Alameda Creek Riparian Bird Community Occupancy Analyses

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Alameda Creek and its tributaries comprise one of the largest watersheds in the South San Francisco Bay. It provides refuge to a number of special status species, including an array of Neotropical birds. To inform habitat management that promotes biological diversity, bird counts were conducted along a 14 mile stretch of Alameda Creek that flows through Sunol Regional Wilderness Area, in Alameda County. Our avian surveys included three stream reaches that are subject to differing levels of recreational, agricultural (grazing) and hydrological regimens.

We used the Variable Circular Point Count method to survey for birds along three different stream reach sections of Alameda Creek during each breeding season from 2007 through 2011. Over the five year study, 2596 bird detections were recorded, including 62 species (7 Focal Species for Riparian Conservation, and 12 Focal Species for Oak Woodland Conservation). We used Multiple-species hierarchical Bayesian occupancy models to assess species occupancy and richness to identify possible associations with stream reach vegetation and landscape characteristics.

Results indicate that the highest species richness, as well as the highest focal species occupancy and richness, occurred along the upper stream reach section of Alameda Creek where elevation is higher and human activity is much lower. Focal species occupancy is similar between the middle and lower reaches, but both are lower than the upper reach, despite the similarity in vegetation among all three reaches. These results point toward elevation, topography, human use patterns, hydrology, and potentially other large-scale factors influencing bird species richness, abundance, and probability of presence rather than habitat structure and composition. Further investigation is needed to evaluate which of these features are likely drivers of this pattern and how we may be able to manage these areas to maximize biodiversity of our riparian avifauna.

Keywords: Riparian Bird Monitoring, Watershed Management to Maximize Biodiversity

Poster Topic: Birds

Projected Impacts of Climate, Urbanization, and Water Management Scenarios on Ecology and Habitats of Waterfowl and Other Waterbirds in the Central Valley of California

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The Central Valley of California contains some of the most important habitats for waterfowl, shorebirds, and other waterbirds in North America. Waterbird habitats in the Central Valley are dependent on precipitation and snow pack for water supplies. Global climate models indicate substantial changes in temperature, timing, and amounts of precipitation in watersheds of the Central Valley, translating into temporal and spatial variations in many of the driving forces that define the availability and productivity of waterbird habitats. Food availability is a key factor limiting waterbirds during migration and winter, and it impacts body condition and other aspects of waterbird ecology. We developed Central Valley landscape change scenarios based upon precipitation, temperature patterns, and resulting water supplies projected from downscaled climate models, urbanization, and water management scenarios and investigated impacts on habitats and ecology of waterfowl and other waterbirds. For each scenario, we modeled water supplies and demands in the Central Valley using the Water Evaluation and Planning system (WEAP) to quantify future potential water deficit impacting waterbird habitats during migration and winter. WEAP results were translated to available habitat. For each scenario, the computed habitat areas were included in a bioenergetics model to quantify future potential waterfowl food deficits. Initial modeling results focusing on Butte Basin indicate that under some scenarios, water supplies will not be adequate to maintain habitat at the levels necessary to support Central Valley Joint Venture goal populations of waterfowl and result in late-winter food deficits for waterfowl and other waterbirds. Of scenarios we investigated, waterbird habitats and food supplies would be impacted the most by a combination of warm, dry future climate, expansive urban encroachment, and a proposed instream flow requirement for protecting migratory salmonids in Butte Creek. We are currently evaluating additional scenarios and expanding our efforts into other Central Valley regions.

Keywords: Bioenergetics, Central Valley, Climate Change, Habitat, Waterbirds, Water Management, WEAP

Poster Topic: Birds

Estimating a Baseline Condition for Landbirds Within the Sacramento-San Joaquin Delta

