

June 27, 2016

Ms. Stacey Love
U.S. Fish and Wildlife Service
Carlsbad Field Office
2177 Salk Ave, Suite 250
Carlsbad, CA 92008

Subject: Fairy Shrimp Survey Report for the Vista Del Mar Elementary School Project San Diego County, CA.

Dear Ms. Love:

As required by the U.S. Fish and Wildlife Service (USFWS), this letter provides documentation of the results of 2015/2016 wet season surveys for federally-listed vernal pool branchiopod (fairy shrimp) species. The surveys were conducted on behalf of the San Ysidro School District within the vernal pool restoration area associated with the Vista Del Mar Elementary School Project (Project), located in the community of San Ysidro, San Diego County, California.

Overview

To mitigate impacts to vernal pools from Project construction, a total of 32 vernal pools within the restoration area were created, restored, or enhanced through implementation of the agency-approved Vista Del Mar Elementary School Vernal Pool Restoration Plan for the Off-Site Preserve (Restoration Plan; Helix 2011, as amended by TAIC 2011). Pursuant to Project permit requirements, protocol-level fairy shrimp surveys were conducted annually during the five year restoration period to ensure successful restoration. This report discusses the results of the fairy shrimp surveys conducted during the 2015/2016 wet season (Year 5), which were as summarized below:

Name of project: Vista Del Mar Elementary School

Permittee: San Ysidro School District

Property Owner: City of San Diego

Location: The 1-acre survey area comprises 18 newly created and 14 restored or enhanced vernal pools within the vernal pool restoration area. The restoration area is located within the Imperial Beach 7.5 minute U.S. Geologic Survey (USGS) Quadrangle, on the Otay Mesa in the community of San Ysidro within the City of San Diego, San Diego County, California (Figure 1).

Reference Site: Two reference sites have been selected for monitoring. One reference site is located adjacent to the references area on the west side. This area was restored as mitigation for impacts associated with construction of the San Ysidro High School. The second site, known as the J26 Complex, is formally recognized by the U.S. Fish and Wildlife Service as a programmatic vernal pool reference site. This site is located approximately 10 km northeast of the restoration area (Figure 2).

Fairy Shrimp & Vernal Pool Biology

Fairy shrimp habitat includes all vernal pools and swales (including road ruts) that occur within the species' range, which can hold water for an extended period of time. According to the USFWS, vernal pools and swales can be defined as ephemeral wetlands that form in areas of California with Mediterranean climates that have shallow depressions underlain by a substrate of hardpan, clay, or basalt near the surface that restricts the percolation of water. They may be characterized by a barrier to overland flow that causes water to collect and pond. Vernal pools/swales may occur singly, but more typically occur in vernal pool/swale complexes, due to the local hydrology, geology, and topography. Initially, the dry soil in vernal pools/swales becomes wet and starts to saturate during the fall and early winter rains. The second stage in a typical vernal pool cycle is characterized by peak rainfall and inundation of the vernal pools/swales. Vernal pools may remain inundated until spring or early summer, sometimes filling and drying numerous times during the wet season. The vernal pools gradually dry down during the spring, quite often forming the unique "bathtub ring" of flowers from endemic vernal pool plants blooming profusely at the pool margins. This drying down stage is typified by the production of seeds in the endemic plants and the dispersal of animals from the vernal pools. These pools eventually dry down totally, with the onset of drought conditions. During this final stage, early season and shallow-rooted plants turn brown, and the soil dries and may crack. With average rainfall patterns, vernal pools are typically characterized by a predominantly annual plant community dominated by wetland species (USFWS 2015).

Fairy shrimp mature and lay cysts in the soils lining the bottom of the pools while the pools are filled with water. Fairy shrimp hatch from cysts once the pools fill with water during winter months. As the pools dry in the spring and summer, the cysts are able to remain dormant in the soil for extended periods of time until the pool becomes inundated again. Fairy shrimp cysts can persist unharmed in the soil for years despite extreme weather conditions. Fairy shrimp cysts do not all hatch at once, and each time a pool fills in a single season new cysts may hatch (Eriksen and Belk 1999).

Existing Conditions and Restoration Background

The 1-acre restoration area is located on a plateau within coastal sage scrub vegetation on the Otay Mesa and is known to have historically contained vernal pools (Figure 1). Prior to restoration, the

restoration area had been disturbed by off-road vehicles and was previously owned by The Environmental Trust (TET). After TET declared bankruptcy, the restoration area and conservation easement was transferred to the City of San Diego. As part of the mitigation requirements for the Vista Del Mar Elementary School construction, the restoration area was seeded and planted with native vernal pool and upland coastal sage scrub species.

