

## 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's watersheds. Scientific monitoring of the Bay's natural resources and restoring coastal wetlands are important parts of the Bay Restoration Plan.

In September 2011, the SMBRC completed the second year of baseline assessment 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, 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, vertebrate mortality along roads, 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. Sediment quality data included trace metals, amphipod toxicity, grain size, and total organic carbon. This document provides a summary of the data collected during the second year of the Baseline Assessment Program (BAP) survey of the BWER.

### CHEMICAL ANALYSES

Water quality surveys were 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 [FIB (i.e. total coliform, *E. coli*, and enterococci)] were obtained through water column stratification studies in the second baseline year. Overall, water quality sampling showed high levels of FIB, and indicated that the tidal portion of the BWER generally functions as a sink, rather than a source of bacteria, with higher bacteria numbers in the Ballona Creek estuary than in the tide channels. Bacteria levels at most sites consistently exceeded Total Maximum Daily Load (TMDL) levels, sometimes by several orders of magnitude. Nutrient levels overall were low.

Dissolved metals in water were tested once in January 2011 at seven stations, to capture one-time wet season values. Dissolved metals exceeding acute toxicity levels (USEPA 2009) at multiple stations included: zinc, copper (all stations), cadmium, selenium, and tin. Additionally, dissolved metals exceeding chronic toxicity levels (USEPA 2009) at multiple stations included: iron, boron (all stations), cadmium, cobalt, and lead.

Marine sediment surveys at seven stations were assessed in the first baseline year using a gentle extraction method (extractable ammonium bicarbonate diethylene triamine pentaacetic acid or DTPA), to assess bioavailability of trace metals within the sediments. Marine sediment surveys were assessed during the second baseline year using an acid digestion method to evaluate the soluble, exchangeable, and bulk mineral forms of the metals for comparison. Results during the first year indicated an exceedance [evaluated using ERL limits (USEPA 1996)] at one station during the first baseline year (BW8). All stations in the second baseline year trace metals and elements results had at least one metal exceedance using the strong acid digestion. Stations BW5, BW7, and BW9 exceeded limits for all elements evaluated against ERLs (i.e. arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc).

Carbon sequestration and analysis of stratification of carbon and other organic matter in the soil was scheduled to be completed, but due to permit restrictions, these surveys were not conducted.

## VEGETATION

The objective of the vegetation surveys was to determine average percent cover of species using both transect-level and habitat-level assessments. Vegetation cover surveys were conducted on randomly allocated transects throughout each habitat. 122 vegetation transects were surveyed in the second baseline year including 51 in the salt marsh habitat types and 71 in non-salt marsh habitat types. 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. In addition to vegetation surveys, terrestrial and aerial invertebrate surveys were conducted on a subset of transects to evaluate ecosystem-level function of the habitat.

All transects in Area C had greater than 10% non-native vegetative cover; nine of 13 transects had greater than 50% non-native cover (69.2% of the Area C transects). All transects in Area A except for two had greater than 10% non-native vegetative cover; two additional transects had cover between 11-25%, and the rest (26 transects) had greater than 26% non-native cover. Conversely, the salt marsh habitats had predominantly native cover. The muted tidal marsh of Area B had a higher percent cover of native plant species than either Area A or C.

Results for the salt marsh habitats indicated that the low marsh habitat type had the highest average percent cover of native species at  $92.5 \pm 2.6\%$ , followed by the mid marsh ( $77.7 \pm 8.2\%$ ) and the high marsh ( $65.1 \pm 8.8\%$ ). Results for the non-salt marsh habitats indicated that the brackish and freshwater habitats had a higher average percent cover of native species ( $66.6 \pm 8.5\%$  and  $60.5 \pm 11.8\%$ , respectively) than non-native species; the brackish marsh habitat had the highest average native percent cover of the non-salt marsh habitats evaluated.

