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2017 ANNUAL REPORT
WETLAND VEGETATION AND WILDLIFE MONITORING
CONTRACT NO. W91238-14-D-0010-0007

FORMER FORT ORD

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ACRONYMS AND ABBREVIATIONS

BO	Biological Opinion
Burleson	Burleson Consulting, Inc.
CNPS	California Native Plant Society
CTS	California Tiger Salamander
cm	centimeter(s)
DQO	Data Quality Objective
FAC	Facultative Plant
FACU	Facultative Upland Plant
FACW	Facultative Wetland Plant
fairy shrimp	California Fairy Shrimp
FNU	Formazin Nephelometric Unit
HLA	Harding Lawson and Associates
HMP	Habitat Management Plan
MEC	Munitions and Explosives of Concern
m	meter(s)
mg/L	milligram(s) per liter
NCDC	National Climatic Data Center
NOAA	National Oceanic and Atmospheric Administration
NWSFO	National Weather Service Forecast Office
NL	Not Listed
OBL	Obligate Wetland Plant
sp.	species
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
UPL	Obligate Upland Plant
Wetland Plan	Wetland Monitoring and Restoration Plan for Munitions and Contaminated Soil Remediation

1 INTRODUCTION

The United States Army Corps of Engineers (USACE) contracted Burleson Consulting, Inc. (Burleson) to conduct wetland monitoring at former Fort Ord, Monterey County, California (see Figure 1-1). Wetland monitoring includes three types of monitoring: hydrology, vegetation, and wildlife. These monitoring activities are centered around historic vernal pools on former Fort Ord.

The team monitored hydrological and water quality conditions, wetland vegetation, the state and federally threatened CTS California tiger salamander (*Ambystoma californiense*; CTS) and California fairy shrimp (*Linderiella californica*; fairy shrimp) and other aquatic invertebrates in wetlands on former Fort Ord. All biologists handling CTS were approved by the United States Fish and Wildlife Service (USFWS) under the Army to handle, capture, and relocate on former Fort Ord (USFWS, 2017). These requirements were documented in the *Installation-wide Multispecies Habitat Management Plan* (HMP), the *Programmatic Biological Opinion for Cleanup and Property Transfer Actions Conducted at the Former Fort Ord, Monterey County, California* (BO); and the *Wetland Monitoring and Restoration Plan for Munitions and Contaminated Soil Remedial Activities at Former Fort Ord* (Wetland Plan) (USACE, 1997; USFWS, 2017; Burleson, 2006).

This report presents the results of monitoring within a number of vernal pools on former Fort Ord. Vernal pools assessed in 2017 included Ponds 5, 101 East (West), 101 East (East), 997, 40 South, 42, 61, 16, 18, 54, 10, 30A, 30B, and 30C (see Figure 1-2 and Figure 1-3). In 2017, vegetation monitoring was conducted at all vernal pools except Ponds 40 South, 54, 30A, 30B, and 30C. The populations of Contra Costa goldfields (*Lasthenia conjugens*) were mapped and evaluated at Ponds 61 and 997. Invertebrate and protocol-level CTS aquatic sampling surveys were conducted at all vernal pools except Ponds 40 South, 42, 16, 30A, 30B, and 30C. All vernal pools that required wildlife monitoring held water long enough to meet the hydrologic criteria established to conduct monitoring for CTS and fairy shrimp except for Ponds 61 and 997. The criterion used to identify suitable CTS breeding habitat requires that a vernal pool retain average depth of at least 25 centimeters (cm) from the first rain event through March (Burleson, 2006). The criterion used to identify suitable fairy shrimp habitat requires that a vernal pool retain an average of 10 cm of water for at least 18 consecutive days. Monitoring for both species began when the vernal pools maintained a minimum depth of 10 cm of water during the March hydrologic monitoring survey. Suitability of a vernal pool for breeding was based upon the results of the survey.

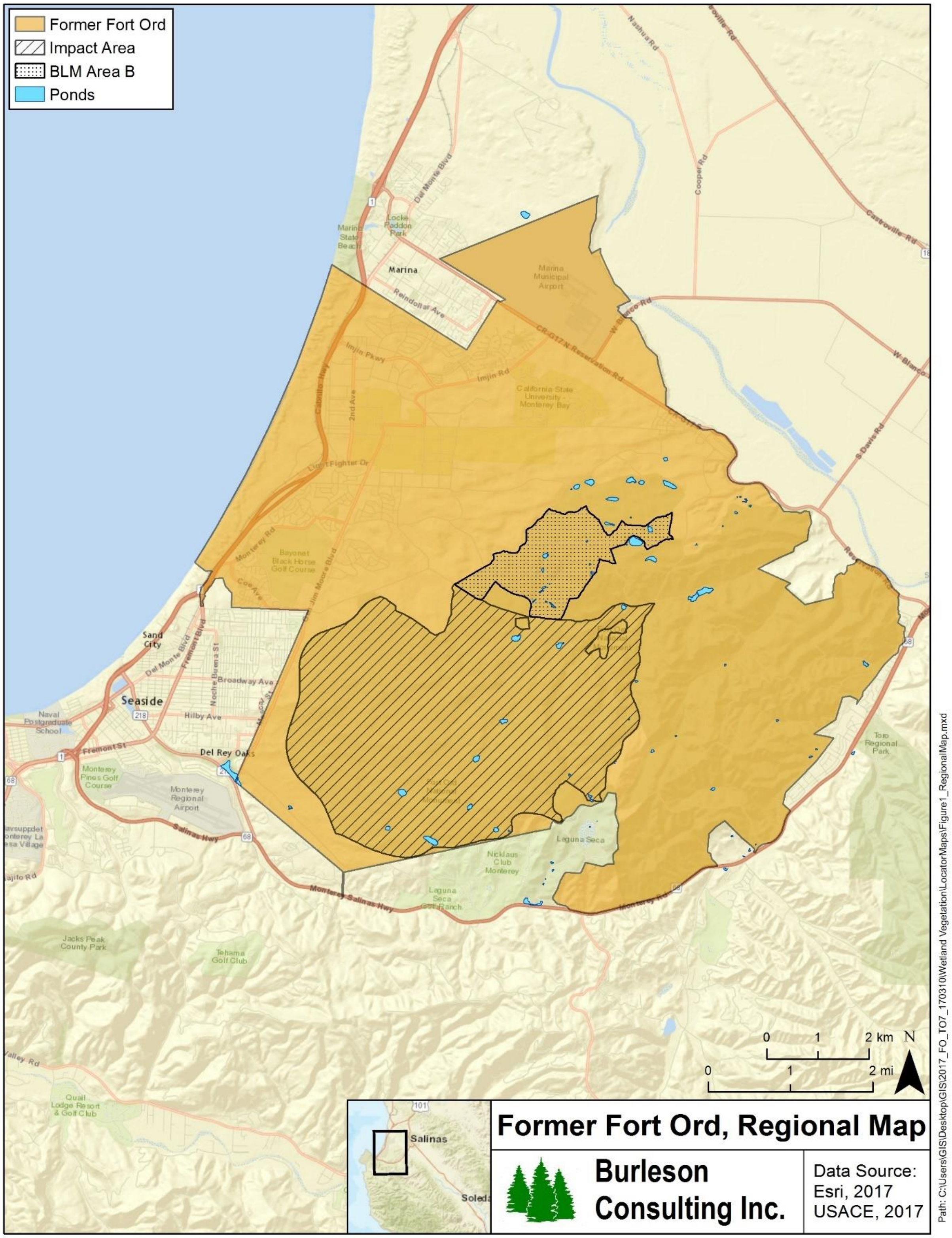

Figure 1-1. Location Map of Vernal Pools on Former Fort Ord

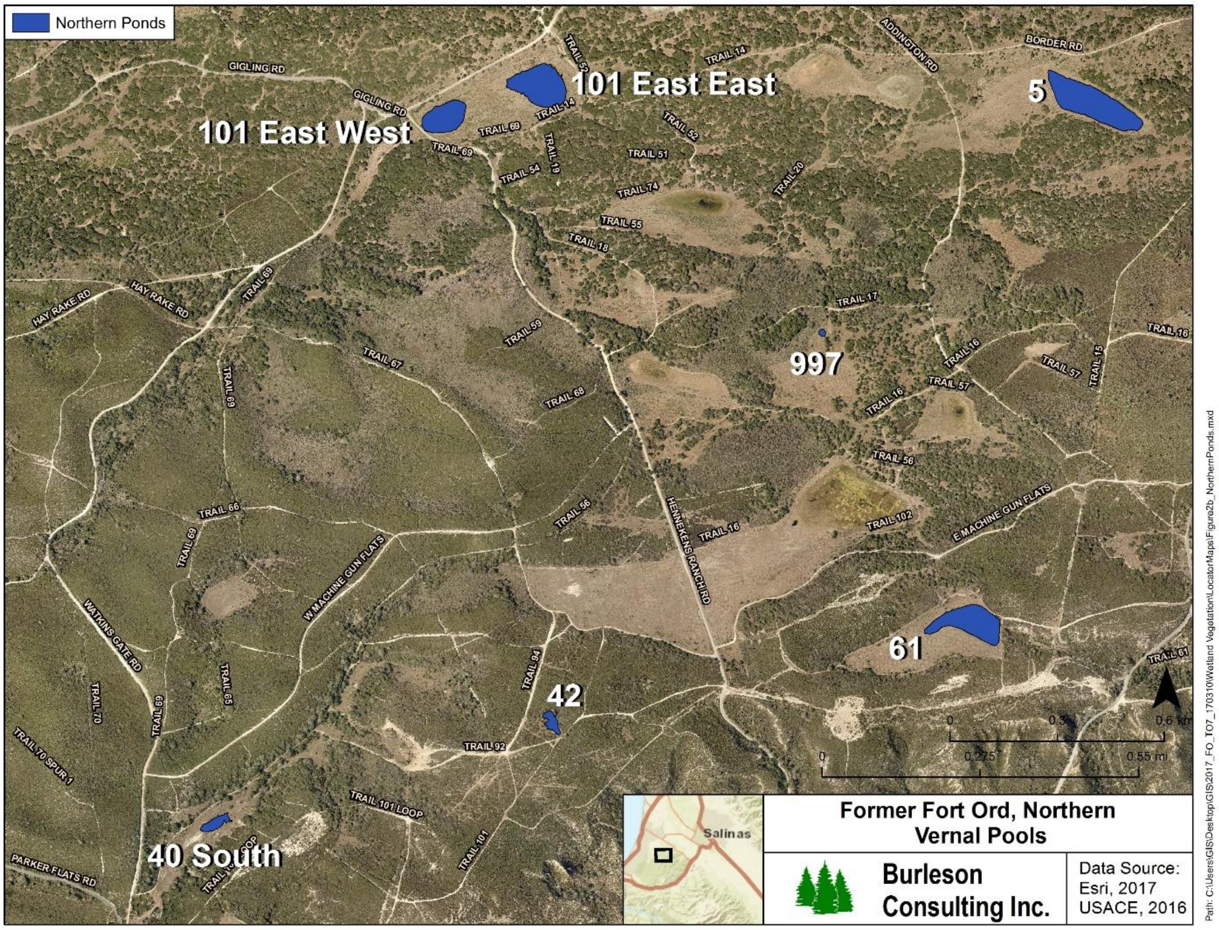

Figure 1-2. Location Map of Ponds 5, 101 East (West), 101 East (East), 997, 40 South, 42 and 61

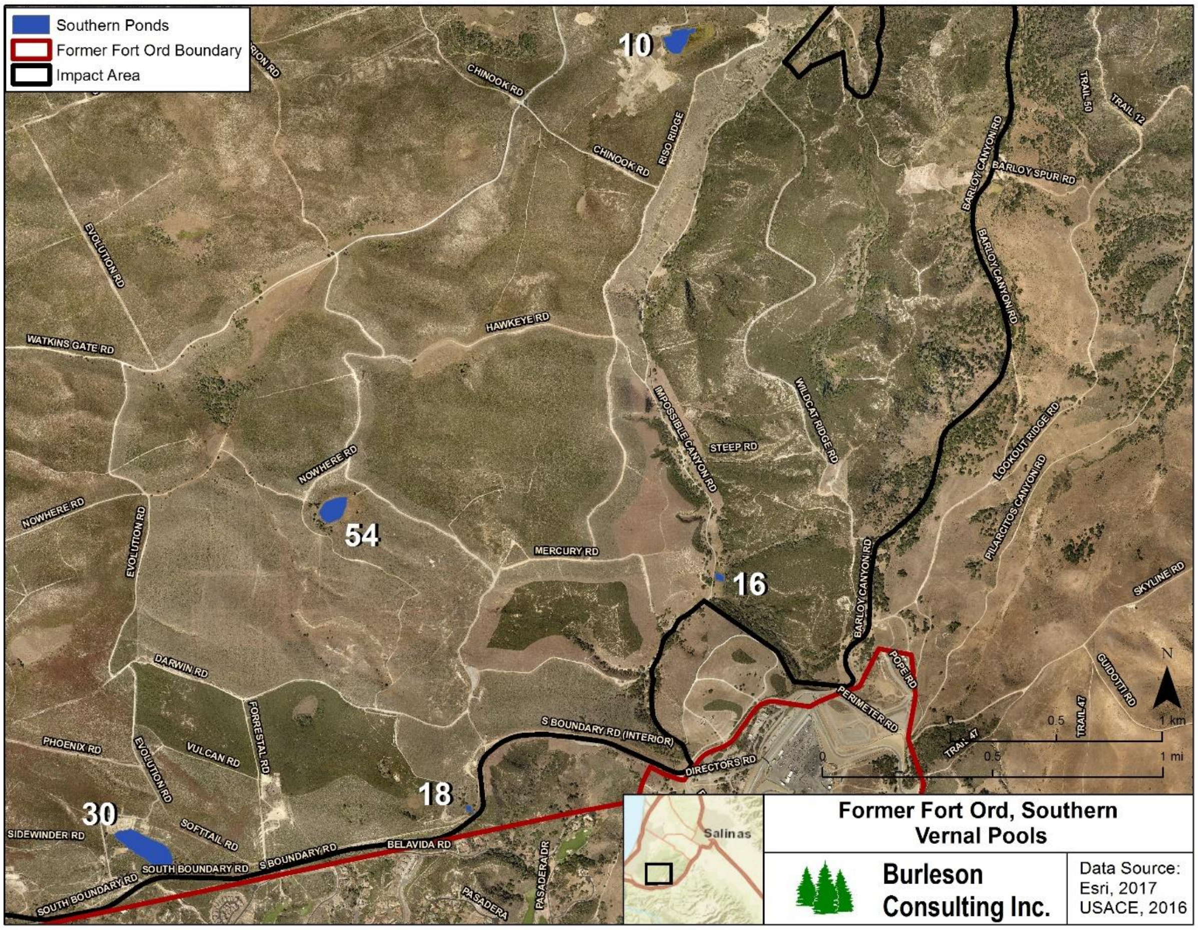

Figure 1-3. Location Map of Ponds 16, 18, 54, 10 and 30.

In the 2016-2017 water-year, the state of California experienced its first year out of the drought conditions which persisted from 2012 to 2016 (United States Geological Survey, 2016). The National Weather Service Forecast Office (NWSFO) meteorological tower, located approximately 5 miles southwest of Site 39 on former Fort Ord, recorded cumulative monthly precipitation values above-normal for the past two water-years (see Figure 1-4; Naval Postgraduate School Department of Meteorology, 2017). Normal rainfall for the NWSFO station is based on a 30-year average that at the end of each decade, is moved forward another 10 years. Normal for this station is defined as the mean precipitation from years 1981-2010. Consistent, approximately normal, and occasional below-normal rainfall occurred through most of the 2016-2017 water-year. However, the exceptionally wet October, January, and February months contributed to the conditions which fostered the first non-drought year in the past six years (see Figure 1-5).

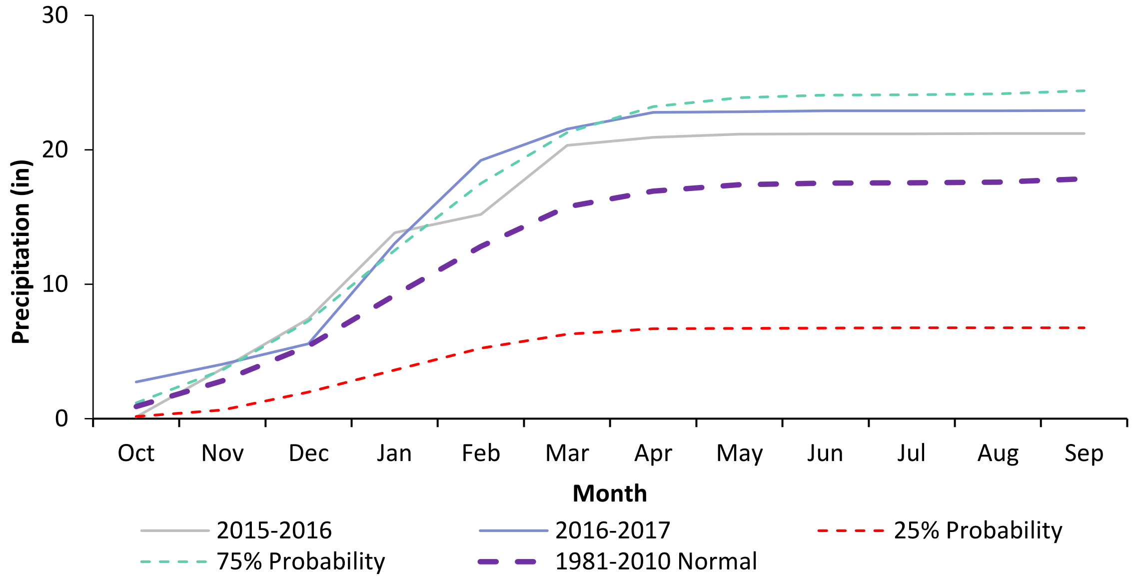

Figure 1-4. Cumulative Monthly Precipitation for the 2016-2017 Water-Year compared to the 30-Year Normal (mean 1981-2010), the 2015-2016 Water-Year, and the 25 and 75% Probabilities (NPS, 2017; National Climatic Data Center [NCDC] and National Oceanic and Atmospheric Administration [NOAA], 2016)

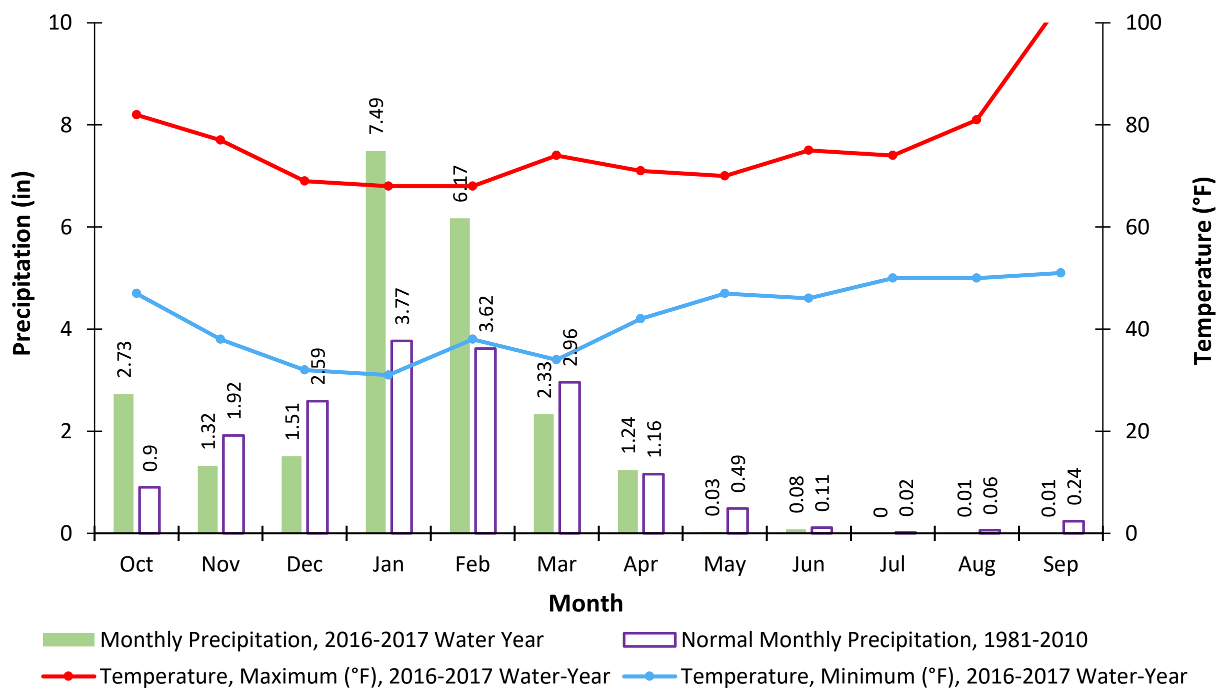

Figure 1-5. Monthly Precipitation, Maximum and Minimum Temperatures for the 2016-2017 Water-Year and Normal Monthly Precipitation (NPS, 2017)

The goal of wetland vegetation and wildlife monitoring efforts is to evaluate vernal pools affected by remediation activities against success criteria identified in the HMP, Programmatic BO, and Wetland Plan (USFWS, 2017; USACE, 1997; Burleson, 2006). The Wetland Plan outlines the Data Quality Objectives (DQO) that were used to evaluate the success criteria for this report. The DQOs focus on vernal pool depth, inundation, vegetation, water quality, and wildlife. The Programmatic BO outlines success criteria specifically for CTS and Contra Costa goldfields. Reestablishment of these species will be considered successful if, at the end of monitoring, wetland function, wildlife usage, plant cover and wetland plant diversity and dominance, and Contra Costa goldfield abundance are directly comparable to the conditions before remediation. Monitoring results guide decision-making when corrective actions are necessary as well as provide insight for potential mitigation or evaluation of monitoring methodologies. The objectives of monitoring were to document the ability of the vernal pools to support CTS and fairy shrimp, understand hydrologic function and water quality conditions, document baseline conditions, and provide data for follow-up comparison. Table 1-1 presents the status of vernal pools monitored at former Fort Ord indicating which year of monitoring were conducted in 2017.

Table 1-1. 2017 Monitoring Status for Vernal Pools on Former Fort Ord

Vernal Pool	Monitoring Status
Pond 5	Reference
Pond 101 East (West)	Reference
Pond 101 East (East)	Reference
Pond 997	Reference
Pond 40 South	Baseline
Pond 42	Baseline
Pond 61	Baseline
Pond 16	Year 1 Post-Mastication
Pond 18	Year 2 Post-Mastication
Pond 54	Year 2 Post-Mastication
Pond 10	Year 5 Post-Lead Remediation
Pond 30A	Year 5 Post-Fire-Retardant
Pond 30B	Year 5 Post-Fire-Retardant
Pond 30C	Year 5 Post-Fire-Retardant

2 METHODS

Sampling methods for wetland vegetation monitoring and aquatic surveys were consistent with the BO and Wetland Plan (USFWS, 2017; Burleson, 2006). Biologists did not enter areas where standing water was present except at Ponds 5, 101 East (West), 101 East (East), 997, and 10 where it was deemed safe by USACE. Sampling and observations were completed from the bank for all other vernal pools due to risk of Munitions and Explosives of Concern (MEC) presence.

Vernal pools must be monitored for baseline condition prior to any remedial activities such as prescribed burns, mastication, excavation, or artificial draining (USFWS, 2017). As described in the BO, the Army will conduct two years of pre-activity larval sampling in the ponds where more than 50 percent of the watershed is affected by prescribed burns, thus for some pools this was a second year of baseline (USFWS, 2017). Additionally, at some ponds baseline surveys were conducted over 10 years ago, and were sampled again to account for any changes that may have occurred over that period. Historical account of all surveys is presented in Appendix F. Vernal pools are then monitored following any remedial activity in 3 to 5 years depending on the type of disturbance. Reference vernal pools that will not be remediated will also be monitored for comparison. In 2017, Ponds 40 South, 42, and 61 were monitored for baseline. Pond 16 was monitored for year 1 post-mastication. Ponds 18 and 54 were monitored for year 2 post-mastication. Ponds 10, 30A, 30B, and 30C were monitored for year 5 post-lead remediation and post-fire retardant. Ponds 5, 101 East (West), 101 East (East), and 997 are reference vernal pools.

2.1 Hydrology Monitoring

Biologists measured pH, turbidity, temperature, dissolved oxygen, and vernal pool depth and inundation area. Water quality data were collected using the Hanna Instrument 9829 Multi-parameter Meter. The meter was calibrated prior to each data collection event (see Appendix A). Data were collected monthly between January and June 2017. Data collection for water quality ceased at the end of June or when vernal pools became completely dry, whichever came first. These sampling methods are consistent with the BOs and Wetland Plan (Burleson, 2006). Recommendations were to collect data at mid-pool and mid-depth in all vernal pools. The staff gauge is located at the deepest point of the pond, mid-pool was therefore considered the location of staff gauge, regardless of the variable pool perimeter. Mid-depth was dependent on the depth of the pond during the time of monitoring. Recommendations of mid-pool, mid-depth data collection required pool entry. Due to ordnance-associated safety concerns of BRAC, biologists were only able to enter Ponds 5, 101 East (West), 101 East (East), 10, and 997. When vernal pools were entered, biologists used chest waders and personal floatation devices. Despite the ability to enter vernal pools, the depth of the water restricted biologists from reaching mid-pool and mid-depth at the largest vernal pools including Ponds 5, 10, and 101 East (East) at monitoring collection from February through May. In these instances, the biologists would walk out as far as possible, without compromising safety, towards the staff gauge and take the reading mid-depth. Data was collected at the pool edge for all of the other vernal pools. Supplemental data for December and January depth and inundation were provided by USACE. Additionally, Burleson continued to monitor depth through September in order to record when the vernal pools dried.

When water quality data were collected from the pool edge, the probe was placed just beyond vegetation. Care was taken to ensure the probe was completely covered by water and within reach of the biologist. The locations of these collection points were recorded with GPS units. Data were collected at the same location in subsequent months. However, when pools began drying, sampling locations moved inward. The pH, temperature, and turbidity were logged and recorded on the field data sheet after initial probe adjustment was complete (see Appendix A). The dissolved oxygen was recorded while the probe was held vertically and bobbed up and down in the water column. When dissolved oxygen values stabilized, the reading was taken. This was done because the probe consumes oxygen as it is takes the reading. If the probe is left motionless in low oxygen water, false readings of 0.00 mg/L are possible.

Inundated surface area was delineated by creating shape files with a Trimble® Juno ® T41 Series GPS unit. The perimeters of the pools were mapped in their entirety, unless physically impossible due to safety risks. Areas were calculated from the resulting shape files using ArcGIS (Esri, 2015). Pool depths were recorded from staff gauges in the deepest point of each pool. Exact depths were not measured at Pond 5 from February through April or Pond 101 East (East) from January through June because water levels covered the maximum gauge marking. Estimates were made in these cases and are noted as such within this report. Photographs of each vernal pool were taken at established photo points.

2.2 Vegetation Monitoring

Prior to collecting transect data, vernal pools were visited in early spring to assess the condition and initiate a list of present plant species. When possible, vegetation quadrat data were collected after the vernal pools had dried. Some pools were visited more than once prior to collection of quadrat data to identify species present, evaluate vegetative strata, and determine the ideal time to collect data. Vegetation quadrat data were collected at each of the vernal pools between May 4, 2017 and September 21, 2017. Data were collected as the vernal pools dried and the vegetation was sufficiently identifiable (see Appendices B, C, G, and H). Biologists visually assessed the historic vernal pool basins for each resource and identified homogeneous vegetative strata.

Vernal pool basins are defined by the hydrogeomorphic basin feature and the distinctly different vegetative community compared to the surrounding upland area. Because the basins vary from year to year and from wet to dry weather cycles over decades, the center portions of the basins typically support wetland vegetation associations, while outer portions at the highest elevations may not. This hydrologic regime often precludes the presence of mature stands of upland tree and shrub communities within the basin boundaries. For vernal pools located within grasslands, basin boundaries are typically defined by a change from mesic grasses to monotypic stands of upland grasses.

For the purposes of this report, vegetative strata refer to the different homogenous vegetative communities that are distributed around the vernal pools in a zonate pattern. These are generally concentric circles similar to a bullseye. Open water typically recedes towards the center through the dry season. Differing depths and duration of inundation result in suites of plant species which are organized into discernable functional zones. These can be readily differentiated and mapped. During the visual assessment, biologists recorded the percent of submergent, emergent, and floating vegetative cover within the inundated areas when present. Inundated areas were characterized by the presence of standing water with wetland vegetation, while open water areas were characterized by standing water without vegetation.

Strata were differentiated based on dominant species and overall species composition. The team used a stratified random quadrat method to collect data within each accessible stratum (Barbour *et al.*, 1980). When strata were inundated, vegetation was too dense or tall to enter, or in areas with MEC concern, visual data were collected to define strata. In vernal pools that have been monitored using the same methodology in previous years, the transect locations were repeated when the strata were defined by the same dominant species and the transect locations were representative of the species composition for that strata. Otherwise, biologists placed a new transect in the most homogenous representative area for each accessible stratum. These were mapped using a Trimble® Juno ® T41 Series GPS unit. Transects were 5-meters (m) or 10-m in length depending on stratum size. Biologists used a random number table to determine placement of a 0.25 m^2 quadrat along each transect. The quadrat was placed a minimum of three times for every 5 m of transect. Biologists recorded the absolute percent cover by plant species, groundcover, and bare ground (see Appendix B). Species percent cover was averaged for each stratum of the sampled vernal pools (see Appendix C). Biologists mapped strata the same day as quadrat sampling using a Trimble® Juno ® T41 Series GPS unit and calculated absolute percent cover of the strata using ArcGIS (Esri, 2015).

Plant species observed at each vernal pool were recorded. Most species were identified in the field using *The Plants of Monterey County, an Illustrated Field Key; Second Edition* (Matthews and Mitchell, 2015) and *The Jepson Manual: Vascular Plants of California, Second Edition* (Baldwin *et al.*, 2012). Plants were categorized as native, non-native, or unidentified (see Appendix G Tables G-1 – G-10). Additional categorization of the plants occurred to identify them as one of the following: obligate wetland (OBL), facultative wetland (FACW), facultative (FAC), facultative upland (FACU), obligate upland (UPL), or not listed (NL) (see Appendix G Tables G-11 – G-20) (Lichvar *et al.*, 2016). Some species could not be identified in the field. Samples were collected from the vernal pool (not from the quadrats) and identified in the office.

Contra Costa goldfields (*Lasthenia conjugens*) populations were mapped by creating polygons using a Trimble® Juno ® T41 Series GPS unit. Absolute cover was visually estimated for these polygons. Contra Costa goldfields is a species listed as federally endangered under the Endangered Species Act of 1973.

2.3 Wildlife Monitoring

Following BO, HMP, and Wetland Plan protocols, biologists conducted aquatic surveys for CTS and fairy shrimp (USFWS, 2015; Burleson, 2006). These were conducted concurrently on multiple occasions. The criterion used to identify suitable CTS breeding habitat requires that a vernal pool retain average depth of at least 25 cm from the first rain event through March (Burleson, 2006). The criterion used to identify suitable fairy shrimp habitat requires that a vernal pool retain an average of 10 cm of water for at least 18 consecutive days. Monitoring for both species began when the vernal pools maintained a minimum depth of 10 cm of water during the March hydrologic monitoring survey.

Nets, boots, and other equipment were scrubbed with Quat-128 solution and completely air-dried between monitoring different vernal pools to reduce the possibility of spreading disease. Additionally, nets, boots, and equipment were treated with Quat-128 solution and air-dried at the end of each day. Cleaning solutions were applied to equipment in areas away from aquatic resources, on disturbed or developed roads to reduce contamination. Disposable nitrile gloves were used when handling CTS. Biologists used a new pair of gloves at each vernal pool.

2.3.1 California Tiger Salamander

Survey methods for CTS followed the *Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander* (USFWS and California Department of Fish and Game, 2003). Some exceptions were made as needed: aquatic sampling continued after initial detection and some inundated vernal pools were not entered. Further aquatic sampling was completed to provide additional insight into vernal pool function. Biologists did not enter some pools due to MEC-related safety concerns and instead collected samples from the pool's edge.

USACE Safety deemed the following vernal pools safe to enter: Ponds 5, 101 East (West), 101 East (East), 997, and 10. Ponds 61, 18, and 54 were surveyed from the pool's edge.

CTS larvae were collected using long-handled, fine-meshed, D-shaped dipnets to allow biologists to record individual metrics and derive an approximation of CTS count for each vernal pool. All sites were sampled using dipnets to minimize aquatic habitat disturbance. This methodology was chosen to allow direct comparison to past results. Depending on the extent of aquatic habitat, two to four biologists sampled each site. Biologists collected samples from each vernal pool until the habitat was adequately represented.

Biologists measured and recorded the length of a subset of the first 30 individual CTS larvae collected. When the total number of CTS collected was less than 30, than all of the individuals were measured. CTS and other amphibian species encountered were identified and the total numbers recorded. The relative abundance of amphibian species other than CTS was reported as follows:

- Few (F): 1 to 10 individuals;
- Common (C): 11 to 100 individuals; and
- Abundant (A): greater than 101 individuals.

2.3.2 California Fairy Shrimp

Aquatic sampling for fairy shrimp and other aquatic invertebrates was conducted using a fine-meshed dip net (see Appendix D Table D-2). Biologists recorded the presence/absence of these species.

2.4 Evaluation for Data Quality Objectives and Success Criteria

Data quality objectives (DQOs) and performance standards outlined in the Wetland Plan were used to measure successful wetland function following MEC and soil remediation activities (Burleson, 2006). DQOs can be summarized as:

- DQO 1: depth – average of 25 cm through March for CTS and at least 10 cm through May for fairy shrimp
- DQO 2: inundation – consistent with baseline and similar to reference vernal pool trends
- DQO 3: vegetation – similar hydrophytic vegetation as reference control wetlands
- DQO 4: water quality – adequate for the presence of CTS and/or fairy shrimp
- DQO 5: wildlife – consistent with baseline and similar to reference control wetland trends

Hydrological conditions and inundation area were assessed using DQO 1 and DQO 2. Hydrology survey results were analyzed to evaluate if the vernal pool held a sufficient depth of water appropriate for CTS and fairy shrimp for the duration of the breeding season. Suitable CTS habitat was defined as a vernal pool that retains an average depth of at least 25 cm from the first rain event through March (Burleson, 2006). Suitable fairy shrimp habitat was defined as a vernal pool that retains an average depth of 10 cm for 18 consecutive days through May. Hydrology results were compared to previous surveys and reference vernal pools to better understand if the vernal pool followed trends in inundation and function similar to the baseline and reference vernal pools. Water quality results were evaluated in a similar manner; however, observed water quality parameters in vernal pools were variable. This is common due to the complex mechanisms contributing to water quality, such as air temperature, plant respiration rates, microbial community structure, and soil chemistry. In addition, the primary measure of adequate water quality was measured by the presence or absence of wildlife in DQO 4.

Plant cover and species diversity were assessed using DQO 3. Species diversity was assessed by examining species richness and species abundance. Wetland vegetation monitoring results were analyzed to identify whether the vernal pool was similar to baseline and reference vernal pools and if wetland function was consistent through time. The disturbed vernal pool should have the following characteristics by the end of the last year of monitoring:

- A number of native wetland species present in the vernal pool comparable to the number present in the vernal pool before MEC and contaminated soils removal or in control wetlands, and
- A relative dominance of native wetland species in the vernal pool comparable to the relative dominance in the vernal pool before MEC and contaminated soil removal or in control wetlands.

Wildlife usage was assessed using DQO 1, DQO 4, and DQO 5. The vernal pool was considered successful if the post-remediation wildlife usage was similar to pre-disturbance usage. The Wetland Plan indicates that a vernal pool which supported CTS and fairy shrimp prior to remediation activities should continue to support those species following such activities (Burleson, 2006). The presence or absence of wildlife was taken into consideration with regards to sufficient depth and inundation, described in DQO 1, as well as whether water quality was adequate to support wetland species, described in DQO 4.

In addition to the Wetland Plan, the Programmatic BO from 2017 outlines the following success criteria specifically for CTS and Contra Costa goldfields (USFWS, 2017). Species reestablishment will be considered successful if, at the end of monitoring, each of the following is directly comparable to the conditions before the start of work:

1. Wetland function, as measured by the parameters of hydrologic conditions (inundation are area and depth, pH, dissolved oxygen levels);
2. Wildlife usage, specifically California tiger salamander larval presence;
3. Plant cover and wetland plant species diversity and dominance; and
4. Contra Costa goldfields abundance.

These four conditions were accessed in conjunction with the DQOs. Wetland function was assessed with DQO 1, DQO 2, and DQO 4. Wildlife usage was assessed with DQO 5. Plant cover and wetland plant species diversity and dominance was assessed with DQO 3. And Contra Costa goldfield abundance was assessed with DQO 3.

Historic data for cumulative precipitation, physical characteristics, water quality, wetland vegetation, and wildlife presence or absence for all of the reference and post remediation vernal pools were summarized by vernal pool. Vernal pool inundations were mapped and compared to the inundations in previous years at remediated and reference vernal pools. A historic outline of inundation and water quality in comparison to the precipitation year is provided in Appendix F with text and tables. Wetland vegetation was compared across years and to reference vernal pools based on the stratum, absolute percent vegetative cover, species richness, native plant species richness, relative percent native species cover, wetland plant species richness, relative percent wetland plant cover, and species composition (see Appendices G and H). Wildlife was compared by presence or absences of CTS and fairy shrimp.

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3 RESULTS

Hydrology surveys were conducted monthly from January through June at Ponds 5, 101 East (East), 101 East (West), 997, 40 South, 42, 61, 16, 18, 54, 10, 30A, 30B, and 30C. Measurable ponding was observed in all vernal pools monitored in 2017. Pond 101 East was the largest vernal pool with a maximum depth and inundation of approximately 160 cm and 9.38 acres, respectively. The smallest vernal pool was Pond 997 with a maximum depth and inundation of 15 cm and 0.33 acre, respectively. Inundation through the monitoring period was variable among the vernal pools. By June, only 21% of 14 vernal pools were dry. All but Ponds 5, 10, 16, and 101 East (East) were dry by September. Maximum depth and acreage measurements indicate that vernal pools which were smaller and shallower in early season, dried sooner than larger, deeper pools, as expected (see Table 3-1).

Table 3-1. Month Vernal Pools Dried Compared to Initial Inundated Surface Areas and Max Depths May through September, 2017

Month Vernal Pools Dried	Number of Vernal Pools Dried	Mean Inundated Surface Area from Initial Survey (acres)	Mean Max Depth from Initial Survey (cm)
May	3 (Ponds 997, 40 South and 61)	0.44	21.0
June	None	-	-
July	7 (Ponds 101 East (West), 42, 18, 54, 30 A, 30 B and 30 C)	1.10	43.0
August	None	-	-
Did Not Dry	4 (Ponds 5, 10, 16 and 101 East (East))	4.34	109

Observed water quality measurements were similar to surveys from previous years for all vernal pools (see Appendix A Tables A-1 – A-9). Mean temperature increased from 9.51 °C in January to 21.14 °C in June. Mean dissolved oxygen values were 2.68 milligrams per liter (mg/L) in January, increased to 6.26 mg/L in February, decreased to 2.69 mg/L in March, and remained around 4.0 mg/L in April, May, and June. Mean pH values gradually increased from 6.28 in January to 6.78 in June. Mean turbidity values generally were similar between January and June with a slight decrease in April and May. The minimum mean turbidity value was 29.1 formazin nephelometric units (FNU) in May and the maximum was 111.7 FNU in March.

The minimum depth requirement for wildlife surveys was 10 cm and was based on the success criterion for fairy shrimp outlined in the Wetland Plan (Burleson, 2006). Hydrology survey results for January indicated that CTS and fairy shrimp wildlife monitoring minimum depth requirements were met at all 14 vernal pools.

Vegetation monitoring was conducted at Ponds 5, 101 East (West), 101 East (East), 997, 42, 61, 16, 18, and 10. The mean number of native plant species across all monitored vernal pools was 14 and non-native was 8 (see Table 3-2). Of these species, a mean of 11 were wetland species, either obligate OBL or FACW (see Table 3-3). In addition to vegetative strata mapping and transect surveys, the populations of Contra Costa goldfields were mapped at Pond 61 and Pond 997.

Table 3-2. Vegetation Species Richness of Native and Non-Native Species at Vernal Pools Monitored in 2017

Vernal Pool	Monitoring Status	Native	Non-Native
5	Reference	15	11
101 East (West)	Reference	23	12
101 East (East)	Reference	13	5
997	Reference	16	11
42	Baseline	10	4
61	Baseline	14	6
16	Year 1 Post-Mastication	13	11
18	Year 2 Post-Mastication	11	8
10	Year 5 Post-Lead Remediation	11	4
Mean	**-**	**14**	**8**

Table 3-3. Vegetation Species Richness of Obligate and Facultative Wetland Species at Vernal Pools Monitored in 2017

Vernal Pool	Monitoring Status	OBL	FACW	OBL & FACW
5	Reference	5	6	11
101 East (West)	Reference	8	11	19
101 East (East)	Reference	3	6	9
997	Reference	5	10	15
42	Baseline	5	4	9
61	Baseline	3	7	10
16	Year 1 Post-Mastication	4	4	8
18	Year 2 Post-Mastication	3	6	9
10	Year 5 Post-Lead Remediation	7	4	11
Mean	**-**	**5**	**6**	**11**

Aquatic wildlife monitoring was conducted at Ponds 5, 101 East (West), 101 East (East), 997, 61, 18, 54, and 10 (see Appendix D Table D-1). When possible, biologists sampled vernal pools three times; however, this was not possible in all cases since some pools dried sooner than others. Ponds 61 and 997 dried up during the sampling period and were not sampled during all events. Ponds 5, 101 East (West), 101 East (East), 54, and 10 contained CTS. Ponds 997, 61, and 18 had negative findings for CTS. Fairy shrimp were not found at any of the vernal pools.

3.1 Pond 5

Pond 5 is a reference pool that was monitored as a control for comparison to the remediated vernal pools. In 2017, Pond 5 was monitored for hydrology, vegetation, and wildlife. Pond 5 had not dried by the time of the last monitoring event on September 6, 2017.

3.1.1 Hydrology Monitoring

Pond 5 was monitored for hydrology nine times (see Table 3-4 and Figure 3-1). The first monitoring data were provided by the USACE and include the depth and inundation but not water quality. The final monitoring events in July, August, and September only included depth surveys and were conducted as an additional effort to document when the vernal pool dried.

Table 3-4. Pond 5 (Reference) Hydrology Monitoring Results

Date	Time	pH	Temperature (C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Max Depth (cm)	Inundated Surface Area (acres)
1/25/2017	11:45	6.09	8.9	2.13	4.0	58	5.32
2/27/2017	11:30	6.24	11.8	4.52	6.4	~130, gauge submerged	7.78
3/23/2017	8:15	6.54	15.3	1.55	8.3	~130, gauge submerged	7.30
4/20/2017	10:30	6.38	17.2	0.00	5.9	~130, gauge submerged	7.24
5/25/2017	15:20	6.28	21.9	2.73	4.5	110	6.49
6/20/2017	13:40	7.12	24.2	3.54	7.4	98	5.74
7/28/2017	9:45	-	-	-	-	94	-
8/16/2017	9:35	-	-	-	-	57	-
9/6/2017	11:53	-	-	-	-	45	-

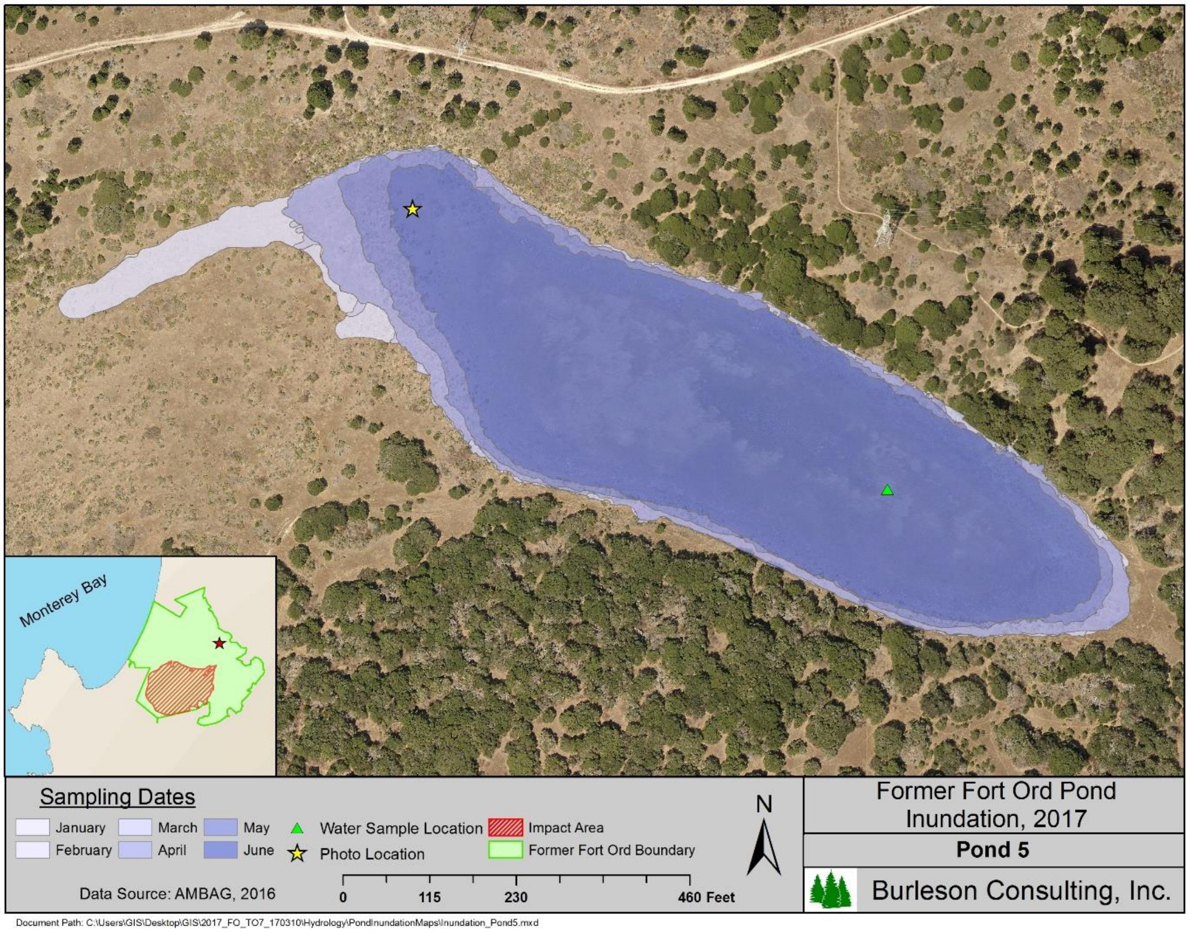

Figure 3-1. Map of Pond 5 on Former Fort Ord, 2017

3.1.2 Vegetation Monitoring

Vegetation monitoring was conducted at Pond 5 on July 6, July 28, and September 21, 2017. This monitoring represents reference data. Standing water was present during all monitoring events. At the final survey, on September 21, the depth was 38 cm. Biologists identified five vegetative strata in the pool (see Figure 3-2). The vernal pool basin boundary was identified and all vegetative strata within the basin were mapped and tabulated (see Table 3-5). Appendix C provides the species cover results for each stratum. Strata 1, 2, 3, and 4 were repeated from 2016, and stratum 5 was new in 2017. No transect was placed in stratum 1 because it was inundated in 2017. Although strata 2 and 3 were repeated from 2016, the transects were relocated because the previous locations were no longer within the correct strata. Transect 4 was established in 2017 because in 2016 vegetation monitoring was conducted too late in the season and the species in the strata were no longer easily identifiable. Transect 5 was established in 2017.

Seventy-three plant species were observed within the vernal pool basin boundary. Of these species, 46 were native, 24 were non-native, and three were unidentified. Additionally, 13 species were OBL wetland plants, 25 were FACW or FAC, 14 were FACU or UPL, and 21 were not-listed. Appendix G identifies the number of native, non-native, and unidentified species within each stratum as well as the number of species within each wetland indicator category for each stratum.

Table 3-5. Pond 5 (Reference) Vegetative Strata Percentage Within the Vernal Pool Basin Boundary

Stratum	Percentage
1	53%
2	12%
3	12%
4	16%
5	7%

Stratum 1 at Pond 5 contained approximately 65% emergent vegetation, 10% floating vegetation, and 25% open water. Emergent vegetation consisted of pale spikerush (*Eleocharis macrostachya*) and floating vegetation consisted of Howell's quillwort (*Isoetes howellii*). Both species are native. No transects were placed in the stratum since it was inundated at the time of monitoring. Percent cover was visually assessed for this stratum.

Transect 2 at Pond 5 consisted of a 10-m transect placed in stratum 2. Six plant species were observed along the transect. Of these species four were native and two were non-native. Pale spikerush and salt grass (*Distichlis spicata*) were the dominant species, accounting for approximately 49% and 21% cover, respectively. Thatch and bare ground were fairly abundant, accounting for approximately 16% and 12% cover, respectively. Other species included scarlet pimpernel (*Lysimachia arvensis*), Hickman's popcornflower (*Plagiobothrys chorisianus* var. *hickmanii*), weedy cudweed (*Pseudognaphalium luteoalbum*), and bugle hedge-nettle (*Stachys ajugoides)*.

Transect 3 at Pond 5 consisted of a 10-m transect placed in stratum 3. Eight plant species were observed along the transect. Of these species four were native and four were non-native. Brown-headed rush (*Juncus phaeocephalus)* was the dominant species, accounting for approximately 37% cover. Bare ground was abundant, accounting for approximately 37% cover. Other species included annual quaking grass (*Briza minor*), California oat grass (*Danthonia californica*), salt grass, rattail sixweeks grass (*Festuca myuros*), low bulrush (*Isolepis cernua*), grass poly (*Lythrum hyssopifolia*), and rabbitfoot grass (*Polypogon monspeliensis*). Thatch was also present.

Transect 4 at Pond 5 consisted of a 10-m transect placed in stratum 4. Twelve plant species were observed along the transect. Of these species four were native, seven were non-native, and one was unidentified. Brown-headed rush was the dominant species, however it only comprised approximately 7% cover. Annual quaking grass, salt grass, common toad rush (*Juncus bufonius* var. *bufonius*), grass poly, and sheep sorrel (*Rumex acetosella*) contributed cover ranging from 2-4%. Thatch was abundant, accounting for approximately 57% cover. Other species included silvery hair-grass (*Aira caryophyllea*), soft chess (*Bromus hordeaceus*), California oat grass, *Erodium* sp. (species), rattail sixweeks grass, and small-flower catchfly (*Silene gallica*). Bare ground was also present, accounting for 17% cover.

Transect 5 at Pond 5 consisted of a 10-m transect placed in stratum 5. Sixteen plant species were observed along the transect. Of these species ten were native, four were non-native, and two were unidentified. Salt grass, small-flowered nightshade (*Solanum americanum*), and cottonbatting plant (*Pseudognaphalium stramineum)* were the dominant species, accounting for approximately 36%, 13%, and 11% cover, respectively. Other species included beardless wild rye (*Elymus triticoides*), *Galium* species, lowland cudweed (*Gnaphalium palustre*), Baltic rush (*Juncus balticus*), scarlet pimpernel, grass poly, chaffweed (*Lysimachia minima*), Hickman's popcornflower, weedy cudweed, cutleaf burnweed

(*Senecio glomeratus*), bugle hedge-nettle, *Vicia* sp., and Davy's centaury (*Zeltnera davyi*). Bare ground was fairly abundant, accounting for 13% cover.

Figure 3-2. Pond 5 Vegetation Transects and Strata on Former Fort Ord, 2017

3.1.3 Wildlife Monitoring

Pond 5 was monitored for CTS and fairy shrimp on March 28, April 24, and May 30, 2017. CTS were present at all three monitoring events while fairy shrimp were not observed. Table 3-6 provides the results of the CTS monitoring conducted in 2017. Invertebrate results for 2017 are provided in Appendix D (see Table D-2).

Table 3-6. Pond 5 (Reference) CTS Aquatic Monitoring Results

Vernal Pool	Sampling Date	# of Larvae Obs.	# of Larvae Measured	Total Length of Larvae (mm)			Snout-Vent Length of Larvae (mm)			Survey Hours
				Mean*	Range	Mode	Mean*	Range	Mode	
5	3/28/2017	12	12	50	40-67	50	27	22-35	25	3 hrs 52 min
	4/24/2017	18	18	95	72-119	95	51	-	58	4 hrs
	5/30/2017	16	16	128	114-140	125	65	58-73	65	2 hrs

* The mean was rounded to the nearest whole number

3.2 Pond 101 East (West)

Pond 101 East (West)[1] is a reference pool that was monitored as a control for comparison to the remediated vernal pools. In 2017, Pond 101 East (West) was monitored for hydrology, vegetation, and wildlife. Pond 101 East (West) was hydrologically connected to Pond 101 East (East) from January through April but was separate by May.

3.2.1 Hydrology Monitoring

Pond 101 East (West) was monitored for hydrology nine times and dried in July (see Table 3-7 and Figure 3-3). Data for the first two monitoring events were provided by the USACE and include the depth and inundation but not water quality. The final monitoring event in July only included the depth and was conducted as an additional effort to document when the vernal pool dried.

Table 3-7. Pond 101 East (West) (Reference) Hydrology Monitoring Results

Date	Time	pH	Temperature (C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Max Depth (cm)	Inundated Surface Area (acres)
12/13/2016	-	-	-	-	-	DRY	0.00
1/17/2017	-	-	-	-	-	40	2.40
1/24/2017	13:57	5.81	10.6	1.99	13.7	79	Connected to 101 East (East), total 5.02
2/27/2017	9:20	6.21	10.4	6.18	10.8	88	Connected to 101 East (East), total 9.37
3/20/2017	13:12	6.13	14.7	5.80	2.8	84	Connected to 101 East (East), total 8.89
4/20/2017	8:30	6.10	15.3	5.28	10.0	86	Connected to 101 East (East), total 9.38
5/25/2017	13:50	6.02	18.7	1.68	36.6	74	0.95
6/21/2017	13:02	6.53	26.6	2.97	79.8	18	0.17
7/27/2017	13:00	-	-	-	-	DRY	0.00

[1] Pond 101 East (West) is identified as "Waterbody 53" in Harding ESE (2002).

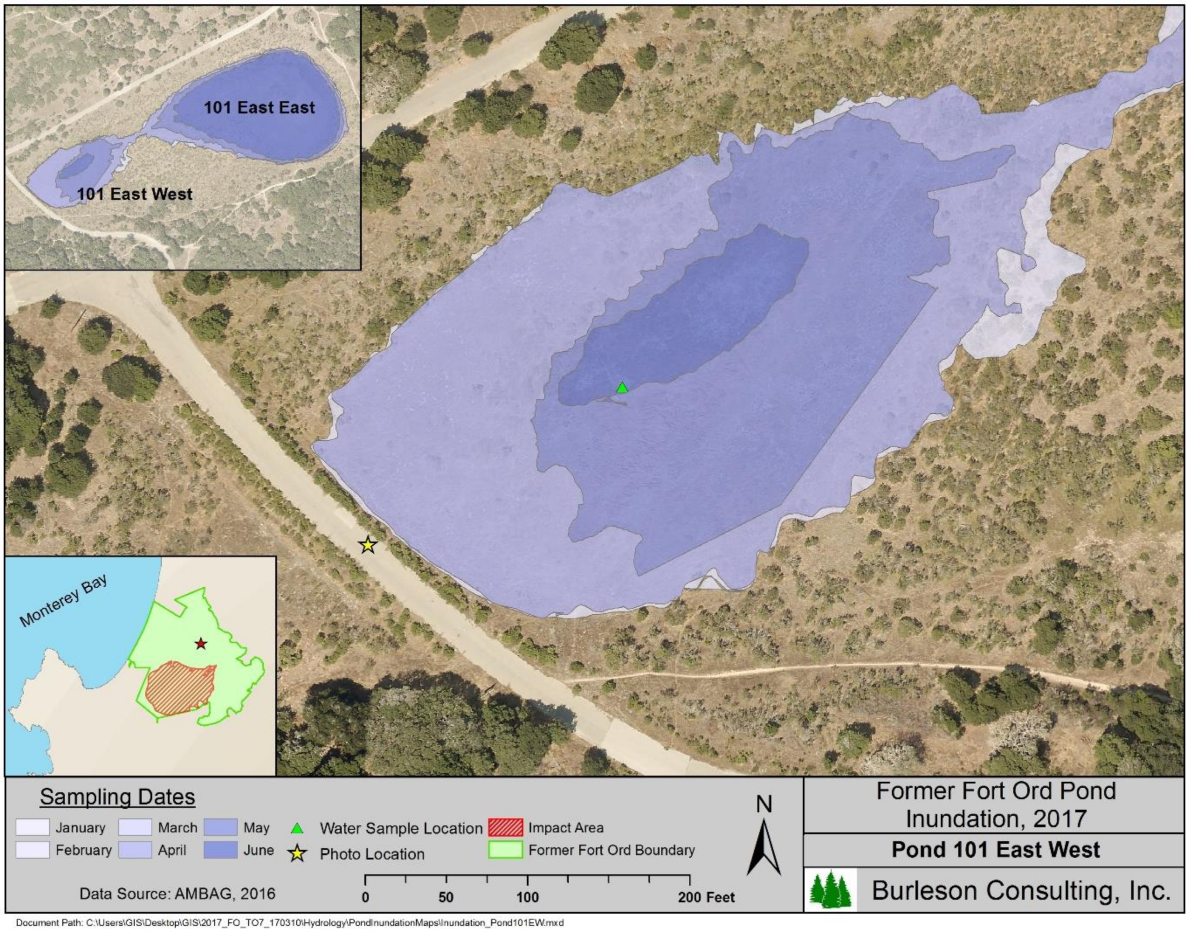

Figure 3-3. Map of Pond 101 East (West) on Former Fort Ord, 2017

3.2.2 Vegetation Monitoring

Vegetation monitoring was conducted at Pond 101 East (West) on July 6 and July 27, 2017. This monitoring represents reference data. Standing water was present during the monitoring event on July 6 but the vernal pool was dry by July 27. Biologists identified seven strata at the pool (see Figure 3-4). The vernal pool basin boundary was identified and all vegetative strata within the basin were mapped and tabulated (see Table 3-8). Appendix C provides the species cover results within each stratum. Strata 1, 2, 3, 4, and 5 were repeated from 2016, while strata 6 and 7 were new in 2017. The transects within strata 1, 2, and 3 were repeated in their 2016 locations, the transects in strata 4 and 5 were relocated to a location with more representative vegetative composition, and the transects in strata 6 and 7 were established in 2017.

Sixty-eight plant species were observed within the vernal pool basin boundary. Of these species 44 were native, 22 were non-native, and two were unidentified. Additionally, 12 species were OBL wetland plants, 27 were FACW or FAC, 12 were FACU or UPL, and 17 were not-listed. Appendix G identifies the number of native, non-native, and unidentified species within each stratum as well as the number of species within each wetland indicator category for each stratum.

Table 3-8. Pond 101 East (West) (Reference) Vegetative Strata Percentage Within the Vernal Pool Basin Boundary

Stratum	Percentage
1	6%
2	48%
3	8%
4	28%
5	2%
6	1%
7	7%

Transect 1 at Pond 101 East (West) consisted of a 10-m transect placed in stratum 1. Ten plant species were observed along the transect. Of these species nine were native and one was non-native. Pale spikerush was the dominant species, accounting for approximately 33% cover. Thatch was abundant, accounting for approximately 33% cover. Other species included Pacific foxtail (*Alopecurus saccatus*), lowland cudweed, Howell's quillwort, grass poly, alkali mallow (*Malvella leprosa*), western yellow cress (*Rorippa curvisiliqua*), willow dock (*Rumex salicifolius*), flowering quillwort (*Triglochin scilloides*), and western vervain (*Verbena lasiostachys*). Bare ground was also present, accounting for 20% cover.

Transect 2 at Pond 101 East (West) consisted of a 10-m transect placed in stratum 2. Four plant species were observed along the transect. Of these species three were native and one was non-native. Pale spikerush was the dominant species, accounting for approximately 86% cover. Bare ground was moderately abundant, accounting for approximately 13% cover. Other species included rabbitfoot grass, smooth goldfields (*Lasthenia glaberrima*), and Hickman's popcornflower. Thatch was also present.

Transect 3 at Pond 101 East (West) consisted of a 10-m transect placed in stratum 3. Fourteen plant species were observed along the transect. Of these species seven were native, six were non-native, and one was unidentified. Howell's quillwort and salt grass were the dominant plant species, accounting for approximately 24% and 17% cover, respectively. Thatch was abundant, accounting for approximately 30% cover. Other species included coyote thistle (*Eryngium armatum*), redstem filaree (*Erodium cicutarium*), Italian rye grass (*Festuca perennis*), Chinese pusley (*Heliotropium curassavicum*), smooth cat's-ear (*Hypochaeris glabra*), smooth goldfields, grass poly, Hickman's popcornflower, weedy cudweed, sheep sorrel, curly dock (*Rumex crispus*), and willow dock. Bare ground was also present, accounting for 10% cover.

Transect 4 at Pond 101 East (West) consisted of a 10-m transect placed in stratum 4. Eighteen plant species were observed along the transect. Of these species ten were native, seven were non-native, and one was unidentified. Grass poly was the dominant species, accounting for approximately 47% cover. Bare ground was fairly abundant, accounting for approximately 18% cover. Other species included coyote brush (*Baccharis pilularis*), soft chess, annual quaking grass, salt grass, pale spikerush, rattail sixweeks grass, lowland cudweed, Chinese pusley, *Isolepis* species, common toad rush, brown-headed rush, coast tarweed (*Madia sativa*), rabbitfoot grass, weedy cudweed, brook cinquefoil (*Potentilla rivalis*), sheep sorrel, and bugle hedge-nettle. Thatch was also present, accounting for approximately 8% cover.

Transect 5 at Pond 101 East (West) consisted of a 10-m transect placed in stratum 5. Fourteen plant species were observed along the transect. Of these species eight were native and six were non-native. Italian rye grass, pale spikerush, and grass poly were the dominant species, accounting for approximately 15%, 11%, and 11% cover, respectively. Other species included coyote brush, annual quaking grass, rattail sixweeks grass, Chinese pusley, common toad rush, brown-headed rush, alkali mallow, coast tarweed, rabbitfoot grass, sheep sorrel, and willow dock. Thatch and bare ground were fairly abundant, accounting for 23% cover and 13% cover, respectively.

Transect 6 at Pond 101 East (West) consisted of a 10-m transect placed in stratum 6. Fourteen plant species were observed along the transect. Of these species eight were native and six were non-native. Brown-headed rush and sheep sorrel were the dominant species, each accounting for approximately 19% cover. Bare ground was abundant, accounting for approximately 25% cover. Other species included horseweed (*Erigeron canadensis*), lowland cudweed, Chinese pusley, smooth cat's-ear, rough cat's-ear (*Hypochaeris radicata*), Baltic rush, common toad rush, grass poly, Hickman's popcornflower, weedy cudweed, curly dock, and bugle hedge-nettle. Thatch was also present.

Transect 7 at Pond 101 East (West) consisted of a 5-m transect placed in stratum 7. One plant species was observed along the transect. Clustered field sedge (*Carex praegracilis*) is a native grass, and accounted for approximately 92% cover. Thatch was also present, accounting for approximately 8% cover.

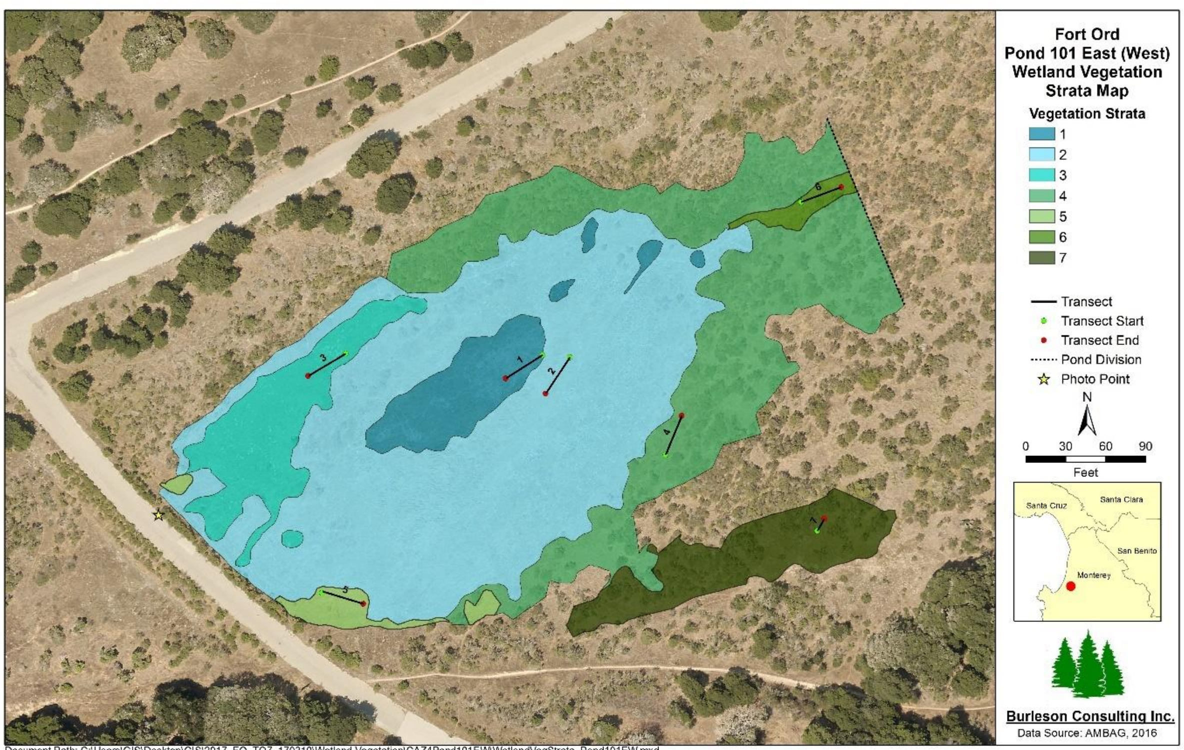

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Figure 3-4. Pond 101 East (West) Vegetation Transects and Strata on Former Fort Ord, 2017

3.2.3 Wildlife Monitoring

Pond 101 East (West) was monitored for CTS and fairy shrimp on March 28, April 24, and May 30, 2017. CTS were present at all three monitoring events while fairy shrimp were not detected. Table 3-9 provides the results of the CTS monitoring conducted in 2017. Invertebrate results for 2017 are provided in Appendix D (see Table D-2).

Table 3-9. Pond 101 East (West) (Reference) CTS Aquatic Monitoring Results

Pond	Sampling Date	# of Larvae Obs.	# of Larvae Measured	Total Length of Larvae (mm)			Snout-Vent Length of Larvae (mm)			Man Hours
				Mean*	Range	Mode	Mean*	Range	Mode	
101 East (West)	3/28/2017	21	21	43	11-57	45	24	8-32	25	2 hrs
	4/24/2017	39	30	76	43-103	76	43	30-61	42	1 hr 41 min
	5/30/2017	47	30	107	74-127	95	57	37-71	60	53 min

* The mean was rounded to the nearest whole number

3.3 Pond 101 East (East)

Pond 101 East (East) is a reference pool that was monitored as a control for comparison to the remediated vernal pools. In 2017, Pond 101 East (East) was monitored for hydrology, vegetation, and wildlife. Pond 101 East (East) was hydrologically connected to Pond 101 East (West) from January through April but was separate by May. Pond 101 East (East) did not dry by the time of the last recorded monitoring on September 6, 2017.

3.3.1 Hydrology Monitoring

Pond 101 East (East) was monitored for hydrology ten times (see Table 3-10 and Figure 3-5). The first monitoring data were provided by the USACE and include the depth and inundation but not water quality. The final monitoring events in July, August, and September only included the depth and were conducted as an additional effort to document when the vernal pool dried.