A total of 32 vernal pools within the Restoration Area were either created, restored, or enhanced through implementation of the agency-approved Restoration Plan. Eighteen of the pools (i.e., pool numbers 2, 5-10, 12-15, 22, 23, 27-29, 31, and 32) were newly created within the restoration area and were inoculated with vernal pool soils containing the federally-listed San Diego fairy shrimp (*Branchinecta sandiegonensis*) cysts salvaged from the Vista Del Mar Elementary School impact site and/or a vernal pool donor site located just west of the restoration area. The remaining fourteen pools (i.e., pool numbers 1, 3, 4, 11, 16-21, 24-26, and 30) were existing pools that were restored or enhanced within the restoration area and inoculated with San Diego fairy shrimp cysts from the road rut pool adjacent to the restoration area. All pools were constructed or recontoured in January and February 2012.

Fairy Shrimp Survey Methods

Branchiopod surveys were conducted within pools that were inundated for a sufficient amount of time and depth to support fairy shrimp, based on the results of hydrological monitoring that was being conducted within the restoration area and reference pools. During the 2015/2016 rainy season, the restoration area pools reference site were sampled once during the season on January 18, 2016; the J-26 reference pools and the adjacent pools at San Ysidro High School were not sampled as they were not inundated sufficiently to support fairy shrimp. Sampling was conducted by Rocks Biological Consulting biologist Melanie Rocks (TE-082908-1), who was assisted by Rocks Biological Consulting biologist Ian Hirschler, on January 18, 2016 according to the Survey Guidelines for the Listed Large Branchiopods (USFWS 2015).

The protocol requires that depressions be examined 24 hours after a storm event to determine if the depression is inundated (defined as holding more than three centimeters of water). If after two weeks the depressions are still inundated, protocol fairy shrimp surveys must be conducted. All pools inundated to levels sufficient to support fairy shrimp were sampled using a hand-held net, which was swept through the water and the net contents were examined for invertebrates. San Diego fairy shrimp were collected and identified with the aid of a dissecting microscope after the surveys were completed. The collected voucher specimens will be accessioned to the Los Angeles Natural History Museum, Crustacea Section, Invertebrate Zoology, 900 Exposition Boulevard, Los Angeles, California 90007.

Survey Results

The 2015/2016 wet season was expected to be much wetter than normal due to El Niño conditions; however, between October 2015 and May 2016, a total of only 7.86 inches of rain fell in the San Diego area (based on rainfall data from Lindbergh Field; NOAA 2016), as compared to an average of 11.07 inches for that time period (Table 1). This is even less rainfall than last year (8.91 inches). According to the United States Drought Monitor, coastal San Diego County is still considered to be in extreme drought conditions (NDMC et al. 2016). Drought conditions have prevailed throughout the entire five-year restoration monitoring period. However, despite these conditions, the fairy shrimp populations in the restored pools have increased significantly every year during the monitoring period.

Table 1. Actual vs. Average Precipitation October 2014-May 2015

Month	Average (in.)	Actual (in.)
October 2015	0.57	0.43
November 2015	1.01	1.54
December 2015	1.53	0.88
January 2016	1.98	3.21
February 2016	2.27	0.05
March 2016	2.81	0.76
April 2016	0.78	0.55
May 2016	0.12	0.44
TOTALS	11.07	7.86

Source: local climate data from the National Oceanic and Atmospheric Administration (NOAA), Lindbergh Field.

On January 18, 2016, the sampled pools within the restoration site varied in size from 6.0 to 70.0 square meters, with maximum depths ranging from 2.0 to 19.0 centimeters (Table 2). Water temperatures ranged from 15.3 to 18.5 degrees Celsius. All 32 pools held water for a sufficient depth and duration to support fairy shrimp, and fairy shrimp were observed in all of the pools; therefore, no additional surveys were conducted within the restoration area. The fairy shrimp survey datasheets are attached to this report.

