**Historical Ecology Informing Restoration in East Contra Costa County**

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The East Contra Costa County Habitat Conservancy and the Contra Costa Watershed Forum partnered with the San Francisco Estuary Institute to conduct an historical ecology assessment of natural resources in eastern Contra Costa County, CA. With limited money for restoration and conservation, concerned stakeholders want to use financial resources efficiently and effectively. A strong understanding of the historical distribution of habitats and their controlling factors provides a critical basis for understanding current conditions and the potential for future restoration. A large amount of data, both textual and graphic, has been collected and georeferenced. This data from the 1800s and early 1900s provide a wealth of information to describe the general historic status of habitat in the region as well as very parcel specific information on stream courses, plant diversity and other natural features. Though the Final Study will not be available until the end of 2009, the Conservancy is already using the interim products and datasets developed to inform habitat restoration design. A number of case studies will be presented demonstrating the application of this information in restoration. 1San Francisco Estuary Institute 2Contra Costa County and East Contra Costa County Habitat Conservancy

**Key Words** - *Historical Ecology; Habitat Conservation Plan; San Francisco Estuary Institute; East Contra Costa County Habitat Conservancy; Restoration; Contra Costa Watershed Forum; CA Coastal Conservancy; CCC Flood Control; Contra Costa County*

**Theme:** Habitat Restoration and Protection

**Poster Board Number:** 73. Submission Number: 231

**Final Results of California's Wetland Demonstration Program Statewide Wetlands Assessment**

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California's wetlands provide critical ecological services, even though the state has lost vast amounts of wetlands. It is imperative to protect what remains and to ensure that wetlands acreage being regained through restoration provide the desired ecological services. California has recently completed a survey of the extent and condition of coastal wetlands. This survey demonstrates how the state's Level 1-2-3 toolkit for assessing wetland resources can be used to determine where wetlands can be found and how they are doing. The 1-2-3 toolkit consists of standardized protocols form mapping (Level 1), low-cost assessment of the overall condition of wetland ecosystems via the California Rapid Assessment Method (CRAM) (Level 2), and standardized, intensive assessment protocols to quantify functions of wetlands (Level 3). We will present the survey's results for estuarine assessments (both ambient and project) and for riverine wetlands condition in the Napa watershed. 77% of the state's perennial estuarine wetlands can be found in the San Francisco estuary so focus will be on these regional results. State and regional survey results show landscape-level patterns related to anthropogenic. Overall condition decreases north to south. Threats that alter wetland hydrology, substrates, or biological communities include discharge of fill material, excavation, habitat fragmentation, and stressors such as invasive species excess sediment, and contaminants. We will discuss the evaluation of the distributions, amounts, and shapes of estuarine wetlands and land use patterns. Clear landscape-level trends emerge. For instance, the survey found that 60% of the Bay's wetland margins are adjacent to developed land. This reinforces the link between wetlands and watersheds and the importance of our land use decisions. We will also present results of condition assessments. Regional CRAM results show consistently lower wetland physical structure scores for Bay Area than other regions. Ditching and invasive plants are more strongly correlated to wetland condition for Bay wetlands than for other regions of the state. The paper discusses the relative CRAM condition scores for wetland restoration projects and ambient survey results. Both statewide and regional project scores were lower than ambient scores. Such findings can be used to identify and prioritize appropriate, cost-effective management actions.

**Key Words** - *wetlands; restoration; monitoring; assessment, CRAM,*
**Theme:** Habitat Restoration and Protection; **Poster Board #:** 78. Submission #: 260

**Nutrient dynamics and production in San Francisco Bay eelgrass (Zostera marina) beds: food web and restoration implications.**

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Seagrasses are important primary producers worldwide; seagrass beds harbor myriad species of primary producers, including algal epiphytes on their blades and benthic macroalgae. We conducted a survey of these three producer groups in San Francisco Bay eelgrass (*Zostera marina*) beds to support mesocosm experiments evaluating the interactions of these groups and their roles in trophic dynamics. We conducted quarterly surveys of four eelgrass beds, estimating biomass of eelgrass, epiphytes, and macroalgae. We found highly variable species composition and relative biomass of producers across these four eelgrass beds as well as large seasonal changes within beds. Both eelgrass and epiphyte biomass frequently varied 2 to 4-fold among sites. Macroalgal species composition was very different among sites, with a different dominant species contributing 1-2 orders of magnitude greater biomass than other algal species. We conclude that the total and relative contribution of biomass among producers varies dramatically across space and time in San Francisco Bay eelgrass beds, with implications for eelgrass health and food availability for higher trophic levels.

