

The New Delta, after the Inevitable Transition

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The Sacramento-San Joaquin Delta's fragile levee system is subject to several physical realities that make them increasingly prone to failure. State planners face the challenge of preparing for future Delta flooding. This study presents an economic method for approaching the evaluation of Delta island levee upgrades and repairs. A Levee Decision Analysis Model (LDAM) is applied to the question: How should the state optimally prioritize levee upgrade and repair efforts in the Delta? We focus on 34 major agricultural islands that make up most of the Delta's Primary Zone and include all non-urban subsidized islands. This initial analysis indicates that it is economically optimal for the state to not upgrade all 34 Delta islands examined, mostly due to the high cost of levee upgrades that produce little improvement in levee reliability. When we assume increased effectiveness of upgrades, it becomes optimal to upgrade some islands. Others are never optimally upgraded, even under the most optimistic scenario. Our analysis also suggests that from an economic perspective, taking into account land and asset values, it is not cost effective to repair between 18 and 23 of these islands when they fail. When property values for all islands were doubled in a sensitivity analysis, only four islands of those originally not repaired become cost effective to repair. The LDAM model presented here is a useful approach for Delta policy-makers. It provides a quantitative framework for answering several relevant questions regarding reasonable levee upgrade and repair investments. These initial results may act as a springboard for discussion, and the LDAM model as a working framework for developing an optimal strategy. An important and inescapable conclusion of this analysis is that maintaining the current Delta landscape is unlikely to be economical from a business or land use perspective.

Session: The Future Delta and its Ecosystem

Variability and Complexity for Improving the Delta for Native

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The San Francisco Estuary is a complex estuarine ecosystem. Variability in environmental conditions, especially in the Delta, once made it highly productive for native biota. Present conditions discourage desirable species, providing a rationale for restoring estuarine variability and complexity. Achieving a variable, more complex estuary requires establishing seaward gradients in salinity and other water quality variables, diverse habitats throughout the estuary, more floodplain habitat along inflowing rivers, and improved water quality. These goals in turn encourage policies which: (1) establish flows that create a tidally-mixed, upstream-downstream gradient in water quality; (2) create slough networks with natural channel geometry; (3) improve flows from the San Joaquin River; (4) increase tidal marsh habitat, including shallow (1-2 m) subtidal areas, in both fresh and brackish zones of the estuary; (5) create/allow large expanses of low salinity (1-4 mg/l) open water habitat in the Delta; (6) create a hydrodynamic regime in which salinities range from near-fresh to 8-10 mg/l on a regular basis to discourage alien species and favor desirable species; (7) create habitat conditions that support higher and more variable site-specific native species diversity; (8) establish abundant annual floodplain habitat, with large areas that flood in less frequent wet years; (9) reduce inputs of pollutants; and (10) improve temperature regimes in large areas so temperatures rarely exceed 20° C during summer and fall. These actions collectively provide a realistic approach to achieving flow and habitat objectives to benefit desirable species. Some of the goals are likely to be achieved as the result of sea level rise, climate change, and levee failures, but habitat, flow restoration and export reduction projects will enhance a return to a more variable and more productive ecosystem. This finding has widespread support in ecological theory and observations from other systems, but making quantitative predictions of change is not yet possible.

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Our Actions, Our Estuary
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ORAL ABSTRACTS: Day 3 – Track C

Flooded Island Ecosystems

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The Sacramento-San Joaquin Delta is the heart of California's water supply system and the base of an important, but quickly declining, ecosystem that includes five native fish species listed as threatened or endangered. A number of factors including sea level rise, seismic activity, continued land subsidence and more extreme climate events will increase the frequency and associated costs of Delta island failures. Flooded Delta islands will have a direct and immediate impact on the water quality and ecology of the Delta system. The exact impact will be a function of the island which is breached and the locations and number of breaches. However, with sufficient study, it is possible to manage flooded islands in a way that is beneficial to the ecosystem. In this study, we use a three-dimensional hydrodynamic and water quality model (SI3DWQ) to simulate virtual Delta islands and the surrounding channels. The goal is to explore the location and geometry of flooded islands and the type of food web each potential flooded island can sustain. The model can be used to help guide the configuration and management of flooded islands that will best support a pelagic food web versus islands that will promote growth of invasive species. Using the information from the model simulations, recommendations from an ecological standpoint can be provided, along with other economic and societal factors, to Delta managers on which islands should be saved or remain flooded.