Table 2. Fairy Shrimp Data from January 18, 2016 Survey

Pool Number	Description	Water Temp. (°C)	Maximum Depth (cm)	Size (m ²)	Presence of Fairy Shrimp	Voucher No. Male	Voucher No. Female	Population Estimate
1	Enhanced	16.1	8.0	18.0	<i>B. sandiegonensis</i>	7	1	1000s
2	Created	13.9	7.0	30.0	<i>B. sandiegonensis</i>	17	3	1000s
3	Enhanced	15.6	4.0	20.0	<i>B. sandiegonensis</i>	8	2	1000s
4	Enhanced	15.0	7.0	35.0	<i>B. sandiegonensis</i>	11	2	1000s
5	Created	15.6	7.5	35.0	<i>B. sandiegonensis</i>	8	2	1000s
6	Created	17.8	4.0	16.0	<i>B. sandiegonensis</i>	7	2	1000s
7	Created	16.7	10.0	35.0	<i>B. sandiegonensis</i> ¹	7	1	1000s
8	Created	16.7	17.0	56.0	<i>B. sandiegonensis</i>	5	2	1000s
9	Created	17.8	8.0	24.0	<i>B. sandiegonensis</i> ¹	10	0	1000s
10	Created	16.7	9.0	56.0	<i>B. sandiegonensis</i>	8	3	1000s
11	Enhanced	16.7	7.0	60.0	<i>B. sandiegonensis</i>	7	0	1000s
12	Created	17.8	6.0	20.0	<i>B. sandiegonensis</i>	11	2	1000s
13	Created	17.8	6.0	36.0	<i>B. sandiegonensis</i>	8	2	1000s
14	Created	18.9	4.0	54.0	<i>B. sandiegonensis</i>	5	3	1000s
15	Created	19.4	8.0	40.0	<i>B. sandiegonensis</i>	12	1	1000s
16	Enhanced	19.4	8.0	42.0	<i>B. sandiegonensis</i>	6	1	1000s
17	Enhanced	19.4	14.0	24.0	<i>B. sandiegonensis</i>	8	0	1000s
18	Enhanced	20.0	5.0	9.0	<i>B. sandiegonensis</i>	5	1	1000s
19	Enhanced	19.4	11.0	25.0	<i>B. sandiegonensis</i> ¹	7	0	1000s
20	Enhanced	19.4	6.0	30.0	<i>B. sandiegonensis</i>	10	2	1000s
21	Enhanced	17.8	19.0	36.0	<i>B. sandiegonensis</i>	9	2	1000s
22	Created	18.3	13.0	25.0	<i>B. sandiegonensis</i>	9	2	1000s
23	Created	18.9	2.0	6.0	<i>B. sandiegonensis</i>	11	4	100's
24	Enhanced	19.4	15.0	35.0	<i>B. sandiegonensis</i>	6	0	1000s
25	Enhanced	18.9	7.0	25.0	<i>B. sandiegonensis</i>	7	2	1000s
26	Enhanced	18.9	11.0	30.0	<i>B. sandiegonensis</i>	3	1	100s
27	Created	20.0	10.0	45.0	<i>B. sandiegonensis</i>	6	1	1000s
28	Created	20.6	5.0	12.0	<i>B. sandiegonensis</i>	6	1	1000s
29	Created	18.9	11.0	24.0	<i>B. sandiegonensis</i>	5	1	1000s
30	Enhanced	19.4	10.0	70.0	<i>B. sandiegonensis</i>	7	2	1000s
31	Created	18.9	4.5	12.0	<i>B. sandiegonensis</i>	6	1	1000s
32	Created	19.4	8.0	9.0	<i>B. sandiegonensis</i>	7	1	1000s

¹ Tadpoles (presumably western spadefoot toads; *Spea hammondi*) also present

Most pools supported thousands, and two pools supported hundreds of fairy shrimp. The presence of fairy shrimp is much higher than in the previous year in which fairy shrimp were found in only 30 pools, 17 of which were in the thousands (the remaining pools supported tens or hundreds of fairy shrimp). This trajectory of more occupied pools and higher densities within the pools has been observed consistently in the restoration area during every monitoring year since Year 1. No signs of hybridization were observed; however, note that in all pools except VDM 29 and 30 the females were too immature to assess hybridization.

No pools within the San Ysidro High School reference site or J26 Complex reference site were inundated for a sufficient depth and duration to support fairy shrimp, and therefore, these pools were not surveyed.

If you have any questions about the surveys or the Project, please do not hesitate to contact Rosanne Humphrey.

I certify that the information in this survey report and attached exhibits fully and accurately represent my work.

Sincerely,

A handwritten signature in black ink, appearing to read 'Melanie Rocks'.

Melanie Rocks, TE-082908-1
Rocks Biological Consulting
5101 September Street
San Diego, CA 92110-1118
(619) 843-6560

A handwritten signature in black ink, appearing to read 'Rosanne Humphrey'.