Species lists and relative abundances were tallied and analyzed across several variables, including habitat, area, and native or non-native classifications. Results from the second year of the BAP indicated overall 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: black mustard (*Brassica nigra*), crown daisy (*Glebionis coronaria*), and iceplant (*Carpobrotus edulis*). The most common native species in the tidal marsh habitats included: common pickleweed (*Salicornia pacifica*), fleshy jaumea (*Jaumea carnosa*), saltgrass (*Distichlis spicata*), alkali weed (*Cressa truxillensis*), and Parish's pickleweed (*Arthrocnemum subterminale*).

Nineteen plant species germinated in the soil cores; six were native species representing 45% of the total number of germinated seedlings on transects. *S. pacifica* represented 42% of the seedlings on the vegetation transects and 47% of the seedlings on the channel bank transects.

Overall, the pattern of percent cover of native species and non-native species in each habitat was similar between both baseline years.

## VERTEBRATES

The Ballona Wetlands region, and the BWER, has suffered a decline in native vertebrate populations, a reduction in species ranges, and an increase in introduced species throughout the last century (Friesen et al. 1981). Up-to-date comprehensive vertebrate surveys are imperative to establish current ranges and species presences within the BWER.

### *Ichthyofauna*

Ichthyofauna sampling occurred three times during the second baseline assessment year: September 2010, April 2011, and July 2011. Sampling methods employed a combination of blocking nets and beach seines, and shrimp trawls. The blocking net and beach seine surveys were conducted at six permanent stations within the BWER: three in the Fiji Ditch in Area A, and three in the tidal channels within Area B. These stations were a subset of the invertebrate, sediment, and water quality sampling stations. Single-day shrimp trawl surveys were conducted during July and September 2011 in Ballona Creek following protocols from the first baseline year.

The beach seine surveys identified a total of seven 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*), and round stingray (*Urobatis halleri*); one non-native species was identified, the western mosquitofish (*Gambusia affinis*). The most common fish caught using the beach seine method was topsmelt, with 593 individuals across all sites. Killifish and arrow gobies were the next most abundant species, with 516 and

382, respectively. Macroinvertebrates caught in the surveys were also identified. The most common invertebrate captured in the seines was the California horn snail (*Cerithidea californica*).

A total of five species of fish were found in the shrimp trawl surveys in Ballona Creek: giant kelpfish (*Heterostichus rostratus*), California halibut, (*Paralichthys californicus*), California lizardfish, (*Synodus lucioceps*), diamond turbot (*Hypsopsetta guttulata*), and kelp bass (*Paralabrax clathratus*). Three species not identified in the first baseline year (i.e. California lizardfish, kelp bass, and giant kelpfish) were captured in the second baseline year shrimp trawls.

### ***Herpetofauna***

Surveys throughout the BWER recorded ten species of herpetofauna during the second baseline year. 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, a California Species of Special Concern, was confirmed on site in the dune habitats of Area B in the first Baseline year (Johnston et al. 2011). In order to minimize habitat disturbance, legless lizard survey protocols were not repeated in the second year, however continued presence was confirmed in Area B dune habitats during coverboard surveys.

Surveys for the second baseline year were altered to assess a wider diversity of herpetofauna species and to address potential data gaps. Cover board surveys were implemented in an effort to capture both snakes and lizards with less effort than the first baseline year. Cover board surveys consisted of 190 sheets of plywood placed in arrays over rodent burrows. A combination of cover board surveys and site searches resulted in the confirmed presence of ten herpetofauna species including: 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*), California legless lizard (*Aniella pulchra pulchra*), San Bernardino ring-necked snake (*Diadophis punctatus modestus*), and garden slender salamander (*Batrachoseps major*). Two species (i.e. San Bernardino ring-necked snake and garden slender salamander) not identified in the first baseline year were confirmed using the cover board array method in the second baseline year.

