ATTACHMENT B: ENTOMOLOGY REPORT

Final Report

Oxford Basin Invertebrate Study

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Executive summary

Marina del Rey's Oxford Basin is one of the few remaining areas in Los Angeles County with intertidal mud flat habitat. Mud flats provide essential feeding grounds for numerous animal species.

Invertebrates, because of their omnipresence and pivotal role in the food chain, are key indicators of the health of an ecosystem. The aquatic invertebrate fauna of Oxford Basin, albeit somewhat impoverished, is not atypical for a Southern Californian coastal wetland. A broad selection of phyla was encountered from sieved, netted, benthic and non-benthic samples, indicating a functional ecosystem. Most abundant among the aquatic macro-invertebrates were the native California Mud Snail (*Cerithidea californica*), and Gammarid Amphipods, which are a primary food source and an important link in healthy lagunal ecosystems.

The Oxford Basin flora is predominantly non-native, and constitutes a degraded fundament for a terrestrial faunal ecosystem. The native and non-native terrestrial invertebrate fauna at Oxford Basin consists, for the most part, of species found in urban environments. Despite the relative abundance of non-native plant and invertebrate species, the ecosystem is functional, with primary consumers, and both primary and secondary predators, present. A few remarkable species were found at the site, including a Signal Fly (Platystomatidae), see figure 1, that appears to be a first record for California.

Besides Monarch Butterflies, and the Signal Fly mentioned above, no species of potential biological sensitivity were found. The Basin in its current state does not offer a suitable overwintering site for Monarch Butterflies. Recommendations for conservation are provided toward the end of the report.

This project had the following three goals:

- to provide a high-level baseline inventory of the invertebrates of Oxford Basin;
- to survey and document invertebrate species of potential conservation concern; and
- to establish recommendations for conservation.

These goals have been successfully completed.

Figure 1: **Signal Fly** (*Amphicnephes sp.*)

1 Introduction

This report describes the methods and provides the results of the Oxford Basin Invertebrate Study that took place between September 18, 2009 and May 24, 2010. The study concerns the Oxford Retention Basin in Marina del Rey, Los Angeles County, California (the Basin or simply "the site"). The site is located approximately one mile inland from the coast and is predominantly bounded by Washington Boulevard, Admiralty Way, and Oxford Avenue. Its approximate Global Positioning System (GPS) coordinates are: 33**d** 59' 07" North; 118**d** 27' 18" West, where boldface '**d**' stands for degrees, a single quote for minutes, and a double quote for seconds.

The approximately 10.7-acre site consists of a large retention basin covering approximately three to five acres, depending on the water level. The basin is under tidal influence and can be isolated from the Marina waters by closing a gate.

The site is surrounded by urban areas, but has relative proximity to a few natural areas. The site is approximately 1.5 mile northwest of the Ballona Wetlands, three miles northwest of the El Segundo Dunes remnant west of LAX International Airport, six miles southeast of the Santa Monica Mountains, and 13 miles north of the Palos Verdes Peninsula. These four areas harbor a relatively high biodiversity, including a number of endemics, threatened species, and various other species of concern.

This study involved a high-level baseline invertebrate survey of both the upland and aquatic habitats. A key focus of the project was in determining if any species of conservation concern might be present at the site. Another goal was to provide recommendations for invertebrate conservation. The following sections contain the results obtained toward these goals.

Figure 2: **Fiery Skipper** (*Hylephita phyleus*) female on **Sea-lavender** (*Limonium perezii*)

2 Invertebrate surveys

The following two subsections contain details on the methodologies used for the terrestrial and aquatic surveys, as well as a discussion of the data obtained.

2.1 Terrestrial invertebrates data collection

Common terrestrial invertebrates are mostly comprised of insects and arachnids (spiders and kin). Other, less abundant taxa include: isopods (sow bugs and kin), land snails, and earthworms. Terrestrial invertebrates can be divided into (1) herbivores and detrivores, which are the primary consumers, and (2) predators and parasites. The herbivores and detrivores comprise the lower levels of the food chain; they are an essential cornerstone of ecosystems. Terrestrial herbivores are usually associated with certain host- or food-plants, which are predominantly plants native to the area. Native plants are therefore the base for a healthy terrestrial ecosystem.