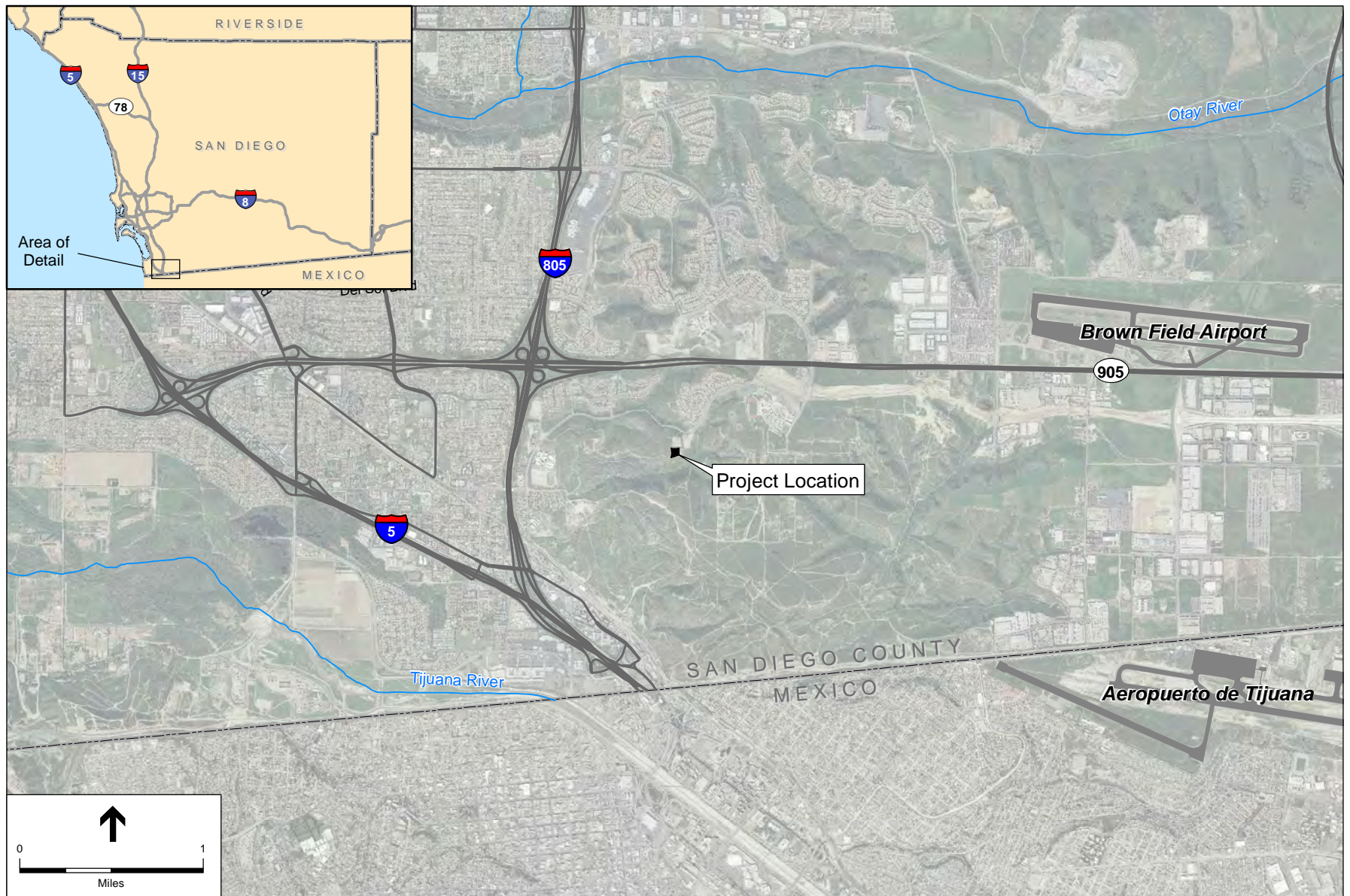
Rosanne Humphrey
Senior Biologist
ESA | Biological Resources and Land
Management
rhumphrey@esassoc.com

Enclosures

Figure 1. Regional Location Map
Figure 2. Site Map
Figure 3. Presence of Fairy Shrimp within Restoration Area
Datasheets for 2016 Surveys
CNDDB Field Form

