a toll, small populations can still be found today in coastal rivers and creeks up and down the state.

The curriculum is designed to enhance participants' understanding of salmon and steelhead, and the critical relationship these fish have to healthy watersheds. Through a variety of "hands-on" and "heads-on" learning activities, participants are encouraged to explore their surroundings and the connections between salmon and steelhead and the people in their community.

Using real-life investigation and problem solving skills, participants:

- Investigate the natural history of their local salmon or steelhead population
- Find out how human activities have impacted the salmon and steelhead populations in local rivers and streams
- Work with other community members to enhance salmon and steelhead habitat within the community.

Finally, this project is directed towards engaging youth from under-served communities with a concentration on engaging Latino youth and families. It is intended for 10-15 year-old young people participating in nonformal and formal education programs and is aligned with California educational standards for the 6th grade. These include after-school programs, camps, education centers, museums, and youth programs, as well as educators willing to implement Place-Based Learning programs in formal education.

The curriculum project is a collaboration of the University of California Cooperative Extension (UCCE), the UCCE 4-H Youth Development Program and the non-profit Adopt-A-Watershed Program, with the support of various community agencies and organizations. These include the Resident Services of the Housing Authority City of Santa Barbara, the Santa Barbara County Water Agency and the California Department of Fish and Game.

The curriculum is available at no charge on the web: *http://groups.ucanr.org/sns/*

1 University of California Cooperative Extension

Quest of the Steelhead: Environmental Education through GPS/GIS Technology and Treasure Hunting

Connie O'Henley[1]

The greatest sign of success for a teacher is to be able to say, "The children are now working as if I did not exist." –Maria Montessori

As the great educator Maria Montessori expressed, we are doing our best work with success when a child seeks knowledge without the pressure of a teacher. The current use of the GPS unit by Central Coast Salmon Enhancement in their Education and Outreach Program is an educational tool with unlimited potential across age groups, environments, and knowledge/outcome base.

GPS Questing, a combination of geocaching, community questing and old-fashioned treasure hunting, is a moveable challenge course with changeable outcomes depending on your goals. We have had the pleasure to see people of all ages come running off of these courses, excited about learning, ready to go again, and "working as if I did not exist."

During our presentation, we will give multiple examples of how this tool can be implemented for uses such as teaching young children about our natural resources, team building with adults, and much more. We will also share our first quest, "Quest of the Morro Bay Steelhead," and explore the ways Central Coast Salmon Enhancement can help bring Questing to your community.

1 Central Coast Salmon Enhancement, Inc.

State of the Los Angeles River Report: Towards a Swimmable, Fishable, Boatable River

Shelly Backlar[1]

The State of the Los Angeles River Report and Report Card summarizes the results of Friends of the Los Angeles River's RiverWatch program—the most comprehensive citizen water quality-monitoring program ever undertaken on the Los Angeles River. The report uses baseline data collected via the organization's water quality monitoring program, RiverWatch. The State of the Los Angeles River Report makes the Los Angeles River water quality crisis accessible to the public, helping inform and enlighten all stakeholders in our River's future.

Each month from May 2003 through May 2004, Friends of the Los Angeles River (FoLAR) collected and tested samples from 22 sites along the entire length of the river and several of its tributaries, from the headwaters in Canoga Park to the mouth in Long Beach. The report presents information on water quality and trash TMDLs, including trash sorts, as a way of understanding the criteria needed to restore the steelhead trout run in the Los Angeles River.

The results are bleak. Most sites consistently failed to meet water quality standards set by the Los Angeles Regional Water Quality Control Board. This was true throughout the year, in natural-bottom and concrete stretches along the river and its monitored tributaries. The results of quarterly bacteria tests grossly exceeded Health Department standards for all three organisms (e. coli, enterococcus and total coliforms) monitored at every single site.

An important component of FoLAR's mission to restore and revitalize the Los Angeles River is improving the quality of its water. FoLAR plans to continue monitoring the health of the river and publishing future State of the Los Angeles River Reports.

1 Friends of the Los Angeles River

Saturday Morning Concurrent Session 2: Building Community Support for Steelhead Education

Fishing for a Hook: Pitching Your Message to the News Media

Cathy Murillo[1]

News coverage and public perception can be the friend or foe of salmonid conservation. Veteran news professional Cathy Murillo will advise on how to get your message published in the local news media, including print, web, TV, and radio. For TV coverage, hope and pray that no car crashes, fires, major crime, political scandals, or other tragedies happen to displace your story on the day you want it to appear. For other media, the key to success is a little investment in a News Media Plan, including these issues and strategies:

Write punchy news releases with lively verbs, including the requisite who-what-when-where-why easy to find, preferably all on one page at the top.

Craft your message with a news hook to show why it is news now and not later.

Take advantage of free venues, such as calendar listings, personality and business profiles in the Lifestyle section, opinion letters and essays, and public service announcements; use your friends as a front instead of the usual suspects as author.

Search the newspaper web sites for past articles on the place or issue.

Know which reporters are on the fish or environment beat, and cultivate relationships with them, especially by actually reading their stuff and listening to their stories.

Start in smaller markets with a very local slant for stories, and then use that publication to show newsworthiness for larger markets.

Send out your package of materials before your interview or event, as the better reporters actually will do the research if it first is under their nose; include photos and other graphics, especially as an electronic file.

Focus on a specific message for a specific reporter, or small group of reporters, instead of mass mailing or blast faxing to generic addresses.

Send simultaneously email to individuals and faxes to their office, as the fax in the editor's hands still can garner critical attention.

Include local Spanish-language media and send them your materials at the same time as to the other media, even if the content is in English; focus your fish nexus to health, water quality, education, and family issues; and, even with rudimentary language skills, offer a sound bite in Spanish.

Break or release your news before noon on a slow news day in the weekly cycle, typically the day without local government meetings.

Bribe the reporters with food and drink.

1 KCSB-FM, University of California, Santa Barbara

Saturday Morning Concurrent Session 2: Building Community Support for Steelhead Education

Salmon & Steelhead Video: A Time For Recovery

Film by Marla Morrissey[1] and discussion with David Pritchett[2]

This 11-minute video tells the story of salmon and steelhead in their modern environment through a historic, evolutionary context. With a catchy beat and original music by Bobby McElver of San Luis Obispo, the story tells the past, present, and hope for the future. The narrative begins when conditions were pristine, and then explains recovery in the context of historic problems and current solutions.

Targeted to kids, non-fish people, and elected representatives, it serves as a backdrop or supplement to the typically fragmented treatment of salmonid conservation that pervades the news media and other outreach efforts. While not specific to any particular geographic region, this story of the wild fish includes issues about hatcheries, water pollution, watershed management, and the benefits of multi-stakeholder collaborative planning. The video concludes with an inspiring representation of stakeholder remarks during an animatic[3] meeting at The Round Table.

The video on a DVD will be provided free to all participants of the conference, and it will be shown on a computer during the Friday Night Poster Session. The video also can be seen as a small Quicktime streaming file under the link "educational movie" at the group's web site (*www.steelheadrecovery.org*).

Everyone is encouraged to show the video to local groups and organizations, especially governmental bodies with an influence over steelhead and salmon recovery issues. Schools, park visitor centers, museums, aquariums, and other educational institutions could show the video as part of their curricula, displays, and programs. Marla Morrissey, the video's producer, invites feedback on places and audiences that should receive the video.

The video also could serve as an ideal introduction for encouraging local agencies, cities, and counties to recognize every October as "Salmon and Steelhead Awareness Month" in California. This designation was approved by the State Assembly in 2000 as a resolution by then-Assemblymember Maldonado. Marla Morrissey also will discuss this annual statewide awareness month, with examples of its recognition in San Luis Obispo County.