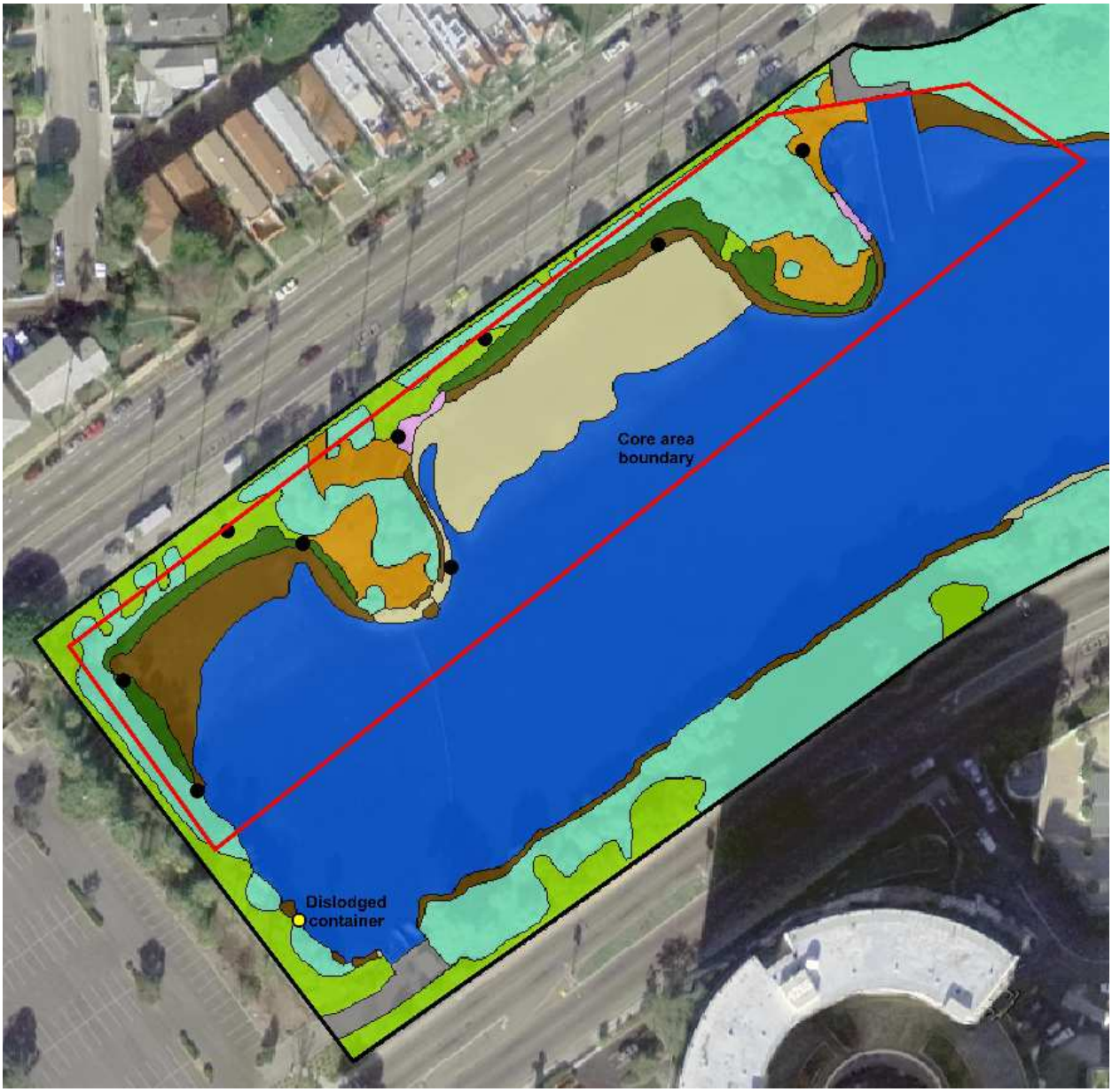
The majority of the upland area of the site is currently dominated by ruderal, non-native plant species, as documented in David Bramlet's accompanying botanical report. The biodiversity of the site is therefore expected to be compromised. The uplands of the site can be divided into "core" and "non-core" areas. The core areas include most of the basin's northwest and southwest banks, where native vegetation, such as Wild Heliotrope (*Heliotropium curassavicum*) and Common Woody Pickleweed (*Salicornia virginica*), is found. The rest of the site's uplands are non-core areas that harbor little to no native vegetation. Map 1 shows the core area delineated by a red line.

2.1.1 Methodology

The minimal impact terrestrial invertebrate survey was performed in stages, using the following methodologies:

- visual detection and photo-documenting salient organisms, as well as evidence of their presence;
- overnight pitfall trapping focused on flightless invertebrates; and
- beat-sheet collection.

Five field trips were conducted during the course of this project. The field trip dates were: September 23rd and 24th, 2009, October 5th, 2009, January 12th, 2010, and May 7th, 2010. Visual detection took place during all five visits of the site, with the bulk recorded on September 23 and 24, 2009, during unseasonably warm weather with high temperatures of approximately 85ºF. Ten pitfall traps, consisting of 1.75-liter white polypropylene containers with smooth, near-vertical walls, were placed on September 23, 2009 at various well-spaced locations between the waterline and the higher parts of the core upland areas. The locations of the pitfall traps are indicated by circles on Map 1. The next morning they were collected, and their content documented.



Map 1: Map of western part of Oxford Basin (adapted from vegetation map by David Bramlet). The red margined area delineates the core area. Pitfall trap locations are depicted by circles. The yellow circle indicates location of the pitfall trap container dislocated by the rising tide.

One container, which was placed closest to the waterline, was dislocated by the still rising water and only contained one terrestrial mite. The location of this contained is marked with a yellow circle on Map 1. The beat sheet collection took place on January 12, 2010. This technique involves beating vegetation with a stick to dislodge invertebrates that are caught on a large, white sheet placed below.

The organisms encountered were photographically recorded and the photos archived. Approximately 1,500 photos of specimens were taken during the project.

2.1.2 Terrestrial invertebrate data collected

The combined results from the three data collection methodologies are listed in Appendix A. Specimens in families already represented in the table, which were not yet identified to genus level, have been omitted.

2.1.3 Discussion

The Oxford Basin flora is predominantly non-native, and constitutes a degraded fundament for terrestrial faunal ecosystem. The native and non-native terrestrial invertebrate fauna at Oxford Basin consists, for the most part, of species typically found in urban environments. Despite the relative abundance of non-native plant and invertebrate species, the Basin's ecosystem is functional, including primary consumers and both primary predators (e.g., spiders) and secondary predators (e.g., spider wasps).

The terrestrial fauna is dominated by non-native species, in particular the Argentine Ant (*Linepithema humile*), which is discussed below. Another important non-native is the European Paper Wasp (*Polistes dominula*), which often outcompetes and then replaces native paper wasp species. Two out of three adult hemipteran species encountered are non-native to the United States. They are Bagrada Bug, also known as the Painted Bug (*Bagrada hilaris*), native to Africa, Southern Asia, and Southern Europe, and the Torpedo Bug (*Siphanta acuta*), see figure 7, native to Australia. The third adult hemipteran encountered was one exemplar of a plant bug (*Phytocoris* sp.), which is not commonly found in metropolitan Los Angeles.

Some native species were also found in relative abundance, like the Brine Fly (*Ephydra niveiceps*), which is associated with aquatic habitats, and the Sinuous Bee Fly (*Hemipenthes sinuosa*), as well as the Jumping Spider (*Habronattus pyrrithrix*) and the Margined Spurthroated Grasshopper (*Melanoplus marginatus*). The latter two are discussed below.

