

EXECUTIVE SUMMARY

The mission of the Santa Monica Bay Restoration Commission (SMBRC) is to restore and enhance the Santa Monica Bay (Bay) through actions and partnerships that improve water quality, conserve and rehabilitate natural resources, and protect the Bay's benefits and values. The SMBRC is charged with implementing the Bay Restoration Plan, a stakeholder-developed plan that describes goals, objectives, and milestones to address the environmental problems facing the Bay and the Bay watershed. Scientific monitoring of the Bay's natural resources and restoring coastal wetlands are important parts of the Bay Restoration Plan.

In September 2010, the SMBRC completed the first year of surveys at the Ballona Wetlands Ecological Reserve (BWER). The comprehensive surveys were developed in partnership with the California Department of Fish and Game and the California State Coastal Conservancy to assess the condition of the BWER and inform the state's wetlands restoration planning. The surveys incorporated monitoring and assessment of biological, chemical, and physical components of the BWER ecosystem. Vegetation, seed core, terrestrial invertebrate, soil, and elevation surveys were conducted on permanent transects randomly located throughout all habitat types at the BWER. Additional biological data collected included surveys for small and large mammals, herpetofauna, ichthyofauna, benthic invertebrates, birds, and submerged aquatic vegetation (Table 1). Water quality data collected included dissolved metals, fecal indicator bacteria, nutrients, and additional parameters. This document provides a summary of the data collected during the first year of the Baseline Assessment Program (BAP) survey of the BWER. The second year of the BAP survey will be reported separately.

CHEMICAL ANALYSES

Water quality surveys are a critical component of the BAP. Comprehensive temporal and spatial data on the distributions of metals, nutrients (nitrates, nitrites and orthophosphates), and fecal indicator bacteria (total coliform, *E. coli*, and enterococci) were obtained by several methods. Two 24-hour studies of fecal indicator bacteria and nutrients were conducted in Ballona Creek, within the wetland tidal channels, and in the Fiji Ditch to assess conditions throughout the tidal cycle. Dissolved metals were sampled at eight water stations throughout the BWER on a quarterly basis. Runoff from 12 locations at small drainages and ponding areas during three storms (>1-inch) were also analyzed for metals to determine stormwater contaminant inputs to the BWER. Samples from terrestrial soils were also analyzed for phytoavailable trace metals.

Bacteria levels at most sites consistently exceeded Total Maximum Daily Load (TMDL) levels, sometimes by several orders of magnitude, while nutrient levels were typically below recommended targets. Dissolved copper, lead, and selenium were consistently above dry weather TMDL levels in each quarter

and at most stations. Zinc, copper, boron, barium, cadmium, lead, lithium, mercury, selenium, silver, and tin all exceeded acute toxicity levels for seawater during at least one quarterly sampling event¹.

Stormwater exceeded the TMDL wet weather numeric target for copper at seven of the 12 stations. Lead, selenium, and zinc all exceeded the TMDL wet weather numeric target at least once. Aluminum, boron, and cadmium exceeded acute toxicity levels¹ at multiple stations. The water and sediment quality analyses will continue in the second baseline year with reduced sampling frequency.

VEGETATION

A primary goal of the BAP was an intensive cross-habitat vegetation assessment. Vegetation cover surveys were conducted on randomly allocated transects throughout each habitat. Specific methods used depended on habitat type. In addition to vegetation surveys, terrestrial invertebrate, soil, and elevation surveys were conducted on a subset of transects to evaluate ecosystem-level function of the habitat. The objective of the vegetation surveys was to determine average percent cover of species using both transect-level and habitat-level assessments. Several methods were used to assess percent cover and diversity because of the differing conditions across multiple habitats (e.g. plant height and density, species diversity, topography). The tidally influenced lower marsh habitats were surveyed via laser quadrat method. Percent cover was evaluated using size classes to survey the upland dune, scrub, and grassland habitats. Canopy heights were also recorded. Targeted surveys for all species of special concern were conducted throughout the BWER.

Species lists and relative abundances were tallied and analyzed across several variables, including habitat, area, and native or non-native classifications. Preliminary results from the first year of the BAP indicated dominant cover of non-native plant species in the upland habitats and dominant cover of native species within the marsh habitats. The most common non-native species in upland areas included: iceplant (*Carpobrotus edulis*), black mustard (*Brassica nigra*), riggut chess (*Bromus diandrus*), and crown daisy (*Chrysanthemum coronarium*). The most common native species in the tidal marsh habitats included: common pickleweed (*Salicornia virginica*), alkali weed (*Cressa truxillensis*), and Parish's pickleweed (*Salicornia subterminalis*). Surveys for species of special concern will continue in year two.

VERTEBRATES

The Ballona Wetlands region has suffered a decline in native populations, a reduction in species ranges, and an increase in introduced species throughout the last century (Friesen et al. 1981). Studies spanning the last few decades have shown a decline in native vertebrate populations in the BWER. Up-to-date

¹ Toxicity levels based on EPA Ambient Water Quality Criteria

comprehensive vertebrate surveys are imperative to establish current ranges and species presences at the site. The data collected during the BAP surveys were compared to previous surveys.