Table 3-10. Pond 101 East (East) (Reference) Hydrology Monitoring Results

Date	Time	pH	Temperature (C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Max Depth (cm)	Inundated Surface Area (acres)
1/17/2017	-	-	-	-	-	40	2.4
1/24/2017	14:17	5.50	10.0	1.95	1.9	~155, gauge submerged	Connected to 101 East (West), total 5.02
2/27/2017	10:31	6.23	12.2	3.68	21.8	~160 cm, gauge submerged	Connected to 101 East (West), total 9.37
3/20/2017	13:40	6.23	15.3	1.07	39.2	~160, gauge submerged	Connected to 101 East (West), total 8.89
4/20/2017	9:30	6.49	17.3	0.00	43.2	~160, gauge submerged	Connected to 101 East (West), total 9.38

Date	Time	pH	Temperature (C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Max Depth (cm)	Inundated Surface Area (acres)
5/25/2017	15:20	6.89	19.0	2.38	4.0	~160, gauge submerged	6.52
6/21/2017	13:20	6.91	20.1	3.58	10.7	~150, gauge submerged	5.57
7/28/2017	8:50	-	-	-	-	100	-
8/16/2017	10:20	-	-	-	-	95	-
9/6/2017	12:22	-	-	-	-	77	-

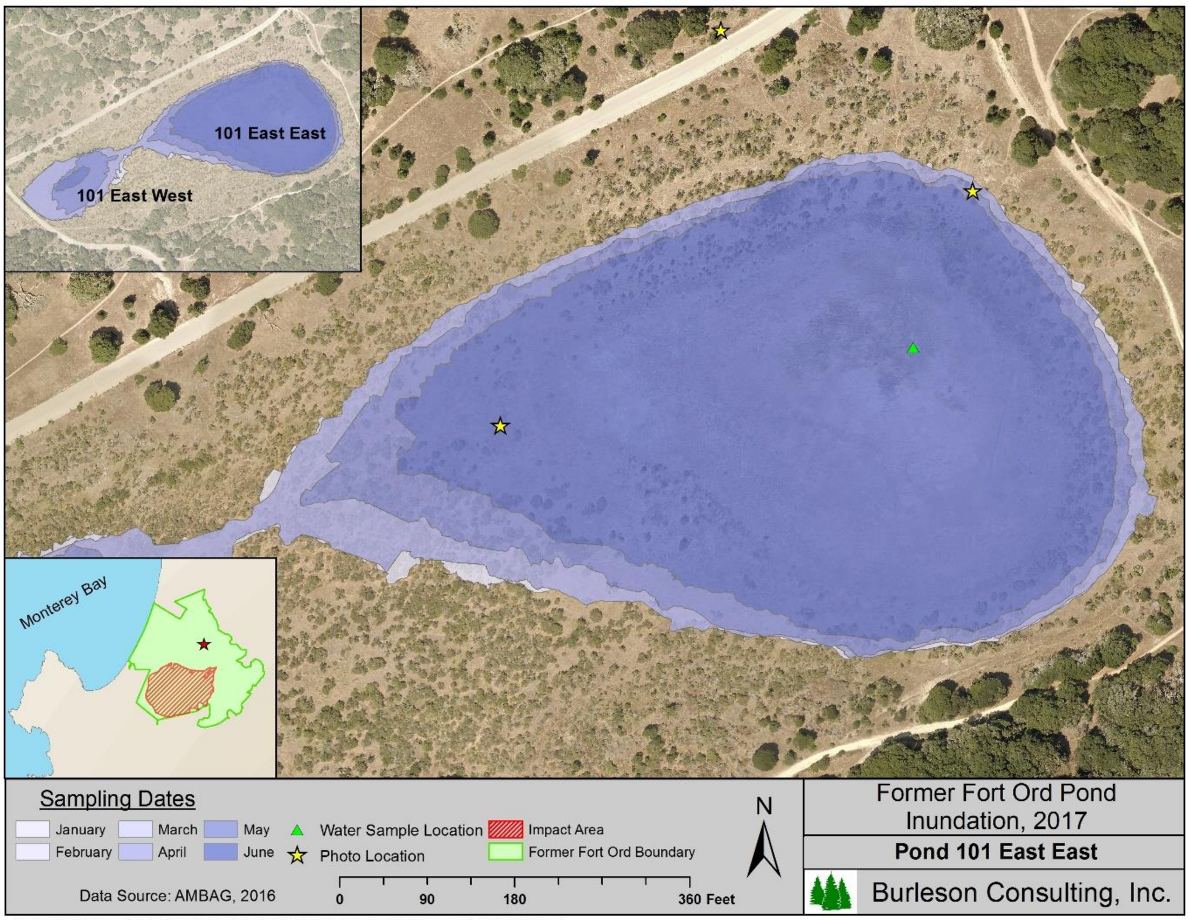

Figure 3-5. Map of Pond 101 East (East) on Former Fort Ord, 2017

3.3.2 Vegetation Monitoring

Vegetation monitoring was conducted at Pond 101 East (East) on July 6, 2017 and September 21, 2017. This monitoring represents reference data. Standing water was present during the monitoring event on September 21 to a depth of 68 cm. Biologists identified three strata at the pool (see Figure 3-6). The vernal pool basin boundary was identified and all vegetative strata within the basin were mapped and tabulated (see Table 3-11). Appendix C provides the species cover results within each stratum. Strata 1, 3, and 4 that were mapped in previous years were not present in 2017. Strata 2 was repeated from

2016. The transect locations for strata 1 through 4 were under water. New strata were identified as 5 and 6. Transects were only placed in strata 5 and 6; stratum 2 consisted of inundated area.

Fifty-nine plant species were observed within the vernal pool basin boundary. Of these species 35 were native, 23 were non-native, and one was unidentified. Additionally, 8 species were OBL wetland plants, 22 were FACW or FAC, 13 were FACU or UPL, and 16 were not-listed. Appendix G identifies the number of native, non-native, and unidentified species within each stratum, as well as the number of species within each wetland indicator category for each stratum.

Table 3-11. Pond 101 East (East) (Reference) Vegetative Strata Percentage Within the Vernal Pool Basin Boundary

Stratum	Percentage
2	42%
5	28%
6	30%

Stratum 2 at Pond 101 East (East) consisted of the inundated area with approximately 45% emergent vegetation and 55% open water. Emergent vegetation consisted of pale spikerush, a native plant species. No transects were placed in the stratum because it was inundated at the time of monitoring. Percent cover was visually assessed for this stratum.

Transect 5 at Pond 101 East (East) consisted of a 10-m transect placed in stratum 5. Twelve plant species were observed along the transect. Of these species eight were native and four were non-native. Lowland cudweed, weedy cudweed, and Chinese pusley were the dominant species, accounting for approximately 25%, 16%, and 12% cover, respectively. Bare ground was fairly abundant, accounting for approximately 14% cover. Other species included tall cyperus (*Cyperus eragrostis*), long-beaked filaree (*Erodium botrys*), Baltic rush, common toad rush, grass poly, brook cinquefoil, western yellow cress, sheep sorrel, and bugle hedge-nettle.

Transect 6 at Pond 101 East (East) consisted of a 10-m transect placed in stratum 6. Twelve plant species were observed along the transect. Of these species eight were native and four were non-native. Baltic rush and clustered field sedge were the dominant species, accounting for approximately 46% and 13% cover, respectively. Bare ground was fairly abundant, accounting for approximately 12% cover. Other species included hill lotus (*Acmispon parviflorus*), tall cyperus, salt grass, grass poly, brook cinquefoil, weedy cudweed, cottonbatting plant, sheep sorrel, curly dock, and western vervain. Thatch was also present, accounting for approximately 7% cover.

Figure 3-6. Pond 101 East (East) Vegetation Transects and Strata on Former Fort Ord, 2017

3.3.3 Wildlife Monitoring

Pond 101 East (East) was monitored for CTS and fairy shrimp on March 28, April 24, and May 30, 2017. CTS were present at all three monitoring events while fairy shrimp were not detected. Table 3-12 provides results of the CTS monitoring conducted in 2017. Invertebrate results for 2017 are provided in Appendix D (see Table D-2).

Table 3-12. Pond 101 East (East) (Reference) CTS Aquatic Monitoring Results

Vernal Pool	Sampling Date	# of Larvae Obs.	# of Larvae Measured	Total Length of Larvae (mm)			Snout-Vent Length of Larvae (mm)			Survey Hours
				Mean*	Range	Mode	Mean*	Range	Mode	
101 East (East)	3/28/2017	36	30	47	25-61	41	25	11-35	27	2 hrs 55 min
	4/24/2017	70	30	95	65-14	96	50	35-63	55	3 hrs 5 min
	5/30/2017	5	5	120	111-126	N/A	61	56-66	N/A	2 hrs

*The mean was rounded to the nearest whole number

3.4 Pond 997

Pond 997 is a reference pool that was surveyed as a control for comparison to the remediated vernal pools. In 2017, Pond 997 was surveyed for hydrology, vegetation, and wildlife.

3.4.1 Hydrology Monitoring

Pond 997 was surveyed for hydrology seven times and dried in May (see Table 3-13 and Figure 3-7). Data for the first two surveys were provided by the USACE and include the depth and inundation but not water quality.

Table 3-13. Pond 997 (Reference) Hydrology Monitoring Results

Date	Time	pH	Temperature (C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Max Depth (cm)	Inundated Surface Area (acres)
12/13/2016	-	-	-	-	-	DRY	0.00
1/17/2017	-	-	-	-	-	10	0.20
1/25/2017	10:50	6.40	10.2	7.17	25.6	13	0.33
2/27/2017	12:45	6.78	17.0	12.20	14.1	15	0.23
3/23/2017	9:21	6.43	13.0	7.88	72.4	12	0.10
4/19/2017	15:02	7.07	25.4	7.14*	25.5*	6	0.02
5/24/2017	13:15	-	-	-	-	DRY	0.00

*Water quality meter probe was on its side.

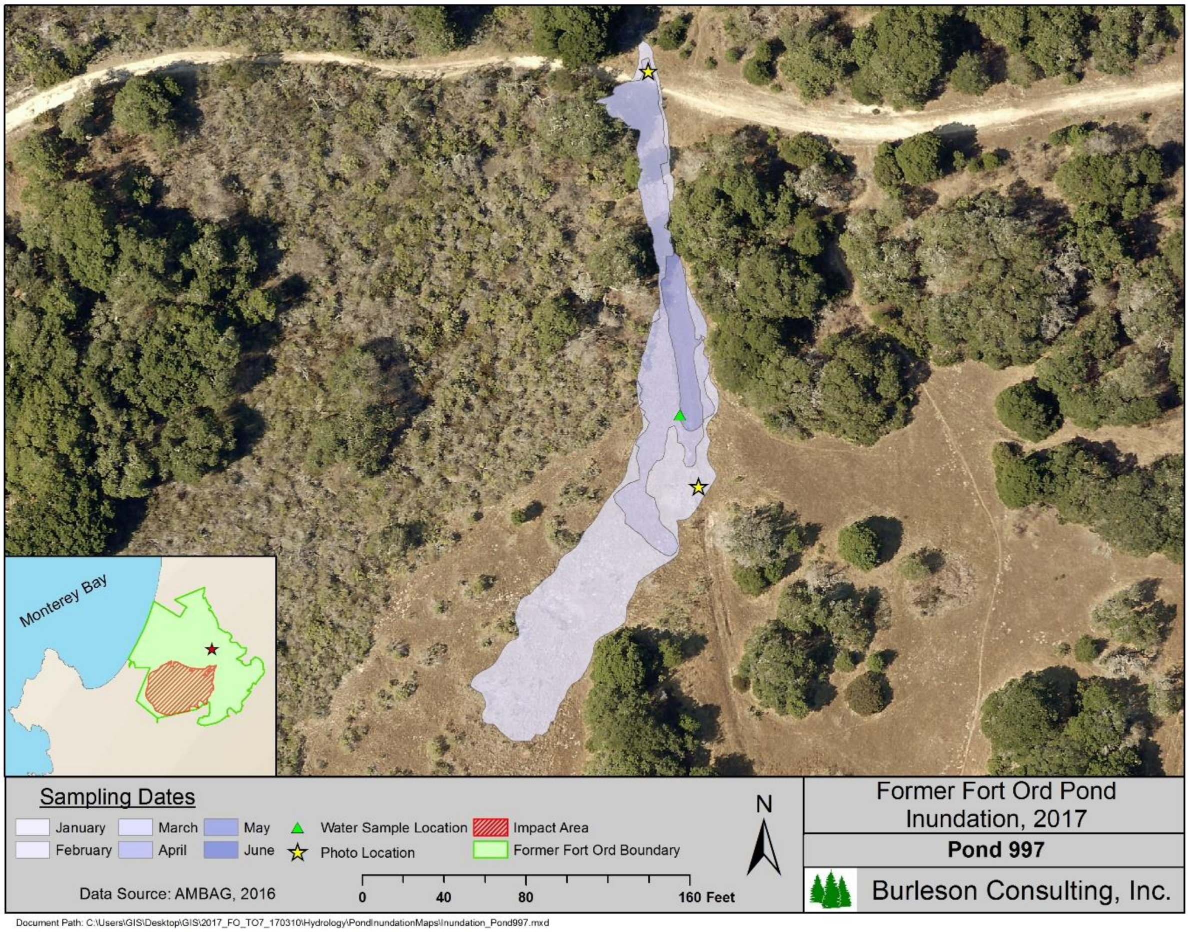

Figure 3-7. Map of Pond 997 on Former Fort Ord, 2017

3.4.2 Vegetation Monitoring

Vegetation monitoring was conducted at Pond 997 on May 11, 2017. These survey data represent baseline conditions. No standing water was present during the survey on May 11. Biologists identified four strata at the pool (see Figure 3-8). The vernal pool basin boundary was identified and all vegetative strata within the basin were mapped and tabulated (see Table 3-14). Appendix C provides the species cover results within each stratum. Strata 1, 2, 3, and 4 were first identified in 2017, and the transects within strata 1, 3, and 4 were established in 2017. Stratum 2 consisted of Contra Costa goldfields and no transects were placed in this stratum. Figure 3-9 illustrates the extent and density of the goldfields population at the vernal pool.

Sixty-five plant species were observed within the vernal pool basin boundary. Of these species 43 were native, 20 were non-native, and two were unidentified. Nine species were OBL wetland plants, 23 were FACW or FAC, 10 were FACU or UPL, and 23 were not-listed. Appendix G identifies the number of native, non-native, and unidentified species within each stratum as well as the number of species within each wetland indicator category for each stratum.

Table 3-14. Pond 997 (Reference) Vegetative Strata Percentage Within the Vernal Pool Basin Boundary

Stratum	Percentage
1	3%
2	2%
3	89%
4	2%
Upland	4%

Transect 1 at Pond 997 consisted of a 10-m transect placed in stratum 1. Six plant species were observed along the transect. Of these species five were native and one was unidentified. Coyote thistle and *Agrostis* sp. were the dominant species, accounting for approximately 20% and 15% cover, respectively. Bare ground and thatch were abundant, accounting for approximately 35% and 21% cover, respectively. Other species included pale spikerush, coyote thistle, brown-headed rush, Hickman's popcornflower, and round woolly-marbles (*Psilocarphus chilensis)*.

Stratum 2 consisted of Contra Costa goldfields (*Lasthenia conjugens*). The population was mapped, and Figure 3-9 illustrates the extent and density of the population at the vernal pool. No transects were placed in stratum 2 to avoid damaging the population.

Transect 3 at Pond 997 consisted of a 10-m transect placed in stratum 3. Nineteen plant species were observed along the transect. Of these species ten were native and nine were non-native. California oat grass was the dominant species, accounting for approximately 21% cover. Annual quaking grass, coyote thistle, low bulrush, and brown-headed rush contributed cover ranging from 3% to 9%. Bare ground and thatch were fairly abundant, accounting for approximately 24% and 16% cover, respectively. Other species included rattlesnake grass (*Briza maxima*), Johnny-Nip (*Castilleja ambigua*), coastal tarweed (*Deinandra corymbosa*), pale spikerush, long-beaked filaree, redstem filaree, rattail sixweeks grass, cut-leaved geranium (*Geranium dissectum*), smooth cat's-ear, common toad rush, inch-high rush (*Juncus uncialis*), grass poly, chaffweed (*Lysimachia minima*), and sheep sorrel.

Transect 4 at Pond 997 consisted of a 5-m transect placed in stratum 4. Eleven plant species were observed along the transect. Of these species seven were native and four were non-native. Rabbitfoot grass and spike bent grass (*Agrostis exarata*) were the dominant plant species, accounting for approximately 26% and 16% cover, respectively. Annual hair grass, coyote thistle, brown-headed rush, grass poly, Hickman's popcornflower, and round woolly-marbles contributed cover ranging from 3% to 7%. Bare ground was fairly abundant, accounting for approximately 22% cover. Other species included annual quaking grass, needle spikerush (*Eleocharis acicularis*), and small-flower catchfly. Thatch was also present, accounting for approximately 8% cover.

Figure 3-8. Pond 997 Vegetation Transects and Strata on Former Fort Ord, 2017

3.4.2.1 Contra Costa Goldfields

Contra Costa goldfields were mapped on May 11, 2017. Contra Costa goldfields comprised 0.02 acre, with a density of 10% cover.

Figure 3-9. Contra Costa Goldfields Populations at Pond 997, 2017

3.4.3 Wildlife Monitoring

Pond 997 was surveyed for CTS and fairy shrimp on March 27, 2017. No CTS or fairy shrimp were observed. No further surveys were conducted due to insufficient depth in April and May. Invertebrate results for 2017 are provided in Appendix D (see Table D-2).

3.5 Pond 40 South

Pond 40 South was a baseline vernal pool in 2017, and was monitored for hydrology.

3.5.1 Hydrology Monitoring

Pond 40 South was monitored for hydrology six times and dried in May (see Table 3-15 and Figure 3-10). Data from the first monitoring event were provided by the USACE and include the depth and inundation but not water quality.

Table 3-15. Pond 40 South (Baseline) Hydrology Monitoring Results

Date	Time	pH	Temperature (C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Max Depth (cm)	Inundated Surface Area (acres)
12/13/2016	-	-	-	-	-	DRY	0.00
1/23/2017	13:27	6.36	10.3	1.83	135.0	29	0.30
2/28/2017	10:17	6.79	6.6	11.62	56.1	31	0.61
3/22/2017	10:22	6.47	13.5	4.88	596.0	34	0.96
4/18/2017	12:59	6.57	16.6	4.81	37.6	28	0.12
5/25/2017	11:00	-	-	-	-	DRY	0.00

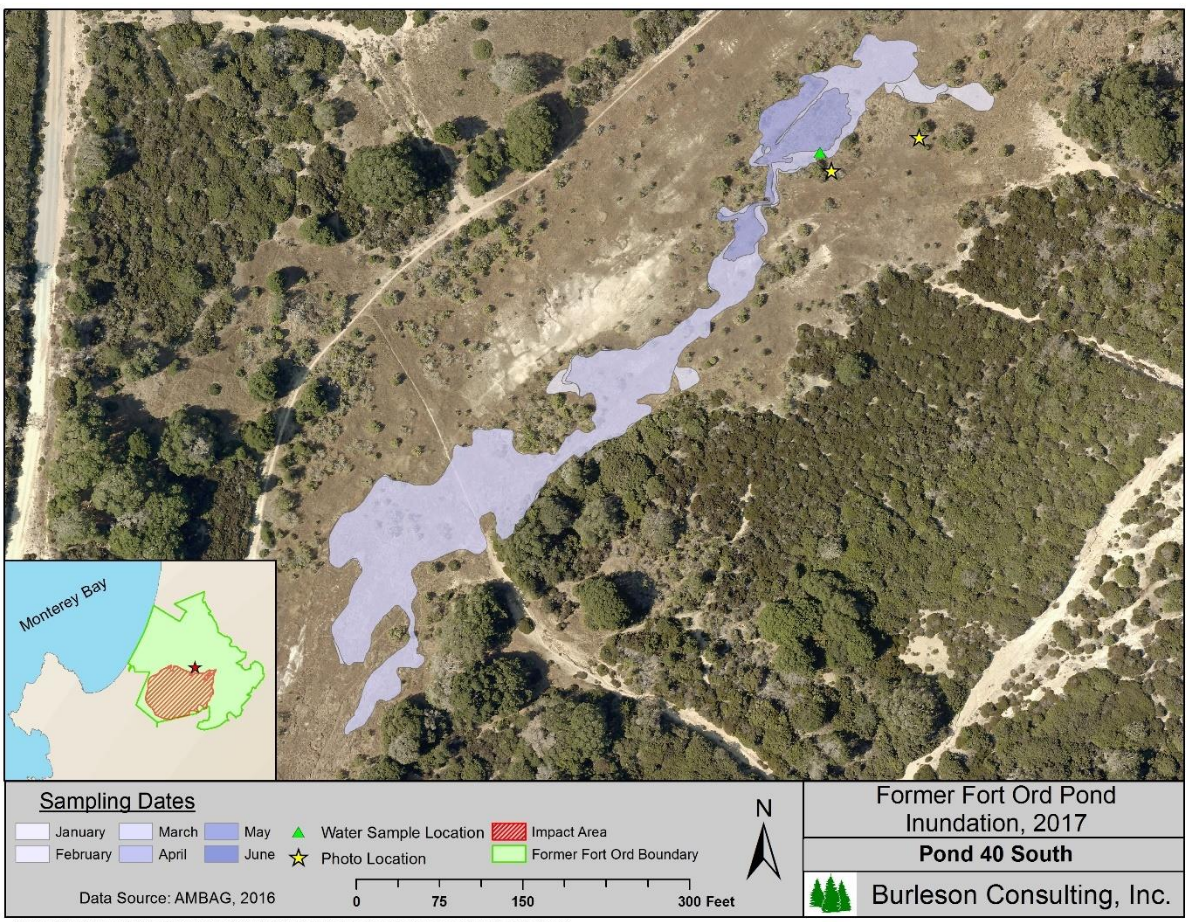

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Figure 3-10. Map of Pond 40 South on Former Fort Ord, 2017

3.6 Pond 42

Pond 42 was a baseline vernal pool in 2017, and was monitored for hydrology and vegetation.

3.6.1 Hydrology Monitoring

Pond 42 was monitored for hydrology eight times and dried in July (see Table 3-16 and Figure 3-11). The first monitoring data were provided by the USACE and include the depth and inundation but not water quality. The final monitoring event in July only included the depth and was conducted as an additional effort to document when the vernal pool dried.

Table 3-16. Pond 42 (Baseline) Hydrology Monitoring Results

Date	Time	pH	Temperature (C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Max Depth (cm)	Inundated Surface Area (acres)
12/13/2016	-	-	-	-	-	DRY	0.00
1/23/2017	14:20	6.47	10.4	2.60	51.3	58	0.52
2/28/2017	11:11	6.86	9.4	6.55	2.0	76	0.81
3/22/2017	11:20	6.08	13.3	4.26	>1000	72	0.77
4/18/2017	13:40	6.97	16.5	11.15	57.3	62	0.58
5/25/2017	11:30	5.97	17.6	5.27	60.1	38	0.30
6/15/2017	12:51	5.54	17.0	2.63	70.4	~28	0.34
7/7/2017	10:30	-	-	-	-	DRY	0.00

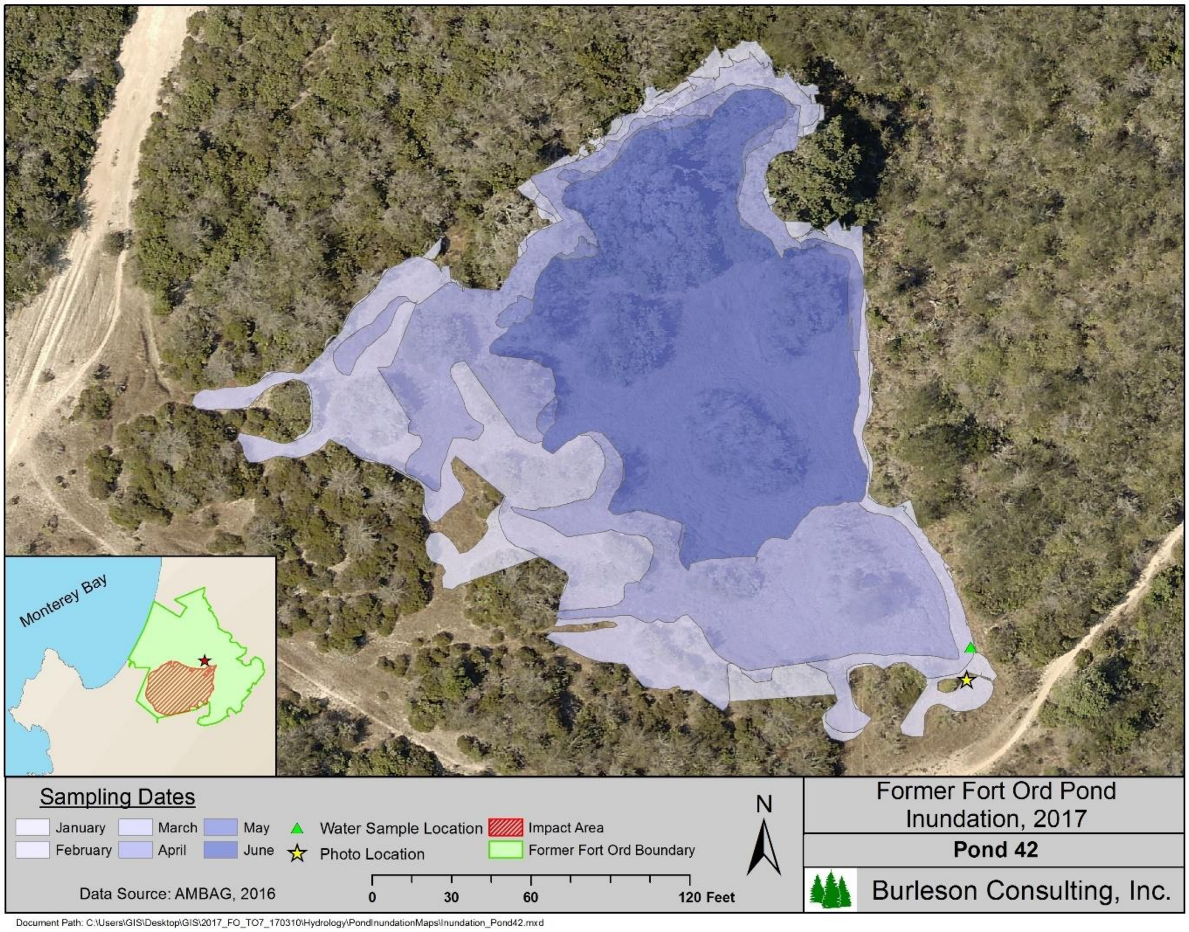

Figure 3-11. Map of Pond 42 on Former Fort Ord, 2017

3.6.2 Vegetation Monitoring

Vegetation monitoring was conducted at Pond 42 on July 7, 2017. These data represent baseline conditions. Pond 42 was dry by the July 7 monitoring event. Biologists identified four strata at the pool (see Figure 3-12). The vernal pool basin boundary was identified and all vegetative strata within the basin were mapped and tabulated (see Table 3-17). Appendix C provides the species cover results within each stratum. Strata 1, 2, 3, and 4 were identified as new strata in 2017. The transects within the strata were established in 2017.

Seventy-eight plant species were observed within the vernal pool basin boundary. Of these species 57 were native, 20 were non-native, and one was unidentified. Additionally, nine species were OBL wetland plants, 22 were FACW or FAC, 12 were FACU or UPL, and 35 were not-listed. Appendix G identifies the number of native, non-native, and unidentified species within each stratum as well as the number of species within each wetland indicator category for each stratum.

Table 3-17. Pond 42 (Baseline) Vegetative Strata Percentage Within the Vernal Pool Basin Boundary

Stratum	Percentage
Inundated	4%
1	8%
2	9%
3	52%
4	10%
Upland	17%

Transect 1 at Pond 42 consisted of a 4-m transect placed in stratum 1. This transect was less than 5-m so that it could fit within the stratum. Five plant species were observed along the transect. Of these species four were native and one was non-native. Brown-headed rush was the dominant species, accounting for 14% cover, while needle spikerush, coyote thistle, and rabbitfoot grass provided cover ranging from 3-7%. The dominant cover was thatch, accounting for approximately 75% cover. Hickman's popcornflower was the other species observed and contributed approximately 1% cover.

Transect 2 at Pond 42 consisted of a 5-m transect placed in stratum 2. Two plant species were observed along the transect. Of these species one was native and one was non-native. Pale spike-rush was the dominant species, accounting for approximately 93% cover. Rabbitfoot grass was the other species observed, accounting for approximately 1% cover. Thatch was also present.

Transect 3 at Pond 42 consisted of a 10-m transect placed in stratum 3. Five plant species were observed along the transect. Of these species four were native and one was non-native. Brown-headed rush was the dominant plant species, accounting for approximately 55% cover, while coyote thistle contributed approximately 5% cover. Thatch was abundant, accounting for approximately 42% cover. Other species included needle spikerush, smooth goldfields, and rabbitfoot grass.

Transect 4 at Pond 42 consisted of a 5-m transect placed in stratum 4. Nine plant species were observed along the transect. Of these species six were native and three were non-native. California oat grass and common toad rush were the dominant species, accounting for approximately 40% and 18% cover, respectively. Coastal tarweed and coyote thistle contributed cover ranging from 4% to 7%. Bare ground was abundant, accounting for approximately 20% cover. Other species included rattail sixweeks grass, nit grass (*Gastridium phleoides*), brown-headed rush, grass poly, and Davy's centaury. Thatch was also present, accounting for approximately 8% cover.

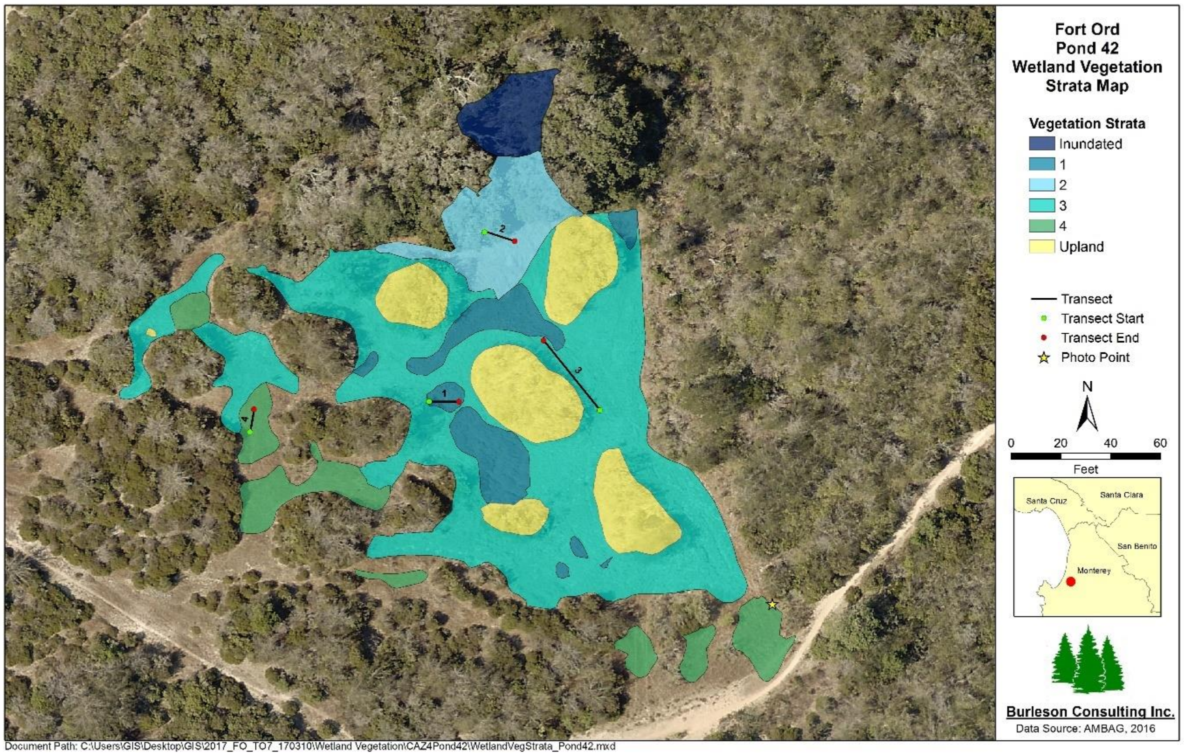

Figure 3-12. Pond 42 Vegetation Transects and Strata on Former Fort Ord, 2017

3.7 Pond 61

Pond 61 was a baseline vernal pool during the 2017 monitoring season and was surveyed for hydrology, vegetation, and wildlife.

3.7.1 Hydrology Monitoring

Pond 61 was surveyed for hydrology six times and dried in May (see Table 3-18 and Figure 3-13). The first survey data were provided by the USACE and include the depth and inundation but not water quality.

Table 3-18. Pond 61 (Baseline) Hydrology Monitoring Results

Date	Time	pH	Temperature (C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Max Depth (cm)	Inundated Surface Area (acres)
12/13/2016	-	-	-	-	-	DRY	0.00
1/24/2017	9:38	5.61	7.0	1.76	59.1	21	0.70
2/28/2017	12:01	6.66	11.1	10.54	31.3	21	0.52
3/22/2017	11:57	6.16	15.9	4.08	76.7	21	0.62
4/19/2017	8:23	6.48	12.3	4.31	28.8	10	0.05
5/25/2017	12:30	-	-	-	-	DRY	0.00

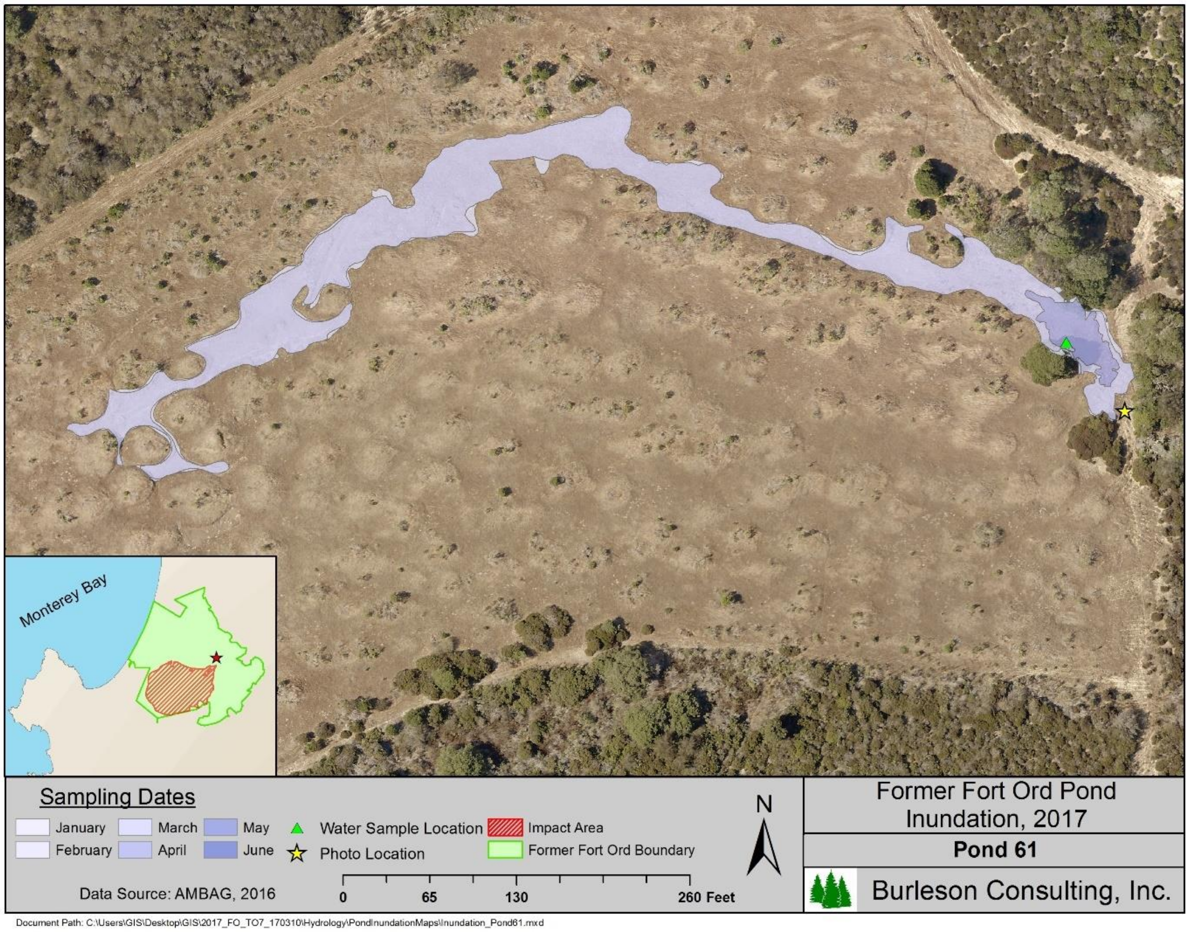

Figure 3-13. Map of Pond 61 on Former Fort Ord, 2017

3.7.2 Vegetation Monitoring

Vegetation monitoring was conducted at Pond 61 on May 4 and May 11, 2017. These survey data represent baseline conditions. No standing water was present at the staff gauge during the survey on May 11; however, there were isolated areas of standing water within the vernal pool basin boundary. Biologists identified four strata at the pool (see Figure 3-14). The vernal pool basin boundary was identified and vegetative strata within the basin were mapped and tabulated (see Table 3-19). Appendix C provides the species cover results within each stratum. Because Pond 61 was a baseline vernal pool in 2017, strata 1, 2, 3, and 4 were identified in 2017, and the transects within strata 1, 3, and 4 were created in 2017. Stratum 2 consisted of Contra Costa goldfields and no transect was placed in this stratum. Figure 3-15 illustrates the extent and density of the populations at the vernal pool.

One hundred plant species were observed within the vernal pool basin boundary. Of these species 77 were native, 21 were non-native, and two were unidentified. Additionally, 13 species were OBL wetland plants, 28 were FACW or FAC, 13 were FACU or UPL, and 46 were not-listed. Appendix G identifies the number of native, non-native, and unidentified species within each stratum as well as number of species within each wetland indicator category for each stratum.

Table 3-19. Pond 61 (Baseline) Vegetative Strata Percentage Within the Vernal Pool Basin Boundary

Stratum	Percentage
1	1%
2	5%
3	7%
4	54%
Upland	33%

Transect 1 at Pond 61 consisted of a 10-m transect placed in stratum 1. Six plant species were observed along the transect. All six species were native. Pale spikerush was the dominant plant species, accounting for approximately 50% cover. Bare ground and thatch were fairly abundant, accounting for approximately 17% and 7% cover, respectively. Other species included dwarf Brodiaea (*Brodiaea terrestris* ssp. *terrestris*), coyote thistle, brown-headed rush, smooth goldfields, and Hickman's popcornflower.

Stratum 2 consisted of Contra Costa goldfields. The population was mapped, and Figure 3-15 illustrates the extent and density of the populations at the vernal pool. No transects were placed in stratum 2 to avoid damaging the population.

Transect 3 at Pond 61 consisted of a 10-m transect placed in stratum 3. Thirteen plant species were observed along the transect. Of these species eleven were native, one was non-native, and one was unidentified. Brown-headed rush, annual hair grass, and Hickman's popcornflower were the dominant plant species, accounting for approximately 20%, 14%, and 11% cover, respectively. Bare ground and thatch were fairly abundant, accounting for approximately 26% and 15% cover, respectively. Other species included vernal pool bent grass (*Agrostis lacuna-vernalis*), California oat grass, needle spikerush, coyote thistle, rattail sixweeks grass, smooth goldfields, chaffweed, marsh microseris (*Microseris paludosa*), round woolly-marbles, and *Trifolium* species.

Transect 4 at Pond 61 consisted of a 10-m transect placed in stratum 4. Sixteen plant species were observed along the transect. Of these species eight were native, six were non-native, and two were unidentified. Brown-headed rush and California oat grass were the dominant species, accounting for approximately 41% and 13% cover, respectively. Thatch and bare ground were fairly abundant, accounting for approximately 18% and 13% cover, respectively. Other species included Hickman's allium, silvery hair-grass, soft chess, rattlesnake grass, annual quaking grass, dwarf brodiaea, coyote thistle, long-beaked filaree, rattail sixweeks grass, *Madia* species, marsh microseris, Hickman's popcornflower, round woolly-marbles, and sun cups (*Taraxia ovata*).

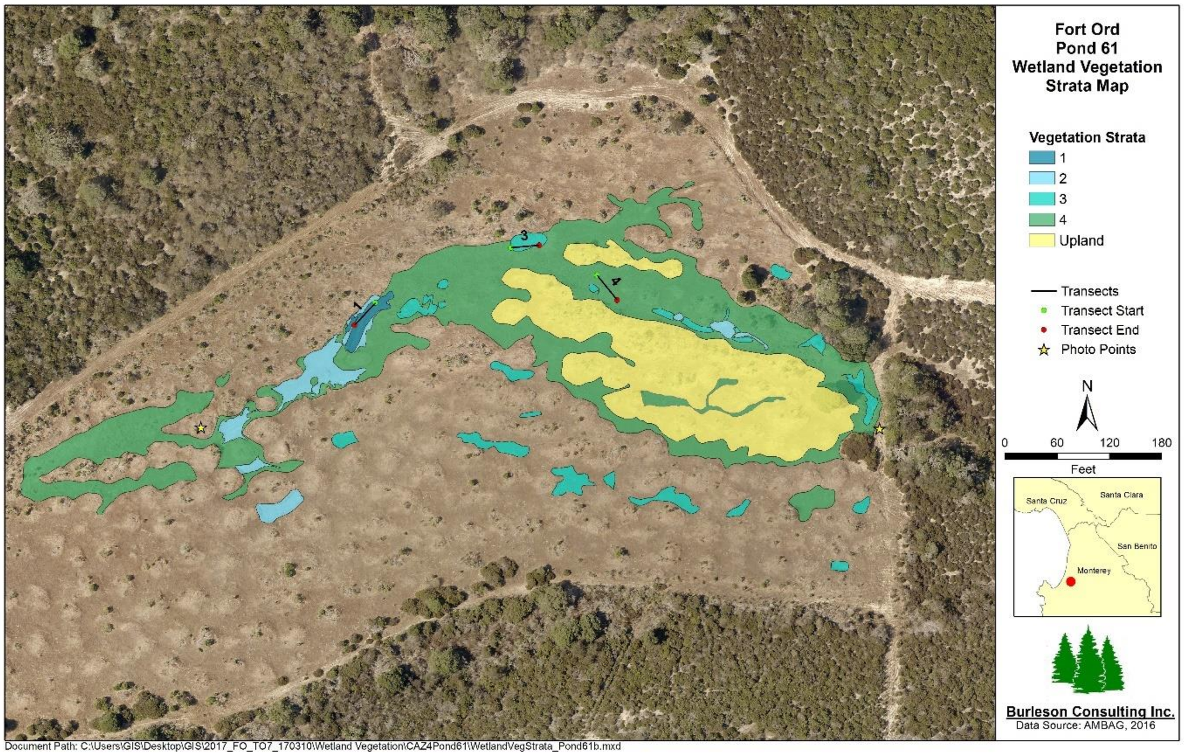

Figure 3-14. Pond 61 Vegetation Transects and Strata on Former Fort Ord, 2017

3.7.2.1 Contra Costa Goldfields

Contra Costa goldfields were mapped on April 27, May 4, May 11, and May 24, 2017. Contra Costa goldfields comprised 0.14 acre with a density range of 10-85% cover. Figure 3-15 illustrates the extent of the Contra Costa Goldfields population at Pond 61.

Figure 3-15. Contra Costa Goldfields Populations at Pond 61, 2017

3.7.3 Wildlife Monitoring

Pond 61 was surveyed for CTS and fairy shrimp on March 30, 2017. No CTS or fairy shrimp were observed. No further surveys were conducted due to insufficient depths in April and May. Invertebrate results for 2017 are provided in Appendix D (see Table D-2).

3.8 Pond 16

Pond 16 is a post-mastication remediation vernal pool and is in year 1 of monitoring. In 2017, Pond 16 was monitored for hydrology and vegetation. Pond 16 did not dry before the last recorded monitoring on September 6, 2017.

3.8.1 Hydrology Monitoring

Pond 16 was monitored for hydrology ten times (see Table 3-20 and Figure 3-16). The first monitoring data were provided by the USACE and include the depth and inundation but not water quality. The final monitoring events in July, August, and September only included the depth and were done as an additional effort to document when the vernal pool dried. Pond 16 did not dry before the last recorded monitoring on September 6, 2017.

Table 3-20. Pond 16 (Year 1) Hydrology Results for Reference Monitoring

Date	Time	pH	Temperature (C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Max Depth (cm)	Inundation Area (acres)
12/13/2016	-	-	-	-	-	DRY	0.000
1/23/2017	11:17	6.84	8.9	1.80	188	142	1.295
2/21/2017	9:30	6.09	12.4	4.87	584	144	2.572
3/22/2017	8:22	6.22	13.5	0.66	182	142	2.174
4/18/2017	8:45	6.78	14.4	0.05	66.6	140	0.803
5/25/2017	8:35	6.96	18.6	1.55	33.8	109	0.571
6/21/2017	9:30	6.98	20.0	1.40	121	98	0.513
7/27/2017	9:35	-	-	-	-	90	-
8/15/2017	15:15	-	-	-	-	40	-
9/6/2017	9:33	-	-	-	-	28	-

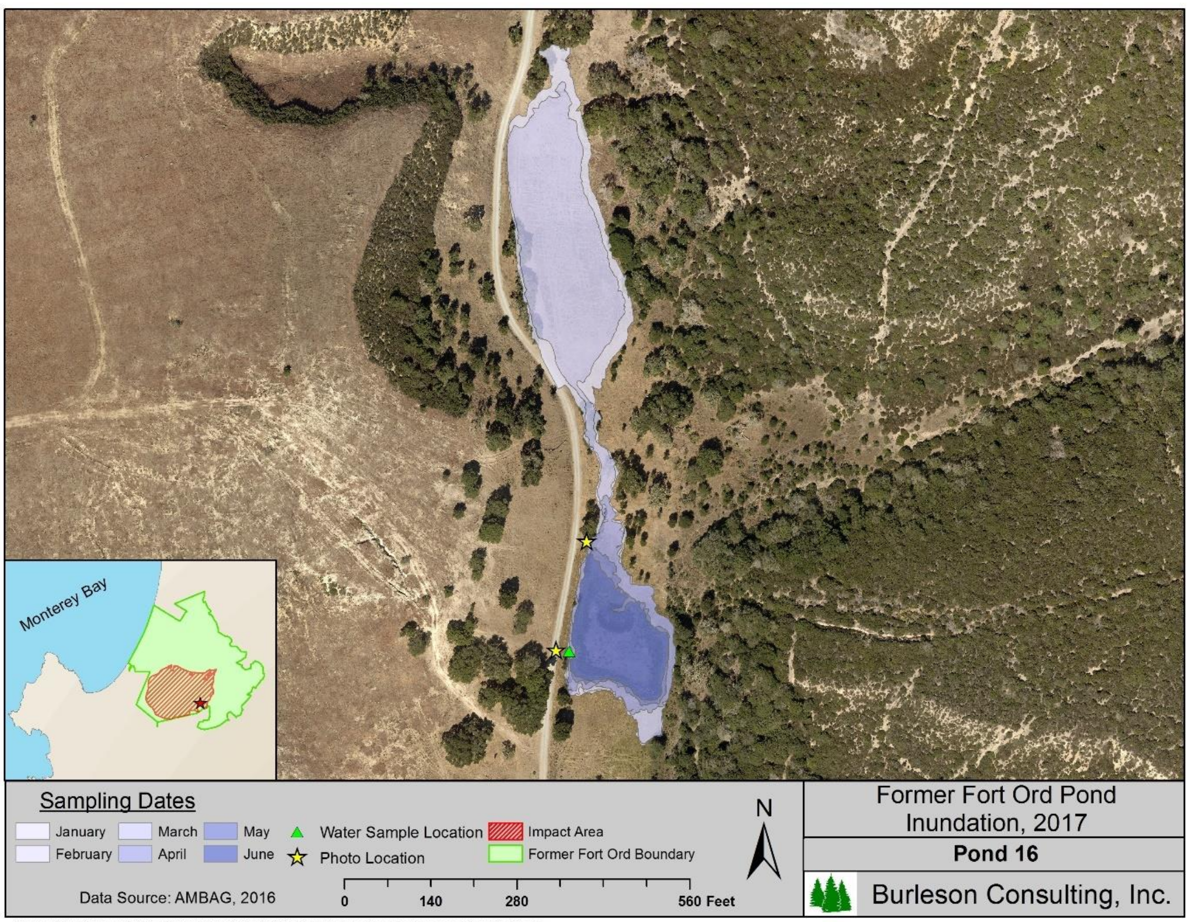

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Figure 3-16. Map of Pond 16 on Former Fort Ord, 2017

3.8.2 Vegetation Monitoring

Vegetation monitoring was conducted at Pond 16 on September 20, 2017. Standing water was present during the monitoring event with a depth of 26 cm. Biologists identified seven strata at the pool (see Figure 3-17). All vegetative strata within the basin were mapped and tabulated (see Table 3-21). Appendix C provides the species cover results within each stratum. Strata 1 through 5 were repeated from 2015, while strata 6 and 7 were identified in 2017. It should be noted that stratum 5 was labeled as the adjacent wetland in 2015. Transects in strata 1 and 4 were new in 2017 due to the change in stratum shape between 2016 and 2017. Stratum 2 consisted of the inundated area. Transects in strata 3 and 5 were repeated from 2015 and transects in strata 6 and 7 were created in 2017.

Eighty-seven plant species were observed within the vernal pool basin boundary. Of these species 49 were native, 37 were non-native, and one was unidentified. Additionally, eight species were OBL wetland plants, 28 were FACW or FAC, 21 were FACU or UPL, and 30 were not-listed. Appendix G identifies the number of native, non-native, and unidentified species within each stratum as well as the number of species within each wetland indicator category for each stratum.

Table 3-21. Pond 16 (Year 1) Vegetative Strata Percentage Within the Vernal Pool Basin Boundary

Stratum	Percentage
1	2%
2	11%
3	17%
4	37%
5	28%
6	1%
7	4%

Transect 1 at Pond 16 consisted of a 5-m transect placed in stratum 1. Four plant species were observed along the transect. Of these species two were native and two were non-native. California bulrush (*Schoenoplectus californicus*) and Chinese pusley were the dominant species, accounting for approximately 52% and 16% cover, respectively. Bare ground was abundant, accounting for approximately 25% cover. Bull thistle (*Cirsium vulgare*) and weedy cudweed were the other two species observed and contributed approximately 2-3% cover. Thatch was also present and accounted for approximately 2% cover.

Stratum 2 consisted of the inundated area with about 15% emergent vegetation, 7% submerged vegetation, and 78% open water. Emergent vegetation consisted of pale spikerush and submerged vegetation consisted of coon’s tail (*Ceratophyllum demersum*). Both are native species. No transects were placed in the stratum because it was inundated at the time of monitoring. Percent cover was visually assessed for this stratum.

Transect 3 at Pond 16 consisted of a 10-m transect placed in stratum 3. Three plant species were observed along the transect. Of these species one was native and two were non-native. Pale spikerush was the dominant species, accounting for approximately 76% cover. Bare ground was abundant, accounting for approximately 23% cover. Swamp pricklegrass (*Crypsis schoenoides*) and sheep sorrel were the other two species observed.

Transect 4 at Pond 16 consisted of a 10-m transect placed in stratum 4. Fifteen plant species were observed along the transect. Of these species seven were native and eight were non-native. Clustered field sedge was the dominant plant species, accounting for approximately 63% cover. Weedy cudweed and sheep sorrel contributed cover ranging from 2% to 4%. Thatch was fairly abundant, accounting for approximately 10% cover. Other species included common yarrow (*Achillea millefolium*), hill lotus, silvery hair-grass, annual quaking grass, horseweed, rattail sixweeks grass, smooth cat's-ear, Baltic rush, grass poly, willow dock, California blackberry (*Rubus ursinus*), and common sow thistle (*Sonchus oleraceus*). Bare ground was also present, accounting for approximately 5%.

Transect 5 at Pond 16 consisted of a 10-m transect placed in stratum 5. Two plant species were observed along the transect. Both species were native. Santa Barbara sedge (*Carex barbarae*) was the dominant plant species, accounting for approximately 68% cover. California blackberry was the other species present and contributed approximately 1% cover. Thatch was abundant, accounting for approximately 29% cover. Bare ground was also present, accounting for approximately 4%.

Transect 6 at Pond 16 consisted of a 5-m transect placed in stratum 6. Five plant species were observed along the transect. Of these species three were native and two were non-native. Baltic rush was the dominant plant species, accounting for approximately 64% cover. Small-flowered nightshade contributed 6% cover. Bare ground was fairly abundant, accounting for approximately 20% cover. Other species included bull thistle, Chinese pusley, and weedy cudweed. Thatch contributed approximately 8% cover.

Transect 7 at Pond 16 consisted of a 5-m transect placed in stratum 7. Three plant species were observed along the transect. Of these species one was native and two were non-native. Swamp pricklegrass and barnyard grass (*Echinochloa crus-galli*) were the dominant plant species, accounting for approximately 59% and 34% cover, respectively. Lowland cudweed was the other species observed, accounting for approximately 3% cover. Bare ground contributed 4% cover.

Figure 3-17. Pond 16 Vegetation Transects and Strata on Former Fort Ord, 2017

3.9 Pond 18

Pond 18[2] is a post-mastication remediation vernal pool and was in year 2 of monitoring in 2017. In 2017, Pond 18 was monitored for hydrology, vegetation, and wildlife.

3.9.1 Hydrology Monitoring

Pond 18 was monitored for hydrology eight times (see Table 3-22 and Figure 3-18). The first monitoring data were provided by the USACE and include the depth and inundation but not water quality. The final monitoring event in July only included the depth and was conducted as an additional effort to document when the vernal pool dried.

Table 3-22. Pond 18 (Year 2) Hydrology Monitoring Results

Date	Time	pH	Temperature (C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Max Depth (cm)	Inundated Surface Area (acres)
12/13/2016	-	-	-	-	-	DRY	0.000
1/23/2017	11:59	6.14	8.6	4.20	40.1	27	0.140
2/21/2017	10:25	5.97	13.8	4.72	47.8	41	0.202
3/22/2017	9:06	6.23	13.3	0.22	81.1	42	0.222
4/18/2017	10:55	6.21	13.6	0.29	46.6	42	0.213
5/25/2017	9:15	5.98	15.2	9.69	13.9	40	0.091

[2] Pond 18 is identified as "Waterbody 50" in HLA (1999).

Date	Time	pH	Temperature (C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Max Depth (cm)	Inundated Surface Area (acres)
6/21/2017	10:20	6.46	16.5	0.00	401	8	0.001
7/5/2017	10:33	-	-	-	-	DRY	0.000

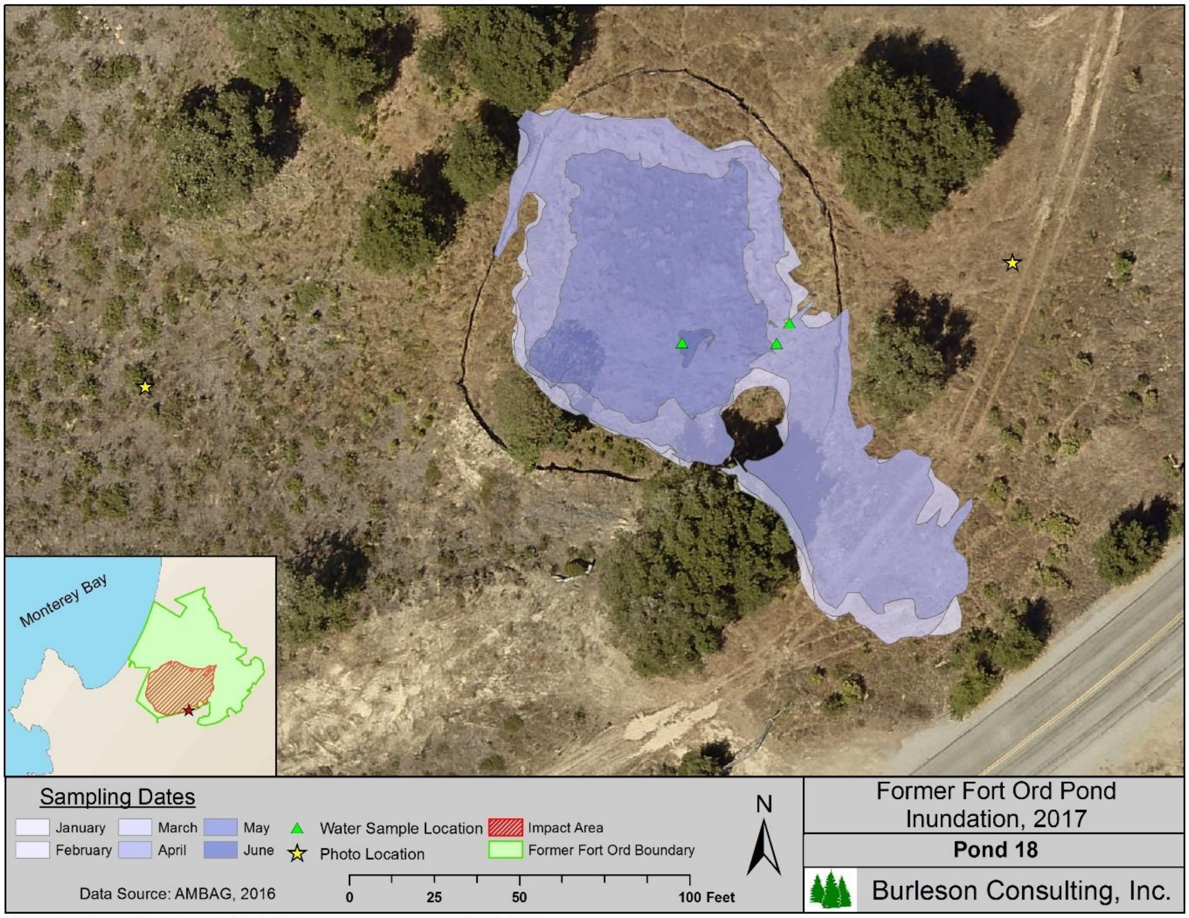

Figure 3-18. Map of Pond 18 on Former Fort Ord, 2017

3.9.2 Vegetation Monitoring

Vegetation monitoring was conducted at Pond 18 on July 5, 2017. These monitoring data represent year 2 post-mastication conditions. The vernal pool was dry at the time of monitoring. The Fort Ord Inland Ranges boundary line was mowed in the spring 2017 which included the south-eastern portion of Pond 18. This impacted the wetland vegetation because the 2016 transect location was partially mowed and it became impossible to identify all of the species in the basin boundary. Biologists identified four strata at the pool (see Figure 3-19). The vernal pool basin boundary was identified and all vegetative strata within the basin were mapped and tabulated (see Table 3-23). Appendix C provides the species cover results within each stratum. Strata 1 through 4 were repeated based off of dominant plants from 2016. Transects 1, 2, and 4 were relocated to more representative locations within the strata identified in 2016, and transect 3 was repeated from 2016. Transect 4 was relocated to a more representative location because the previous transect location had been mowed.

Forty-two plant species were observed within the vernal pool basin boundary. Of these species 26 were native, 15 were non-native, and one was unidentified. Additionally, six species were OBL wetland plants, 16 were FACW or FAC, nine were FACU or UPL, and 11 were not-listed. Appendix G identifies the number of native, non-native, and unidentified species within each stratum as well as the number of species within each wetland indicator category for each stratum.

Table 3-23. Pond 18 (Year 2) Vegetative Strata Percentage Within the Vernal Pool Basin Boundary

Stratum	Percentage
1	26%
2	11%
3	59%
4	3%
Upland	1%

Transect 1 at Pond 18 consisted of a 5-m transect placed in stratum 1. One plant species was observed along the transect. Pale spikerush, a native species, was the dominant species, accounting for approximately 90% cover. Thatch was also present, accounting for approximately 10% cover.

Transect 2 at Pond 18 consisted of a 10-m transect placed in stratum 2. Two plant species were observed along the transect. Both pale spikerush and beardless wild rye are native species. Beardless wild rye was the dominant species, accounting for approximately 39% cover, while pale spike rush accounted for approximately 9% cover. Thatch was abundant, accounting for approximately 41% cover, while bare ground contributed approximately 11% cover.

Transect 3 at Pond 18 consisted of a 10-m transect placed in stratum 3. Twelve plant species were observed along the transect. Of these species seven were native and five were non-native. Fiddle dock, pale spikerush, and Chinese pusley were dominant plant species, accounting for approximately 13%, 10%, and 5% cover, respectively. Thatch and bare ground were abundant, accounting for approximately 34% and 24% cover, respectively. Other species included seashore bent grass (*Agrostis pallens*), rattlesnake grass, beardless wild rye, coyote thistle, western goldenrod (*Euthamia occidentalis*), grass poly, Hickman’s popcornflower, rabbitfoot grass, and sheep sorrel.

Transect 4 at Pond 18 consisted of a 5-m transect placed in stratum 4. Nine plant species were observed along the transect. Of these species four were native and five were non-native. Cut-leaved plantain (*Plantago coronopus*) was the dominant species, accounting for approximately 29% cover. Bare ground and thatch were abundant, accounting for approximately 23% and 21% cover, respectively. Other species included rattlesnake grass, annual quaking grass, coastal tarweed, smooth cat’s-ear, common toad rush, brown-headed rush, grass poly, and Davy’s centaury.

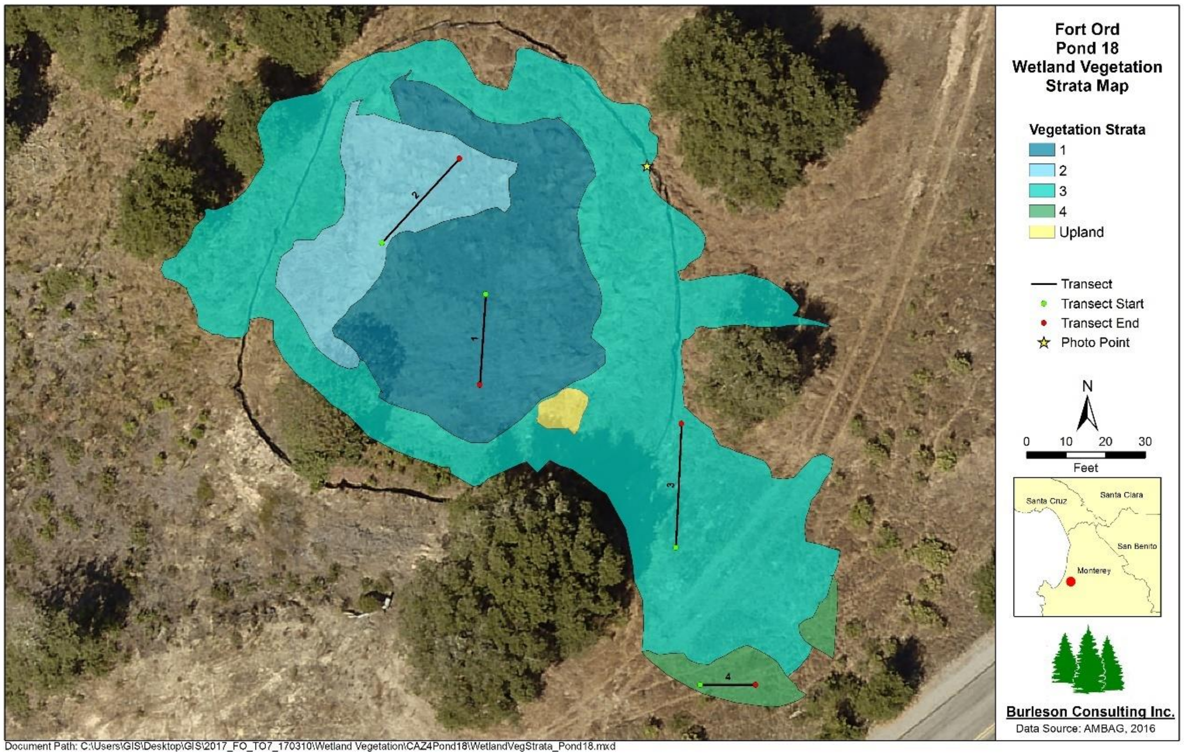

Figure 3-19. Pond 18 Vegetation Transects and Strata on Former Fort Ord, 2017

3.9.3 Wildlife Monitoring

Pond 18 was monitored for CTS and fairy shrimp on March 29, April 25, and May 31, 2017. CTS and fairy shrimp were not detected at all three monitoring events. Invertebrate results for 2017 are provided in Appendix D (see Table D-2).

3.10 Pond 54

Pond 54 is a post-mastication remediation vernal pool and was in year 2 of monitoring in 2017. Pond 54 was monitored for hydrology and wildlife.

3.10.1 Hydrology Monitoring

Pond 54 was monitored for hydrology eight times (see Table 3-24 and Figure 3-20). The first monitoring data were provided by the USACE and include the depth and inundation but not water quality. The final monitoring event in July only included the depth and was completed as an additional effort to document when the vernal pool dried.

Table 3-24. Pond 54 (Year 2) Hydrology Monitoring Results

Date	Time	pH	Temperature (C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Max Depth (cm)	Inundated Surface Area (acres)
12/13/2016	-	-	-	-	-	DRY	0.00
1/23/2017	12:45	6.64	10.1	2.82	8.4	54	1.60
2/28/2017	9:17	6.63	8.3	4.92	5.3	112	3.09

Date	Time	pH	Temperature (C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Max Depth (cm)	Inundated Surface Area (acres)
3/22/2017	9:40	6.51	13.8	0.04	29.7	111	3.10
4/18/2017	11:40	6.85	15.1	5.55	37.6	108	2.95
5/25/2017	10:00	6.69	17.3	6.08	69.3	78	2.21
6/21/2017	11:00	6.98	23.3	7.22	10.5	~60	1.90
7/31/2017	13:50	-	-	-	-	DRY	0.00

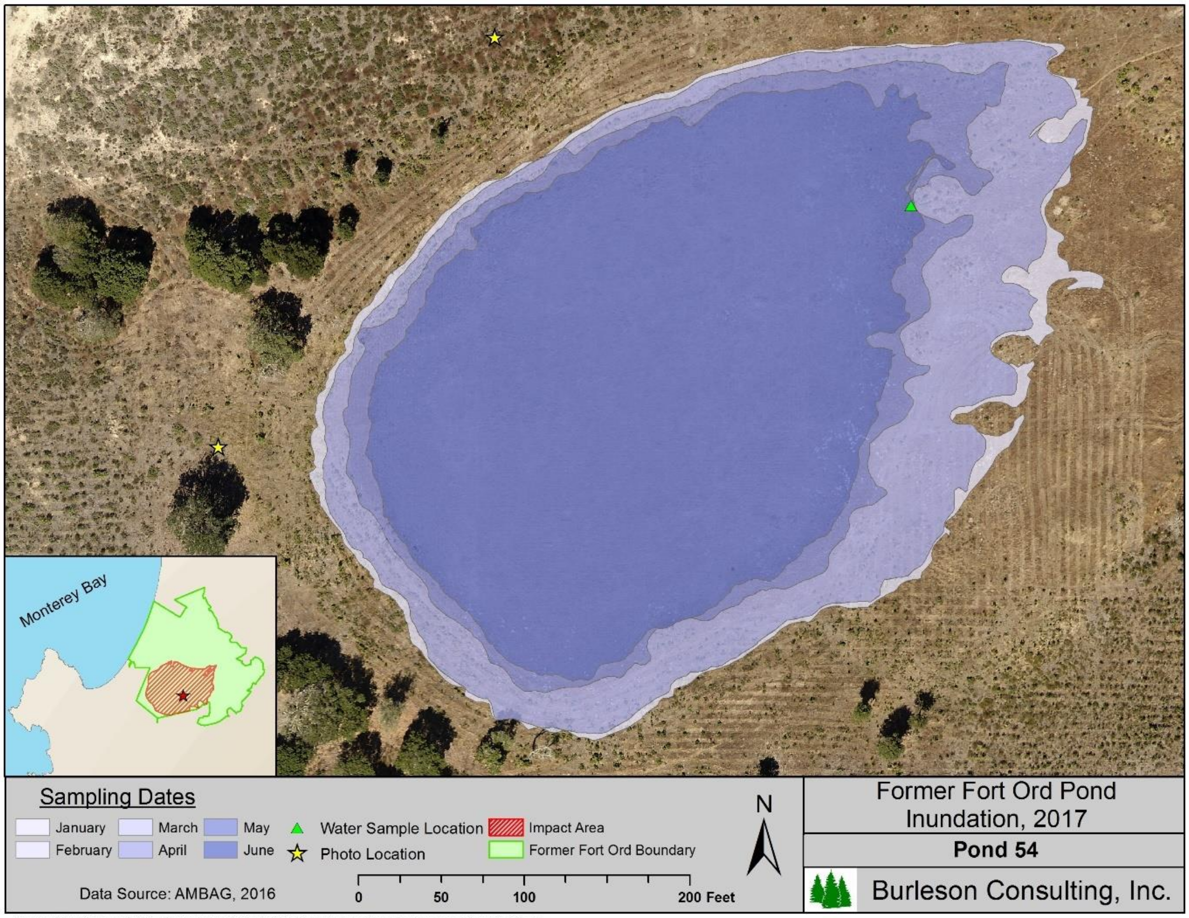

Figure 3-20. Map of Pond 54 on Former Fort Ord, 2017

3.10.2 Wildlife Monitoring

Pond 54 was monitored for CTS and fairy shrimp on March 29, April 25, and May 31, 2017. CTS were present at all three monitoring events while fairy shrimp were not detected. Table 3-25 provides the results of the CTS monitoring conducted in 2017. Invertebrate results for 2017 are provided in Appendix D (see Table D-2).