The most remarkable species found at the site was a beetle-like insect with a long aardvark like snout. It is a Signal Fly (Platystomatidae), see figure 1, and seems to be a new record for California. Robb Hamilton found one exemplar of this Signal Fly that looks like it belongs in genus *Amphicnephes*. There are only three species of *Amphicnephes* described in the world, all from America:

1. *A. fasciola*, with records from Kansas and Arizona,
2. *A. pullus*, which is relatively common and widespread in the Eastern Nearctic region, (west to Texas), and
3. *A. stellatus*, with records from southern and eastern Mexico.

The specimen is likely *Amphicnephes fasciola*, given that its distribution range, which includes Arizona, is the closest to Southern California of the three described species, and Coquillett's original description of *A. fasciola* [Coquillett 1900] matches reasonably well. On subsequent visits the principal investigator surveyed the area where the specimen was seen but did not find another exemplar as potential voucher specimen. It is likely that the restricted public access has contributed to the survival of this rarity at Oxford Basin.

A few species of special interest are discussed in some detail here:

Argentine Ant (*Linepithema humile*)

A species of special concern in terms of its abundance is the Argentine Ant (*Linepithema humile*). This small ant is abundant on the site, across much of Los Angeles County, and far beyond. It is an introduced, i.e. non-native, species that outcompetes native ant species [Nygard 2008] [Holway 1999] [Kennedy 1998] [Erickson 1971] [Human 1996] [Human 1998] and other invertebrates [Cole 1992] [Holway 1995] [Grover 2008]. In Los Angeles County, Argentine Ants have decimated the native California Harvester Ant (*Pogonomyrmex californicus*) and hence, indirectly their predator, the Coast Horned Lizard (*Phrynosoma blainvillii*), which primarily feeds on native ant species like the California Harvester Ant. No native ants were found at the site.

Margined Spurthroated Grasshopper (*Melanoplus marginatus*)

Only one species of grasshopper was found during the survey. This is the short-winged form of the Margined Spurthroated Grasshopper (*Melanoplus marginatus*), see figure 5, which was fairly common at the site. This species is endemic to California. The southern edge of its range includes part of the Santa Monica Mountains [Capinera 2004]. The Oxford Basin population may therefore represent its southernmost recorded occurrence. It is not clear if it is found in the Ballona Region, as only "*Melanopus species?*" is listed in the 1980-1981 entomology survey report [Schreiber 1981], and there are a number of other *Melanoplus* species present in the Los Angeles Basin. Increasing their distribution area is hampered by their short wings, which render them incapable of sustained flight and limits their dispersal, especially when surrounded by urban areas. Their local gene pool is therefore in danger of becoming impoverished.

Jumping Spider (*Habronattus pyrrithrix*)

The Jumping Spider (Salticidae) most often encountered during the survey is *Habronattus pyrrithrix*. This a common spider of the Los Angeles area, whose prime habitat includes wetlands. There seems to be a healthy population of these small jumping spiders at the site.

Spider Wasp (*Aporinellus sp.*)

A good-sized population of small, gray-and-black spider wasps (*Aporinellus sp.*) was present at the site. Despite a cosmopolitan distribution across the United States and beyond, they are uncommonly found in the Los Angeles metropolitan area. Their main prey is Jumping Spiders (see previous species account), which are food for their offspring. This renders these spider wasps secondary predators in this slender ecosystem.

2.2 Aquatic invertebrates

2.2.1 Methodology

The aquatic data collection was performed using a 500 micron D-frame net (BioQuip # 7412D). Sampling took place on Monday October 5th, 2009 near high-tide at various locations on the north and west side of the basin. These areas have the lowest bottom gradient, and consequently more extensive shallow areas, which usually have a higher invertebrate biodiversity. Before stepping into the water, we sampled the shallowest water depths, to minimize disturbance of potentially fast species. Next, we entered the water wearing waders and sampled up to deepest reachable areas, while standing in about 3 feet of water and using the 5-foot-long aquatic net handle. We first sampled the water column, followed by sweeps along the benthos, both with long, swift sweeps. The collected material was deposited into a wide white bucket. Next, the content of the bucket was transferred into collection jars using a 1-mm sieve for later examination in the lab.

2.2.2 Aquatic data

Our aquatic data collection, as described in section 2.2.1, resulted in specimens from a spectrum of phyla, as expected. We encountered large schools of juvenile fish, which were predominantly Mosquito Fish (*Gambusia affinis*, Phylum Chordata). This, and other fish species encountered at the site, are discussed in the accompanying fish report by Camm Swift of Entrix, Inc. We found the California Mud Snail (*Cerithidea californica*; Phylum Mollusca) in large quantities below the high-tide line, some Straight Horsemussels (*Modiolus rectus*), and a few other small to microscopic bivalves in the benthos. In the Phylum Arthropoda we found large numbers of Gammarid Amphipod (Suborder Gammaridae; Order Amphipoda) adults and immatures, as well as some Copepods (Class Maxillopoda) and the remains of one shrimp, which is apparently an Ocean (Smooth) Pink, also known as Pink Shrimp (*Pandalus jordani*; Order Decapoda; Class Malacostraca). We furthermore recorded relatively large numbers of Nematodes (Phylum Nematoda), some Flatworms (Phylum Platyhelminthes), Rotifers (Phylum Rotifera), and Seed Shrimp (Phylum Ostracoda), and various microscopic Protozoans (Phylum Protozoa), including some collared flagellates. Within each taxon we observed relatively little diversity.

This broad variety of organisms, plus the overall abundance of amphipods, indicates the relative health of the basin's water, and provides ample feeding grounds for various wildlife. Specifically, gammarid amphipods are a prime food source for fish and birds [McCurdy 2005] [Schneider 1981]. They also have a high sensitivity to environmental changes [Conlan 1994] [Zajac 2003], and monitoring their abundance can provide one useful measure of the quality of the ecosystem.