1 Steelhead and Stream Recovery Coalition of South-Central Coast
2 Southern California Steelhead Coalition
3 An animatic is a series of still images edited together and displayed in sequence, often with movement simulated by the camera or computer. As such, animatic productions save costs by requiring far fewer original images than traditional frame-by-frame animation. Working further with Morrissey, in April 2005 they expect to release an animatic video about conservation of snowy plover birds on California beaches.

Saturday Morning Concurrent Session 3: Southern California Steelhead Distribution and Habitat Needs: What Do We Know So Far?

Southern California Steelhead Distribution and Habitat Needs: What Do We Know So Far?

Session Chair*: Lisa C. Thompson*[1]

Recovery planning for threatened South-Central California Coast steelhead and endangered Southern California steelhead has begun. What factors help these amazing fish survive at the southern edge of the species' distribution? This session includes presentations of field studies of southern steelhead distribution and its relationship to habitat, including the underlying geology and geomorphology, migration barriers, and water temperature. Results from these studies will help to provide a baseline for future restoration efforts, and will help in the identification of restoration needs.

1 University of California, Davis

Saturday Morning Concurrent Session 3: Southern California Steelhead Distribution and Habitat Needs: What Do We Know So Far?

Salmonid Exchange: Building Bridges between the Atlantic and Pacific

Melissa Laser[1] and Bob Coey[2]

While research, restoration and recovery planning efforts exist on both Atlantic and Pacific coasts, the transfer of information and techniques to avoid "re-inventing the wheel" has not happened at an organized level. Even though the species and landscapes are different on each coast, many of the underlying principles and strategies for recovery of salmonids are transferable. The goal of a Bi-coastal Information Exchange is to develop networks, and widen the perspective of people working with salmonids, on issues that are similar and different on both coasts. The idea for the Exchange began two years ago at the SRF conference in 2004, when two people from the Atlantic side traveled across to the Pacific side of the country to talk about efforts in Maine to recover Atlantic salmon (*Salmo salar*). Since that time, a delegation from Maine has traveled to Washington (October 2004) and California (October 2005) and plans are underway for a trip to Oregon in 2006. In response, a biologist from California traveled to Maine in 2005, and reciprocal visits from California and Washington to Maine are planned for 2006. This paper seeks to disseminate information on the similarities and differences between Maine and California's landscape, fish and fish programs, and discuss what has been learned from the project. The differences and similarities in the collection and utilization of habitat data will be discussed as an example of unique yet transferable opportunities. We also present recommendations on how this information and further coordination might be useful now and in the future to bridge the knowledge gaps between the coasts.

1 Maine Atlantic Salmon Commission; Antioch New England Graduate School
2 California Department of Fish and Game

Saturday Morning Concurrent Session 3: Southern California Steelhead Distribution and Habitat Needs: What Do We Know So Far?

Steelhead/Rainbow Trout Distribution in Coastal Streams South of San Francisco, California

Gordon Becker[1] (presenter), Stephen M. Powers[2], Cheryl Davis[1]

Introduction: Several previous and ongoing research efforts focus on the historical distribution and current population status of steelhead/rainbow trout (*Oncorhynchus mykiss)* in coastal watersheds south of the San Francisco Estuary. We reviewed existing distribution information for the southern California coast and determined that the process of steelhead restoration planning could be advanced by publication of a comprehensive and authoritative study of steelhead resources-related information for the region.

Methods: Our analysis is based on a review of available documentation concerning steelhead in south coast streams. We rely primarily on records from the California Department of Fish and Game (DFG), the U.S. Forest Service, consultants' reports, and the so-called "Capelli files" housed at the University of California, Santa Barbara. We also use interviews with knowledgeable persons from agencies, consulting firms, and other organizations who study steelhead resources.

Information on steelhead is reviewed for evidence of the species' presence, life history features, and limiting factors. We use an Access™ database software to assemble and analyze information that is then searchable by a number of parameters. Our method reflects the quality of information gathered and incorporates conclusions made by reliable sources that accurately characterize steelhead resources in particular watersheds.

Results: Our results include a listing of every coastal stream or tributary for which we could find fisheries information. We believe this streams list to be unique in its inclusiveness and accuracy. For each stream or tributary, we assign historical and current population status designations. We also report various data attributes that speak to the survey record and current population status.

Discussion: Our results show the number of streams used by steelhead historically, which may be compared with the current distribution to show range restriction over time. Since we account for all *O. mykiss* populations including resident rainbow trout, the restriction estimate is, by nature, conservative. We produce another measure of the degree to which steelhead use of southern California coastal streams has changed using our estimate of the streams that currently support the anadromous steelhead life history. The ratio of this figure to the number of historical "steelhead streams" characterizes the overall health of steelhead resources in the study area. We find that with the exception of a small number of well-studied watersheds, most streams have been visited by fisheries professionals few times. The corresponding lack of data concerning steelhead resources has implications for their management. Our results also indicate that the leading causes of steelhead decline in southern California streams include migration barriers, water diversion, and habitat degradation through channelization, filling, and sedimentation, among others.

1 Center for Ecosystem Management and Restoration
2 University of Wisconsin, Madison, Center for Limnology

Saturday Morning Concurrent Session 3: Southern California Steelhead Distribution and Habitat Needs: What Do We Know So Far?

Sediment Dynamics and Southern Steelhead Habitat (*Oncorhynchus mykiss*) in the Matilija Creek Watershed, Southern California

J. Toby Minear[1] (presenter) and G. Mathias Kondolf[1]

Matilija Creek, one of the two principal forks of the Ventura River, drains 142 km2 in the Western Transverse Ranges of southern California. Matilija Dam was built on Matilija Creek in 1947 with an initial capacity of 8 million m3, and is currently being considered for removal because it is nearly full of sediment, is unsafe, and blocks migration of the threatened southern steelhead trout (*Oncorhynchus mykiss*) (approximately 2,500 returned to Matilija Creek per year before the dam). Thanks to rapid tectonic uplift and weak clastic rocks, Matilija Creek has sediment yields exceeding 1000 m3/km2 annually. Previous studies in southern California have focused on quantifying sediment yields, particularly following debris flows and fires, but the interaction of geomorphic processes with aquatic habitat and fish life history in this highly episodic environment is not well understood. We used a combination of mapping and survey techniques, sediment traps, grain size analysis, lithologic analysis and scour rods to study intra-annual geomorphic processes and sediment dynamics affecting southern steelhead habitat in the Matilija Creek area over four years—2002 through 2005—which includes a severe drought year, two intermediate years and a moderate flood year. Despite the high sediment yield, we found only small amounts of sediment were deposited in pools. However, we found that other processes not previously recognized significantly affected the steelhead habitat in the study pools including tufa cementation (carbonate deposition) and alder root growth in spawning gravels, as well as seasonal desiccation of some reaches. Removal of Matilija Dam will reopen suitable habitat to steelhead trout, but managers should recognize that habitat quality is likely to vary considerably from year-to-year, especially in response to episodic events.