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Estimation of Flow Needs for Native Fishes

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A major issue facing the long-term management of the Sacramento-San Joaquin Delta is the development of flow prescriptions for supporting habitat conditions for desirable fishes in the Delta. In the larger professional literature, much is written on environmental flows for rivers and other water bodies, with little consensus on method (Richter et al. 1997; King and Louw 1998; others). This stems, in part, from the complexity involved (Moyle et al., 2009 in preparation). Estimating human demands for water, both in quantity and quality, is fairly straightforward with well-established methods. Estimating flows for improving habitat conditions, particularly to support fishes with different and often conflicting life history strategies, is much more complex and is hampered by numerous uncertainties. For the Delta, these difficulties are compounded by major geological, biological, and engineering changes and transitions, particularly the return of subsided diked lands to aquatic habitat (subtidal, intertidal and floodplains), changes in water management within and upstream of the Delta, invasive species, and water contamination from upstream and in-Delta uses. These massive ongoing and potential changes cast doubt on the long-term value of empirical relationships often used to establish required Delta flows. As pointed out elsewhere (Lund et al., 2008), we are unlikely to ever resolve all these uncertainties and issues in the Delta before proactive actions are required – since courts are already requiring action. Initial flow prescriptions with a habitat and biological basis need to be developed to move the planning and policy process forward, even knowing that these prescriptions are based on incomplete data and understanding, and will undoubtedly be modified in the future.

To support on-going policy and scientific discussions, we present preliminary methods for estimating fresh water flows needed to sustain viable populations of native fishes in the Delta. Three separate approaches to this problem are explored and (for now) illustrative quantities of water are estimated. While these estimated flows might have some value in furthering discussions in light of the justifications and references provided, the greater value, for the time being, lies in the approach developed and applied here. This approach is developed largely to facilitate more transparent and scientific discussion of desirable freshwater flows and to suggest potential methods for their estimation.

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Components of the UC Davis Delta Solutions Program

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The Delta Solutions Program at the University of California, Davis, Center for Watershed Sciences seeks to develop scientific knowledge in a coherent and focused way to develop insights and information useful for developing solutions to the problems of the Sacramento-San Joaquin Delta. This presentation will present an overview of components of this program and its activities for trying to provide independent scientific information useful for policy-making. It is a challenging and imperfectable goal

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Native Trees and Healthy Neighborhoods

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In recent years there has been growing recognition of the practical contributions trees make to healthy neighborhoods -- from temperature and run off reduction to air quality, aesthetic values, and quality-of-life benefits. Less attention has been directed to the potential incorporation of native trees into the suburban canopy, although remnant or volunteer trees are often an existing component.

In fact, many of the Bay Area's suburban landscapes were formerly oak savannas with a relatively dispersed natural spacing. Their loss is an often overlooked impact to native California habitats. Recent research suggests that elements of the structure and function of the native oak savannas are compatible with contemporary land uses, and could provide significant ecological functions in addition to the other benefits of canopy cover. This presentation explores an approach to strategically reintroducing native trees to suburban California landscapes through coordinated local stewardship, urban forestry, and parkland management programs.

Key Words - *urban ecology; urban forestry; valley oak savanna; Quercus lobata; LID*

Session: Sustainable Urban Retrofit Session

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Converting a Channelized Creek into an Asset: Lower Silver Creek

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Urban creeks represent a common and important ecological interface with humans; an interface that has downstream implications that can affect the health of the San Francisco Bay. Natural creeks provide a host of ecological functions and values that include storm water retention, water temperature regulation and habitat corridors. For many years it has been common practice to direct stormwater into channelized urban creeks which quickly carry surface runoff to the Bay, but this direct conveyance reduces water filtration and local groundwater recharge and sometimes increases downstream flooding. Fortunately, even in a highly developed urban setting, steps can be taken to beneficially retrofit our channelized creeks. The Santa Clara Valley Water District is prioritizing and systematically retrofitting channelized urban creeks to improve water quality, flood protection and habitat values in Santa Clara County.