References

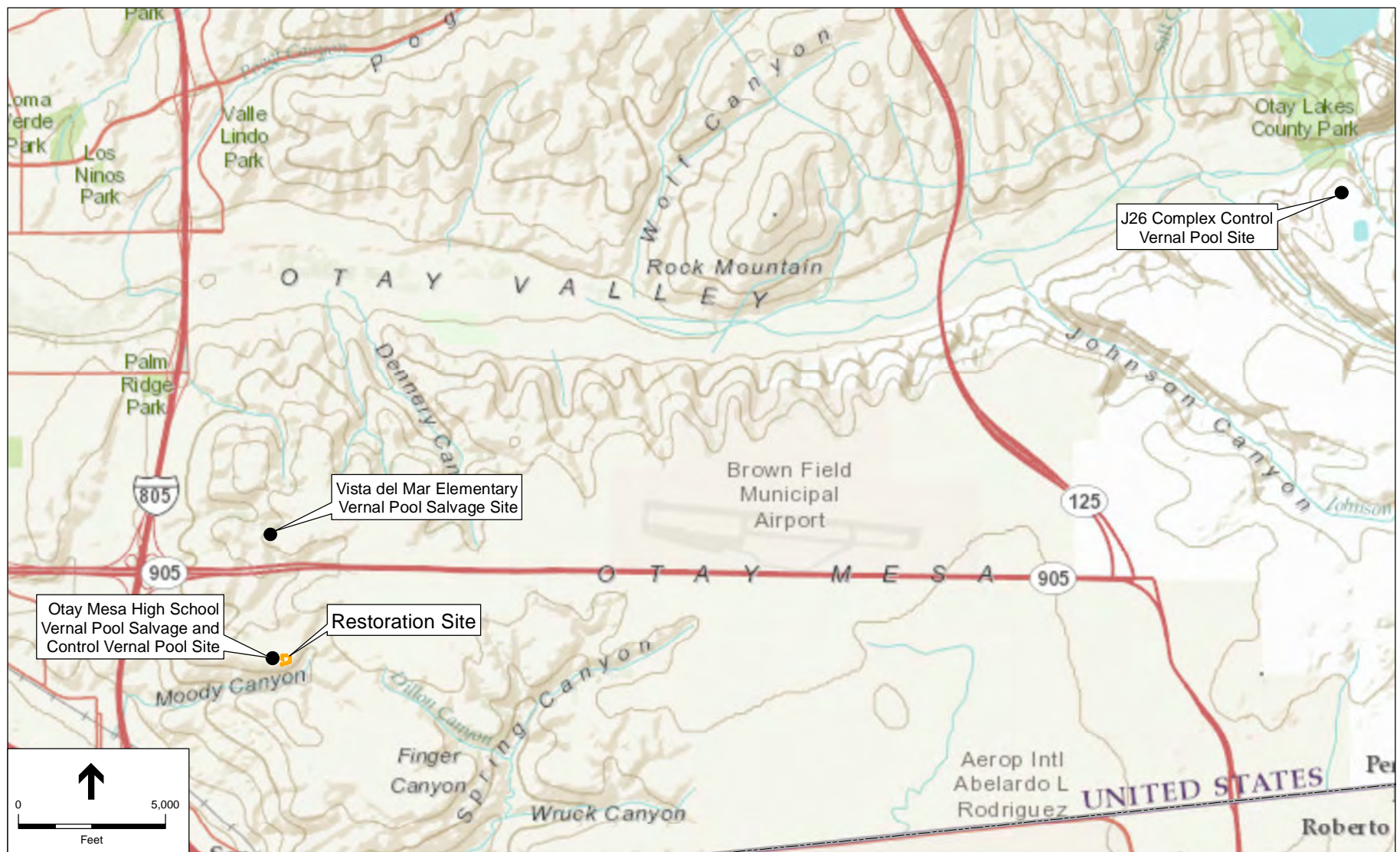
- Eriksen, C.H. and D. Belk. 1999. Fairy Shrimps of California's Puddles, Pools, and Playas. Mad River Press.
- Environmental Science Associates, Inc. (ESA). 2012. 90-Day Report: Post-Survey Notification of Fairy Shrimp Surveys on the San Ysidro School District's Vista Del Mar Elementary Vernal Pool Restoration Area.
- Helix Environmental Planning (Helix). February 2, 2011; amended by TAIC August, 5, 2011. Vista Del Mar Elementary School Vernal Pool Restoration Plan for the Off-Site Preserve. Prepared for San Ysidro School District.
- U.S. Fish and Wildlife Service (USFWS). 2015. Survey Guidelines for the Listed Large Branchiopods. May 31, 2015.
- National Drought Mitigation Center at University of Nebraska-Lincoln (NDMC), U.S. Department of Agriculture (USDA), and National Oceanic and Atmospheric Administration (NOAA). 2016. United States Drought Monitor, June 21, 2016. <http://droughtmonitor.unl.edu/>. Accessed June 23, 2016.
- National Oceanic and Atmospheric Administration (NOAA). 2016. Monthly Precipitation Summary Water Year 2016. http://www.cnrfc.noaa.gov/monthly_precip.php. Accessed June 23, 2016.



SOURCE: ESA, 2012.