1 University of California, Berkeley

Assessment of Snorkel-Based vs. Automated Underwater Camera Surveillance as a Means of Quantifying Steelhead Trout (*Oncorhynchus mykiss*) Habitat Preference in the Carmel Lagoon

Maggie Watts[1]

My capstone study (senior project) developed, assessed, and compared two methods of monitoring steelhead trout in the Carmel Lagoon and recommended a way to best locate fish in their natural, preferred habitat conditions. The South Central California steelhead trout (*Oncorhynchus mykiss*), an Evolutionarily Significant Unit (ESU), are listed as threatened under the Federal Endangered Species Act (ESA). This species' conservation and management are a part of many organizations' and communities' efforts to improve policies regarding restoration and management of important habitat. Current management practices under the ESA advocate non-intrusive techniques to monitor and assess special status species in their habitats. I created an automated underwater video surveillance system with motion detection software and also used snorkeling surveillance as means to locate fish in their preferred habitats. The Main Lagoon, the South Arm, the Odello Arm, and a portion of the Carmel River were monitored. The frequency of fish encounters, visibility ranges, levels of disturbance, and general observations were recorded for analysis. Snorkeling resulted in a greater rate of fish encounters and a larger range of visibility, but was intrusive. The automated underwater surveillance system created little disturbance, but yielded low fish-encounter rates and had a smaller visibility range. I recommend that both methods be used together to better define and locate steelhead and other fish in preferred habitat conditions.

1 San Jose State University

Saturday Morning Concurrent Session 3: Southern California Steelhead Distribution and Habitat Needs: What Do We Know So Far?

Upper Salinas River Watershed Rainbow Trout/Steelhead: Seasonal Habitat Use and Distribution Study

Lisa Thompson[1] (presenter) and Royce Larsen[2]

We studied the distribution of rainbow trout/steelhead (*Oncorhynchus mykiss*) in relation to habitat conditions in the Upper Salinas River and five tributary streams in 2004 and 2005. Steelhead in the Salinas River drainage are in the South/Central California Coast Evolutionarily Significant Unit (ESU) and are federally listed as threatened. Our goal was to provide information on rainbow trout/steelhead distribution and habitat conditions, particularly for private lands, for which there is currently little information, in the hope of facilitating management and restoration efforts in the watershed.

We made seven sampling trips between June 15, 2004 and August 18, 2005. During the course of the study, we acquired a total of 16 sample sites (pools). We sampled fish species, numbers and size by snorkeling. We recorded water and air temperature between May and November at 30-minute intervals using temperature loggers. At each visit we sampled pool dimensions, flow, transparency, cover, pool-tail substrate, and a vertical profile for temperature and dissolved oxygen to test for stratification. We collected triplicate water samples for nitrogen and phosphorus.

When we began sampling in 2004, the watershed was near the end of an approximately four-year drought. In contrast, 2005 was a wet year, with the mainstem Salinas River flowing well above Paso Robles until mid-summer. Most pools did not temperature stratify, and pools only stratified if there was no inflow. Some pools were stratified for dissolved oxygen. Transparency was generally good if flows were low, but was lower after rain events. Transparency usually exceeded four feet, while the lowest visibility sampled was less than one foot, which precluded snorkel surveys. Nutrient concentrations were generally low, and sometimes below laboratory detection limits. Native fish species observed were rainbow trout/steelhead, Monterey roach, hitch, Sacramento pikeminnow, speckled dace, stickleback, and sucker. Non-native species included bass, bluegill, bullhead, carp, catfish, green sunfish, and mosquitofish. A total of 5,515 fish were seen (including repeat visits), and the number of fish per pool ranged from zero to 1,400. Rainbow trout/steelhead were seen in Atascadero, Rinconada, Santa Margarita, Tassajera, and Trout Creeks. In 2004, our sites ranged between 900 to 2,700 feet in elevation. Rainbow trout/steelhead were seen at elevations of approximately 1,400 feet and higher. In 2005, our sites ranged between 700 and 2,700 feet in elevation, due to the acquisition of new sites. In this wet year, rainbow trout/steelhead were seen as low as 900 feet (May), 960 feet (July), and 1,000 feet (August). Analyses of results for temperature and water quality are ongoing. We plan to continue our efforts to work with landowners and other stakeholders to provide research and education about streams and fish in the Upper Salinas River watershed.

1 University of California Cooperative Extension, University of California, Davis
2 University of California Cooperative Extension

Saturday Morning Concurrent Session 3: Southern California Steelhead Distribution and Habitat Needs: What Do We Know So Far?

Historic Distribution of Southern Steelhead Trout in the Santa Monica Bay

Rosi Dagit[1] (presenter) and Sabrina Drill[2]

Historical ecology of southern steelhead trout populations and distribution in the Santa Monica Bay is a necessary element to inform current and future protection, preservation, and management decisions for this Evolutionarily Significant Unit (ESU). Documentation was scattered among many sources and required the integrated use of primary archival sources, historic maps, archeological records and interviews with local informants who have a long-term perspective on the resource. All known records of southern steelhead abundance and distribution from 1800 to the present were compiled and organized for easy reference. Watersheds were divided into three categories: those for which we have documented evidence of current trout presence, those for which we have evidence of historical trout distribution, and those for which we could find no evidence of historical trout presence. This information can be combined with current physical observations of habitat condition and degradation to prioritize restoration efforts to those streams that show the greatest potential for supporting populations in the future.

1 Resource Conservation District of the Santa Monica Mountains
2 University of California Cooperative Extension

Saturday Morning Concurrent Session 3: Southern California Steelhead Distribution and Habitat Needs: What Do We Know So Far?

Steelhead Recovery Planning in Southern California: How Much Recovery Is Enough?

Mark H. Capelli[1]

In 1997 the National Marine Fisheries Services (NMFS) listed two distinct sub-populations of steelhead (Onchorhynchus mykiss) within the southern half of coastal California: a threatened sub-population along the south-central coast and an endangered sub-population along the south coast. The range of the southern sub-population was extended to the U.S. Mexico border in 2002. The Endangered Species Act (ESA) requires Recovery Plans be prepared for each listed species; these plans are intended to identify conservation actions which, if implemented, would result in the recovery, and ultimate de-listing of the distinct sub-populations.

The development of Recovery Plans for these sub-populations raises the fundamental question of how much of the depleted pre-historical sub-populations must be recovered to ensure populations will be free from extinction threats over a specified period. This question raises a number of related questions regarding the number, size, and distribution of anadromous runs: the role which various polymorphic/life- history types within populations play in the persistence of the populations; and the role of evolvability of the distinct sub-populations.

Phase I of the NMFS's Recovery Planning process has focused on the scientific understanding of the biology/life-history, habitat requirements, and pre-historical distribution and population structure of the listed sub-populations. Building on this understanding, Phase I will develop criteria for the viability of independent populations (and identify the role of potentially independent, dependent, and ephemeral populations). These individual population criteria will then be used to develop viability for the listed distinct sub-populations as a whole. Taken together, these viability criteria will provide an outline of the over-all character of recovery for these two listed distinct sub-populations of South-Central and Southern California coastal steelhead.

Phase II of Recovery Planning will identify conservation actions to achieve the viability criteria for individual populations and the listed sub-populations as a whole. Because of gaps in, and in some cases the complete absence of, quantitative data regarding important aspects of the biology and ecology of steelhead near the southern extent of their pre-historical range, both the Phase I and Phase II Recovery Planning process will identify research and monitoring needs. The results from these efforts will be used to refine viability criteria, identify and enhance conservation actions, and measure the effectiveness of conservation actions intended to recover and ultimately de-list the threatened and endangered steelhead of South-Central and Southern California.

Steelhead recovery in South-Central and Southern California will take place in a landscape which has been profoundly altered and is currently occupied by over 17 million people. Recovery will require more than restoring degraded habitats—it will require re-integrating the listed sub-populations back into habitats in a manner which allows the co-occupancy of watersheds. Since recovery of steelhead to pre-historical levels is neither expected, or required by the ESA, the ultimate question is: How Much Recovery Is Enough?