**Key Words** - *eelgrass; zostera marina; algae; san francisco bay*

**Theme:** Habitat Restoration and Protection

**Poster Board Number:** 71. Submission Number: 327

**The Lower Silver Creek Project, San José, California - From an Urban Flood Control Channel to a Naturally Functioning Urban Creek**

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Lower Silver Creek has seen its hydrology progressively altered over the last 100 years by intense urbanization. In the summer of 2002, the Santa Clara Valley Water District started the construction of a 5-mile long flood control channel improvement project with the objective of providing 100-year flood protection while enhancing habitat value through the creation of a functional riparian and wetland system. To meet this objective, efforts were made to enhance in-stream and riparian ecosystem features while integrating principles of fluvial geomorphology into the project design. Design features included: 1) a vegetated multi-stage channel composed of an in-channel floodplain to dissipate high flow energy and facilitate the formation of a base flow channel by natural fluvial processes and, 2) a sediment transport channel sized to mobilize and transport sediment at an ecologically relevant frequency. The downstream reach of the project (approximately 2.5 miles) was completed in stages from November 2003 to November 2005. This presentation will present results of five years of monitoring riparian, wetlands and geomorphological features as well as address the major benefits, constraints, and limitations of integrating fluvial geomorphology concepts with urban stream flood control efforts.

**Key Words** - *restoration; flood control; monitoring*

**Theme:** Habitat Restoration and Protection

**Poster Board Number:** 66. Submission Number: 251

**Conceptual models for the Subtidal Goals Project**

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The San Francisco Bay Subtidal Habitat Goals Project is a collaborative interagency effort that will establish a comprehensive and long-term management vision for protection, restoration, and appropriate use of the subtidal habitats of San Francisco Bay. The Project is a collaborative interagency effort among the Bay Conservation and Development Commission (BCDC), California Ocean Protection Council/State Coastal Conservancy, National Oceanic and Atmospheric Administration (NOAA), and San Francisco Estuary Project. The Subtidal Habitat Goals Project has recently developed conceptual models of various subtidal habitats, using color conceptual diagrams to illustrate key concepts in a visually intuitive way. The purpose of these models is to collect in one place the current understanding of these systems, and to provide some guidance to the development of goals. We present three examples of the current versions of these models. 1) A very general overall model emphasizes the decisions process concerning each of the habitat types: for example, which of the habitats are understood well enough to support actions and, of these habitats, which should be enhanced or protected? 2) The eelgrass model emphasizes the potential ecological roles of eelgrass beds and the opportunities for restoration or establishment of new beds. This model is the best supported by available information. 3) A model of hard substrates contrasts the function of hard-bottom areas in providing physical habitat with their potentially negative roles in supporting introduced species or introducing contaminants into the environment. Because other considerations go into the setting of habitat goals, the conceptual models alone are insufficient for this purpose. Nevertheless, the models provide a useful summary of the state of our understanding relevant to setting goals.

**Key Words** - *subtidal; restoration; conceptual diagrams*

**Theme:** Habitat Restoration and Protection

**Poster Board Number:** 72. Submission Number: 103

**Greening the Bay: the SF Bay Restoration Authority**

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In 1999, the San Francisco Bay Area scientific community published the *Baylands Ecosystem Habitat Goals*, a consensus blueprint detailing the restored habitat needed to make the Bay healthy and sustainable. A central recommendation of this report is to attain at least 100,000 acres of tidal wetlands.

Using the *Habitat Goals*, together we have made significant progress toward protecting this vital natural and economic asset, and the ambitious 100,000 acre goal is actually in sight. The greatest obstacle is a lack of steady, reliable funding.

Save The Bay's report, *"Greening the Bay: Financing Wetland Restoration in San Francisco Bay,"* presents our vision for a vibrant, healthy Bay ecosystem. This report documents the estimated cost to restore an additional 36,176 acres of shoreline property awaiting restoration to tidal wetlands. We highlight the challenges facing government agencies and advocacy organizations, and reveal the overwhelming public support for Bay restoration.

The 2008 creation of the SF Bay Restoration Authority, a new regional government agency charged with raising and allocating resources for the restoration of wetlands, implements the primary recommendation in *"Greening the Bay."* The Authority met for the first time on Earth Day 2009. The report recommends other specific policy initiatives to adequately fund the restoration of San Francisco Bay, aimed at increasing state and federal resources for wetland restoration.

