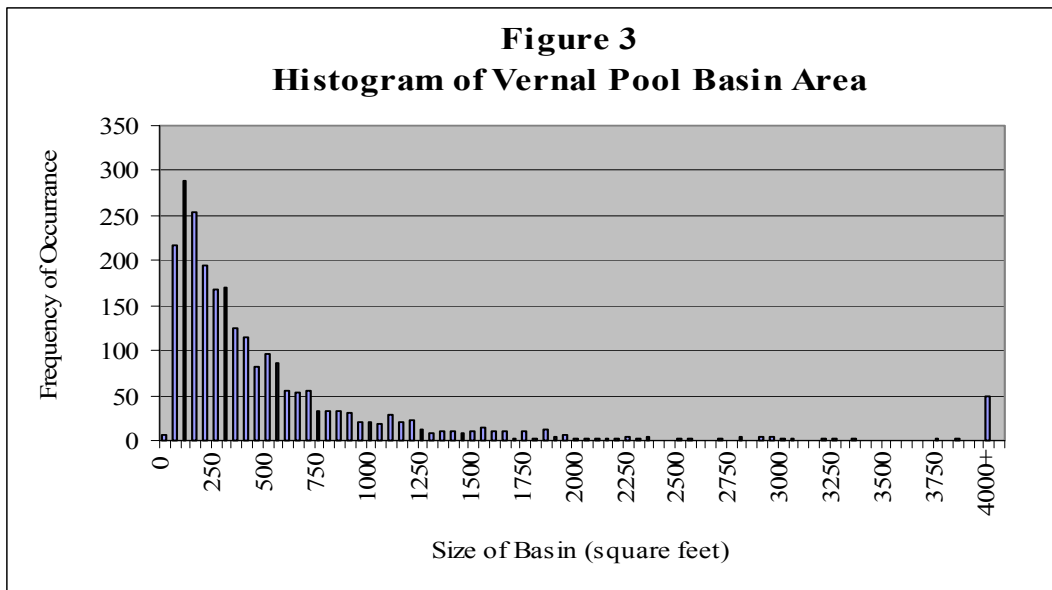


of the procedure and assess the utility of remote sensing to detect or monitor vernal pools in the future.

### 3.0 RESULTS

#### 3.1 *Inventory summary*

A total of 2516 vernal pool basins at 62 sites were mapped during the 2002-2003 rainy season. For this study, a vernal pool basin was defined as the extent of land surface covered by ponding water following a large rain event during an average rainfall year. Watershed area is not included in the basin area. Basin areas were highly variable—from 2.13 to 68,364 square feet—with a standard deviation of 2,138 around the mean of 668. The frequency distribution of basin areas is given in Figure 3.



The sites and associated Bauder identification numbers are listed with the number of mapped basins in Table 1. Sites in this inventory that were not recognized by the Bauder survey have been assigned a Bauder-type identification number in the following manner: Sites located adjacent to Bauder complexes were included in the existing designation, while isolated sites were assigned to the nearest complex and given a series number subsequent to those of historical designations. These revised Bauder identification numbers are shown in bold in Table 1.

Sites are designated as conserved according to the following criteria: vernal pool basin area occurring on land covered by a conservation easement, dedicated in fee title to the City for mitigation purposes, or designated City open space. A total of 1,369 vernal pools within the City of San Diego are conserved; this represents 54% of the basins mapped in this inventory. Of the remaining 1,193 vernal pools, 419 (17% of total basins) are located on publicly owned parcels but are not considered conserved according to the stated criteria; these sites are noted by an asterisk in Table 1. Note that site acreage for unconserved sites is based on parcel boundaries and is not indicative of natural habitat and/or vernal pool watershed. Site acreage for conserved sites corresponds to the preserved area surrounding the vernal pool basins.