Ichthyofauna

Ichthyofauna sampling occurred three times during the first year of baseline assessment: September 2009, April 2010, and July 2010. Sampling methods employed a combination of blocking nets and beach seines, minnow traps, and shrimp trawls. Surveys were conducted in Ballona Creek, the Fiji Ditch, and the tidal channels within Area B of the BWER at six permanent stations: three in the Fiji Ditch, and three in the tidal channels. These stations were a subset of the invertebrate, sediment, and water quality sampling stations. Additionally, five 250m trawls were conducted in Ballona Creek.

The beach seine surveys identified a total of eight native species: topsmelt (*Atherinops affinis*), arrow goby (*Clevelandia ios*), California killifish (*Fundulus parvipinnis*), longjaw mudsucker (*Gillichthys mirabilis*), diamond turbot (*Hypsopsetta guttulata*), Pacific staghorn sculpin (*Leptocottus armatus*), striped mullet (*Mugil cephalus*), and round stingray (*Urobatis halleri*); one non-native species was identified, the western mosquitofish (*Gambusia affinis*). Macroinvertebrates caught in the surveys were also identified. The most common invertebrate captured in the seines was the California horn snail (*Cerithidea californica*).

Herpetofauna

Surveys throughout the BWER have recorded up to ten species of herpetofauna. Several surveys for endangered and special concern herpetofauna species in the last 25 years have found only one endangered species, the California legless lizard (*Anniella pulchra*). The California legless lizard was confirmed in several locations during the first year BAP surveys, including one dune habitat where it had not been found in almost 20 years, according to previous BWER reports.

Surveys during the first baseline year were conducted over three seasons (early fall, spring, and early summer) in four habitat types (seasonal wetland, upland grassland, upland scrub, and dune). To obtain comprehensive information, several sampling methods were utilized throughout the site. Pitfall and driftnet arrays were employed in several of the major habitats including site searches, cover board flipping, and targeted surveys for the California legless lizard within potential habitat areas.

The pitfall traps had a wide variety of success rates, depending on the habitat. The dune habitat had a significantly greater overall capture rate than any of the other habitats (34.62%). Herpetofauna identified during the baseline year included eight species: Great Basin fence lizard (*Sceloporus occidentalis*), western side-blotched lizard (*Uta stansburiana*), San Diego alligator lizard (*Elgaria multicarinata*), California kingsnake (*Lampropeltis getulus*), San Diego gopher snake (*Pituophis*

melanoleucus), Southern Pacific rattlesnake (*Crotalus viridis*), Baja California treefrog (*Pseudacris regilla*), and the California legless lizard. Amphibian and reptile surveys will continue in year two with the addition of cover board array surveys.

Mammals

Mammals are an important link in functioning wetland and upland ecosystems. Surveys over the past 29 years throughout the Ballona Wetlands have found 16 mammal species (nine native and seven non-native). Three of the species identified from past reports are listed as California species of special concern, although no special status species were identified during the first baseline year. In the 2010 baseline surveys, mammal surveys were conducted using Sherman live traps for small mammals and baited camera stations (Critter Cams) for medium and large mammals.

Eight native species were live captured using Sherman traps, observed visually, or observed using Critter Cams during the first baseline year: California ground squirrel (*Spermophilus beecheyi*), coyote (*Canis latrans*), desert cottontail (*Sylvilagus audubonii*), pocket gopher (*Thomomys bottae*), raccoon (*Procyon lotor psora*), striped skunk (*Mephitis mephitis*), western harvest mouse (*Reithrodontomys megalotis*), and California meadow vole (*Microtus californicus*). Five non-native species were observed or captured: Virginia opossum (*Didelphis virginiana*), house mouse (*Mus musculus*), domestic dog (*Canis familiaris*), domestic cat (*Felis catus*), and rat (*Rattus sp.*).

Avifauna

While birds are one of the most commonly observed groups of animals at the BWER, they are seldom surveyed comprehensively. Site-wide quarterly surveys were performed in October 2009, January, April, and July 2010. Digitized spot-maps display the spatial and temporal distribution of birds on the reserve, as well as their observed relative abundances. During fall and winter of the baseline year, "post-rain" rapid-count censuses were also conducted. Waterbird surveys were conducted on a semi-monthly basis. Between March and June 2010, supplemental visits were made to several of the more productive breeding habitats around the reserve in an effort to fully document nesting occurrences and site usage by nesting species that fell outside the scheduled April and July surveys. Potential nesting areas of special-status species were also visited. Protocol surveys were performed for two special-status species: the Least Bell's Vireo (*Vireo bellii pusillus*) and Belding's Savannah Sparrow (*Passerculus sandwichensis beldingi*). Volunteer waterbird and raptor censuses were conducted monthly and contribute to the professional avian surveys.