Today we have the most significant opportunity to make San Francisco Bay healthier for wildlife and people since 1961, when Save The Bay was founded to stop the Bay from being filled in. Over the next several decades, we can secure a healthy future by restoring thousands of acres of thriving wetlands, reversing more than a century of degradation that reduced the size of our Bay by one-third.

**Key Words** - *Restoration; Tidal Marsh; Financing*

**Theme:** Habitat Restoration and Protection

**Poster Board Number:** 77. Submission Number: 99

**Evaluating Habitat Restoration Success at the Scale of a River Reach: Rutherford Reach Restoration Monitoring, Napa River**

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The Rutherford Reach Restoration project provides a unique opportunity for long-term monitoring of a 4.5 mile reach of the Napa River in response to a comprehensive treatment aimed at enhancing habitat value and reducing rates of fine sediment production on an incised North Coast alluvial channel draining to the San Francisco Bay estuary. The monitoring design provides for an annual rapid assessment of major changes along the thalweg and less frequent comprehensive geomorphic and habitat assessments at selected cross-section transects and longitudinal profile sub-reaches. The physical habitat assessment aims to capture potential increases in complexity due to the installation of instream structures, riparian revegetation, and potentially as a result of agricultural levee and land use setbacks. These results are integrated with ongoing fish surveys that document functional redds relative to pool-riffle distributions. With Phase 1 of the project breaking ground in summer 2009 and likely several years of implementation ahead, this monitoring framework promises adaptive management benefits in refining future phase designs and guiding long-term project maintenance.

**Key Words** - *Napa River; habitat restoration; monitoring; geomorphology; fish habitat*

**Theme:** Habitat Restoration and Protection

**Poster Board Number:** 65. Submission Number: 197

**San Francisco Bay Joint Venture Active Wetland and Watershed Projects**

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The goal of the San Francisco Bay Joint Venture (SFBJV) is to protect, restore, increase and enhance all types of wetlands, riparian habitats and associated uplands throughout the San Francisco Bay region to benefit birds, fish and other wildlife. The SFBJV helps identify potential partnerships and provide assistance needed to enhance the success of projects. SFBJV partners are undertaking a wide array of wetland, creek and associated projects throughout the region. This poster shows current active projects within the SFBJV boundaries that satisfy criteria laid out by the JV's Restoration Committee. Criteria for SFBJV "adoption" include projects that a) implement the recommendations of the Habitat Goals report and/or the JV Implementation Strategy, Restoring the Estuary; b) advance the goals of the JV by protecting, restoring, or enhancing habitat for target species including waterfowl, shorebirds, special status species, and anadromous fish; c) have a strong biological foundation; d) are implemented by a partnership of organizations and agencies; and e) provide linkages or connectivity to other priority wildlife areas. Once adopted, projects are prioritized based on readiness to be implemented, urgency, cost, connectivity, and community support. Habitat protection, restoration, enhancement and assessment work in the estuary is being undertaken by many diverse entities, including public agencies, conservation groups, landowners, corporate interests, local businesses, and citizen volunteers in the nine Bay counties. Based on goals laid out in the SFBJV Implementation Strategy, partners are half way through their timeline and are making great progress towards protecting 63,000 acres, restoring 37,000 acres, and enhancing another 35,000 acres of Bay habitats. They will also work to secure habitat values of adjoining seasonal wetlands and intend to protect 4,000 acres of riparian corridors and restore and enhance over 1,000 miles of creeks. See our associated poster, San Francisco Bay Joint Venture Habitat Goals Accomplishments, for details on progress towards these goals.

**Key Words** - *Joint Venture; partnership; habitats; restoration; acquisition; enhancement; projects*

**Theme:** Habitat Restoration and Protection

**Poster Board Number:** 75. Submission Number: 240

**Assessing Human Communities and Environmental Feasibility of Restoring a Steelhead Salmonid Run in Wildcat Creek and Rheem Creek on Urban Northern San Francisco Bay.**

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San Francisco Bay creeks historically with salmonid populations are being to some degree restored, but in this urbanized area, challenges for restoring suitable natural ecosystems are daunting. Obstacles to salmonid recovery can be grouped into three categories, illustrated in comparing two north Bay creeks:

1. Overexploitation: Historically important, but harvest is now prohibited.

2. Degraded Habitat: Destruction and degradation of stream and river habitat as a result of poorly controlled development and other resource exploitation probably remains the greatest challenge to salmonid recovery in urban areas. Requirements for salmonid survival are well understood, but obstacles to restoring those conditions, a major goal of recovery efforts, are often great.