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Historically, the Sacramento-San Joaquin Delta (Delta) was a vast, tidally influenced freshwater marsh, with soils rich in peat and alluvium from the upstream watersheds. Levees built along stream channels and reclamation of lands for agriculture, water, and urban development have reduced wetland and riparian land cover types to less than 5% of their historical extent. These changes have resulted in the decline of the fish and wildlife species dependent upon the Delta ecosystem and associated habitats. The implementation of projects associated with the permitting, operation and maintenance of the water delivery and flood management systems, as well as the reversal of subsidence and greenhouse gas reduction, provide an opportunity to restore thousands of acres of the Delta landscape to more natural land cover types such as managed and tidal marsh, and riparian forests. These landscape scale changes may provide significant benefits to multiple wildlife taxa, including landbird communities; however, the current status of terrestrial birds is poorly understood within the region. In order to address this information gap, we have implemented a multiyear study of the bird communities using agricultural and natural landscapes throughout the Delta. Using repeatable, quantitative data collection methods, this study will provide a baseline condition for measuring restoration success, inform adaptive management processes, and provide region-specific information on bird-habitat associations. We have gathered bird community composition and abundance data, and fine-scale habitat characteristics at sampling plots (n=218) within 25 sites throughout the Delta. The findings of this study provide a novel understanding of the landbird communities throughout the Delta and will be important in tracking bird response to the large-scale restoration and conservation efforts currently being planned and implemented.

Keywords: Landbirds, Sacramento-San Joaquin Delta, Monitoring, Adaptive Management

Poster Topic: Birds

Effects of Heron and Egret Colony-Site Disturbance on Subregional Nesting Abundance

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In the San Francisco Bay Area, disturbance by humans and nest predators is an important factor in the dynamics and distribution of heron and egret nesting colonies. Herons and egrets may respond to disturbance events by moving to other nearby breeding colonies, or by leaving a wetland area altogether, leading to a decline in the number of nesting herons and egrets in the surrounding landscape. Therefore, understanding the effects of disturbance at one colony site is important in understanding the dynamic nature of regional heron and egret abundance and distribution. We used time series analyses to investigate the extent to which colony-size fluctuations related to major disturbance events over 20 years affect the abundances of nesting herons and egrets within ten wetland subregions in the northern San Francisco Bay Area. All species exhibited gradual subregional recovery from colony-site disturbance. On average, the number of years needed for a 90% recovery from disturbance was 11 years for Great Blue Heron, 15 years for Great Egret, 5 years for Snowy Egret, and 9 years for Black-crowned Night-Heron. The initial subregional impact of colony-site disturbance was lowest for Great Blue Herons, but their rate of recovery was relatively slow. The fastest recovery rate was exhibited by Snowy Egrets, with only about 60% of the disturbance effect carried over between years. Great Egrets had the slowest estimated recovery rates with about 82% of the disturbance effect carried over between years. Repeated disturbances prolonged recovery times. These models will provide planners and decision-makers with a simple tool for predicting the extent to which an impact to a particular heronry is likely to affect the number of herons and egrets that nest and feed in the surrounding wetland landscape.

Keywords: Heron, Egret, Disturbance, Time Series, Population Dynamics, Resilience, Colonial Waterbirds

Poster Topic: Birds

Tidal Marsh Revegetation by Design
Rapid Habitat Enhancement to Benefit California Clapper Rail (*Rallus longirostris obsoletus*): Two Examples from Eden Landing Ecological Reserve

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The California Coastal Conservancy and U.S. Fish and Wildlife Service San Francisco Estuary Invasive *Spartina* Project is implementing a five year restoration program that focuses on enhancing habitat for California clapper rail (*Rallus longirostris obsoletus*) in areas affected by non-native *Spartina* invasion. Revegetation sites include restored tidal marshes that were heavily invaded by non-native *Spartina* that out-competed native vegetation. After successful removal of non-native *Spartina,* natural recruitment of some native species has been very successful (e.g., perennial pickleweed, *Sarcocornia pacifica*). However, two key components of rail habitat, *Grindelia stricta* and native *Spartina foliosa*, are still missing at some sites. Revegetation focusing on these two key species aims to rapidly enhance existing rail habitat in support of rail populations. ISP designed and implemented plantings that aim to rapidly establish dense, strategically-located patches of vegetation that will benefit nesting, foraging and roosting rails as well as provide high tide refuge.

Whale's Tail South and Cargill Mitigation Marsh (Eden Landing Ecological Reserve) are two adjacent marshes that differ greatly in restoration age. These marshes exemplify the program's approach to revegetation. Once established, *Spartina foliosa* that has been planted on marsh channel banks (Whale's Tail South) and on open mudflats (Cargill) will provide cover for foraging rails that is currently largely absent. *Grindelia stricta* has been planted along marsh channel edges at both sites to provide nesting cover and on berms within Cargill to provide high tide refuge. In addition, several upland transition zone plant species were planted along a levee that separates these sites to provide extreme high tide refuge. 2011-2013 plant installation at Whale's Tail South and 2012-2013 at Cargill totaled over 11,800 plants (*S. foliosa* counted as plugs). Initial survivorship results from the first year of planting informed the planting in the second year (e.g., 41% for marsh plain channel *Grindelia*).