1 National Marine Fisheries Service

Saturday Afternoon Concurrent Session 1: What is Good? How to Evaluate Habitat for Southern Steelhead

What is Good?: How to Evaluate Habitat for Southern Steelhead

Session Chair*: Sabrina Drill*[1]

Southern populations of steelhead live in flashy, warm, sometimes intermittent, highly variable streams. How do we evaluate the habitat requirements for these unique fish? Most of the protocols and parameters established to evaluate habitat for *Oncorhynchus mykiss* were developed based upon information collected about steelhead from the Pacific Northwest and Northern California, or about rainbow trout from other parts of the country. Researchers in Southern California continually modify these parameters for local populations. Speakers in this session will present some of these modified protocols, to generate discussion about how we can generate codified procedures to assess habitat for southern Steelhead.

1 University of California Cooperative Extension

Populations and Habitats of *Oncorhynchus mykiss* on the Santa Clara River

Elise Kelley[1] (presenter) and Matt Stoecker[2]

In the fall of 2004, 702 habitat reaches were surveyed on the Santa Clara River watershed in Ventura County. The tributaries that occur within the geographic boundaries of this study were: Santa Paula Creek, Sespe Creek, Pole Creek, Hopper Creek, and Piru Creek. The habitat assessment protocol generally followed is that proposed by the California Department of Fish and Game in the *Salmonid Stream Habitat Restoration Manual*. Some parameters were modified to better address habitat conditions in southern California. Parameters likely to be important to various *Oncorhynchus mykiss* lifestages were identified and a scoring protocol was developed based on these parameters. The scores of the parameters were summed for each reach resulting in a habitat unit score. The habitat unit scores were calculated for each tributary to assist in identifying good quality habitat within the watershed. Based on *O. mykiss* abundance and habitat quality the following tributaries should receive the highest level of protection, and where necessary, rehabilitation: Piedras Blancas Creek, Howard Creek, W.F. Sespe Creek, Bear Creek, Lion Creek, Timber Creek, Sisar Creek, upper Santa Paula Creek, and Hopper Creek. The greatest number of *O. mykiss* were found in Sespe Creek.

1 University of California, Santa Barbara
2 Stoecker Ecological

Santa Monica Mountains Steelhead Habitat Assessment

Jim Edmondson[1], and Michelle Bates[2] (presenter)

The purpose of this assessment was to identify the best opportunities for restoring habitat to recover the Santa Monica Mountains population of steelhead. The major goals of this project were: *First* identify and prioritize which streams within 13 focal watersheds should be selected for steelhead restoration actions; and *Second* within each watershed recommend what specific restoration actions could be implemented, where, and at what cost.

Field Four factors were used to develop three prioritization analyses which ranked watersheds by steelhead habitat restoration potential. These four factors were: (1) habitat quantity and quality combined with the past/present occurrence of steelhead; (2) hydrologic conditions; and (3) land ownership. The three prioritization analyses resulted in three general ranking categories:

1. Top priority watersheds included Malibu, Topanga, and Arroyo Sequit. Of these three watersheds, only Arroyo Sequit is not receiving significant restoration attention or activity.
2. The lowest priority watersheds were consistently identified in each of the three analyses (Las Flores, Escondido, Lachusa, Corral, Encinal and Little Sycamore).
3. Big Sycamore, Trancas, and Zuma consistently rated in the top half of the ranking results. Each of these watersheds has little prior or current steelhead restoration activity.

The watershed prioritization analyses led to the following recommendations, which would aid steelhead recovery in the region:

- Existing steelhead restoration activity at Malibu and Topanga should be continued and strengthened.
- A comprehensive watershed plan for the Arroyo Sequit watershed should be developed and implemented.
- Existing steelhead restoration actions are fragmented and without a single entity to maximize effectiveness or public outreach opportunities. Support to enhance/ coordinate the capacity of existing organizations is needed.
- A comprehensive steelhead monitoring program for the Santa Monica Mountains is needed to fill data gaps in steelhead life history knowledge and to estimate population trends.

1 California Trout
2 Tetra Tech

Evaluating Steelhead Habitat in Topanga Creek

Rosi Dagit[1] (presenter) and Kevin Reagan[1]

Since June 2001, the distribution and abundance of a reproducing population of southern steelhead trout have been monitored by monthly snorkel surveys and migration trapping during storm events in Topanga Creek, Los Angeles County, California. Also documented have been habitat availability and suitability, temperature regimes, water quality, the conditions of the ocean/creek interface and the role of groundwater and geology in relation to the trout distribution. Several discrepancies were identified between standard CDFG criteria and literature-based assumptions of suitable habitat based on conditions in central and northern California, compared to the reality of conditions in this southern California creek. Examples of observed differences include types and distribution of pools preferred, role of riffles and runs, influence of canopy cover, lack of large woody debris, role and types of instream cover, embeddedness conditions, impacts of low flow natural barriers, and, most significantly, depth. Further investigation of these differences is underway and will be discussed in this presentation.

1 Resource Conservation District of the Santa Monica Mountains

2004 vs. 2005, Changes in Steelhead Pool Habitat from a Dry to Wet Year along the Lower Santa Ynez River

Scott Volan[1]

Water quality conditions, such as temperature, dissolved oxygen, and algal growth will be discussed in the context of the management actions specified in the Cachuma Project Biological Opinion and Lower Santa Ynez River Management Plan with respect to the presence or absence of rearing flows. Findings will be compared to other steelhead fisheries within the Southern Steelhead Evolutionarily Significant Unit. The discussion will focus on three imperiled pool habitats in the lower mainstem region, and the critical water quality conditions found for steelhead in those habitats. 2004 was a dry year in which downstream water right releases were made to recharge groundwater basins, and no steelhead trout were observed. On the other hand, 2005 was a wet year in which Bradbury Dam spilled from January through May, and steelhead were observed in multiple mainstem pools from Bradbury Dam to downstream of the City of Solvang. Contributing elements include five months of continuous spill, surcharge rearing flows, increased summer groundwater upwelling from an elevated groundwater table, and the increased distribution of pool habitats due to a record rainfall year. Frequent water quality monitoring and snorkel surveys were conducted throughout the spring, summer, and fall of 2005 to evaluate the steelhead survival under critical water quality constraints.

1 Cachuma Conservation and Release Board

Habitat Evaluation Procedures for Steelhead in Matilija Creek, the Ventura River, and Malibu Creek.

Sabrina Drill[1]

In southern California there are two major conservation projects being driven by the need to improve passage for endangered southern Steelhead trout (*Oncorhynchus mykiss*) past large dams. Both are now being led by Army Corps of Engineers and local partners. The first, in the Ventura River, has examined the feasibility of restoring passage to a major tributary, Matilija Creek, by removing Matilija Dam. The second is assessing the feasibility of restoring passage past Rindge Dam on Malibu Creek, with dam removal as one option. For each, a major part of the decision making process involved developing a Habitat Evaluation Procedure (HEP) to evaluate how much and what quality of habitat could be gained for steelhead and other organisms.

HEP is a habitat-based evaluation procedure, originally developed by the US Fish and Wildlife Service, used to give a quantitative, numerical value to biological resources of concern. In the Ventura River and Matilija Creek, HEP variables were developed by a combination of field based evaluations using best professional judgment, and quantitative surveys (upstream of the dam site) that measured twenty-eight variables and sub-variables assessing physio-chemical conditions, flow, habitat type, substrate morphology, and cover. These were drawn from a Habitat Suitability Index (HSI) developed by USFWS for rainbow trout (Raleigh et al, 1984). Modifications to data collection and analysis were proposed for six variables to make this HSI suitable for southern Steelhead. In Malibu Creek an existing data set was used to assess habitat by focusing on in-stream pools. Variables used to assess habitat quality were pool to reach ratio, year round connectedness between pools, depth, shelter, percent gravel, embeddedness, and number of exotic predators.