For completeness, we report collecting a wide spectrum of minute pieces of polymers (plastics) of all colors of the rainbow, as well as extruded polystyrene foam (Styrofoam) pellets, in our net. These ubiquitous particles typically become an undesired and unhealthy part of the food chain.

3 Species of potential concern

Species of concern range from those whose population survival is critically endangered and are formally protected by law, to rare, endemic, and other species whose populations may be declining due to urbanization, environmental pollution, or other threats. Invertebrate species of concern whose range includes, or potentially includes, the site, are discussed in the following subsections, grouped by information source.

3.1 Venice area species listed in the California Natural Diversity Database

The list of key species of concern for a certain area is usually obtained from the California Natural Diversity Database (CNDDB), which includes endangered species that are protected by law. The database contains the status and locations of rare plants and animals in California. The CNDDB data is linked to global status information, which is listed in the Global Natural Diversity Database (NDDB). The land area units used by the CNDDB correspond to Topographic Quadrangles (Quads), as defined by the United States Geological Survey (USGS). The standardized Quad map scale is 1:24,000 and the map covers an area measuring 7.5 minutes of latitude (approximately 8.5 miles) and 7.5 minutes of longitude (approximately 7 miles). The Oxford Basin is situated on the Venice Quad map. The CNDDB lists twelve species for the area covered by the Venice Quad map.

Table 1 contains the following information for each of these twelve species:

- scientific name (genus, species, and, where applicable, subspecies),
- common name,
- conservation status for the following five entities:
  - NDDB [CNDDB 2010]: “NDDB-rarity, Global”
  - CNDDB [CNDDB 2010]: “NDDB-rarity, CA”
  - Federal Endangered Species Act (ESA): “Fed.”
  - California Endangered Species Act (CESA): “(C)ESA, CA”
  - International Union for Conservation of Nature (IUCN) [IUCN 2010],
- whether the species was encountered during our surveys, and
- likelihood of presence at Oxford Basin.

Figure 3: **Plant Bug** (*Phytocoris sp.*)

Genus	Species	Sub-species	Common Name	Conservation Status					ob ser ved	Likelihood of presence at Oxford Lagoon
				NDDB-rarity		(C)ESA		IU		
				Global	CA	Fed.	CA	CN		
Brennania	belkini		Belkin's Dune Tabanid Fly	G1G2	S1S2	0	SC		no	low; lack of suitable sand dune habitat
Carolella	busckana		Busck's Gall Moth	G1G3	SH	0	SC	NE	no	very low; extirpated in L.A. County [LADoT 2009]
Cicindela	hirticollis	gravida	Sandy Beach Tiger Beetle	G5T2	S1	0	SC		no	very low; lack of suitable habitat.
Cicindela	senilis	frosti	Senile Tiger Beetle	G2G3 T1T3	S1	0	0		no	very low; possibly extirpated in L.A. Co.
Coelus	globosus		Globose Dune Beetle	G1	S1	0	SC	VU	no	very low; >50m from high-tide line; no fore-dune habitat.
Danaus	plexippus		Monarch Butterfly	G5	S3	0	SC		yes	present as migratory species
Eucosma	hennei		Henne's Eucosman Moth	G1	S1	0	SC		no	low; no host plant
Euphilotes	battoides	allyni	El Segundo Blue Butterfly	G5T1	S1	FE	0		no	low; no host plant
Onychobaris	langei		Lange's El Segundo Dune Weevil	G1	S1	0	SC	NE	no	low; lack of suitable sand dune habitat
Panoquina	errans		Wandering Skipper (Butterfly)	G4G5	S1	0	SC	NT	no	low; no host plant
Trigonoscuta	dorothea	dorothea	Dorothy's El Segundo Dune Weevil	G1T1	S1	0	SC		no	low; lack of suitable sand dune habitat
Tryonia	imitator		Mimic Tryonia (Brackish Water Snail)	G2G3	S2S3	0	SC	DD	no	very low; lack of suitable habitat; assumed extirpated in L.A. Co.

Table 1: Species listed in CNDDB for the area covered by the Venice Quad map
Abbreviations used: DD = Data Deficient; FE = Federally Endangered; NE = Not Evaluated; NT = Near Threatened; SC = Species of Concern; VU = Vulnerable; for (C)NDDB codes see [CNDDB 2010].

Some of the data in Table 1 is color coded. The conservation status data is color coded from red, representing the highest conservation level, via pinkish and brown, to beige-brown, representing the lowest level. If a species was observed during the survey, it is color coded green, otherwise brownish.

3.2 Notes on selected species

This section contains additional information on selected species listed in Table 1.

3.2.1 El Segundo Blue (*Euphilotes battoides allyni*)

The El Segundo Blue butterfly (*Euphilotes battoides allyni*) is the only taxon in Table 1 that is placed on the federal list of endangered species. It is endemic to the coastal sand dunes of southwestern Los Angeles County, which historically ranged from Westchester, which is situated southeast of Marina del Rey, southward to the Palos Verdes Peninsula [USFWS 1998]. Urbanization has drastically reduced their range to a few small disjunct populations. The site, being on the north side of Marina del Rey, is at least two miles northwest of Westchester. It is however located within the Ballona Recovery Unit for the El Segundo Blue butterfly

[USFWS 1998]. The larval food plant for the El Segundo Blue is Seacliff Buckwheat, also known as Dune Erigonium, (*Eriogonum parvifolium*), which is not found at the site. This, plus the fact that they do not stray far from their food plant, renders it quite unlikely that the El Segundo Blue will be found at the site.

3.2.2 Immitator Tryonia Snail (*Tryonia imitator*)

All but one of the 23 extant species of *Tryonia* snails live in fresh water habitats; most live in springs, some in lakes. The Immitator Tryonia (*Tryonia imitator*) is the only exception, having its habitat in brackish coastal water [Kellogg 1985]. When present, they are usually one of the more abundant among the macro-invertebrate benthos [Meffe 1983] with typical densities of 20,000 or more animals per meter square [Kellogg-1985], and hence unlikely to be missed. They have historically been found at two locations in Los Angeles County: San Pedro (extirpated) and Ballona Creek (1974) [Kellogg-1985]. Since the Basin receives an irregular influx of "fresh" water from the urban drains, mostly during the rainy season, it has a relatively high salinity and no permanent areas of brackish water. This, combined with the fact that we did not encounter any evidence of the presence of Immitator Tryonia during this survey, renders it highly unlikely that this rare species is present at the site.