Table 3-25. Pond 54 (Year 2) CTS Aquatic Monitoring Results

Vernal Pool	Sampling Date	# of Larvae Obs.	# of Larvae Measured	Total Length of Larvae (mm)			Snout-Vent Length of Larvae (mm)			Survey Hours
				Mean*	Range	Mode	Mean*	Range	Mode	
54	3/29/2017	1	1	54	-	N/A	-	-	-	1hr
	4/25/2017	4	4	94	83-112	N/A	43	30-60	N/A	2hrs
	5/31/017	2	2	135	122-147	N/A	72	68-76	N/A	50min

* The mean was rounded to the nearest whole number

3.11 Pond 10

Pond 10 is a post-lead remediation vernal pool and was in year 5 of monitoring in 2017. In 2017, Pond 10 was monitored for hydrology, vegetation, and wildlife. Pond 10 did not dry by the last recorded monitoring on September 6, 2017.

3.11.1 Hydrology Monitoring

Pond 10 was monitored for hydrology ten times (see Table 3-26 and Figure 3-21). The first monitoring data were provided by the USACE and include the depth and inundation but not water quality. The final monitoring events in July, August, and September only included depth and were conducted as additional efforts to document when the vernal pool dried.

Table 3-26. Pond 10 (Year 5) Hydrology Monitoring Results

Date	Time	pH	Temperature (C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Max Depth (cm)	Inundated Surface Area (acres)
1/17/2017	-	-	-	-	-	40	2.40
1/23/2017	10:30	7.45	9.3	2.77	262	79	5.71
3/1/2017	8:50	6.94	10.6	4.64	126	144	6.21
3/20/2017	11:15	6.74	15.1	2.95	129	140	6.11
4/19/2017	11:30	6.81	14.8	4.03	55.8	156	6.14
5/24/2017	11:42	7.05	18.7	3.99	37	127	6.03
6/20/2017	9:50	7.08	20.1	4.48	27.4	112	5.73
7/28/2017	9:56	-	-	-	-	94	-
8/16/2017	9:10	-	-	-	-	80	-
9/6/2017	10:27	-	-	-	-	70	-

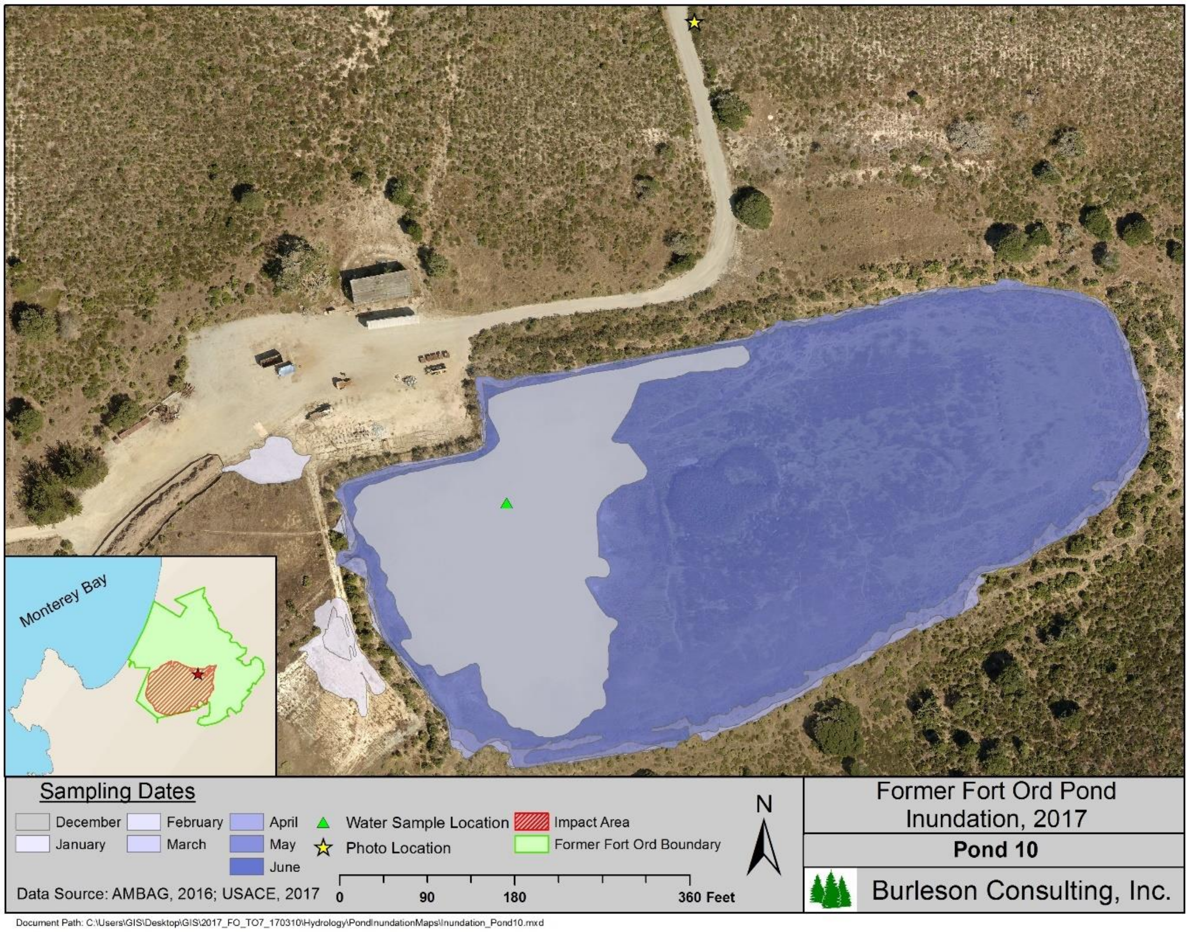

Figure 3-21. Map of Pond 10 on Former Fort Ord, 2017

3.11.2 Vegetation Monitoring

Vegetation monitoring was conducted at Pond 10 on July 7 and September 20, 2017. These monitoring data represent year 5 conditions. Standing water was present during both monitoring events. The depth on September 20 was 70 cm. Biologists identified five strata at the pool (see Figure 3-22). The vernal pool basin boundary was identified and all vegetative strata within the basin were mapped and tabulated (see Table 3-27). Appendix C provides the species cover results within each stratum. An inundated stratum and an upland area were present. Strata 1, 2, 3, 4, and 5 were repeated from 2016. No transects were placed in strata 1 and 2 because these strata were inundated during surveys; transects in strata 3 and 5 were repeated from 2016; and transect 4 was relocated to a more representative location.

Sixty-two plant species were observed within the vernal pool basin boundary. Of these species, 43 were native, 17 were non-native, and two were unidentified. Additionally, 11 species were OBL wetland plants, 23 were FACW or FAC, 12 were FACU or UPL, and 16 were not-listed. Appendix G identifies the number of native, non-native, and unidentified species within each stratum as well as the number of species within each wetland indicator category for each stratum.

Table 3-27. Pond 10 (Year 5) Vegetative Strata Percentage Within the Vernal Pool Basin Boundary

Stratum	Percentage
1	24%
2	3%
3	59%
4	5%
5	2%
Upland	7%

Stratum 1 at Pond 10 consisted of the inundated area with about 15% emergent vegetation and 85% open water. Emergent vegetation consisted of pale spikerush, broad-leaved cattail (*Typha latifolia*), and water smartweed (*Persicaria amphibia*). All three species were native. No transects were placed in the stratum since it was inundated at the time of monitoring. Percent cover was visually assessed for this stratum.

Stratum 2 consisted of a dense area of California bulrush with about 95% emergent vegetation cover. No transects were placed in the stratum since it was inundated at the time of monitoring. Percent cover was visually assessed for this stratum.

Transect 3 at Pond 10 consisted of a 10-m transect placed in stratum 3. Four plant species were observed along the transect. All four species were native. Pale spikerush was the dominant species, accounting for approximately 84% cover. Salt grass, California water-starwort (*Callitriche marginata*), and needle spikerush were the other species observed, contributing cover ranging from 1-6%. Thatch and bare ground were also present, contributing 3-4% cover.

Transect 4 at Pond 10 consisted of a 10-m transect placed in stratum 4. Six plant species were observed along the transect. All six species were native. Brown-headed rush was the dominant species, accounting for approximately 53% cover. Bare ground was abundant, accounting for approximately 31% cover. Other species included fern-like azolla (*Azolla filiculoides*), salt grass, western goldenrod, low bulrush, and bugle hedge-nettle. Thatch was also present.

Transect 5 at Pond 10 consisted of a 10-m transect placed in stratum 5. Seven plant species were observed along the transect. Of these species two were native, four were non-native, and one was unidentified. Baltic rush was the dominant plant species, accounting for approximately 32% cover. Thatch and bare ground were abundant, accounting for approximately 34% and 32% cover, respectively. Other species included horseweed, grass poly, rabbitfoot grass, curly dock, prickly sow thistle (*Sonchus asper*), and *Vicia* sp.

Figure 3-22. Pond 10 Vegetation Transects and Strata on Former Fort Ord, 2017

3.11.3 Wildlife Monitoring

Pond 10 was monitored for CTS and fairy shrimp on March 30, April 26, and May 31, 2017. CTS were present at all three monitoring events while fairy shrimp were not detected. Table 3-28 provides the results of the CTS survey conducted in 2017. Invertebrate results for 2017 are provided in Appendix D (see Table D-2).

Table 3-28. Pond 10 (Year 5) CTS Aquatic Monitoring Results

Vernal Pool	Sampling Date	# of Larvae Obs.	# of Larvae Measured	Total Length of Larvae (mm)			Snout-Vent Length of Larvae (mm)			Survey Hours
				Mean*	Range	Mode	Mean*	Range	Mode	
10	3/30/2017	30	30	39	25-50	46	23	9-30	20	4 hrs
	4/26/2017	25	24	64	39-101	66	35	19-58	35	4 hrs
	5/31/2017	2	2	79	78-79	N/A	79	41-55	N/A	4 hrs

*The mean was rounded to the nearest whole number

3.12 Pond 30A

Pond 30A[3] is a post-fire-retardant remediation vernal pool and was in year 5 of monitoring in 2017. Pond 30A was monitored for hydrology. Pond 30A is the largest vernal pool within the Pond 30 complex. Ponds 30B and 30C (discussed separately) are adjacent to Pond 30A. These depressions were created as a result of soil remediation in 2011. Ponds 30B and 30C are distinguished from Pond 30A by the abrupt change in elevation where the excavation occurred; however, at times, these three vernal pools are hydrologically connected.

3.12.1 Hydrology Monitoring

Pond 30A was monitored for hydrology eight times (see Table 3-29 and Figure 3-23). The first monitoring data were provided by the USACE and include the depth and inundation but not water quality. The final monitoring event in July only included the depth and was conducted as an additional effort to document when the vernal pool dried.

Table 3-29. Pond 30A (Year 5) Hydrology Monitoring Results

Date	Time	pH	Temperature (C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Max Depth (cm)	Inundated Surface Area (acres)
1/17/2017	-	-	-	-	-	40	2.40
1/24/2017	11:39	6.22	13.0	1.82	29.6	14	0.32
3/1/2017	10:15	6.52	11.3	4.05	47.6	86	connected to 30B and 30C, total 1.12
3/20/2017	10:21	6.58	14.9	1.50	150.0	73	connected to 30B and 30C, total 1.07
4/19/2017	10:42	6.61	14.3	4.19	9.7	83	connected to 30B and 30C, total 1.06
5/24/2017	10:00	6.93	19.1	5.42	17.8	44	connected to 30B and 30C, total 0.74
6/20/2017	11:40	6.69	21.9	7.68	47.2	~35	0.44
7/27/2017	-	-	-	-		DRY	0.00

[3] Pond 30 is a complex of Ponds 30A, 30B, and 30C identified as “Waterbody 47” in HLA (1999).

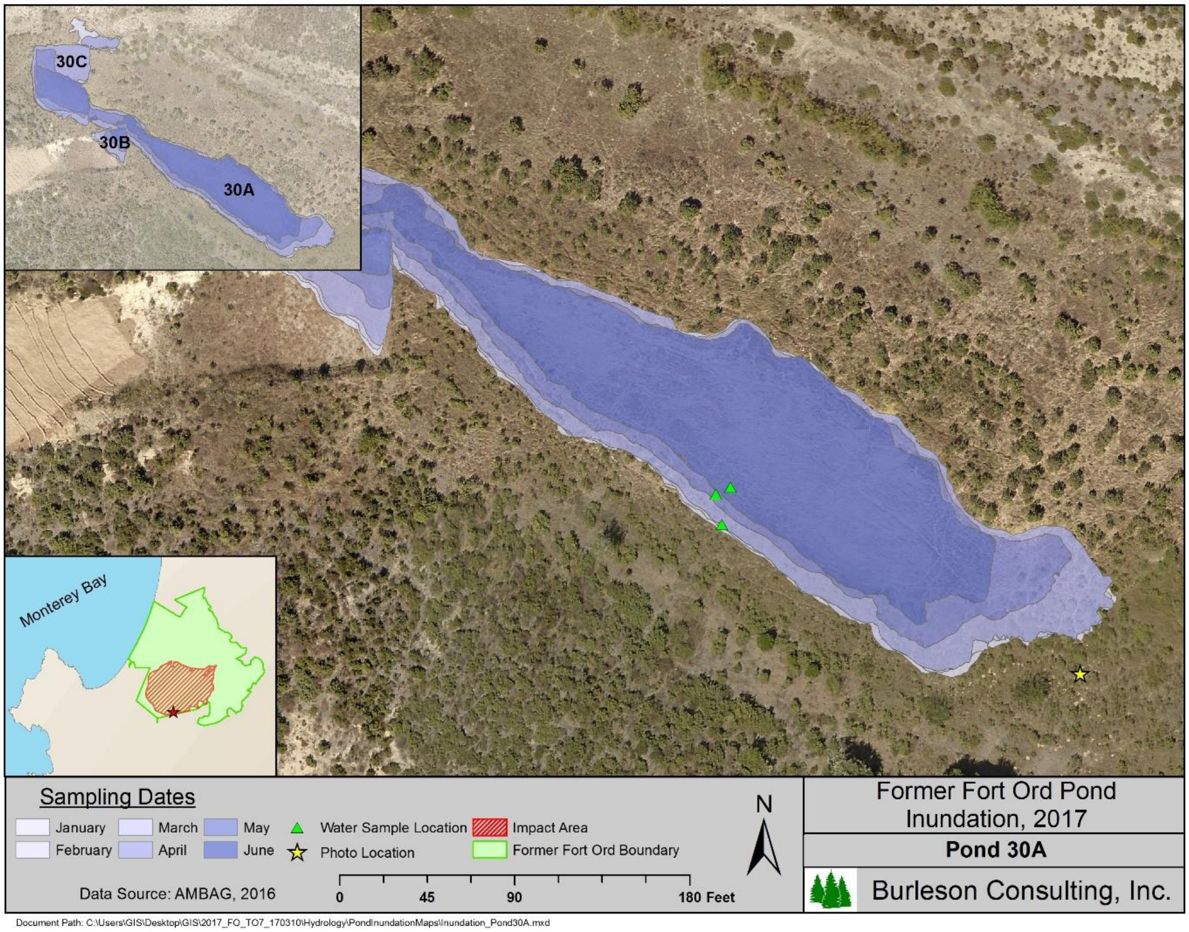

Figure 3-23. Map of Pond 30A on Former Fort Ord, 2017

3.13 Pond 30B

Pond 30B[4] is a post-fire-retardant remediation vernal pool and was in year 5 of monitoring in 2017. Pond 30B was monitored for hydrology. Ponds 30A and 30C (discussed separately) are adjacent to Pond 30B. Ponds 30B and 30C were created as a result of the 2011 soil remediation excavation. Ponds 30B and 30C are distinguished from Pond 30A by the abrupt change in elevation where the excavation occurred; however, at times, these three vernal pools are hydrologically connected.

3.13.1 Hydrology Monitoring

Pond 30B was monitored for hydrology eight times (see Table 3-30 and Figure 3-24). The first monitoring data were provided by the USACE and include the depth and inundation but not water quality. The final monitoring event in July only included the depth and was done as an additional effort to document when the vernal pool dried.

[4] Pond 30 is a complex of Ponds 30A, 30B, and 30C identified as "Waterbody 47" in HLA (1999).

Table 3-30. Pond 30B (Year) Hydrology Monitoring Results

Date	Time	pH	Temperature (C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Max Depth (cm)	Inundated Surface Area (acres)
1/17/2017	-	-	-	-	-	40	2.40
1/24/2017	11:30	6.35	7.40	1.99	171.0	28	0.01
3/1/2017	10:25	6.53	8.9	4.80	53.9	74	connected to 30A and 30C, total 1.12
3/20/2017	10:09	6.33	13.1	1.91	54.2	81	connected to 30A and 30C, total 1.07
4/19/2017	10:26	6.57	12.5	2.46	15.9	71	connected to 30A and 30C, total 1.06
5/24/2017	10:15	6.52	18.2	3.53	23.4	40	connected to 30A and 30C, total 0.74
6/20/2017	11:30	7.24	22.3	4.77	47.1	18	0.01
7/27/2017	10:25	-	-	-	-	-	DRY

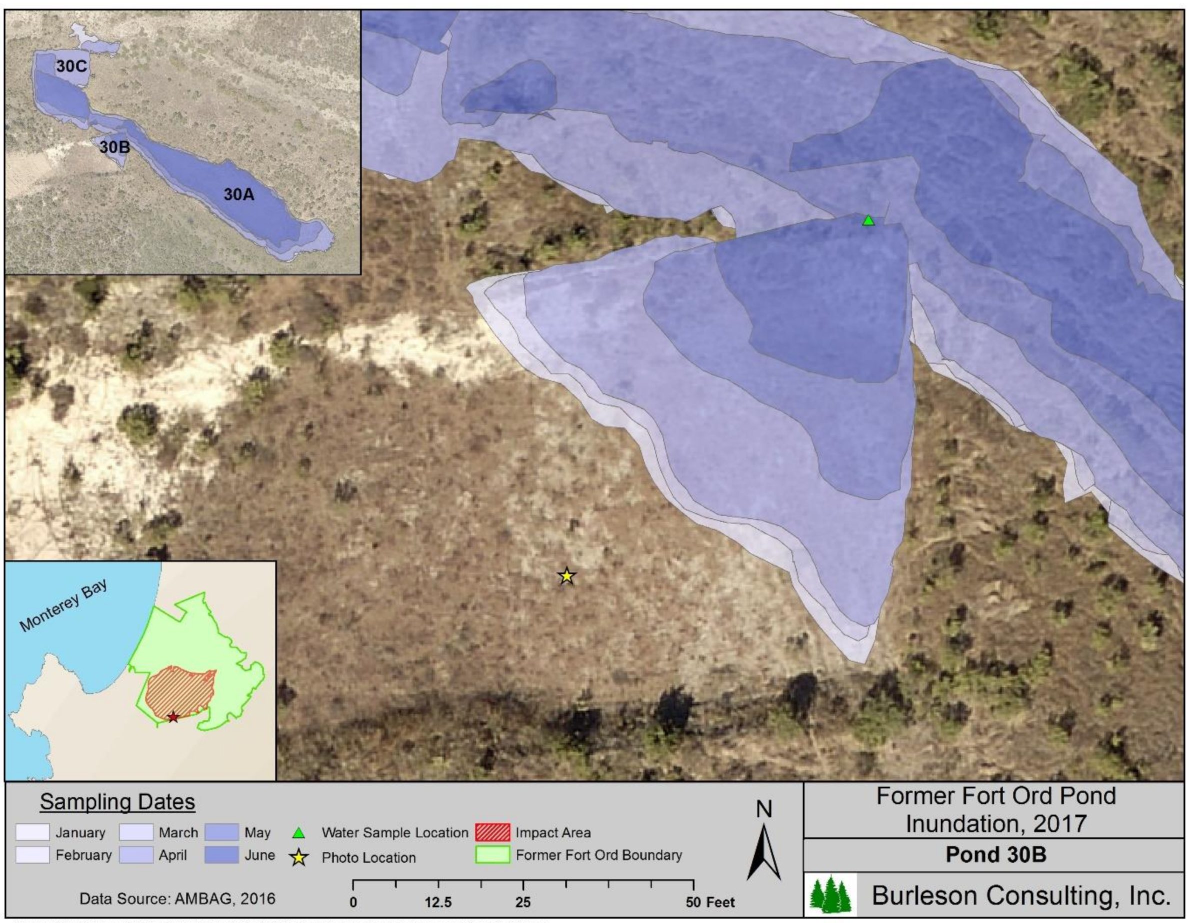

Figure 3-24. Map of Pond 30B on Former Fort Ord, 2017

3.14 Pond 30C

Pond 30C[5] is a post-fire-retardant remediation vernal pool and was in year 5 of monitoring in 2017. Pond 30C was monitored for hydrology. Ponds 30A and 30B (discussed separately) are adjacent to Pond 30C. Ponds 30B and 30C were created as a result of the 2011 soil remediation excavation. Ponds 30B and 30C are distinguished from Pond 30A by the abrupt change in elevation where the excavation occurred; however, at times, these three vernal pools are hydrologically connected.

3.14.1 Hydrology Monitoring

Pond 30C was monitored for hydrology eight times (see Table 3-31 and Figure 3-25). The first monitoring data were provided by the USACE and include the depth and inundation but not water quality. The final monitoring event in July only included the depth and was conducted as an additional effort to document when the vernal pool dried.

Table 3-31. Pond 30C (Year 5) Hydrology Monitoring Results

Date	Time	pH	Temperature (C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Max Depth (cm)	Inundated Surface Area (acres)
1/17/2017	-	-	-	-	-	40	2.40
1/24/2017	11:05	5.98	8.6	2.66	122	38	0.16
3/1/2017	10:00	6.69	9.1	4.29	44.7	75	connected to 30A and 30B, total 1.12
3/20/2017	9:55	6.31	13.6	0.87	30.9	73	connected to 30A and 30B, total 1.07
4/19/2017	10:00	6.65	13.9	3.46	19.2	72	connected to 30A and 30B, total 1.06
5/24/2017	10:30	6.52	18.7	4.63	19.2	45	connected to 30A and 30B, total 0.74
6/20/2017	11:20	7.03	20.6	6.26	11.7	22	0.11
7/27/2017	10:23	-	-	-	-	-	DRY

[5] Pond 30 is a complex of Ponds 30A, 30B, and 30C identified as "Waterbody 47" in HLA (1999).

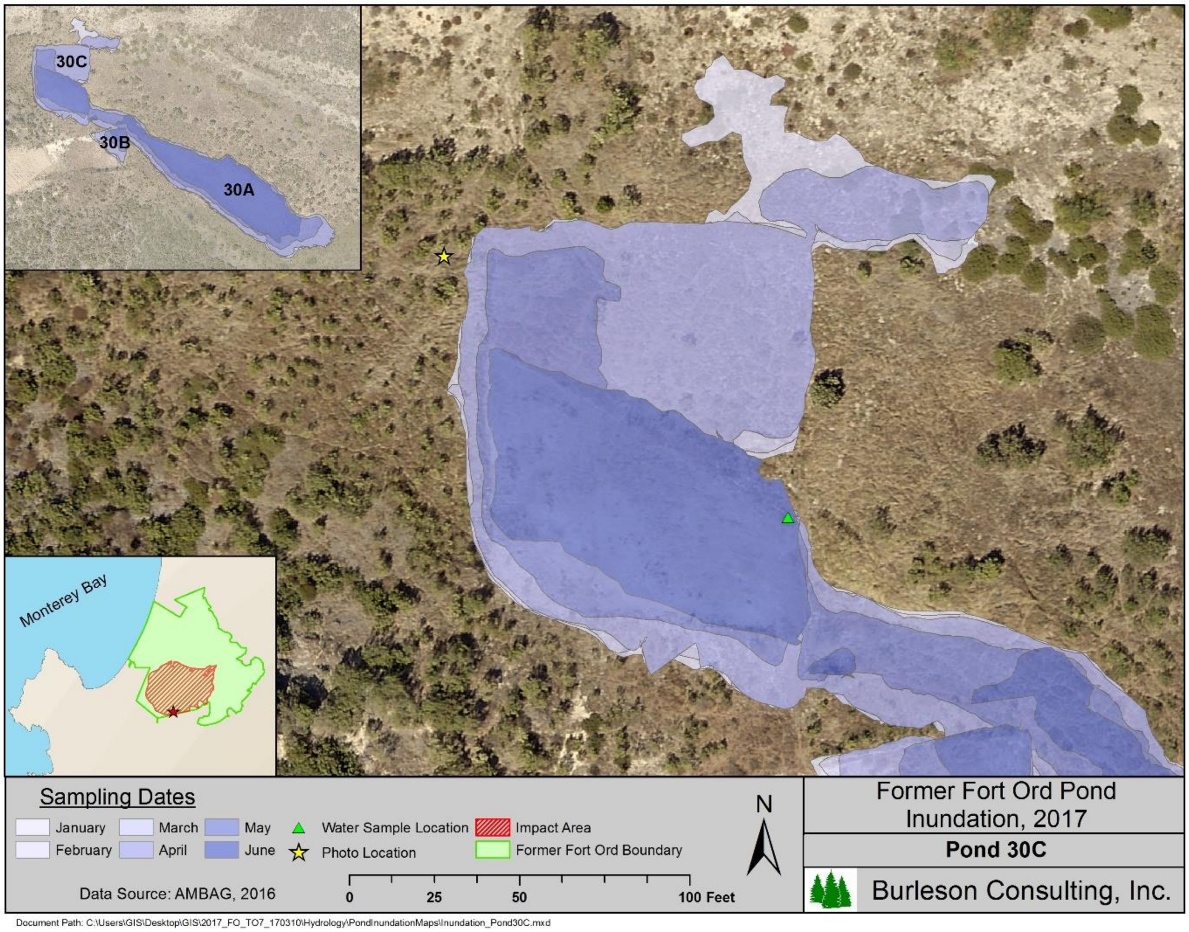

Figure 3-25. Map of Pond 30C on Former Fort Ord, 2017

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4 DISCUSSION

Data quality objectives (DQOs) and performance standards outlined in the Wetland Plan are used to measure successful wetland function following MEC and soil remediation activities (Burleson, 2006). Evaluation for the DQOs is included in the Methods Section 2.4. The DQOs can be summarized as:

- DQO 1: depth – average of 25 cm through March for CTS and at least 10 cm through May for fairy shrimp
- DQO 2: inundation – consistent with baseline and similar to reference vernal pool trends
- DQO 3: vegetation – similar hydrophytic vegetation as reference control wetlands
- DQO 4: water quality – adequate for the presence of CTS and/or fairy shrimp
- DQO 5: wildlife – consistent with baseline and similar to reference control wetland trends

4.1 Pond 5 - Reference

Pond 5 has been monitored for nine years as a reference vernal pool. Table 4-1 summarizes the years in which monitoring occurred and the type(s) of survey(s) conducted. The cumulative precipitation graph indicates the precipitation for the years that monitoring was conducted (see Figure 4-1). Above-normal water-years were 1994-1995, 2015-2016, and 2016-2017. All other monitoring was conducted either in a below-normal water-year, drought year, or consecutive drought year.

Table 4-1. Pond 5 (Reference) Summary of Historic Surveys for Hydrology, Vegetation, and Wildlife Surveys

Survey	Water-Year								
	1993-1994	1994-1995	1995-1996	2006-2007	2009-2010	2012-2013	2013-2014	2015-2016	2016-2017
Hydrology	●	●	●	●		●	●	●	●
Vegetation	●	●	●	●				●	●
Wildlife	●	●	●	●	●			●	●

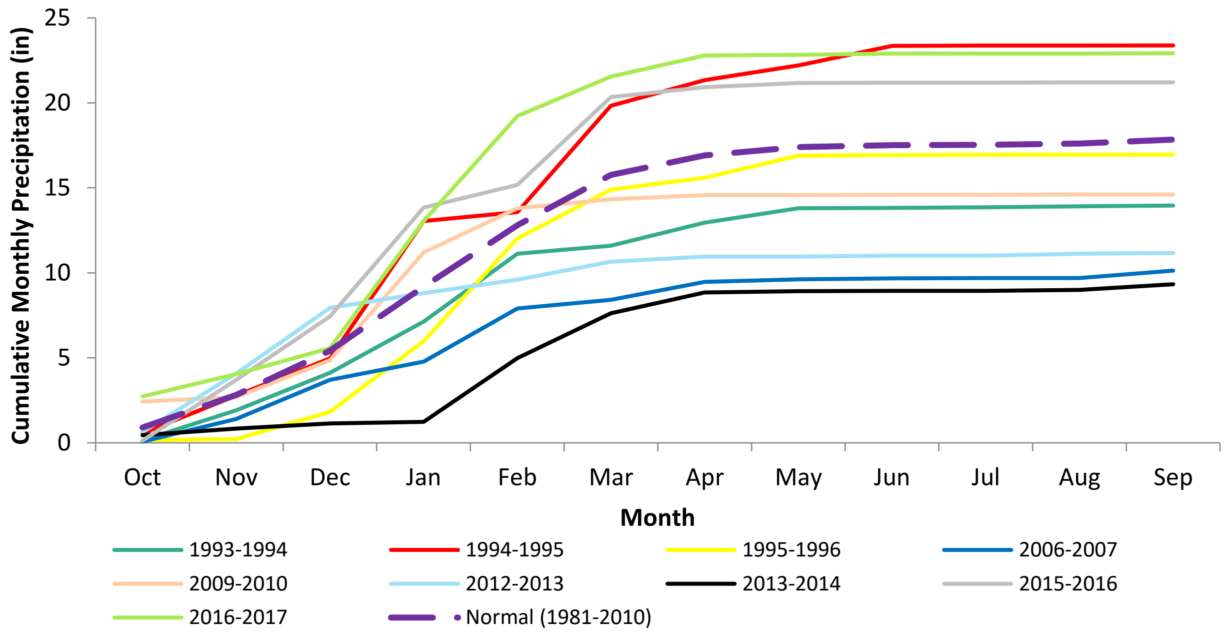

Figure 4-1. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 5 Compared to the 30-Year Normal (mean 1981-2010) (NPS, 2017; NCDC and NOAA, 2017)

4.1.1 Hydrology Monitoring

Pond 5 did not dry by the last recorded monitoring event in September. During 2017, the maximum inundation for Pond 5 was 7.78 acres with a maximum depth of approximately 130 cm. These recordings were the largest recorded values of depth and inundation at Pond 5 to date. Figure 4-2 illustrates the relationship of precipitation and depth at Pond 5 for 2017.

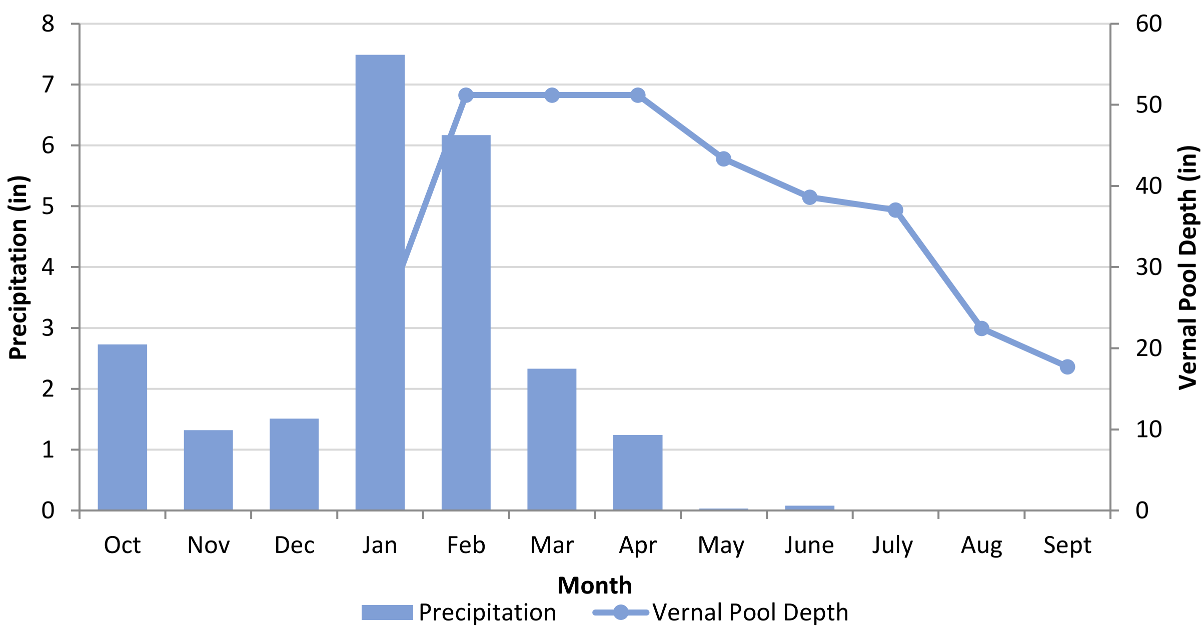

Figure 4-2. Monthly Depth and Precipitation at Pond 5 (Reference) for 2016-2017 Water-Year

Pond 5 was inundated in 1994, 1995, 2007, 2013, and 2016. It did not fill in 1996 or 2014. The historic inundation ranges were 0.17-6.89 acres in 1995 and 0.36-5.33 acres in 2016. The maximum inundation for both years was within the inundation range of 2017.

In below-normal precipitation years, Pond 5 is likely to range from 0-30 cm in depth with a maximum inundation of 0-3 acres. In normal precipitation years, Pond 5 is likely to have a maximum depth of approximately 40 cm and a maximum inundation of approximately 3 acres. In above-normal precipitation years, Pond 5 has maximum depths of up to 130 cm or more and a maximum inundation ranging from 5.3-7.8 acres (see Appendix F Table F-1). Figure 4-3 illustrates historic vernal pool depths by month and organized by water-year. Figure 4-4 illustrates historic and current inundation areas.

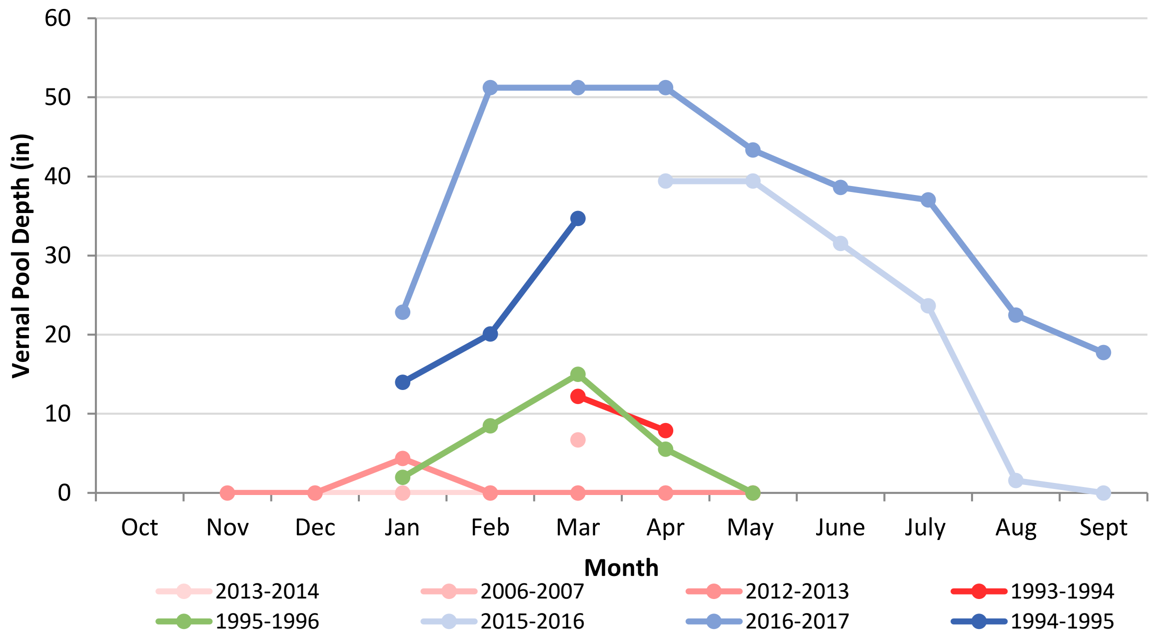

Figure 4-3. Historic Monthly Depths at Pond 5 (Reference). Water-years are color coded in relation to 30-Year Normal (mean 1981-2010). Reds are cumulative water-years below-normal, greens are cumulative water-years within 2 inches of normal, blues are cumulative water-years above-normal.

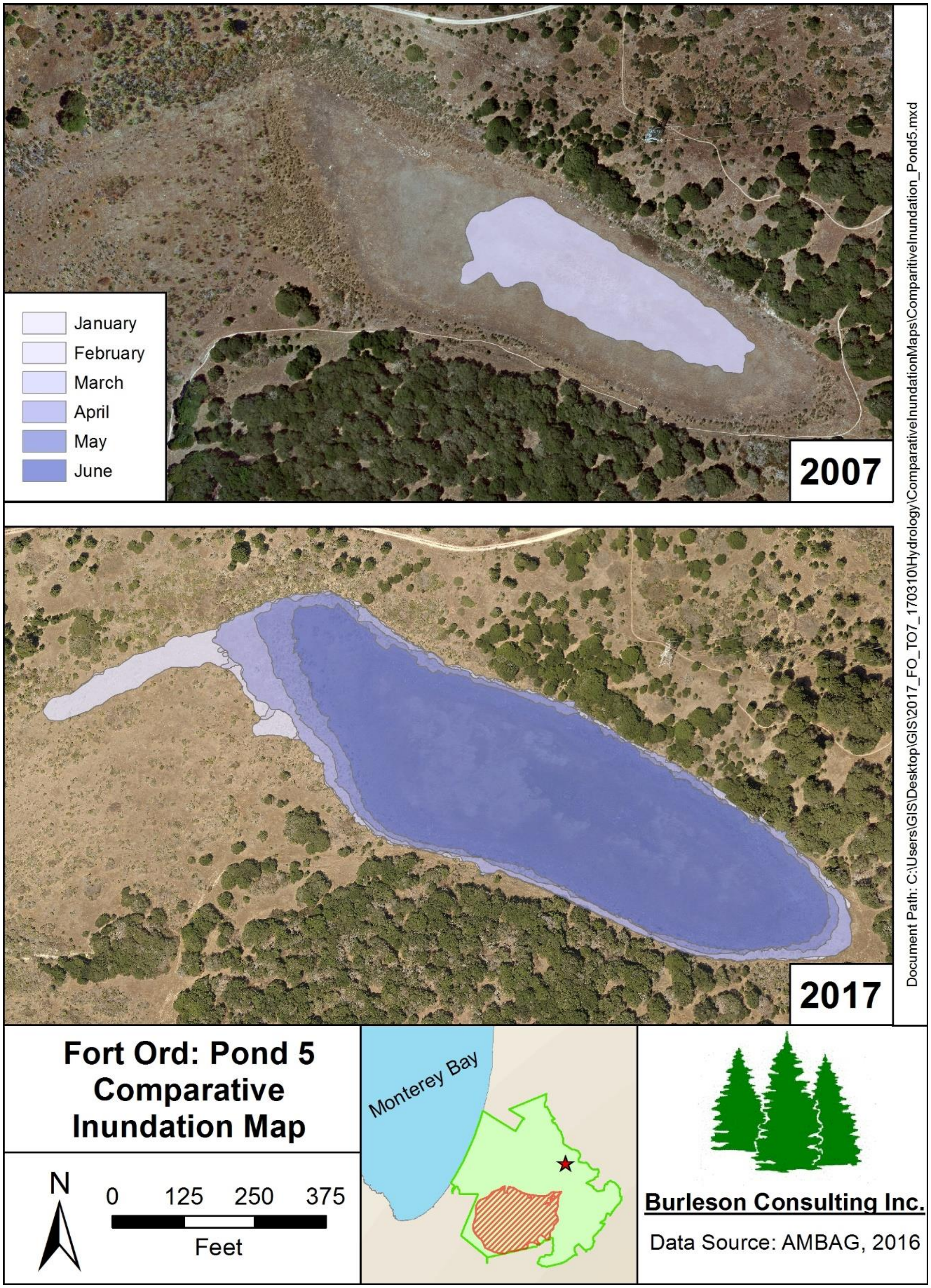

Figure 4-4. Pond 5 (Reference) Inundations for 2006-2007 (below normal precipitation) and 2016-2017 (above normal precipitation). This vernal pool received no remediation.

4.1.1.1 Data Quality Objective 1

The average depth from the first monitoring event until the last monitoring event in September was 95 cm. DQO 1 requires an average of 25 cm depth from the first rain event through March and 10 cm for 18 consecutive days through May. Pond 5 provided sufficient depth for suitable habitat for both CTS (80 cm through March) and fairy shrimp (112 cm through May).

4.1.1.2 Data Quality Objective 2

Pond 5 was inundated January through September with an inundation range of 5.32-7.78 acres and a mean of 6.65 acres. The vernal pool did not dry by the last recorded monitoring event on September 6, 2017.

4.1.1.3 Performance Standard: Hydrological Conditions and Inundation Area

Pond 5 is a reference vernal pool and not required to meet the performance standards but was used as a control for comparison to other post-remediated vernal pools.

4.1.2 Vegetation Monitoring

Vegetation data were collected at Pond 5 in 2007, 2016, and 2017 (Shaw, 2008; Burleson, 2017). Data were collected in 2007 in three zones using a 1.0 m^2 quadrat placed at three locations within each zone. Because these data were collected using a different methodology than was used in 2016 and 2017, data for all strata were combined for the entire pool to make comparison to 2016 and 2017 feasible. Data from 2016 and 2017 were collected using the same methodology and are compared stratum-to-stratum in Table 4-2 as well as side-by-side strata map comparison (see Figure 4-5).

Table 4-2. Pond 5 (Reference) Vegetative Strata Percentage Within the Vernal Pool Basin Boundary

Stratum	Percentage	
	2016	2017
1	26%	53%
2	32%	12%
3	38%	12%
4	4%	16%
5	N/A	7%

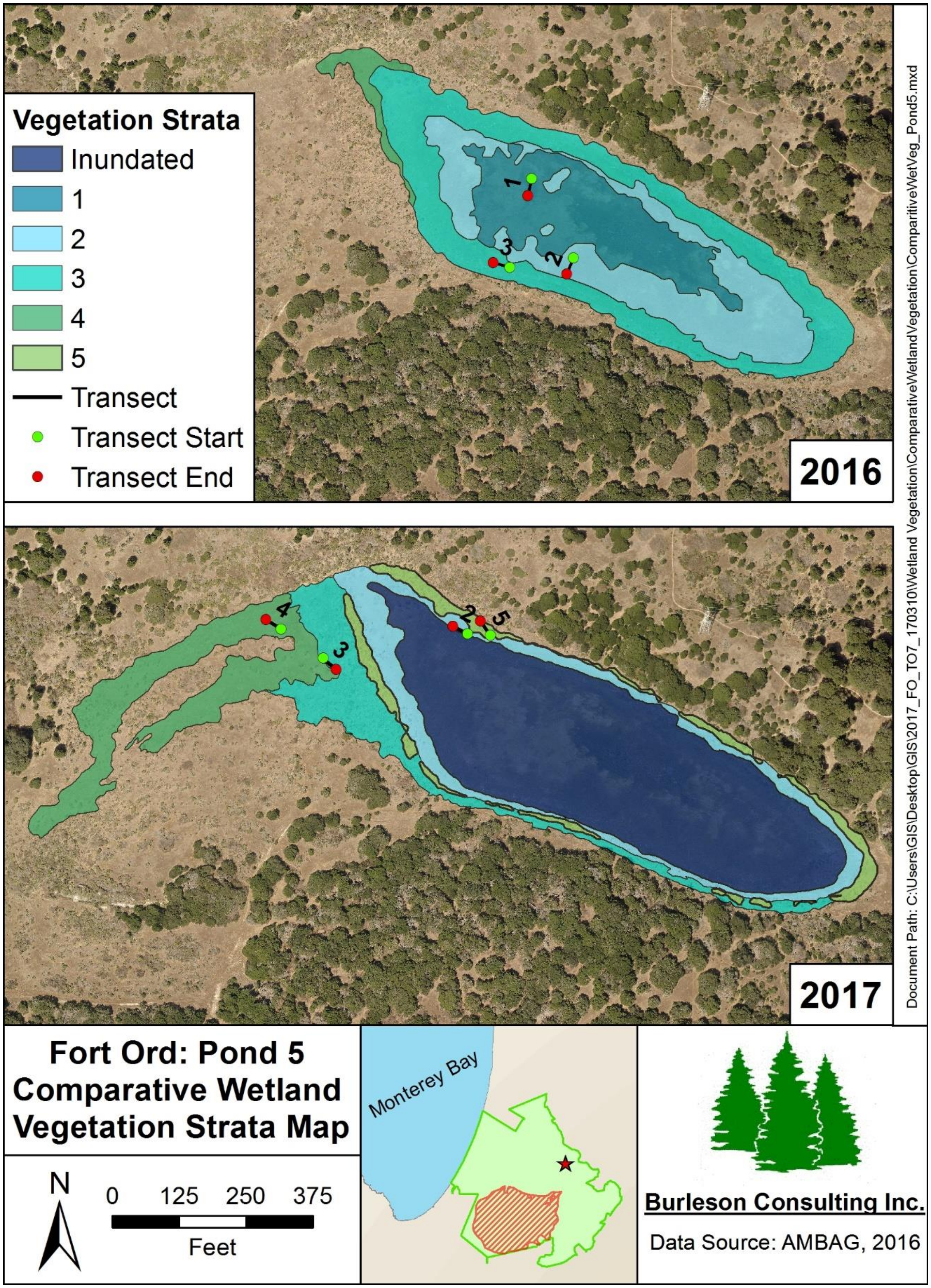

Figure 4-5. Pond 5 Vegetation Strata and Transects for 2016 and 2017

The absolute vegetative cover observed in 2017 was closer to the ranges observed in 2016; however, there were differences when comparing 2007, 2016, and 2017 (see Table 4-3). Vegetative cover ranges from 36.3% in 2007 to 80.6% in 2016. The differences of vegetative cover between 2007 and 2016 were likely related to different methodologies. However, the increase in thatch from 2016 to 2017 was related to the fact that in 2016 stratum 4 was considered too desiccated to monitor. In 2017, stratum 4, as well as an addition outer stratum, stratum 5, were both monitored and contributed to the increase in thatch.

Table 4-3. Pond 5 (Reference) Absolute Percent Cover

Year	Vegetative Cover	Thatch/Bare Ground
2007	36.3%	63.7%
2016	80.6%	24.1%
2017	60.5%	40.4%

An increase in species richness was observed between 2007 and 2017. Species richness tends to be higher in wet years than in dry years (Witham *et al.*, 1998). In 2007, 26 plant species were recorded in the vernal pool basin, while four species were recorded on the transects. In 2016, 40 species were recorded within the vernal pool basin, while seven species were recorded on the transects. In 2017, 73 species were recorded within the vernal pool basin, while 29 species were recorded on the transects (see Appendix B).

Pond 5 species composition varied between monitoring years; however, the dominant species remained the same through time. This variability can be expected in vernal pools which tend to experience dynamic conditions, typically in response to precipitation and the resulting hydroperiod of the vernal pool.

Pale spike rush (*Eleocharis macrostachya*) and salt grass (*Distichlis spicata*) were the dominant species in 2007, 2016, and 2017. Howell's quillwort (*Isoetes howellii)* was also dominant in 2016, but was not found on the transects in 2007 or 2017. The differences from 2007 to 2016 were likely due to differing methodology. The differences between surveys include quadrats vs. transects and different delineation methods for determining the vegetative zones or strata. It is possible these differences omitted species during the 2007 survey. The species composition shift between 2016 and 2017 was likely related to higher precipitation in 2017. These conditions supported an expansion of wetland species into areas where these species had not previously been observed. In addition, obligate species, such as Howell's quillwort, may not have been represented in the transect data because the area where Howell's quillwort was dominant in 2016 was still submerged in 2017. In 2017, Howell's quillwort was still observed in stratum 3, however it was not a dominant species. A complete comparison of species composition observed during the surveys at Pond 5 in 2007, 2016, and 2017 can be found in Appendix H. Figure 4-6 shows a subset of this comparison for species observed with a 2% cover or greater.

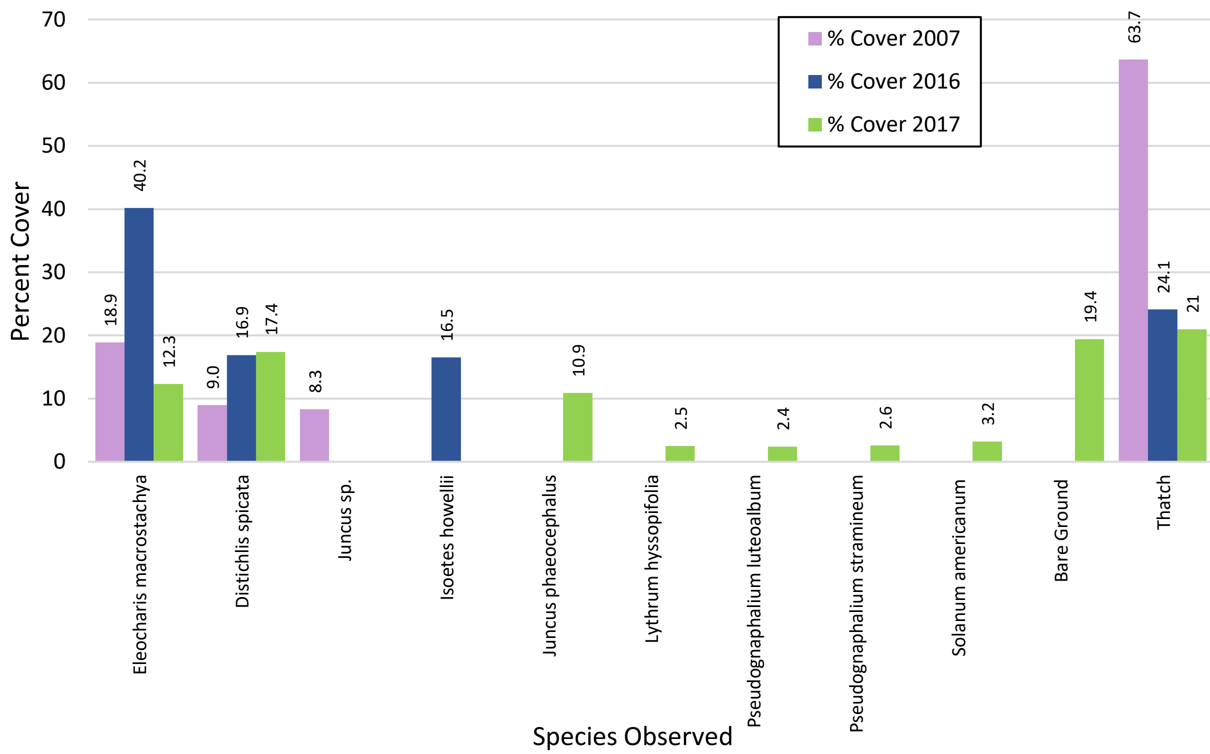

Figure 4-6. Percent Cover of Dominant Species at Pond 5 (Reference)

Native and non-native species richness within Pond 5 progressively increased through time (see Table 4-4). However, the relative percent covers of native and non-native species were variable (see Table 4-5). The increased number of species was likely due to increased precipitation in 2017. The relative percent cover for native and non-native species remained within the range of previous years, though more non-native species were observed in 2017.

Table 4-4. Pond 5 (Reference) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
2007	2	1	1
2016	7	0	0
2017	15	11	3

Table 4-5. Pond 5 (Reference) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
2007	76.9%	0.3%	22.9%
2016	100.0%	0.0%	0.0%
2017	86.6%	12.9%	0.6%

More wetland and non-wetland species were observed in Pond 5 in 2017 compared to previous years (see Table 4-6). This increase was likely due to the increased precipitation observed in 2017. In 2007, two wetland plants and one non-wetland plant were observed in the quadrats. In 2016, six wetland plants and one non-wetland plant were observed along the transects. In 2017, 17 wetland plants and six non-wetland plants were observed on the transects. The proportion of wetland to non-wetland species was similar between 2007, 2016, and 2017. For 2007 the ratio was 2:1, 2016 the ratio was 6:1, and 2017 the ratio was 17:6. The relative percent cover of wetland species decreased slightly from 2016, while the relative percent cover of non-wetland species increased (see Table 4-7). It is likely because stratum 1, a stratum with typical high abundance and vegetative cover of wetland species, was not represented in the dataset due to inundation.

Table 4-6. Pond 5 (Reference) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2007	1	0	1	1	0	1
2016	3	2	1	1	0	0
2017	5	6	6	6	0	6

Table 4-7. Pond 5 (Reference) Relative Percent Cover of Wetland and Non-Wetland Species

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2007	52.1%	0.0%	24.8%	0.3%	0.0%	22.9%
2016	70.7%	7.6%	21.0%	0.7%	0.0%	0.0%
2017	26.3%	22.6%	40.3%	10.0%	0.0%	0.8%

4.1.2.1 Data Quality Objective 3

While there are observable changes in hydrophytic vegetation between surveys, these changes are largely associated with precipitation fluctuations. This can be expected to occur given the dynamic nature of vernal pools and the close relationship between the hydroperiod and wetland vegetation. As a reference vernal pool, Pond 5 can be used for comparison to baseline and remediated vernal pools.

4.1.2.2 Performance Standard: Plant Cover and Species Diversity

Pond 5 is a reference vernal pool and was not required to meet the performance standards in 2017. However, it provides a control for comparison to other post-remediated vernal pools.

4.1.3 Wildlife Monitoring

Wildlife data were collected at Pond 5 in 1994, 1995, 1996, 2007, 2010, 2016, and 2017 (Jones and Stokes, 1996; Shaw, 2008; Shaw, 2011; Burleson, 2017). Fairy shrimp were only detected in 1995. CTS larvae were observed in 1995, 2010, 2016, and 2017. Table 4-8 shows historic wildlife monitoring results. In 2017, 46 CTS larvae were observed and no fairy shrimp were detected.

Table 4-8. Pond 5 (Reference) Historic Wildlife Monitoring Results

Sampling Year	CTS Larvae Abundance (# Individuals)	Fairy Shrimp Abundance (# Individuals)
1994	0	0
1995	Abundant	Very low – moderate abundance
1996	0	0
2007	0	0
2010	12	0
2016	>101	0
2017	46	0

4.1.3.1 Data Quality Objective 1

Pond 5 experienced sufficient depths in 2017 to provide suitable CTS and fairy shrimp habitat as discussed in Section 4.1.1.1.

4.1.3.2 Data Quality Objective 4

CTS were present in 2017 at Pond 5; therefore, the water quality was adequate for the presence of CTS. In comparison to other vernal pools and across years, the water quality data was within normal ranges. The pH range was 6.09 in January to 7.12 in June with a mean of 6.44. Temperatures ranged from 8.9° C in January to 24.2° C in June with a mean of 16.5° C. Dissolved oxygen ranged between 0.0 mg/L in April to 4.52 mg/L in February with a mean of 2.41 mg/L. The turbidity range was 4.0 FNU in January to 8.3 FNU in March with a mean of 6.08 FNU.

4.1.3.3 Data Quality Objective 5

CTS were present in 2017, which was align with some, but not all, previous survey years. CTS were present in 1995, 2010, 2016, and 2017, but not in 1994, 1996, or 2007. This variation in CTS presence may be associated with rainfall patterns. Although 2009-2010 was a below-normal water-year, early storms with above-normal precipitation likely provided enough suitable habitat for CTS through March. Additionally, 1995, 2016, and 2017 had above-normal precipitation levels (see Figure 4-1 and Figure 4-2).

Fairy shrimp were not detected in 2017, which was consistent with previous monitoring. Fairy shrimp were only detected in 1995. Although fairy shrimp were not detected in 2017, it was possible that monitoring timing may not have been adequate to detect fairy shrimp. Previous fairy shrimp detections was conducted in January through March, while monitoring in 2017 was conducted March through May. Wildlife monitoring does not begin until March to avoid disturbance of any CTS eggs which may be present.

4.1.3.4 Performance Standard: Wildlife Usage

Pond 5 is a reference vernal pool and was not required to meet the performance standards. It was used as a control for comparison to other post-remediated vernal pools.

4.1.4 Conclusion

Pond 5 was used for comparison to remediated vernal pools (see Table 4-9).

Table 4-9. Success at Pond 5 (Reference) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Hydrological Conditions & Inundation Area	DQO 1	Suitable for Comparison
	DQO 2	Suitable for Comparison
Plant Cover & Species Diversity	DQO 3	Suitable for Comparison
Wildlife Usage	DQO 1	Suitable for Comparison
	DQO 4	Suitable for Comparison
	DQO 5	Suitable for Comparison

4.2 Pond 101 East (West) - Reference

Pond 101 East (West) was monitored for six years as a reference vernal pool. Table 4-10 summarizes the monitoring years and types of surveys conducted. The cumulative precipitation graph illustrates precipitation for monitoring (see Figure 4-7). The 2010-2011, 2015-2016, and 2016-2017 water-years were above-normal. Other monitoring years occurred during normal or below-normal precipitation conditions.

Table 4-10. Pond 101 East (West) (Reference) Summary of Historic Surveys for Hydrology, Vegetation, and Wildlife Surveys

Survey	Water-Year					
	1991-1992	2000-2001	2009-2010	2014-2015	2015-2016	2016-2017
Hydrology		●		●	●	●
Vegetation		●			●	●
Wildlife	●	●	●		●	●

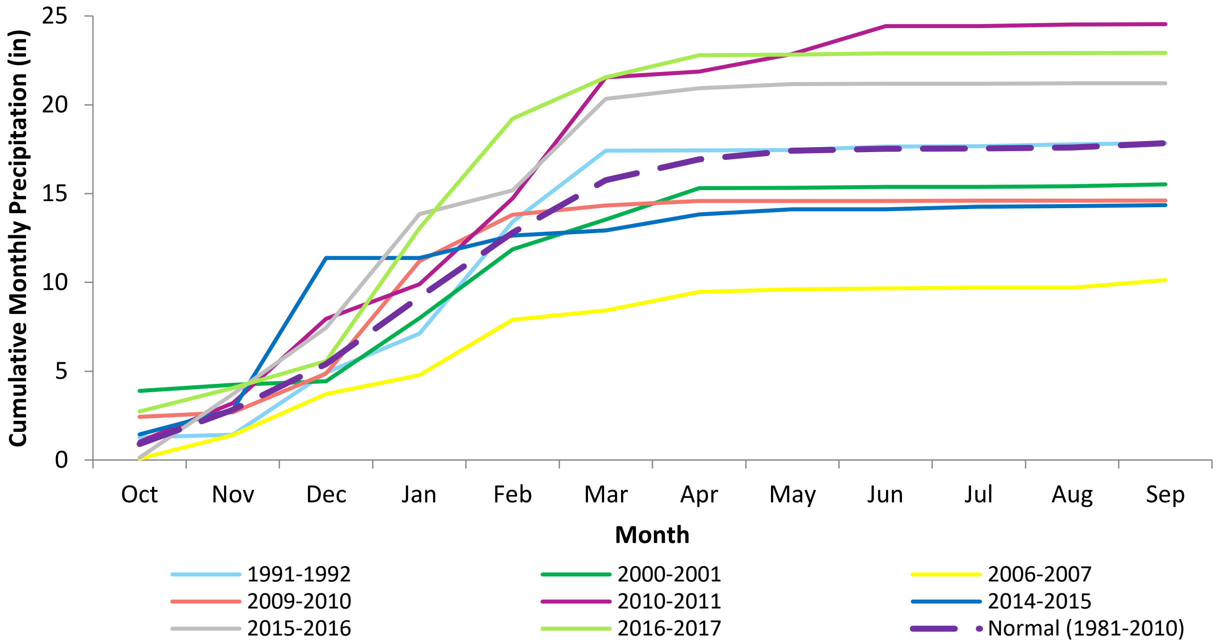

Figure 4-7. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 101 East (West) Compared to the 30-Year Normal (mean 1981-2010) (NPS, 2017; NCDC NOAA, 2017)

4.2.1 Hydrology Monitoring

In most years, Pond 101 East ponds as two distinct water bodies: Pond 101 East (East) and Pond 101 East (West). During 2017, these pools were hydrologically connected prior to May. In May, Pond 101 East dried into these two separate pools. In past reports, Pond 101 East (East) was referred to as the “east pool” and Pond 101 East (West) was referred to as the “middle pool” (Harding ESE, 2002; Shaw, 2008).

The maximum inundation for Pond 101 East (West) was 9.4 acres in 2017, with a maximum depth of 88 cm. When maximum inundation and depth were recorded, Pond 101 East (East) was hydrologically connected to Pond 101 East (West). These depth and inundation values are larger than previously recorded values for Pond 101 East (West). Figure 4-8 illustrates the relationship of precipitation and depth at Pond 101 East (West) for 2017.

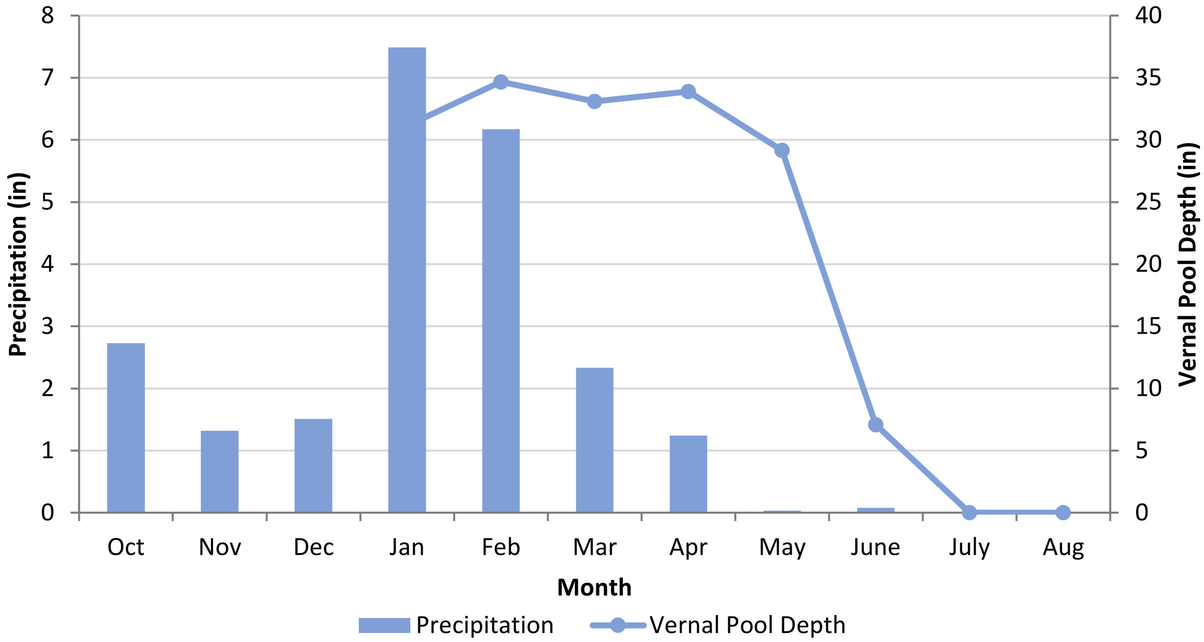

Figure 4-8. Monthly Depth and Precipitation at Pond 101 East (West) (Reference) for 2016-2017 Water-Year

Pond 101 East (West) was inundated in 2001 and 2016, but dry in 2015. The historic inundations from 2001 and 2016 are smaller than the inundations observed in 2017 because 101 East (West) and 101 East (East) were not connected. Pond 101 East (West) inundates a small area, or not at all, during below-normal precipitation years. During these years, it typically does not connect with Pond 101 East (East). No inundations were recorded during below-normal water-years. In 2016, an above-normal water-year after consecutive drought, Pond 101 East (West) had a moderate inundation but did not connect with 101 East (East). In contrast, this above-normal water-year resulted in a large inundation, and was connected to Pond 101 East (East) from January to May (see Figure 4-10).

In below-normal precipitation years, Pond 101 East (West) is likely to range from 0-45 cm in depth with a maximum inundation of 0-0.1 acre. In normal precipitation years, Pond 101 East (West) is likely to have a maximum depth of approximately 50 cm and a maximum inundation of approximately 0.5 acre. In above-normal precipitation years, Pond 101 East (West) could have maximum depths of up to 88 cm or more and a maximum inundation of up to 1 acre or more but would likely be connected with 101 East (East) as observed in 2017(see Appendix F Tables F-2 – F-3). Figure 4-9 illustrates historic vernal pool depths by month and organized by water-year. Figure 4-10 illustrates historic and current inundation areas.

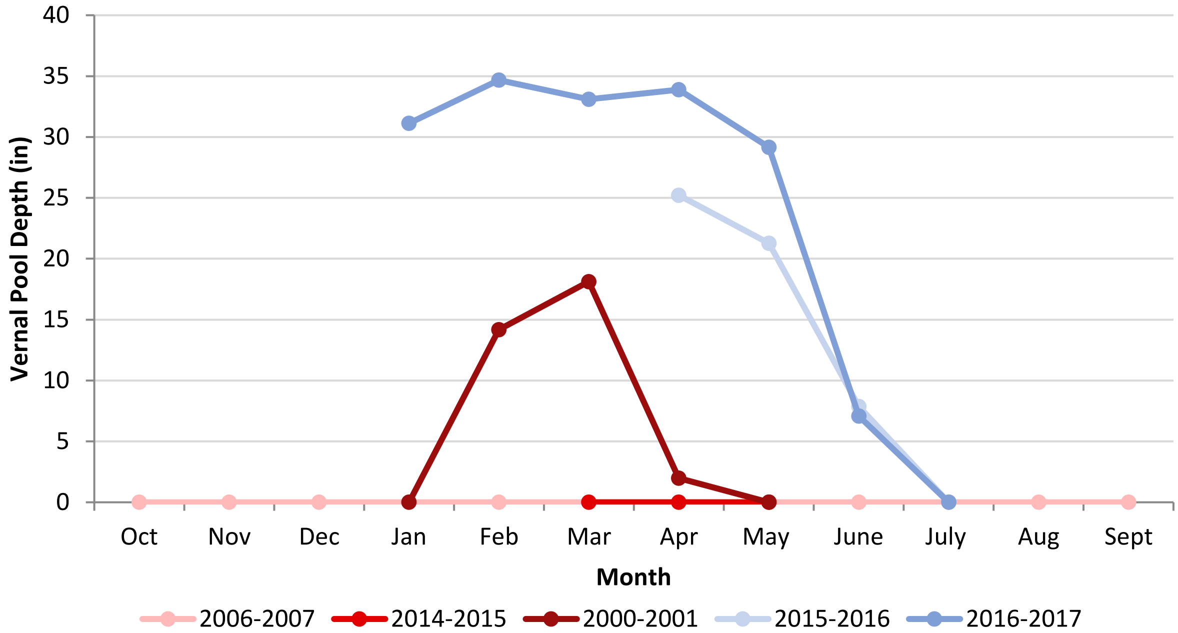

Figure 4-9. Historic Monthly Depths at Pond 101 East (West) (Reference). Water-years are color coded in relation to 30-Year Normal (mean 1981-2010). Reds are cumulative water-years below-normal, greens are cumulative water-years within 2 inches of normal, blues are cumulative water-years above-normal.