This presentation will discuss the modifications made to variables chosen, data collection techniques developed, and data evaluation designed to reflect the biology of this southernmost, arid adapted evolutionarily significant unit of *O. mykiss*.

1 University of California Cooperative Extension

Where Do We Need to Go to Evaluate Southern Steelhead Habitat?
Group Discussion

Sabrina Drill[1] and John O'Brien[2]

In this session, several authors will present the methodology they developed to evaluate habitat quality for southern steelhead. In some cases, they developed new methods, but in many cases, adapted evaluation procedures developed for other populations of *Oncorhynchus mykiss* to the southern evolutionarily significant unit (ESU). Some of these protocols, often developed based upon what we know about the biology of more northern populations of steelhead or even inland populations of rainbow trout, do not work to adequately reflect the ecological requirements of southern steelhead.

Southern California watersheds are arid, with high temperature and flashy environments. Highly erosive soils naturally generate high sediment loads. Summer baseflows are often very low and high gradient coastal ranges lead to very small estuaries. Chaparral dominated uplands yield little woody debris. Can we develop a standardized set of protocols for this ESU? We will lead a group discussion about this topic. Some of the questions we may consider for southern steelhead are:

- Is a different temperature range appropriate?
- How important is woody debris as a contributor to instream structures in southern California?
- Are embeddedness regimes more variable in southern streams?
- How do we evaluate intermittent streams?
- How do we evaluate instream features such as pools and flatwater habitat, elements that occur at much different frequencies than more northerly streams?
- How important are tributaries, as opposed to mainstem reaches, for spawning and rearing?
- Is a different method of evaluating fish passage criteria appropriate given the very different hydrology?
- How does nutrient loading affect populations?
- How does the degraded and highly manipulated state of many of our lagoons and estuaries affect these populations? Is this, perhaps combined with habitat fragmentation, driving southern steelhead populations to become resident trout?
- What do we know now about the biology of these fishes, and what are short and longer-term research priorities?
- Do data exist that have not been made public that would illuminate these issues?

Please bring your own questions, and your own data!

1 University of California Cooperative Extension
2 California Department of Fish and Game

Saturday Afternoon Concurrent Session 2: Project Monitoring for Watershed Management

Project Monitoring for Watershed Management

Session Chair*: Michael Lennox*[1]

The monitoring of restoration projects can offer another tool for improving outcomes from restoration efforts for salmon and trout habitat. However, typically utilized short-term performance questions and implementation monitoring have not prepared us to document project outcomes that result in the long-term. Though monitoring has generally lacked assessments of project effectiveness or validation over decades and target species response not quantified, the times are changing. How do we most efficiently combine these theoretical goals with the practical requirements of implementation monitoring? What is monitoring teaching us about the results from our restoration work?

The project monitoring session will provide broad perspectives to these questions. Given the great diversity of projects implemented to improve salmon and trout populations, this session will cover a broad range of project types. The focus will be how monitoring is being utilized to improve both project effectiveness and speed the recovery of desired functions. We will explore the feedback mechanisms guiding future project design, site selection, and priorities while adapting to manage unintended outcomes. The practical agency-mandated efforts will be integrated with theoretical research monitoring that is occurring in California.

This session will capitalize on the project based habitat and population assessments that have improved the collection and interpretation of data with realistic expectations, the understanding of ecosystem processes, and the design of restoration methods. You will leave this session with some new tools and approaches to efficiently monitor the outcomes of projects in your watershed.

1 UC Cooperative Extension

Cooperatively Monitoring Instream Effectiveness in the Gualala River Watershed

Kathleen Morgan[1]

The Gualala River is a coastal watershed located 110 miles north of San Francisco. The river flows through 298 square miles of watershed along the coast of southwestern Mendocino County and northwestern Sonoma County. The watershed is primarily private timberland with well over sixty percent of the watershed zoned timber production. The remainder of the watershed is largely grazing land, with a smaller amount of land holdings associated with rural residential and agricultural operations such as orchards and vineyards.

The Gualala River Watershed Council's (GRWC) Cooperative Monitoring Program is designed to assess watershed conditions for restoration and to monitor project effectiveness through collaboration between private landowners, community groups, and public agencies. Oversight of the program comes from a Technical Advisory Committee comprised of representatives from the GRWC, Sotoyome Resource Conservation District (SRCD), CGS, California Dept. of Forestry, North Coast Regional Water Quality Control Board, and the Dept. of Fish and Game.

The GRWC monitoring program is comprehensive and employs a Quality Assurance Plan approved by the North Coast Regional Water Quality Control Board. The Quality Assurance Project Plan (QAPP) for Monitoring Sediment Reduction in the Gualala River Watershed (Williams and Morgan, 2002) was developed and implemented by the GRWC and the SRCD and was the first QAPP to be approved for North Coast watersheds. The QAPP outlines procedures for monitoring water temperature; thalweg profiles; cross-sections; substrate size; riparian composition and large woody debris (LWD) recruitment potential; LWD in-stream inventory; and canopy density. Monitoring reaches are installed throughout the 190,000-acre watershed based on spatial distribution, geology, and stream features.

Stream reach monitoring is a powerful tool, which can successfully guide the planning of restoration implementation and monitor project effectiveness. Data collected over the past eight years demonstrate the program's ability to assess natural and/or anthropogenic changes to the environment.

The thalweg profile is one of the most useful metrics to quantitatively monitor pre- and post-project habitat suitability for salmonids. The installation of stream reaches throughout the watershed allows the tracking of pool formation, residual pool volume, pool depth, and streambed aggradation/degradation.

The placement of large wood in monitoring reaches where pre-project thalweg data is available has enabled the Council to closely monitor changes in the streambed. Data collected from restoration project reaches show an increase in pool formation, pool depth and stream complexity based on the size, quantity and placement position of project LWD.

1 Gualala River Watershed Council

Comparison of Methods for Estimating Adult Salmon Escapement

Walter Duffy[1] (presenter) and Steven Gough[1]

We compared three techniques used to estimate escapement, the number of adult salmon returning to a stream. These techniques included area-under-the-curve (AUC) estimates from live fish observations, estimates from mark-recapture experiments on carcasses, and counts of the number of redds formed. Data used for comparisons were collected from a 12 kilometer reach of Prairie Creek, Humboldt County, California during a six-year period beginning in December 1998 and continuing through March 2004. Prairie Creek supports populations of coho salmon (*Oncorhynchus kisutch*), Chinook salmon (*O. tshawytscha*), steelhead trout (*O. mykiss*), and coastal cutthroat trout (*O. clarki clarki*). Our studies focused on coho and Chinook salmon.

AUC techniques provided estimates of escapement that were consistently greater than either carcass mark-recapture or redd counting techniques. Using AUC, we estimated the number of adult coho salmon returning to Prairie Creek during the six-year period ranged from 42 to 608 fish while the number of Chinook salmon returning ranged from 95 to 531. The number of redds that could be associated with either coho or Chinook salmon during the period ranged twenty to forty percent of AUC estimates for the number of females of each species. Estimates of escapement derived using carcass mark-recapture were typically lower than estimates derived from AUC, but were less consistent.

We discuss the application of these techniques to monitoring adult salmon and steelhead as well as reasons why estimates differ among techniques.

1 California Cooperative Fish Research Unit, Humboldt State University

Quantifying Outcomes at Riparian Restoration Project Sites on Coastal Ranches

M. Lennox[1] (presenter), D. Lewis[1], D. Stokes[5], R. Jackson[2], J. Harper[1], B. Allen-Diaz[3], S. Larson[1], K. Tate[4]

We are researching long-term revegetation effectiveness and restoration trajectory of riparian habitats in coastal California. This presentation will combine theoretical expectations of riparian recovery with preliminary results from 115 sites surveyed in a cross-sectional post-project analysis. Project sites of various ages have been characterized to compare site outcomes given the original methods of restoration utilized. Project sites selected were tributary stream corridors across three counties ranging from four to 40 years since revegetation was initiated. We compared site outcomes using results of instream habitat and vegetation.