Keywords: Restoration, California Clapper Rail, Invasive Species, Tidal Marsh, Spartina

Poster Topic: Birds

Tidal Marsh Restoration Program in Support of California Clapper Rail in the San Francisco Estuary

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In 2011, the California Coastal Conservancy and U.S. Fish and Wildlife Service San Francisco Estuary Invasive *Spartina* Project undertook an ambitious five-year program to rapidly improve habitat for California clapper rail (*Rallus longirostris obsoletus*) in tidal marshes of the San Francisco Estuary. Program components include: artificial floating islands, constructed high tide refuge islands, rapid intensive revegetation, predator control actions and Bay-wide eradication of invasive *Spartina*. One objective of the program is to intensively plant native marsh vegetation, primarily marsh gumplant (*Grindelia stricta*) and Pacific cordgrass (*Spartina foliosa*), in strategic locations at invasive *Spartina* eradication sites, with the goal of rapidly enhancing cover, nesting, and high tide refuge habitat for rails. While restoration practitioners have previously had success with planting *G. stricta* in the transition zone, there has been less effort planting on the marsh plain. Additionally, there has been little success with *S. foliosa* in the San Francisco Estuary, and new methods had to be tested and developed.

Revegetation sites were selected primarily where there were existing clapper rail populations that would benefit in the near term from habitat enhancement. Other sites were selected based on opportunities to develop field-based propagation techniques and establish propagule sources for adjacent tidal areas. In addition, at some sites high tide refuge islands are being constructed and densely planted. Over the past two years, the Program has installed over 165,000 plants with good success, and 90,000 plants will be installed next season totaling 255,000 plants in the first three planting seasons. The average survivorship for 2011-2012 varied: survivorship for *S. foliosa* surpassed the Program's target survivorship goal of 40% (at one site mean survivorship was 94%). Marsh plain *G. stricta* survivorship overall was 35% (several had survivorship over 50%). Future planting designs and treatments continue to be adapted to meet target survivorship goals.

Keywords: Restoration, Revegetation, Tidal Marsh, Invasive Species, Spartina, California Clapper Rail

Poster Topic: Birds

Breeding Status and Diet Trends of Two California Least Tern Colonies in the San Francisco Bay

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The two largest colonies of the California least tern (*Sternula antillarum browni*) in the San Francisco Bay Area, Alameda Point and Hayward, are located 10 miles apart. The Alameda Point colony, on the former Naval Air Station, Alameda, has grown at an average rate of 8.7% per year since its inception in 1976. Long-term breeding success at Alameda has averaged 0.83 fledglings per breeding pair. Breeding success has varied through time, with improved success in recent years. The Hayward colony is located on an island created from dredge materials in 2001; least terns began appearing at this island in 2003, and successful breeding attempts have been observed since 2006. This colony has grown at an average rate of 42.9% per year. Long-term breeding success has averaged 0.94 fledglings per breeding pair. It is suspected that when Alameda terns experience high disturbance and predation pressure, they move to the Hayward colony to breed (e.g., 2006, 2012), although there are no banded individuals to confirm this. Dropped fish have been collected from both colonies, and silversides (family Atherinopsidae) are the dominant dropped prey at both sites. Hayward terns forage mainly on nearshore species in the shallow marsh waters near their breeding site; Alameda terns forage on a greater variety of species found in Central and South Bay. While Atherinopsids remain the dominant dropped prey, northern anchovy (*Engraulis mordax*) have declined since the 1990s.

Keywords: California Least Tern, Alameda Point, Hayward, Population, Breeding Success, Diet

Poster Topic: Birds

Control of Invasive Exotic Mayweed Chamomile and its Effect on Nesting California Least Terns

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Invasive exotic plants are a major threat to many wild bird species. The rapid colonization of noxious weeds can result in substandard nesting habitat. The Hayward Regional Shoreline located along the eastern shore of San Francisco Bay, supports the second largest California Least Tern (*Sternula antillarum browni)* colony north of Ventura County. However, the rapid growth of Mayweed Chamomile (*Anthemis cotula*) starting in 2007 through the 2011 breeding season became the dominant cover plant creating crowded tern breeding conditions.