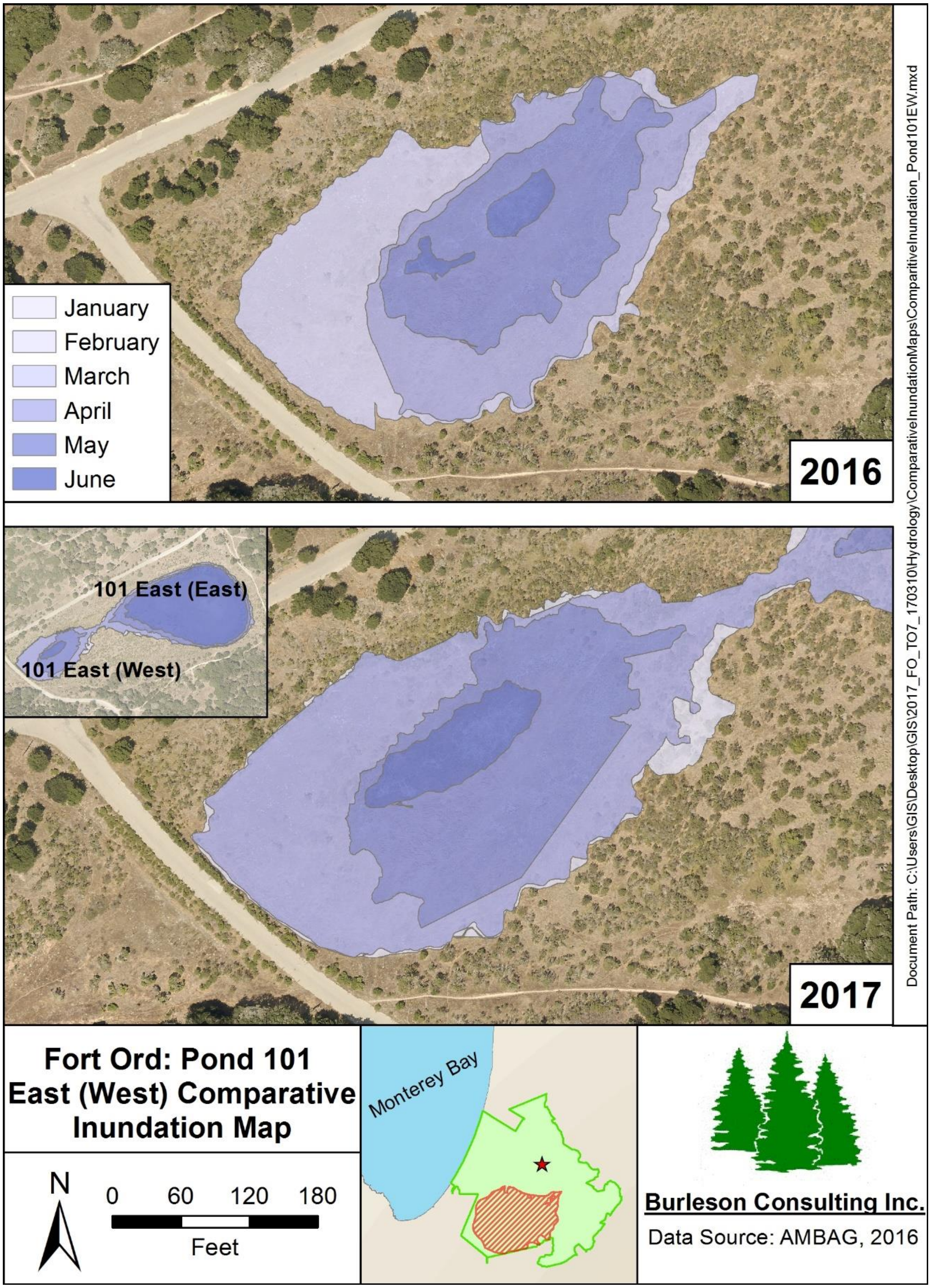

Figure 4-10. Pond 101 East (West) (Reference) Inundations for 2015-2016 (above-normal precipitation) and 2016-2017 (above-normal precipitation). This vernal pool received no remediation.

4.2.1.1 Data Quality Objective 1

The average depth from the first monitoring event until the vernal pool dried was 72 cm. The DQO requires an average of 25 cm of depth from the first rain event through March and 10 cm for 18 consecutive days through May. Pond 101 East (West) provided suitable habitat for both CTS (84 cm through March) and fairy shrimp (82 cm through May).

4.2.1.2 Data Quality Objective 2

Pond 101 East (West) was inundated January through June with areas between 0.17 and 9.38 acres and a mean of 4.83 acres. The vernal pool was hydrologically connected to Pond 101 East (East) for the larger inundation values.

4.2.1.3 Performance Standard: Hydrological Conditions and Inundation Area

Pond 101 East (West) is a reference vernal pool and was not required to meet the performance standard but rather was used as a control for comparison to other post-remediated vernal pools.

4.2.2 Vegetation Monitoring

Vegetation data were collected at Pond 101 East (West) in 2001, 2016, and 2017 (Harding ESE, 2002; Burleson, 2017). In 2001, data were collected along two 41-foot transects using 0.25 m^2 quadrats at 10-foot intervals, which alternated from the right to left of the transect. In 2016, data were collected with the same methodology as 2017. Because 2001 data were collected differently than in other years, strata were combined across the vernal pool to allow comparison to other years. Data from 2016 and 2017 were compared stratum-to-stratum in Table 4-11 as well as side-by-side (see Figure 4-11).

Table 4-11. Pond 101 East (West) (Reference) Vegetative Strata Percentage Within the Vernal Pool Basin Boundary

Stratum	Percentage	
	2016	2017
1	13%	6%
2	37%	48%
3	12%	8%
4	22%	28%
5	15%	2%
6	N/A	1%
7	N/A	7%

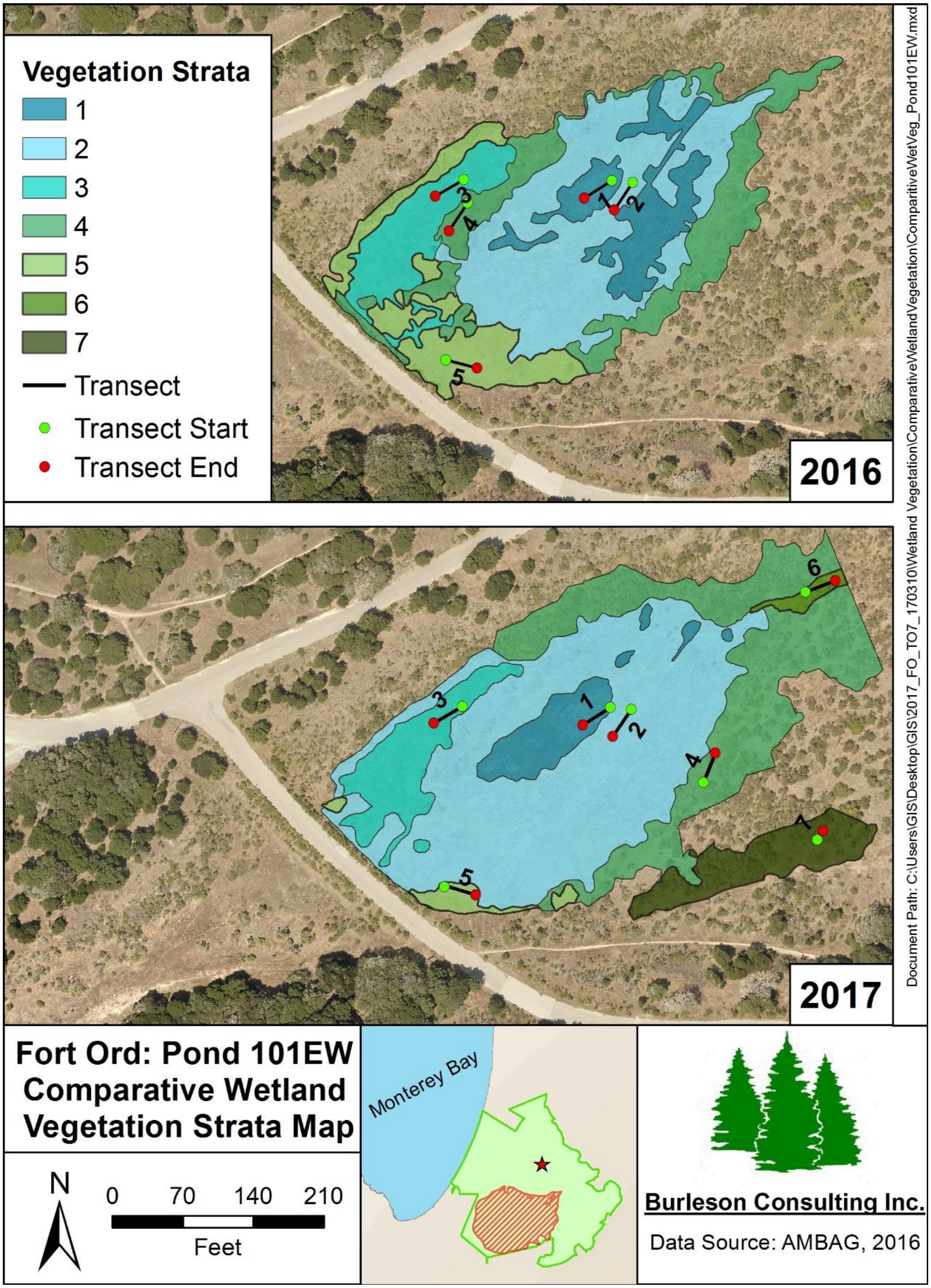

Figure 4-11. Pond 101 East (West) Vegetation Strata and Transects for 2016 and 2017

The absolute vegetative cover observed in 2017 was comparable to previous years (see Table 4-12).

Table 4-12. Pond 101 East (West) (Reference) Absolute Percent Cover

Year	Vegetative Cover	Thatch/Bare Ground
2001	66.5%	34.3%
2016	75.2%	23.0%
2017	68.9%	30.5%

An increase in species richness was observed between previous years and 2017. The above-normal water-year likely contributed to the increase since species diversity and richness tend to be higher in wet years than in dry years (Witham *et al.*, 1998). In 2001, 31 plant species were recorded on the transects. In 2016, 37 species were recorded within the vernal pool basin, while 29 species were recorded on the transects. In 2017, 59 species were recorded within the vernal pool basin, while 36 species were recorded on the transects (see Appendix B).

Species composition was variable in Pond 101 East (West) through time. A complete comparison of species composition in 2001, 2016, and 2017 can be found in Appendix H. Figure 4-12 shows a subset of this comparison for species observed with a 2% cover or greater. Pale spike rush (*Eleocharis macrostachya*) was the dominant species in 2017. Sand spikerush (*Eleocharis montevidensis)* was the dominant species in 2001, but was not observed in 2016 or 2017. Italian rye grass (*Festuca perennis*) was the dominant species in 2016 and was not observed in 2017 or 2001.

Species composition shifts may be due to differences in survey methodology or precipitation fluctuations between water-years. Transects in 2001 were comprised of varying lengths and located in areas of representative transitional and emergent habitats. Conversely, 2016 and 2017 transects were in the most homogenous portions of the identified strata. For this reason, it is likely that different species were recorded during the survey in 2001 than in 2016 and 2017. The shift in species from 2016 to 2017 is likely related to the increase in precipitation as well as which strata were monitored with transects. The increased precipitation allowed for new outer vegetation strata that were not observed in 2016. The variable species composition is not surprising considering how dynamic vernal pools are from year to year due to changes in precipitation and the resulting hydroperiod of the vernal pool.

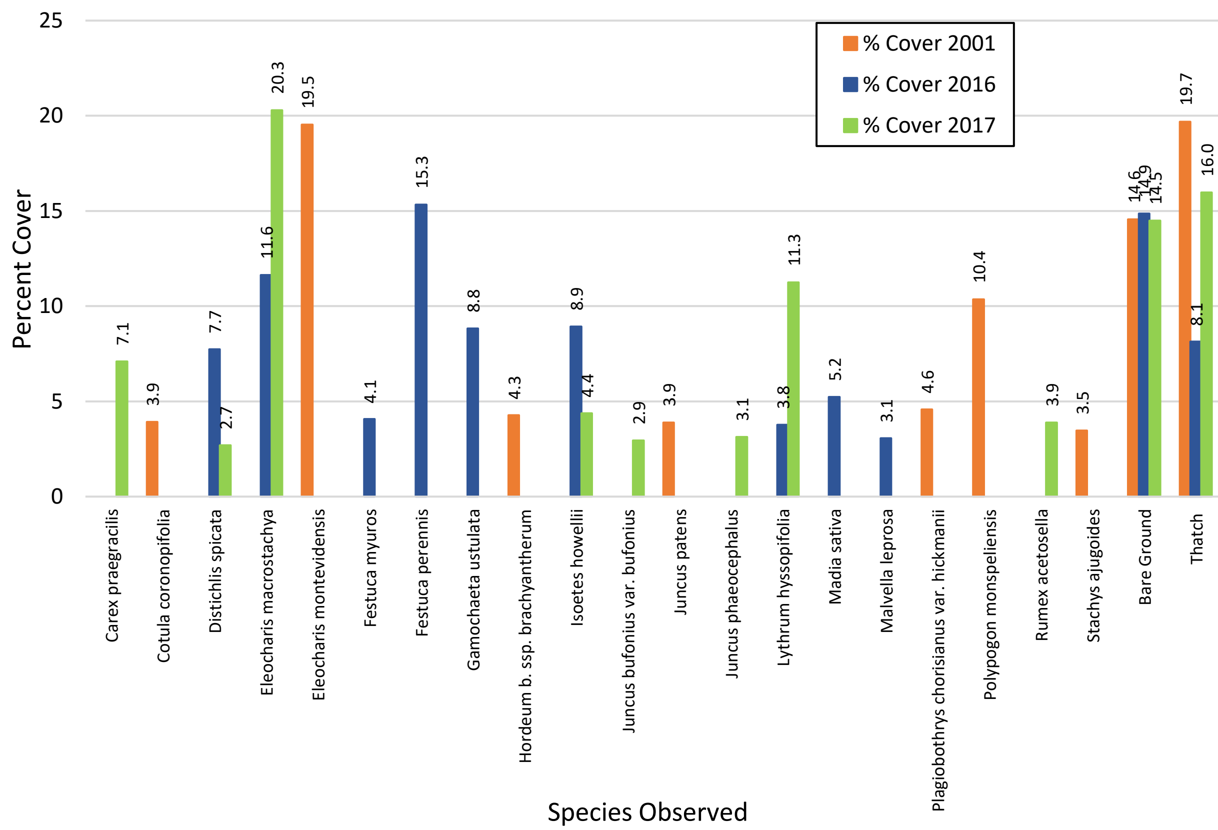

Figure 4-12. Percent Cover of Dominant Species at Pond 101 East (West) (Reference)

The number of native species in Pond 101 East (West) increased between 2001 and 2017, while non-native species richness decreased slightly (see Table 4-13). The relative percent cover of native species increased, while the relative percent cover of non-native species decreased (see Table 4-14).

Table 4-13. Pond 101 East (West) (Reference) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
2001	15	16	0
2016	16	11	1
2017	23	12	1

Table 4-14. Pond 101 East (West) (Reference) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
2001	63.4%	36.6%	0.0%
2016	65.7%	34.3%	0.0%
2017	70.3%	29.6%	0.1%

Wetland species richness in Pond 101 East (West) nearly doubled between 2001 and 2017, while non-wetland species richness remained within the range of 5-9 species (see Table 4-15). In 2001, 17 wetland plants and nine non-wetland plants were observed along the transects. In 2016, 14 wetland plants and five non-wetland plants were observed along the transects. In 2017, 24 wetland plants and seven non-wetland plants were observed on the transects. Species richness increases in wetland species are likely due to the above-normal precipitation levels in 2017. The relative percent covers of wetland and non-wetland species have remained similar to both 2016 and baseline with a shift toward more wetland species and specifically more obligate wetland species in 2017 (see Table 4-16). In 2001, 80% of the relative percent cover were wetland species, in 2016 71%, and in 2017 89%.

Table 4-15. Pond 101 East (West) (Reference) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2001	4	6	7	7	2	5
2016	7	4	3	5	0	7
2017	8	11	5	7	0	5

Table 4-16. Pond 101 East (West) (Reference) Relative Percent Cover of Wetland and Non-Wetland Species

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2001	20.9%	54.2%	5.2%	6.9%	2.2%	10.5%
2016	18.5%	47.9%	4.6%	6.1%	2.0%	19.3%
2017	55.1%	25.7%	8.1%	9.0%	0.0%	4.8%

4.2.2.1 Data Quality Objective 3

While there are observable changes in hydrophytic vegetation between surveys, these changes are largely associated with precipitation fluctuations. This can be expected to occur given the dynamic nature of vernal pools and the close relationship between the hydroperiod and wetland vegetation. As a reference vernal pool, Pond 101 East (West) can be used for comparison to baseline and remediated vernal pools.

4.2.2.2 Performance Standard: Plant Cover and Species Diversity

Pond 101 East (West) is a reference vernal pool and was not required to meet the performance standard but was used as a control for comparison to other post remediated vernal pools.

4.2.3 Wildlife Monitoring

Wildlife data were collected at Pond 101 East (West) in 1992, 2001, 2010, 2016, and 2017 (Jones and Stokes, 1992; Harding ESE, 2002; Shaw, 2011; Burleson, 2017). Fairy shrimp were detected in 2001, but not in 1992, 2010, 2016, or 2017. CTS larvae were detected in 1992, 2010, 2016, and 2017. Table 4-17 shows historic wildlife monitoring results. In 2017, 107 CTS larvae and no fairy shrimp were observed.

Table 4-17. Pond 101 East (West) (Reference) Historic Wildlife Monitoring Results

Sampling Year	CTS Larvae Abundance (# Individuals)	Fairy Shrimp Abundance (# Individuals)
1992	Present*	0*
2001	0*	Moderate abundance*
2010	11	0*
2016	>101	0
2017	107	0

*Data do not differentiate between 101 East (East), 101 East (West), and 101 West. They are identified collectively as Pond 101.

4.2.3.1 Data Quality Objective 1

Pond 101 East (West) provided suitable habitat for CTS and fairy shrimp as discussed in Data Quality Objective 1.

4.2.3.2 Data Quality Objective 4

CTS were present in 2017 at Pond 101 East (West); therefore, the water quality was adequate for the presence of CTS. In comparison to other vernal pools and through time, the water quality data was within normal ranges. The pH ranged from 5.81 in January to 6.53 in June with a mean of 6.13. Temperature ranged from 10.4° C in February to 26.6° C in June with a mean of 16.0° C. Dissolved oxygen ranged from 1.68 mg/L in May to 6.18 mg/L in February with a mean of 3.98 mg/L. Turbidity range was from 2.8 FNU in March to 79.8 FNU in June with a mean of 25.6 FNU.

4.2.3.3 Data Quality Objective 5

CTS were present in 2017, which is consistent with previous monitoring efforts. CTS were present in 1992, 2010, 2016, and 2017, but not in 2001. The lack of CTS observed in 2001 may be associated with below-normal precipitation (see Figure 4-9).

Fairy shrimp were not detected in 2017, which is consistent with previous monitoring. Fairy shrimp were only present in 2001. Although fairy shrimp were not detected in 2017, the timing of monitoring may have affected detectability. Previous detections of fairy shrimp was conducted between January and March, and monitoring in 2017 was conducted March through May. Wildlife monitoring does not occur until March to avoid disturbance of any CTS eggs which may be present.

4.2.3.4 Performance Standard: Wildlife Usage

Pond 101 East (West) is a reference vernal pool and was not required to meet the performance standard but was used as a control for comparison to other post remediated vernal pools.

4.2.4 Conclusion

Pond 101 East (West) was used for comparison to remediated vernal pools (see Table 4-18).

Table 4-18. Success at Pond 101 East (West) (Reference) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Hydrological Conditions & Inundation Area	DQO 1	Suitable for Comparison
	DQO 2	Suitable for Comparison
Plant Cover & Species Diversity	DQO 3	Suitable for Comparison
Wildlife Usage	DQO 1	Suitable for Comparison
	DQO 4	Suitable for Comparison
	DQO 5	Suitable for Comparison

4.3 Pond 101 East (East) - Reference

Pond 101 East (East) was monitored for nine years as a reference vernal pool (see Appendix F Table F-3). Table 4-19 summarizes the years that monitoring occurred and the type(s) of surveys conducted. The cumulative precipitation graph shows the precipitation for the years in which monitoring was conducted at Pond 101 East (East) (see Figure 4-13). The only water-years above-normal were 2015-2016 and 2016-2017. Other monitoring years were below-normal, drought year, or consecutive drought year.

Table 4-19. Pond 101 East (East) (Reference) Summary of Historic Surveys for Hydrology, Vegetation, and Wildlife Surveys

Survey	Water-Year								
	1991-1992	2000-2001	2006-2007	2009-2010	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
Hydrology		●	●		●	●	●	●	●
Vegetation								●	●
Wildlife	●	●		●				●	●

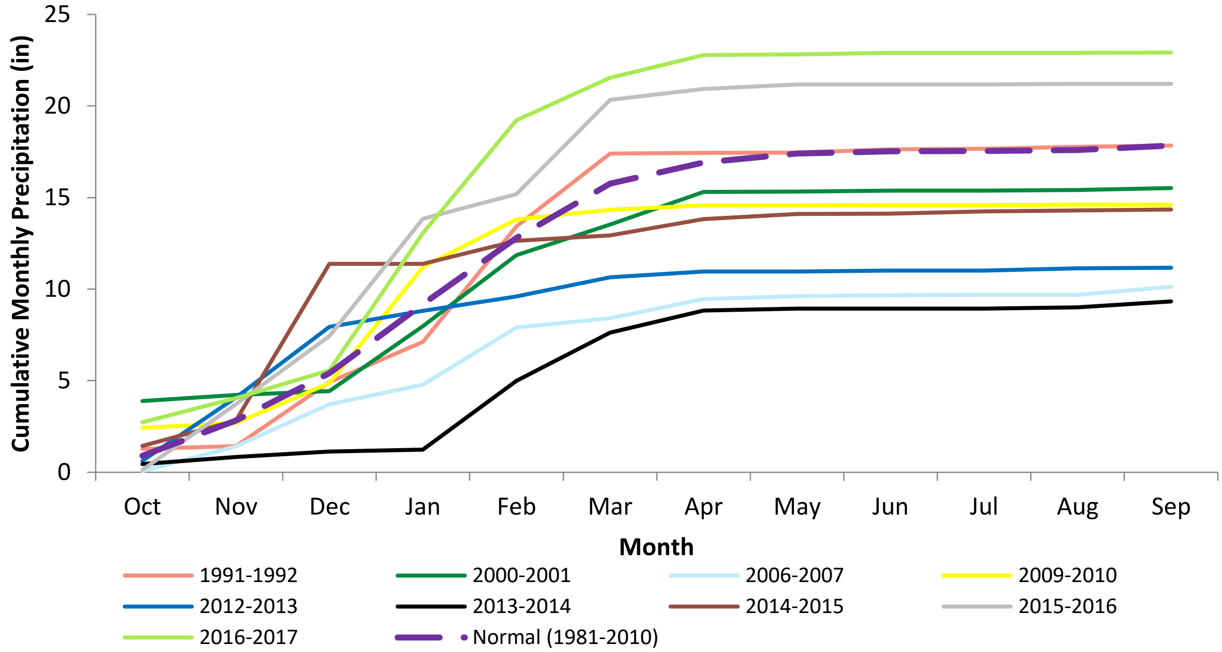

Figure 4-13. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 101 East (East) Compared to the 30-Year Normal (mean 1981-2010) (NPS, 2017; NCDC NOAA, 2017)

4.3.1 Hydrology Monitoring

In most years, Pond 101 East ponds as two distinct water bodies: Pond 101 East (East) and Pond 101 East (West). During 2017, these pools were hydrologically connected prior to May. In May, Pond 101 East dried into these two separate pools. In past reports, Pond 101 East (East) was referred to as the “east pool” and Pond 101 East (West) was referred to as the “middle pool” (Harding ESE, 2002; Shaw, 2008).

The maximum inundation for Pond 101 East (East) was 9.38 acres in 2017 with a maximum depth of ~160 cm. When maximum inundation and depth were recorded, Pond 101 East (East) was hydrologically connected to Pond 101 East (West). These depth and inundation values are larger than previously recorded values for Pond 101 East (East). Figure 4-14 illustrates the relationship of precipitation and depth at Pond 101 East (East) for 2017.

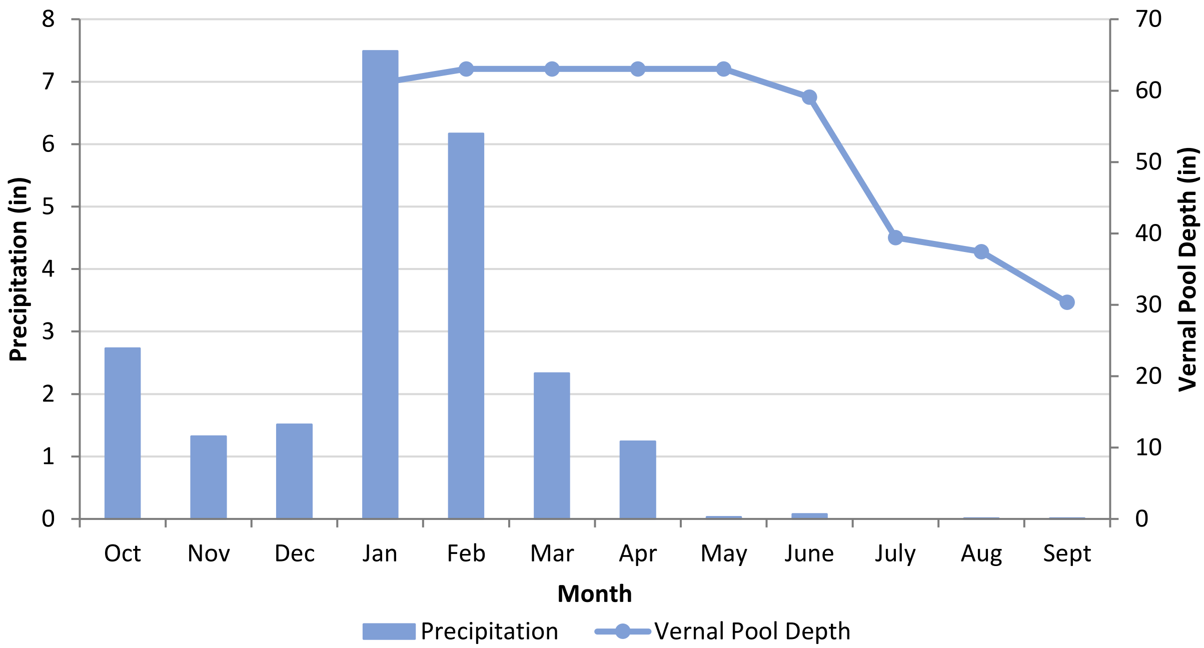

Figure 4-14. Monthly Depth and Precipitation at Pond 101 East (East) (Reference) for 2016-2017 Water-Year

Pond 101 East (East) was inundated in 2001, 2007, 2013, and 2016. The historic inundation range for 2016 was 1.23-3.24 acres, which was slightly smaller than in 2017. Although water-year 2015-2016 was above-normal, Pond 101 East (East) did not connect to 101 East (West) as in 2017. In dry years, Pond 101 East (East) does not pond or is very small and disconnected from Pond 101 East (West). Inundations were recorded one or two times in the below-normal water-years 2001, 2007, and 2013. In 2016, an above-normal water-year after consecutive drought, Pond 101 East (East) experienced a moderate inundation but was disconnected from Pond 101 East (West). The above-normal precipitation in 2017 resulted in a large inundation, and the two adjacent pools were connected between January and May (see Figure 4-16).

In below-normal precipitation years, Pond 101 East (East) is likely to range from 0-45 cm in depth with a maximum inundation of 0-1.5 acres. In normal precipitation years, Pond 101 East (East) is likely to have a maximum of approximately 50 cm and a maximum inundation of approximately 2 acres. In above-normal precipitation years, Pond 101 East (East) could have maximum depths of up to 160 cm or more and a maximum inundation of up to 6.5 acres or more but would likely be connected with 101 East (West) as observed in 2017 (see Appendix F Tables F-2 and F-3). Figure 4-15 illustrates historic vernal pool depths by month and organized by water-year. Figure 4-16 illustrates historic and current inundation areas.

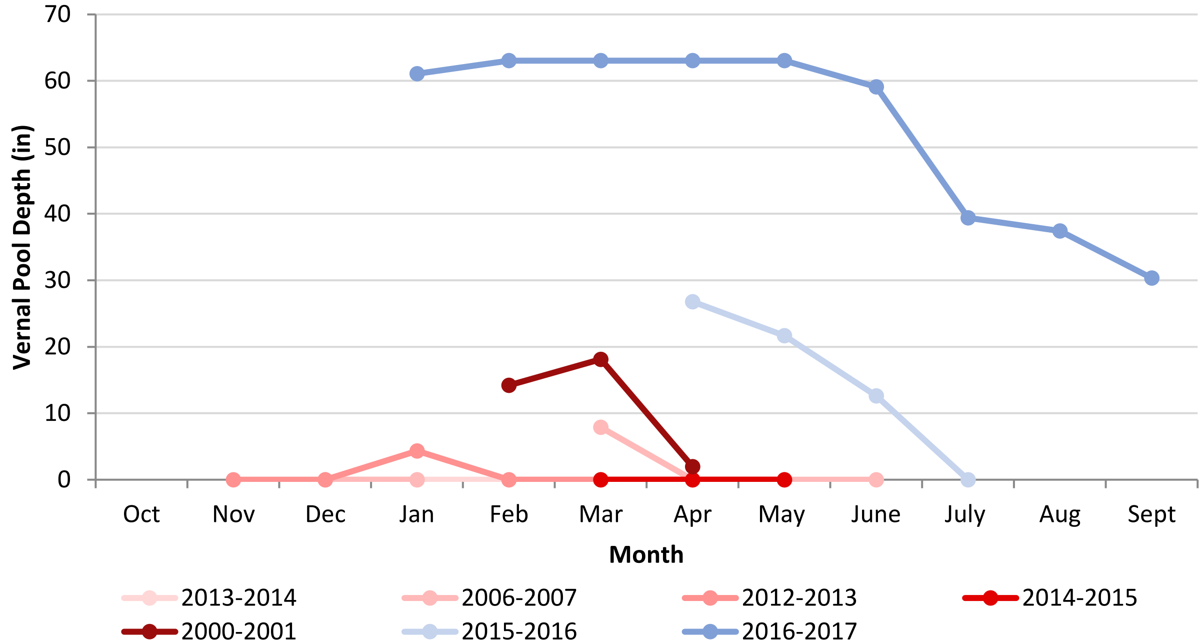

Figure 4-15. Historic Monthly Depths at Pond 101 East (East) (Reference). Water-years are color coded in relation to 30-Year Normal (mean 1981-2010). Reds are cumulative water-years below-normal, greens are cumulative water-years within 2 inches of normal, blues are cumulative water-years above-normal.

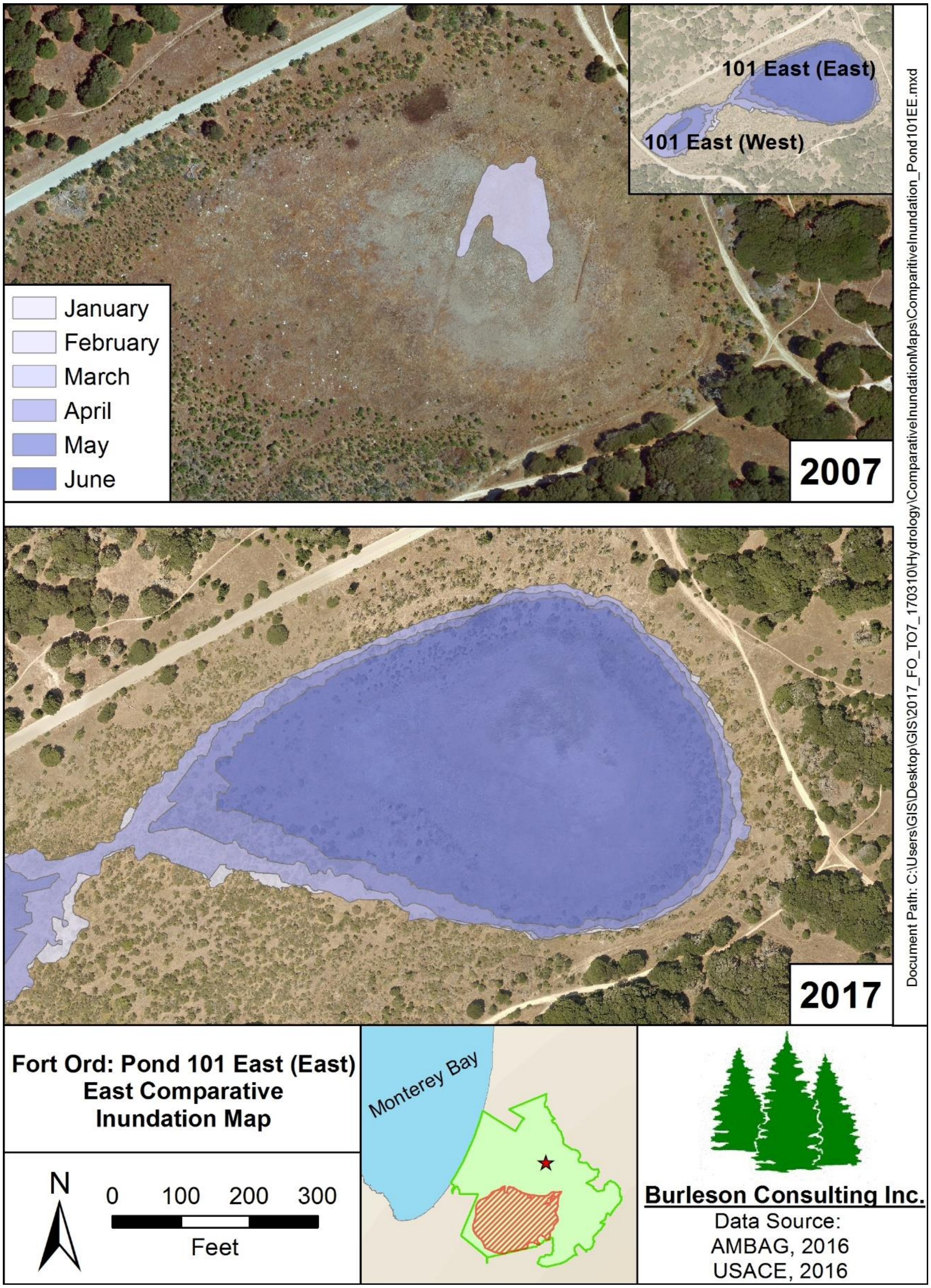

Figure 4-16. Pond 101 East (East) (Reference) Inundations for 2006-2007 (below-normal precipitation) and 2016-2017 (above-normal precipitation). This vernal pool received no remediation.

4.3.1.1 *Data Quality Objective 1*

The average depth from the first monitoring event until the last monitoring event in September was 152 cm. DQO 1 requires an average of 25 cm of depth from the first rain event through March and 10 cm for 18 consecutive days through May. Pond 101 East (East) provided suitable depth for both CTS (158 cm through March) and fairy shrimp (159 cm through May).

4.3.1.2 *Data Quality Objective 2*

Pond 101 East (East) was inundated January through September with an inundation range of 5.02-9.40 acres and a mean of 7.46 acres. The vernal pool was connected to Pond 101 East (West) for the maximum values and did not dry by the last monitoring event on September 6, 2017.

4.3.1.3 *Performance Standard: Hydrological Conditions and Inundation Area*

Pond 101 East (East) is a reference vernal pool and was not required to meet the performance standard but was used as a control for comparison to other post-remediated vernal pools.

4.3.2 Vegetation Monitoring

Vegetation data were collected at Pond 101 East (East) in 2016 and 2017 (Burleson, 2017). Data from 2016 and 2017 were collected using the same methodology and were compared stratum to stratum in Table 4-20 as well as side-by-side (see Figure 4-17).

Table 4-20. Pond 101 East (East) (Reference) Vegetative Strata Percentage Within the Verna Pool Basin Boundary

Stratum	Percentage	
	2016	2017
1	0.4%	N/A
2	48%	42%
3	44%	N/A
4	8%	N/A
5	N/A	28%
6	N/A	30%

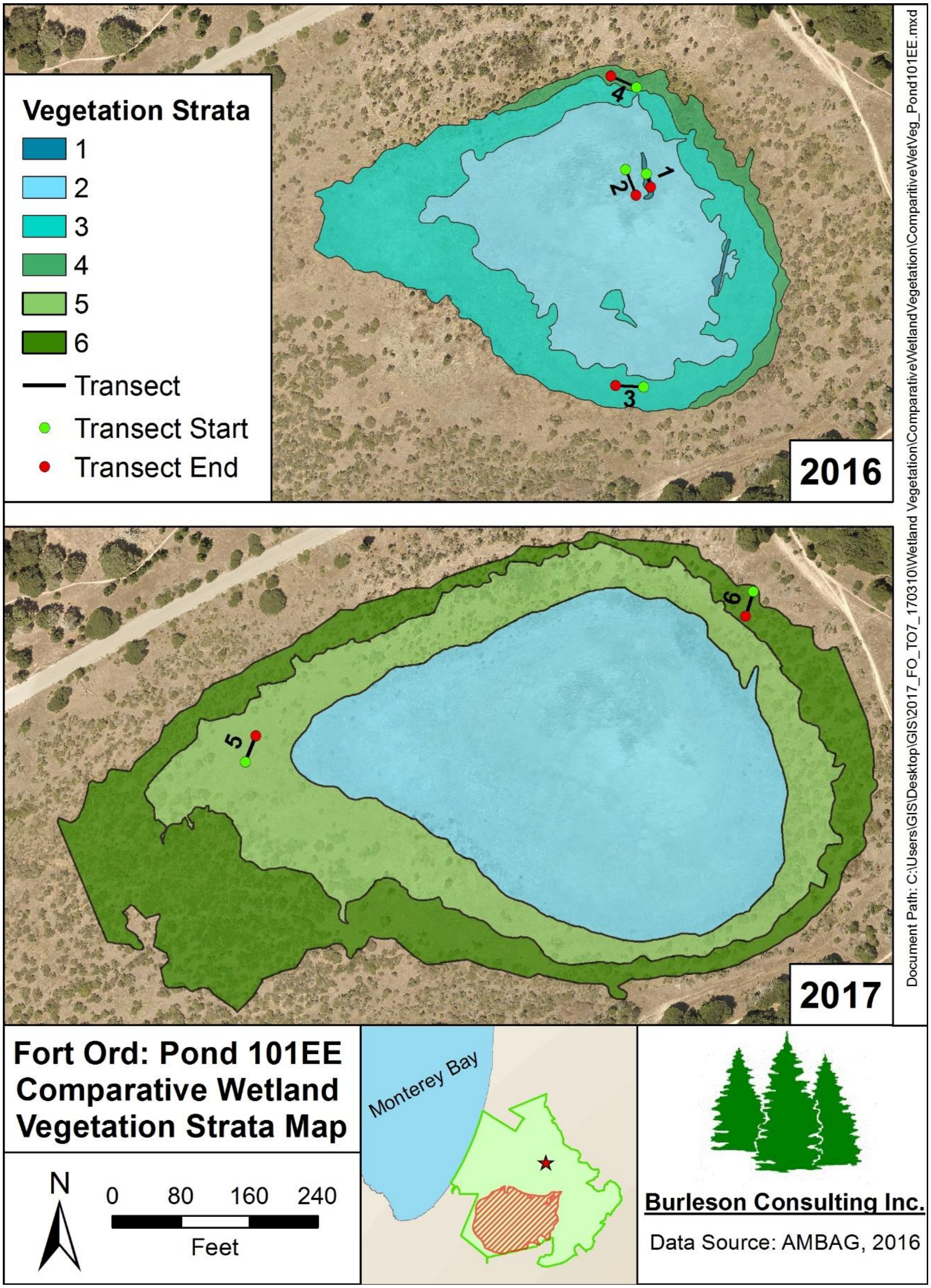

Figure 4-17. Pond 101 East (East) Vegetation Strata and Transects for 2016 and 2017

More absolute vegetative cover was observed in 2017 than in 2016 (see Table 4-21). This was likely due to precipitation which caused an expansion of vegetation strata from previous years. These outer strata were not previously mapped and influenced the overall species composition of the pool.

Table 4-21. Pond 101 East (East) (Reference) Absolute Percent Cover

Year	Vegetative Cover	Thatch/Bare Ground
2016	57.8%	41.0%
2017	81.3%	16.6%

Species richness increased between 2016 and 2017 at Pond 101 East (East). The above-normal water-year may have contributed to the increase since species diversity and richness tend to be higher in wet years than in dry years (Witham *et al.*, 1998). In 2016, 37 species were recorded within the vernal pool basin, while 18 plant species were recorded on the transects. In 2017, 59 species were recorded within the vernal pool basin, while 18 species were recorded on the transects (see Appendix B).

Species composition was variable in Pond 101 East (East) through time. A complete comparison of species composition observed during 2016 and 2017 can be found in Appendix H. Figure 4-18 shows a subset of this comparison for species observed with a 2% cover or greater. Pale spikerush (*Eleocharis macrostachya*) was the dominant species in 2016, while Baltic rush (*Juncus balticus*) was the dominant species in 2017. The shift in species composition was most likely attributed to the above-normal precipitation during the 2016-2017 water-year. Stratum 2 was inundated during 2017 surveys, and no transects were surveyed. Stratum 2 cover values were not included in the analysis at Pond 101 East (East). Variable species composition is generally common in vernal pools due to their dynamic nature.

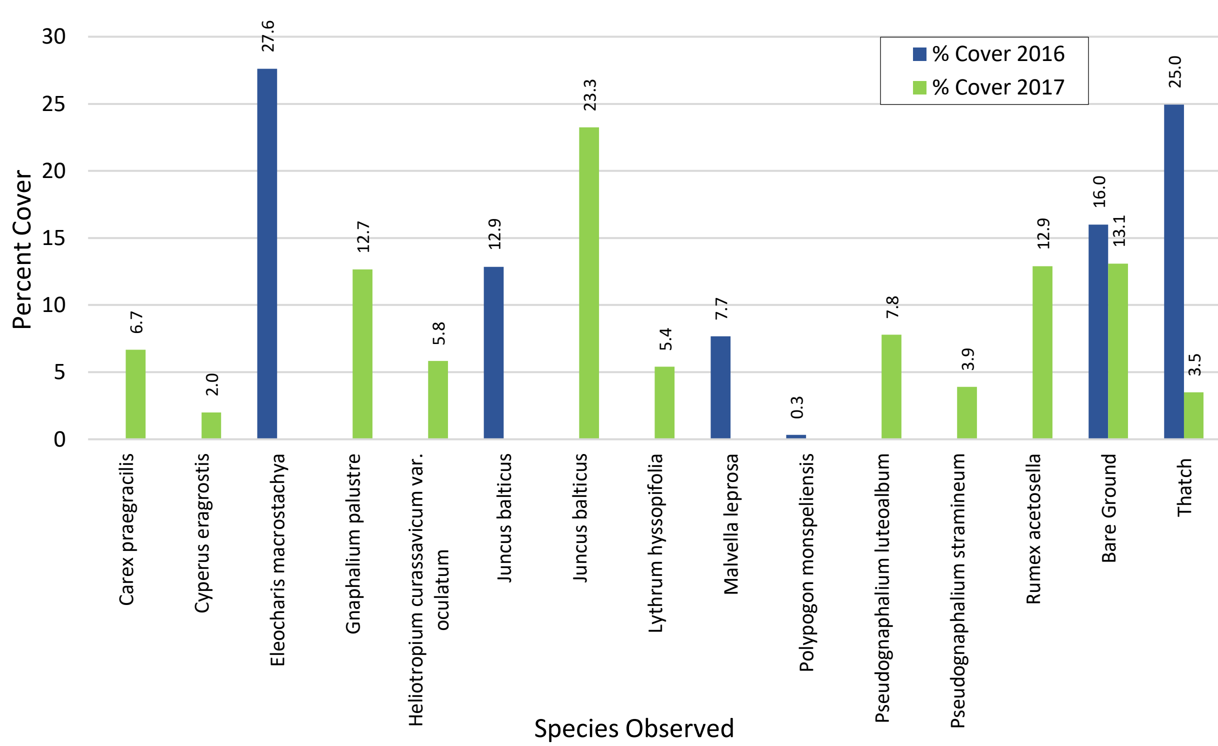

Figure 4-18. Percent Cover of Dominant Species at Pond 101 East (East) (Reference)

Native species richness in Pond 101 East (East) increased between 2016 and 2017, while non-native species richness decreased (see Table 4-22). Conversely, native species relative percent cover decreased between monitored years and non-native species cover increased (see Table 4-23). This may be due to the inclusion of newly mapped areas which were inundated in the above-normal 2017 water-year but not mapped previously.

Table 4-22. Pond 101 East (East) (Reference) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
2016	9	9	0
2017	13	5	0

Table 4-23. Pond 101 East (East) (Reference) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
2016	91.1%	8.9%	0.0%
2017	68.2%	31.8%	0.0%

Wetland species richness in Pond 101 East (East) increased between 2016 and 2017, while non-wetland species richness remained the same at three species (see Table 4-24). In 2016, 10 wetland plants and three non-wetland plants were observed along the transects. In 2017, 14 wetland plants and three non-wetland plants were observed along the transects. The increased number of wetland species is due to the precipitation levels in 2017. The relative percent covers of wetland and non-wetland species changed between surveys (see Table 4-25). The relative percent cover of obligate species decreased significantly, while facultative wetland and facultative species increased significantly. This is likely because the strata containing obligate species observed in 2016 were inundated in 2017. However, the collective totals of relative cover of wetland species have remained similar between years, at 78.2% wetland species in 2016 and 78.5% wetland species in 2017.

Table 4-24. Pond 101 East (East) Reference Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2016	3	5	2	3	0	5
2017	3	6	5	3	0	1

Table 4-25. Pond 101 East (East) Relative Percent Cover of Wetland and Non-Wetland Species

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2016	50.7%	25.6%	1.9%	15.2%	0.0%	6.5%
2017	8.3%	55.4%	15.2%	21.0%	0.0%	0.1%

4.3.2.1 Data Quality Objective 3

While there are observable changes in hydrophytic vegetation between surveys, these changes are largely associated with precipitation fluctuations. This can be expected to occur given the dynamic nature of vernal pools and the close relationship between the hydroperiod and wetland vegetation. As a reference vernal pool, Pond 101 East (East) can be used for comparison to baseline and remediated vernal pools.

4.3.2.2 Performance Standard: Plant Cover and Species Diversity

Pond 101 East (East) is a reference vernal pool and was not required to meet the performance standard but was used as a control for comparison to other post-remediated vernal pools.

4.3.3 Wildlife Monitoring

Wildlife data were collected at Pond 101 East (East) in 1992, 2001, 2010, 2016, and 2017 (Jones and Stokes, 1992; Harding ESE, 2002; Shaw, 2011; Burleson, 2017). Fairy shrimp were only detected in 2001. CTS larvae were observed in 1992, 2010, 2016, and 2017. Table 4-26 shows historic wildlife monitoring results.

Table 4-26. Pond 101 East (East) (Reference) Historic Wildlife Monitoring Results

Sampling Year	CTS Larvae Abundance (# Individuals)	Fairy Shrimp Abundance (# Individuals)
1992	Present*	0*
2001	0*	Moderate abundance*
2010	11	0*
2016	>101	0
2017	107	0

*Data do not differentiate between 101 East (East), 101 East (West), and 101 West. They are identified collectively as Pond 101.

4.3.3.1 Data Quality Objective 1

Pond 101 East (East) provided suitable depth for CTS and fairy shrimp as discussed in Section 4.3.1.1.

4.3.3.2 Data Quality Objective 4

CTS were present in 2017 at Pond 101 East (East); therefore, the water quality was adequate for CTS. Compared to other vernal pools and through time, the water quality data were within normal ranges. The pH range was 5.5 in January to 6.91 in June with a mean of 6.38. Temperature ranged from 10.0° C in January to 20.1° C in June with a mean of 15.7° C. Dissolved oxygen range was 0.00 mg/L in April to 3.68 mg/L in February with a mean of 2.11 mg/L. Turbidity range was from 1.9 FNU in January to 43.2 FNU in April with a mean of 20.13 FNU.

4.3.3.3 Data Quality Objective 5

CTS were present in 2017, which was consistent with previous monitoring. CTS were present in 1992, 2010, 2016, and 2017, but not in 2001. The lack of CTS in 2001 may have been associated with below-normal precipitation.

Fairy shrimp were not detected in 2017, which was consistent with previous monitoring. Fairy shrimp were only detected in 2001. Although fairy shrimp were not detected in 2017, it was possible monitoring event timing prevented detection. Previous fairy shrimp detections were observed in January through

March, while 2017 monitoring was conducted March through May. Wildlife monitoring events do not occur until March to avoid disturbance of any CTS eggs which may be present.

4.3.3.4 Performance Standard: Wildlife Usage

Pond 101 East (East) is a reference vernal pool and was not required to meet the performance standard but was used as a control for comparison to other post remediated vernal pools.

4.3.4 Conclusion

Pond 101 East (East) was used for comparison to remediated vernal pools (see Table 4-27).

Table 4-27. Success at Pond 101 East (East) (Reference) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Hydrological Conditions & Inundation Area	DQO 1	Suitable for Comparison
	DQO 2	Suitable for Comparison
Plant Cover & Species Diversity	DQO 3	Suitable for Comparison
Wildlife Usage	DQO 1	Suitable for Comparison
	DQO 4	Suitable for Comparison
	DQO 5	Suitable for Comparison

4.4 Pond 997 - Reference

Reference Pond 997 was surveyed for the first time in 2017. Table 4-28 summarizes the surveys that were conducted in 2017. The cumulative precipitation graph shows the precipitation at Pond 997 for the 2016-2017 water-year compared to the normal (see Figure 4-19).

Table 4-28. Pond 997 (Reference) Summary of Historic Surveys for Hydrology, Vegetation, and Wildlife Surveys

Survey	Water-Year
	2016-2017
Hydrology	●
Vegetation	●
Wildlife	●

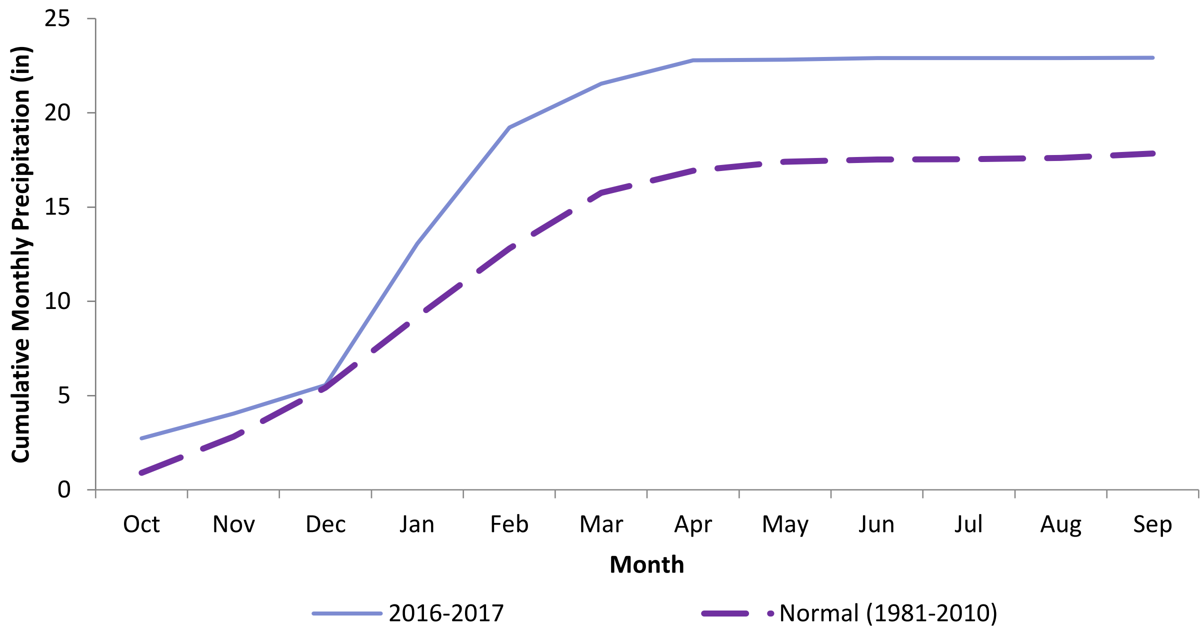

Figure 4-19. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 997 Compared to the 30-Year Normal (mean 1981-2010) (NPS, 2017; NCDC NOAA, 2017)

4.4.1 Hydrology Monitoring

Pond 997 was surveyed for the first time in 2017. The maximum inundation for Pond 997 was 0.33 acre in 2017 with a maximum depth of 15 cm. Figure 4-20 illustrates the relationship of precipitation and depth at Pond 997 for 2017.

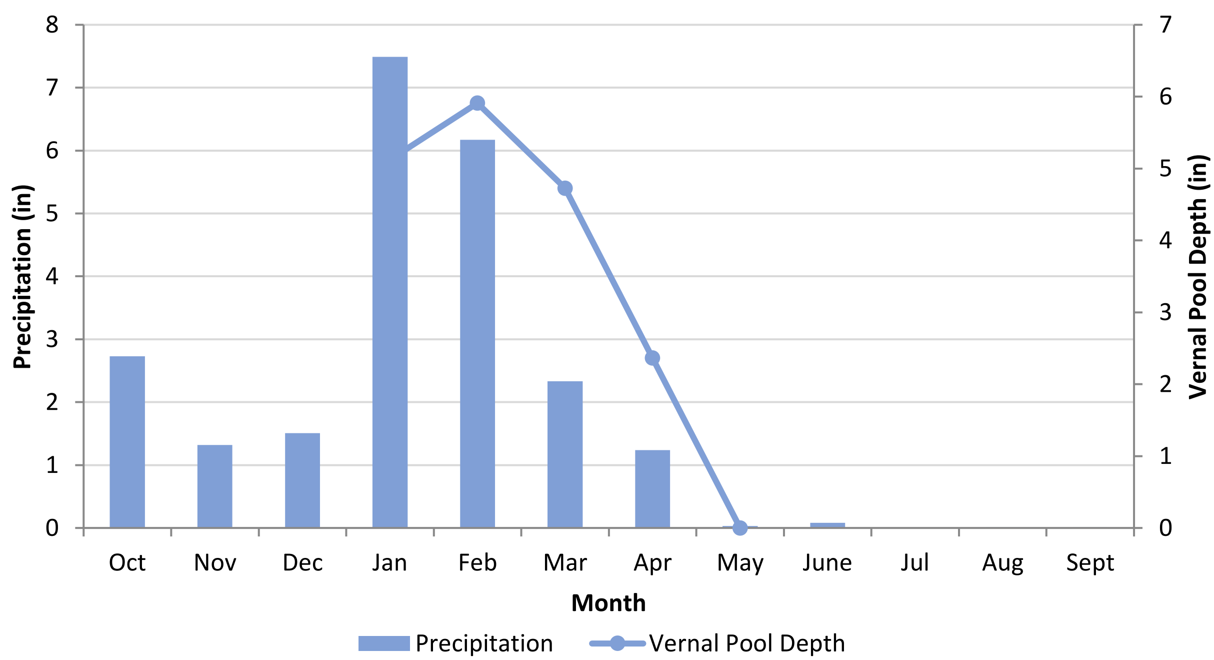

Figure 4-20. Monthly Depth and Precipitation at Pond 997 (Reference) for 2016-2017 Water-Year

4.4.1.1 Data Quality Objective 1

The average depth from the first survey until the vernal pool dried was 11.5 cm. DQO 1 requires an average of 25 cm of depth from the first rain event through March and 10 cm for 18 consecutive days through May. Pond 997 did not provide suitable depth for CTS (13 cm through March) or fairy shrimp (9 cm through May).

4.4.1.2 Data Quality Objective 2

Pond 997 was inundated January through April with an inundation range of 0.02-0.33 acre and a mean of 0.14 acre. Pond 997 is shallower and smaller than other reference pools. Pond 997 may only hold water in above-normal water-years. Pond 997 inundation should only be used as a reference for small vernal pools of similar size.

4.4.1.3 Performance Standard: Hydrological Conditions and Inundation Area

Pond 997 is a reference vernal pool and was not required to meet the performance standard but was used as a control for comparison to other post-remediated vernal pools.

4.4.2 Vegetation Monitoring

Baseline vegetation data were collected at Pond 997 in 2017. Pond 997 will be used for comparison against remediated vernal pools to identify similar characteristics between disturbed and undisturbed vernal pools. Pond 997 also supports a Contra Costa goldfields population. The population was mapped and a visual estimate of percent cover recorded (see Figure 3-9 in Section 3.4.2.1).

The absolute percent vegetative cover observed during the baseline survey in 2017 was 57.3% vegetation and 43.7% thatch (see Table 4-29).

Table 4-29. Pond 997 (Reference) Absolute Percent Cover

Year	Vegetative Cover	Thatch/Bare Ground
2017	57.3%	43.7%

Pond 997 species richness was 65 for the entire vernal pool basin in 2017 and 27 for transects (see Appendix B). A complete list of species observed at Pond 997 in 2017 can be found in Appendix H. Figure 4-21 shows a subset of the observed species with a 2% cover or greater. Coyote thistle (*Eryngium armatum*), a native, facultative species, was the dominant species in 2017 at Pond 997.

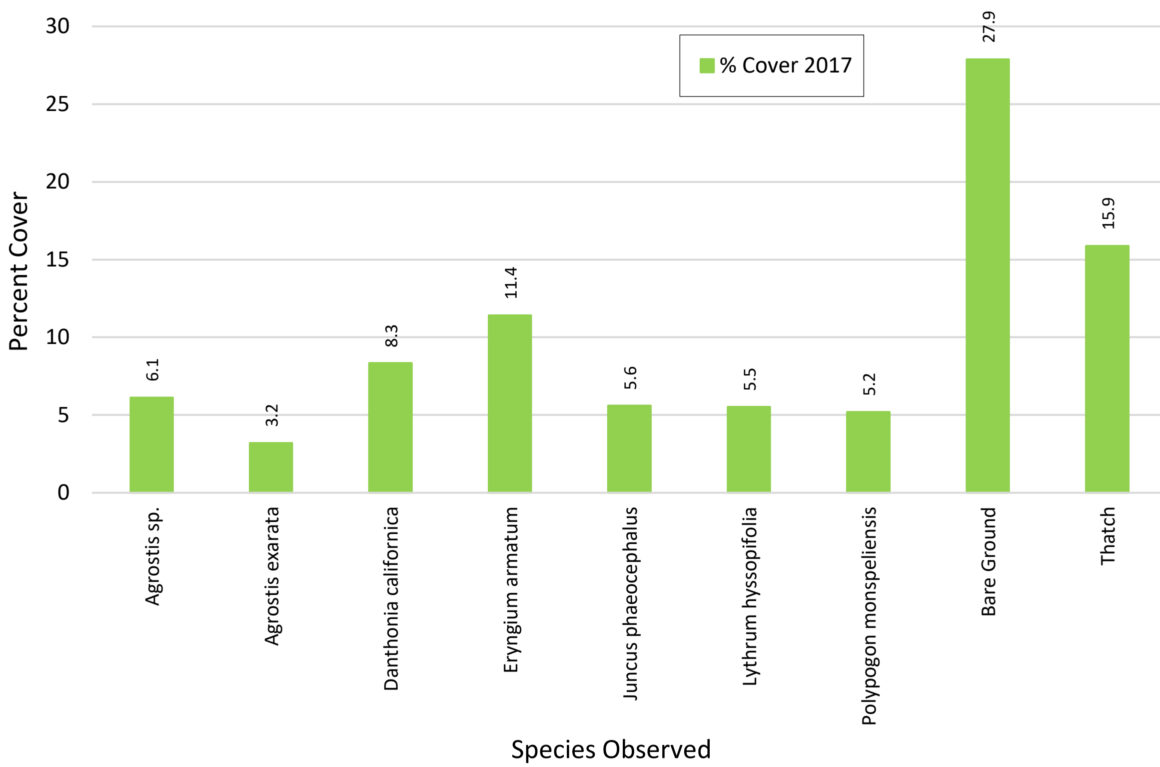

Figure 4-21. Percent Cover of Dominant Species at Pond 997 (Reference)

The native species richness in Pond 997 was greater than the non-native species richness (see Table 4-30). Similarly, native relative percent cover was greater than non-native percent cover (see Table 4-31).

Table 4-30. Pond 997 (Reference) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
2017	16	11	0

Table 4-31. Pond 997 (Reference) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
2017	77.0%	23.0%	0.0%

Wetland species richness was greater than non-wetland species richness (see Table 4-32

Table 4-32. Pond 997 (Reference) Wetland and Non-Wetland Species Richness

). In 2017, 16 wetland plants and four non-wetland plants were observed on the transects. Additionally, the relative percent cover of wetland species was greater than the relative percent cover of non-wetland species (see Table 4-33).

Table 4-32. Pond 997 (Reference) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2017	5	10	1	4	0	7

Table 4-33. Pond 997 (Reference) Relative Percent Cover of Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2017	19.3%	50.7%	2.0%	15.0%	0.0%	13.0%

4.4.2.1 Contra Costa Goldfields

Contra Costa goldfield populations have been noted at Pond 997 in previous years; however, data were only collected in 2017. The population occurred in a topographical depression that held water in 2017 from January through April (see Figure 3-9 in Section 3.4.2.1).

4.4.2.2 Data Quality Objective 3

Pond 997 supported many native and wetland species in 2017. As a reference vernal pool, Pond 997 can be used for comparison to baseline and remediated vernal pools.

4.4.2.3 Performance Standard: Plant Cover and Species Diversity

Pond 997 is a reference vernal pool and was not required to meet the performance standard but was used as a control for comparison to other post-remediated vernal pools.

4.4.3 Wildlife Monitoring

Baseline wildlife data were collected at Pond 997 in 2017. CTS and fairy shrimp had a negative finding.

4.4.3.1 Data Quality Objective 1

Pond 997 did not provide suitable depth for CTS or fairy shrimp as discussed in Section 4.4.1.1.

4.4.3.2 Data Quality Objective 4

CTS were not present in 2017 at Pond 997; however, the water quality appears adequate for the presence of CTS. When compared to other vernal pools, the water quality data was in the normal range. The pH ranged from 6.4 in January to 7.07 in April with a mean of 6.67. Temperature ranged from 10.2° C in February to 25.4° C in April with a mean of 16.4° C. Dissolved oxygen ranged from 7.14 mg/L in April to 12.2 mg/L in February with a mean of 8.6 mg/L. Turbidity ranged from 14.1 FNU in February to 72.4 FNU in March with a mean of 37.4 FNU.

4.4.3.3 Data Quality Objective 5

Wildlife surveys indicate that CTS and fairy shrimp were not present in 2017. Future CTS and fairy shrimp detections at 997 will be compared to a baseline of no detections for either species.

4.4.3.4 Performance Standard: Wildlife Usage

Pond 997 is a reference vernal pool and was not required to meet the performance standard but was used as a control for comparison to other post-remediated vernal pools.

4.4.4 Conclusion

Pond 997 was used for comparison to remediated vernal pools (see Table 4-34).

Table 4-34. Success at Pond 997 (Reference) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Hydrological Conditions & Inundation Area	DQO 1	Suitable for Comparison
	DQO 2	Suitable for Comparison
Plant Cover & Species Diversity	DQO 3	Suitable for Comparison
Wildlife Usage	DQO 1	Suitable for Comparison
	DQO 4	Suitable for Comparison
	DQO 5	Suitable for Comparison

4.5 Pond 40 South - Baseline

Pond 40 South was monitored for four years as a baseline vernal pool. All surveys are pre-remediation and are considered baseline. Table 4-35 summarizes the monitoring years and type(s) of surveys. The cumulative precipitation graph shows precipitation for the years in which monitoring was conducted (see Figure 4-22). The water-years above-normal were 1997-1998, 2015-2016, and 2016-2017. The 2014-2015 water-year was a consecutive drought year with precipitation below normal.

Table 4-35. Pond 40 South (Baseline) Summary of Historic Surveys for Hydrology, Vegetation, and Wildlife Surveys

Survey	Water-Year			
	1997-1998	2014-2015	2015-2016	2016-2017
Hydrology	●	●	●	●
Vegetation	●			
Wildlife	●			

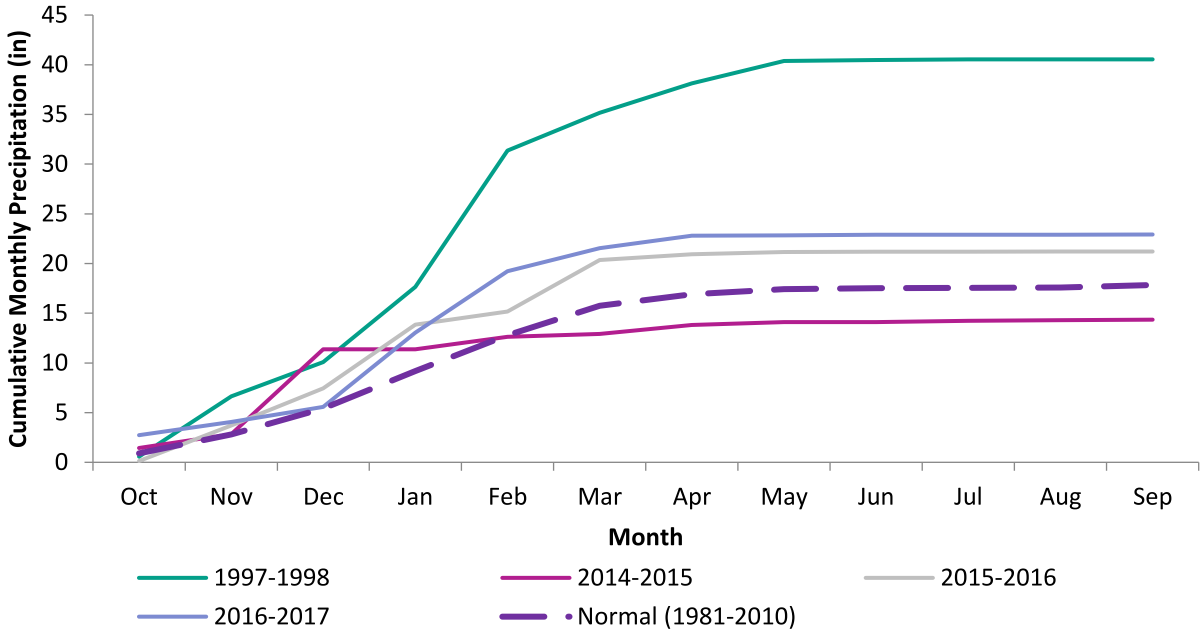

Figure 4-22. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 40 South Compared to the 30-Year Normal (mean 1981-2010) (NPS, 2017; NCDC NOAA, 2017)

4.5.1 Hydrology Monitoring

The maximum inundation for Pond 40 South was 0.958 acre in 2017 with a maximum depth of approximately 34 cm. These depth and inundation values are larger than previously recorded values for Pond 40 South. Pond 40 South was connected via surface hydrology to Pond 39 which did not occur in previously monitored above-normal water-years. Figure 4-23 illustrates the relationship of precipitation and depth at Pond 40 South for 2017.

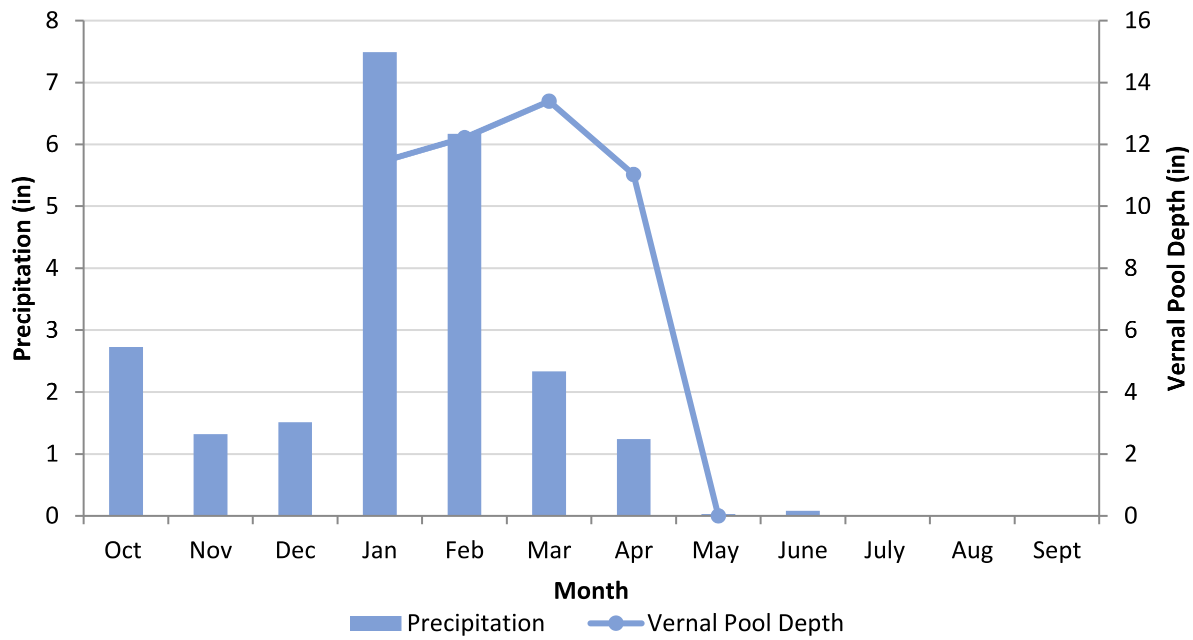

Figure 4-23. Monthly Depth and Precipitation at Pond 40 South (Baseline) for 2016-2017 Water-Year

The inundation in baseline year 1998 was 0.12-0.21 acre and in 2016 was 0.081 acre (Harding Lawson and Associates [HLA], 1998; Burleson et al., 2016). When Pond 40 South is connected to Pond 39, the inundation is generally larger than when the ponds are separated. This is evidenced by the differences between 2017 inundations and previous inundations. In 2017, when Pond 40 South connected to Pond 39, the inundation ranged from 0.12-0.96 acres, while in 2016 the inundation was much smaller (0.08 acre) because Pond 40 South was separate. In contrast, in 2015, a consecutive drought year with below-normal precipitation, Pond 40 South was dry the entire monitoring season. In an above-normal water-year, Pond 40 South will likely be inundated and may connect to Pond 39. In drought years, it is unlikely that Pond 40 South will fill. This vernal pool is small compared to the other vernal pools monitored in 2017.