Rehabilitation techniques have generally relied on establishing native tree cover at historically grazed sites to improve desired ecological functions over time. However, what is the long-term fate of these efforts, and how do sites change over time? Preliminary results showed the importance of collecting specific environmental data to assist the interpretation of a response or changes in habitat or a specific population. Cross-section scale results indicated a significant change over time (trajectory) of greater shade over the thalweg and bank stability as well as a reduction in the bankfull width-to-depth ratio. Site scale data supported a trajectory hypothesis of woody debris and pool depth parameters increasing over time since project installation. By exploring the effectiveness of specific methods and characterizing site change over time, restoration ecologists may capitalize on the previous projects installed.

Understanding local site trajectory patterns enables neighboring concerns and dislikes of certain project outcomes to be appropriately managed for when designing future projects. Neighboring landowners may have widely diverging goals and site constraints that require adapting revegetation objectives and methods instead of a one-size fits all approach to restoration. Incorporating time into our analysis gives greater statistical power for understanding the effects of installation and maintenance on project performance. Also, plot scale results show differences by landform class and support monitoring methods that collect data from similar geomorphic features.

Validating similar desired outcomes may be balanced with unanticipated outcomes. Our results indicated an increase in exotic cover over time. Vegetation management may become an important consideration to ensure broad participation in restoration efforts from watershed landowners—specifically, when and how to reintroduce disturbance to riparian sites as a potential tool for optimizing floristic diversity while maintaining the required hydrologic functions. This research project is a collaborative effort between resource agencies, consultants, private landowners, academics, and watershed groups working in coastal California.

1 University of California Cooperative Extension
2 University of Wisconsin, Madison
3 University of California, Berkeley
4 University of California, Davis
5 Sonoma State University

Evaluation of the Effectiveness of CDFG-funded Road Decommissioning Projects in Northern and North Central California

Tom Leroy[1] (presenter), William Weaver[1], Eileen Weppner[1]

In the restoration of managed wildland watersheds and streams, roads are often targeted for treatment because they represent a significant source of anthropogenic sediment and they can be effectively treated to reduce sediment delivery. For over a decade, the California Department of Fish and Game (CDFG) has administered a regional fisheries restoration grant program to improve and protect salmonid habitat. Components of the restoration program include: in-stream habitat restoration, public education, riparian protection, fish passage and erosion control, among others. Road upgrading and decommissioning are two common classes of sediment control projects, and since 1997 over 150 miles of erodible or unstable roads have been decommissioned under the program.

In 2004, with funding from CDFG, Pacific Watershed Associates inventoried over 51 miles of decommissioned forest and ranch roads between San Francisco and the Oregon border. We documented the current condition of roads and evaluated them with regards to achieving CDFG's goal of sediment reduction to anadromous streams. This information was then used to identify the most common restoration mistakes and to develop a suite of recommendations to improve practices. We evaluated 449 sites, including 275 stream crossings, 111 landslides, and 63 "other" sites from a variety of road types, land ownerships and geologic terrains. Data collection included pertinent site variables, treatments, geomorphic and hydrologic conditions, and subsequent erosion volumes. Decommissioning practices on each sampled road and at each treated site were compared to standard protocols.

Stream crossing excavation was found to be a highly effective treatment for reducing long term sediment delivery from decommissioned roads. At the same time, the freshly excavated crossings also underwent short-term erosion as the excavated channels stabilized and the slopes revegetated over the first few years following treatment. A small amount of post-decommissioning erosion at all sites was found to be unavoidable and could be attributed to specific site variables. Where erosion was significant it was usually attributable to poor implementation practices including irregular upstream profile transitions (profile nickpoints), oversteepened excavation sideslopes, incomplete excavation, unidentified or uncontrolled emergent groundwater, and poor spoil disposal techniques. The effectiveness of stream crossing decommissioning was found to be closely related to adherence to generally accepted CDFG decommissioning protocols. Specific improvements in problem recognition, prescription development and excavation practices can be employed to significantly reduce sediment delivery and improve the overall cost-effectiveness of stream crossing decommissioning.

Road-related landslide excavations and road surface drainage treatments were also evaluated for their overall effectiveness. Landslide sites accounted for only 2% of the total quantified post-decommissioning sediment delivery from the decommissioned roads. CDFG protocols for treatment of small road-related landslides were found to be adequate.

Hydrologic connectivity and fine sediment delivery from road surfaces was routinely treated using practices such as ripping, partial outsloping, full re-contouring, and/or drainage structure installation. Field data suggests CDFG roadbed decommissioning protocols are effective in strictly minimizing sediment delivery from roads. Significantly, it was found that there was no general increase in sediment savings when applying full re-contouring, as opposed to less intense treatments, on the time scale of our observations.

1 Pacific Watershed Associates

Chinook Salmon Monitoring in the Napa River

Jonathan Koehler[1]

Increasing numbers of Chinook salmon (*Oncorhynchus tshawytscha*) have been documented in the Napa River basin during the past five years. It is not clear whether these fish originated as strays from central valley hatcheries or represent a self-sustaining local run. In 2005, we began genetic analysis of adults to examine relationships with known stocks. To better estimate the size and distribution of the run, the Napa RCD conducts redd counts and carcass surveys in the mainstem Napa River and several key tributaries. Spawner surveys in 2004 documented 61 redds and 102 live Chinook salmon in a 3.6 mile reach of the river. Based on these surveys, habitat availability, and reconnaissance surveys, we estimate that total Napa River basin escapement in 2004 was between 200 and 400 adult fish.

Incubation conditions were assessed in water year 2004/2005 along a 4.5 mile reach of the Napa River near Rutherford. We conducted gravel permeability, pebble counts, cross-sectional surveys, and installed 40 scour chains at ten sites. Gravel permeability results suggested relatively low egg survival at most sites (average = 37%). Scour chain data suggests that bed scour was highly variable within the study reach; neither uniformly high nor low. Half of the ten sites experienced scour of 15 cm or greater, a value that corresponds to the upper levels of expected Chinook egg burial depth. The largest flood recorded during the 2004/2005 water year had a recurrence interval of approximately 1.6 years. We conclude that frequent redd scour and low gravel permeability in the Napa River appears to be a significant source of mortality for incubating salmon eggs.

1 Napa County Resource Conservation District

Methods and Madness: Observations of Revegetation Monitoring Pitfalls

Brian B. Stark[1]

Monitoring of riparian revegetation projects is an important part of adaptive management and is integral to the restorationist's knowledge of successful methods in any given watershed. Monitoring of these projects may also be required by permitting agencies. So, how do we really know if we are getting the right information from our monitoring protocols and learning what we need to learn to be good at revegetation? Hopefully by choosing a protocol that measures important variables and is fast to perform.

Ultimately, there are two types of monitoring, performance monitoring and functional monitoring. Performance monitoring is simply showing if the plants you have planted are surviving, and this has been the primary interest of permitting agencies. Functional monitoring asks a deeper question: Is the project contributing to the ecosystem in a meaningful way? This type of monitoring is more rare, probably due to funding needs and the long-term nature of the studies. Some functional aspects can be added to the performance monitoring protocols, however, and will give a better impression of the project.

This presentation will discuss several of the common monitoring methods that are used and even required by regulatory agencies. We'll discuss some of the pitfalls of these methods and some recommendations for improving the monitoring protocols.