### ***Mammals***

Mammals are an important link in functioning wetland and upland ecosystems. In the 2011 baseline surveys, mammal surveys were conducted using targeted Sherman live traps for small mammals, road mortality surveys, and baited camera stations (Critter Cams) for medium and large mammals.

Targeted Sherman live trap surveys were conducted fall 2011 in salt marsh habitats, primarily to confirm presence of the South Coast marsh vole (*Microtus californicus stephensi*), a California Species of Special

Concern. Forty-eight western harvest mice (*Reithrodontomys megalotis*) were captured during the surveys with an overall capture rate of 13.3%. The South Coast marsh vole was not captured during the live trapping surveys, yet visual observations identified a vole species (*Microtus Californica*) as present. The species is believed to be the South Coast marsh vole due to habitat and historic records but cannot be confirmed without skull measurements.

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*), Eastern fox squirrel (*Sciurus niger*), domestic dog (*Canis familiaris*), domestic cat (*Felis catus*), and rat (*Rattus sp.*).

Semi-monthly vertebrate mortality surveys were initiated in the second baseline year to identify the locations, time of year, and species most affected by the thoroughfares bisecting the BWER. The highest mortality rates were in July (4.7 kills/ mile) and the lowest in March (1.5 kills/ mile). The most commonly identified vertebrate mortality species over the course of the second baseline year were cottontail rabbits, squirrels, and opossums.

### ***Avifauna***

While birds are one of the most commonly observed groups of animals at the BWER, they are seldom surveyed comprehensively. Reserve-wide semi-annual surveys were performed in October 2010 and April 2011. Digitized spot-maps display the spatial and temporal distribution of birds on the reserve, as well as their observed relative abundances. Waterbird surveys were conducted on a semi-monthly basis. Protocol surveys were performed for two special-status species: the Light-footed Clapper Rail (*Rallus longirostris levipes*) and the California Gnatcatcher (*Polioptila californica*).

A total of 135 species and distinctive subspecies were recorded during the second year of baseline assessment (combining all survey types). Bird species richness was similar between both the first and second baseline year reserve-wide surveys (68 species in October 2010 vs. 64 species in October 2009; 69 species in April 2011 vs. 72 species in April 2010). Sixty-seven species were recorded along the Ballona Creek channel during five, one-day waterbird surveys. February 2011 had the highest numbers of individual birds (2,009 individuals of all species combined) and June 2011 had the lowest usage of Ballona Creek (188 individuals).

A total of 26 special-status species were detected during the second baseline year. This total includes vagrant species that use the site very briefly, or in small numbers, presumably en route to breeding or wintering grounds elsewhere. A total of seven special status species were detected on site exhibiting the behavior for which a special status listing is afforded (e.g. nesting): Belding's savannah sparrow

(*Passerculus sandwichensis*), California gnatcatcher (*Polioptila californica*), Cooper's hawk (*Accipiter cooperii*), Double-crested Cormorant (*Phalacrocorax auritus*), Merlin (*Falco columbarius*), Vesper Sparrow (*Pooecetes gramineus*), and Western Meadowlark (*Sturnella neglecta*).

## INVERTEBRATES

The benthic infaunal and epifaunal aquatic invertebrate communities provide essential ecosystem services and support. The presence or absence of certain infaunal taxa within tidal channels and mudflats can indicate water quality, identify anthropogenic stressors to the estuary, and gauge the potential to support other trophic levels. For the second year of the BAP, infaunal benthic invertebrate sampling was conducted semi-annually (October 2010 and April 2011) in seven locations: two in Area A and five in Area B. Sampling, processing, and preservation methods followed those outlined in the first baseline year for October. The October samples were sorted and analyzed using preliminary processing methods only and are therefore not included in the species-level results.