In below-normal precipitation years, Pond 40 South is likely to range from 0-20 cm in depth with a maximum inundation of 0-0.1 acre. In normal precipitation years, Pond 40 South is likely to have a maximum depth of approximately 25 cm and a maximum inundation of approximately 0.5 acre. In above-normal precipitation years, Pond 40 South could have maximum depths of up to 35 cm and a maximum inundation of 1 acre but would likely be connected with Pond 39 as observed in 2017 (see Appendix F Table F-5). Figure 4-24 illustrates historic vernal pool depths by month and organized by water-year. Figure 4-25 illustrates historic and current inundation areas.

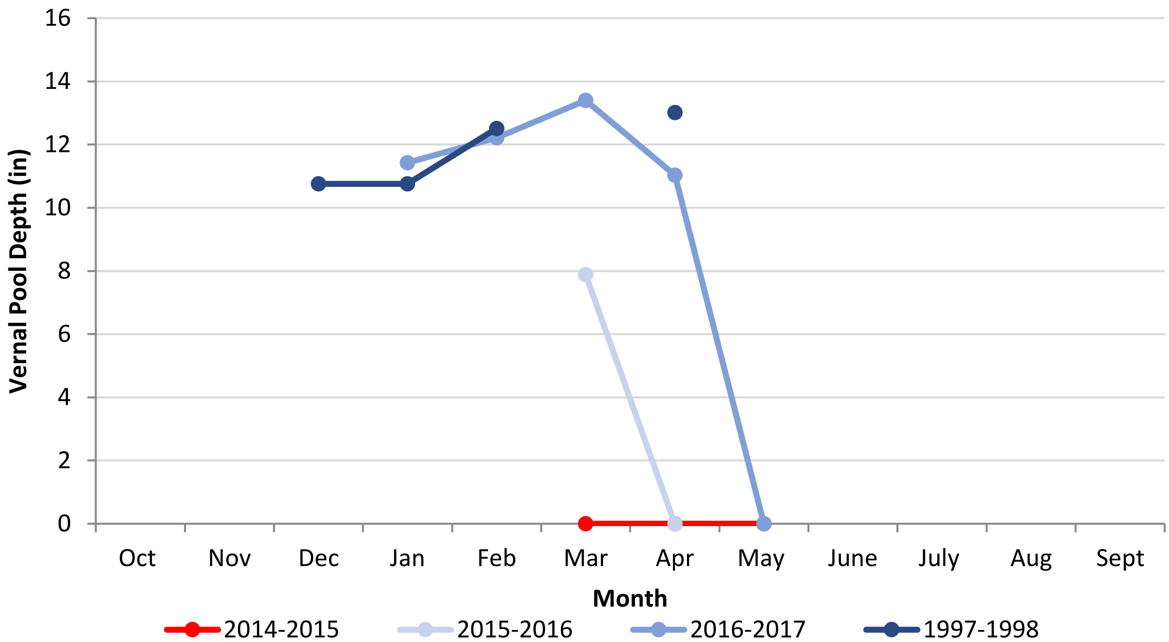

Figure 4-24. Historic Monthly Depths at Pond 40 South (Baseline). Water-years are color coded in relation to 30-Year Normal (mean 1981-2010). Reds are cumulative water-years below-normal, greens are cumulative water-years within 2 inches of normal, blues are cumulative water-years above-normal.

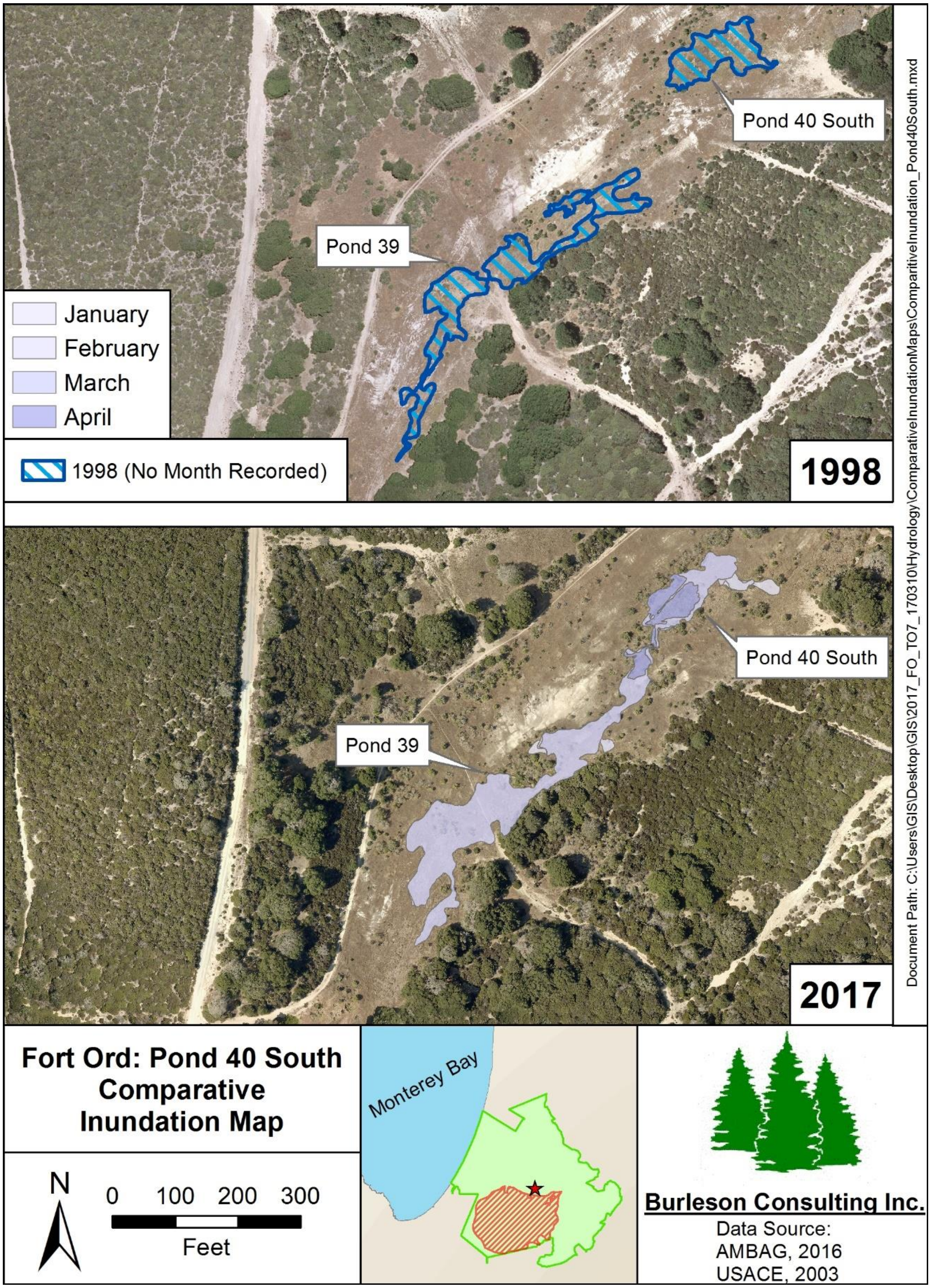

Figure 4-25. Pond 40 South (Baseline) Inundations for 1997-1998 (above-normal precipitation) and 2016-2017 (above-normal precipitation). This vernal pool received no remediation but has been monitored for baseline in 1998, 2015, 2016 and 2017.

4.5.1.1 Data Quality Objective 1

The average depth from the first monitoring event until the vernal pool dried in May 2017 was 30.5 cm. Pond 40 South met DQO 1, which requires an average of 25 cm of depth from the first rain event through March and 10 cm for 18 consecutive days through May. Pond 40 South provided suitable depth for CTS (31 cm through March) and fairy shrimp (24 cm through May). Pond 40 South also met the DQO in 1997-1998. Although Pond 40 South is similar in size to reference vernal pool Pond 997, Pond 40 South met the DQO 1 while Pond 997 did not.

4.5.1.2 Data Quality Objective 2

Pond 40 South was inundated January through April with an inundation range of 0.12-0.96 acre and a mean of 0.40 acre, and was hydrologically connected to Pond 39 for some of this time. Pond 40 South is similar to Pond 997 (reference) because both ponds held water through April and had inundation less than 1 acre. However, Pond 40 South was slightly larger, for both the inundation range and mean, than Pond 997 in 2017 and may fill in years when Pond 997 remains dry.

4.5.1.3 Performance Standard: Hydrological Conditions and Inundation Area

Pond 40 South is a baseline vernal pool and was not required to meet the performance standard. Pond 40 South will be monitored after remediation and compared to the baseline conditions.

4.5.2 Wildlife Monitoring

Wildlife data were collected at Pond 40 South in 1998 (HLA, 1998). Neither CTS nor fairy shrimp were detected at Pond 40 South in 1998. Pond 40 South was not monitored for CTS or fairy shrimp in 2017. However, DQO 1 and DQO 4 will be evaluated so that the results can be used for comparison to future years. DQO 5 is not applicable.

4.5.2.1 Data Quality Objective 1

Pond 40 South provided sufficient depth for suitable habitat for CTS and fairy shrimp as discussed in Section 4.5.1.1.

4.5.2.2 Data Quality Objective 4

Water quality conditions were adequate for the presence of CTS. In comparison to other vernal pools, the water quality data were within normal ranges. The pH ranged from 6.36 in January to 6.79 in February with a mean of 6.55. Temperature ranged from 6.61° C in February to 16.58° C in April with a mean of 11.74° C. Dissolved oxygen ranged from 1.83 mg/L in January to 11.62 mg/L in February with a mean of 5.79 mg/L. Turbidity ranged from 37.6 FNU in April to 596.0 FNU in March with a mean of 206.2 FNU.

4.5.2.3 Performance Standard: Wildlife Usage

Pond 40 South is a baseline vernal pool and was not required to meet the performance standard. CTS were not observed at Pond 40 South in 1998, the first year that the vernal pool was surveyed. As a baseline vernal pool, Pond 40 South will be monitored after remediation occurs for comparison to baseline.

4.5.3 Conclusion

Pond 40 South was not compared to the DQOs since it was in baseline conditions in 2017. However, it is suitable for comparison against future data for DQO 1, DQO 2, and DQO 4 (see Table 4-36).

Table 4-36. Success at Pond 40 South (Baseline) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Hydrological Conditions & Inundation Area	DQO 1	Suitable for Baseline
	DQO 2	Suitable for Baseline
Plant Cover & Species Diversity	DQO 3	N/A*
Wildlife Usage	DQO 1	Suitable for Baseline
	DQO 4	Suitable for Baseline
	DQO 5	N/A*

*Not applicable, only hydrology surveys were conducted. Vegetation surveys from 2016 will be used in the future to measure DQO 3 success.

4.6 Pond 42 - Baseline

Pond 42 was first monitored as a baseline vernal pool in 1998. Following MEC remediation activities, Pond 42 was surveyed annually from 2000 to 2003. Additional baseline surveys occurred in 2015. All surveys are pre-remediation and are considered baseline. Table 4-37 summarizes the monitoring years and type(s) of surveys conducted in each year. The cumulative precipitation graph shows the precipitation for Pond 42 monitoring years (see Figure 4-26). The above-normal water-years were 1997-1998 and 2016-2017. Other monitoring years were below-normal water-year, drought year, or consecutive drought year.

Table 4-37. Pond 42 (Baseline) Summary of Historic Surveys for Hydrology, Vegetation, and Wildlife Surveys

Survey	Water-Year						
	1997-1998	1999-2000	2000-2001	2001-2002	2002-2003	2014-2015	2016-2017
Hydrology	●	●	●	●	●	●	●
Vegetation	●		●	●	●		●
Wildlife	●	●	●	●	●		

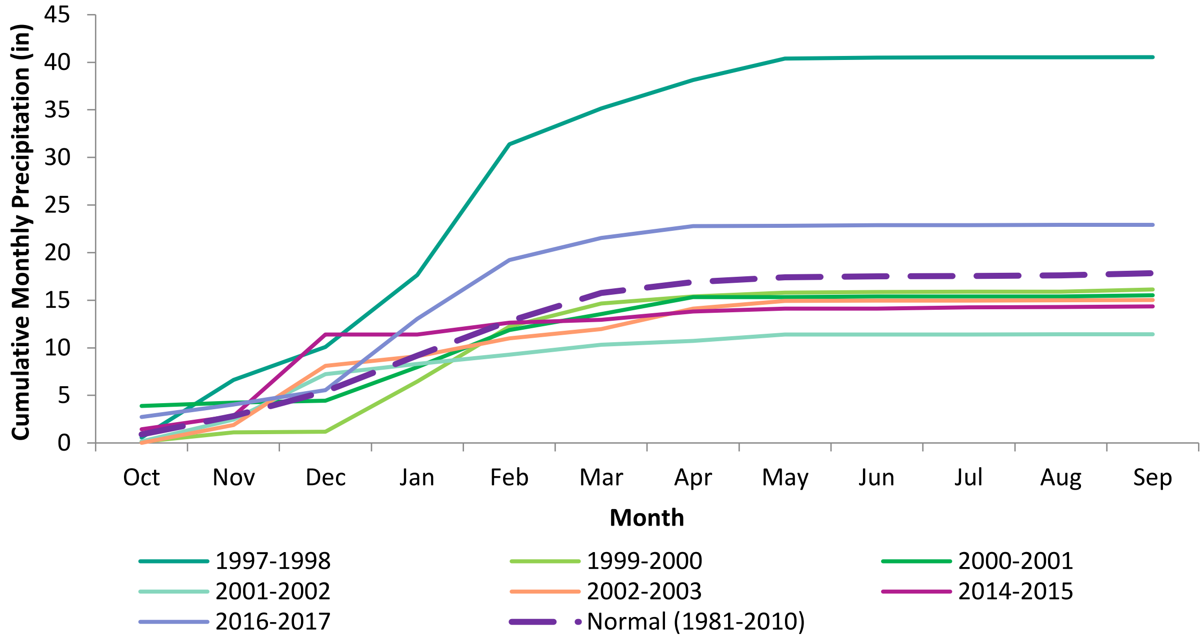

Figure 4-26. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 42 Compared to the 30-Year Normal (mean 1981-2010) (NPS, 2017; NCDC NOAA, 2017)

4.6.1 Hydrology Monitoring

The Pond 42 maximum inundation was 0.81 acre in 2017, with a maximum depth of approximately 76 cm. These depth and inundation values fall within the range previously recorded for Pond 42. Figure 4-27 illustrates the relationship of precipitation and depth at Pond 42 for 2017.

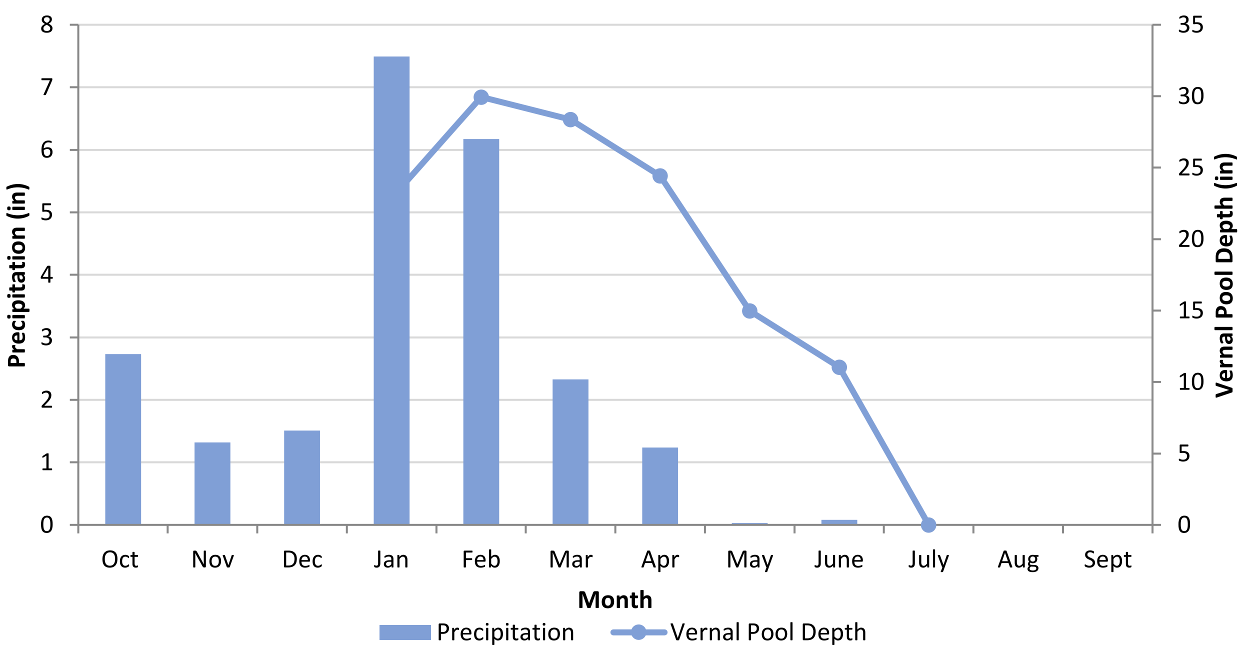

Figure 4-27. Monthly Depth and Precipitation at Pond 42 (Baseline) for 2016-2017 Water-Year

Pond 42 was also inundated in 1998, 2000, 2001, 2002, and 2003 (see Figure 4-28). The historic inundation ranged from 0.46-0.96 acre, 0.006-0.82 acre, 0.11-0.34 acre, 0.04-0.07 acre, and 0.050.11-0.11 acre in 1998, 2000, 2001, 2002, and 2003 respectively. The maxima from these years went from 0.07-0.96. The 2017 maximum was within this range.

In below-normal precipitation years, Pond 42 is likely to range from 0-30 cm in depth with a maximum inundation of 0-0.8 acre. In normal precipitation years, Pond 42 is likely to have a maximum of approximately 35 cm and a maximum inundation of approximately 0.8 acre. In above-normal precipitation years, Pond 42 could have maximum depths of 76 cm or more and a maximum inundation of up to 1.0 acre (see Appendix F Table F-6). Figure 4-28 illustrates historic vernal pool depths by month and organized by water-year. Figure 4-29 illustrates historic and current inundation areas.

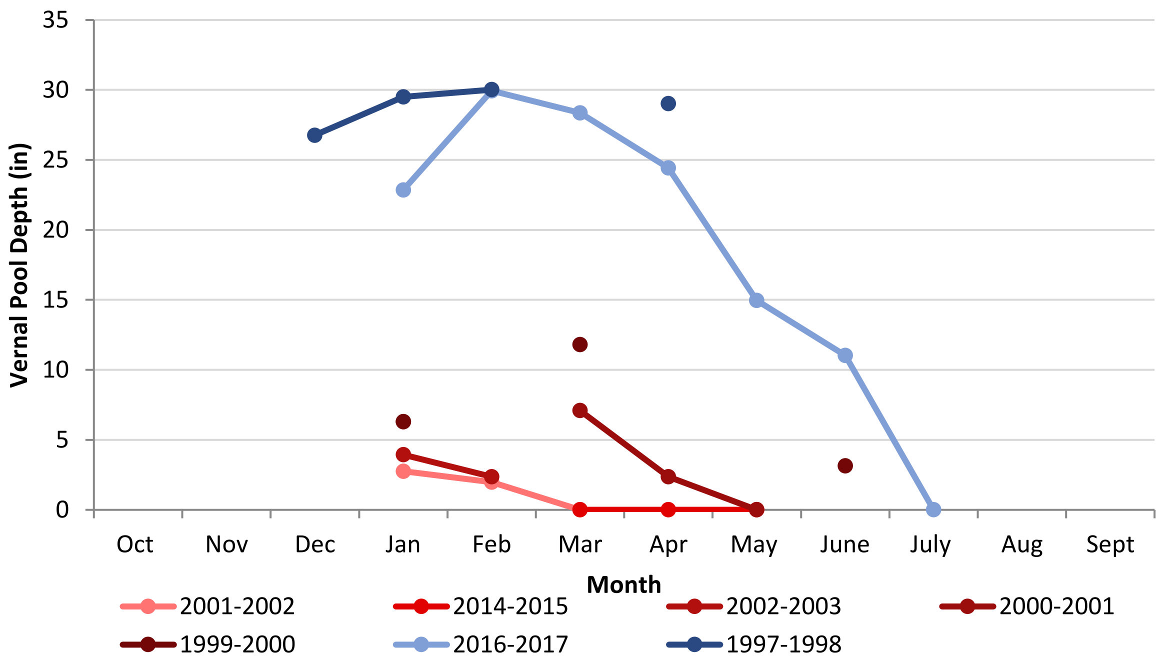

Figure 4-28. Historic Monthly Depths at Pond 42 (Baseline). Water-years are color coded in relation to 30-Year Normal (mean 1981-2010). Reds are cumulative water-years below-normal, greens are cumulative water-years within 2 inches of normal, blues are cumulative water-years above-normal.

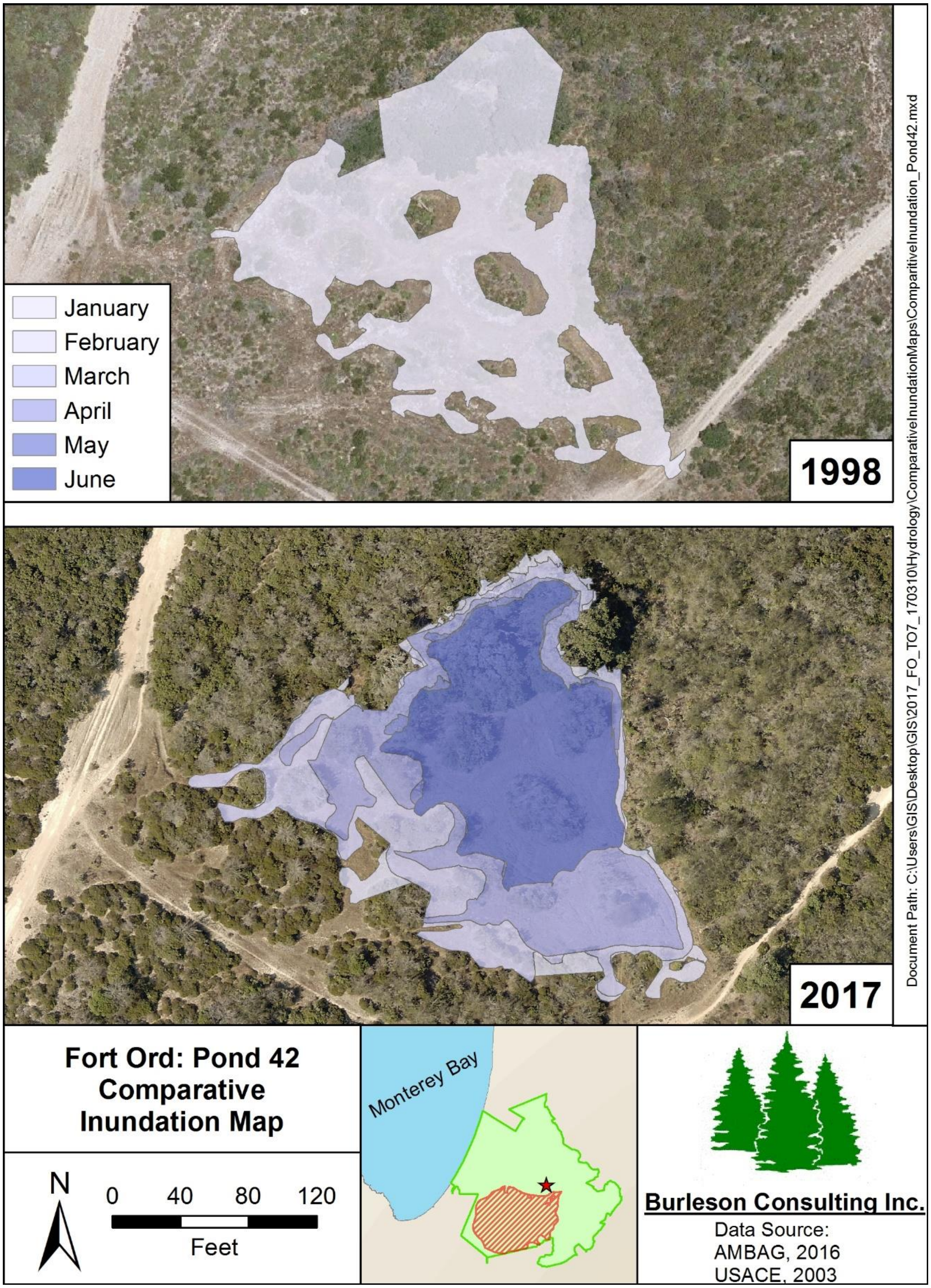

Figure 4-29. Pond 42 (Baseline) Inundations for 1997-1998 (above-normal precipitation) and 2016-2017 (above-normal precipitation). This vernal pool received no remediation, but was monitored for baseline in 1998-2003, 2015, and 2017.

4.6.1.1 Data Quality Objective 1

The average depth from the first monitoring until the vernal pool dried was 61.2 cm. Pond 42 met DQO 1, which requires an average of 25 cm of depth from the first rain event through March and 10 cm for 18 consecutive days through May. Pond 42 provided sufficient depth for suitable habitat for CTS (69 cm through March) and fairy shrimp (61 cm through May). In previous years, when data were collected from the first rain event through May, DQO 1 was met for CTS in 1998 and 2000 but was not met for CTS in 2001, 2002, or 2003. It was likely met for fairy shrimp in 1998, 2000, and 2001, but was not met in 2002 or 2003. Pond 42 baseline results indicate that above-normal water-years result in suitable habitat while below-normal water-years do not.

4.6.1.2 Data Quality Objective 2

Pond 42 was inundated January through June of 2017 with an inundation range of 0.30-0.81 acre and a mean of 0.55 acre. Pond 42 is a small vernal pool that likely fills in a normal or slightly below-normal water-year. It may remain dry during drought years. The most appropriate reference pond for comparison to Pond 42 is Pond 101 East (West).

4.6.1.3 Performance Standard: Hydrological Conditions and Inundation Area

Pond 42 is a baseline vernal pool and was not required to meet the performance standard. As a baseline vernal pool, Pond 42 will be monitored after remediation occurs and will be compared against its baseline in future years.

4.6.2 Vegetation Monitoring

Vegetation data were collected at Pond 42 in 1998, 2000, 2001, 2002, 2003, and 2017 (HLA, 1998; HLA, 2001; Harding ESE, 2002; MACTEC, 2003; MACTEC, 2004). In 1998, 2000, 2001, 2002, and 2003 data were collected along transects in lengths varying from 50 to 241 feet. In 2000, 0.25 m^2 quadrats were placed at intervals ranging from 10 to 20 feet, while in 1998, 2001, 2002, and 2003, quadrats were placed at 10-foot intervals. Quadrats were placed at the given intervals, alternating from right to left along the transect. In 1998, 2000, 2001, 2002, and 2003, transects of varying lengths were located in areas of representative transitional and emergent habitats. Data for all strata in each respective year were combined for comparison to 2017 due to differing methodologies. All previous monitoring data from Pond 42 represent baseline conditions.

The absolute vegetative cover observed in 2017 was lower than in previous surveys (see Table 4-38). This was likely due to different survey methods. Pond 42 absolute vegetative cover was within the range of the reference vernal pool vegetative covers (see Table 4-39).

Table 4-38. Pond 42 (Baseline) Absolute Percent Cover

Year	Vegetative Cover	Thatch/Bare Ground
1998	69.6%	33.1%
2000	101.5%	10.3%
2001	77.5%	24.5%
2002	83.5%	21.2%
2003	85.5%	16.1%
2017	61.9%	38.7%

Table 4-39. Pond 42 (Baseline) and Reference Vernal Pool Absolute Percent Cover in 2017

Vernal Pool	Vegetative Cover	Thatch/Bare Ground
5	60.5%	40.4%
101 East (West)	69.0%	30.5%
101 East (East)	83.7%	16.6%
997	57.3%	43.7%
42	**61.9%**	**38.7%**

Pond 42 species richness decreased between previous monitoring years and 2017. However, this decrease can be attributed to the differing data collection methodologies. Those differences are: longer transects in previous surveys compared to 2017 and delineated vegetative zones instead of strata. These factors may have increased species richness and cover. Twenty plant species were recorded during 1998 transects. Thirty-one plant species were recorded during 2000 transects. Transects in 2001 contained 28 plant species, while 2002 transects contained 24 plant species. Thirty-four plant species were recorded in 2003. In 2017, 14 species were recorded on transects and 78 in the entire vernal pool basin. When compared to reference vernal pools, Pond 42 had fewer species present on the transects than any of the other reference ponds; however, it had more species present within the entire vernal pool basin (see Appendix B).

Species composition was different in 2017 than in previous years. A complete comparison of species composition observed during the surveys at Pond 42 in 1998, 2000, 2001, 2002, 2003, and 2017 can be found in Appendix H. Figure 4-30 shows a subset of this comparison for species observed with a 2% cover or greater. Pale spikerush (*Eleocharis macrostachya*) and brown-headed rush (*Juncus phaeocephalus*) were the two most dominant species in 2017 at Pond 42. Silvery hair-grass (*Aira caryophyllea*), needle spikerush (*Eleocharis acicularis*), coyote thistle (*Eryngium armatum*), common toad rush (*Juncus bufonius* var. *bufonius*), or smooth cat's-ear (*Hypochaeris glabra*) were dominant in previous years but did not contribute greater than 2% cover in 2017. While the species composition varied through time, this may be an artifact of different collection methodologies. In 1998, 2000, 2001, 2002, and 2003, transects of varying lengths were located in areas of representative transitional and emergent habitats, while in 2017, transects were located in the most homogenous portions of the identified strata. For this reason, it is likely that different species were recorded during the surveys in 1998, 2000, 2001, 2002, and 2003 than in 2017. In future years, the wetland vegetation comparison should be made with 2017 baseline data. The shift in species composition from year to year observed at Pond 42 is also observed at all the reference vernal pools. Variable species composition through time can be expected in dynamic ecosystems such as vernal pools.

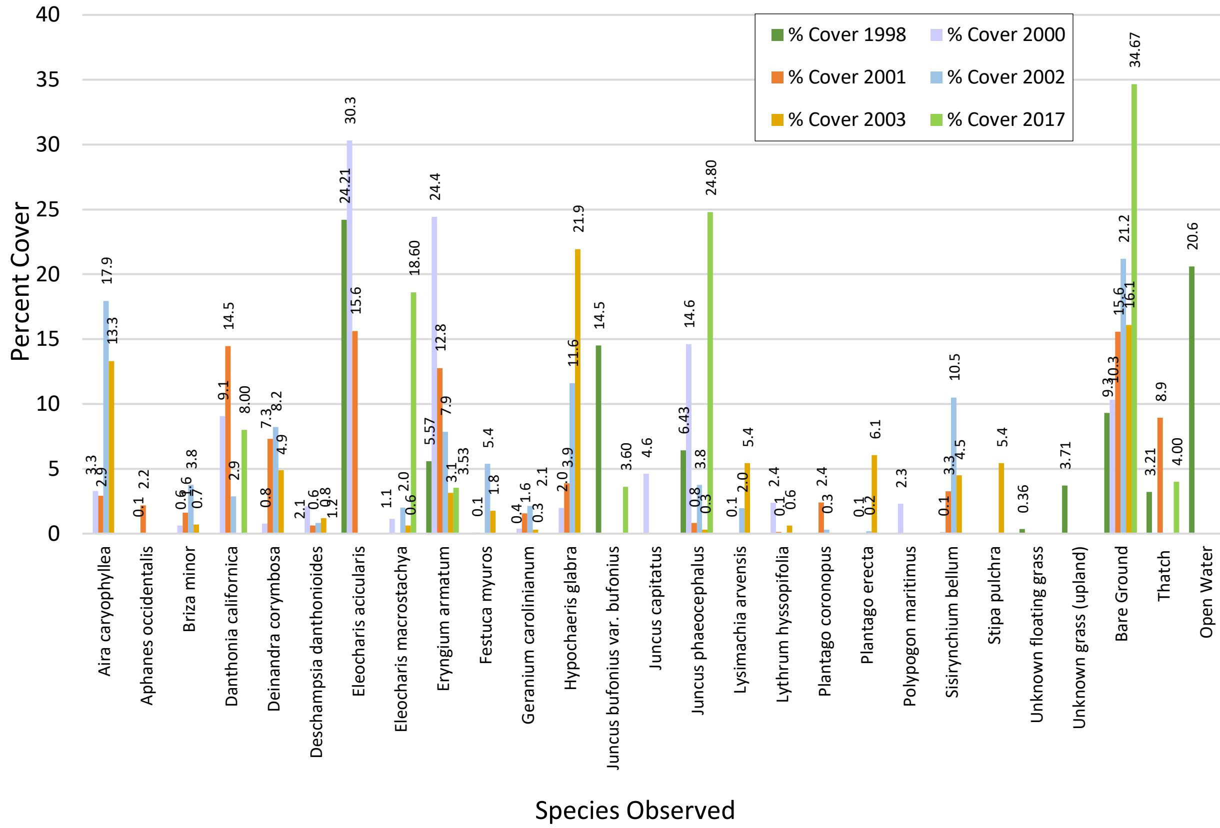

Figure 4-30. Percent Cover of Dominant Species at Pond 42 (Baseline)

Native and non-native species richness decreased between previous surveys and 2017, and are slightly below the ranges observed in reference vernal pools (see Table 4-40 and Table 4-41). The relative percent cover of natives increased since 2003 while the non-natives decreased (see Table 4-42). Additionally, Pond 42 relative native percent cover was above the cover observed at reference vernal pools (see Table 4-43).

Table 4-40. Pond 42 (Baseline) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
1998	12	5	3
2000	21	10	0
2001	14	13	1
2002	16	8	0
2003	19	13	1
2017	10	4	0

Table 4-41. Pond 42 (Baseline) and Reference Vernal Pool Native and Non-Native Species Richnes in 2017

Vernal Pool	Native	Non-Native	Unidentified
5	15	11	3
101 East (West)	23	12	1
101 East (East)	13	5	0
997	16	11	0
42	**10**	**4**	**0**

Table 4-42. Pond 42 (Baseline) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
1998	87.7%	4.4%	7.9%
2000	86.8%	13.4%	0.0%
2001	77.4%	22.4%	0.3%
2002	49.0%	51.0%	0.0%
2003	39.9%	59.1%	0.9%
2017	97.8%	2.2%	0.0%

Table 4-43. Pond 42 (Baseline) and Reference Vernal Pool Relative Percent Cover of Native and Non-Native Plants in 2017

Vernal Pool	Native	Non-Native	Unidentified
5	86.6%	12.9%	0.6%
101 East (West)	70.3%	29.6%	0.1%
101 East (East)	68.2%	31.8%	0.0%
997	77.0%	23.0%	0.0%
42	**97.8%**	**2.2%**	**0.0%**

Pond 42 wetland species richness had two fewer species than the average of 12 species observed in previous years. Non-wetland species richness was within the range of previous surveys (see Table 4-44). In 1998, 13 wetland plants and two non-wetland plants were observed on transects. In 2000, 12 wetland plants and eight non-wetland plants were observed on transects. In 2001, 11 wetland plants and seven non-wetland plants were observed on transects. In 2002, 12 wetland plants and four non-wetland plants were observed on transects. In 2003, 14 wetland plants and four non-wetland plants were observed on transects. In 2017, 10 wetland plants and three non-wetland plants were observed on transects. The decrease in non-wetland species richness through time may be due to above-normal precipitation levels in 2017. Pond 42 had fewer wetland species in 2017 than the reference vernal pools (see Table 4-45). The relative percent cover of wetland species increased between previous years and 2017, and the non-wetland species cover decreased (see Table 4-46). The relative percent cover of wetland and non-wetland species at Pond 42 in 2017 (84.3% and 13.4%, respectively) was similar to the 78.0% wetland and 17.4% non-wetland values observed in 2000. Pond 42 relative percent cover of wetland and non-wetland species was within the range observed in reference pools (see Table 4-47).

Table 4-44. Pond 42 (Baseline) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
1998	6	5	2	2	0	5
2000	5	5	2	8	0	10
2001	3	6	2	6	1	10
2002	3	6	3	4	0	9
2003	5	6	3	4	0	15
2017	5	4	1	3	0	1

Table 4-45. Pond 42 (Baseline) and Reference Vernal Pool Wetland and Non-Wetland Species Richness in 2017

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	5	6	6	6	0	6
101 East (West)	8	11	5	7	0	5
101 East (East)	3	6	5	3	0	1
997	5	10	1	4	0	7
42	**5**	**4**	**1**	**3**	**0**	**1**

Table 4-46. Pond 42 (Baseline) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
1998	42.2%	39.4%	0.7%	7.7%	0.0%	10.0%
2000	35.7%	40.9%	1.4%	17.4%	0.0%	4.7%
2001	20.7%	27.9%	2.2%	25.4%	0.4%	23.3%
2002	3.1%	27.8%	7.0%	31.5%	0.0%	30.6%
2003	5.7%	12.0%	7.4%	19.3%	0.0%	55.5%
2017	30.9%	53.0%	0.3%	13.4%	0.0%	2.4%

Table 4-47. Pond 42 (Baseline) and Reference Vernal Pool Relative Percent Cover of Wetland and Non-Wetland Species in 2017

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	26.3%	22.6%	40.3%	10.0%	0.0%	0.8%
101 East (West)	55.1%	25.7%	8.1%	9.0%	2.1%	0.0%
101 East (East)	8.2%	54.3%	14.9%	22.6%	0.0%	0.1%
997	19.3%	50.7%	2.0%	15.0%	0.0%	13.0%
42	**30.9%**	**53.0%**	**0.3%**	**13.4%**	**0.0%**	**2.4%**

4.6.2.1 Vernal Pool Bent Grass

Vernal pool bent grass was identified for the first time at Pond 42 and is listed as a 1B-1 seriously endangered plant in California by California Native Plant Society (California Native Plant Society [CNPS], 2013). It was first identified and described as a new species in 2011 and only occurs at vernal pools in Monterey County (Peterson et al., 2011). Vernal pool bent grass has been documented at Machine Gun Flats, Little Moab area, Butterfly Valley, and Pond 44 on former Fort Ord. The Pond 42 documentation expanded the current known range.

4.6.2.2 Data Quality Objective 3

Pond 42 supported native and wetland plant species in 2017. As a baseline vernal pool, Pond 42 will be monitored after remediation for comparison to baseline.

4.6.2.3 Performance Standard: Plant Cover and Species Diversity

Pond 42 was a baseline vernal pool in 2017 and was not required to meet the performance standard. The vernal pool will be monitored after remediation for comparison to baseline.

4.6.3 Wildlife Monitoring

Wildlife data were collected at Pond 42 in 1998, 2000, 2001, 2002, and 2003 (HLA, 1998; HLA, 2001; HLA, 2002; MACTEC, 2003; MACTEC, 2004). CTS and fairy shrimp surveys were not conducted at Pond 42 in 2017 since both of these species have been found at Pond 42 in previous surveys (HLA, 2001; MACTEC, 2003). However, DQO 1 and DQO 4 were evaluated for comparison in future years. DQO 5 was not applicable.

4.6.3.1 Data Quality Objective 1

Pond 42 provided suitable depth for CTS and fairy shrimp habitat as discussed in Section 4.6.1.1.

4.6.3.2 Data Quality Objective 4

CTS presence in 2017 is unknown; however, water quality was adequate for the presence of CTS. Compared to other vernal pools and through time, water quality data were within normal ranges. The pH ranged from 5.54 in June to 6.97 in April with a mean of 6.32. Temperature ranged from 9.4° C in February to 17.6° C in June with a mean of 14.0° C. Dissolved oxygen ranged from 2.6 mg/L in January to 11.15 mg/L in April with a mean of 5.41 mg/L. Turbidity ranged from 2.0 FNU in February to >1000 FNU in March with a mean of 206.9 FNU.

4.6.3.3 Performance Standard: Wildlife Usage

Pond 42 is a baseline vernal pool and was not required to meet the performance standard. As a baseline vernal pool, Pond 42 will be monitored after remediation and compared to baseline in future years.

4.6.4 Conclusion

Pond 42 does not need to be compared to the DQOs since it was a baseline pool in 2017. However, it is suitable for comparison to future years for DQO 1, DQO 2, DQO 3, and DQO 4 (see Table 4-48).

Table 4-48. Success at Pond 42 (Baseline) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Hydrological Conditions & Inundation Area	DQO 1	Suitable for Baseline
	DQO 2	Suitable for Baseline
Plant Cover & Species Diversity	DQO 3	Suitable for Baseline
Wildlife Usage	DQO 1	Suitable for Baseline
	DQO 4	Suitable for Baseline
	DQO 5	N/A*

*Not applicable, only hydrology and vegetation surveys were conducted, CTS and fairy shrimp had been found at Pond 42 in previous surveys.

4.7 Pond 61 - Baseline

Pond 61 was surveyed for the first time in 2017. Although some MEC remediation occurred at this pond in 1999, the Army did not conduct monitoring at this pond prior to 2017, and it is assumed this year represents baseline. Table 4-49 summarizes the surveys conducted in 2017. The cumulative precipitation graph shows the precipitation at Pond 61 for the 2016-2017 water-year compared to the normal (see Figure 4-31).

Table 4-49. Summary of Pond 61 (Baseline) Historic Surveys for Hydrology, Vegetation, and Wildlife Surveys

Survey	Water-Year
	2016-2017
Hydrology	●
Vegetation	●
Wildlife	●

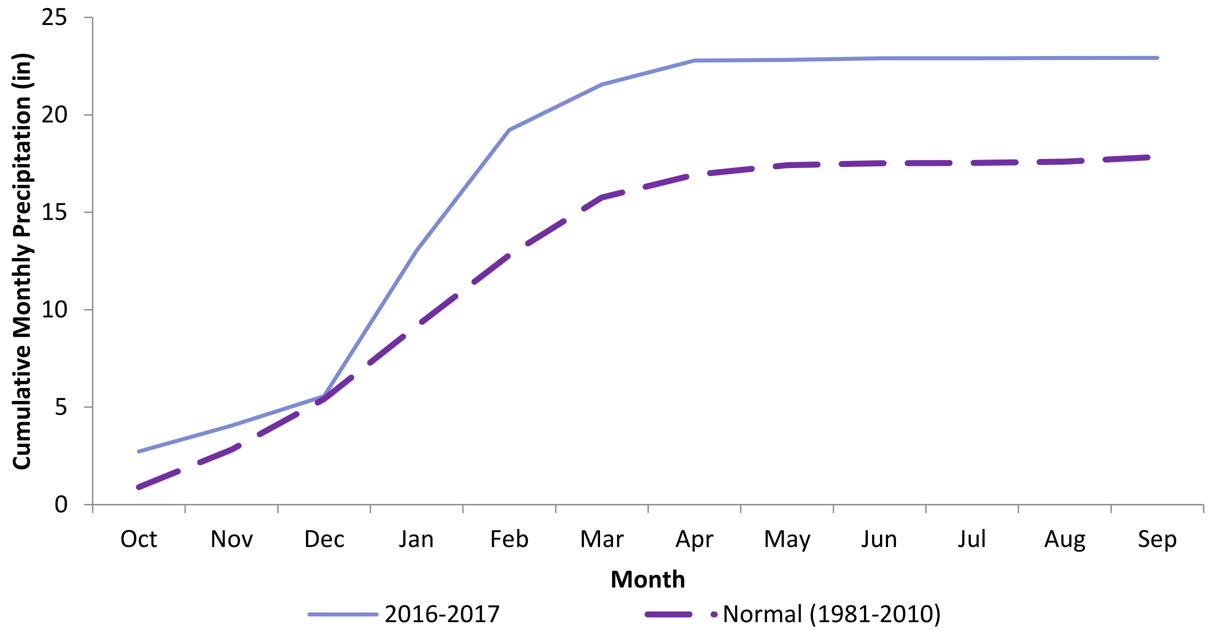

Figure 4-31. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 61 Compared to the 30-Year Normal (mean 1981-2010) (NPS, 2017; NCDC NOAA, 2017)

4.7.1 Hydrology Monitoring

The 2017 maximum inundation for Pond 61 was 0.70 acre and the maximum depth was 21 cm (see Appendix F Table F-7). Figure 4-32 illustrates the relationship of precipitation and depth at Pond 61 for 2017.

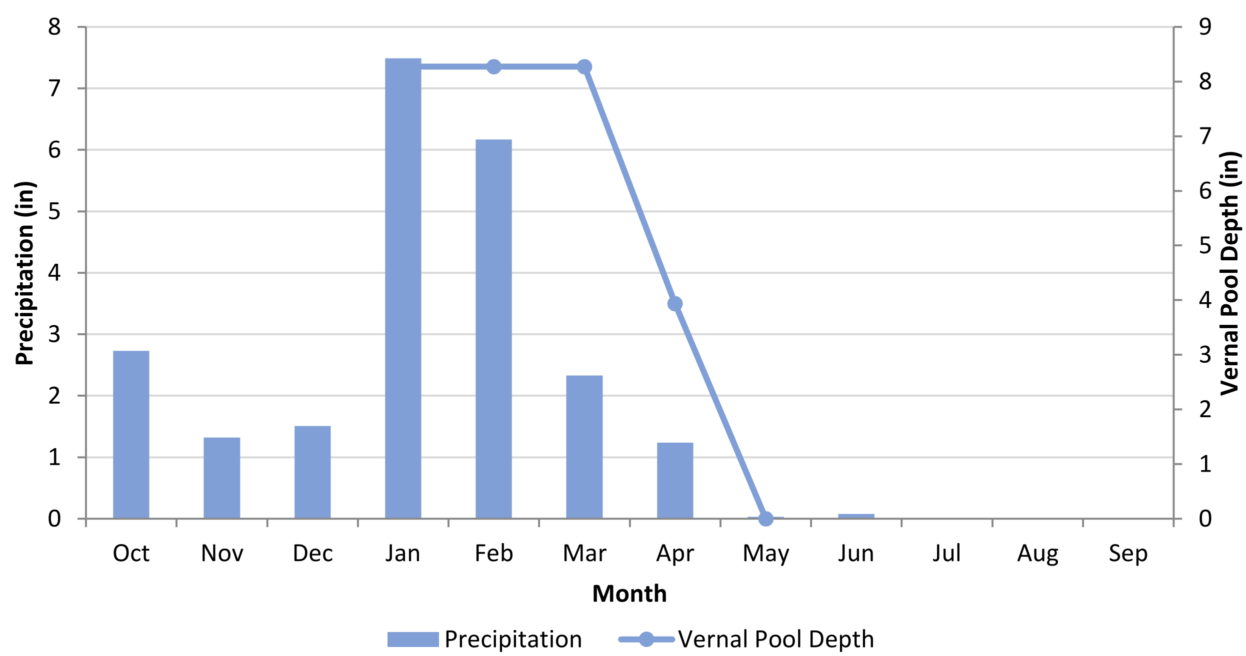

Figure 4-32. Monthly Depth and Precipitation at Pond 61 (Baseline) for 2016-2017 Water-Year

Pond 61 was surveyed for the first time in 2017. No other historic wetland monitoring data were available for comparison except for Contra costa goldfield mapping which was conducted in 1999, 2000, and 2002 (HLA, 1999; HLA, 2001; MACTEC, 2003).

4.7.1.1 Data Quality Objective 1

The average depth from the first survey until the vernal pool dried was 18.3 cm. Pond 61 partially met DQO 1 which requires 10 cm for 18 consecutive days through May, but did not meet the requirement of an average of 25 cm of depth from the first rain event through March. Pond 61 did not provide suitable depths for CTS (21 cm through March) but did provide sufficient depth for fairy shrimp (15 cm through May). Similar to reference vernal pool Pond 997, Pond 61 was shallow and did not meet the required depth for CTS.

4.7.1.2 Data Quality Objective 2

Pond 61 was inundated January through April with an inundation range of 0.05-0.70 acre and a mean of 0.40 acre. In an above-normal water-year, Pond 61 is likely to be inundated. In 2017, Pond 61 was similar to reference vernal pool 997, where both held water through April with inundations less than 1 acre. Pond 61 was slightly larger than Pond 997 in 2017 and may possibly hold water more often than Pond 997 in below-normal water-years.

4.7.1.3 Performance Standard: Hydrological Conditions and Inundation Area

Pond 61 was a baseline vernal pool in 2017 and was not required to meet the performance standard. As a baseline vernal pool, Pond 61 will be monitored after remediation and compared to baseline in future years.

4.7.2 Vegetation Monitoring

Baseline vegetation data were collected at Pond 61 in 2017, and will be compared to data from future surveys. Pond 61 supported a Contra Costa goldfields population during 2017. The population was mapped, and a visual estimate of percent cover was recorded (see Figure 3-15 in Section 3.7.2.1).

The absolute percent vegetative cover was 69.3% vegetation and 32.1% thatch in 2017. Pond 61 vegetative cover was within the range of vegetative cover at the reference vernal pools and was closest to reference vernal pool 101 East (West), which had 68.9% vegetative cover (see Table 4-50).

Table 4-50. Pond 61 (Baseline) and Reference Vernal Pool Absolute Percent Cover in 2017

Vernal Pool	Vegetative Cover	Thatch/Bare Ground
5	59.3%	40.4%
101 East (West)	68.9%	30.5%
101 East (East)	82.1%	16.6%
997	57.4%	43.7%
61	**69.3%**	**32.1%**

In 2017, 61 species were recorded in the vernal pool basin, and 23 species on transects. This was similar to reference Pond 997, where 65 species were recorded in the vernal pool basin and 27 species on the transects (see Appendix B).

A complete list of species composition observed during the surveys at Pond 61 in 2017 can be found in Appendix H. Figure 4-33 shows a subset of this comparison for species observed with a 2% cover or greater. Brown-headed rush (*Juncus phaeocephalus*) and pale spikerush (*Eleocharis macrostachya*) were the dominant species in 2017, and are both native species. Brown-headed rush is a facultative wetland species, while pale spikerush is an obligate species. Pond 61 species composition was different than the composition at reference Pond 997, which was dominated by coyote thistle (*Eryngium armatum*), but was similar to reference Ponds 5 and 101 East (West) which had pale spikerush as a dominant species.

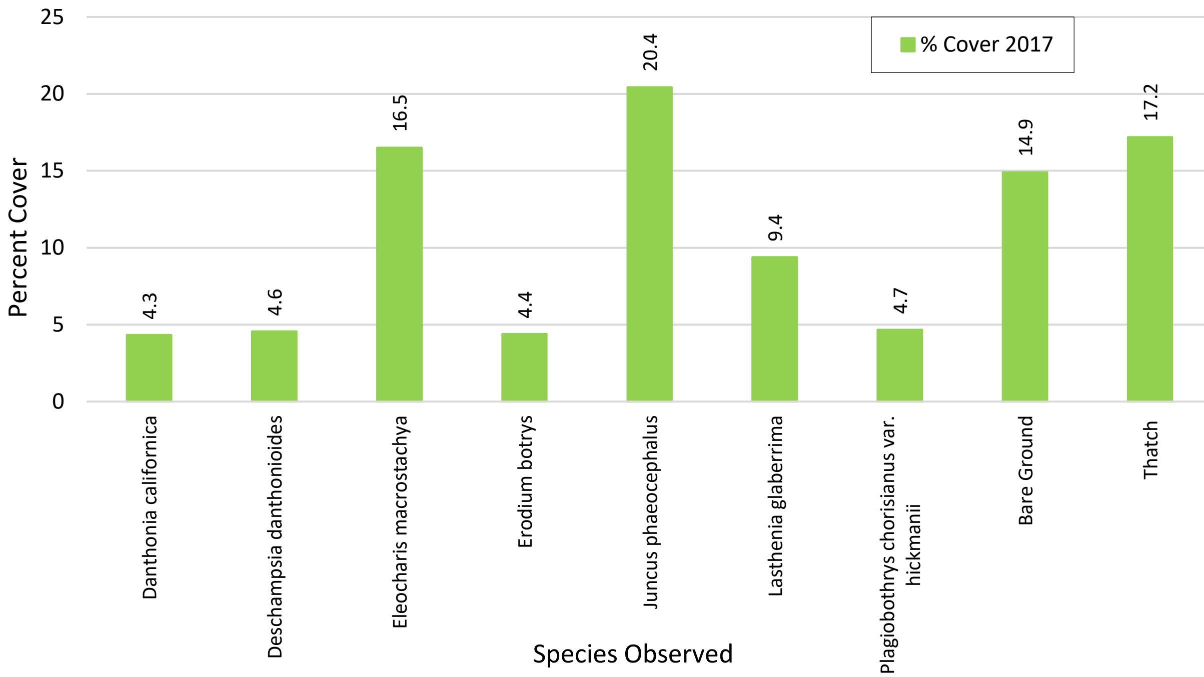

Figure 4-33. Percent Cover of Dominant Species at Pond 61 (Baseline)

Pond 61 had a greater number of native species than non-native species in 2017. The native and non-native species richness values were within the range observed at reference vernal pools in 2017 and was closest to reference Pond 101 East (East) (see Table 4-51). The relative percent cover of native species was greater than the relative percent cover of non-native species. Pond 61 followed the same trend as reference vernal pools in 2017 (see Table 4-52).

Table 4-51. Pond 61 (Baseline) and Reference Vernal Pool Native and Non-Native Species Richness in 2017

Vernal Pool	Native	Non-Native	Unidentified
5	15	11	3
101 East (West)	23	12	1
101 East (East)	13	5	0
997	16	11	0
61	**14**	**6**	**3**

Table 4-52. Pond 61 (Baseline) and Reference Vernal Pool Relative Percent Cover of Native and Non-Native Plants in 2017

Vernal Pool	Native	Non-Native	Unidentified
5	86.3%	13.1%	0.0%
101 East (West)	70.4%	29.4%	0.1%
101 East (East)	69.6%	30.4%	0.0%
997	77.0%	23.0%	0.0%
61	**90.3%**	**9.3%**	**0.4%**

The wetland species in Pond 61 were predominantly obligate and facultative. There were 12 wetland plants and four non-wetland plants observed on transects. Pond 61 followed the same trend as the reference vernal pools with more wetland than non-wetland species, and was closest to reference Pond 101 East (East) (see Table 4-53). Similarly, the relative percent cover of wetland species was greater than that of non-wetland species. Compared to reference vernal pools in 2017, Pond 61 was within the ranges of wetland and non-wetland species relative percent cover (see Table 4-54).

Table 4-53. Pond 61 (Baseline) and Reference Vernal Pool Wetland and Non-Wetland Species Richness in 2017

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	5	6	6	6	0	6
101 East (West)	8	11	5	7	0	5
101 East (East)	3	6	5	3	0	1
997	5	10	1	4	0	7
61	**3**	**7**	**2**	**4**	**0**	**7**

Table 4-54. Pond 61 (Baseline) and Reference Vernal Relative Percent Cover of Wetland and Non-Wetland Species in 2017

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	26.8%	21.0%	41.1%	10.2%	0.0%	0.8%
101 East (East)	55.2%	25.8%	7.9%	9.0%	2.1%	0.0%
101 East (West)	8.3%	55.4%	15.2%	21.0%	0.0%	0.1%
997	19.3%	50.8%	2.0%	15.0%	0.0%	13.0%
61	**20.6%**	**61.5%**	**6.5%**	**8.1%**	**0.0%**	**3.2%**

4.7.2.1 Contra Costa Goldfields and Vernal Pool Bent Grass

The area of Contra Costa goldfields at Pond 61 increased from 0.09 acre to 0.14 acre between 1999 and 2017 (HLA, 1999) (see Figure 3-15 in Section 3.7.2.1). In 1999, 2000, and 2002 the Contra Costa goldfield population was in similar locations as 2017 and all within the range of 0.09-0.11 acre (HLA, 2000; HLA, 2001; MACTEC, 2003). Minor changes in population size can be attributed to natural fluctuation.

Vernal pool bent grass was identified at Pond 61 and is listed as a 1B-1 seriously endangered plant in California by California Native Plant Society (CNPS, 2013). It has previously been identified and documented in this location (Peterson et al., 2011).

4.7.2.2 Data Quality Objective 3

Pond 61 supported native plant species and a substantial amount of wetland plant species. Pond 61 baseline data will be compared to future surveys.

4.7.2.3 Performance Standard: Plant Cover and Species Diversity

Pond 61 was a baseline vernal pool in 2017 and was not required to meet the performance standard. Pond 61 will be monitored after remediation and will be compared to these baseline data in future years.

4.7.3 Wildlife Monitoring

Baseline wildlife data were collected at Pond 61 in 2017. CTS and fairy shrimp were not detected.

4.7.3.1 Data Quality Objective 1

Pond 61 provided sufficient depth for fairy shrimp but not CTS habitat as discussed in Section 4.7.1.1.

4.7.3.2 Data Quality Objective 4

CTS were not detected in 2017 at Pond 61; however, the water quality may have been adequate for the presence of CTS. In comparison to other vernal pools and across years, the water quality data were within normal ranges. The pH ranged from 5.61 in January to 6.66 in February with a mean of 6.23. Temperature ranged from 7.0° C in January to 15.9° C in March with a mean of 11.6° C. Dissolved oxygen ranged from 1.76 mg/L in January to 10.54 mg/L in February with a mean of 5.17 mg/L. Turbidity ranged from 28.8 FNU in April to 76.7 FNU in March with a mean of 50.0 FNU (see Appendix A).

4.7.3.3 Data Quality Objective 5

CTS were not detected in 2017 at Pond 61.

Fairy shrimp were not detected in 2017, though the timing of monitoring may have been a factor. Historically, detections at other vernal pools occurred in January through March while monitoring in 2017 was conducted March through May. Wildlife monitoring does not occur until March to avoid disturbance of CTS eggs.

The absence of CTS and fairy shrimp will be considered the baseline condition when future monitoring is assessed for DQO 5.

4.7.3.4 Performance Standard: Wildlife Usage

Pond 61 is a baseline vernal pool and was not required to meet the performance standard. Pond 61 will be monitored after remediation and compared to baseline conditions.

4.7.4 Conclusion

Pond 61 was not compared to DQOs in 2017 since it was in baseline condition. It is suitable for comparison to future monitoring events for all DQOs (see Table 4-55).

Table 4-55. Success at Pond 61 (Baseline) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Hydrological Conditions & Inundation Area	DQO 1	Suitable for Baseline
	DQO 2	Suitable for Baseline
Plant Cover & Species Diversity	DQO 3	Suitable for Baseline
Wildlife Usage	DQO 1	Suitable for Baseline
	DQO 4	Suitable for Baseline
	DQO 5	Suitable for Baseline

4.8 Pond 16 - Year 1

Pond 16 was monitored in 2017 as a year 1 post-mastication remediation vernal pool. Pond 16 was previously monitored for baseline conditions in 1994, 1995, 1996, 2009, and 2015. Mastication activities occurred in 2015. Table 4-56 summarizes the years that monitoring occurred and which survey(s) were conducted. The cumulative precipitation graph indicates the precipitation for the years that monitoring was conducted at Pond 16 (see Figure 4-34). The 2016-2017 water-year was above-normal, and the 1993-1994, 1994-1995, 1995-1996, 2008-2009, and 2014-2015 water-years were below-normal.

Table 4-56. Pond 16 (Year 1 Post-Mastication) Summary of Historic Surveys for Hydrology, Vegetation, and Wildlife Surveys

Survey	Water-Year					
	1993-1994	1994-1995	1995-1996	2008-2009	2014-2015	2016-2017
Hydrology	●	●	●		●	●
Vegetation	●	●	●		●	●
Wildlife	●	●	●	●		

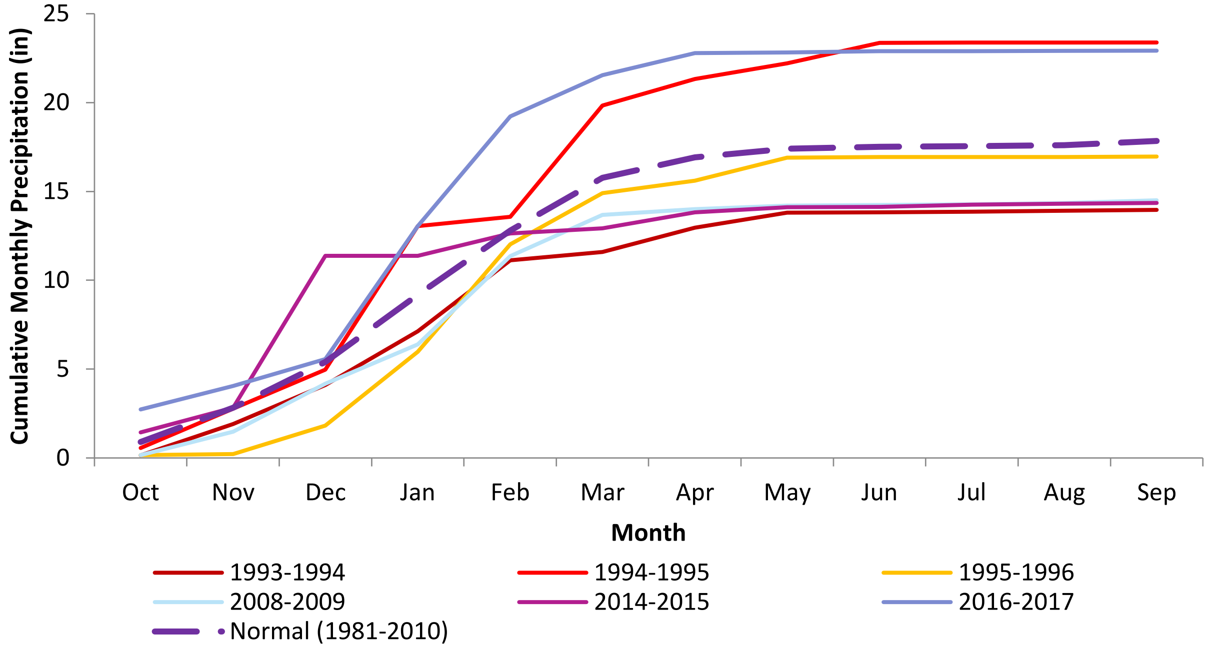

Figure 4-34. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 16 Compared to the 30-Year Normal (mean 1981-2010) (NPS, 2017; NCDC NOAA, 2017)

4.8.1 Hydrology Monitoring

Pond 16 was not dry by the last recorded monitoring in September 2017. The 2017 maximum inundation for Pond 16 was 2.57 acres with a maximum depth of approximately 144 cm. These depth and inundation values are larger than previously recorded values for Pond 16. **Figure** 4-35 illustrates the relationship of precipitation and depth at Pond 16 for 2017 as well as baseline in 1995.

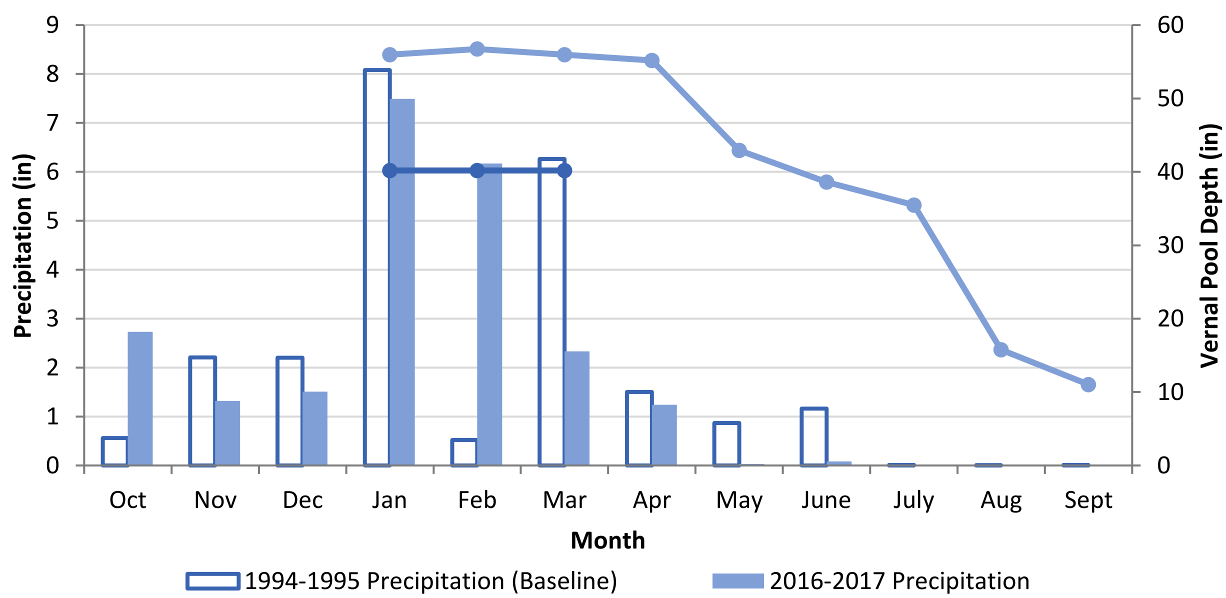

Figure 4-35. Monthly Depth and Precipitation at Pond 16 (Year 1) for 2016-2017 Water-Year Compared to Baseline 1994-1995 Water-Year

In below-normal precipitation years, Pond 16 is likely to range from 0-45 cm in depth with a maximum inundation of 0-0.3 acre. In normal precipitation years, Pond 16 is likely to have a maximum of approximately 80 cm and a maximum inundation of approximately 0.5-1 acre. In above-normal precipitation years, Pond 16 could have maximum depths of 144 cm or more and a maximum inundation up to 2.6 acre (see Appendix F Table F-8). Figure 4-36 illustrates historic vernal pool depths by month and organized by water-year. Figure 4-37 illustrates historic and current inundation areas.

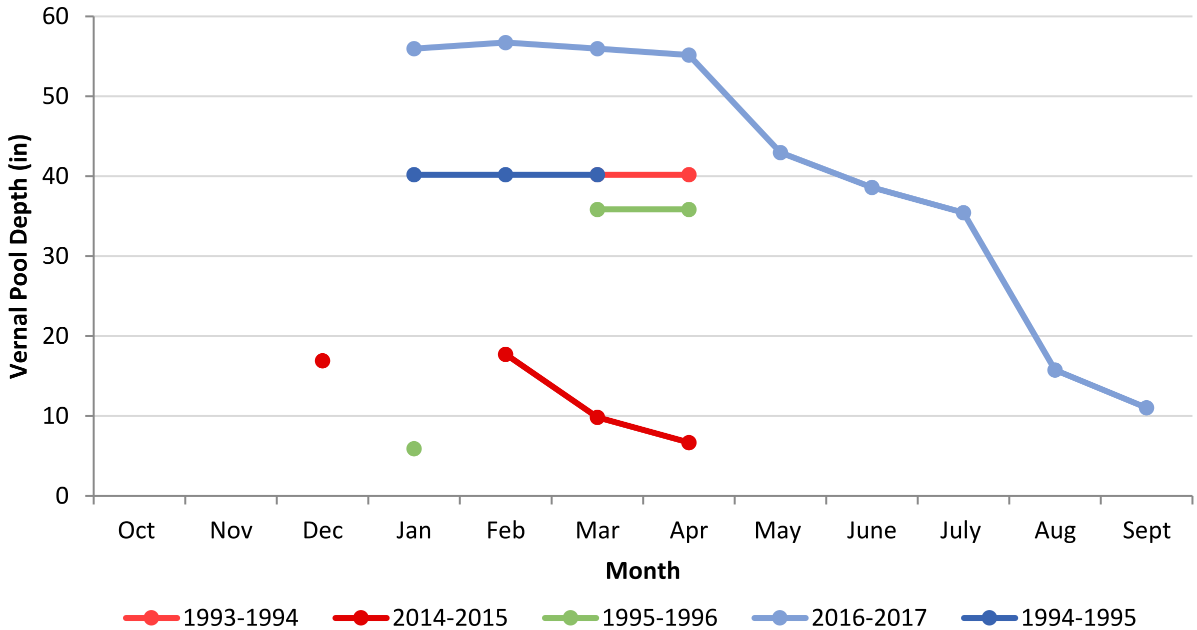

Figure 4-36. Historic Monthly Depths at Pond 16 (Year 1). Water-years are color coded in relation to 30-Year Normal (mean 1981-2010). Reds are cumulative water-years below-normal, greens are cumulative water-years within 2 inches of normal, blues are cumulative water-years above-normal.