Vista Del Mar Elementary School . 211685

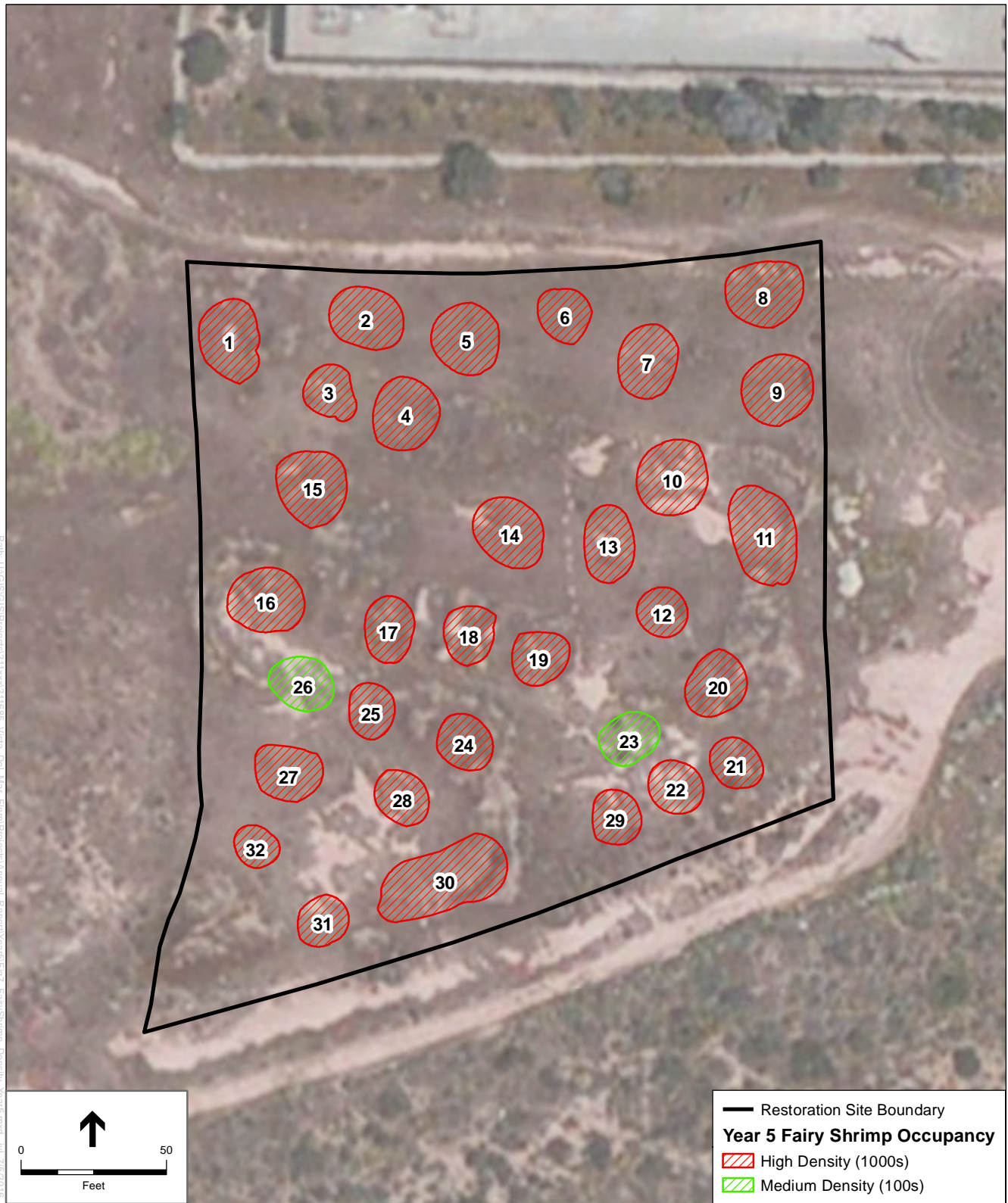
Figure 1
Regional Location



SOURCE: USGS; RBF, 2012; ESA, 2012.