**Table 1 – Summary of Inventoried Vernal Pools**

<u>Area</u>	<u>Revised Bauder ID</u>	<u>Site*</u>	<u>Number of Basins</u>	<u>Site Acreage</u>	<u>Basin Acreage</u>	<u>Conserved</u>	<u>Lambert Coordinate Map</u>
Del Mar Mesa							
	H 1-15	Del Mar Mesa	344	779	5.50	Yes	<a href="#">282-1713</a>
	H 17	Shaw Texas	26	200	0.23	No**	<a href="#">274-1701</a> <a href="#">274-1713</a>
	H 18-23	Rhodes	152	102	0.75	No**	<a href="#">282-1713</a>
	<b>H 39</b>	Greystone Torrey Highlands	19	3.5	0.68	Yes	<a href="#">282-1713</a>
	<b>H 40</b>	Li Collins	2	0.3	0.38	Yes	<a href="#">290-1725</a>
Carmel Mountain							
	H 31-32 <b>H 38</b>	Carmel Mountain	30	300	0.32	Yes	<a href="#">274-1701</a> <a href="#">266-1701</a>
Mira Mesa							
	<b>B 5-6</b>	Tierra Alta	1	0.1	0.0055	Yes	<a href="#">274-1713</a>
	B 5-8	Lopez Ridge	13	12.4	0.48	Yes	<a href="#">274-1713</a>
	B 5-8	Crescent Heights	7	36	0.042	No	<a href="#">274-1713</a>
	B 11	Mesa Norte	45	5	0.58	Yes	<a href="#">274-1713</a>
	C 10-16	Winterwood	61	20	0.81	Partial	<a href="#">266-1713</a>
	C 17-18	Fieldstone	9	4.3	0.32	Yes	<a href="#">266-1713</a>
	C 27	Mira Mesa Market Center	1	0.29	0.057	Yes	<a href="#">266-1725</a>
	<b>C 28</b>	Maddox	82	13	0.97	No	<a href="#">266-1713</a>
	D 5-8	Parkdale Carroll Canyon	4	19	0.021	No	<a href="#">266-1713</a>
	D 5-8	Carroll Canyon Preserve	119	19	1.19	Yes	<a href="#">266-1713</a>
	I 1	Arjons	34	8.7	0.73	Yes	<a href="#">258-1713</a>
Nobel Drive							
	I 6 B	Bob Baker	8	0.5	0.077	No	<a href="#">258-1713</a>
	I 6 C	Bob Baker 2	15	2	0.24	No	<a href="#">258-1713</a>
	I 12	Pueblo Lands	3	10.3	0.017	No***	<a href="#">258-1701</a>
	X 5	Nobel Drive	7	94	0.085	Yes	<a href="#">250-1701</a>
	<b>X 7</b>	Nobel Research Park	28	3.49	0.098	Yes	<a href="#">250-1701</a>
Kearny Mesa							
	N 1-6	Montgomery Field	276	544	6.76	No***	<a href="#">234-1725</a>
	<b>N 7</b>	Serra Mesa Library	25	9.2	0.36	Yes	<a href="#">234-1725</a>
	<b>N 8</b>	General Dynamics	21	4.74	0.40	Yes	<a href="#">234-1725</a>
	U 15	Magnatron	1	1	0.34	No***	<a href="#">242-1725</a>
	U 15	Sander	33	30.6	0.44	No***	<a href="#">242-1725</a>
	U 19	Cubic	29	13.5	0.45	No	<a href="#">242-1725</a>
Mission Trails Regional Park							
	<b>Q 2</b>	Mission Trails Regional Park	15	5760	0.24	Yes	<a href="#">242-1737</a>