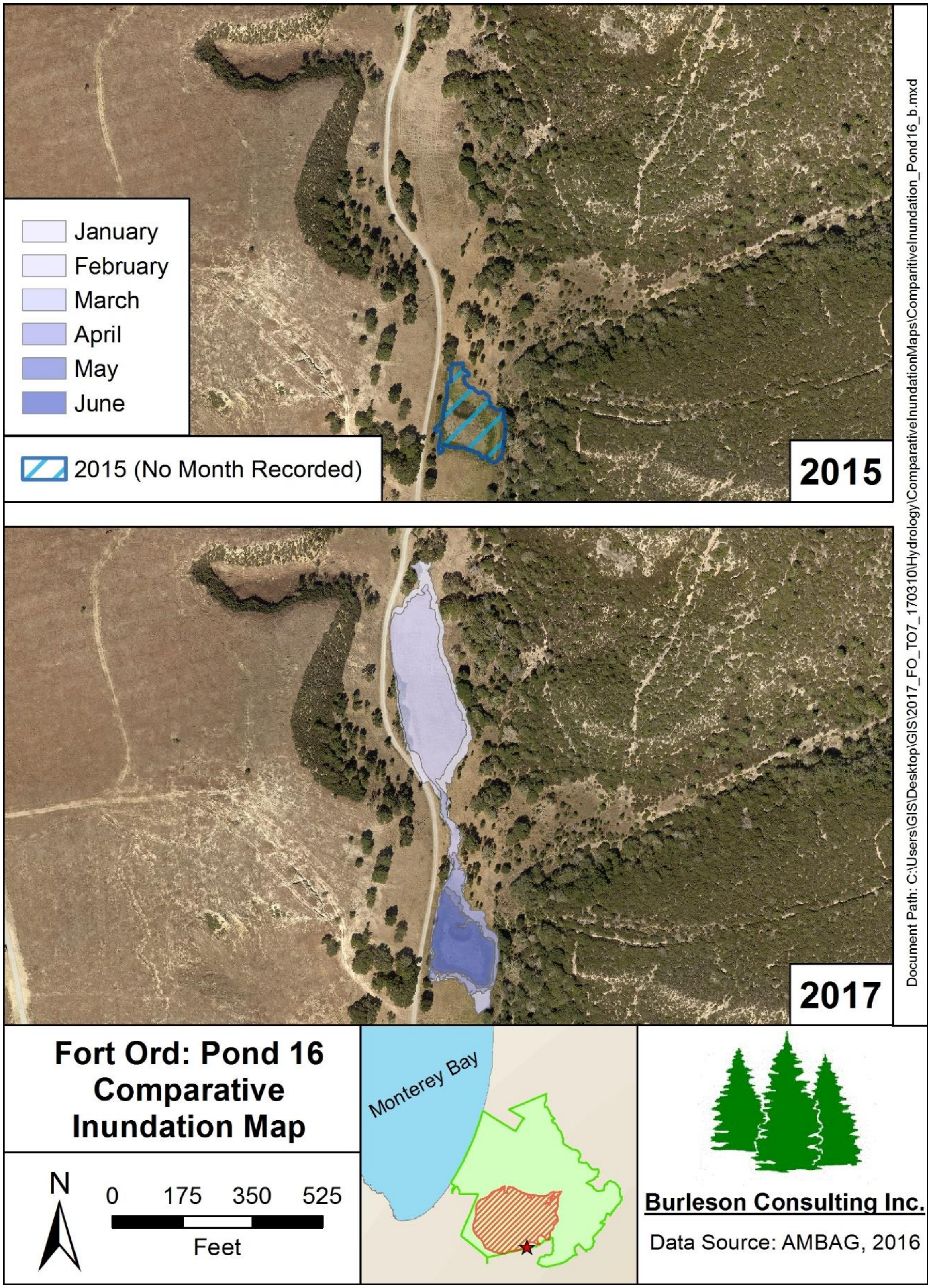

Figure 4-37. Pond 16 (Year 1) Inundations for 2014-2015 (below-normal precipitation) and 2016-2017 (above-normal precipitation). This vernal pool was masticated in 2015 and was in year 1 of monitoring in 2017.

4.8.1.1 Data Quality Objective 1

The average depth between the first and last monitoring events in 2017 was 104 cm. Pond 16 provided sufficient depth for suitable CTS and fairy shrimp habitat to meet DQO 1, which requires an average of 25 cm of depth from the first rain event through March and 10 cm for 18 consecutive days through May. Recorded depths indicate that DQO 1 was likely met in 1994, 1995, 1996, and 2015 even though monitoring did not extend up to May for 1994, 1995, or 2015. Depths at Pond 16 were within the ranges observed at reference vernal pool 101 East (East) since both pools exceeded depths of 135 cm.

4.8.1.2 Data Quality Objective 2

Pond 16 was inundated January through September with an inundation range of 0.51-2.57 acres and a mean of 1.32 acres. The vernal pool did not dry by the last recorded monitoring on September 6, 2017. Three inundations were recorded in March, April, and May of 2015, providing a range of inundations between 0 and 0.27 acre. Inundations were not recorded in 1994, 1995, or 1996, and the inundation in 2015 was not recorded at the maximum depth in February. However, it is reasonable to assume that Pond 16 was smaller in 1994, 1996, and 2015 than in 2017 because the cumulative precipitation was lower in 2015 than in 2017 (see Figure 4-34). Additionally, in 1995 Pond 16 may have been larger or comparable in inundation area to the 2017 inundation area because the cumulative precipitation in 1995 was higher than in 2017 (see Figure 4-34). In 2017, Pond 16 was inundated from January through September like as Ponds 5 and 101 East (East), but acreages were smaller than those at the reference pools.

4.8.1.3 Performance Standard: Hydrological Conditions and Inundation Area

Pond 16 was masticated for remediation and was in year 1 of monitoring in 2017. Pond 16 is currently on track to meet performance standards since pre- and post-treatment hydrologic conditions were generally similar.

4.8.2 Vegetation Monitoring

Vegetation data were collected at Pond 16 in 2015 and 2017 (Burleson *et al.*, 2016). Data from 1994, 1995, and 1996 only represent dominant species and are not included in the following analyses because the data were collected using a different methodology than was used in 2015 and 2017 (Jones and Stokes, 1996). Data from 2015 and 2017 were collected using the same methodology and are compared stratum-to-stratum in Table 4-57 as well as side-by-side (see Figure 4-38).

Table 4-57. Pond 16 (Year 1 Post-Mastication) Vegetative Strata Percentage Within the Vernal Pool Basin Boundary

Stratum	Percentage	
	2015	2017
1	8%	2%
2	24%	11%
3	44%	17%
4	24%	37%
5	N/A	28%
6	N/A	1%
7	N/A	4%

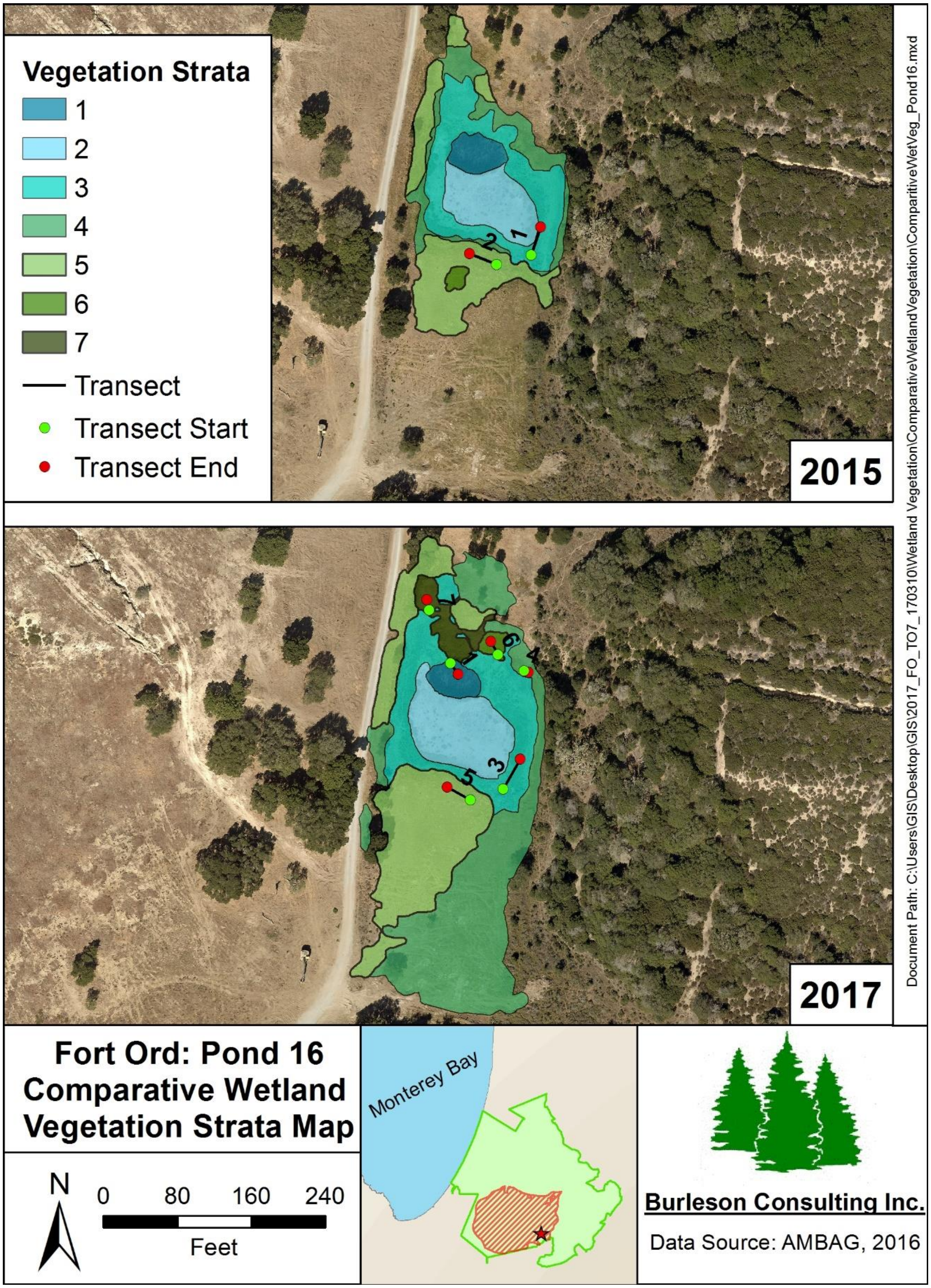

Figure 4-38. Pond 16 Vegetation Strata and Transects for 2015 and 2017

Absolute vegetative cover increased between 2015 and 2017 (see Table 4-58). This is most likely attributed to an increase in precipitation between the years. The absolute vegetative cover of Pond 16 in 2017 was above the average vegetative cover of the reference vernal pools (see Table 4-59).

Table 4-58. Pond 16 (Year 1 Post-Mastication) Absolute Percent Cover

Year	Vegetative Cover	Thatch/Bare Ground
2015	59.1%	38.8%
2017	77.8%	21.8%

Table 4-59. Pond 16 (Year 1 Post-Mastication) and Reference Vernal Pool Absolute Percent Cover in 2017

Vernal Pool	Vegetative Cover	Thatch/Bare Ground
5	60.5%	40.4%
101 East (West)	69.0%	30.5%
101 East (East)	83.7%	16.6%
997	57.3%	43.7%
16	**77.8%**	**21.8%**

Species richness increased between 2015 and 2017. The above-normal water-year likely contributed to the increase since species diversity and richness tend to be higher in wet years than in dry years (Witham *et al.*, 1998). In 2015, 52 species were recorded in the vernal pool basin, and eight species were observed on transects. In 2017, 87 species were recorded in the vernal pool basin, and 24 species were recorded on transects. Pond 16 species richness was higher than the reference vernal pools for the entire basin and within the range of species richness values observed on transects (see Table 4-61).

All species observed and their corresponding abundances from 2015 and 2017 surveys at Pond 16 are presented in Appendix H. Figure 4-39 shows a subset of this comparison for species observed with a 2% cover or greater. Poison hemlock (*Conium maculatum*), sedge (*Carex*) species, and rush (*Juncus*) species were dominant in 1994, 1995, and 1996. Santa Barbara sedge (*Carex barbarae*) was the dominant species in 2015, while pale spikerush (*Eleocharis macrostachya*) was the dominant species in 2017. Both of these species are native. Santa Barbara sedge is a facultative species and pale spikerush is an obligate wetland species. The 2014-2015 water-year was below-normal and had more facultative and upland species vegetative cover than in 2017. More wetland species cover was observed in the above-normal 2016-2017 water-year because the increased rainfall expanded inundation.

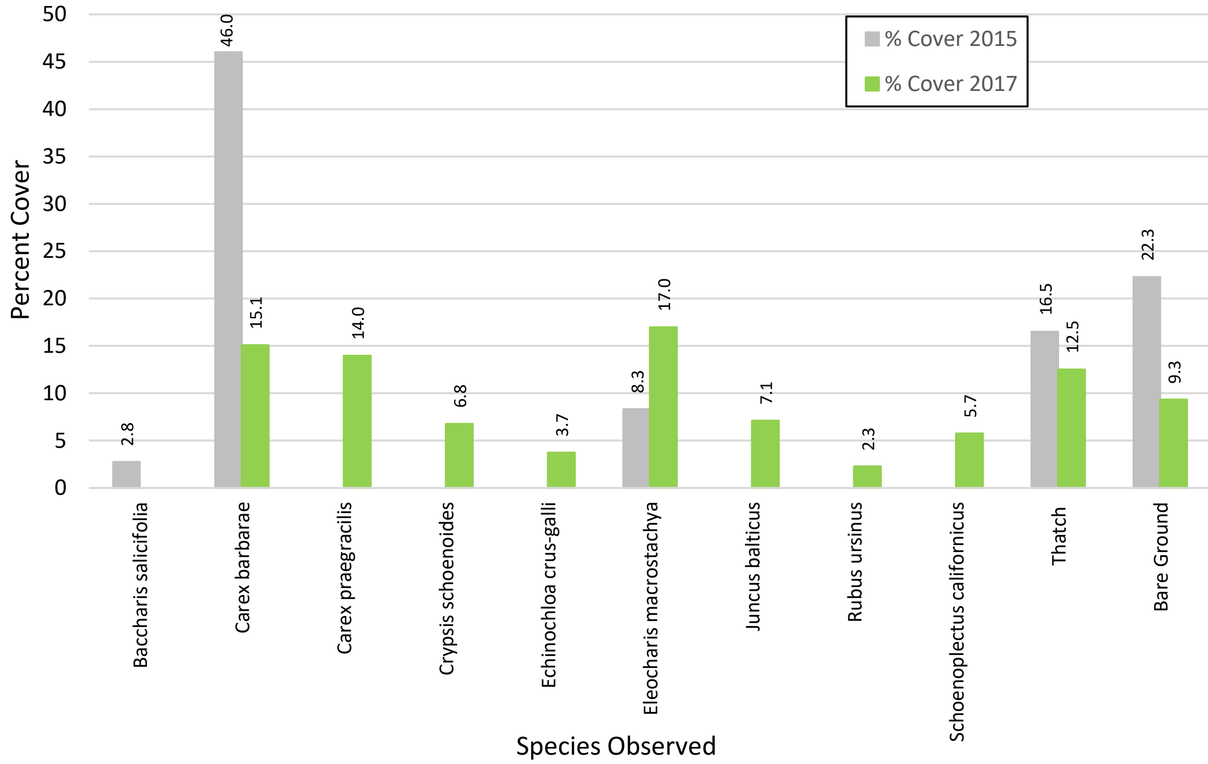

Figure 4-39. Percent Cover of Dominant Species at Pond 16

Native and non-native species richness in Pond 16 increased between 2015 and 2017 (see Table 4-60). The increases were likely due to the increase in distinct homogenous strata between years and the above-normal water-year in 2017. Two transects were placed in two out of five strata in 2015, while six transects were placed in six out of seven strata in 2017. Pond 16 native and non-native species richness values in 2017 were within the range of the reference pool values (see Table 4-61). The relative percent cover of native species decreased between monitoring years, while the relative percent cover of non-native species increased (see Table 4-62). The majority of the non-native species were in stratum 4, an outer stratum that is adjacent to the upland (see Table G-7). In 2015, stratum 4 was mapped but did not support many wetland species and a transect was not placed in this zone (Burleson, 2016). However, in 2017 this transitional zone supported a range from obligate wetland to facultative upland species and a transect was placed in this zone (see Table G-17). Eight of the eleven non-native species were observed in this stratum. In above-normal precipitation years, this stratum will support wetland species and is likely to impact the number of non-native species observed in the ponds basin boundary. Pond 16 was within the range of native and non-native species richness at the reference vernal pools in 2017 (see Table 4-63).

Table 4-60. Pond 16 (Year 1 Post-Mastication) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
2015	5	2	1
2017	13	11	0

Table 4-61. Pond 16 (Year 1 Post-Mastication) and Reference Vernal Pool Native and Non-Native Species Richness in 2017

Vernal Pool	Native	Non-Native	Unidentified
5	15	11	3
101 East (West)	23	12	1
101 East (East)	13	5	0
997	16	11	0
16	**13**	**11**	**0**

Table 4-62. Pond 16 (Year 1 Post-Mastication) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
2015	98.2%	1.1%	0.7%
2017	82.9%	17.1%	0.0%

Table 4-63. Pond 16 (Year 1 Post-Mastication) and Reference Vernal Pool Relative Percent Cover of Native and Non-Native Plants in 2017

Vernal Pool	Native	Non-Native	Unidentified
5	86.6%	12.9%	0.6%
101 East (West)	70.3%	29.6%	0.1%
101 East (East)	68.2%	31.8%	0.0%
997	77.0%	23.0%	0.0%
16	**82.9%**	**17.1%**	**0.0%**

Wetland and non-wetland species richness values in Pond 16 increased between 2015 and 2017 (see Table 4-64). Five wetland plants and one non-wetland plant were observed in 2015, while 12 wetland plants and 11 non-wetland plants were observed in 2017. Additionally, the relative percent cover of wetland and non-wetland species increased from 2016 to 2017 (see Table 4-66). These increases may be due to the increased precipitation levels in 2017. The increase in outer strata observed in 2017 may also have contributed to the increase in facultative upland species. The wetland and non-wetland species richness and relative percent cover at Pond 16 was within the ranges observed at the reference vernal pools in 2017 and was closest to reference Pond 101 East (East) (see Table 4-65 and Table 4-67).

Table 4-64. Pond 16 (Year 1 Post-Mastication) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2015	1	2	2	1	0	2
2017	4	4	4	10	1	1

Table 4-65. Pond 16 (Year 1 Post-Mastication) and Reference Vernal Pool Wetland and Non-Wetland Species Richness in 2017

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	5	6	6	6	0	6
101 East (West)	8	11	5	7	0	5
101 East (East)	3	6	5	3	0	1
997	5	10	1	4	0	7
16	**4**	**4**	**4**	**10**	**1**	**1**

Table 4-66. Pond 16 (Year 1 Post-Mastication) Relative Percent Cover of Wetland and Non-Wetland Species

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2015	14.1%	4.8%	78.3%	1.4%	0.0%	1.4%
2017	37.9%	27.8%	26.0%	7.8%	0.4%	0.1%

Table 4-67. Pond 16 (Year 1 Post-Mastication) and Reference Vernal Pool Relative Percent Cover of Wetland and Non-Wetland Species in 2017

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	26.8%	21.0%	41.1%	10.2%	0.0%	0.8%
101 East (East)	55.2%	25.8%	7.9%	9.0%	2.1%	0.0%
101 East (West)	8.3%	55.4%	15.2%	21.0%	0.0%	0.1%
997	19.3%	50.8%	2.0%	15.0%	0.0%	13.0%
16	**37.9%**	**27.8%**	**26.0%**	**7.8%**	**0.4%**	**0.1%**

4.8.2.1 Data Quality Objective 3

Pond 16 supported a dominance of native plant species and many wetland plant species during year 1 post-mastication monitoring. Differences were observed between baseline and year 1 post-mastication conditions that can be attributed to a larger inundated area over a longer period of time. These trends of more native and wetland plant species as well as larger inundated areas were also observed at reference vernal pools Pond 5, 101 East (East), and 101 East (West). Pond 16 will continue to be monitored and compared to baseline in future monitoring years but is currently on track to meet DQO 3.

4.8.2.2 Performance Standard: Plant Cover and Species Diversity

Pond 16 is a post-mastication remediation vernal pool in year 1 of monitoring. Pond 16 is currently meeting the performance standard in year 1 because the species composition, richness, native, and wetland species relative abundances were similar to baseline and reference pool conditions. While this is the case, native plants did decrease and should be closely evaluated in future years. Pond 16 provided suitable wetland habitat in 2017.

4.8.3 Wildlife Monitoring

Wildlife data were collected at Pond 16 in 1994, 1995, 1996, and 2009 (Jones & Stokes, 1996; Shaw, 2010). Fairy shrimp were detected at Pond 16 in 1994, 1995, and 1996. Pond 16 was not monitored for CTS or fairy shrimp in 2017. However, DQO 1 and DQO 4 were evaluated to allow comparison in future years. DQO 5 was not applicable.

4.8.3.1 Data Quality Objective 1

Pond 16 provided sufficient depth for suitable CTS and fairy shrimp habitat as discussed in Section 4.8.1.1.

4.8.3.2 Data Quality Objective 4

CTS presence in 2017 is unknown; however, water quality was adequate to support CTS. In comparison to other vernal pools and through time, the water quality data were within normal ranges. The pH ranged from 6.09 in February to 6.98 in June with a mean of 6.65. Temperature ranged from 8.9° C in January to 20.0° C in June with a mean of 15.0° C. Dissolved oxygen ranged from 0.05 mg/L in April to 4.87 mg/L in February with a mean of 1.72 mg/L. Turbidity ranged from 33.8 FNU in May to 584.0 FNU in February with a mean of 195.9 FNU.

4.8.3.3 Performance Standard: Wildlife Usage

Pond 16 is a post-mastication remediation vernal pool in year 1 of monitoring. Wildlife was not surveyed in 2017. Pond 16 is on track to meet DQOs 1 and 4. DQO 5 cannot be assessed at this time. The pool provided suitable habitat for CTS and fairy shrimp although presence was unknown in 2017. Although CTS larvae were not observed in 1994, 1995, or 1996, CTS larvae were previously observed in Pond 16 in 2009 and 2015 (Jones and Stokes, 1996; Denise Duffy, 2009; Burleson, 2016).

4.8.4 Conclusion

Pond 16 is a post-mastication remediation vernal pool and was in year 1 of monitoring. Conditions in 2017 at Pond 16 are suitable for comparison to future years and is on track to meet DQOs (see Table 4-68).

Table 4-68. Success at Pond 16 (Year 1 Post-Mastication) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Hydrological Conditions & Inundation Area	DQO 1	On track
	DQO 2	On track
Plant Cover & Species Diversity	DQO 3	On track
Wildlife Usage	DQO 1	On track
	DQO 4	On track
	DQO 5	N/A*

*Not applicable, only hydrology and vegetation surveys were conducted

4.9 Pond 18 - Year 2

Pond 18 was monitored in 2017. It is a post-mastication remediation vernal pool and was in year 2 of monitoring. Mastication occurred in 2015. All surveys before 2015 are pre-remediation and are considered baseline. Table 4-69 summarizes the monitoring years and type(s) of surveys conducted. The cumulative precipitation graph shows the precipitation for all monitoring years (see Figure 4-40). The above-normal water-years were 2015-2016 and 2016-2017. The below-normal water-years were 1991-1992 and 1998-1999, while the only monitored consecutive drought year was 2014-2015.

Table 4-69. Pond 18 (Year 2 Post-Mastication) Summary of Historic Surveys for Hydrology, Vegetation, and Wildlife Surveys

Survey	Water-Year				
	1991-1992	1998-1999	2014-2015	2015-2016	2016-2017
Hydrology		●	●	●	●
Vegetation		●		●	●
Wildlife	●	●		●	●

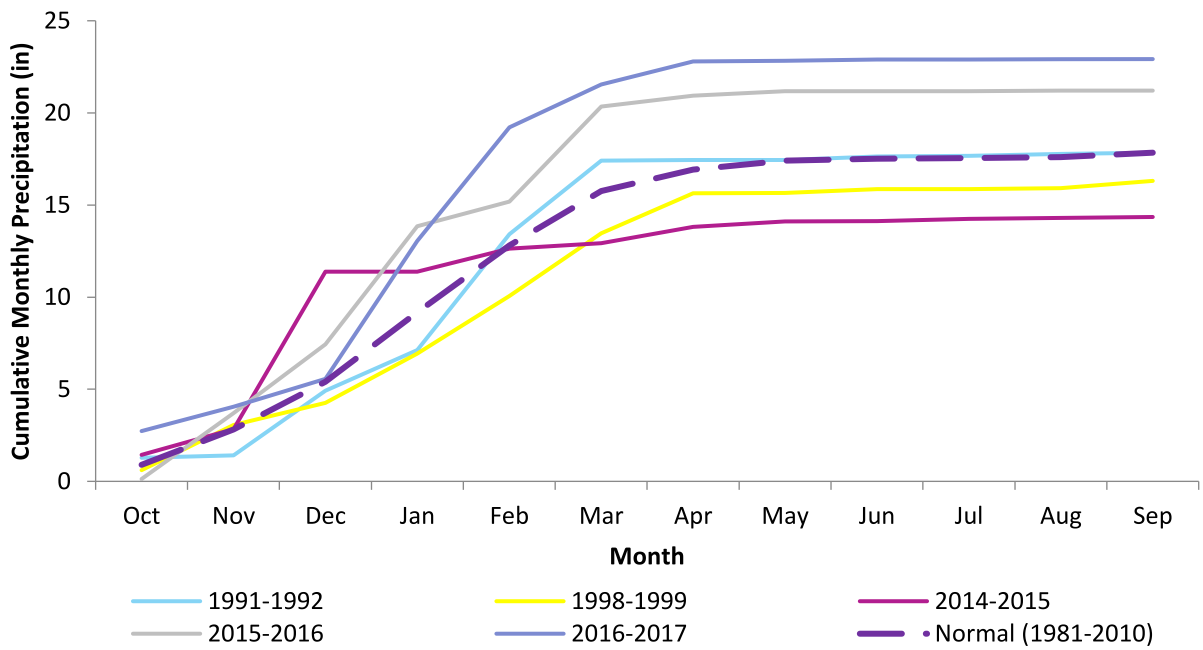

Figure 4-40. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 18 Compared to the 30-Year Normal (mean 1981-2010) (NPS, 2017; NCDC NOAA, 2017)

4.9.1 Hydrology Monitoring

The maximum inundation for Pond 18 in 2017 was 0.22 acre with a maximum depth of 42 cm. These values were slightly higher than any previously recorded values. Figure 4-41 illustrates the relationship of precipitation and depth at Pond 18 for 2017 as well as baseline in 1999.

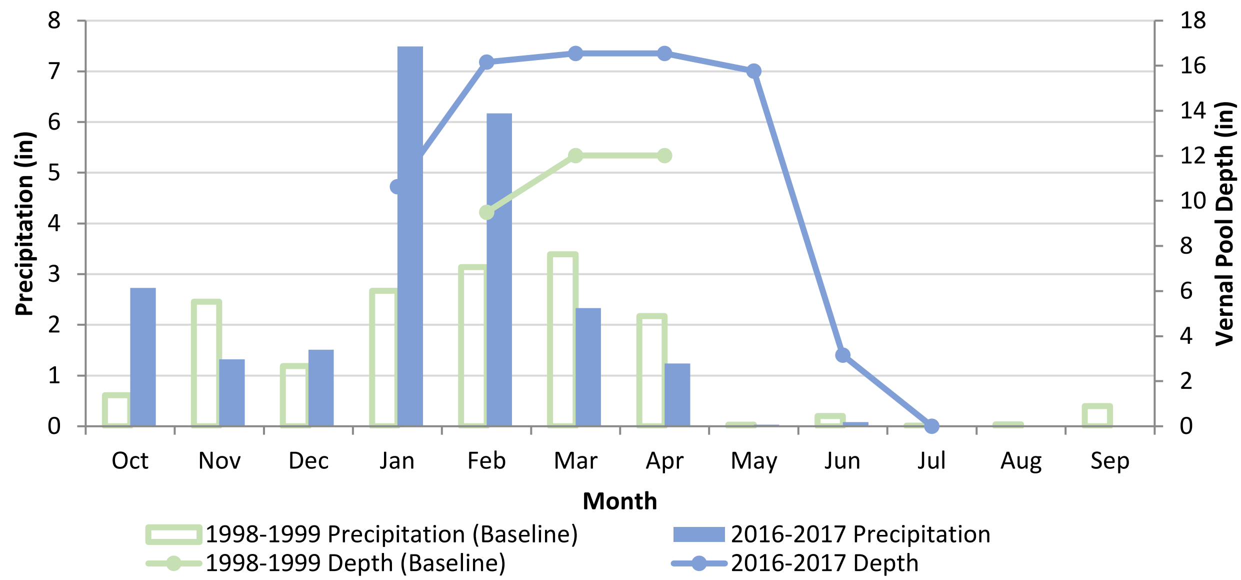

Figure 4-41. Monthly Depth and Precipitation at Pond 18 (Year 2) for 2016-2017 Water-Year Compared to Baseline 1998-1999 Water-Year

In below-normal precipitation years, Pond 18 is likely to range from 0-31 cm in depth with a maximum inundation of 0-0.2 acre. In normal precipitation years, Pond 18 is likely to have a maximum depth of approximately 35 cm and a maximum inundation of approximately 0.2 acre. In above-normal precipitation years, Pond 18 could have maximum depths of 42 cm or more and a maximum inundation up to 0.2 acre (see Appendix F Table F-9). Figure 4-42 illustrates historic vernal pool depths by month and organized by water-year. Figure 4-43 illustrates historic and current inundation areas.

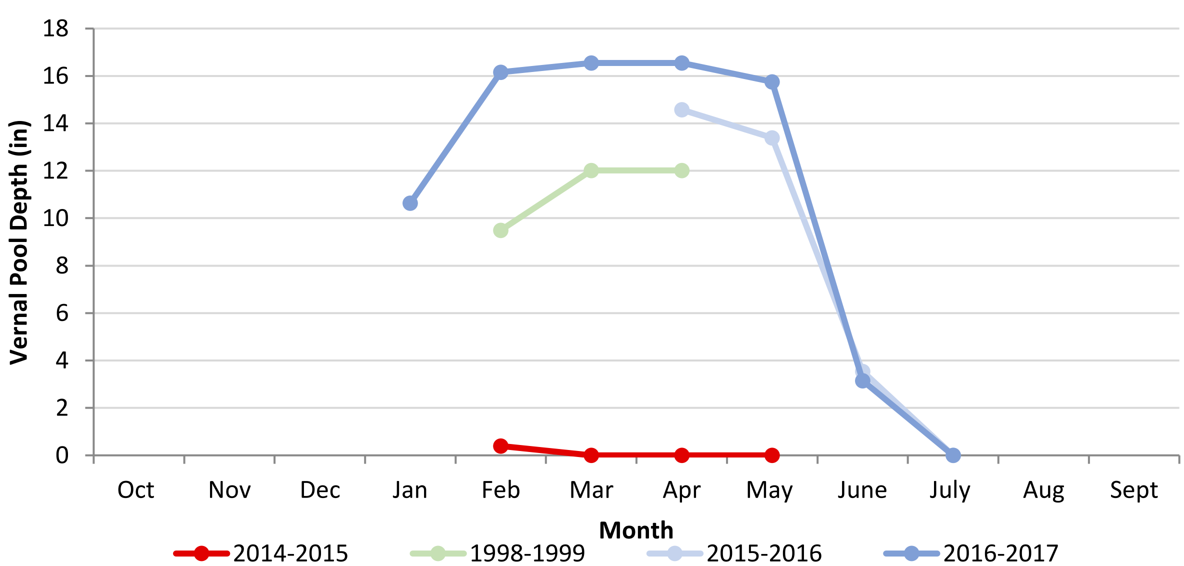

Figure 4-42. Historic Monthly Depths at Pond 18 (Year 2). Water-years are color coded in relation to 30-Year Normal (mean 1981-2010). Reds are cumulative water-years below-normal, greens are cumulative water-years within 2 inches of normal, blues are cumulative water-years above-normal.

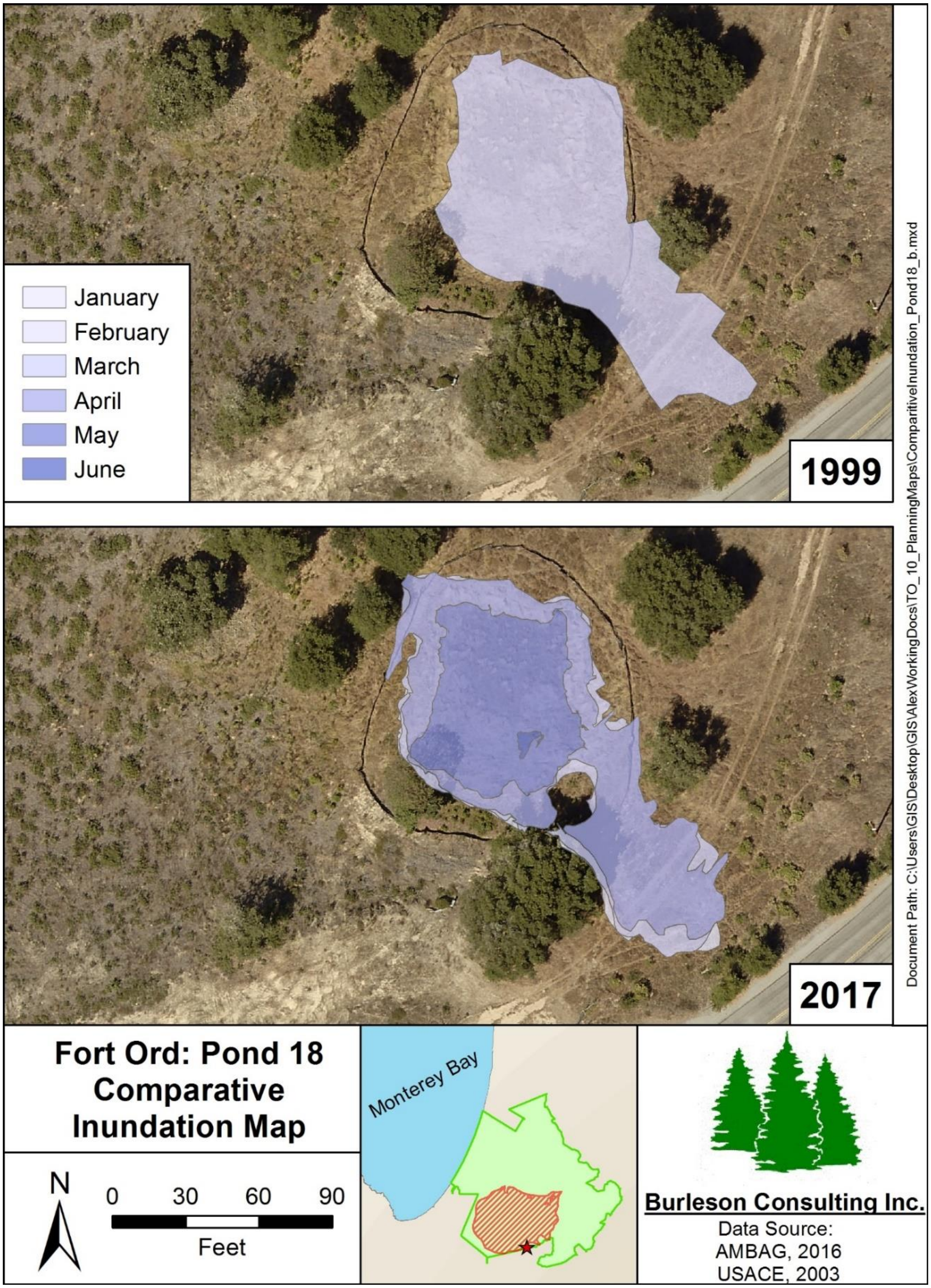

Figure 4-43. Pond 18 (Year 2) Inundations in 1998-1999 (normal precipitation) and 2016-2017 (above-normal precipitation). This vernal pool was masticated in 2015 and is in year 2 of monitoring.

4.9.1.1 Data Quality Objective 1

The average depth from the first monitoring event of 2017 until the vernal pool dried was 33 cm. Pond 18 met DQO 1, which requires an average of 25 cm of depth from the first rain event through March and 10 cm for 18 consecutive days through May. Pond 18 provided sufficient depth for suitable habitat for CTS (37 cm through March) and fairy shrimp (38 cm through May). DQO 1 was met in 1999 and likely met in 2016; however, in 2016, data collection did not begin until April and strict assessment is not possible.

4.9.1.2 Data Quality Objective 2

Pond 18 was inundated January through June with an inundation range of 0.001-0.22 acre. Pond 18 was inundated in 1999 and 2016, but did not fill in 2015. The historic inundation ranges were within the ranges of 2017 inundations, with 0-0.20 acre in 1999 and 0-0.27 acre in 2016. Pond 18 is a small vernal pool that is likely to fill in a normal or slightly below-normal water-year. However, in a drought year, it may remain dry (see Figure 4-26). Pond 18 is much smaller than reference vernal pools Pond 5 and 101 East (East), but larger than Pond 997. It is most comparable to 101 East (West) when 101 East (West) is disconnected from 101 East (East) because 101 East (West) has average inundations of 0.17-0.95 acres.

4.9.1.3 Performance Standard: Hydrological Conditions and Inundation Area

Pond 18 is a post-mastication remediation vernal pool in year 2 of monitoring. While water-years 1998-1999 and 2014-2015 were below-normal and 2015-2016 and 2016-2017 were above-normal, the inundations and depths generally followed the same trend. Pond 18 is currently on track to meet performance standards.

4.9.2 Vegetation Monitoring

Vegetation data were collected at Pond 18 in 1999, 2016, and 2017 (HLA, 1999; Burleson, 2017). In 1999, data were collected along one 179-foot transect with 0.25 m^2 quadrats placed at 10- to 20-foot intervals, alternating from the right to left side of the transect. The transect bisected the entire vernal pool in a northwest to southeast direction. Due to different methodology, 1999 transect data were combined for comparison to 2016 and 2017. Data for 2016 and 2017 were collected using the same methodology and are compared stratum-to-stratum in Table 4-70 as well as side-by-side (see Figure 4-44).

Table 4-70. Pond 18 (Year 2 Post-Mastication) Vegetative Strata Percentage Within the Vernal Pool Basin Boundary

Stratum	Percentage	
	2016	2017
1	19%	26%
2	22%	11%
3	43%	59%
4	15%	3%
Upland	1%	1%

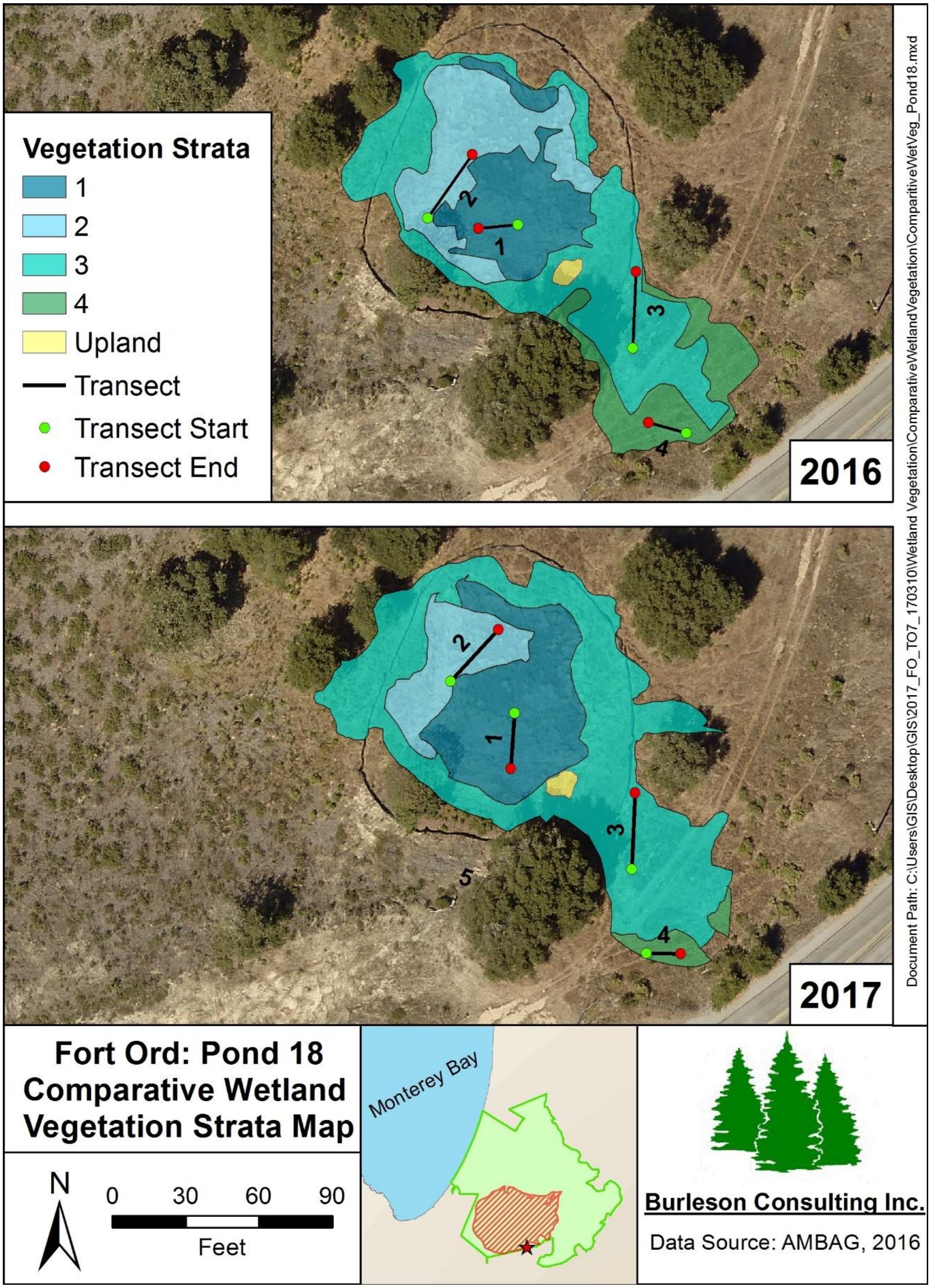

Figure 4-44. Pond 18 Vegetation Strata and Transects for 2016 and 2017

The absolute vegetative cover observed in 2017 was within the range of previous years but has decreased (see Table 4-71). The decrease in vegetative cover between 1999 and 2017 could be due to differing collection methodologies. The longer transect of 1999 may have reported increased species richness and vegetative cover. It is not clear why there is a decrease in total vegetation cover from 2016 to 2017. However, Pond 18 vegetative cover was just below the minimum value observed in the reference vernal pools and was closest to Pond 997 in 2017 (see Table 4-72). Additionally, the vegetative cover is primarily native and wetland species.

Table 4-71. Pond 18 (Year 2 Post-Mastication) Absolute Percent Cover

Year	Vegetative Cover	Thatch/Bare Ground
1999	73.4%	27.1%
2016	67.1%	33.0%
2017	56.8%	45.3%

Table 4-72. Pond 18 (Year 2 Post-Mastication) and Reference Vernal Pool Absolute Percent Cover in 2017

Vernal Pool	Vegetative Cover	Thatch/Bare Ground
5	59.3%	40.4%
101 East (West)	68.9%	30.5%
101 East (East)	82.1%	16.6%
997	57.4%	43.7
18	**56.8%**	**45.3%**

Pond 18 species richness in 2017 was lower than species richness in 1999, which may be attributable to differences between strata delineation methods. Thirty plant species were recorded on the 1999 transect. The species richness was 66 in the vernal pool basin in 2016, and 23 on the transects. The 2017 species richness was 42 in the vernal pool basin and 19 on the transects. The decrease in species richness between 2016 and 2017 was likely related to mowing in the southern edge of the vernal pool. Pond 18 species richness was within the ranges observed at Pond 101 East (East) but lower than all other reference vernal pool species richness values in 2017 (see Appendix B).

A complete comparison of species composition observed during the surveys at Pond 18 in 1999, 2016, and 2017 can be found in Appendix H. Figure 4-45 shows a subset of this comparison for species observed with a 2% cover or greater. While brown-headed rush (*Juncus phaeocephalus*) was dominant in 1999 and pale spike rush (*Eleocharis macrostachya*) was dominant in 2016 and 2017, species composition was dominated by native wetland plant species throughout the three years.

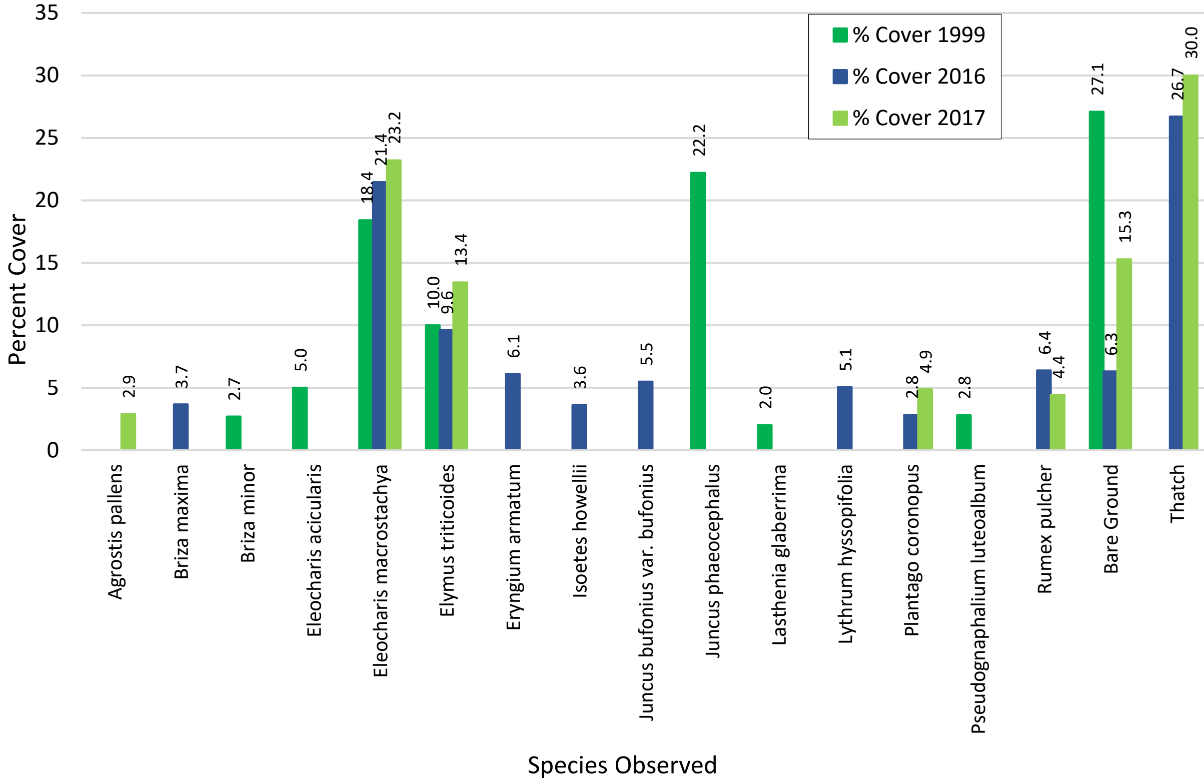

Figure 4-45. Percent Cover of Dominant Species at Pond 18

Native and non-native species richness at Pond 18 was less than the richness observed in 1999 and 2016 and less than any of the reference ponds (see Table 4-73 and 4-74). The total species richness including native and non-native species decreased. This is likely related to mowing in the southern edge of the vernal pool. In particular, transect 4 from 2016 was mowed; and although the transect was moved to a more representative area in 2017 only 9 species were observed, while in 2016, 14 species were observed. Despite the impact of mowing, Pond 18 did have a majority of native species, a trend observed in all of the reference vernal pools (see Table 4-74). The relative percent covers of native and non-native species in 2017 were within 5% of the native and non-native species cover observed in 2016 (see Table 4-75). The absolute vegetative cover at Pond 18 was within 1% of the average vegetative cover in the reference vernal pools and was closest to Pond 997 (see Table 4-76).

Table 4-73. Pond 18 (Year 2 Post-Mastication) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
1999	18	12	0
2016	16	11	1
2017	11	8	0

Table 4-74. Pond 18 (Year 2 Post-Mastication) and Reference Vernal Pool Native and Non-Native Species Richness in 2017

Vernal Pool	Native	Non-Native	Unidentified
5	15	11	3
101 East (West)	23	12	1
101 East (East)	13	5	0
997	16	11	0
18	**11**	**8**	**0**

Table 4-75. Pond 18 (Year 2 Post-Mastication) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
1999	89.2%	10.8%	0.0%
2016	71.1%	28.3%	0.0%
2017	76.7%	23.3%	0.0%

Table 4-76. Pond 18 (Year 2 Post-Mastication) and Reference Vernal Pool Relative Percent Cover of Native and Non-Native Plants in 2017

Vernal Pool	Native	Non-Native	Unidentified
5	86.3%	13.1%	0.0%
101 East (West)	70.4%	29.4%	0.1%
101 East (East)	69.6%	30.4%	0.0%
997	77.0%	23.0%	0.0%
18	**76.7%**	**23.3%**	**0.0%**

Wetland and non-wetland species richness values in Pond 18 in 2017 were slightly less than in 1999 but only differed by one less wetland species and two less non-wetland species from 2016 (see Table 4-77). In 1999, 19 wetland plants and six non-wetland plants were observed on transects. In 2016, 14 wetland plants and five non-wetland plants were observed on transects. In 2017, 13 wetland plants and three non-wetland plants were observed on transects. The difference from 1999 to 2017 is likely due to the differing collection methods between monitoring events. Whereas the difference from 2016 to 2017 is minimal. Pond 18 had 5 less wetland plants than the average of the reference vernal pools (see Table 4-78). It was most similar to Pond 101 East (West) with only one less wetland species. This decrease in wetland plants could be related to the impact of mowing. The relative percent cover of wetland species decreased slightly between previous surveys and 2017 surveys, while the relative percent cover of non-wetland species increased slightly (see Table 4-79). The relative percent cover from 2017 is 4% less than the previous year. However, Pond 18 relative percent cover in 2017 were within ranges observed at reference vernal pool (see Table 4-80).

Table 4-77. Pond 18 (Year 2 Post-Mastication) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
1999	7	6	6	6	0	5
2016	6	3	5	5	0	5
2017	3	6	4	2	1	3

Table 4-78. Pond 18 (Year 2 Post-Mastication) and Reference Vernal Pool Wetland and Non-Wetland Species Richness in 2017

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	5	6	6	6	0	6
101 East (East)	8	11	5	7	0	5
101 East (West)	3	6	5	3	0	1
997	5	10	1	4	0	7
18	**3**	**6**	**4**	**2**	**1**	**3**

Table 4-79. Pond 18 (Year 2 Post-Mastication) Relative Percent Cover of Wetland and Non-Wetland Species

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
1999	37.7%	38.4%	19.2%	1.6%	0.0%	3.0%
2016	46.4%	21.5%	24.5%	1.1%	0.0%	6.4%
2017	43.9%	12.1%	32.4%	4.6%	5.1%	1.8%

Table 4-80. Pond 18 (Year 2 Post-Mastication) and Reference Vernal Pool Relative Percent Cover of Wetland and Non-Wetland Species in 2017

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	26.3%	22.6%	40.3%	10.0%	0.0%	0.8%
101 East (East)	55.1%	25.7%	8.1%	9.0%	0.0%	0.0%
101 East (West)	8.2%	54.3%	14.9%	22.6%	0.0%	0.1%
997	19.3%	50.7%	2.0%	15.0%	0.0%	13.0%
18	**43.9%**	**12.1%**	**32.4%**	**4.6%**	**5.1%**	**1.8%**

4.9.2.1 Data Quality Objective 3

Pond 18 supported a dominance of native and wetland plant species during year 2 post-mastication monitoring. Differences were observed between baseline, year 1, and year 2 post-mastication conditions that can largely be attributed either to differing methodology or impact from mowing. Pond 18 had a decrease in vegetative cover and species richness but still largely followed the trends of dominance of native and wetland plant species similar to the reference vernal pools. Pond 18 will continue to be monitored and compared to baseline in future monitoring years but is currently on track to meet DQO 3.

4.9.2.2 Performance Standard: Plant Cover and Species Diversity

Pond 18 is a post-mastication remediation vernal pool and was in year 2 of monitoring. Pond 18 is currently meeting the performance standard in 2017 because the species composition, relative abundance of native species, and relative abundance of wetland species were similar to baseline and reference surveys. While this is the case, total vegetation cover and species richness decreased, and should be closely evaluated in future years. Pond 18 generally provided suitable wetland habitat in 2017.

4.9.3 Wildlife Monitoring

A large portion of the Pond 18 watershed was masticated in 2014. In 2017 the vernal pool was in year 2 of post-mastication remediation monitoring.

Wildlife data were collected at Pond 18 in 1992, 1999, 2016, and 2017 (Jones and Stokes, 1992; HLA, 1999; Burleson, 2017). Fairy shrimp and CTS were not detected in previous years.

4.9.3.1 Data Quality Objective 1

Pond 18 provided sufficient depth for suitable CTS and fairy shrimp habitat in 2017 as discussed in Section 4.9.1.1.

4.9.3.2 Data Quality Objective 4

CTS were not present in 2017 at Pond 18; however, the water quality may have been adequate for presence. In comparison to other vernal pools and through time, the water quality data were within normal ranges. The pH ranged from 5.97 in February to 6.46 in June with a mean of 6.17. Temperature ranged from 8.6° C in January to 16.5° C in June with a mean of 13.5° C. Dissolved oxygen ranged from 0.00 mg/L in June to 9.69 mg/L in May with a mean of 3.19 mg/L. Turbidity ranged from 13.9 FNU in May to 401.0 FNU in June with a mean of 105.1 FNU.

4.9.3.3 Data Quality Objective 5

CTS and fairy shrimp were not detected in 2017, which was consistent with previous monitoring events in 1992 and 1999. It was possible that the monitoring events were too late in the season to capture fairy shrimp presence. Previous detections were observed between January and March, while monitoring in 2017 was conducted March through May. Wildlife monitoring does not occur until March to avoid disturbance to potential CTS eggs.

4.9.3.4 Performance Standard: Wildlife Usage

Pond 18 was a post-mastication remediation vernal pool in year 2 of monitoring. Pond 18 achieved the performance standard and is on track to meet DQOs 1, 4, and 5 and provided suitable CTS habitat.

4.9.4 Conclusion

Pond 18 is a post-mastication remediation vernal pool in year 2 of monitoring. Pond 18 data from 2017 is suitable for comparison to future years and the vernal pool is on track to meet DQOs (see Table 4-81).

Table 4-81. Success at Pond 18 (Year 2 Post-Mastication) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Hydrological Conditions & Inundation Area	DQO 1	On track
	DQO 2	On track
Plant Cover & Species Diversity	DQO 3	On track
Wildlife Usage	DQO 1	On track
	DQO 4	On track
	DQO 5	On track

4.10 Pond 54 - Year 2

Pond 54 is a post-mastication remediation vernal pool in year 2 of monitoring. Mastication occurred in 2014. All surveys before 2014 are pre-remediation and are considered baseline. Table 4-82 summarizes the monitoring years and corresponding survey(s). The cumulative precipitation graph shows the precipitation for monitoring years at Pond 54 (see Figure 4-46). The 2016-2017 precipitation was above-normal, while water-years 2003-2004 and 2008-2009 were below-normal.

Table 4-82. Pond 54 (Year 2 Post-Mastication) Summary of Historic Surveys for Hydrology, Vegetation, and Wildlife Surveys

Survey	Water-Year		
	2003-2004	2008-2009	2016-2017
Hydrology	●		●
Vegetation	●		
Wildlife	●	●	●

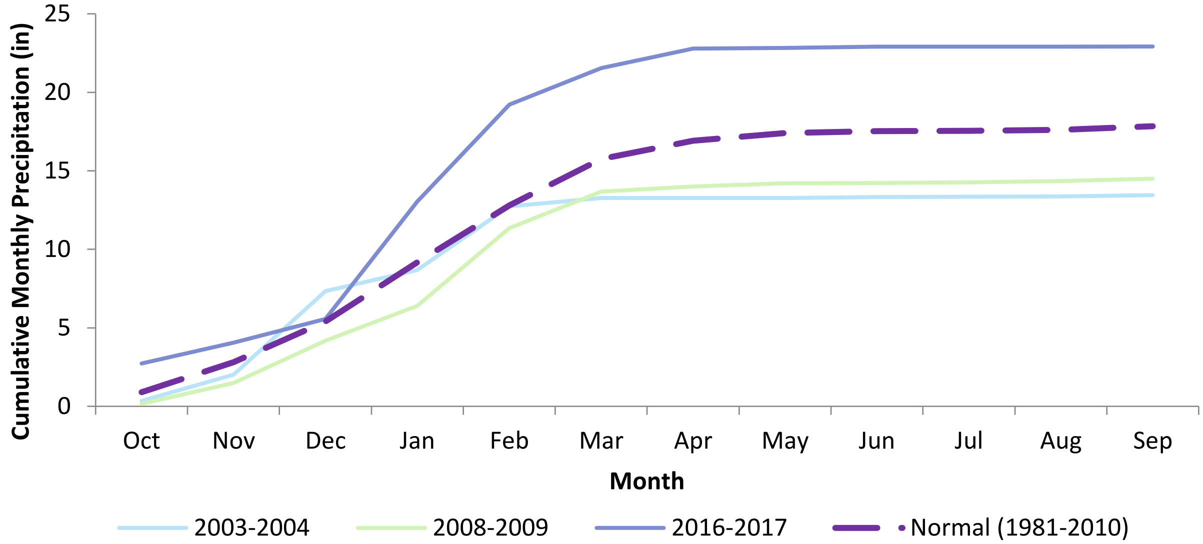

Figure 4-46. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 54 Compared to the 30-Year Normal (mean 1981-2010) (NPS, 2017; NCDC NOAA, 2017)

4.10.1 Hydrology Monitoring

The maximum inundation for Pond 54 in 2017 was 3.10 acres with a maximum depth of 111 cm. These values exceeded historic maxima. Figure 4-47 illustrates the relationship of precipitation and depth at Pond 54 for 2017 as well as baseline in 2004.

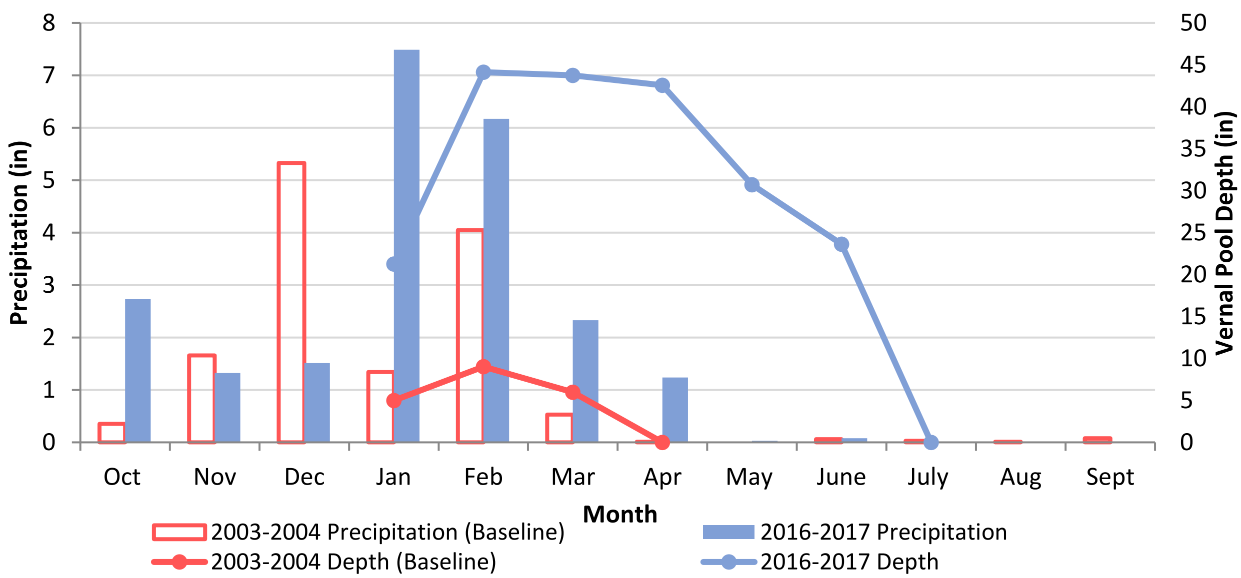

Figure 4-47. Monthly Depth and Precipitation at Pond 54 (Year 2) for 2016-2017 Water-Year Compared to Baseline 2003-2004 Water-Year

In below-normal precipitation years, Pond 54 is likely to range from 0-23 cm in depth with a maximum inundation of 0-1.4 acres. In normal precipitation years, Pond 54 is likely to have a maximum depth of approximately 50 cm and a maximum inundation of approximately 2 acres. In above-normal precipitation years, Pond 54 could have maximum depths of up to 111 cm and a maximum inundation of

3.1 acres (see Appendix F Table F-10). Figure 4-48 illustrates historic vernal pool depths by month and organized by water-year. Figure 4-49 illustrates historic and current inundation areas.

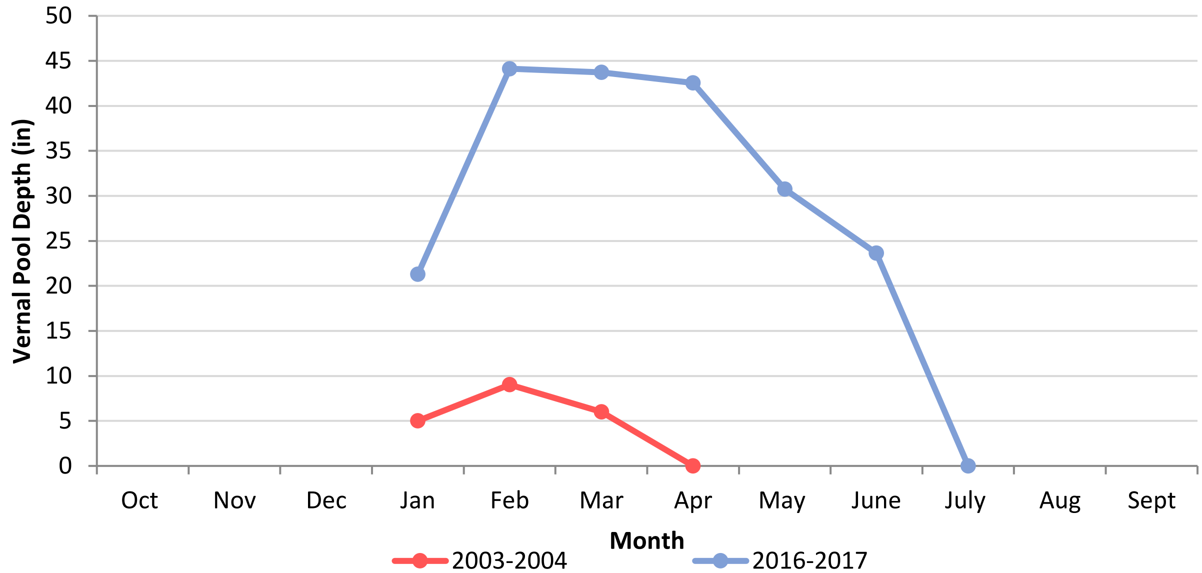

Figure 4-48. Historic Monthly Depths at Pond 54 (Year 2). Water-years are color coded in relation to 30-Year Normal (mean 1981-2010). Reds are cumulative water-years below-normal, greens are cumulative water-years within 2 inches of normal, blues are cumulative water-years above-normal.

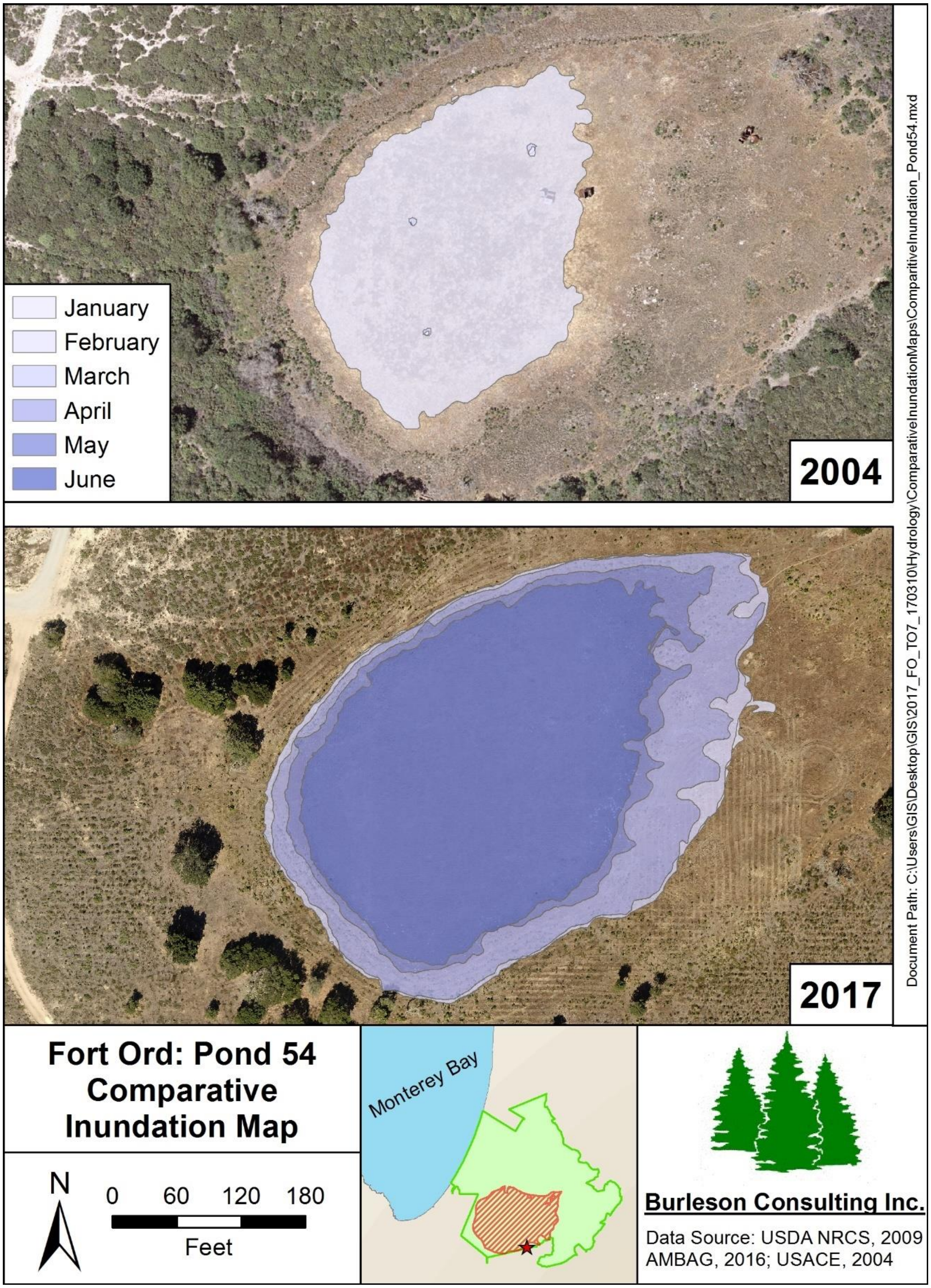

Figure 4-49. Pond 54 (Year 2) Inundations for 2003-2004 (below-normal precipitation) and 2016-2017 (above-normal precipitation). This vernal pool was masticated in 2014 and was in year 2 of monitoring in 2017.

4.10.1.1 Data Quality Objective 1

The average depth from the first monitoring event until the vernal pool dried was 88.2 cm. Pond 54 met DQO 1, which requires an average of 25 cm of depth from the first rain event through March and 10 cm for 18 consecutive days through May. Pond 54 provided sufficient depth for suitable habitat for both CTS (92 cm through March) and fairy shrimp (93 cm through May). In previous years when data were collected from the first rain event through May, DQO 1 was not met in 2003. Pond 54 dried in April and only held an average of 16 cm through April. Pond 54 and Pond 101 East (West) both had average depths between 70 – 90 cm and both met DQO 1.