Vista Del Mar Elementary School . 211685

Figure 2
Site Map



SOURCE: ESRI 2014; RBF 2012; ESA 2016

Vista Del Mar Elementary School . 211685

Figure 3
 Presence of Fairy Shrimp in Restoration Site Pools

ROCKS

Fairy Shrimp Survey Form

Surveyor: MELANIE ROCKS Add'l Persons: IAN HIRSCHLER Date: 1/18/16
 Project: VISTA DEL MAR
 Start Time: 0955 T: 61 CC: 50% Wind Sp/Dir: 1-3 General Weather Condition: COOL w/ BREEZE
 End Time: 1320 T: 61 CC: 100% Wind Sp/Dir: 1-3 General Weather Condition: OVERCAST

Pool or Area ID	Latitude*	Longitude*	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
01								
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate					
B. sandiegorensis	7	1	10005					

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments: **ALL POOLS ARE RESTORED.**

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
02								
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate					
B. sandiegorensis	17	3	10005					

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
03								
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate					
B. sandiegorensis	8	2	10005					

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

** All ♀'s too immature to assess hybridization except vernal 29 & 23*

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
<u>04</u>			<u>61</u>	<u>59</u>	<u>5</u>	<u>7</u>	<u>5</u>	<u>7</u>
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				
<u>B. sandiegensis</u>	<u>11</u>	<u>2</u>	<u>1000s</u>	copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths				

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
<u>05</u>			<u>61</u>	<u>60</u>	<u>5</u>	<u>7.5</u>	<u>7</u>	<u>5</u>
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				
<u>B. sandiegensis</u>	<u>8</u>	<u>2</u>	<u>1000s</u>	copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths				

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
<u>06</u>			<u>61</u>	<u>64</u>	<u>3</u>	<u>4</u>	<u>4</u>	<u>4</u>
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				
<u>B. sandiegensis</u>	<u>7</u>	<u>2</u>	<u>1000s</u>	copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths				

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
<u>07</u>			<u>61</u>	<u>62</u>	<u>100</u>	<u>100</u>	<u>7</u>	<u>5</u>
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				
<u>B. sandiegensis</u>	<u>7</u>	<u>2</u>	<u>1000s</u>	copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths				

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

Eryngium aristolatum in center of pool, tadpoles present / 3 immature specimens

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
08			61	62	14	17	7	8
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				

B. sandiegensis

5

2

1000s

copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
09			61	64	4	8	6	4
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				

B. sandiegensis

10

0

1000s

copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
10			61	62	7	9	7	8
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				

B. sandiegensis

8

3

1000s

copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
11			61	62	5	7	12	5
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				

B. sandiegensis

7

1000s

copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

Tadpoles

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
<u>12</u>			<u>61</u>	<u>64</u>	<u>5.5</u>	<u>6</u>	<u>4</u>	<u>5</u>
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				
<u>B. sandiegorensis</u>	<u>11</u>	<u>2</u>	<u>1000s</u>	copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths				

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
<u>13</u>			<u>61</u>	<u>64</u>	<u>5</u>	<u>6</u>	<u>9</u>	<u>4</u>
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				
<u>B. sandiegorensis</u>	<u>8</u>	<u>2</u>	<u>1000s</u>	copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths				

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
<u>14</u>			<u>61</u>	<u>66</u>	<u>3</u>	<u>4</u>	<u>9</u>	<u>6</u>
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				
<u>B. sandiegorensis</u>	<u>5</u>	<u>3</u>	<u>1000s</u>	copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths				

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
<u>15</u>			<u>61</u>	<u>67</u>	<u>6</u>	<u>8</u>	<u>8</u>	<u>5</u>
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				
<u>B. sandiegorensis</u>	<u>12</u>	<u>1</u>	<u>1000s</u>	copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths				

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

1 insect we

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
16			61	67	6	8	7	6
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				
<i>B. sandiegensis</i>	6	1	1000s	copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths				
Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms								
Additional Comments:								
Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
17			61	67	12	14	6	4
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				
<i>B. sandiegensis</i>	8	0	1000s	copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths				
Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms								
Additional Comments: 1 immature roach								
Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
18			61	68	5	5	3	3
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				
<i>B. sandiegensis</i>	5	1	1000s	copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths				
Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms								
Additional Comments:								
Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
19			61	67	10	11	5	5
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				
<i>B. sandiegensis</i>	7	0	1000s	copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths				
Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms								
Additional Comments: Specimens immature, but still identifiable								

Tadpoles

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
20			61	67	4.5	6	6	5
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				
<i>B. sandiegensis</i>	10	2	10005	copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths				
Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms								
Additional Comments: <i>some immature, but still identifiable</i>								
21			61	64	14	19	6	6
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				
<i>B. sandiegensis</i>	9	2	10005	copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths				
Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms								
Additional Comments:								
22			61	65	11	13	5	5
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				
<i>B. sandiegensis</i>	9	2	10005	copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths				
Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms								
Additional Comments:								
23			61	66	1.5	2	3	2
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				
<i>B. sandiegensis</i>	11	4	10005	copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths				
Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms								
Additional Comments: <i>Unknown invert. collected 2. No hybrids</i>								