For more information on this topic, please contact me at the Land Conservancy of San Luis Obispo County. (805) 544-9096 *brian@special-places.org*.

1 Land Conservancy of San Luis Obispo County

Science-Based Restoration Monitoring Guidance, Example Data Management, and a Socio-economic Perspective

Dr. Perry F. Gayaldo[1]

Habitat restoration may be defined as the return of an area to a previous condition by improving biological structure and function. The implications of this equate to prioritization of restoration needs, selection of restoration projects, planning/ design, permitting, construction/implementation, followed by monitoring/evaluation, and ultimately the regular informing of prioritization (back to the first step) with monitored results. Until recently (in the history of restoration ecology), construction/implementation has been viewed as the act of restoration. Today, the full set of requirements are commonly accepted by practitioners and recognized by many funding sources/agencies. This recognition, however, has not yet led to cookbook standards (nor should it) for restoration implementation.

With that said, advances have been made in synthesizing technical assistance in the development and implementation of sound scientific restoration and monitoring of coastal habitats.

In response to the Estuary Restoration Act (ERA), Title I of the Estuaries and Clean Waters Act of 2000, NOAA recently published a two-volume guidance series (in 2003 and 2005) titled /Science-Based Restoration Monitoring of Coastal Habitats/. The two volumes synthesize the current state of monitoring science with regards to identifying progress towards restoration project goals. The NOAA Restoration Center has begun implementing this guidance with current partners and has developed early data management techniques to aid with project evaluation. In addition to providing guidance in monitoring for structural and functional biological gains, a chapter in Volume II provides a basic understanding of the human dimensions (socio-economic) issues in coastal restoration and provides example metrics.

With effective monitoring, restoration efforts should be able to 1) recognize early warnings indicating a need for intervention (i.e., adaptive management), 2) assess whether project goals and quantifiable objectives are being met, 3) determine what metrics may need to be used to better demonstrate progress or success, 4) gauge how well a restoration site is functioning before and after implementation, and 5) maximize project coordination and efficiency. All of these benefits, which are not exhaustive, lead to improved accountability and ability for us all to demonstrate that what we're doing is having an impact.

1 Deputy Chief, NOAA Restoration Center

Saturday Afternoon Concurrent Session 3: Floodplain and Sediment Management

Floodplain and Sediment Management

Session Chair*: Don Allan*[1]

Salmonid restoration often focuses on protecting or restoring stream habitat and providing fish with access to that habitat. An important element in the creation of good fish habitat within a stream or river ecosystem is the stream's interaction with its floodplain. The floodplain provides a corridor within which alluvial streams create their channels. Streams and their floodplains have evolved over time and salmonids have adapted to the habitat created by this interaction.

Because of their relatively flat ground and proximity to water, floodplains have been developed for a variety of uses, from agriculture to industry to residential development. Restoring fish habitat ideally includes restoring the natural functions of and interactions between a stream and its floodplain, and managing human activities to minimize their detrimental effects on stream processes and habitat.

This session will discuss floodplain management and its effects on fish habitat. Presenters were invited to submit abstracts for presentations that discuss physical, biological, and/or political considerations in floodplain management as they relate to the management of fisheries resources, especially salmonids.

1 Natural Resources Services Division of Redwood Community Action Agency

Building Partnerships for Restoration: The Lower Mokelumne River Watershed Stewardship Program

Kent Reeves[1] (presenter), John Brodie[2], Brook Edwards[3], and Michelle Workman[1]

Stakeholder cooperation is essential for the development and implementation of floodplain management and restoration within a watershed composed primarily of multiple private landowners. In order to enhance watershed health and water quality, a large and diverse group of local stakeholders in the lower Mokelumne River Watershed effectively collaborated to complete the Lower Mokelumne River Watershed Stewardship Plan (*Plan*) in 2002, a three-year project funded by CALFED.

The *Plan* identifies and addresses issues important to stakeholders in the lower Mokelumne River Watershed. Ten elements are addressed in the Plan, including biological resources and restoration. The biological resources element emphasizes improvement of salmonid spawning habitat, support for studies of salmonid survival rates and other fisheries and wildlife studies, coordination with the San Joaquin County Multi-Species Conservation Plan; and it encourages landowner participation in riparian restoration projects. The restoration element emphasizes the protection, enhancement, and/or restoration of riparian habitat that will simultaneously serve to reduce stream bank erosion, stabilize levees, provide a buffer or transition zone between the river and agricultural operations, reduce the occurrence of non-native invasive plant species, and increase habitat values for anadromous fish, riparian birds, and terrestrial wildlife.

The *Plan* is now in the planning, prioritization, and implementation phase with 47 private and three public landowners within the watershed demonstrating a commitment to protect, restore, and/or enhance approximately 800 acres, which is sixty percent of the riparian habitat targeted for restoration along the lower Mokelumne River by CALFED. Commitments range from evaluating and planning restoration/enhancement opportunities to implementing funded projects. We will discuss the process of building partnerships between private landowners and government agencies that leads to successful collaboration within the context of the Plan. Examples of current planning, restoration, enhancement, conservation, protection, and monitoring projects will also be discussed.

1 East Bay Municipal Utility District, Fisheries and Wildlife Division
2 San Joaquin County Resource Conservation District
3 Robertson-Bryan, Inc.

Implications of Dam Removal on Floodplain and Watershed Management

Paul Jenkin[1]

Planning for the removal of Matilija Dam is based upon the fundamental objective of restoring fish passage and the natural sediment transport regime. This has significant implications in the semi-arid climate of southern California, where consideration is required for the management of sediment without disruptions to water supply. The Ecosystem Restoration project includes extensive re-engineering of water diversion facilities, as well as modification of levees and bridges.

1 Surfrider Foundation and Matilija Coalition

Stealth Sediment: Reducing Hydrologic Connectivity and Fine Sediment Delivery from Roads, an Essential Component to Improving Habitat for Central Coast Steelhead

Danny Hagans[1] (presenter), William Weaver[1], Tom Leroy[1], Ben Letton[1]

Fine sediment, whether in suspension or settled, has negative impacts on fish. These two forms of sediment reduce feeding efficiency and damage fish gills, as well as reduce pool habitat and intra-gravel flow, and block or impair fry emergence. Steelhead may be particularly vulnerable, as they remain in natal streams for up to two years longer than other salmonids. Recent research shows a linear relationship between the deposition of fine sediment and stunted juvenile steelhead growth. There is no threshold below which the effects are harmless. Consequently, any management actions that reduce fine sediment loading in streams could likely produce immediate benefits for salmonid restoration (Suttle, et al., 2004).

United States Environmental Protection Agency Total Maximum Daily Load (TMDL) studies of impaired watersheds in coastal California indicate that roads are the primary source of anthropogenic fine sediment production and delivery to streams (*http://www.epa.gov/region09.html*). Overall, roads increase basin-wide fine sediment production and delivery, and can serve as a major limiting factor to salmonid recovery.

Roads are connected to streams primarily through direct routing of road surface runoff to the stream channel network at stream crossings, or through gullies developed at the outlet of ditch relief culverts and other road drainage features (Wemple et al., 1996; Croke and Mockler, 2001; Coe and MacDonald, 2001). PWA field inventories, conducted along 1000 miles of Northern and Central California roads, indicate typical road connectivity values range from thirty-five percent to over seventy-five percent of the road network. Depending on the surfacing and use level on individual roads, each mile of road can produce from 390 cubic yards to 780 cubic yards per decade. Reducing hydrologic connectivity of roads throughout central coast watersheds is essential to protecting and improving the quality and quantity of in-stream spawning and rearing habitat.