4.10.1.2 Data Quality Objective 2

Pond 54 was inundated January through September of 2017 with an inundation range of 1.60-3.10 acres and a mean of 2.47 acres. The historic inundation ranges were between 0.00 and 1.37 acres in 2004 and 2009. These inundations were lower than 2017, as expected since those water-years had below-normal precipitation levels. Pond 54 can be expected to fill in years slightly below normal precipitation, it may remain dry in a drought year (see Figure 4-31). Pond 54 is generally smaller than reference vernal pools Pond 5 and 101 East (East), but larger than Pond 997 and 101 East (West). It cannot be directly compared to these reference vernal pools but should be analyzed in terms of proportion and relation to the water-year.

4.10.1.3 Performance Standard: Hydrological Conditions and Inundation Area

Pond 54 is a post-mastication remediation vernal pool in year 2 of monitoring. While 2003-2004 was a below-normal water-year and 2016-2017 was above-normal, the inundations and depths followed the same trend. Pond 54 is currently on track to meet the performance standard and will be used for comparison in future years.

4.10.2 Wildlife Monitoring

Wildlife data were collected at Pond 54 in 2004, 2009, and 2017 (MACTEC, 2005; Shaw, 2010). CTS eggs were observed in 2009. Table 4-83 shows historic wildlife monitoring results. Seven CTS larvae were observed in 2017 but no fairy shrimp were detected.

Table 4-83. Pond 54 (Year 2 Post-Mastication) Historic Wildlife Monitoring Results

Sampling Year	CTS Larvae Abundance (# Individuals)	Fairy Shrimp Abundance (# Individuals)
2004	0	-
2009	CTS eggs present; no larvae	0
2017	7	0

4.10.2.1 Data Quality Objective 1

Pond 54 provided sufficient depth for suitable CTS and fairy shrimp habitat as discussed in Section 4.10.1.1.

4.10.2.2 Data Quality Objective 4

CTS were present in 2017 at Pond 54; therefore, the water quality was adequate. In comparison to other vernal pools and through time, the water quality data were in the normal range. The pH ranged from 6.51 in April to 6.98 in June with a mean of 6.72. Temperature ranged from 8.3° C in February to 23.3° C in June with a mean of 14.6° C. Dissolved oxygen ranged from 0.04 mg/L in March to 7.22 mg/L in June with a mean of 4.44 mg/L. The turbidity ranged from 5.3 FNU in February to 69.3 FNU in May with a mean of 26.8 FNU.

4.10.2.3 Data Quality Objective 5

CTS were present in 2017. CTS eggs were present in 2009, but no CTS larvae were observed, which might be attributed to rainfall patterns. The 2016-2017 water-year had above-normal precipitation levels, while the 2008-2009 water-year had below-normal precipitation (see Figure 4-46 and Figure 4-47).

Fairy shrimp were not detected in 2017, which was consistent with previous monitoring.

4.10.2.4 Performance Standard: Wildlife Usage

Pond 54 was a post-mastication remediation vernal pool in year 2 of monitoring. Pond 54 currently meets the performance standard because it achieved DQOs 1, 4, and 5, by providing suitable habitat for CTS and fairy shrimp.

4.10.3 Conclusion

Pond 54 is a post-mastication remediation vernal pool and is in year 2 of monitoring. Pond 54 data from 2017 is suitable for comparison to future years and the vernal pool is on track to meet DQOs (see Table 4-84).

Table 4-84. Success at Pond 54 (Year 2 Post-Mastication) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Hydrological Conditions & Inundation Area	DQO 1	On track
	DQO 2	On track
Plant Cover & Species Diversity	DQO 3	N/A*
Wildlife Usage	DQO 1	On track
	DQO 4	On track
	DQO 5	On track

*Not applicable, only hydrology and wildlife surveys were conducted

4.11 Pond 10 - Year 5

Pond 10[6] is a post-lead remediation vernal pool in year 5 of monitoring. Lead remediation activities occurred in 2013 at the adjacent HA 37 which resulted in the excavation of approximately 19,500 cubic yards of soil in the Pond 10 watershed (Burleson, 2012). All surveys before 2013 are pre-remediation and are considered baseline. No excavations occurred in the Pond 10 inundation area (Burleson, 2012). Table 4-85 summarizes the monitoring years and corresponding survey(s). The cumulative precipitation graph illustrates the precipitation for survey years at Pond 10 (see Figure 4-50). The above-normal water-years were 1996-1997, 2015-2016, and 2016-2017. Other monitoring years were below-normal, drought year, or consecutive drought year.

[6] Pond 10 is referred to as “Range 37” in HLA (1997).

Table 4-85. Pond 10 (Year 5 Post-Lead Remediation) Summary of Historic Surveys for Hydrology, Vegetation, and Wildlife Surveys

Survey	Water-Year						
	1991-1992	1996-1997	2006-2007	2012-2013	2013-2014	2015-2016	2016-2017
Hydrology		●	●	●	●	●	●
Vegetation		●	●			●	●
Wildlife	●		●	●	●	●	●

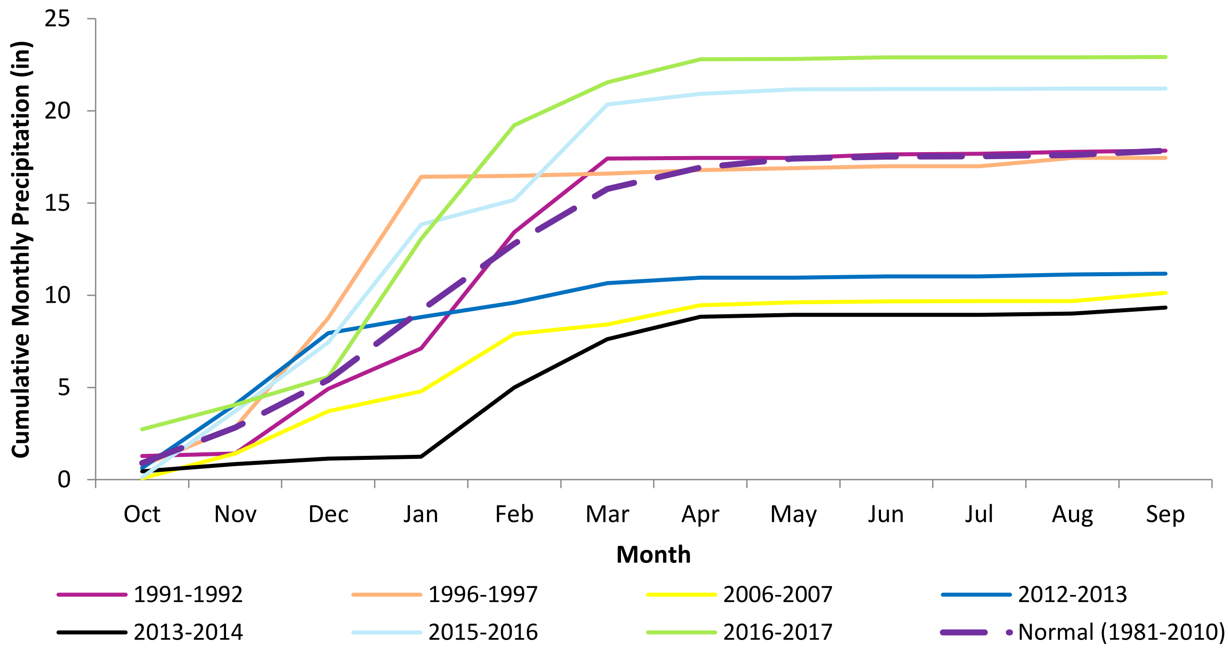

Figure 4-50. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 10 Compared to the 30-Year Normal (mean 1981-2010) (NPS, 2017; NCDC NOAA, 2017)

4.11.1 Hydrology Monitoring

Pond 10 was monitored for baseline conditions in 1997, an above-normal cumulative precipitation year. Water quality data recorded in 1997 were a pH reading in June of 7.45 and a Secchi disk reading of 3.5 inches. The inundated area was 5.6 acres in August of 1997. 2007 was also considered baseline and was a below-normal precipitation year. Pond 10 depths in 2007 were 50 cm in January and 65 cm in March, and inundation area in March was 2.08 acres.

Pond 10 was not dry by the last recorded monitoring event in September 2017. The maximum inundation of 2017 was 6.21 acres with a maximum depth of 156 cm. These values exceeded the known maxima at that pond. Figure 4-51 illustrates the relationship of precipitation and depth at Pond 10 for 2017 as well as baseline in 1997.

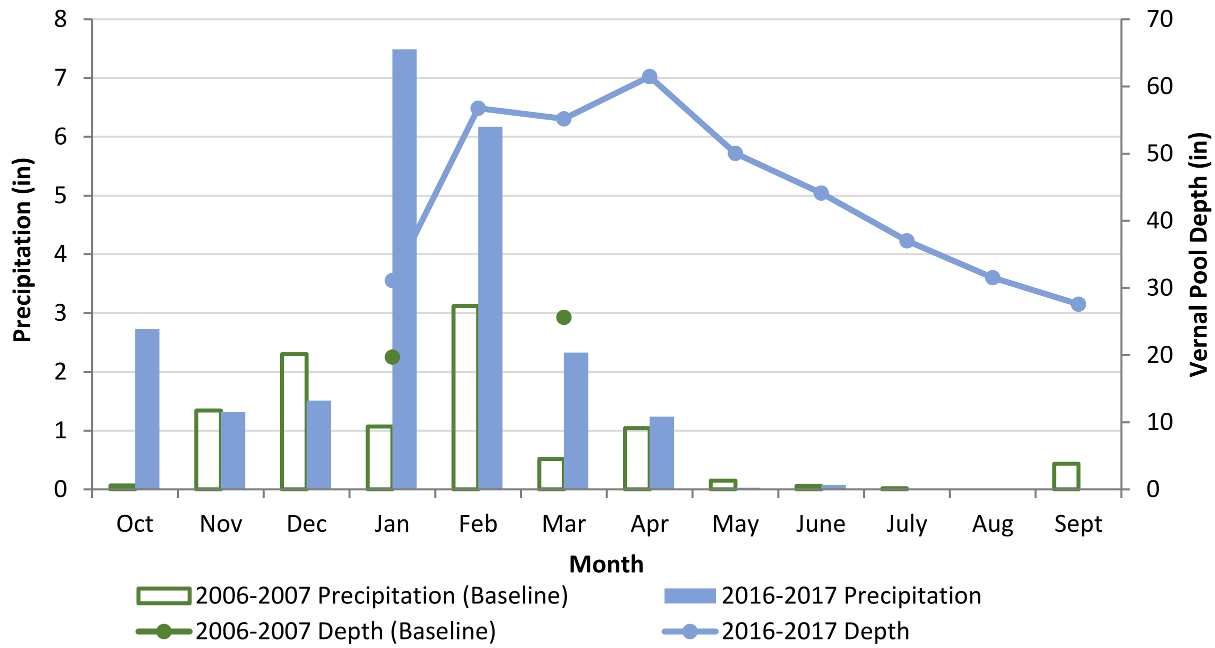

Figure 4-51. Monthly Depth and Precipitation at Pond 10 (Year 5) for 2016-2017 Water-Year Compared to Baseline 2006-2007 Water-Year

In below-normal precipitation years, Pond 10 is likely to range from 0-66 cm in depth with a maximum inundation of 0-2 acres. In normal precipitation years, Pond 10 is likely to have a maximum depth of approximately 100 cm and a maximum inundation of approximately 2-4 acres. In above-normal precipitation years, Pond 10 could have maximum depths of 156 cm or more and maximum inundation up to 6.2 acres (see Appendix F Table F-11). Figure 4-52 illustrates historic vernal pool depths by month and organized by water-year. Figure 4-53 illustrates historic and current inundation areas.

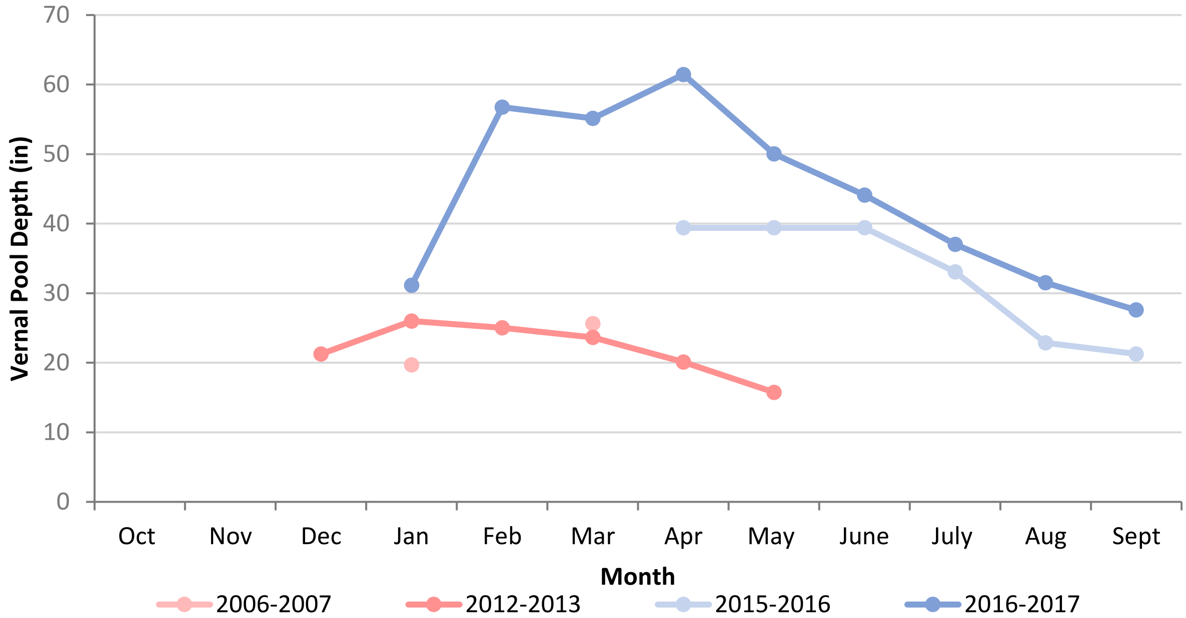

Figure 4-52. Historic Monthly Depths at Pond 10 (Year 5). Water-years are color coded in relation to 30-Year Normal (mean 1981-2010). Reds are cumulative water-years below-normal, greens are cumulative water-years within 2 inches of normal, blues are cumulative water-years above-normal.

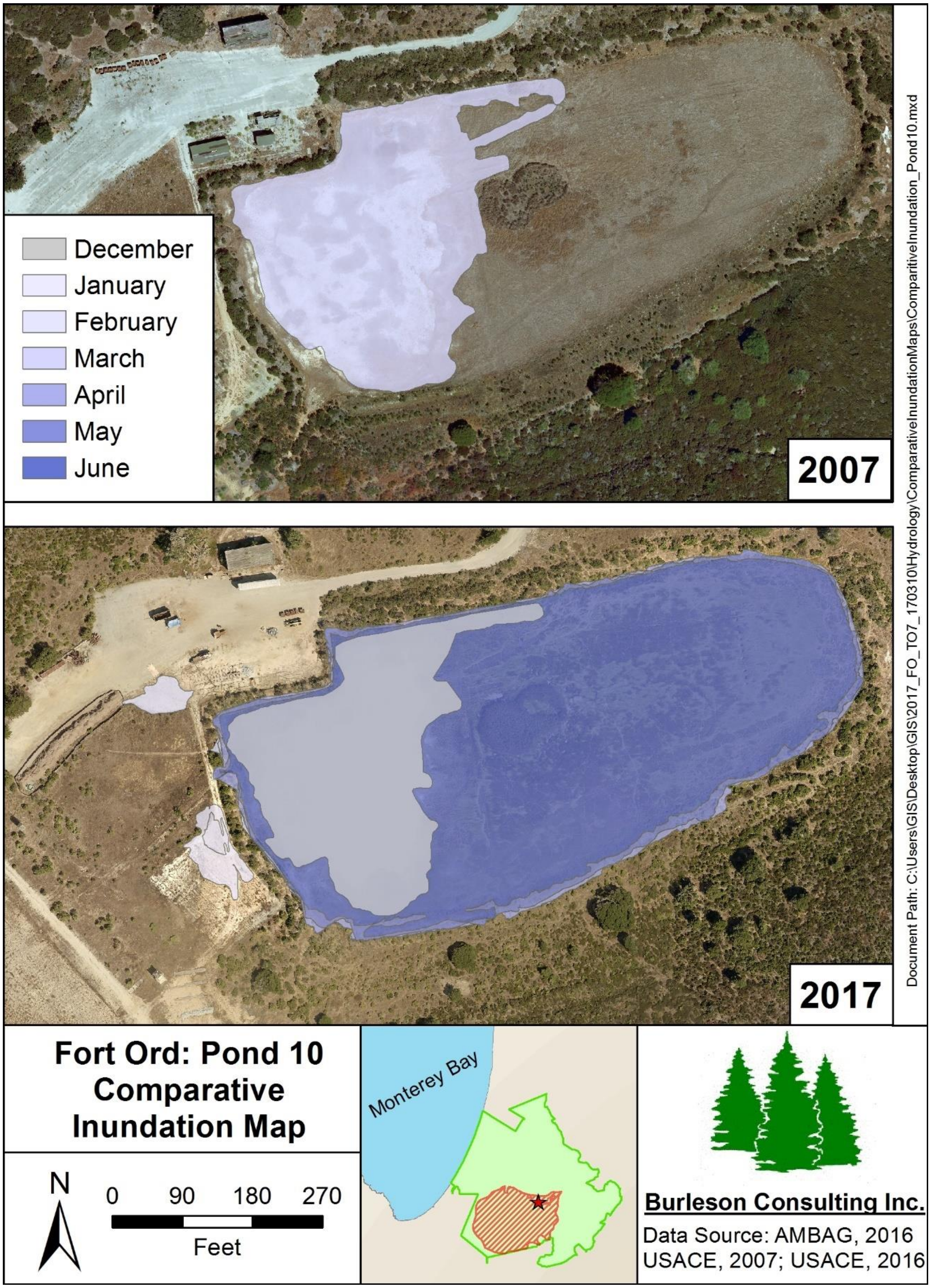

Figure 4-53. Pond 10 (Year 5) Inundations in 2006-2007 (below-normal precipitation) and 2016-2017 (above-normal precipitation). This vernal pool was remediated for lead and was in year 5 of monitoring in 2017.

4.11.1.1 Data Quality Objective 1

The average depth from the first monitoring event until the last monitoring event in September was 111 cm. Pond 10 met DQO 1, which requires an average of 25 cm of depth from the first rain event through March and 10 cm for 18 consecutive days through May. Pond 10 provided suitable depth for CTS (121 cm through March) and fairy shrimp (129 cm through May) habitat. DQO 1 was met in 2013 and 2014. DQO 1 was likely met in 2007 and 2016; however, although the depths recorded in 2007 met DQO 1, data collection in 2007 was only conducted in January and March and data collection in 2016 was only in April through June making assessment difficult. The DQO could not be assessed for 1997 since depths were not recorded.

4.11.1.2 Data Quality Objective 2

Pond 10 was inundated January through September with an inundation range of 5.71-6.21 acres and a mean of 5.99 acres. Pond 10 was not dry by the last recorded monitoring on September 6, 2017. Previous inundations at Pond 10 were in the expected range when precipitation was considered. The below-normal precipitation years (2007, 2013, 2014) had average inundations ranging from 1.25-3.30 acres. Additionally, the above-normal precipitation years (1997, 2016, 2017) had average inundations ranging from 4.3-5.99 acres, which were generally larger than those observed in the below-normal years (see Figure 4-51). Pond 10 met DQO 2 in 2017 since inundations were within ranges observed in previous years.

4.11.1.3 Performance Standard: Hydrological Conditions and Inundation Area

Pond 10 is a post-lead remediation vernal pool in year 5 of monitoring which met the performance standard in 2017. Although the 1996-1997, 2006-2007, 2012-2013, 2013-2014, and 2015-2016 water-years were variable, their inundation and depth conditions generally met DQOs 1 and 2.

4.11.2 Vegetation Monitoring

Vegetation data were collected at Pond 10 in 1997, 2007, 2016, and 2017 (HLA, 1997; Shaw, 2008; Burleson, 2017). In 1997, data were collected with six 100-foot transects in transitional and emergent habitats. In 2007, data were collected along a single 150-foot transect. In 1997 and 2007, 0.25 m^2 quadrats were placed at 10-foot intervals, alternating from the right to left side of the transect. Because these data were collected using different methodologies than were used in 2016 and 2017, the 1997 and 2007 data were combined in order to compare to 2016 and 2017. Data from 2016 and 2017 were collected using the same methodology and are compared stratum-to-stratum in Table 4-86 and Figure 4-54.

Table 4-86. Pond 10 (Year 5 Post-Lead Remediation) Vegetative Strata Percentage Within the Vernal Pool Basin Boundary

Stratum	Percentage	
	2016	2017
1	24%	24%
2	3%	3%
3	55%	59%
4	8%	5%
5	4%	2%
Upland	6%	7%

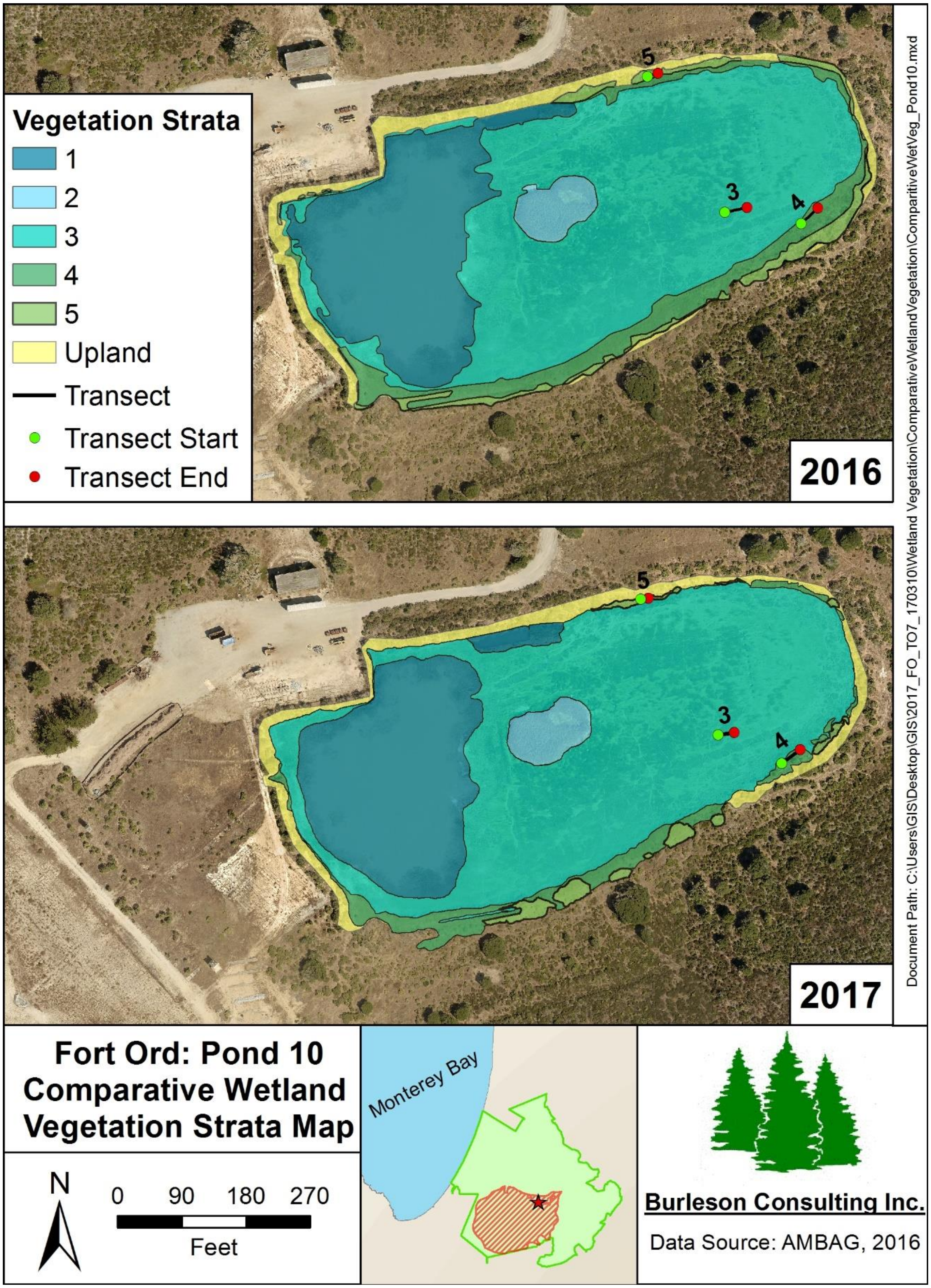

Figure 4-54. Pond 10 Vegetation Strata and Transects in 2016 and 2017

The absolute vegetative cover in 2017 was within the ranges observed in baseline years but lower than 2016 (see Table 4-87). The only year with very low vegetative cover was 2007. This was likely related to precipitation levels (see Figure 4-50). Very low precipitation levels likely precluded vegetative growth in areas that were inundated in 1997, 2016, and 2017, thereby creating significant bare areas and increasing thatch in 2007. Differing data collection methodologies may have increased the number of species on longer transects or may have decreased absolute percent vegetative cover when transects were not truly representative of the surrounding area. Vegetative cover at Pond 10 in 2017 was within the observed ranges at reference vernal pools (see Table 4-88).

Table 4-87. Pond 10 (Year 5 Post-Lead-Remediation) Absolute Percent Cover in 2017

Year	Vegetative Cover	Thatch/Bare Ground
1997	73.8%	22.6%
2007	26.4%	73.3%
2016	91.7%	8.5%
2017	66.6%	33.2%

Table 4-88. Pond 10 (Year 5 Post-Lead-Remediation) and Reference Vernal Pool Absolute Percent Cover in 2017

Vernal Pool	Vegetative Cover	Thatch/Bare Ground
5	60.5%	40.4%
101 East (West)	69.0%	30.5%
101 East (East)	83.7%	16.6%
997	57.3%	43.7%
10	**66.6%**	**33.2%**

Species richness decreased between 1997 and 2017. The discrepancy between years may have been artificially inflated by survey methodology differences. The 1997 transects were located in transitional and emergent vegetation zones, while in 2007 the single transect was stretched across the entire vernal pool. The 2016 and 2017 transects were placed in areas that were identified by homogenous species composition, and were generally shorter in length than previous surveys. Longer transects can increase species richness and cover. In 1997, 33 species were recorded on transects. In 2007, 18 plant species were recorded in the vernal pool basin, while six species were recorded on transects. In 2016, 66 species were recorded in the vernal pool basin, while 24 species were recorded on transects. In 2017, 62 species were recorded in the vernal pool basin, while 16 species were recorded on transects. The species richness at Pond 10 was very close to that observed at Pond 101 East (East) in 2017. Pond 101 East (East) had 59 species within the vernal pool basin boundary and 18 species recorded on the transects (see Appendix B).

Pond 10 species composition was variable from year to year. This variability was common among other remediated and reference pools. A complete comparison of species composition at Pond 10 in 1997, 2007, 2016, and 2017 can be found in Appendix H. Figure 4-55 shows a subset of this comparison for species observed with a 2% cover or greater. While species composition was variable, pale spike rush (*Eleocharis macrostachya*) was the dominant species in all years. Brown-headed rush (*Juncus phaeocephalus*) was second-most dominant in 2017. Composition variability could be an artifact of methodology differences between years.

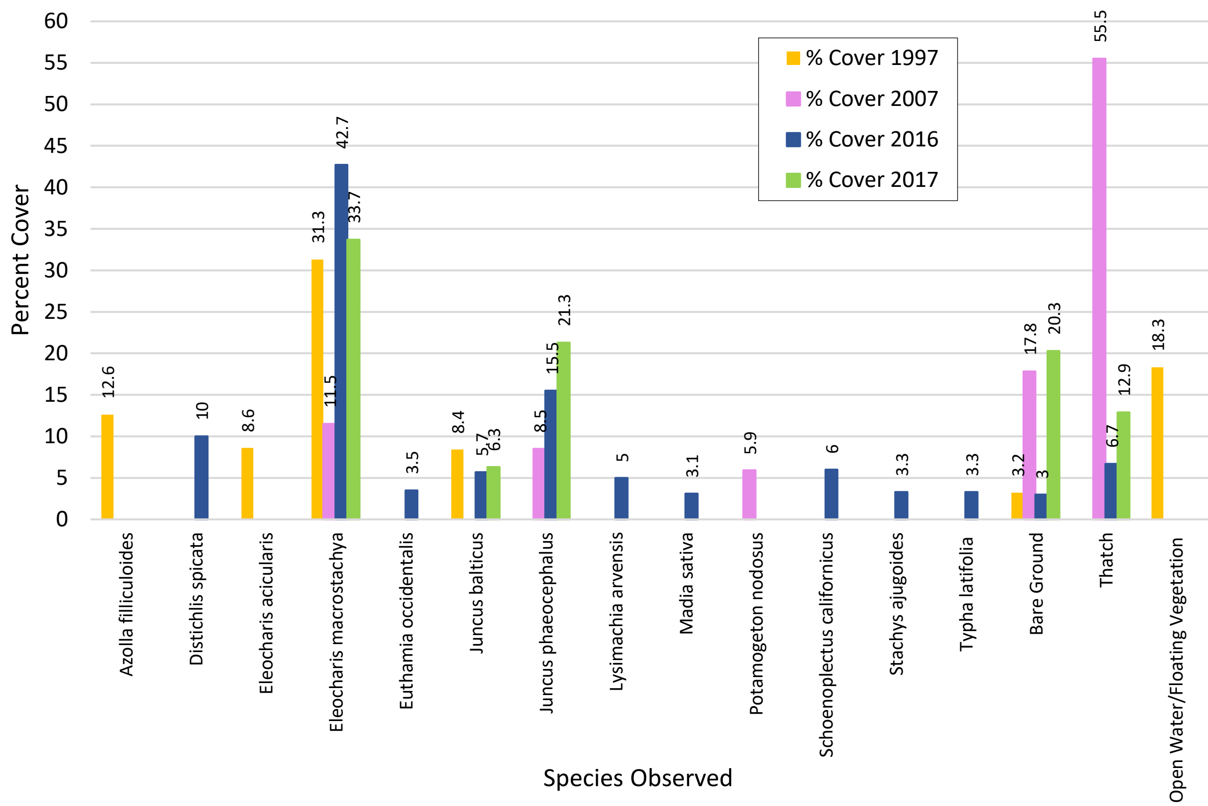

Figure 4-55. Percent Cover of Dominant Species at Pond 10 (Year 5 Post-Lead Remediation)

Native and non-native species richness values in Pond 10 decreased between 1997 and 2017 (see Table 4-89). The decrease was fairly proportionate between native and non-native species, and the species richness values were within the ranges observed at the reference vernal pools in 2017 (see Table 4-90). Pond 10 was closest to Pond 101 East (East) in the number of native and non-native species observed in 2017. Despite the differences in precipitation, throughout the years that Pond 10 was monitored the relative percent cover of native and non-native species remained at or above 90% for native species and at or below 10% for non-native species (see Table 4-91). The relative percent cover of native species at Pond 10 was higher than any of the other vernal pools (see Table 4-92).

Table 4-89. Pond 10 (Year 5 Post-Lead Remediation) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
1997	15	11	0
2007	5	1	0
2016	13	7	0
2017	11	4	1

Table 4-90. Pond 10 (Year 5 Post-Lead Remediation) and Reference Vernal Pool Native and Non-Native Species Richness in 2017

Vernal Pool	Native	Non-Native	Unidentified
5	15	11	3
101 East (West)	23	12	1
101 East (East)	13	5	0
997	16	11	0
10	**11**	**4**	**1**

Table 4-91. Pond 10 (Year 5 Post-Lead Remediation) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
1997	90.2%	9.8%	0.0%
2007	98.9%	1.1%	0.0%
2016	92.1%	7.9%	0.0%
2017	99.1%	0.8%	0.2%

Table 4-92. Pond 10 (Year 5 Post-Lead Remediation) and Reference Vernal Pool Relative Percent Cover of Native and Non-Native Plants in 2017

Vernal Pool	Native	Non-Native	Unidentified
5	86.6%	12.9%	0.6%
101 East (West)	70.3%	29.6%	0.1%
101 East (East)	68.2%	31.8%	0.0%
997	77.0%	23.0%	0.0%
10	**99.1%**	**0.8%**	**0.0%**

Wetland species richness in Pond 10 was variable and was highest in 1997 and lowest in 2007 (see Table 4-93). The 2017 wetland species richness was closest to the 2016 values. Non-wetland species richness was less variable. In 1997, 21 wetland plants and one non-wetland plant were observed on transects. In 2007, five wetland plants and one non-wetland plant were observed on transects. In 2016, 12 wetland plants and two non-wetland plants were observed on transects. In 2017, 13 wetland plants and two non-wetland plants were observed on transects. Pond 10 wetland species richness was comparable to values observed in the reference vernal pools (see Table 4-94). The relative percent covers of wetland and non-wetland species have remained within the ranges observed in previous years and reference pools (see Table 4-95 and Table 4-96).

Table 4-93. Pond 10 (Year 5 Post-Lead Remediation) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
1997	9	6	6	1	0	4
2007	3	1	1	1	0	0
2016	4	5	3	2	0	6
2017	7	4	2	2	0	1

Table 4-94. Pond 10 (Year 5 Post-Lead Remediation) and Reference Vernal Pool Wetland and Non-Wetland Species Richness in 2017

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	5	6	6	6	0	6
101 East (West)	8	11	5	7	0	5
101 East (East)	3	6	5	3	0	1
997	5	10	1	4	0	7
10	**7**	**4**	**2**	**2**	**0**	**1**

Table 4-95. Pond 10 (Year 5 Post-Lead Remediation) Relative Percent Cover of Wetland and Non-Wetland Species

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
1997	74.9%	16.1%	6.0%	0.1%	0.0%	2.8%
2007	67.0%	32.2%	0.4%	0.4%	0.0%	0.0%
2016	53.2%	25.2%	15.0%	0.4%	0.0%	6.1%
2017	56.0%	41.7%	1.8%	0.3%	0.0%	0.2%

Table 4-96. Pond 10 (Year 5 Post-Lead Remediation) and Reference Vernal Pool Relative Percent Cover of Wetland and Non-Wetland Species in 2017

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	26.3%	22.6%	40.3%	10.0%	0.0%	0.8%
101 East (East)	55.1%	25.7%	8.1%	9.0%	0.0%	0.0%
101 East (West)	8.2%	54.3%	14.9%	22.6%	0.0%	0.1%
997	19.3%	50.7%	2.0%	15.0%	0.0%	13.0%
10	**56.0%**	**41.7%**	**1.8%**	**0.3%**	**0.0%**	**0.2%**

4.11.2.1 Data Quality Objective 3

As a post-remediation vernal pool in year 5 of monitoring, Pond 10 monitoring is complete. Pond 10 meets DQO 3, since it supports a dominance of native plant species and substantial wetland plant species. The hydrophytic vegetation composition has remained close to 1997 baseline conditions and is within the ranges observed at reference vernal pools.

4.11.2.2 Performance Standard: Plant Cover and Species Diversity

Pond 10 is a post-lead remediation vernal pool in year 5 of monitoring in 2017. Pond 10 achieved the performance standard because the species richness and relative abundance of native wetland species were within the ranges observed at other remediated vernal pools.

4.11.3 Wildlife Monitoring

Pond 10 received lead remediation in 2012. Wildlife data were collected in 1992 and 2007 prior to soil remediation activities (Jones and Stokes, 1992; Shaw, 2008). Fairy shrimp were not detected. CTS larvae were detected but not quantified in 1992, and were abundant in 2007 (>101 individuals).

Post-remediation monitoring was conducted in 2013, 2014, 2016, and 2017 (Tetra Tech, 2014; Tetra Tech, 2015; Burleson, 2017). In 2013, the number of CTS larvae captured ranged from 59 to 421 over three surveys. In 2014, the number of CTS larvae captured ranged from 0 to 4 over three surveys. The difference in CTS larvae captured was likely due to a change in methodology. In 2014, biologists were not allowed to enter the vernal pool due to UXO safety concerns, while every other year the pond was entered. In 2016, the number of CTS larvae ranged from 29 to greater than 101 over three monitoring events. Table 4-97 shows historic wildlife monitoring results. In 2017, 37 CTS larvae were observed while no fairy shrimp were detected.

Table 4-97. Pond 10 (Year 5 Post-Lead Remediation) Historic Wildlife Monitoring Results

Sampling Year	Monitoring Year	CTS Larvae Abundance (# Individuals)	Fairy Shrimp Abundance (# Individuals)
1992	Baseline	Present	0
2007	Baseline	>101	Moderate abundance
2013	Year 1	59-421	0
2014	Year 2	0-4*	
2016	Year 4	29->101	0
2017	Year 5	37	0

*Biologists surveyed for CTS from the edge of Pond 10 in 2014

4.11.3.1 Data Quality Objective 1

Pond 10 provided sufficient depth for CTS and fairy shrimp habitat and met DQO 1 as discussed in Section 4.11.1.1.

4.11.3.2 Data Quality Objective 4

DQO 4 was met. CTS were present in 2017 at Pond 10; therefore, the water quality was adequate. In comparison to other vernal pools and through time, the water quality data were within normal ranges. The pH ranged from 6.74 in March to 7.45 in January with a mean of 7.01. Temperature ranged from 9.3° C in January to 20.1° C in June with a mean of 14.8° C. Dissolved oxygen ranged from 2.77 mg/L in

January to 4.64 mg/L in March with a mean of 3.81 mg/L. Turbidity ranged from 27.4 FNU in June to 262.0 FNU in January with a mean of 106.2 FNU.

4.11.3.3 Data Quality Objective 5

DQO 5 was partially met. CTS were present in 2017, which was consistent with previous monitoring. CTS were present in 1992, 2007, 2013, 2014, 2016, and 2017. Though some water years were above-normal precipitation, and some were below-normal, all years provided sufficient depth and inundation for CTS (see Figures 4-32 and 4-33).

Fairy shrimp were not detected in 2017. Historically, fairy shrimp were not detected in baseline year 1992, but were detected in baseline year 2007. Although fairy shrimp were not detected in 2017, it was possible that the timing of monitoring was too late to detect fairy shrimp. Previous detections of fairy shrimp were recorded in January through March, while monitoring in 2017 was conducted March through May. Wildlife monitoring begins in March to avoid disturbance to potential CTS eggs.

4.11.3.4 Performance Standard: Wildlife Usage

Pond 10 is a post-lead remediation vernal pool and was in year 5 of monitoring. Pond 10 achieved the performance standard since DQOs 1 and 4 were met while DQO 5 was partially met. If fairy shrimp presence is required with more certainty, Burleson recommends that surveys be conducted following the USFWS protocol.

4.11.4 Conclusion

Pond 10 is a post-lead remediation vernal pool and was in year 5 of monitoring in 2017. Pond 10 met all post-remediation performance standards except DQO 5 (see Table 4-98).

Table 4-98. Success at Pond 10 (Year 5 Post-Lead Remediation) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Hydrological Conditions & Inundation Area	DQO 1	Yes
	DQO 2	Yes
Plant Cover & Species Diversity	DQO 3	Yes
Wildlife Usage	DQO 1	Yes
	DQO 4	Yes
	DQO 5	Partial

4.12 Pond 30A - Year 5

Pond 30A is a post-fire-retardant remediation vernal pool in year 5 of monitoring. During the prescribed burn of Unit 7 in the fall of 2013, an emergency application of fire retardant occurred within 300 feet of Pond 30. Thus, Pond 30 became a post-fire-retardant remediation vernal pool and is evaluated for DQO 4 (water quality) only as described in the 2017 Reinitiated Programmatic BO (USFWS, 2017). Pond 30 can be separated into three different water bodies: Pond 30A which is the largest pool, and Ponds 30B and 30C which are distinguished by the abrupt elevation change where excavation occurred. These three vernal pools are hydrologically connected at times. Table 4-99 summarizes monitoring years and survey type(s) conducted. The cumulative precipitation graph shows the precipitation for Pond 30A monitoring years (see Figure 4-56). The only water-years above-normal were 2015-2016 and 2016-2017.

All other monitoring was conducted in below-normal water-years, drought years, or consecutive drought years.

Table 4-99. Pond 30A (Year 5 Post-Fire-Retardant) Summary of Historic Surveys for Hydrology

Survey	Water-Year							
	1998-1999	2006-2007	2009-2010	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
Hydrology	●	●	●	●	●	●	●	●

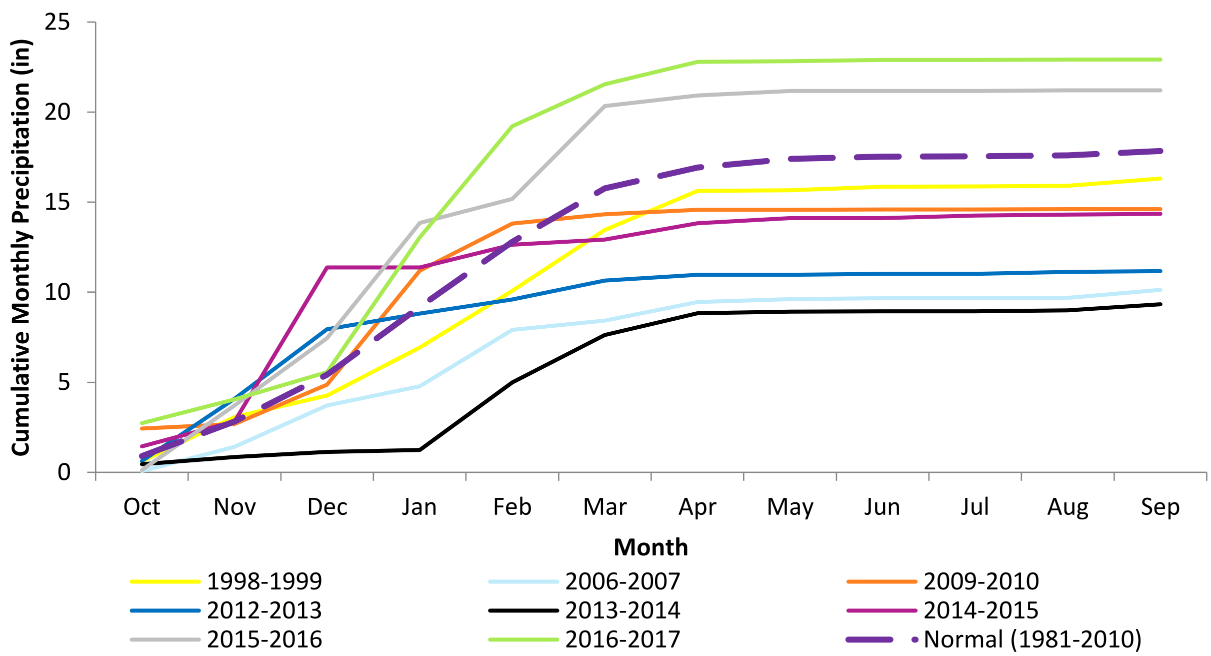

Figure 4-56. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 30A Compared to the 30-Year Normal (mean 1981-2010) (NPS, 2017; NCDC NOAA, 2017)

4.12.1 Hydrology Monitoring

The 2017 maximum inundation for Pond 30 (as a complex of Ponds 30A, 30B, and 30C) was 1.12 acres and maximum depth for Pond 30A was 86 cm. This was within the historic inundation range but much higher than the historic depth. This could be explained by a difference in methodology. Methodology for maximum depth in 1998-1999 was to wade into the vernal pool and estimate the deepest point. It is possible that the deepest point was not accurately reported. In contrast, the 2016-2017 methodology for maximum depth was to measure the value from a permanent staff gage. Figure 4-57 illustrates the relationship of precipitation and depth at Pond 30A for 2017 as well as baseline in 1999.

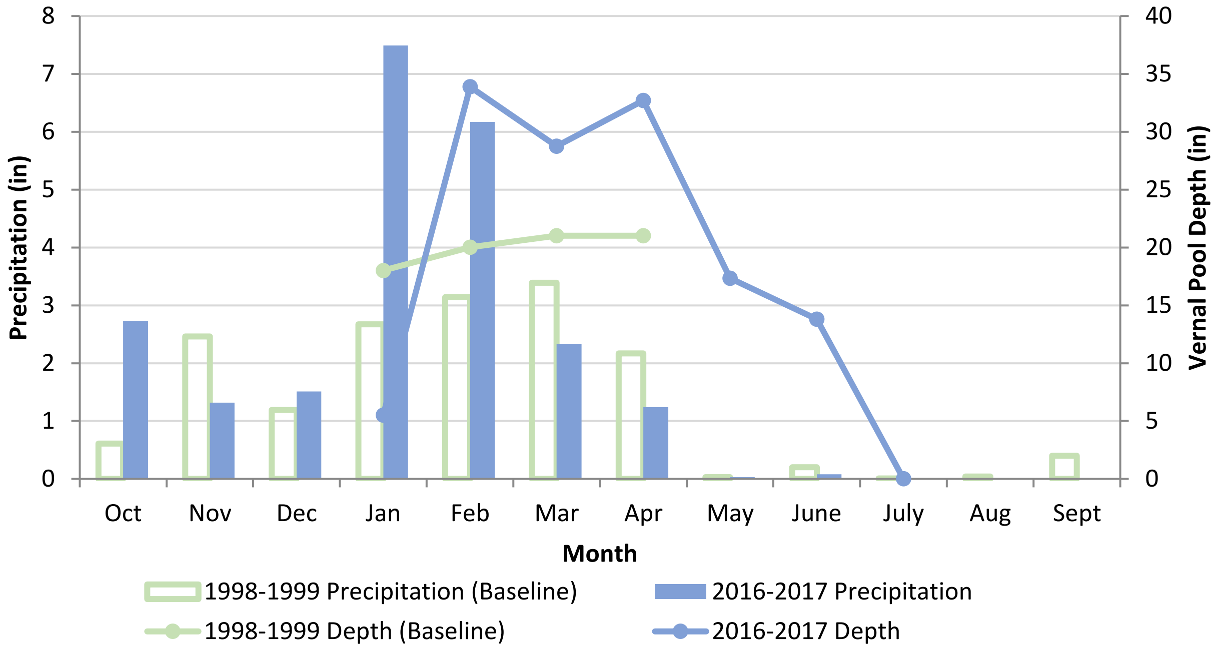

Figure 4-57. Monthly Depth and Precipitation at Pond 30A (Year 5) for 2016-2017 Water-Year Compared to Baseline 1998-1999 Water-Year

In below-normal precipitation years Pond 30A is likely to remain dry. In a normal water-year, Pond 30A is likely to range from 45.7-53.3 cm in depth with a maximum inundation of 3.57 acres (see Appendix F Tables F-12 – F-14). Figure 4-58 illustrates historic vernal pool depths by month and organized by water-year. Figure 4-59 illustrates historic and current inundation areas.

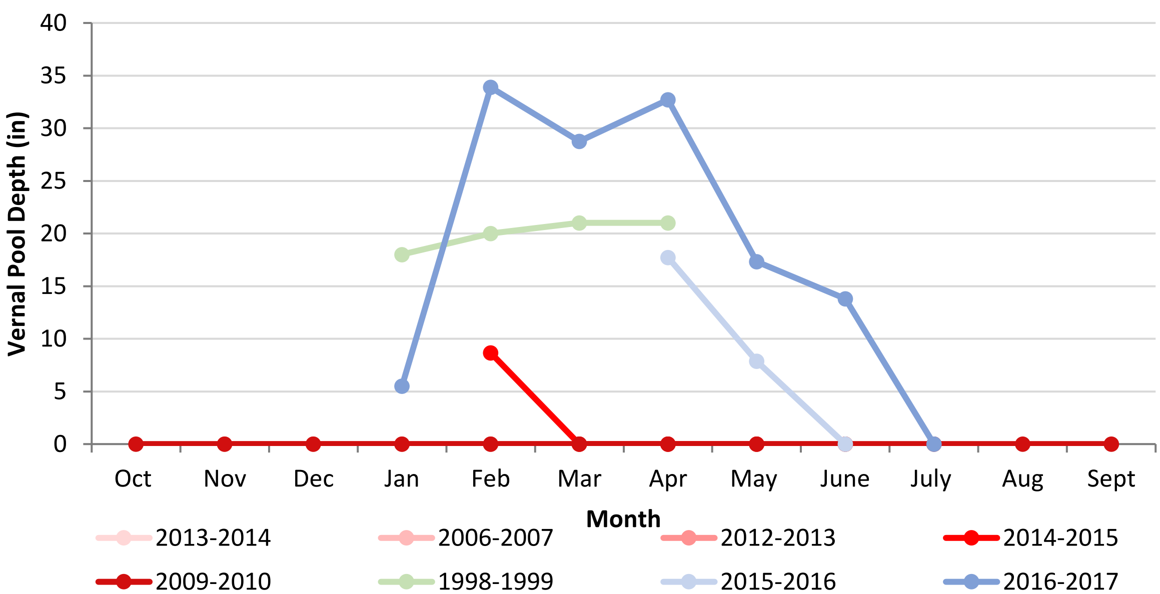

Figure 4-58. Historic Monthly Depths at Pond 30A (Year 5). Water-years are color coded in relation to 30-Year Normal (mean 1981-2010). Reds are cumulative water-years below-normal, greens are cumulative water-years within 2 inches of normal, blues are cumulative water-years above-normal. The pond was dry for 2006-2007, 2012-2013, and 2013-2014 therefore depths do not appear on the graph.

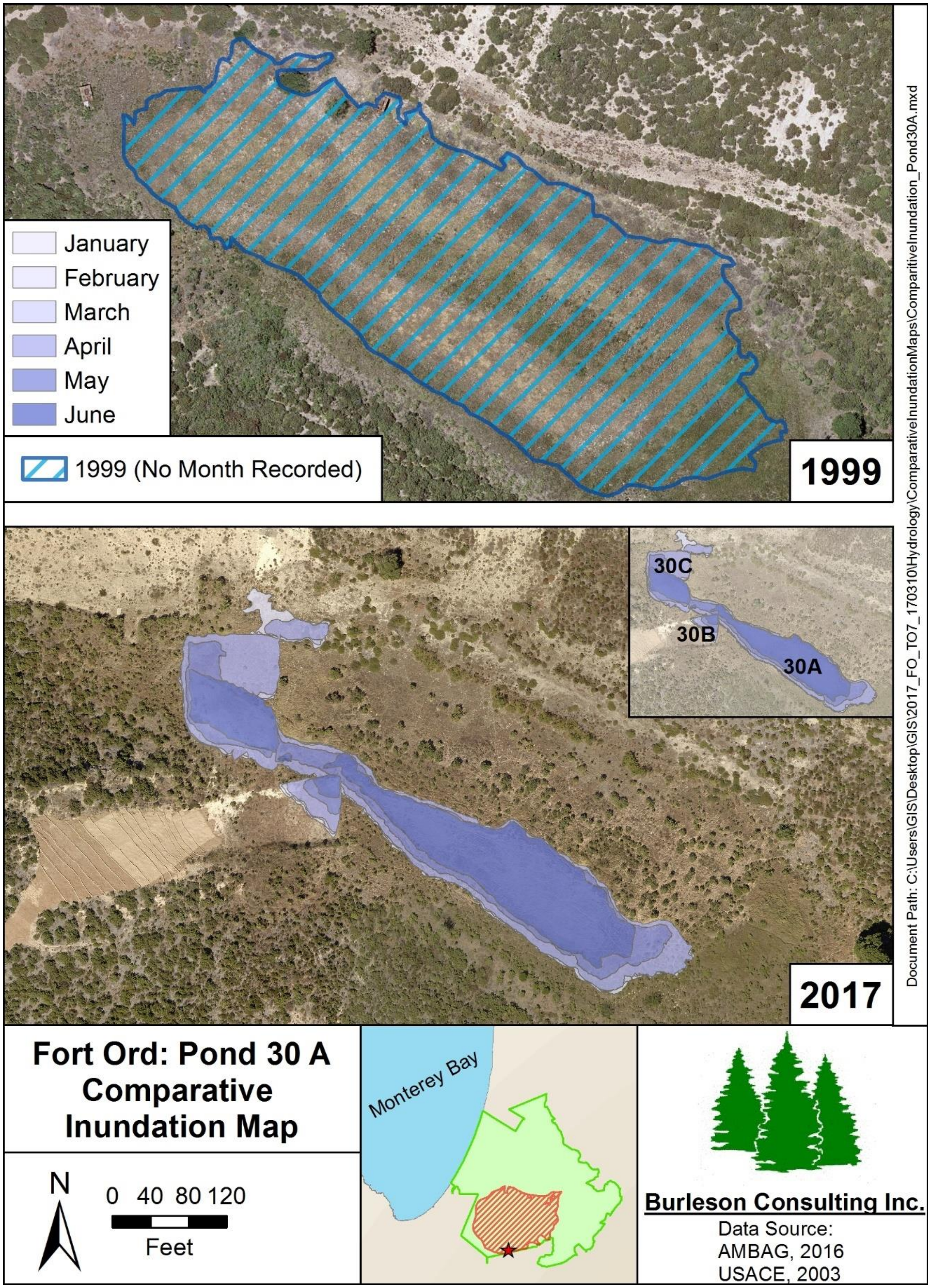

Figure 4-59. Pond 30A (Year 5) Inundations in 1998-1999 (normal precipitation) and 2016-2017 (above-normal precipitation). This vernal pool is in year 5 of water quality monitoring due to fire retardant application within 300 ft. of the vernal pool in 2013.

4.12.1.1 Data Quality Objective 1

Pond 30A was not evaluated for DQO 1 as this vernal pool is only required to meet DQO 4 for water quality.

4.12.1.2 Data Quality Objective 2

Pond 30A was not evaluated for DQO 2 as this vernal pool is only required to meet DQO 4 for water quality.

4.12.1.3 Performance Standard: Hydrological Conditions and Inundation Area

Pond 30A was not required to meet the performance standard for hydrological conditions and inundation are as it is only required to meet DQOs for water quality.

4.12.2 Wildlife Monitoring

Pond 30A was not monitored for CTS and fairy shrimp in 2017. However, DQO 4 was evaluated because this DQO is based on water quality which were measured in 2017.

4.12.2.1 Data Quality Objective 1

Pond 30A was not evaluated for DQO 1 as this vernal pool is only required to meet DQO 4 for water quality.

4.12.2.2 Data Quality Objective 4

CTS presence in 2017 is unknown; however, water quality was adequate. Compared to other vernal pools and through time, the water quality data was within normal ranges. The pH ranged from 6.22 in January to 6.93 in May with a mean of 6.59. Temperature ranged from 11.3° C in February to 21.9° C in June with a mean of 15.8° C. Dissolved oxygen ranged from 1.5 mg/L in March to 7.68 mg/L in June with a mean of 4.11 mg/L. Turbidity ranged from 9.7 FNU in April to 150.0 FNU in March with a mean of 50.3 FNU.

4.12.2.3 Performance Standard: Wildlife Usage

Pond 30A is a post-fire-retardant remediation vernal pool in year 5 of monitoring. According to the requirement of the Wetland Plan, it is unknown whether it met DQO 4 because wildlife monitoring was not conducted in 2017, and therefore Pond 30A wildlife performance standards cannot be fully assessed. However, according to the Programmatic BO, the only required parameter to measure following fire-retardant use is water quality (USFWS, 2017). With this considerations in mind, Pond 30A has met the performance standard for water quality only.

4.12.3 Conclusion

Pond 30A is a post-fire-retardant remediation vernal pool in year 5 of monitoring. Pond 30A achieved the wildlife usage standard for water quality (see Table 4-100).

Table 4-100. Success at Pond 30A (Year 5 Post-Fire-Retardant) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Hydrological Conditions & Inundation Area	DQO 1	N/A*
	DQO 2	N/A*
Plant Cover & Species Diversity	DQO 3	N/A*
Wildlife Usage	DQO 1	N/A*
	DQO 4	Yes**
	DQO 5	N/A*

*Not applicable, only water quality results are required for evaluation
**Met water quality standards with consideration of Programmatic BO requirements

4.13 Pond 30B - Year 5

Pond 30B is a post-fire-retardant remediation vernal pool in year 5 of monitoring. Ponds 30B and 30C were created in 2011 when lead remediation activities at HA 28 resulted in soil excavation. During the prescribed burn of Unit 7 in the fall of 2013, an emergency application of fire retardant occurred within 300 feet of Pond 30. Pond 30 can be separated into three different water bodies: Pond 30A which is the largest pool, and Ponds 30B and 30C which are distinguished by the abrupt elevation change where excavation occurred. These three vernal pools are hydrologically connected at times. Table 4-101 summarizes the years of monitoring and which survey(s) were conducted. The cumulative precipitation graph illustrates precipitation for monitoring years at Pond 30B (see Figure 4-63). The only water-years above-normal were 2015-2016 and 2016-2017. All other monitoring was conducted in a below-normal water-year, drought year, or consecutive drought year.

Table 4-101. Pond 30B (Year 5 Post-Fire-Retardant) Summary of Historic Surveys for Hydrology Surveys

Survey	Water-Year				
	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
Hydrology	●	●	●	●	●

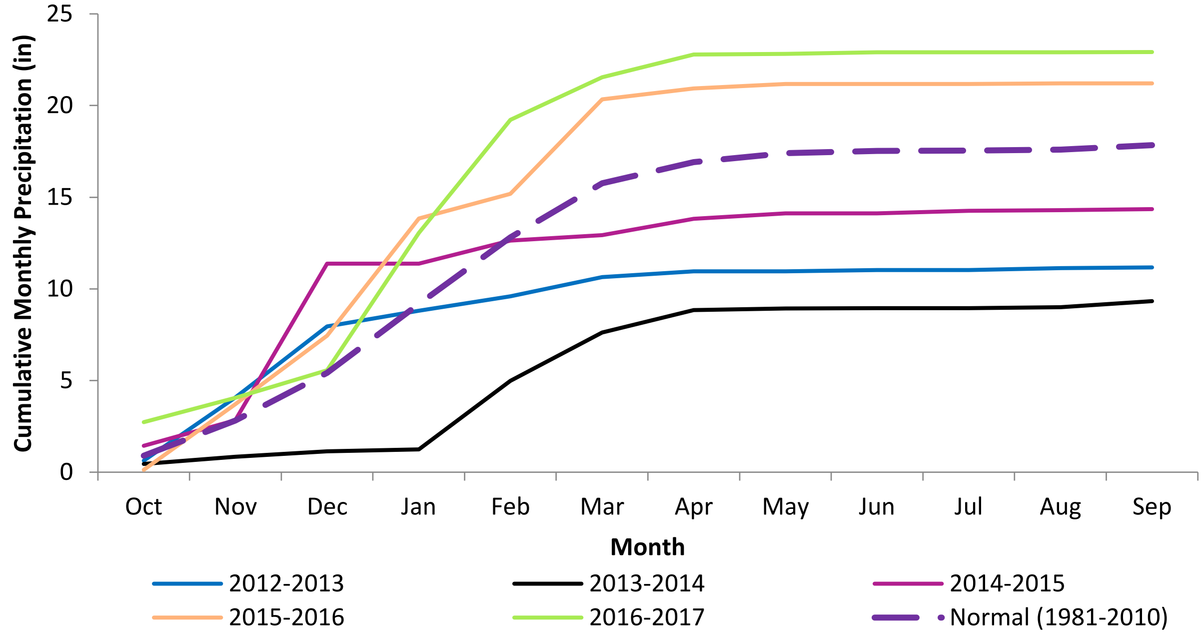

Figure 4-60. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 30B Compared to the 30-Year Normal (mean 1981-2010) (NPS, 2017; NCDC NOAA, 2017)

4.13.1 Hydrology Monitoring

The maximum 2017 inundation for Pond 30 (as a complex of Ponds 30A, 30B, and 30C) was 1.07 acres and the maximum depth for Pond 30B was 81 cm. Pond 30B was separate from Pond 30A by June and had an inundation 0.012 acres and depth of 18 cm. These values exceeded historic maxima. Figure 4-61 illustrates the relationship of precipitation and depth at Pond 30B for 2017 as well as baseline in 2013.

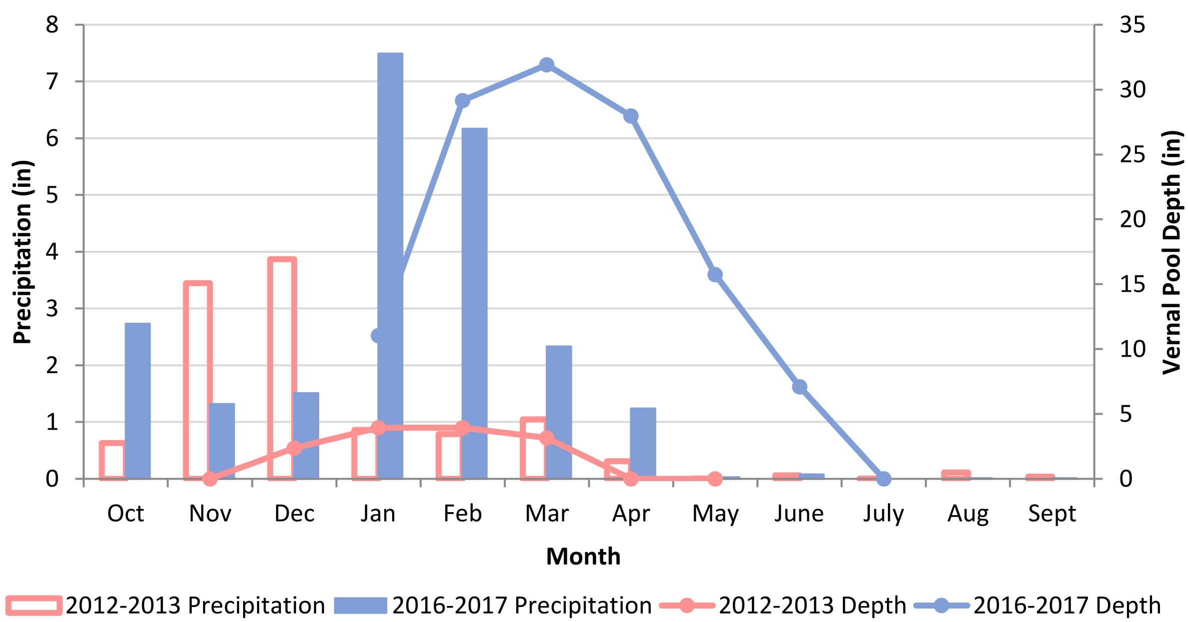

Figure 4-61. Monthly Depth and Precipitation at Pond 30B (Year 5) for 2016-2017 Water-Year Compared to Baseline 2012-2013 Water-Year

In below-normal precipitation years, Pond 30B had approximate 0-10 cm of water and maximum inundation of 0.01 acre. In an above-normal water-year, Pond 30B had depth range from 6-25 cm, but above 25 cm was connected and measured as a part of Pond 30A (see Appendix F Tables F-12 – F-14). Figure 4-62 illustrates historic vernal pool depths by month and organized by water-year. Figure 4-63 illustrates historic and current inundation areas.

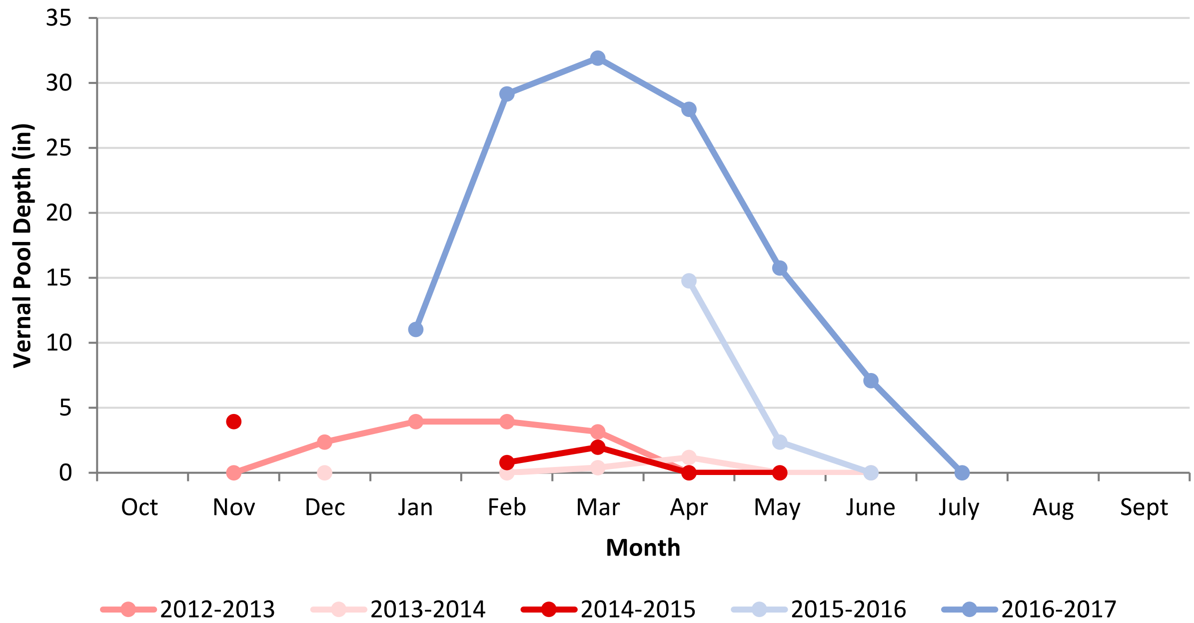

Figure 4-62. Historic Monthly Depths at Pond 30B (Year 5). Water-years are color coded in relation to 30-Year Normal (mean 1981-2010). Reds are cumulative water-years below-normal, greens are cumulative water-years within 2 inches of normal, blues are cumulative water-years above-normal.

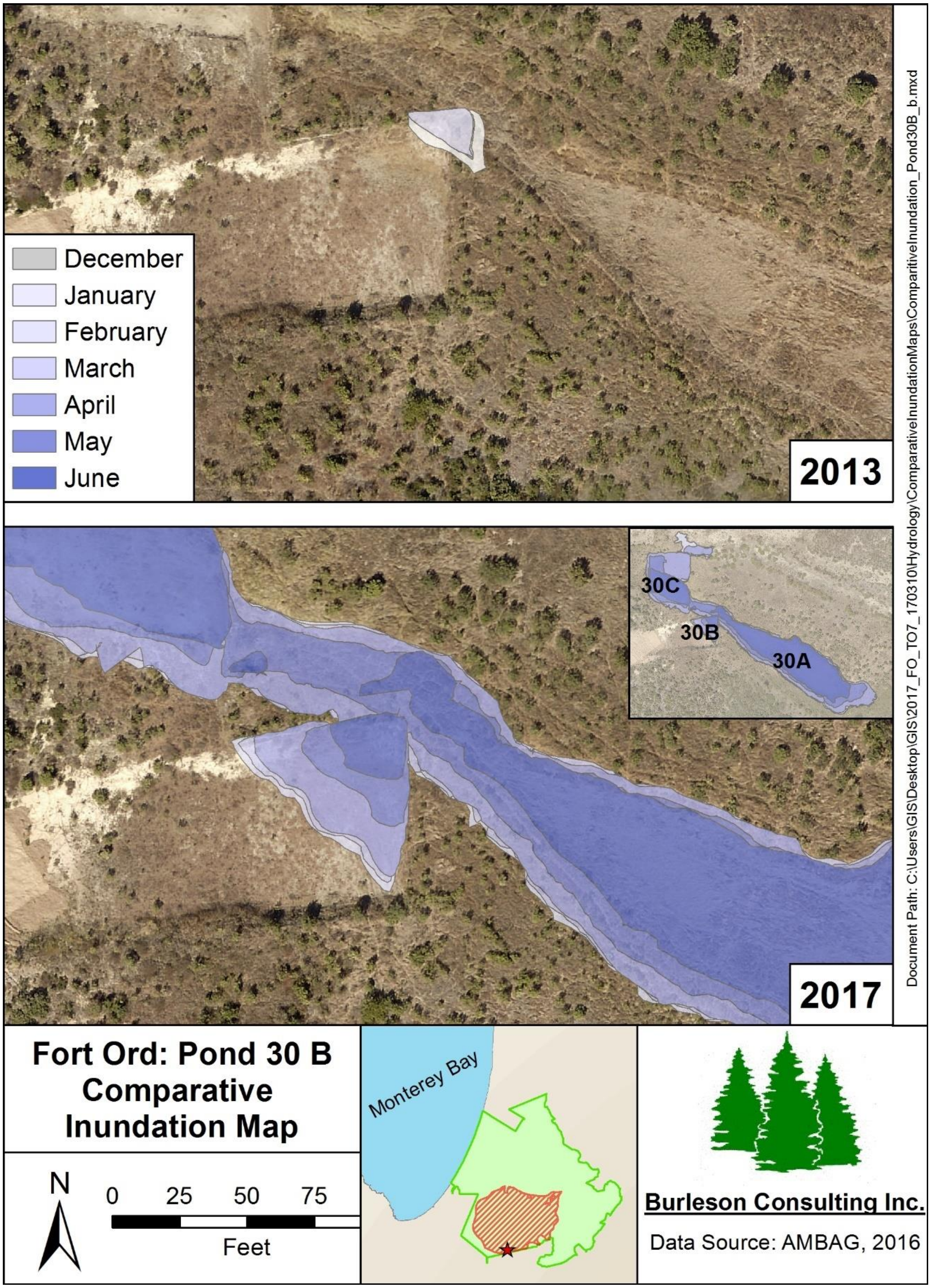

Figure 4-63. Pond 30B (Year 5) Inundations in 2012-2013 (below-normal precipitation) and 2016-2017 (above-normal precipitation). This vernal pool received fire-retardant application in 2013 and is in year 5 of monitoring.