3.2.3 Monarch Butterfly (*Danaus plexippus*)

During all of our site visits we recorded Monarch (*Danaus plexippus*) specimens passing by the site in an approximately east to west direction. Each specimen stayed only briefly near the site and visited a few flowers before continuing in westerly direction.

Monarch butterflies are migratory and are frequently seen in coastal Los Angeles County and beyond. Their numbers have been fluctuating over the years, with a distressing downward trend during the recent past [Xerces 2010]. They are a species of concern as they have a limited number of remaining overwintering sites. Their overwintering sites are covered by statues of the California Public Resources Code and the California Fish and Game Code.

Overwintering sites usually consist of groves of trees of mixed height and diameter, with an understory of brush and sapling trees [Calvert 1986], often adjacent to a clearing, to maximize protection from the wind, as well as avail from the winter season sun. The larger the grove, the more choices the butterflies have for relocation to areas with more optimal conditions. The vegetation moderates weather conditions and overall temperatures [Calvert 1981]. The Monarchs tend to avoid the tops of the trees to minimize exposure [Brower-2008], and favor the zone 15 to 50 feet above the ground. Availability of winter-blooming food-plants is also an important selection criterion for their overwintering sites.

Monarch butterflies feed on nectar from Milkweeds (*Asclepias* spp.) and Butterfly Mint (*Monardella* spp.) flowers. Other flowers that are used by the Monarch butterfly are: Black Sage (*Salvia mellifera*), Woolly Blue Curls (*Trichostema lanatum*), California Licorice Mint (*Agastache urticifolia*), Desert Willow (*Chilopsis linearis*), Dwarf Sunflower (*Helianthus gracilentus*), Brittlebush or California Bush Sunflower (*Encelia californica*), Nevin's Barberry

(*Mahonia nevinii*), Golden Currant (*Ribes aureum* var. *gracillimum*), Wild Hyacinth (*Dichelostemma capitatum*), Bladder Pod (*Isomeris arborea*), Blue Lobelia (*Lobelia dunnii*), and Venus Thistle (*Cirsium occidentale var. venustum*).

Some of the most important Monarch overwintering sites are along the coast of Central and Southern California. In Southern California, Monarchs usually overwinter in groves of Blue Gum (*Eucalyptus globulus*) or (River) Red Gum (*E. camaldulensis*) [Lane 1993], in a zone between a half mile and one mile from the coast. Even though the Oxford Basin is on the migratory path of the Monarchs, is located approximately one mile from the coast, and has both Blue Gum and Red Gum trees, it does not feature a grove of mixed height and diameter, with an understory of brush and sapling trees. It also lacks food plants for adult Monarchs. Hence it is unlikely that Monarchs will choose the site in its present condition for overwintering.

3.2.4 Sand Dune Tiger Beetle (*Cicindela hirticollis gravida*)

Sand Dune Tiger Beetles, also known as Sandy Beach Tiger Beetles (*Cicindela hirticollis gravida*), have been recorded from Playa del Rey in 1906. Their habitat is light-colored sand at the mouths of estuaries or barrier islands, which is not present at the site. This species of tiger beetle is very sensitive to contact with humans [Nagano 1980] and likely sensitive to human alteration of waterways [Brust 2006]. It is now apparently extinct from the mouth of Ballona Creek, which was the only remaining suitable habitat of the area [Schreiber 1981].

3.2.5 Wandering Skipper (*Panoquina errans*)

The Wandering Skipper butterfly (*Panoquina errans*) is found in a few locations in a narrow coastal strip between Santa Barbara and the cape region of Baja California [MacNeill 1962]. Its habitat is coastal salt marshes and estuaries near ocean bluffs and other open areas, and its host plants are Saltgrass (*Distichlis spicata* var. *spicata*) and Cordgrass (*Spartina foliosa*). Historically, Wandering Skippers were found in the Ballona region, but they were not found there during surveys performed between 1996 and 1998 [FHA 1998]. There is still a viable population at Malibu Lagoon in the Santa Monica Mountains area. Since the host plants are absent and no specimens were recorded during our survey, it is highly unlikely that the Oxford Basin supports a population of the Wandering Skipper.

Figure 4: **Sweat Bee** (*Halictus tripartitus*) female on **Alkali Heliotrope** (*Heliotropium curassavicum*)

3.3 Other CNDDB species

There are other invertebrates listed in the CNDDB with a historical distribution range that includes coastal Los Angeles County. These are three tiger beetle species and one freshwater mussel. The three tiger beetles, which are not listed in table 1, inhabit tidal flats and salt marshes:

- *Cicindela gabbi*, the **Western Tidal Flat Tiger Beetle**, also known as **Gabb's Tiger Beetle**;
- *Cicindela latesignata latesignata*, the **Western Beach Tiger Beetle**; and
- *Cicindela trifasciata sigmoidea*, the **Western S-banded Tiger Beetle**, also known as the **Mudflat Tiger Beetle**.

Tiger beetles are active on warm sunny days on open mud or sand. Their larvae inhabit burrows in the soils of the same habitats. Tiger beetles are severely threatened by urban expansion, insecticide use, and recreational use of coastal habitats.

The first tiger beetle listed above, *C. gabbi*, is a rare species that inhabits dark colored mud of upper mudflats and salt-pannes of coastal salt marshes. Its historic range stretched from Wilmington in southern Los Angeles County southward to northwestern Mexico. There exist three specimens labeled "Pt. Mugu, California," but Christopher Nagano feels these have been mis-labeled [Nagano 1980]. This tiger beetle species is very sensitive to urbanization pressure, and has been considered extirpated from Los Angeles County [Nagano 1980].