The Silver Creek Watershed covers approximately 43 square miles in eastern San Jose and unincorporated Santa Clara County. The Lower Silver Creek Flood Control Project, implemented in 2003 and partially completed in 2007, included: broadened floodplain and channel modifications for conveying flood flows; installation of bank protection and new creek maintenance access roads; significant native revegetation within the channel and along the channel banks; improved access and aesthetics, and enhanced public spaces to create a sense of community.

An interdisciplinary team of hydrologists, civil and geotechnical engineers, ecologists and landscape architects worked to develop plans for over 2 miles of Lower Silver Creek. The restoration plans included the planting of native riparian trees and shrubs along the creek banks and channel to provide shaded riverine aquatic habitat. However, there are numerous design constraints in retrofitting a channelized urban creek, including right-of-way and property ownership issues, existing roads and utilities, maintaining flood protection, soils, vandalism, and neighborhood-specific issues. The Lower Silver Creek project provided the necessary flood control while increasing riparian habitat, improving in-stream aquatic habitat and enhancing overall aesthetics.

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Creating a Regional Watershed Voice – Policy Needs

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The Bay Area watershed community includes nonprofits, local government agencies, private firms, landowners, and resource conservation districts. By banding together, we can convincingly convey to decision-makers the societal benefits of our work, and influence policies and decisions that affect our effectiveness.

Key Words - *policy; watershed*

Session: Creating a Bay Area Watershed Network

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Assessment, Restoration and Monitoring Tools Working Group

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The Assessment, Restoration and Monitoring (ARM) Tools Working Group of the Bay Area Watershed Network (BAWN) is intended to develop specific methods and protocols to address practical issues of design and monitoring of creek restoration projects around the Bay Area. The subgroup arose from discussions that current assessment, monitoring, and “watershed health” measures are subject to different interpretations, and are inadequate to allow grant-program funders and agency staff to set priorities for creek restoration. The group, currently in its inception phase, aims to develop better regional and State level communications in setting funding and program priorities by developing (1) a Bay Area framework for watershed stream and floodplain protection and restoration goals, (2) priorities for developing stream restoration tools and methods appropriate to the social and environmental challenges of the Bay Area, and (3) integrating collaborative stormwater monitoring efforts with the State’s Surface Water Ambient Monitoring Program. Early-phase program objectives will be outlined. Requirements include defining unifying principles and clear objectives for monitoring programs to maximize the value of collected data, determining simple universal data needs for solving common issues in watershed management and river restoration, and guidance for appropriate tools and protocols that facilitate different informational needs at different scales, ranging from reaches to watersheds. In addition, the program is anticipated to result in proposals for pilot projects to test the efficacy of ecological engineering methods and low impact development designs in urban settings, and to achieve a broad prioritization of Bay Area watershed management, protection and restoration objectives that consider both environmental and social challenges.

Key Words - *monitoring; assessment; restoration*

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Welcome to the 21st Century! Creative Media for Outreach and Education

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Caroline Warner, San Francisco Bay Joint Venture

Earth team and the SF Bay Joint Venture are creating visual and audio social media to reach and involve their respective audiences. In this session, Caroline and Lana will share examples of their recent projects and the ways they are being used to help foster a regional community who are aware of and care about the wetland habitat environment.

Key Words - *media; outreach; teen; visual; audio;*

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Creating a Bay Area Watershed Network (BAWN Panel)

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S T R A W

Students and Teachers Restoring A Watershed

A Project of The Bay Institute

The STRAW Project coordinates and sustains a network of K-12 teachers, students, and community members as they plan and implement watershed projects leading to habitat restoration. The STRAW Project works with technical professionals and partners in the North Bay to provide training and support in environmental project-based learning, watershed curriculum, bird research, aquatic insect monitoring, and creek and wetlands restoration. Since 1993, more than 16,000 students have participated in over 275 STRAW restorations on rural and urban creeks, planting over 32,000 native plants and restoring approximately 100,000 linear feet of creek banks. STRAW has the following goals: to empower students, to support teachers, to restore the environment, and to reconnect communities.

The STRAW network consists of many committed, long-term partners, including Prunuske Chatham, Inc., Marin County Stormwater Pollution Prevention Program (MCSTOPPP), Marin Resource Conservation District, PRBO Conservation Science, Conservation Corps North Bay (CCNB), San Pablo Bay National Wildlife Refuge, and more. With our partners we support a variety of watershed studies and implement and design restoration activities.

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