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
29			61	66	11	15	6	4
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				

B. sandiegensis

5

1

10005

copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

1 immature voucher

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
24			61	67	812	15	7	5
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				

B. sandiegensis

6

0

10005

copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

Immature but still identifiable - MC

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
25			61	66	6	7	5	5
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				

B. sandiegensis

7

2

10005

copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
26			61	66	10	11	6	5
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				

B. sandiegensis

3

1

10008 1005

copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
27			61	68	9	10	9	5
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				

B. sandiegensis

6

1

1000s

copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
28			61	69	5	5	4	3
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				

B. sandiegensis

6

1

1000s

copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

No hybrids

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
30			61	67	10	11	14	5
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				

B. sandiegensis

7

2

1000s

copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

1 immature: All vouchers immature, but most identifiable

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
31			61	66	9	10	5	3
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				

B. sandiegensis

6

1

1000s

copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

Fairy Shrimp Survey Form—(continued)

Surveyor:

MELANIE ROCKS

Date 1/18/16

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Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
32								
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				
B. sordidus	7	1	10005	copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths				

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				
				copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths				

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				
				copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths				

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

Pool or Area ID	Latitude	Longitude	Air Temp. (°C)	Water Temp. (°C)	Average Depth (cm)	Max. Depth (cm)	Pool length (m)	Pool width (m)
Fairy Shrimp Present (Species)	Voucher # Male (♂)	Voucher # Female (♀)	Population Estimate	Other species present in pool (circle, add additional below)				
				copepods, ostracods, cladocera, coleptera, hemiptera, diptera, culicidae, platyhelminths				

Habitat condition (circle one): 1. natural vernal pool 2. constructed pool Pool condition (circle all): 1. undisturbed 2. disturbed (tire tracks trash plowing) 3. ungrazed 4. grazed (cattle horses sheep) (light moderate heavy) 5. algal blooms

Additional Comments:

Mail to:
California Natural Diversity Database
California Dept. of Fish & Wildlife
1807 13th Street, Suite 202
Sacramento, CA 95811
Fax: (916) 324-0475 email: CNDDDB@wildlife.ca.gov

For Office Use Only

Source Code: _____ Quad Code: _____
Elm Code: _____ Occ No.: _____
EO Index: _____ Map Index: _____

Date of Field Work (mm/dd/yyyy): _____

California Native Species Field Survey Form

Scientific Name: _____

Common Name: _____

Species Found?

Yes No _____ If not found, why? _____

Total No. Individuals: _____ Subsequent Visit? Yes No

Is this an existing NDDDB occurrence? _____ No Unk.

Yes, Occ. # _____

Collection? If yes: _____

Number _____

Museum / Herbarium _____

Reporter: _____

Address: _____

E-mail Address: _____

Phone: _____

Plant Information

Phenology:

% vegetative % flowering % fruiting

Animal Information

adults # juveniles # larvae # egg masses # unknown
wintering breeding nesting rookery burrow site lek other

Location Description (please attach map AND/OR fill out your choice of coordinates, below)

County: _____ Landowner / Mgr: _____

Quad Name: _____ Elevation: _____

T _____ R _____ Sec _____, _____ 1/4 of _____ 1/4, Meridian: H M S Source of Coordinates (GPS, topo. map & type): _____

T _____ R _____ Sec _____, _____ 1/4 of _____ 1/4, Meridian: H M S GPS Make & Model: _____

DATUM: NAD27 NAD83 WGS84 Horizontal Accuracy: _____ meters/feet

Coordinate System: UTM Zone 10 UTM Zone 11 **OR** Geographic (Latitude & Longitude)

Coordinates: _____

Habitat Description (plants & animals) plant communities, dominants, associates, substrates/soils, aspects/slope:

Animal Behavior (Describe observed behavior, such as territoriality, foraging, singing, calling, copulating, perching, roosting, etc., especially for avifauna):

Please fill out separate form for other rare taxa seen at this site.

Site Information Overall site/occurrence quality/viability (site + population): Excellent Good Fair Poor

Immediate AND surrounding land use: _____

Visible disturbances: _____

Threats: _____

Comments: _____

Determination: (check one or more, and fill in blanks)

Keyed (cite reference): _____

Compared with specimen housed at: _____

Compared with photo / drawing in: _____

By another person (name): _____

Other: _____

Photographs: (check one or more)

Slide Print Digital

Plant / animal

Habitat

Diagnostic feature

May we obtain duplicates at our expense? yes no