The second, *C. latesignata latesignata*, which inhabits coastal dunes and mudflats, is also very sensitive to urbanization pressure [Zedler 1982] [Pearson 2006]. It is historically known from San Pedro in southern Los Angeles County south to Baja California in Mexico. Its U.S. range has shrunk from three Southern California counties to one location in San Diego County [Nagano 1980] [Pearson 2006].

The third, *C. trifasciata sigmoidea*, inhabits mudflats and other areas with dark-colored, moist-to-wet sands, has been exterminated from the historic Venice Salt Marsh area, which is now Marina del Rey, except the Ballona Creek Region [Schreiber 1981]. Given the history of Oxford Basin, and it being surrounded by intense urbanization, plus the fact that we found no evidence of these tiger beetles during our survey studies — some of which took place in warm, sunny weather within their annual adult activity period — it is highly unlikely that this beetle is present at the site.

The last of the four species mentioned above is *Anodonta nuttalliana*, the **Winged Floater**. This is a freshwater mussel found on muddy and sandy bottoms in rivers and lakes [Clarke 1981], which is habitat that does not occur on the site.

For completeness we list a few species, listed in the CNDDB, whose historical range is in relative proximity of the site:

- *Coelus pacificus*, the **Channel Islands Dune Beetle**, is considered endemic to the California Channel Islands [Miller-1985].
- *Glaucopsyche lygdamus palosverdesensis*, the federally endangered **Palos Verdes Blue Butterfly**, whose larval foodplants, Rattlepod (*Astragalus trichopodus lonchus*) and Deervetch (*Lotus scoparius*) are not present on the site. This species is restricted to the Palos Verdes Peninsula area, more than twelve miles from the site.
- *Gonidea angulata*, the **Western Ridged Mussel**, is restricted to freshwater habitat, which is not (permanently) available on the site.
- *Haplotrema caelatum*, the **Slotted Lancetooth Snail**, is a little-known terrestrial snail with a distribution from coastal Central California south to northwestern Baja California, Mexico. No Slotted Lancetooth snails were found during this study.
- *Helminthoglypta traski coelata*, also known as *Helminthoglypta coelata*, the **Peninsular Range Shoulderband**, is another little-known land snail. This two centimeter diameter crepuscular snail has been found in rock slides beneath bark and rotten logs, and in coastal vegetation [SD-DPLU 2009]. The holotype is from Pacific Beach, in San Diego County, California.
- *Rhaphiomidas terminatus terminatus*, the **El Segundo Flower-loving Fly**, has historically been described from the El Segundo Dunes, and is now considered extirpated at that location [Mattoni 1994]; a small population survives on the Palos Verdes Peninsula. Its dune habitat, as well as its apparent preferred vegetation, California Croton (*Croton californicus*), are absent from Oxford Basin.

Figure 5: **Margined Spurthroated Grasshopper** (*Melanoplus marginatus*)

3.4 NatureServe

NatureServe is a non-profit conservation organization whose mission is to provide the scientific basis for effective conservation action. The NatureServe database is a leading source for information about rare and endangered species and threatened ecosystems. It contains the species included in the CNDDB. It also lists a species, with a historical range encompassing coastal Los Angeles County whose vulnerability has not yet been ranked by NDDB or CNDDB. This unranked species is *Psammobotys fordi*, **Ford's Sand Dune Moth**. The adults of this snout moth in the Crambidae family nectar at *Gnaphalium*, which is not present at the site. The moth is endemic to the El Segundo dunes and is suspected to be extinct [Mattoni 2000].

3.5 Other sources

For completeness, we list species of potential concern from the undisturbed remnant of the El Segundo Dunes west of Los Angeles International Airport and from the Ballona Wetlands and surrounding areas in Playa del Rey. A number of these species are rare, and some have not been formally described and do not yet have a scientific species name. None of these species have been recorded from the site during this project.

- *Aegialia convexa*, the **Dune Scarab Beetle** is a 4.5 millimeter long, black to dark-brown scarab beetle, found on ocean beaches;
- *Aptostichus simus*, the **Dune Trapdoor Spider**, which has been reported from the El Segundo Dunes, in Los Angeles County, north to Monterey County. Its habitat is fairly steep, undisturbed, south-facing slopes of packed sand, which are not present at the site;
- *Comadia intrusa*, the **El Segundo Goat Moth**, uses **Dune Lupine** (*Lupinus chamissonis*) as host plant, which does not occur on the site;
- *Copablepharon sanctaemonicae*, the **Santa Monica Dunes Moth**, is restricted to sand dune habitats, and primarily found in foredunes. Its host plant is Sand Verbena (*Abronia* sp.) [Mattoni 1990], which does not occur on the site;
- *Cophura clausa*, the **Seashore Robber Fly** [Schreiber 1981], a little-known, 7 to 9 millimeter long fast-flying predatory fly, originally described from Orange County. It has a large distribution range that includes the Mojave desert;
- *Cylindrocopturus new sp.*, an undescribed weevil, which isendemic to the El Segundo Dunes;
- *Ebo new sp.*, an undescribed crab spider, was reported to be present in encouraging numbers in the El Segundo dunes in 1993 [Mattoni-1993];
- *Eremobates new sp.*, **Coastal Dune Whip Scorpion**, is a solifugid. Solifugids, also known as sun spiders, are in a taxonomic order different from both the spiders and the scorpions. This solifugid species is not endemic to the Ballona Creek Region [Schreiber 1981];
- *Euxoa riversii*, **River's Dune Moth**, is a rare noctuid moth found in sand dune habitat;

- *Nebritus powelli*, a recently described stiletto fly without a common name, is possibly associated with coastal dunes and willows (*Salix* spp.) [Webb 1991]; it could become recognized as a species of concern because its distribution range is limited to a few coastal locations between Los Angeles County (Ballona Wetlands) and San Luis Obispo County, and such areas are prone to urbanization pressure;
- *Psammodius mcclayi*, the **South Coast Dune Beetle**, is a detritus-feeding scarab beetle found among the roots of grasses on sand dunes of the Californian sea coast. The holotype is from Playa del Rey;
- *Scythris new sp. 1*, the **El Segundo Scythrid Moth**, was reported to be present in encouraging numbers in the El Segundo dunes in 1993 [Mattoni 1993];
- *Scythris new sp. 2*, the **Lesser Dunes Scythrid Moth**, is reported to be rare and restricted to the El Segundo dunes [Mattoni 1993];
- *Stenopelmatus new sp.*, the **El Segundo Jerusalem Cricket**, is endemic to the El Segundo Dunes, whose northern limits are south of Marina del Rey [Mattoni 1993].