Area	Revised Bauder ID	Site*	Number of Basins	Site Acreage	Basin Acreage	Conserved	Lambert Coordinate Map
Urban San Diego							
	<b>S 4</b>	Kelton	3	29	0.022	Yes	<a href="#">194-1737</a>
Otay Lakes							
	K 3, 5, 10, 13	Otay Lakes	87	632	2.89	No***	<a href="#">162-1785</a>
	R 1	Proctor Valley	19	157	0.25	No***	<a href="#">178-1785</a>
Otay Mesa							
	J 2 S	Otay Mesa Road Helix	13	1	0.21	Yes	<a href="#">146-1761</a>
	J 2 S, J 2 W	Otay Mesa Road Pardee	31	38.42	0.31	No	<a href="#">146-1761</a>
	J 2 W	Otay Mesa Road Recon	20	2.5	0.45	Yes	<a href="#">146-1761</a>
	<b>J 2 W</b>	J 2 W	59	40	0.68	No	<a href="#">146-1761</a>
	<b>J 2 N/W/S</b>	Recon Cal Terraces	271	155	2.89	Yes	<a href="#">146-1761</a>
	<b>J 2 W; J 31</b>	Hidden Trails	42	76.52	0.13	No	<a href="#">146-1761</a>
	J 3	J 3	5	42	0.087	Yes	<a href="#">146-1761</a>
	<b>J 4</b>	J 4	11	15	0.094	No	<a href="#">146-1761</a>
	J 4-5	Robinhood Ridge	83	16	0.56	Yes	<a href="#">146-1761</a>
	J 11 E	J 11 E	2	40.53	0.63	No	<a href="#">138-1761</a>
	J 11 W	J 11 W	5	40.53	0.49	No	<a href="#">138-1761</a>
	J 12	J 12	5	163.56	0.28	No	<a href="#">138-1761</a>
	J 13 E	J 13 E	8	163.56	0.059	No	<a href="#">138-1761</a>
	J 13 N	J 13 N	41	40	0.28	No	<a href="#">138-1761</a>
	J 13 S	J 13 S	44	108	0.62	No	<a href="#">138-1761</a>
	J 14	J 14	58	105	0.60	No	<a href="#">138-1761</a>
	<b>J 14</b>	905	7	38	0.069	Partial	<a href="#">138-1761</a>
	<b>J 14</b>	Recon South	64	17.7	1.4	Yes	<a href="#">138-1761</a>
	J 15	Arnie's Point	29	150	0.65	Yes	<a href="#">138-1761</a>
	J 16-18	J 16-18	13	99	0.40	Yes	<a href="#">138-1761</a>
	<b>J 16-18</b>	Wruck Canyon	6	9.3	0.016	Yes	<a href="#">138-1761</a>
	J 21	J 21	7	49	0.21	No	<a href="#">138-1773</a>
	J 27	J 27	10	6.4	0.23	No	<a href="#">138-1773</a>
	J 28 E	J 28 E	5	20	0.16	No	<a href="#">138-1773</a>
	J 29-30	J 29-30	76	664	0.98	No	<a href="#">146-1773</a>
	<b>J 32</b>	West Otay A + B	44	9	0.34	Yes	<a href="#">138-1761</a>
	<b>J 33</b>	Sweetwater High School	8	50	0.065	Yes	<a href="#">138-1761</a>
	<b>J 34</b>	J 34	14	246	0.15	No	<a href="#">138-1761</a>
	<b>J 35</b>	Brown Field	2	74	0.010	No	<a href="#">146-1773</a>
Marron Valley							
	<b>MM 1</b>	Marron Valley	14	2644	0.18	Yes	<a href="#">Marron Valley</a>
* Sites are defined according to location, ownership, and related project, if any (see page 15.)							
**Recently approved for conservation; fee dedication/easement process in progress.							
*** Denotes site in public ownership which does not meet the conservation criteria (see page 19.)							

All sites are shown on maps included in Appendix C. The maps follow the City 800-scale engineering format (Lambert coordinate system) used by Beauchamp (1979) and Bauder (1986) to aid in the comparison of these products. Infrared aerial photographs have been overlain with the original Bauder complex outlines and the basins mapped as part of this inventory. Sites are labeled with Bauder or revised Bauder (shown in italics) identification numbers.

Fairy shrimp were observed in a total of 643 vernal pools: *Branchinecta* spp. were identified in 628 basins, *B. sandiegoensis* were identified in 408 basins, *B. lindahli* in 20 basins, and *S. woottonii* in 134 basins. Fairy shrimp presence/absence is listed by site in Appendix D.

Juvenile and/or metamorph amphibians were noted in 326 basins. Thirty-four vernal pools contained *B. boreas*, 91 contained *H. regilla*, and 89 contained *S. hammondii*.

Rare, threatened, and endangered plants were found at 1,142 vernal pools. *E. aristulatum* was observed at 804 basins, *P. abramsii* was observed at 372 basins, *P. nudiscula* was observed at 376 basins, *N. fossalis* was observed at 99 basins, *M. minimus* was observed at 51 basins, and *O. californica* was observed at 58. Refer to Appendix G for results by site.

