Building a Regionally Coordinated Assessment Framework for the San Francisco Bay Joint Venture

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The mission of the San Francisco Bay Joint Venture (SFBJV) is to protect, restore, increase and enhance wetlands, riparian habitat and associated uplands throughout the region to benefit birds, fish and other wildlife. The SFBJV has worked towards habitat acreage-based goals as established in its 2001 Implementation Plan. Hundreds of millions of dollars have been spent since 2003 on habitat conservation, restoration, and enhancement activities thought to benefit wildlife populations. To date, success has been measured primarily through acreage tallies of target habitats included within project boundaries. Yet, these do not link wildlife response or other measures of habitat quality to the activities of these projects. Efficacy assessments with measurable outcomes at multiple scales, particularly at the regional scale, are needed.
In 2011, with extensive input from the scientific community, the SFBJV created the first phase of a "Monitoring and Evaluation Framework" (Framework) for the region designed as the first step in the process to link actions taken by the SFBJV partners to measurable results on the landscape. The SFBJV is now using "Open Standards for the Practice of Conservation" (OS) as the planning tool to develop effective and measurable conservation strategies in the context of changing landscapes. This poster describes the process and shows excerpts from the model currently under development to addresses riparian habitats within the region.
This example demonstrates how OS can be utilized in this context to set integrated conservation target goals, threat and strategy objectives linked to measurable indicators for effective and accountable conservation actions.

Keywords: Joint Venture, Monitoring, Riparian, Habitat, Conservation, Targets, Wildlife Response, Assessment

Poster Topic: Regional Habitat Monitoring and Assessment

Measuring Wetland Canopy Leaf Area Index from Hemispherical Photography: First Results in the Delta and Strategies for Spatial Interpolation

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Leaf area index (LAI; one-sided leaf area per unit ground area, m2 m-2) is one of the important characteristics of vegetation canopies used in the analyses of plant-atmosphere carbon and water exchange, ecosystem productivity and energy transfer. Previous studies have measured LAI extensively in "upland" terrestrial landscapes and explored methods to up-scale field measurements to regional levels with satellite and airborne remote sensing data. However, in wetland regions (including California Sacramento-San Joaquin Delta, hereafter the Delta), much uncertainty still exists about spatial and temporal variation in canopy properties as well as the best strategies to monitor them remotely. This poster presents results from our pilot assessment of LAI in portions of the Delta and Suisun Marsh and preliminary statistical relationships between field-measured canopy properties and spectral indicators of vegetation greenness from the National Aeronautics and Space Administration (NASA) Landsat-8 satellite (30 m pixel size). LAI was measured from in situ hemispherical photography from late May to September 2013 in a range of sites representing brackish tidal marshes, restored freshwater marshes, rice agriculture and a pepperweed-infested pasture. We discuss variation in LAI and feasibility of the measurement techniques with respect to dominant plant species, canopy structure, site history, disturbance regime and spatial heterogeneity. We further outline the next steps towards regional-scale LAI interpolation with satellite image archives.

Keywords: Wetland Vegetation, Canopy, LAI, Vegetation "Remote Sensing," Restored Tidal, Agriculture

Poster Topic: Regional Habitat Monitoring and Assessment

Marin County Progress Toward Integrated NHD Local Resolution and NWI Local Features

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Marin County has been developing detailed terrain models and hydrologic analysis to support the generation of Local Resolution features for National Hydrography Dataset (NHD) throughout the county and adjacent drainages. Terrain from several bathymetric and airborne LiDAR surveys have been integrated into a seamless topographic-bathymetric surface with 50cm gridding. Very considerable effort has been expended to develop hydrologic enforcement (HE) lines that connect all outfalls to upland drainage, branching through low-flow pathways that integrate pipes, ditches, reservoirs, and fluvial channels. The HE lines are used to constrain the location of flow lines generated by ArcHydro from a 1m grid surface. Flow lines are attributed by flow accumulation at frequent intervals along their length, which supports flow regime classification. The HE features are also a source of NHD feature codes (FCode) used to classify the modeled flow lines.