3. Migration Barriers: Physical, chemical, and/or thermal barriers may prevent adult steelhead from returning to their natal stream headwaters to spawn and prevent maturing smolts from reaching the ocean, denying the fish access to the habitat they require to complete their life cycle.

With limited resources available for restoration, a first need is to target creeks and watersheds where greatest amounts of best quality habitat can, with the least expenditure of resources, be saved or restored and made accessible to fishes. Useful tools for performing such cost-benefit analyses are GIS map-databases.

A restoration project involving, from the outset, citizens within the target watershed also can serve as a vehicle for human community and economic renewal, especially in depressed urban areas such as in Wildcat and Rheem Creek watersheds. Local participation in habitat restoration (e.g. shaded riparian corridors, other natural amenities) provides citizens the opportunity to improve their surroundings by enhancing human community environmental quality, as well as offering residents opportunities to facilitate political action re: environmental justice. The land use most compatible with salmon stream riparian zones is parkland, a resource recently in especially short supply in these neighborhoods.

**Key Words** - *Restoration; creeks; communities; salmonids*

**Theme:** Habitat Restoration and Protection

**Poster Board Number:** 64. Submission Number: 201

**San Francisco Bay Joint Venture Habitat Goals Accomplishments**

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The San Francisco Bay Joint Venture (SFBJV) is one of eighteen habitat Joint Ventures nationally, and brings together a partnership of public and private agencies, conservation groups, businesses, development interests, and others to restore wetlands and other wildlife habitats in San Francisco Bay watersheds and the Pacific coast counties of San Mateo, Marin and Sonoma. In 2001, the SFBJV Management Board adopted Restoring the Estuary as the SFBJV implementation strategy, based on the Baylands Ecosystem Habitat Goals Report, with specific habitat goals for 200,000 acres of San Francisco Bay's tidal flats, marshes, lagoons and seasonal wetlands during a 20-year period. As of July 2009, Joint Venture partners have been responsible for the acquisition of more than 40,000 acres of wetlands, representing almost half of our total acquisition goals. Of the 129,000 acre combined restoration and enhancement goals, approximately 17,000 have been realized since the adoption of the implementation strategy, with more acres currently in planning and implementation phases. Here we provide detailed habitat accomplishments in comparison to targeted goals for each wetland habitat type and conservation action, including acquisition, restoration, or enhancement. This effort also acknowledges partner accomplishments and states the case for ongoing support of wetland restoration and enhancement. The summary reflects over 100 completed wetland protection, restoration, or enhancement projects.

**Key Words** - *Joint Venture; partnership; habitats; restoration; acquisition; enhancement*

**Theme:** Habitat Restoration and Protection

**Poster Board Number:** 76. Submission Number: 238

**San Francisco Bay Eelgrass: Transplantation using TERF-style Frames, and Other Avoidance and Minimization Measures**

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Water dependant uses in San Francisco Bay, such as dredging and dock installation, often come into conflict with eelgrass (*Zostera marina*). When impacts to these areas of eelgrass are not avoidable, mitigation is often required in the form of eelgrass transplantation. However, attempts to transplant eelgrass in San Francisco Bay have had limited success due to the often harsh habitat conditions including strong currents, high turbidity, and sediment resuspension. This poster examines the successful transplantation of eelgrass at two project locations in San Francisco Bay, using frames designed based on the Transplanting Eelgrass Remotely with Frame Systems (TERFS). Design of the frames was modified from the TERF to utilize biodegradable materials instead of metal frames. Eelgrass transplantation has been performed using this technique at two project locations in San Francisco Bay, and have met success criteria through two years of monitoring. Avoidance and minimization measures for dock and structure construction are also displayed. Dock avoidance and minimization measures are currently being implemented at projects in San Francisco and Tomales Bay. These techniques present ways to manage the requirements of water dependant uses and eelgrass habitat in San Francisco Bay.

**Key Words** - *Eelgrass; Dredging; Docks; Piers; Subtidal Habitats*

**Theme:** Habitat Restoration and Protection

**Poster Board Number:** 70. Submission Number: 330

**San Francisco Bay ecotone vegetation R&M**

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Vegetation management is often just hard work: control weeds, amend soils, seed/plant natives, maintain things during establishment, and then some long-term maintenance to ensure the community stabilizes as intended. However in habitats adjacent to San Francisco Bay basic tactics have not meet with success, forcing managers to reconsider dominant paradigms and test novel tactics. One of those paradigms is the "bunchgrass hypothesis", which proposes a grass-dominated herbaceous community for much of Coastal California's valleys. Some believe this was due to an inappropriate baseline set after the influences of European activities, but our aesthetics may also play some part in what appears to be a bias against forblands. For three years we have attempted to establish grasses in an effort to preclude invasive forbs during habitat creation, as recommended in a management plan, but found grasses difficult to establish onsite and ineffectual against invasive forbs. Further background research and the casual introduction of a native forb have led us to reconsider that plan.