Percent cover estimates of the rare, threatened, and endangered plants were used to approximate the total basin area covered by each species. Table 2 shows the mean, maximum, and minimum percent cover for each species, as well as the estimated total basin coverage in square feet. Note that the numbers for Table 3 and site specific cover estimates were calculated using cover class categories. Federally threatened and endangered species are shown in bold.

**Table 2 – Area Percent Cover Sensitive Vernal Pool Species**

<u>Species</u>	<u>Basins</u>	<u>Mean</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Area Covered (sq. ft)</u>
<b><i>E. aristulatum</i></b>	804	19.5%	95%	<1%	98,497
<i>M. minimus</i>	51	1%	20%	<1%	261
<b><i>N. fossalis</i></b>	99	2.4%	16%	<1%	1,516
<b><i>O. californica</i></b>	58	3.8%	38%	<1%	2,677
<b><i>P. abramsii</i></b>	373	6.2%	70%	<1%	36,225
<b><i>P. nudiscula</i></b>	376	18.5%	82%	<1%	31,833

The low values associated with *M. minimus*, *N. fossalis*, and *O. californica* are in part a function of plant physiognomy. Slender and/or diminutive species such as these will yield low cover estimates even in areas of relatively high population density.

The percentage of vernal pools occurring in the Multi-Habitat Planning Area (MHPA) was calculated to better understand current and future conservation issues. The MHPA was designated under the MSCP as prime habitat, and provides the framework for extensive City acquisition. This area of restricted development is considered crucial to the preservation of sensitive species within the MSCP. A total of 1,496 basins (59%), covering 1,169,371 square feet (26.8 acres), are located within the MHPA. Of these, 1,005 are considered conserved. Outside the MHPA, 1,020 basins (41%) cover 512,612 square feet (11.8 acres); 364 of these basins are considered

conserved. Please see Table 3 for the allocation of sensitive species within these categories.

**Table 3 – Distribution of vernal pools relative to the MHPA**

	Inside MHPA		Outside MHPA	
	Conserved	Not Conserved*	Conserved	Not Conserved
Number of Basins	1005	491	364	656
Basin (ft <sup>2</sup> )	649,488	519,883	176,177	336,435
Basins containing				
<i>E. aristulatum</i>	580	87	106	31
<i>M. minimus</i>	5	2	44	0
<i>N. fossalis</i>	79	3	16	1
<i>O. californica</i>	52	0	5	1
<i>P. abramsii</i>	168	126	43	36
<i>P. nudiscula</i>	319	2	55	0
<i>Branchinecta</i> spp.	289	52	125	133
<i>B. sandiegoensis</i>	236	15	107	21
<i>B. lindahli</i>	18	0	1	0
<i>S. woottonii</i>	94	3	11	3
Total fairy shrimp	294	53	130	133
Percent Cover (ft <sup>2</sup> )**				
<i>E. aristulatum</i>	84,784	2,446	9,680	1,214
<i>M. minimus</i>	16	149	154	0
<i>N. fossalis</i>	1,406	152	141	17
<i>O. californica</i>	2,206	0	328	330
<i>P. abramsii</i>	12,022	17,768	4,527	1,714
<i>P. nudiscula</i>	27,910	107	3,520	0
* Sites in public ownership that do not meet conservation criteria (see page 10) are considered "Not Conserved." Refer to Table 1 for list of sites.				
**Percent cover estimates in this table were calculated using in-field cover estimates.				

Results of the comprehensive plant surveys have been divided into vernal pool indicator species, facultative wetland plants, and upland vegetation. These data are included at Appendices D, E and F, respectively.

### 3.2 Results by site

The inventory results have been organized geographically, from north to south, by site. Revised Bauder identification numbers (noted in parentheses), location and conservation status of the site, as well as number and size of vernal pools, are included in the following descriptions. Vernal pools are natural unless noted as "enhanced," "restored," or "created." Enhancement refers to improvement of existing, functional vernal pools (i.e., introduction of fairy shrimp). Restoration describes efforts to reestablish the ecosystem values of vernal pools that have ceased to function. Creation efforts establish new vernal pool basins in areas where historic vernal pools have been destroyed. Survey findings are compared with results from Bauder (1986) when applicable. Cover percentage estimates in this section were calculated using the