In addition to tideland classification from topography and orthoimagery, terrain surface local minima identify spillway-level areas for inland ponds and reservoirs. Together with the drainage structure provided by NHD Local Resolution, these features produce local-resolution National Wetland Inventory (NWI) features with BAARI-compatible classifications.

The target map accuracy for urban areas in this work is 1:2400, and with LiDAR-derived terrain, we consistently exceed 1:4800 map accuracy. Tideland features are interpreted as polygons at typical 1:300 screen scale, HE features are sketched in rural areas at 1:800 screen scale, and in urbanized areas at 1:250 screen scale.

Keywords: National Hydrography Dataset Local Resolution, National Wetland Inventory, ArcHydro, BAARI

Poster Topic: Regional Habitat Monitoring and Assessment

A Method of Identifying Reference Condition in Riparian Forests, and Establishment of Monitoring Protocols for Restoration Project Assessment

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Problem Statement: Reference sites are frequently used in restoration design, yet reference *condition* is rarely incorporated into project monitoring or adaptive management. This limits our ability to achieve genuine recovery of damaged systems, and suggests that restoration in general may not be achieving maximal results for its investment. We propose to use aggregated reference information from a set of riparian forests and woodlands in near-pristine watersheds to establish goal conditions for restoration projects.

Approach: Twenty-one reference-condition sites, representing "best achievable condition" in the state, were sampled via census method for woody species and tree size class, along transects of consistent size (121 by 15 m). Census method allows for derivation of exact relative abundance, size class distribution, species richness, and species accumulation (i.e. species- area curves) for these reference forests. These data also allow us to forecast species richness over longer transects (up to 1800 meters), which informs species-richness targets for restoration sites.

Results: The study identified several common characteristics of minimally disturbed riparian forests. Each reference site fell into an alliance defined in the *Manual of California Vegetation* per alliance membership rules. Reference forests follow clear patterns of relative abundance: most reference sites contain fewer than 4 dominant species and many more minor species than dominants. Woody species richness ranged from 10 to 19 species per transect and averaged 15 species. The data also reveal reference condition for trees per acre and size class distribution. Finally, the study determined that species richness can be modeled from a known transect to a larger site to forecast target species richness for restoration sites.

Conclusions: This study presents a specific definition of reference condition and establishes reference metrics for riparian vegetation from contemporary reference sites. From these, reference condition indices can be derived and used guide restoration, management, and assessment.

Keywords: Reference condition, Riparian Forests, Reference Sites, Restoration, Monitoring

Poster Topic: Regional Habitat Monitoring and Assessment

Delta Habitat Projects Database: Tracking Restoration and Mitigation Projects For Improved Coordination

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Delta habitats are mere remnants of what once existed, so restoration is a priority for myriad State and federal agencies and non-profit organizations. Evolving delta planning efforts (e.g., Delta Plan, Delta Conservancy, Fish Restoration Program Agreement, FESSRO, Bay Delta Conservation Plan) have discrete restoration and mitigation targets and goals, that guide the identification and acquisition of properties from willing sellers. These large scale planning efforts require tools to coordinate restoration planning and evaluation.

A GIS database (and map) of current and planned restoration projects in the Sacramento San Joaquin Delta, was developed by DWR FESSRO Delta Levees in 2011 to facilitate agency/ stakeholder coordination and enhance our understanding of existing projects and planning efforts. The database is currently being reviewed and updated through an interagency effort lead by the Department of Water Resources and the Delta Conservancy. A crosswalk and list of queries are being developed to improve functionality and data sharing with other project tracking tools, such as the EcoAtlas, San Francisco and Central Valley Joint Ventures, and Natural Resource Projects Inventory. The goal is to make the database usable to a wide group of project participants and to facilitate project evaluation and synthesis. Enhancing the Delta Habitat Projects Database with a consistent set of attributes and augmenting project descriptions, will improve restoration coordination and the ability to track progress toward landscape level restoration and monitoring goals. We invite comment and critique as we complete the database design effort and develop summary maps and reports.