Results obtained using the line intercept method yielded a vegetation cover value of 30% (height of 24 cm) in 2007, while the vegetation cover value climbed to 90% (height of 30.25 cm) in 2011. This threefold increase in vegetative cover on the site started attracting nesting waterfowl, mammalian predators, and restricting tern-nesting opportunities by confining them to a few open space areas.

In an effort to reduce the crowded tern nesting conditions and presumably improve their reproductive success, licensed pest control advisers prescribed herbicides that have been proven to be “practically nontoxic” in laboratory conditions to curb this overgrowth of vegetation. Dow AgroSciences contributed a combination of Milestone®, Capstone®, Rodeo® and Dimension® specialty herbicides that were applied using the technical expertise and equipment of Caltrans specialists. During the 2012 tern breeding season the vegetation cover value was less than 10% (height of 23 cm), and a record number of 189 nests were incubated on the site producing 228 chicks. This presentation will highlight the success of this partnership that brought unique skills and resources to the table that accomplished more than any one of them could do alone.

Keywords: Invasive Mayweed, California Least Tern Nest Success, Herbicide Application

Poster Topic: Birds

South Bay Salt Ponds Restoration Project Design Revisions, Informed by Science, Implemented in Design and Construction: Ponds E12-E13 Islands and Foraging/Roosting Mounds

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The South Bay Salt Pond Restoration Project (SBSPRP) is the largest tidal wetland restoration project on the West Coast and will restore 15,100 acres of industrial salt ponds to a mosaic of tidal wetlands and other habitats. Project goals include reconfiguring 1,600 acres of salt ponds to provide optimal habitat for a variety of waterbirds, including shorebirds. The SBSPRP has enhanced 480 acres of ponds managed as part of the Don Edwards San Francisco Bay National Wildlife Refuge, and is constructing 240 reconfigured acres at Eden Landing Ecological Reserve (ELER). Pond enhancement and reconfiguration has provided nesting areas on islands and levees. On new islands constructed of excavated pond material, drying bay mud results in cracks which are obstacles to use and movement and have resulted in, and may continue to result in, mortality due to loss of chicks in cracks which cannot be exited. Cracking of island surfaces also can limit foraging and roosting. Cracking islands require periodic maintenance to regrade and is expensive and time consuming. At ELER, various construction methods have been employed to ensure new islands do not have cracks, including import of upland fill and various “toppings” such as oyster shells, gravel, and earth treated with lime. Newly constructed "test" islands that have these toppings appear to successfully mitigate cracking and will require less maintenance. Berms are also being constructed to vary slopes in ponds, to maximize foraging and roosting, some of which are submerged and not subject to cracking. Furthermore, island use and successful nesting and fledging may be impacted by location of islands, due to disturbance from trail users, according to recent studies. Therefore, island locations include 600-foot buffers from adjacent public access trails. We continue to use this applied science in planning, designing and constructing current, on-going and future SBSPRP actions.

Keywords: Reconfigured, Managed Salt Ponds, Waterbirds, Islands, Nesting, Foraging, Roosting

Poster Topic: Birds

Controlling Physical and Chemical Characteristics of Habitat Islands in the San Francisco Bay Estuary

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Islands in San Francisco Bay provide important nesting, resting, roosting, and foraging habitat for myriad waterbirds. However, creating islands that can provide persistent high quality habitat without continuous maintenance is challenging. Hyper-expansive soils cause large desiccation cracks when dry which are obstacles to waterbirds at best and death traps at worst. Vegetation growth on islands is undesirable for waterbirds as it limits nesting and other usages. Wind-wave erosion destroys important transitional foraging habitat and impedes island access for unfledged waterbirds. In order to seek solutions to cracking, vegetation, and erosion problems, test islands were constructed at Eden Landing Ecological Reserve. Five different surface treatments were installed on test islands and their physical and chemical properties were studied. Logistics of constructing new islands and modification of existing islands in shallowly flooded ponds with young bay mud soils were also considered. Waterbird usage was observed. Preliminary results indicate that surface treatments can affect cracking, erosion, and vegetation. Also, hauling surfacing material over saturated young bay muds can be unfeasible and expensive. By utilizing one or a combination of surface treatments, island habitat can be enhanced and its usable life extended. Ultimately this results in increased waterbird usage, higher nesting success and chick survival, decreased maintenance, and decreased capital construction costs.

Keywords: Islands, Nesting, Erosion, Desiccation, Foraging

Poster Topic: Birds