There are two ways to reduce sediment delivery, and the resultant impact on in-stream fisheries. These include *reducing erosion* at the site or reach level, and *reducing the delivery* of eroded sediment to stream channels. Altering roadbed shapes (e.g. outsloping roads) and installing additional road surface drainage structures (e.g. rolling dips, ditch relief culverts, etc.) are the most effective methods for reducing road-stream connectivity (Weaver and Hagans, 1994; Mendocino RCD, 2003). Management practices that either reduce the connectivity length or maximize the filtering of runoff are the most effective treatments for these sites (ODF, 1998; Grace, 2002).

For road surface drainage, there is a limit to the degree of "disconnectedness" that can be achieved by road upgrading practices. Of the nine TMDLs that have been formulated by the EPA for sediment impaired watersheds in coastal California, road surface erosion controllability targets range from eighty-two percent to ninety-five percent controllable. PWA has conducted focused implementation studies and concluded that road surface connectivity can probably be reduced to between five percent and ten percent at most, depending on stream crossing frequency and other local conditions.

1 Pacific Watershed Associates

Multistage Channel Reconstruction Projects in Northern California: A Preliminary Assessment

Mark Tompkins[1] and Matt Kondolf[1]

Floodplains are essential components of healthy river ecosystems, and floodplain disconnection is increasingly recognized as a major factor in river corridor ecosystem degradation in many parts of the world. Rivers in urbanizing watersheds have been especially sensitive to floodplain disconnection. Increases in the urban density of watersheds amplify flashiness of flood peaks, magnify floods (due to increased impervious area), and alter sediment transport dynamics. In addition, flood control infrastructure confines increased flood peaks within artificially narrow corridors. Together, these alterations to urban rivers have resulted in channel incision and disconnection of active channels from floodplains. One form of floodplain reconnection that has developed largely in urbanizing watersheds has been the construction of multistage channels (i.e. channels with cross sectional geometry that widens with increasing stage). The primary objective of these projects has been to maintain or improve flood conveyance and restore floodplain functions that allow complex aquatic and riparian habitat to develop and persist. I conducted post-project appraisals of multistage channel reconstruction projects on Lower Silver Creek, Alamo Creek, Green Valley Creek, Tassajara Creek, Miller Creek, and Wildcat Creek (all in northern California) to assess performance with respect to flood control and ecosystem restoration goals. I identified wide ranges of habitat development and flood control reliability in these projects, and my results suggest important design and maintenance considerations that could improve future applications of this floodplain reconnection technique.

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Geomorphic Processes in the Santa Clara River Watershed: Implications for Floodplain Restoration Planning

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In 2000, the California Coastal Conservancy proposed the establishment of the Santa Clara River Parkway, a 20 mile-long corridor along the lower Santa Clara River in Ventura County, California. The parkway project aims to acquire and restore historical floodplain lands to enhance habitat for endangered and threatened species while providing flood control benefits—an effort that requires an understanding of the hydrogeomorphic processes that define the river.

The Santa Clara River watershed is dynamic, experiencing significant annual and inter-year flow variability resulting from its semi-arid, Mediterranean-type climate. Intense rainfall events and highly erodible bedrock in combination with significant episodic sediment supply generated by landslides, earthquakes, and wildfires result in large floods that carry some of the highest sediment concentrations in the world. Further, the periodicity of sediment delivery is distinctly correlated to El Niño-Southern Oscillation (ENSO) climate forcing, making popular restoration concepts such as "equilibrium" and "bankfull flow" largely inapplicable.

The morphodynamics of the lower river are influenced strongly by the relative magnitude of flood events from the contributing sub-watersheds, and may have been impacted by flow regulation. Consequently, some floods result in net aggradation while others cause net incision within the lower river. Reach-level channel changes are conditioned by levees, legacy effects from flow diversions, aggregate mining and, possibly, the 1928 St. Francis Dam break. In the future, they may become increasingly influenced by urban growth. Human activities may have also affected the balance of sediment delivery processes to the near-shore zone, potentially causing changes to estuary morphology and regional longshore processes.

1 Stillwater Sciences

Saturday Afternoon Concurrent Session 3: Floodplain and Sediment Management

Managing River Flows and Associated Impacts on Floodplain Processes

Iovanka Todt[1]

Understanding the linkage between the natural flow regime and the functioning of floodplains is critical in effective river management and restoration. Seasonal inundation of floodplains provides essential habitat for hundreds of species of plants and animals, many of them dependent on periodic floods. However, changes to the natural flow regime due to development and construction of dams have resulted in adverse physical, chemical and biological impacts to the floodplain region. An overview of these impacts and proposed solutions is discussed."

1 Floodplain Managment Association

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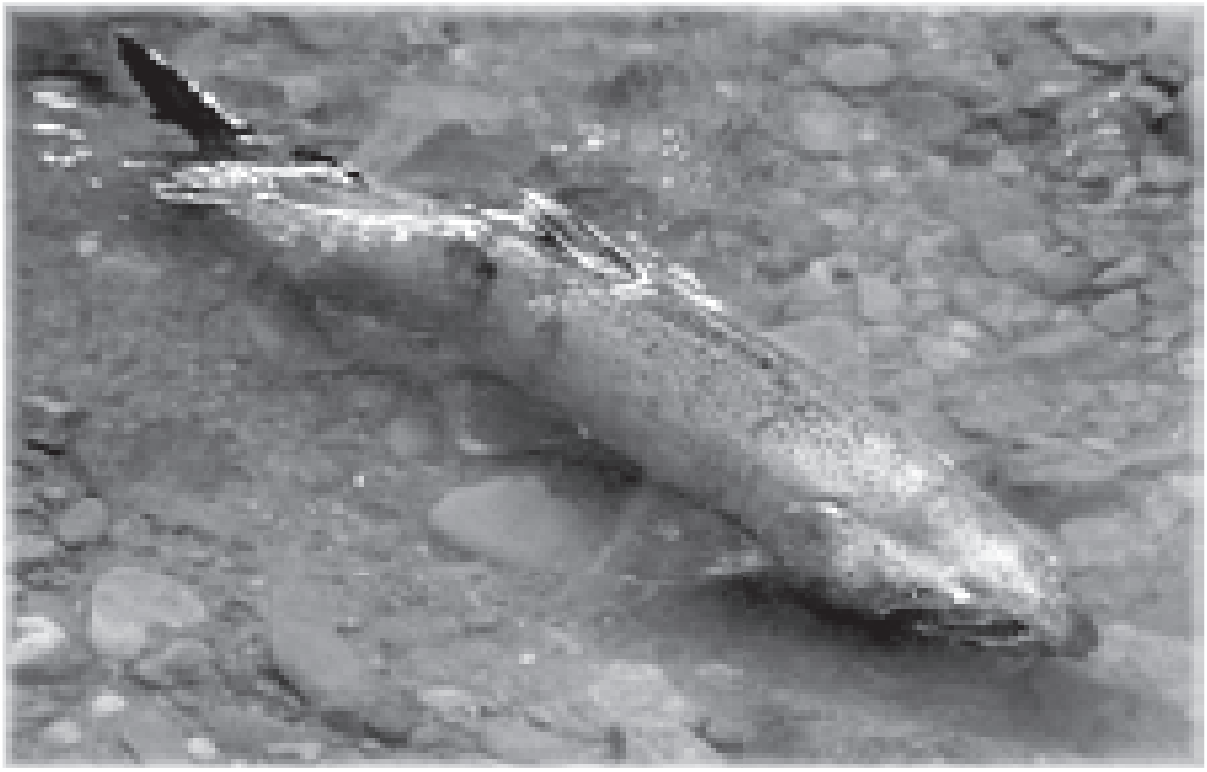

SRF Mission Statement

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.**

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