**Key Words** - *Restoration; Ecotone; Forbland*

**Theme:** Habitat Restoration and Protection

**Poster Board Number:** 74. Submission Number: 155

**Methylmercury production and tidal export associated with Crissy Field Marsh, Golden Gate National Recreation Area**

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Surface waters in the restored salt marsh at Crissy Field, Golden Gate National Recreation Area, were found to have high aqueous methylmercury (MeHg) concentrations (>1 ng L-1), which was unexpected considering its sandy sediment with low total mercury (THg) concentrations. We sought to determine a) the extent to which the marsh was a source or a sink of MeHg to San Francisco Bay, b) where and when MeHg is produced within the marsh, and c) the potential influence of periodic inlet closure events on sediment and surface water MeHg concentrations. A 24-hour sampling event, over two full tidal cycles was conducted during August 2008, and demonstrated that during this period the marsh was a net source of MeHg, and net sink of THg, to the bay. Sediment percent (%) MeHg (a surrogate measure of MeHg production efficiency) was examined seasonally and across marsh elevations. The intertidal zone (low marsh, cordgrass-dominated) had the highest sediment %MeHg. These concentrations were higher during summer than during winter, highest at the sediment surface, and correlated with sediment organic content. Sediment %MeHg was also elevated during closure events at some intertidal sites. However, aqueous MeHg concentrations (both filtered and unfiltered) fell during inlet closure events. Additional water column data suggest that increased algal production and decreased suspended solids (increased water clarity) may both remove MeHg during closure events, either through settling of mineral and algal components or via photodemethylation. This research suggests that MeHg production is most active in the low intertidal sediments of Crissy Marsh, and driven by the wetting/drying cycles and the comparatively elevated organic matter concentrations in this zone. Despite its protected status, we suggest that the mercury present in Crissy Marsh, whether due to historic contamination, atmospheric deposition or tidal loads, is subject to methylation and export as MeHg.

**Key Words** - *tidal marsh, restoration, mercury, diel, flux*

**Theme:** Habitat Restoration and Protection

**Poster Board Number:** 68. Submission Number: 174

**Sulfide is no stress at Crissy Field Marsh but prolonged flooding is: Responses of restored *Spartina foliosa* marsh to periodic inlet closures**

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The restoration of 18-acres of historic tidal marsh at Crissy Field has had great success in terms of public outreach and visibility, but less success in terms of revegetated marsh sustainability. Native cordgrass (*Spartina foliosa*) has experienced dieback and has failed to recolonize following extended flooding events during periodic closures of its inlet channel, which inhibits daily tidal flushing. To determine if the marsh closures could be partially responsible for observed marsh dieback, we examined sulfur chemistry and plant stress throughout the marsh between and during closure events. During closures, porewater sulfide concentration did not respond consistently among sites, nor increased to levels likely to cause stress damage to cordgrass. However, sediment solid-phase total reduced sulfur concentrations did respond strongly to closures at both surface and sub-surface depth intervals, and were greatest in sites with high organic matter. The temporal patterns of both porewater sulfide and solid phase reduced sulfur suggests that while sulfate reduction may be enhanced during closure events, the free-sulfide produced is largely precipitated into solid phase, and does not build up to levels that directly cause stress damage to cordgrass. However, plant stress was observed during closures, as indicated by a buildup of ethanol in root tissues at most locations, a byproduct of oxygen limitation and, therefore, fermentative respiration. These data suggest that closure events may be limiting the extent of the current *S. foliosa* community, and limiting possibilities for replanting previously vegetated zones. The National Park Service dredges the inlet channel approximately once a year in the spring after the inlet has been closed for at least 3 weeks. Our data suggest that dredging the inlet channel more often and more quickly, particularly during warmer weather, would promote growth and expansion of the *S. foliosa* community into zones previously occupied by this species.

**Key Words** - *tidal marsh, restoration, root, sulfur*

**Theme:** Habitat Restoration and Protection

**Poster Board Number:** 69. Submission Number: 172