Keywords: Sacramento-San Joaquin Delta, Habitat Restoration, Mitigation, Status, Trends, GIS

Poster Topic: Regional Habitat Monitoring and Assessment

Cleaning the Drain: Lessons Learned from the Pacific Commons Storm Water Treatment Wetland, Fremont, California

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High-quality monitoring data is critical to understanding the effectiveness of best management practice designs in decreasing concentrations and loads of key pollutants discharged to San Francisco Bay. Constructed in 2007, the Pacific Commons storm water treatment wetland is the final treatment component in the management of urban runoff from the 515-acre Pacific Commons commercial/industrial development in Fremont, California, which drains to San Francisco Bay. The wetland is complex: over half of the 10-acre surface area is vegetated marsh. Five years of monitoring indicate that the wetland substantially reduces concentrations of key runoff pollutants. Concentrations and loadings copper and zinc, were significantly ($p<0.05$) higher in influent runoff than in wetland outflows. Concentrations of nitrate-nitrogen and total nitrogen were also significantly higher in inflows but nitrogen loadings at the inlet and outlet did not differ significantly. Concentrations and loadings of total phosphorus and total suspended solids also did not differ significantly between the inlet and outlet. Monitoring revealed that approximately 25% of the inflow to the wetlands was non-storm baseflow, likely runoff from landscape irrigation. Presumably, this lack of dilution also explains why influent nitrate-nitrogen concentrations were significantly higher in baseflow sampling events than under storm conditions. Despite the existence of a high-flow bypass, the wetland treated over 99% of the runoff from the development during the 5-year period. The bulk of outflows comprised water which had entered the wetland prior to the storm event and been subject to treatment of varying duration. These results demonstrate that while large, well-designed treatment wetlands, such as the Pacific Commons wetland, can successfully reduce dissolved copper and zinc concentrations and loadings, to San Francisco Bay, their effectiveness in reducing nitrogen and phosphorus loadings is more questionable. Focused monitoring, like that undertaken at Pacific Commons, are critical to audit wetland performance in protecting valued natural resources.

Keywords: Stormwater Treatment Wetland, Design, Fremont, Nitrates, Copper, Zinc, Monitoring

Poster Topic: Stormwater Runoff: Contaminant Removal

Our City Forest Green Streets Program

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Bay Area cities are faced with the daunting task of retrofitting existing streets to treat stormwater and to comply with increasingly stricter stormwater regulations. Most solutions are expensive and require considerable engineering. Urban forestry nonprofit Our City Forest (OCF) and the City of San José are partnering on a strategy that provides an affordable, yet effective option to begin addressing these concerns.

Since 1994, OCF has engaged 150,000+ volunteers in implementing thousands of urban plantings. These projects have installed 65,000+ trees within parks, schools yards, and street parkstrips, removed 136,000+ square feet of impermeable paving, and improved watershed health in myriad ways.

To expand impermeable surface removal efforts, OCF launched their Green Streets program in early 2013. This pilot program focuses on removing large sections of concrete from parkstrips and planting them with native and drought-tolerant plants. OCF obtained a State Natural Resources grant plus a City of San José matching contribution for Green Streets, starting with several projects in downtown San José. The Hedding Street Project, the program's largest project to date, was a collaboration between OCF and the City of San José to improve the streetscape along busy Hedding Street. Roughly 350 square feet of impermeable surface was removed from parkstrips adjacent to the new bike lanes, “unpaving the way” for 122 volunteers to plant 215 drought-tolerant street trees and shrubs.

The watershed and water quality benefits of each Green Streets project may be small, but the collective benefits of all the projects are significant. The program provides a model for other cities interested in attaining these benefits within current budget constraints and without the need for large-scale engineering or long-term planning. This strategy engages residents and increases their awareness of watershed issues. This might just be how to best garner community support for future large projects.

Keywords: Watershed Management, Stormwater Runoff, Impermeable Surfaces, Urban Forestry, Green Streets

Poster Topic: Stormwater Runoff: Contaminant Removal