The April 2011 samples were sorted and identified to the lowest practicable taxon by benthic invertebrate taxonomists at Dancing Coyote Environmental (DCE, Inc.). A total of 9,064 individuals representing forty-two taxa were identified in small and large cores in April of the second baseline assessment year. *Monocorophium insidiosum*, *Grandidierella japonica*, *Capitella capitata* Cmplx, *Acteocina inculta*, *Oligochaeta*, and *Streblospio benedicti* were the most common species found in order of greatest to lowest density of individuals / m<sup>2</sup>.

Epifaunal invertebrate surveys followed the methods utilized in the first baseline year with the addition of Transect 4 and increased frequency from semi-annually to quarterly (January, March, June, and September 2011). Epifaunal benthic invertebrate surveys consisted of *in situ* counts of the California horn snail (*Cerithidea californica*). *C. californica* abundances were found to be highest in March 2011 (422.8 individuals / m<sup>2</sup>) and lowest in September 2011 (239.0 individuals / m<sup>2</sup>).

Flying aerial arthropod biomass surveys were conducted following the methods from the first baseline year. The objective was to extrapolate arthropod biomass by weight (mg/m<sup>2</sup>/day) for each habitat using sticky traps. Results of flying invertebrate data indicate the lowest productivity in the salt pan habitat and fairly uniform productivity in the brackish marsh, low salt marsh, mid salt marsh, high salt marsh, and upland scrub habitats. The seasonal wetland had the highest average total aerial arthropod productivity and the highest level of variability between transects. Three special status butterfly species were observed at the BWER during the second baseline year. The Monarch butterfly, *Danaus plexippus*, and the Wandering skipper, *Panoquina errans*, were observed during site-wide surveys. The Federally Endangered El Segundo blue butterfly, *Euphilotes battoides allyni*, was observed on 19 July 2011 (D. Cooper, Cooper Ecological, pers. comm. 2011). Species-level terrestrial surveys will be conducted in the third Baseline year utilizing pitfall traps.

Table 1. Calendar of completed survey events by month for the second year of baseline assessments at the BWER.

TARGET		SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	FREQUENCY	
CHEMICAL	Water Quality - Metals					X									semi-annually	
	Water Quality - Bacteria							X	X						dry and wet season	
	Water Quality - Nutrients							X	X						dry and wet season	
	Water Quality - perm. data sonde	<-X->	throughout year													
	Sediment - Metals							X							semi-annually	
	Soils - Metals & grain size	<-X->	<-X												once every 2-5 years	
BIOLOGICAL	Vegetation - submerged/algae	X			X			X			X			X	quarterly	
	Vegetation - upland habitats								X->	<-X->	<-X				annually (spring)	
	Vegetation - marsh habitats												X->	<-X	annually (summer)	
	Seed bank study					X->	<-X->	<-X->	<-X->	<-X					annually	
	Birds - volunteer surveys	X	X	X											monthly	
	Birds - professional surveys					X			X						wintering & nesting surveys	
	Small Mammals												X->	<-X	targeted surveys	
	Large Mammal	<-X->	<-X->	<-X				X->	<-X->	<-X->	<-X->	<-X->	<-X->	<-X->	<-X	throughout year
	Herpetofauna (coverboards)						<-X->	<-X->	<-X->	<-X->	<-X				late winter through spring	
	Fish - channels and ditch	X							X			X			semi-annually (fall & spring)	
	Fish - Ballona Creek	X										X		X	semi-annually (fall & spring)	
	Invert - flying	<-X->	<-X								X->	<-X->	<-X->	<-X->	<-X	annually (spring/summer)
	Invert - terrestrial	<-X->	<-X								X->	<-X->	<-X->	<-X->	<-X	annually (spring/summer)
Invert, infauna - benthic		X						X						semi-annually		
PHYSICAL	Innundation											X	X	X	semi-annually	
	Elevations		X->	<-X		X->	<-X								every 5 years	
	Channel Cross-Sections									X	X	X			biannually	
	Roadkill surveys	X	X	X	X	X	X	X	X	X	X	X	X	X	semi-monthly	