None of these species have been recorded during the course of this project. Due to the site not being a dune habitat, not being pristine, and not having salt flats or other wetland niche habitats, is it unlikely that these species are present at the site. It is, however, possible that some of the flying species are capable of reaching the site, especially during accommodating weather conditions; and if proper habitat is present at the site, they might take up residence.

3.6 Conclusions

The site in its present state is unlikely to harbor healthy populations of any invertebrate species of concern, with possible exception of the Signal Fly discussed in section 2.1.3 above. This is especially due to the scarcity of native vegetation, minimal habitat diversity, presence of non-native fauna, especially Argentine Ants, and the absence of soft sand dune habitat and presence of concrete and other rubble in the soil. Other intrinsic factors are the site's relatively small area and it being surrounded by urbanization, without explicit migration corridors, like adjacent urban parkland or backyards.

Figure 6: **Robber Fly** (*Nicocles sp.*) female

4 Recommendations

4.1 Recommendations for conservation

The Oxford Basin has great potential as a habitat for native invertebrates. Even though the site is currently in a relatively degraded state, with predominantly non-native vegetation, the basin provides an important breeding ground for many aquatic species. The upland areas still have some native vegetation and can be restored to become a more vibrant coastal ecosystem. Specific recommendations for conservation, restoration, and overall site improvement are:

- Removal of exotic plants, ideally by hand, without the use of toxic pesticides.
- Planting a broad diversity of native plants, specifically plants native to the local coastal area of Los Angeles County.
- Abatement of Argentine Ants, which displace native ant species as well as other arthropods, resulting in an impoverished biotope. A critical part of restoration efforts on the site should include the abatement of Argentine Ants. If desired, BioVeyda can assist in this effort.
- Removal of unnecessary concrete and other construction debris. Some monolithic rocks can be left or intentionally placed, as they will provide habitat for various vertebrate and invertebrate animals.

Possible introduction of native fauna, or at least introduction of their food-plants; for example:

- Pygmy Blue (*Brephidium exilis*): Chenopodiaceae, including Atriplex and Chenopodium.
- Wandering Skipper (*Panoquina errans*): Saltgrass (*Distichlis spicata* var. *spicata*) and Cordgrass (*Spartina foliosa*), which are common native plants in Southern Californian salt marshes.

4.2 Recommendations for future invertebrate surveys

The list of invertebrates encountered on the site is rudimentary, as the scope and duration of the project was limited to obtaining a high-level baseline. It would be beneficial to perform periodic surveys in the future, whose results can be compared to those obtained during this project. These future surveys would add valuable information toward completeness of the list and toward measuring changes in biodiversity over time. It would be of value to monitor before, during, and after a potential restoration effort, or other planned habitat modification.

It would be ideal to continue performing minimal impact surveys, based on visual inspection, including the use of close-focusing binoculars, photography, and capture and release. During minimal impact surveys, a minimal number of specimens are killed and curated for future study. For most common species it is not necessary to examine captured specimens in detail for identification. For uncommon taxa, it is often helpful to examine a specimen in microscopic detail, and occasionally by dissection, in order to arrive at a solid taxonomic identification.

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Figure 7: **Torpedo Bug** (*Siphanta acuta*)

Appendix A Invertebrates recorded

The invertebrates recorded during the project are listed in the following table. The table contains the combined results of the terrestrial invertebrate data collection methodologies, as well as the recorded aquatic macro-invertebrates.

Family	Genus	Species	Subspecies	Common Name(s)
Phylum: Arthropoda				**Arthropods**
Class: Arachnida				**Arachnids = Spiders, Mites, & kin**
Order: Aranea				**Spiders**
Agelenidae				Funnel-web Spiders
Dysderidae	Dysdera	crocata		Woodlouse Spider
Gnaphosidae				Ground Spiders
Lycosidae				Wolf Spiders
Miturgidae	Cheiracanthium	mildei		Longlegged Sac Spider
Oecobiidae	Oecobius	sp.		Baseboard Spider
Salticidae	Habronattus	pyrrithrix		Jumping Spider
Theridiidae	Steatoda	grossa		False Black Widow (Spider)
Class: Collembola				**Springtails**
Order: Entomobryomorpha				**Elongate-bodied Springtails**
Entomobryidae				Elongate-bodied Springtails
Class: Diplura				**Two-pronged Bristletails**
Order: Rhabdura				**Rhabdurans**
Campodeidae	Campodea	kelloggi		Two-pronged Bristletail
Class: Insecta				**Insects**
Order: Coleoptera				**Beetles**
Anobiidae	Ozognathus	cornutus		Death-watch Beetle
Carabidae	Bembidion	sp.		Minute Ground Beetle
Carabidae	Calathus	ruficollis	ruficollis	Redneck Woodland Ground Beetle
Coccinellidae	Cryptolaemus	montrouzieri		Mealybug Destroyer
Dermestidae	Cryptorhopalum	sp.		Carpet Beetle
Hydrophilidae	Enochrus	sp.		Water Scavenger Beetle
Staphylinidae				Rove Beetles
Order: Dermaptera				**Earwigs**
Anisolabididae	Euborellia	annulipes		Ring-legged Earwig
Order: Diptera				**Flies, Mosquitos, & kin**
Asilidae	Nicocles	sp.		Robber Fly (see figure 6)
Bombyliidae	Hemipenthes	sinuosa		Sinuous Bee Fly
Bombyliidae	Villa	lateralis		Bee Fly
Calliphoridae	Lucilia	sp.		Common Green Bottle Fly
Chironomidae				Midges
Ephydridae	Ephydra	niveiceps		Brine Fly (see figure 8)
Ephydridae	Mosillus	sp.		Shore Fly
Limoniidae	Erioptera	pilipes		Limoniid Crane Fly
Muscidae	Coenosia	sp.		Tiger Fly
Platystomatidae	Amphicnephes	sp.		Signal Fly (see figure 1)
Sarcophagidae	Sarcophaga	sp.		Flesh Fly
Syrphidae	Eristalinus	aeneus		Hover Fly
Syrphidae	Eupeodes	volucris		Bird Hover Fly
Syrphidae	Palpada	sp.		Drone Fly
Syrphidae	Paragus	haemorrhous		black+red Hover Fly
Syrphidae	Sphaerophoria	sp.		cylinder Hover Fly
Tachinidae				Tachinid Flies