A total of 156 species and distinctive subspecies were recorded during the first year of baseline assessment (combining all survey types). A total of 11 special status species were confirmed on site during the quarterly surveys: Belding's savannah sparrow (*Passerculus sandwichensis*), brown pelican

(*Pelecanus occidentalis*), Cooper's hawk (*Accipiter cooperii*), elegant tern (*Thalasseus elegans*), Least Bell's vireo (*Vireo bellii pusillus*), loggerhead shrike (*Lanius ludovicianus*), long-billed curlew (*Numenius americanus*), northern harrier (*Circus cyaneus*), peregrine falcon (*Falco peregrinus*), Vaux's swift (*Chaetura vauxi*), and white-tailed kite (*Elanus leucurus*). The California gnatcatcher (*Polioptila californica*) was seen on site after the completion of the first year baseline surveys.

INVERTEBRATES

The benthic infaunal and epifaunal aquatic invertebrate communities provide essential ecosystem services and support. The presence or absence of certain infaunal taxa within the tidal channels can indicate water quality, identify anthropogenic stressors to the estuary, and gauge the potential to support other trophic levels. Assessments of benthic invertebrate community composition have been conducted in Area B multiple times between 1981 and 2004; data from Areas A and C are limited. For the BAP, infaunal benthic invertebrate sampling was conducted semi-annually in seven locations: two in Area A and five in Area B. Existing protocols were utilized and adapted to the specific needs of the BWER. Presence and relative abundance were calculated for general taxonomic groups at each location. Species-level taxonomic identification will be conducted in year two. Epifaunal benthic invertebrate surveys for California horn snail (*Cerithidea californica*) were conducted using transects on the mudflat habitats.

Flying aerial arthropod biomass surveys were also conducted. The objective was to extrapolate arthropod biomass by weight for each habitat using sticky traps. Results of flying invertebrate data indicate the lowest productivity in the brackish marsh and fairly uniform productivity in the low salt marsh, mid salt marsh, and salt pan habitats. The upland grassland had the highest aerial arthropod productivity and the highest level of variability. Species-level terrestrial surveys will be conducted in year two.

Table 1. Calendar of completed survey events by month for the first year of the BAP at the BWER.

TARGET		SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	FREQUENCY	
CHEMICAL	Water Quality - Metals	X			X			X			X			quarterly	
	Water Quality - Bacteria	X					X					X	X	dry, wet, and post-wet season	
	Water Quality - Nutrients *						X->	<-X->	<-X					annually	
	Water Quality - Stormwater - metals		X			X			X					once during wet season	
	Water Quality - perm. data sonde	<-X->	throughout year												
	Sediment - Metals	X						X							semi-annually
	Soils - Metals & grain size											X->	<-X->	<-X->	once every 2-5 years
BIOLOGICAL	Vegetation - submerged/algae	X			X			X			X			quarterly	
	Vegetation - marsh	<-X->	<-X										X->	bi-annually	
	Vegetation - uplands							X->	<-X->	<-X->	<-X->	<-X		bi-annually	
	Vegetation - marsh-wide transect	<-X											X->	bi-annually	
	Vegetation - biomass													bi-annually	
	Seed bank study				X->	<-X->	<-X->	<-X							annually
	Birds - volunteer surveys	X	X	X	X	X	X	X	X	X	X	X	X	X	monthly
	Birds - professional surveys		X			X			X				X		quarterly (+ post-rain surveys)
	Small Mammals			X								X->	<-X		twice annually (fall & spring)
	Large Mammal *					X->	<-X->	<-X->	<-X->	<-X->	<-X->	<-X->	<-X		throughout spring & summer
	Herpetofauna *			X					X->	<-X->	<-X->	<-X			semi-annually (fall & spring)
	Fish - channels, ditch, and Creek *	X						X				X			semi-annually (fall & spring)
	Invert - flying	<-X->	<-X									X->	<-X->	<-X->	annually (spring/summer)
	Invert - terrestrial	<-X->	<-X									X->	<-X->	<-X->	annually (spring/summer)
	Invert, infauna - benthic	X							X						semi-annually
Plant Vouchering *					<-X->	<-X->	<-X->	<-X->	<-X->					spring	
Insect Vouchering *					<-X->	<-X->	<-X->	<-X->	<-X->					spring	
PHYSICAL	Inundation													semi-annually (spring tides)	
	Elevations *										X->	<-X->	<-X->	every 5 years	
	Channel Cross-Sections													annually	
	Piezometers													annually	

* = independent student project



Figure 1. Map of the BWER with sampling locations identified. The yellow outlines indicate the extent of Areas A, B, and C, but do not indicate the full project site outline. Terrestrial invertebrates, soil quality, and elevation surveys were completed on a subset of the randomly allocated vegetation transects (green). Fish, sediment, and benthic invertebrate surveys were completed at a subset of the water quality stations (blue). Herpetofauna and small mammal surveys are indicated by red markers.