Family	Genus	Species	Subspecies	Common Name(s)
Phylum: Arthropoda				**Arthropods**
Class: Insecta				**Insects**
Order: Hemiptera				**True Bugs, Hoppers, Aphids, & kin**
Cicadellidae				Leafhoppers
Flatidae	Siphanta	acuta		Torpedo Bug (see figure 7)
Miridae	Phytocoris	sp.		Plant Bug (see figure 3)
Pentatomidae	Bagrada	hilaris		Bagrada Bug = Painted Bug
Psyllidae				Psyllids
Saldidae				Shore Bugs
Order: Hymenoptera				**Wasps, Ants, Bees, Sawflies, & kin**
Apidae	Apis	mellifera		European Honey Bee
Apidae	Xylocopa	varipuncta		Valley Carpenter Bee
Colletidae	Hylaeus	sp.		Yellow-masked Bee
Formicidae	Linepithema	humile		Argentine Ant
Halictidae	Halictus	tripartitus		Sweat Bee (see figure 4)
Ichneumonidae				Ichneumon Wasps
Pompilidae	Aporinellus	sp.		Spider Wasp
Pompilidae	Episyron	conterminus	posterus	Spider Wasp
Sphecidae	Ammophila	sp.		Thread-waisted Wasp
Sphecidae	Sceliphron	caementarium		Black and Yellow Mud Dauber
Vespidae	Eumenes	sp.		petioled Potter Wasp
Vespidae	Polistes	dominula		European Paper Wasp
Order: Isoptera				**Termites**
Kalotermitidae	Incisitermes	minor		Western Drywood Termite
Order: Lepidoptera				**Butterflies & Moths**
Crambidae	Dicymolomia	metalliferalis		Crambid Snout Moth
Geometridae	Perizoma	sp.		Geometrid Moth
Hesperiidae	Hylephila	phyleus		Fiery Skipper (see figure 2)
Hesperiidae	Poanes	melane		Umber Skipper
Noctuidae	Autographa	californica		Alfalfa Looper (Moth)
Nymphalidae	Danaus	plexippus		Monarch
Nymphalidae	Vanessa	atalanta		Red Admiral
Nymphalidae	Vanessa	cardui		Painted Lady
Papilionidae	Papilio	rutulus		Western Tiger Swallowtail
Pieridae	Pieris	rapae		Cabbage White
Pyralidae	Ephestiodes	gilvescentella		Dusky Raisin Moth
Sphingidae	Hyles	lineata		White-lined Sphinx (Moth)
Tineidae	Oinophila	v-flavum		Yellow V Moth
Order: Microcoryphia				**Bristletails**
Machilidae				Bristletail
Order: Odonata				**Dragonflies & Damselflies**
Coenagrionidae	Ischnura	cervula		Pacific Forktail
Libellulidae	Libellula	saturata		Flame Skimmer
Libellulidae	Pachydiplax	longipennis		Blue Dasher
Libellulidae	Sympetrum	corruptum		Variegated Meadowhawk
Libellulidae	Tramea	lacerata		Black Saddlebag

Family	Genus	Species	Subspecies	Common Name(s)
Phylum: Arthropoda				**Arthropods**
Class: Insecta				**Insects**
Order: Orthoptera				**Grasshoppers, Crickets, & kin**
Acrididae	Melanoplus	marginatus	(see fig. 5)	Margined Spurthroated Grasshopper
Myrmecophilidae	Myrmecophilus	sp.		Ant (Loving) Cricket
Order: Psocoptera				**Booklice & Barklice**
Ectopsocidae				Outer Barklice
Order: Thysanoptera				**Thrips**
Phlaeothripidae				Tube-tailed Thrips
Class: Malacostraca				**Amphipods & Isopods**
Order: Amphipoda				**Scuds & Sideswimmers**
Gammaridae				Gammarid Scud
Order: Decapoda				**Crabs, Lobsters, Shrimp, & kin**
Pandalidae				Shrimp
Order: Isopoda				**Isopods**
Porcellionidae	Porcellionides	pruinosus		Woodlouse
Class: Maxillopoda				**Barnacles, Copopods, & kin**
Order: Sessilia				**Acorn Barnacles**
Balanidae	Balanus	sp.		Acorn Barnacle
Phylum: Mollusca				**Molluscs**
Class: Gastropoda				**Snails & Slugs**
Order: Neotaenioglossa				
Bullidae	Bulla	gouldiana		California Bubble Shell
Potamididae	Cerithidea	californica		California Mud Snail
Class: Bivalvia				**Bivalves**
Order: Mytiloida				**Saltwater Mussels**
Mytilidae	Modiolus	rectus		Straight Horsemussel
Veneridae	Protothaca	laciniata		Rough-sided Littleneck Clam

Figure 8: **Brine Fly** (*Ephydra niveiceps*) female + male

End of Final Report