4.13.1.1 Data Quality Objective 1

Pond 30B was not evaluated for DQO 1 as this vernal pool is only required to meet DQO 4 for water quality.

4.13.1.2 Data Quality Objective 2

Pond 30B was not evaluated for DQO 2 as this vernal pool is only required to meet DQO 4 for water quality.

4.13.1.3 Performance Standard: Hydrological Conditions and Inundation Area

Pond 30B was not required to meet the performance standard for hydrological conditions and inundation are as it is only required to meet DQOs for water quality.

4.13.2 Wildlife Monitoring

Pond 30B was not monitored for CTS and fairy shrimp in 2017. However, DQO 4 was evaluated because this DQO is based on water quality which were measured in 2017.

4.13.2.1 Data Quality Objective 1

Pond 30B was not evaluated for DQO 1 as this vernal pool is only required to meet DQO 4 for water quality.

4.13.2.2 Data Quality Objective 4

CTS presence in 2017 is unknown. However, the water quality was adequate for the presence of CTS. The pH ranged from 6.33 in March to 7.24 in June with a mean of 6.59. Temperature ranged from 7.4° C in January to 22.3° C in June with a mean of 13.0° C. Dissolved oxygen ranged from 1.91 mg/L in March (reading on March 1) to 4.8 mg/L in March (reading on March 20) with a mean of 3.24 mg/L. Turbidity ranged from 15.9 FNU in April to 171.0 FNU in January with a mean of 60.9 FNU.

4.13.2.3 Performance Standard: Wildlife Usage

Pond 30B is a post-fire-retardant remediation vernal pool in year 5 of monitoring. According to the requirement of the Wetland Plan it is unknown whether it met DQO 4 because wildlife monitoring was not conducted in 2017, and therefore Pond 30B wildlife performance standards cannot be fully assessed. However, according to the Programmatic BO, the only required parameter to measure following fire-retardant use is water quality (USFWS, 2017). With this considerations in mind, Pond 30B has met the performance standard for water quality only.

4.13.3 Conclusion

Pond 30B is a post-fire-retardant remediation vernal pool in year 5 of monitoring. Pond 30B achieved the wildlife usage standard for water quality (see Table 4-102).

Table 4-102. Success at Pond 30B (Year 5 Post-Fire-Retardant) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Hydrological Conditions & Inundation Area	DQO 1	N/A*
	DQO 2	N/A*
Plant Cover & Species Diversity	DQO 3	N/A*
Wildlife Usage	DQO 1	N/A*
	DQO 4	Yes**
	DQO 5	N/A*

*Not applicable, only water quality results are required for evaluation
**Met water quality standards with consideration of Programmatic BO requirements

4.14 Pond 30C - Year 5

Pond 30C is a post-fire-retardant remediation vernal pool in year 5 of monitoring in 2017. Ponds 30B and 30C were created in 2011 when lead remediation activities at HA 28 resulted in soil excavation. During the prescribed burn of Unit 7 in the fall of 2013, there was an emergency application of fire retardant within 300 feet of Pond 30. Pond 30 can be separated into three different water bodies: Pond 30A which is the largest pool, and Ponds 30B and 30C which are distinguished by the abrupt elevation change where excavation occurred. These three vernal pools are hydrologically connected at times. Table 4-103 summarizes the monitoring years and associated survey(s). The cumulative precipitation graph shows the precipitation for Pond 30C monitoring years (see Figure 4-64). The only water-years above-normal were 2015-2016 and 2016-2017. All other monitoring was conducted in a below-normal water-year, drought year, or consecutive drought year.

Table 4-103. Pond 30C (Year 5 Post-Fire-Retardant) Summary of Historic Surveys for Hydrology

Survey	Water-Year				
	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
Hydrology	●	●	●	●	●

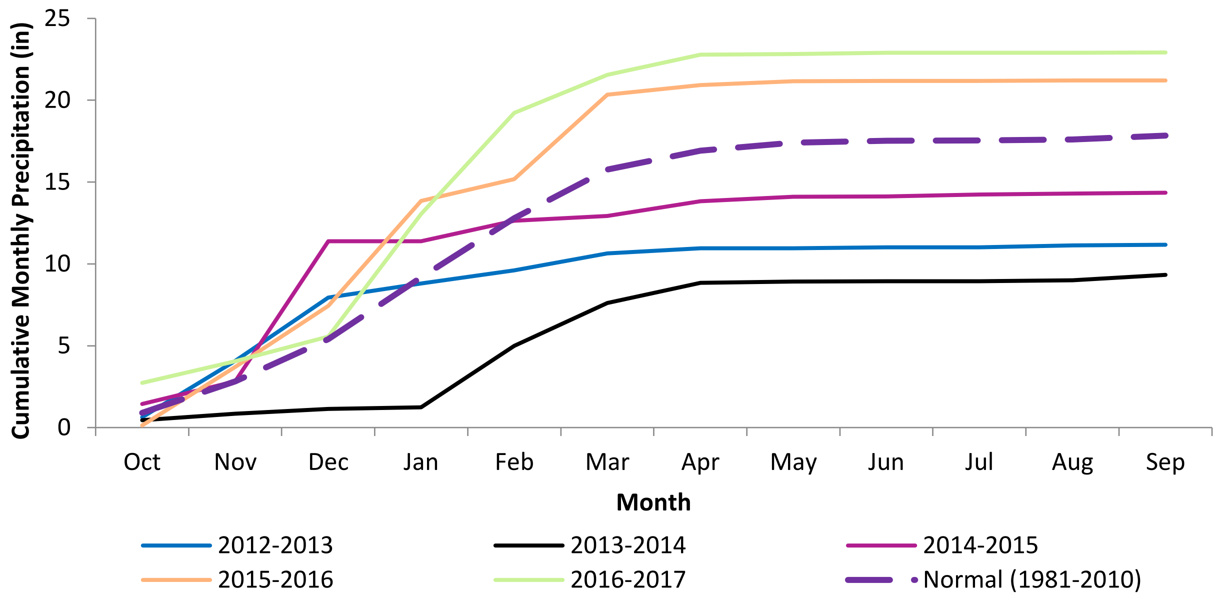

Figure 4-64. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 30C Compared to the 30-Year Normal (mean 1981-2010) (NPS, 2017; NCDC NOAA, 2017)

4.14.1 Hydrology Monitoring

The 2017 maximum inundation for Pond 30 (as a complex of Ponds 30A, 30B, and 30C) was 1.12 acres and the maximum depth for Pond 30C was 75 cm. These values exceeded historic maxima. Figure 4-65 illustrates the relationship of precipitation and depth at Pond 30A for 2017 as well as baseline in 2013.

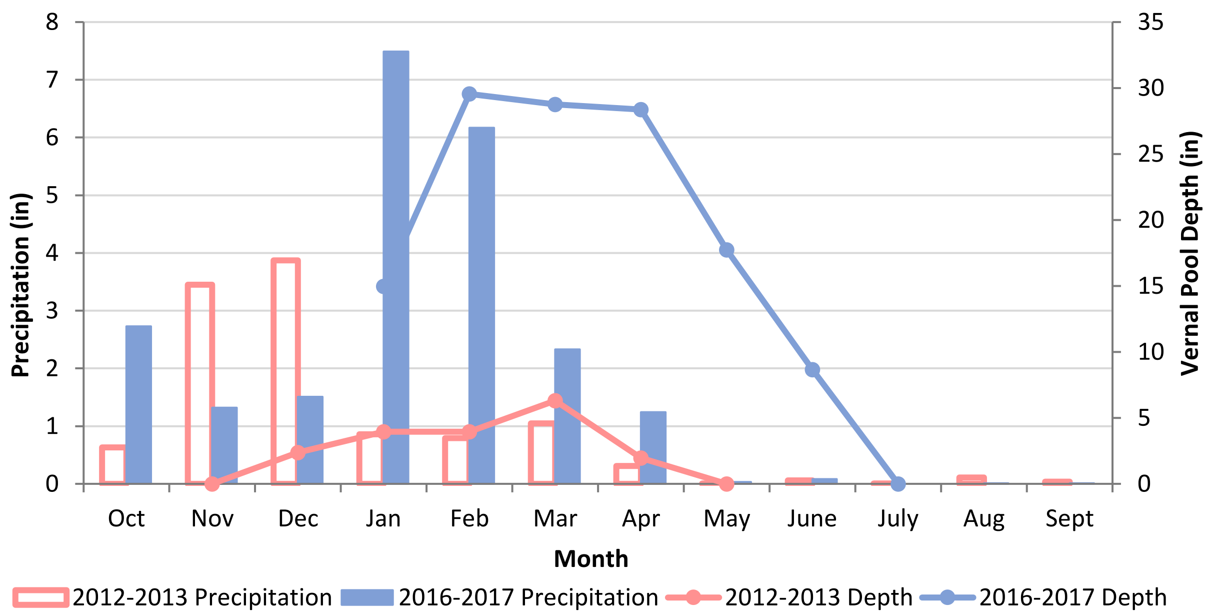

Figure 4-65. Monthly Depth and Precipitation at Pond 30C (Year 5) for 2016-2017 Water-Year Compared to Baseline 2012-2013 Water-Year

In below-normal precipitation years Pond 30C had approximately 0-16 cm of water and maximum inundations of 0.01 acre. In an above-normal water-year, Pond 30C had a depth range from 15-28 cm with a maximum inundation of 1.29 acres (see Appendix F Table F-12 – F-14). Figure 4-66 illustrates historic vernal pool depths by month and organized by water-year. Figure 4-67 illustrates historic and current inundation areas.

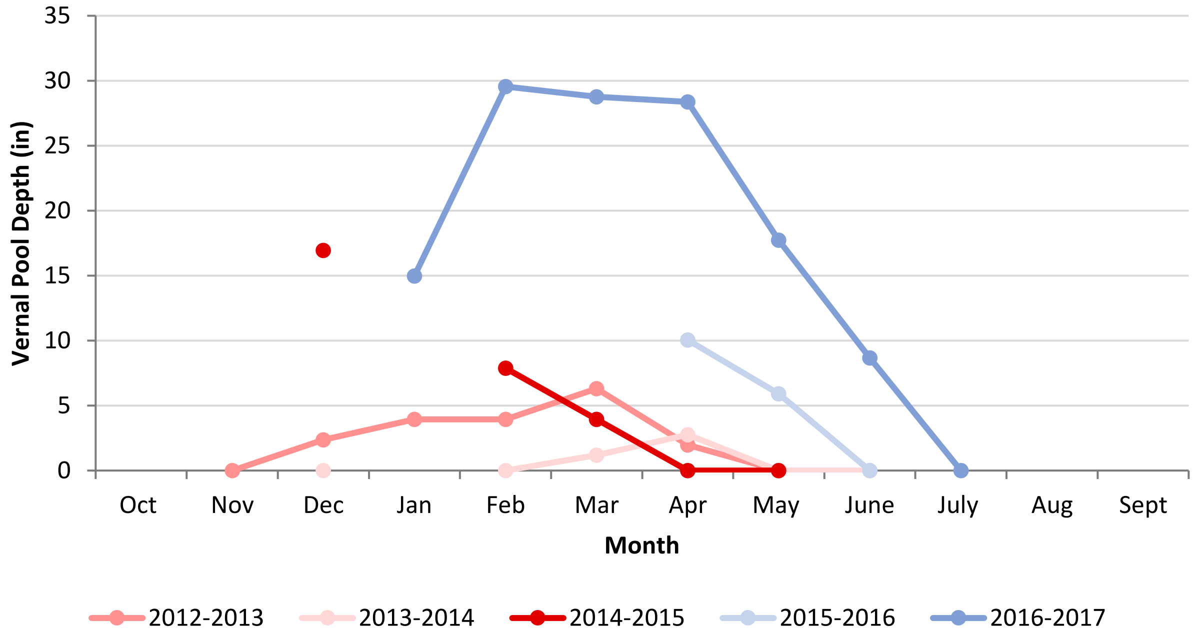

Figure 4-66. Historic Monthly Depths at Pond 30C (Year 5). Water-years are color coded in relation to 30-Year Normal (mean 1981-2010). Reds are cumulative water-years below-normal, greens are cumulative water-years within 2 inches of normal, blues are cumulative water-years above-normal.

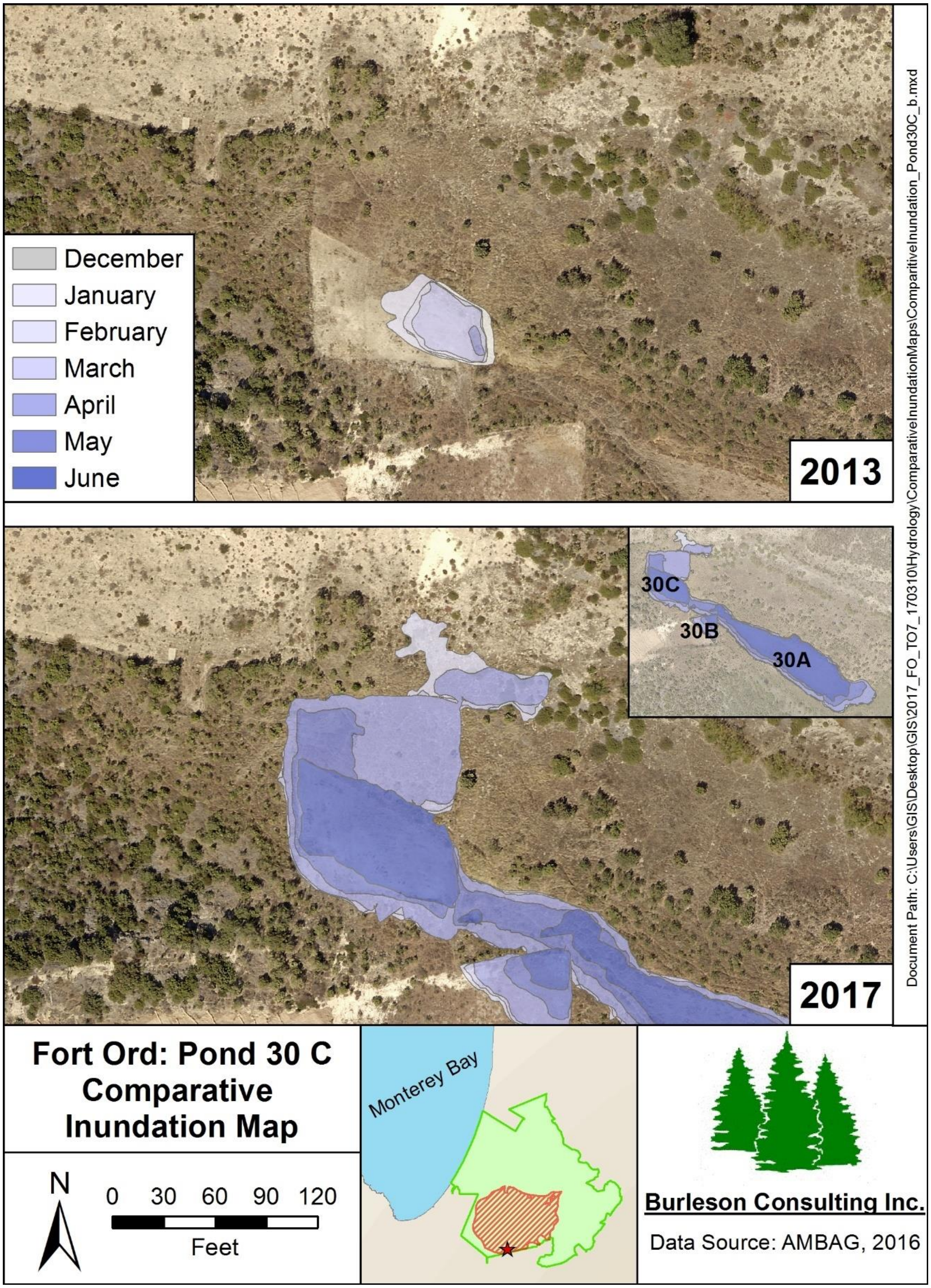

Figure 4-67. Pond 30C (Year 5) Inundations in 2012-2013 (below-normal precipitation) and 2016-2017 (above-normal precipitation). This vernal pool received fire-retardant application in 2013 and was in year 5 of monitoring in 2017.

4.14.1.1 Data Quality Objective 1

Pond 30C was not evaluated for DQO 1 as this vernal pool is only required to meet DQO 4 for water quality.

4.14.1.2 Data Quality Objective 2

Pond 30C was not evaluated for DQO 2 as this vernal pool is only required to meet DQO 4 for water quality.

4.14.1.3 Performance Standard: Hydrological Conditions and Inundation Area

Pond 30C was not required to meet the performance standard for hydrological conditions and inundation are as it is only required to meet DQOs for water quality.

4.14.2 Wildlife Monitoring

Pond 30C was not monitored for CTS and fairy shrimp in 2017. However, DQO 4 was evaluated because this DQO is based on water quality which were measured in 2017.

4.14.2.1 Data Quality Objective 1

Pond 30C was not evaluated for DQO 1 as this vernal pool is only required to meet DQO 4 for water quality.

4.14.2.2 Data Quality Objective 4

CTS presence in 2017 is unknown; however, water quality was adequate. Compared to other vernal pools and through time, water quality data were within normal ranges. The pH ranged from 5.98 in January to 7.03 in June with a mean of 6.53. Temperature ranged from 8.6° C in January to 20.6° C in June with a mean of 14.1° C. Dissolved oxygen ranged from 0.87 mg/L in March to 6.26 mg/L in June with a mean of 3.70 mg/L. Turbidity ranged from 11.7 FNU in June to 122.0 FNU in January with a mean of 41.3 FNU.

4.14.2.3 Performance Standard: Wildlife Usage

Pond 30C is a post-fire-retardant remediation vernal pool in year 5 of monitoring. According to the requirement of the Wetland Plan it is unknown whether it met DQO 4 because wildlife monitoring was not conducted in 2017, and therefore Pond 30C wildlife performance standards cannot be fully assessed. However, according to the Programmatic BO, the only required parameter to measure following fire-retardant use is water quality (USFWS, 2017). With this considerations in mind, Pond 30C has met the performance standard for water quality only.

4.14.3 Conclusion

Pond 30C is a post-fire-retardant remediation vernal pool in year 5 of monitoring. Pond 30C achieved the wildlife usage standard for water quality (see Table 4-104).

Table 4-104. Success at Pond 30C (Year 5 Post-Fire-Retardant) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Hydrological Conditions & Inundation Area	DQO 1	N/A*
	DQO 2	N/A*
Plant Cover & Species Diversity	DQO 3	N/A*
Wildlife Usage	DQO 1	N/A*
	DQO 4	Yes**
	DQO 5	N/A*

*Not applicable, only water quality results are required for evaluation
**Met water quality standards with consideration of Programmatic BO requirements

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APPENDIX A

Water Quality Results and Inundation Area by Vernal Pool by Month

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Hydrology Results for January Monitoring (1/23/2017-1/25/2017)

Vernal Pool	Monitoring Status	Date	Time	pH	Temperature (˚C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Max Depth (cm)	Inundated Surface Area (acres)
5	Reference	1/25/2017	11:45	6.09	8.9	2.13	4.0	58	5.32
101 East (West)	Reference	1/24/2017	13:57	5.81	10.6	1.99	13.7	79	Connected to 101 East (East), total 5.02
101 East (East)	Reference	1/24/2017	14:17	5.50	10.0	1.95	1.9	~155, gauge submerged	Connected to 101 East (West), total 5.02
997	Reference	1/25/2017	10:50	6.40	10.2	7.17	25.6	13	0.33
40 South	Baseline	1/23/2017	13:27	6.36	10.3	1.83	135.0	29	0.30
42	Baseline	1/23/2017	14:20	6.47	10.4	2.60	51.3	58	0.52
61	Baseline	1/24/2017	9:38	5.61	7.0	1.76	59.1	21	0.70
16	Year 1	1/23/2017	11:17	6.84	8.9	1.80	188.0	142	1.30
18	Year 2	1/23/2017	11:59	6.14	8.6	4.20	40.1	27	0.14
54	Year 2	1/23/2017	12:45	6.64	10.1	2.82	8.4	54	1.60
10	Year 5	1/23/2017	10:30	7.45	9.3	2.77	262.0	79	5.71
30A	Year 5	1/24/2017	11:39	6.22	13.0	1.82	29.6	14	0.32
30B	Year 5	1/24/2017	11:30	6.35	7.4	1.99	171.0	28	0.01
30C	Year 5	1/24/2017	11:05	5.98	8.6	2.66	122.0	38	0.16

Hydrology Results for February Monitoring (2/21/2017, 2/27/2017-3/1/2017)

Vernal Pool	Monitoring Status	Date	Time	pH	Temperature (˚C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Max Depth (cm)	Inundated Surface Area (acres)
5	Reference	2/27/2017	11:30	6.24	11.8	4.52	6.4	~130, gauge submerged	7.78
101 East (West)	Reference	2/27/2017	9:20	6.21	10.4	6.18	10.8	88	Connected to 101 East (East), total 9.37
101 East (East)	Reference	2/27/2017	10:31	6.23	12.2	3.68	21.8	~160, gauge submerged	Connected to 101 East (West), total 9.37
997	Reference	2/27/2017	12:45	6.78	16.9	12.20	14.1	15	0.23
40 South	Baseline	2/28/2017	10:17	6.79	6.6	11.62	56.1	31	0.61
42	Baseline	2/28/2017	11:11	6.86	9.4	6.55	2.0	76	0.81
61	Baseline	2/28/2017	12:01	6.66	11.1	10.54	31.3	21	0.52
16	Year 1	2/21/2017	9:30	6.09	12.4	4.87	584.0	144	2.57
18	Year 2	2/21/2017	10:25	5.97	13.8	4.72	47.8	41	0.20
54	Year 2	2/28/2017	9:17	6.63	8.3	4.92	5.3	112	3.09
10	Year 5	3/1/2017	8:50	6.94	10.6	4.64	126.0	144	6.21
30A	Year 5	3/1/2017	10:15	6.52	11.3	4.05	47.6	86	connected to 30B and 30C, total 1.12
30B	Year 5	3/1/2017	10:25	6.53	8.9	4.80	53.9	74	connected to 30A and 30C, total 1.12
30C	Year 5	3/1/2017	10:00	6.69	9.1	4.29	44.7	75	connected to 30A and 30B, total 1.12

Hydrology Results for March Monitoring (3/20/2017, 3/22/2017, 3/23/2017)

Vernal Pool	Monitoring Status	Date	Time	pH	Temperature (˚C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Max Depth (cm)	Inundated Surface Area (acres)
5	Reference	3/23/2017	8:15	6.54	15.3	1.55	8.3	~130, gauge submerged	7.30
101 East (West)	Reference	3/20/2017	13:12	6.13	14.7	5.80	2.8	84	Connected to 101 East (East), total 8.89
101 East (East)	Reference	3/20/2017	13:40	6.23	15.3	1.07	39.2	~160, gauge submerged	Connected to 101 East (West), total 8.89
997	Reference	3/23/2017	9:21	6.43	13.0	7.88	72.4	12	0.10
40 South	Baseline	3/22/2017	10:22	6.47	13.5	4.88	596.0	34	0.96
42	Baseline	3/22/2017	11:20	6.08	13.3	4.26	>1000	72	0.77
61	Baseline	3/22/2017	11:57	6.16	15.9	4.08	76.7	21	0.62
16	Year 1	3/22/2017	8:22	6.22	13.5	0.66	182.0	142	2.17
18	Year 2	3/22/2017	9:06	6.23	13.3	0.22	81.1	42	0.22
54	Year 2	3/22/2017	9:40	6.51	13.8	0.04	29.7	111	3.10
10	Year 5	3/20/2017	11:15	6.74	15.1	2.95	129.0	140	6.11
30A	Year 5	3/20/2017	10:21	6.58	14.9	1.50	150.0	73	connected to 30B and 30C, total 1.07
30B	Year 5	3/20/2017	10:09	6.33	13.1	1.91	54.2	81	connected to 30A and 30C, total 1.07
30C	Year 5	3/20/2017	9:55	6.31	13.6	0.87	30.9	73	connected to 30A and 30B, total 1.07

Hydrology Results for April Monitoring 4/18/2017-4/20/2017

Vernal Pool	Monitoring Status	Date	Time	pH	Temperature (˚C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Max Depth (cm)	Inundated Surface Area (acres)
5	Reference	4/20/2017	10:30	6.38	17.2	0.00	5.9	~130, gauge submerged	7.24
101 East (West)	Reference	4/20/2017	8:30	6.10	15.3	5.28	10.0	86	Connected to 101 East (East), total 9.38
101 East (East)	Reference	4/20/2017	9:30	6.49	17.3	0.00	43.2	~160, gauge submerged	Connected to 101 East (West), total 9.38
997	Reference	4/19/2017	15:02	7.07*	25.4*	7.14*	25.5*	6	0.02
40 South	Baseline	4/18/2017	12:59	6.57	16.6	4.81	37.6	28	0.12
42	Baseline	4/18/2017	13:40	6.97	16.5	11.15	57.3	62	0.58
61	Baseline	4/19/2017	8:23	6.48	12.3	4.31	28.8	10	0.05
16	Year 1	4/18/2017	8:45	6.78	14.4	0.05	66.6	140	0.80
18	Year 2	4/18/2017	10:55	6.21	13.6	0.29	46.6	42	0.21
54	Year 2	4/18/2017	11:40	6.85	15.1	5.55	37.6	108	2.95
10	Year 5	4/19/2017	11:30	6.81	14.8	4.03	55.8	156	6.14
30A	Year 5	4/19/2017	10:42	6.61	14.3	4.19	9.7	83	connected to 30B and 30C, total 1.06
30B	Year 5	4/19/2017	10:26	6.57	12.5	2.46	15.9	71	connected to 30A and 30C, total 1.06
30C	Year 5	4/19/2017	10:00	6.65	13.9	3.46	19.2	72	connected to 30A and 30B, total 1.06

*Water quality probe was on its side

Hydrology Results for May Monitoring (5/24/2017, 5/25/2017)

Vernal Pool	Monitoring Status	Date	Time	pH	Temperature (˚C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Max Depth (cm)	Inundated Surface Area (acres)
5	Reference	5/25/2017	15:20	6.28	21.9	2.73	4.5	110	6.49
101 East (West)	Reference	5/25/2017	13:50	6.02	18.7	1.68	36.6	74	0.95
101 East (East)	Reference	5/25/2017	15:20	6.89	19.0	2.38	4.0	~160, gauge submerged	6.52
997	Reference	5/24/2017	13:15	-	-	-	-	DRY	0.00
40 South	Baseline	5/25/2017	11:00	-	-	-	-	DRY	0.00
42	Baseline	5/25/2017	11:30	5.97	17.6	5.27	60.1	38	0.30
61	Baseline	5/25/2017	12:30	-	-	-	-	DRY	0.00
16	Year 1	5/25/2017	8:35	6.96	18.6	1.55	33.8	109	0.57
18	Year 2	5/25/2017	9:15	5.98	15.2	9.69	13.9	40	0.09
54	Year 2	5/25/2017	10:00	6.69	17.3	6.08	69.3	78	2.21
10	Year 5	5/24/2017	11:42	7.05	18.68	3.99	37.0	127	6.03
30A	Year 5	5/24/2017	10:00	6.93	19.1	5.42	17.8	44	connected to 30B and 30C, total 0.74
30B	Year 5	5/24/2017	10:15	6.52	18.2	3.53	23.4	40	connected to 30A and 30C, total 0.74
30C	Year 5	5/24/2017	10:30	6.52	18.7	4.63	19.2	45	connected to 30A and 30B, total 0.74

Hydrology Results for June Monitoring (6/15/2017, 6/20/2017, 6/21/2017)

Vernal Pool	Monitoring Status	Date	Time	pH	Temperature (˚C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Max Depth (cm)	Inundated Surface Area (acres)
5	Reference	6/20/2017	13:40	7.12	24.2	3.54	7.4	98	5.74
101 East (West)	Reference	6/21/2017	13:02	6.53	26.6	2.97	79.8	18	0.17
101 East (East)	Reference	6/21/2017	13:20	6.91	20.1	3.58	10.7	~150, gauge submerged	5.57
997	Reference	-	-	-	-	-	-	DRY	0.00
40 South	Baseline	-	-	-	-	-	-	DRY	0.00
42	Baseline	6/15/2017	12:51	5.54	17.0	2.63	70.4	~28*	0.34
16	Year 1	6/21/2017	9:30	6.98	20.0	1.40	121.0	98	0.51
18	Year 2	6/21/2017	10:20	6.46	16.5	0.00	401.0	8	0.00
54	Year 2	5/25/2017	11:00	6.98	23.3	7.22	10.5	~60*	1.90
10	Year 5	5/24/2017	9:50	7.08	20.1	4.48	27.4	112	5.73
30A	Year 5	5/24/2017	11:40	6.69	21.9	7.68	47.2	~35*	0.44
30B	Year 5	5/24/2017	11:30	7.24	22.3	4.77	47.1	18	0.01
30C	Year 5	5/24/2017	11:20	7.03	20.6	6.26	11.7	22	0.11

*decreased visibility due to emergent vegetation

Hydrology Results for July Monitoring (7/5/2017, 7/7/2017, 7/27/2017, 7/28/2017, 7/31/2017)

Vernal Pool	Monitoring Status	Date	Time	Max Depth (cm)	Inundated Surface Area (acres)
5	Reference	7/28/2017	9:45	94	-
101 East (West)	Reference	7/27/2017	13:00	DRY	0.000
101 East (East)	Reference	7/28/2017	8:50	100	-
997	Reference	-	-	DRY	0.000
40 South	Baseline	-	-	DRY	0.000
42	Baseline	7/7/2017	10:30	DRY	0.000
61	Baseline	-	-	DRY	0.000
16	Year 1	7/27/2017	9:35	90	-
18	Year 2	7/5/2017	10:33	DRY	-
54	Year 2	7/31/2017	13:50	DRY	0.000
10	Year 5	7/28/2017	9:56	94	-
30A	Year 5	7/27/2017	10:27	DRY	0.000
30B	Year 5	7/27/2017	10:25	DRY	0.000
30C	Year 5	7/27/2017	10:23	DRY	0.000

Hydrology Results for August Monitoring (8/15/2017, 8/16/2017)

Vernal Pool	Monitoring Status	Date	Time	Max Depth (cm)	Inundated Surface Area (acres)
5	Reference	8/16/2017	9:35	57	-
101 East (East)	Reference	8/16/2017	10:20	95	-
16	Year 1	8/15/2017	15:15	40	-
10	Year 5	8/16/2017	9:10	80	-

Hydrology Results for September Monitoring (9/6/2017)

Vernal Pool	Monitoring Status	Date	Time	Max Depth (cm)	Inundated Surface Area (acres)
5	Reference	9/6/2017	11:53	45	-
101 East (East)	Reference	9/6/2017	12:22	77	-
16	Year 1	9/6/2017	9:33	28	-
10	Year 5	9/6/2017	10:27	70	-

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Fort Ord
WATER QUALITY MONITORING

Date: 6/15, 6/20, 6/21/2017 Weather Conditions: windy, clear, sunny Personnel: Haleigh Damron, Kayti Christianson, Elena Loke

Location	Time	pH	Temperature (C)	Specific Cond. (µS/cm)	D/O (mg/L)	Turbidity (FNU)	Comments	
Pond 5 (reference pond) NO UXO ENTER 6/20	13:40	7.12	24.16	222	3.54	7.4	depth: 98 cm	
Pond 10 (year 5 lead remediation) NO UXO ENTER 6/20	9:50	7.08	20.05	266	4.48	27.4	depth: 124 cm → 112cm *	
Pond 16 (year 1 post mastication) UXO DO NOT ENTER 6/21	9:30	6.98	19.97	583	1.40	121	depth: approx. 98cm, all other depth readings for this pond add 100 cm (2 gauges stacked)	
Pond 18 (year 2 mastication) UXO DO NOT ENTER 6/21	10:20	6.46	16.47	638	0.00	401	depth: 8 cm	
Ponds 30A (year 5 fire retardant) NO UXO DO NOT ENTER 6/20	11:40	6.[illegible]	21.90	268	7.68	47.2	depth: approx. 35cm vegetation in the way	A, B + C all separate
Pond 30B (year 5 fire retardant) NO UXO DO NOT ENTER 6/20	11:30	7.24	22.32	402	4.77	47.1	depth: 18 cm	
Pond 30C (year 5 fire retardant) NO UXO DO NOT ENTER 6/20	11:20	7.03	20.64	348	6.26	11.7	depth: 22 cm	
Pond 40 South (baseline) UXO DO NOT ENTER							DRY	
Pond 42 (baseline) UXO DO NOT ENTER 6/15	12:51	5.54	17.01	134	2.63	70.4	depth: approx. 28 cm vegetation in the way	
Pond 54 (year 2 post mastication) UXO DO NOT ENTER 6/21	11:00	6.98	23.28	438	7.22	10.5	depth: approx. 60 cm	
Pond 61 (baseline) UXO DO NOT ENTER							DRY	
Pond 101 East (East) (reference pond) NO UXO ENTER 6/21	13:20	6.91	20.06	224	3.58	10.7	depth: approx. 150cm water over gauge	
Pond 101 East (West) (reference) NO UXO ENTER 6/21	13:02	6.53	26.63	248	2.97	79.8	depth: 18 cm	
997 (reference) NO UXO ENTER							DRY	

* depth adjusted for 12 cm discrepancy in gauge

Figure A-1. Example field data collection sheet

FIELD INSTRUMENT CALIBRATION RECORD **Fort Ord**

Calibration Code: H19828·0		Sheet of
Employee Performing Calibration: HD, KC		
Instruments:	**Standards:**	**Lot Number and Expiration Date:**
(1) pH meter	pH = 7.00	048U , 09/20/21
(2) pH meter	pH = 4.00	
(3) pH meter	pH = 10.00	
(4) pH meter	pH = 6.86 (Blue)	
(5) Specific conductance meter	5,000 µS/cm (Blue)	
(6) Specific conductance meter	___________µS/cm	
(7)		
(8)		
(9)		
(10)		
(11)		

Instrument Calibration Data

Date	Time	Standard Solution	Response As Found	Response As Left	Solution Temp. (C)	°C		Notes
05/24/17	0940	H19828	6.89	6.84	18.77	19.42		

Review	***Action***
Site Manager/Project Manager ________ Date ________	

09/09/16 11:30 AM

Figure A-2. Example Probe Calibration Sheet for Hanna Instruments 9829 Multiparameter Meter

APPENDIX B

Vegetation Transect Data

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Table B-1. Pond 5 (Reference) Wetland Vegetation Transect Data by Stratum

POND 5

Date	7/6/2017, 7/28/2017, 9/21/2017		
Surveying Personnel	Chris Bronny, Kayti Christianson, Elena Loke		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation	65	ELMA	
Floating Vegetation	10	ISHO	
Submerged Vegetation			
Open Water	25		Depth on 9/21/2017: 38 cm

Notes

An inundated area was present and comprised 53% relative cover of wetland; no transect was placed in 2017. Strata 2, 3, and 4 were repeated from 2016, and the transects within the strata were new in 2017. Stratum 5 and transect 5 were new in 2017.

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
2	10 m	12%	DISP	15	DISP	2	DISP	2	DISP	28	DISP	12	DISP	66
			ELMA	50	ELMA	78	ELMA	61	ELMA	35	ELMA	67	ELMA	4
			LYAR	4	TH	10	LYAR	1	PSLU	5	LYAR	1	PLCHH	3
			STAJ	6	BG	10	PSLU	1	TH	20	PSLU	2	PSLU	5
			TH	15			TH	15	BG	12	STAJ	3	STAJ	2
			BG	10			BG	20			TH	10	TH	25
											BG	15	BG	5
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**110**	**TOTAL**	**110**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
3	10 m	12%	DISP	2	DISP	19	BRMI	2	BRMI	1	DISP	2	BRMI	2
			FEMY	1	ISCE	5	DACA	25	DISP	12	JUPH	75	DISP	10
			JUPH	60	JUPH	30	DISP	10	ISCE	3	TH	8	JUPH	20
			TH	10	POMO	1	JUPH	5	JUPH	33	BG	15	LYHY	2
			BG	27	TH	5	LYHY	5	LYHY	1			TH	6
					BG	40	TH	15	TH	10			BG	60
							BG	38	BG	40				
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
4	**10 m**	**16%**	AICA	1	AICA	3	BRMI	8	AICA	1	AICA	1	AICA	1
			BRMI	1	BRMI	3	DISP	1	BRMI	1	BRHO	1	BRHO	1
			DISP	4	DISP	2	*Erodium* sp.	1	DACA	4	BRMI	1	BRMI	1
			FEMY	1	JUBUB	5	FEMY	2	DISP	5	DISP	8	DISP	3
			JUBUB	1	JUPH	20	JUBUB	4	*Erodium* sp.	1	FEMY	1	FEMY	1
			JUPH	10	LYHY	1	JUPH	4	FEMY	4	JUBUB	1	JUBUB	2
			LYHY	5	RUAC	2	LYHY	10	JUBUB	6	JUPH	1	JUPH	3
			RUAC	3	TH	55	RUAC	1	JUPH	1	LYHY	2	LYHY	2
			TH	55	BG	10	TH	45	LYHY	4	RUAC	12	RUAC	1
			BG	19			BG	25	RUAC	1	TH	67	SIGA	1
									TH	62	BG	5	TH	55
									BG	10			BG	30
			TOTAL	**100**	**TOTAL**	**101**	**TOTAL**	**101**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**101**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
5	**10 m**	**7%**	*Galium* sp.	1	DISP	30	DISP	50	DISP	50	DISP	65	DISP	20
			JUBA	30	GNPA	5	GNPA	5	GNPA	2	*Galium* sp.	1	ELTR	20
			LYAR	1	LYHY	5	LYHY	2	LYHY	4	LYHY	10	LYHY	5
			LYHY	1	LYMI	1	PSLU	12	LYMI	1	LYMI	3	LYMI	4
			PSST	10	PSLU	8	PSST	15	PSLU	12	PLCHH	1	PLCHH	3
			SOAM	30	PSST	12	SOAM	8	PSST	11	PSLU	3	PSLU	10
			TH	2	SEGL	1	STAJ	1	SOAM	6	PSST	3	PSST	12
			BG	25	SOAM	25	TH	2	Vicia sp.	4	SEGL	1	SOAM	6
					STAJ	1	BG	8	TH	1	SOAM	2	TH	5
					TH	1			BG	10	ZEDA	1	BG	15
					BG	12					TH	5		
											BG	5		
			TOTAL	**100**	**TOTAL**	**101**	**TOTAL**	**103**	**TOTAL**	**101**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 5 Complete Species List

Species Name	Common Name	Species Code
Achillea millefolium	common yarrow	ACMI
Agrostis avenacea	Pacific bent grass	AGAV
Agrostis exarata	spike bent grass	AGEX
Agrostis pallens	seashore bent grass	AGPA
Aira caryophyllea	silvery hair-grass	AICA
Alopecurus saccatus	Pacific foxtail	ALSA
Baccharis glutinosa	marsh baccharis	BAGL
Baccharis pilularis	coyote brush	BAPI
Briza maxima	rattlesnake grass	BRMA
Briza minor	annual quaking grass	BRMI
Bromus hordeaceus	soft chess	BRHO
Carpobrotus edulis	ice plant	CAED
Cirsium vulgare	bull thistle	CIVU
Clarkia purpurea ssp. *quadrivulnera*	winecup clarkia	CLPUQ
Cotula coronopifolia	brass buttons	COCO
Crassula aquatica	aquatic pygmy weed	CRAQ
Cyperus eragrostis	tall cyperus	CYER
Cyperus squarrosus	bearded flat sedge	CYSQ
Danthonia californica	California oat grass	DACA
Deinandra corymbosa	coastal tarweed	DECO
Diplacus aurantiacus	sticky monkey flower	DIAU
Distichlis spicata	salt grass	DISP
Eleocharis acicularis	needle spikerush	ELAC
Eleocharis macrostachya	pale spikerush	ELMA
Elymus triticoides	beardless wild rye	ELTR
Epilobium ciliatum	fringed willowherb	EPCI
Erodium cicutarium	redstem filaree	ERCI
Erigeron canadensis	horseweed	ERCA
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	redstem filaree	ERCI
Erodium sp.		
Eryngium armatum	coyote thistle	ERAR
Euthamia occidentalis	western goldenrod	EUOC
Festuca myuros	rattail sixweeks grass	FEMY
Galium sp.		
Gnaphalium palustre	lowland cudweed	GNPA
Heliotropium curassavicum var. *oculatum*	Chinese pusley	HECUO
Heteromeles arbutifolia	toyon	HEAR
Hypochaeris radicata	rough cat's-ear	HYRA
Isoetes howellii	Howell's quillwort	ISHO
Isolepis cernua	low bulrush	ISCE
Juncus balticus	Baltic rush	JUBA
Juncus bufonius var. *bufonius*	common toad rush	JUBUB
Juncus phaeocephalus	brown-headed rush	JUPH
Lysimachia arvensis	scarlet pimpernel	LYAR
Lysimachia minima	chaffweed	LYMI
Lythrum hyssopifolia	grass poly	LYHY
Madia sativa	coast tarweed	MASA
Nuttallanthus texanus	blue toadflax	NUTE
Persicaria hydropiperoides	waterpepper	PEHY
Plagiobothrys chorisianus var. *hickmanii*	Hickman's popcornflower	PLCHH
Plantago coronopus	cut-leaved plantain	PLCO
Plantago lanceolata	English plantain	PLLA
Polypogon monspeliensis	rabbitfoot grass	POMO
Pseudognaphalium californicum	California everlasting	PSCA
Pseudognaphalium luteoalbum	weedy cudweed	PSLU
Pseudognaphalium stramineum	cottonbatting plant	PSST
Quercus agrifolia	coast live oak	QUAG
Rumex acetosella	sheep sorrel	RUAC
Rumex crispus	curly dock	RUCR
Salix lasiolepis	arroyo willow	SALA
Salvia mellifera	black sage	SAME
Schoenoplectus californicus	California bulrush	SCCA
Senecio glomeratus	cutleaf burnweed	SEGL
Silene gallica	small-flower catchfly	SIGA
Solanum americanum	small-flowered nightshade	SOAM
Sonchus asper	prickly sow thistle	SOAS
Stachys ajugoides	bugle hedge-nettle	STAJ
Stipa sp.		
Toxicodendron diversilobum	poison oak	TODI
Triglochin scilloides	flowering quillwort	TRSC
Verbena lasiostachys var. *lasiostachys*	western vervain	VELAL
Vicia sp.		
Zeltnera davyi	Davy's centuary	ZEDA
Groundcover Codes		
BG	Bare Ground	
TH	Thatch/Duff/Algae	

Table B-2. Pond 101 East (West) (Reference) Wetland Vegetation Transect Data by Stratum

POND 101 East (West)			
Date	7/6/2017, 7/27/2017		
Surveying Personnel	Chris Bronny, Kayti Christianson, Elena Loke		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water			
Notes			
Pond dry at time of 7/27/2017 survey. Strata 1 through 5 were repeated from 2016. Transects 1 through 3 were repeated from 2016. Transects in strata 4 and 5 were relocated in 2017 to more representative locations. Strata 6 and 7 and transects within these strata were new in 2017.			

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
1	**10 m**	**6%**	ALSA	10	ALSA	5	ALSA	1	ALSA	1	ALSA	1	ALSA	1
			ELMA	10	ELMA	35	ELMA	30	ELMA	25	ELMA	45	ELMA	50
			GNPA	5	GNPA	2	GNPA	1	GNPA	2	GNPA	1	MALE	1
			ISHO	3	ISHO	1	ISHO	1	ISHO	1	ISHO	20	ROCU	3
			LYHY	1	MALE	2	LYHY	1	MALE	2	ROCU	1	TH	35
			MALE	2	ROCU	2	MALE	3	ROCU	1	VELAL	1	BG	10
			ROCU	2	VELAL	1	ROCU	2	TRSC	4	TH	20		
			TRSC	2	TH	35	RUSA	1	TH	40	BG	11		
			VELAL	1	BG	17	VELAL	1	BG	24				
			TH	32			TH	35						
			BG	32			BG	24						
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
2	**10 m**	**48%**	ELMA	85	ELMA	70	ELMA	95	ELMA	95	ELMA	95	ELMA	78
			POMO	1	POMO	1	TH	0	PLCHH	1	LAGL	1	TH	2
			TH	0	TH	0	BG	5	POMO	2	TH	0	BG	20
			BG	13	BG	30			TH	0	BG	4		
									BG	3				
			TOTAL	**99**	**TOTAL**	**101**	**TOTAL**	**100**	**TOTAL**	**101**	**TOTAL**	**100**	**TOTAL**	**100**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
3	**10 m**	**8%**	DISP	10	DISP	25	DISP	10	DISP	4	DISP	35	DISP	20
			ISHO	25	ISHO	30	ERAR	10	ISHO	35	ERCI	1	FEPE	10
			LAGL	1	LYHY	1	ISHO	25	LAGL	1	LYHY	1	HECUO	2
			LYHY	6	PLCHH	10	LYHY	10	LYHY	1	PLCHH	12	HYGL	1
			PLCHH	8	TH	25	PLCHH	1	PLCHH	15	PSLU	2	ISHO	30
			PSLU	2	BG	10	PSLU	8	PSLU	5	RUCR	4	LYHY	3
			TH	30			TH	30	RUSA	1	TH	40	PLCHH	5
			BG	20			BG	10	TH	30	BG	5	PSLU	1
									BG	10			RUAC	1
													TH	25
													BG	2
			TOTAL	**102**	**TOTAL**	**101**	**TOTAL**	**104**	**TOTAL**	**102**	**TOTAL**	**100**	**TOTAL**	**100**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
4	**10 m**	**28%**	BRHO	1	BRMI	1	HECUO	3	BAPI	15	BAPI	10	ELMA	8
			BRMI	1	FEMY	1	JUBUB	10	ELMA	2	ELMA	1	JUPH	5
			DISP	1	HECUO	2	LYHY	65	FEMY	1	FEMY	1	LYHY	65
			FEMY	4	JUBUB	25	TH	15	GNPA	6	GNPA	1	POMO	1
			HECUO	3	LYHY	30	BG	7	*Isolepis* sp.	1	*Isolepis* sp.	2	TH	5
			JUBUB	12	MASA	8			JUBUB	6	JUBUB	2	BG	16
			LYHY	40	PSLU	1			LYHY	30	LYHY	50		
			MASA	1	TH	12			PSLU	3	PSLU	5		
			PSLU	1	BG	20			PORI	1	PORI	2		
			RUAC	20					RUAC	2	RUAC	1		
			STAJ	1					TH	5	TH	3		
			TH	5					BG	28	BG	20		
			BG	15										
			TOTAL	**105**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
5	**10 m**	**2%**	FEPE	40	ELMA	35	ELMA	25	BAPI	4	BRMI	10	BRMI	8
			HECUO	1	FEPE	30	FEPE	10	BRMI	1	ELMA	3	ELMA	4
			LYHY	4	TH	20	JUBUB	10	FEPE	10	FEMY	35	FEMY	10
			MALE	8	BG	15	LYHY	15	JUBUB	30	JUBUB	15	FEPE	2
			POMO	1			TH	30	JUPH	1	LYHY	25	JUBUB	4
			RUSA	2			BG	10	LYHY	20	TH	10	LYHY	3
			TH	34					MASA	2	BG	5	MASA	10
			BG	10					RUAC	1			RUAC	12
									TH	25			TH	20
									BG	10			BG	30
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**104**	**TOTAL**	**103**	**TOTAL**	**103**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
6	**10 m**	**1%**	GNPA	10	GNPA	1	ERCA	3	JUBA	15	ERCA	1	GNPA	4
			HYRA	5	JUPH	57	JUPH	25	JUPH	4	GNPA	30	HECUO	1
			JUBUB	1	LYHY	2	LYHY	5	LYHY	25	HYGL	2	JUBA	25
			JUPH	30	RUAC	5	PLCHH	1	RUAC	30	JUBA	2	LYHY	8
			LYHY	8	TH	5	RUAC	40	RUCR	4	LYHY	20	PSLU	1
			RUAC	10	BG	30	STAJ	7	TH	10	RUAC	15	RUAC	15
			STAJ	1			TH	5	BG	12	RUCR	2	RUCR	1
			TH	5			BG	15			TH	2	TH	10
			BG	30							BG	26	BG	35
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**101**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3	
			Species	% Cover	Species	% Cover	Species	% Cover
7	**5 m**	**7%**	CAPR	85	CAPR	95	CAPR	97
			TH	15	TH	5	TH	3
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 101 East (West) Complete Species List

Species Name	Common Name	Species Code
Agrostis avenacea	Pacific bent grass	AGAV
Aira caryophyllea	silvery hair-grass	AICA
Alopecurus saccatus	Pacific foxtail	ALSA
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Baccharis salicifolia	mule fat	BASA
Briza maxima	rattlesnake grass	BRMA
Briza minor	annual quaking grass	BRMI
Bromus hordeaceus	soft chess	BRHO
Carex praegracilis	clustered field sedge	CAPR
Clarkia sp.		
Cotula coronopifolia	brass buttons	COCO
Cyperus eragrostis	tall cyperus	CYER
Danthonia californica	California oat grass	DACA
Deinandra corymbosa	coastal tarweed	DECO
Deschampsia danthonioides	annual hair grass	DEDA
Distichlis spicata	salt grass	DISP
Eleocharis acicularis	needle spikerush	ELAC
Eleocharis macrostachya	pale spikerush	ELMA
Elymus glaucus	blue wild-rye	ELGL
Erigeron canadensis	horseweed	ERCA
Erodium cicutarium	redstem filaree	ERCI
Eryngium armatum	coyote thistle	ERAR
Epilobium brachycarpum	tall annual willowherb	EPBR
Euthamia occidentalis	western goldenrod	EUOC
Festuca myuros	rattail sixweeks grass	FEMY
Festuca perennis	Italian rye grass	FEPE
Galium porrigens	climbing bedstraw	GAPO
Gamochaeta ustulata	purple cudweed	GAUS
Gnaphalium palustre	lowland cudweed	GNPA
Heliotropium curassavicum var. *oculatum*	Chinese pusley	HECUO
Hordeum b. ssp. *brachyantherum*	meadow barley	HOBRB
Hypochaeris glabra	smooth cat's-ear	HYGL
Hypochaeris radicata	rough cat's-ear	HYRA
Isoetes howellii	Howell's quillwort	ISHO
Isolepis cernua	low bulrush	ISCE
Juncus balticus	Baltic rush	JUBA
Juncus bufonius var. *bufonius*	common toad rush	JUBUB
Juncus patens	spreading rush	JUPA
Juncus phaeocephalus	brown-headed rush	JUPH
Lasthenia glaberrima	smooth goldfields	LAGL
Lysimachia arvensis	scarlet pimpernel	LYAR
Lythrum hyssopifolia	grass poly	LYHY
Madia elegans	common madia	MAEL
Madia gracilis	gumweed	MAGR
Madia sativa	coast tarweed	MASA
Malvella leprosa	alkali mallow	MALE
Navarretia squarrosa	skunkweed	NASQ
Nuttallanthus texanus	blue toadflax	NUTE
Persicaria hydropiperoides	waterpepper	PEHY
Persicaria maculosa	lady's thumb	PEMA
Plagiobothrys chorisianus var. *hickmanii*	Hickman's popcornflower	PLCHH
Plantago coronopus	cut-leaved plantain	PLCO
Polypogon monspeliensis	rabbitfoot grass	POMO
Populus trichocarpa	black cottonwood	POTR
Potentilla rivalis	brook cinquefoiil	PORI
Pseudognaphalium luteoalbum	weedy cudweed	PSLU
Pseudognaphalium stramineum	cottonbatting plant	PSST
Rorippa curvisiliqua	western yellow cress	ROCU
Rumex acetosella	sheep sorrel	RUAC
Rumex crispus	curly dock	RUCR
Rumex salicifolius	willow dock	RUSA
Salix lasiolepis	arroyo willow	SALA
Sonchus asper	prickly sow thistle	SOAS
Stachys ajugoides	bugle hedge-nettle	STAJ
Triglochin scilloides	flowering quillwort	TRSC
Trifolium sp.	clover	
Verbena lasiostachys var. *lasiostachys*	western vervain	VELAL
Groundcover Codes		
BG	Bare Ground	
TH	Thatch/Duff/Algae	

Table B-3. Pond 101 East (East) (Reference) Wetland Vegetation Transect Data by Stratum

POND 101 East (East)			
Date	9/21/2017		
Surveying Personnel	Chris Bronny, Kayti Christianson, Elena Loke		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation	45	ELMA	
Floating Vegetation			
Submerged Vegetation			
Open Water	55		Depth on 9/21/2017: 68 cm
Notes			
Stratum 2 consisted of inundated area and comprised 42% relative cover of wetland; no transect was placed in 2017. Strata 5 and 6 and the transects within these strata were new in 2017.			

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
5	10 m	28%	GNPA	20	GNPA	23	CYER	1	GNPA	22	ERBO	1	GNPA	37
			HECUO	12	HECUO	15	ERBO	2	HECUO	3	GNPA	35	JUBUB	3
			JUBUB	2	LYHY	5	GNPA	15	JUBA	1	HECUO	9	LYHY	13
			LYHY	8	PORI	1	HECUO	31	LYHY	8	JUBUB	1	PSLU	15
			PSLU	25	PSLU	8	JUBUB	2	PSLU	27	LYHY	15	RUAC	20
			RUAC	15	ROCU	1	LYHY	4	RUAC	18	PSLU	15	STAJ	3
			STAJ	5	RUAC	25	PORI	1	STAJ	1	ROCU	1	BG	9
			BG	15	STAJ	4	PSLU	8	BG	20	RUAC	18		
					BG	20	RUAC	20			STAJ	1		
							STAJ	1			BG	5		
							BG	15						
			TOTAL	**102**	**TOTAL**	**102**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**101**	**TOTAL**	**100**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
6	10 m	30%	CAPR	80	JUBA	31	CYER	9	ACPA	1	DISP	2	CYER	4
			RUAC	7	LYHY	5	JUBA	40	CYER	10	JUBA	90	JUBA	55
			VELAL	3	PSST	10	LYHY	1	JUBA	62	LYHY	2	PORI	2
			TH	10	RUAC	12	PSST	10	LYHY	4	PSST	4	PSLU	2
			BG	5	TH	7	RUAC	15	PSLU	1	TH	3	PSST	15
					BG	35	TH	7	PSST	8	BG	1	RUAC	5
							BG	20	TH	7			RUCR	4
									BG	7			TH	8
													BG	5
			TOTAL	**105**	**TOTAL**	**100**	**TOTAL**	**102**	**TOTAL**	**100**	**TOTAL**	**102**	**TOTAL**	**100**

Pond 101 East (East) Complete Species List

Species Name	Common Name	Species Code
Acmispon americanus var. *americanus*	Spanish lotus	ACAMA
Acmispon parviflorus	hill lotus	ACPA
Agrostis avenacea	Pacific bent grass	AGAV
Avena barbata	slender wild oat	AVBA
Baccharis glutinosa	marsh baccharis	BAGL
Baccharis pilularis	coyote brush	BAPI
Briza minor	small quaking grass	BRMI
Bromus diandrus	ripgut grass	BRDI
Bromus hordeaceus	soft chess	BRHO
Carex praegracilis	clustered field sedge	CAPR
Cirsium vulgare	bull thistle	CIVU
Cotula coronopifolia	brass buttons	COCO
Cynodon dactylon	Bermuda grass	CYDA
Cyperus eragrostis	tall cyperus	CYER
Diplacus aurantiacus	sticky monkey flower	DIAU
Distichlis spicata	salt grass	DISP
Eleocharis macrostachya	pale spikerush	ELMA
Elymus triticoides	beardless wild rye	ELTR
Epilobium brachycarpum	tall annual willowherb	EPBR
Erigeron canadensis	horseweed	ERCA
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	redstem filaree	ERCI
Euthamia occidentalis	western goldenrod	EUOC
Gnaphalium palustre	lowland cudweed	GNPA
Heliotropium curassavicum var. oculatum	Chinese pusley	HECUO
Heterotheca grandiflora	telegraph weed	HEGR
Hypochaeris radicata	rough cat's-ear	HYRA
Isolepis cernua	low bulrush	ISCE
Juncus balticus	Baltic rush	JUBA
Juncus bufonius var. *bufonius*	common toad rush	JUBUB
Juncus phaeocephalus	brown-headed rush	JUPH
Lonicera involucrata var. *ledebourii*	black twinberry	LOINL
Lysimachia arvensis	scarlet pimpernel	LYAR
Lythrum hyssopifolia	grass poly	LYHY
Madia sativa	coast tarweed	MASA
Nuttallanthus texanus	blue toadflax	NUTE
Persicaria hydropiperoides	waterpepper	PEHY
Petrorhagia dubia	hairypink	PEDU
Plagiobothrys chorisianus var. *hickmanii*	Hickman's popcornflower	PLCHH
Polypogon monspeliensis	rabbitfoot grass	POMO
Potentilla rivalis	brook cinquefoiil	PORI
Pseudognaphalium luteoalbum	weedy cudweed	PSLU
Pseudognaphalium stramineum	cottonbatting plant	PSST
Rorippa curvisiliqua	western yellow cress	ROCU
Rubus ursinus	California blackberry	RUUR
Rumex acetosella	sheep sorrel	RUAC
Rumex conglomeratus	clustered dock	RUCO
Rumex crispus	curly dock	RUCR
Rumex salicifolius	willow dock	RUSA
Salix lasiolepis	arroyo willow	SALA
Silene sp.		
Solanum americanum	small-flowered nightshade	SOAM
Solidago velutina ssp. *californica*	California goldenrod	SOVEC
Sonchus asper	prickly sow thistle	SOAS
Sonchus oleraceus	common sow thistle	SOOL
Stachys ajugoides	bugle hedge-nettle	STAJ
Toxicodendron diversilobum	poison oak	TODI
Verbena lasiostachys var. *lasiostachys*	western vervain	VELAL
Vicia sativa ssp. *sativa*	spring vetch	VISAS
Groundcover Codes		
BG	Bare Ground	
TH	Thatch/Duff/Algae	

Table B-4. Pond 997 (Reference) Wetland Vegetation Transect Data by Stratum

POND 997			
Date	5/11/2017		
Surveying Personnel	Chris Bronny, Elena Loke		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water			
Notes			
Pond was dry at time of survey. Strata 1, 3, and 4 and the corresponding transects were new in 2017. No transect was placed in stratum 2 due to the presence of Contra Costa goldfields (CCG); see CCG map for vegetative cover estimate. CCG comprised 2% relative cover of wetland. An upland stratum was mapped and comprised 4% relative cover of wetland, but was not included in the cover data.			

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
1	10 m	3%	*Agrostis* sp.	7	*Agrostis* sp.	35	*Agrostis* sp.	15	*Agrostis* sp.	10	*Agrostis* sp.	10	*Agrostis* sp.	15
			ELMA	2	ERAR	20	ELMA	4	ELMA	4	ELMA	4	ELMA	4
			ERAR	25	PLCHH	5	ERAR	12	ERAR	20	ERAR	25	ERAR	20
			PLCHH	1	PSCH	1	JUPH	15	JUPH	1	PLCHH	2	PLCHH	5
			PSCH	1	TH	10	PLCHH	5	PLCHH	2	TH	43	TH	26
			TH	4	BG	29	PSCH	1	PSCH	1	BG	20	BG	30
			BG	60			TH	18	TH	22				
							BG	30	BG	40				
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**104**	**TOTAL**	**100**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
3	10 m	89%	BRMA	2	BRMA	1	BRMI	1	BRMA	1	BRMA	1	BRMI	4
			BRMI	1	BRMI	4	CAAMA	4	BRMI	3	BRMI	2	CAAMA	4
			DACA	25	DACA	25	DACA	20	DACA	30	DACA	20	DACA	5
			DECO	2	DECO	1	ERAR	6	ERAR	9	DECO	1	ERAR	2
			ELMA	1	ERBO	1	ERBO	1	FEMY	1	ERAR	3	ERCI	2
			ERAR	12	JUBUB	2	ISCE	5	HYGL	2	ERCI	3	HYGL	1
			GEDI	1	JUPH	15	JUBUB	2	ISCE	3	ISCE	7	ISCE	2
			HYGL	1	LYHY	10	JUUN	3	JUBUB	1	JUBUB	1	JUPH	12
			JUBUB	1	TH	15	LYHY	10	JUPH	2	LYHY	30	JUUN	1
			JUPH	25	BG	26	RUAC	1	JUUN	1	TH	20	LYHY	10
			LYHY	12			TH	7	LYHY	10	BG	12	LYMI	6
			TH	15			BG	41	TH	17			TH	20
			BG	12					BG	20			BG	31
			TOTAL	**110**	**TOTAL**	**100**	**TOTAL**	**101**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3	
			Species	% Cover	Species	% Cover	Species	% Cover
4	5 m	2%	AGEX	35	AGEX	8	AGEX	5
			BRMI	1	DEDA	1	BRMI	1
			DEDA	3	ELAC	2	DEDA	1
			ELAC	15	ERAR	8	ELAC	3
			ERAR	8	JUPH	2	ERAR	1
			PLCHH	1	PLCHH	3	JUPH	12
			POMO	5	POMO	60	LYHY	1
			PSCH	10	PSCH	8	PLCHH	3
			SIGA	1	TH	5	POMO	13
			TH	10	BG	3	PSCH	2
			BG	12			TH	8
							BG	50
			TOTAL	**101**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 997 Complete Species List

Species Name	Common Name	Species Code
Achillea millefolium	common yarrow	ACMI
Acaena pinnatifida var. *californica*	California acaena	ACPIC
Acmispon sp.		
Agoseris grandiflora	large-flowered agoseris	AGGR
Agrostis sp.		
Agrostis exarata	spike bent grass	AGEX
Aira caryophyllea	silvery hair-grass	AICA
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Briza maxima	rattlesnake grass	BRMA
Briza minor	annual quaking grass	BRMI
Brodiaea terrestris ssp. *terrestris*	dwarf brodiaea	BRTET
Bromus diandrus	ripgut grass	BRDI
Bromus hordeaceus	soft chess	BRHO
Camissonia contorta	contorted primrose	CACO
Castilleja ambigua ssp. *ambigua*	Johnny-Nip	CAAMA
Cicendia quadrangularis	timwort	CIQU
Cotula coronopifolia	brass buttons	COCO
Danthonia californica	California oat grass	DACA
Deinandra corymbosa	coastal tarweed	DECO
Deschampsia danthonioides	annual hair grass	DEDA
Diplacus aurantiacus	sticky monkey flower	DIAU
Eleocharis acicularis	needle spikerush	ELAC
Eleocharis macrostachya	pale spikerush	ELMA
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	redstem filaree	ERCI
Eryngium armatum	coyote thistle	ERAR
Festuca myuros	rattail sixweeks grass	FEMY
Festuca perennis	Italian rye grass	FEPE
Galium aparine	goose grass	GAAP
Gnaphalium palustre	lowland cudweed	GNPA
Geranium dissectum	cut-leaved geranium	GEDI
Horkelia cuneata var. *cuneata*	wedge-leaved horkelia	HOCUC
Hypochaeris glabra	smooth cat's-ear	HYGL
Isolepis cernua	low bulrush	ISCE
Isolepis sp.		
Juncus bufonius var. *bufonius*	common toad rush	JUBUB
Juncus capitatus	dwarf rush	JUCA
Juncus phaeocephalus	brown-headed rush	JUPH
Juncus uncialis	inch-high rush	JUUN
Lasthenia conjugens	Contra Costa goldfields	LACO
Lasthenia glaberrima	smooth goldfields	LAGL
Leptosiphon bicolor	true babystars	LEBI
Luzula comosa	Pacific woodrush	LUCO
Lysimachia arvensis	scarlet pimpernel	LYAR
Lysimachia minima	chaffweed	LYMI
Lythrum hyssopifolia	grass poly	LYHY
Madia sativa	coast tarweed	MASA
Microseris paludosa	marsh microseris	MIPA
Plagiobothrys chorisianus var. *hickmanii*	Hickman's popcornflower	PLCHH
Plantago coronopus	cut-leaved plantain	PLCO
Plantago erecta	California plantain	PLER
Polypogon monspeliensis	rabbitfoot grass	POMO
Psilocarphus chilensis	round woolly-marbles	PSCH
Quercus agrifolia	coast live oak	QUAG
Ranunculus californicus	California buttercup	RACA
Rumex acetosella	sheep sorrel	RUAC
Salvia mellifera	black sage	SAME
Sidalcea malviflora ssp. *malviflora*	checkerbloom	SIMAM
Silene gallica	small-flower catchfly	SIGA
Sisyrinchium bellum	western blue-eyed grass	SIBE
Stachys ajugoides	bugle hedge-nettle	STAJ
Stipa cernua	nodding needle grass	STCE
Toxicodendron diversilobum	poison oak	TODI
Triglochin scilloides	flowering quillwort	TRSC
Triteleia ixioides	coast pretty face	TRIX
Groundcover Codes		
BG	Bare Ground	
TH	Thatch/Duff/Algae	

Table B-5. Pond 42 (Baseline) Wetland Vegetation Transect Data by Stratum

POND 42			
Date	7/7/2017		
Surveying Personnel	Chris Bronny, Kayti Christianson, Elena Loke		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water	100		
Notes			
Pond was dry at time of survey. An open water stratum was present under the oaks in the NE corner of the pond; this stratum was mapped and comprised 4% relative cover of wetland, but did not have wetland vegetation and therefore was not included in the cover data. Strata 1 through 4 and the transects within these strata were new in 2017. An upland stratum was mapped in 2017 and comprised 17% relative cover of wetland, but was not included in the cover data.			

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3	
			Species	% Cover	Species	% Cover	Species	% Cover
1	4 m	8%	ELAC	3	ELAC	1	ELAC	5
			ERAR	1	ERAR	1	ERAR	12
			JUPH	35	JUPH	4	JUPH	3
			TH	61	PLCHH	1	PLCHH	1
					POMO	5	POMO	4
					TH	88	TH	75
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3	
			Species	% Cover	Species	% Cover	Species	% Cover
2	5 m	9%	ELMA	95	ELMA	94	ELMA	90
			TH	5	POMO	1	POMO	1
					TH	5	TH	9
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
3	10m	52%	ELAC	2	ELAC	1	ELAC	3	ELAC	1	ELAC	1	ELAC	1
			ERAR	5	ERAR	6	ERAR	3	ERAR	2	ERAR	10	ERAR	2
			JUPH	41	JUPH	37	JUPH	40	JUPH	77	JUPH	59	JUPH	73
			LAGL	2	POMO	1	POMO	1	TH	20	TH	30	TH	25
			TH	50	TH	65	TH	63						
			TOTAL	**100**	**TOTAL**	**110**	**TOTAL**	**110**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**101**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3	
			Species	% Cover	Species	% Cover	Species	% Cover
4	5 m	10%	DACA	35	DACA	30	DACA	55
			DECO	2	DECO	15	DECO	5
			ERAR	1	ERAR	10	FEMY	1
			GAPH	1	GAPH	1	GAPH	1
			JUBUB	27	JUBUB	15	JUBUB	12
			JUPH	1	LYHY	1	JUPH	2
			LYHY	1	ZEDA	1	LYHY	1
			ZEDA	1	TH	7	ZEDA	1
			TH	10	BG	20	TH	7
			BG	25			BG	15
			TOTAL	**104**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 42 Complete Species List

Species Name	Common Name	Species Code
Achillea millefolium	common yarrow	ACMI
Adenostoma fasciculata	chamise	ADFA
Agrostis lacuna-vernalis	vernal pool bent grass	AGLAV
Agrostis pallens	seashore bent grass	AGPA
Aira caryophyllea	silvery hair-grass	AICA
Arctostaphylos hookeri	Hooker's manzanita	ARHO
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Briza maxima	rattlesnake grass	BRMA
Briza minor	annual quaking grass	BRMI
Brodiaea terrestris ssp. *terrestris*	dwarf brodiaea	BRTET
Bromus hordeaceus	soft chess	BRHO
Calamagrostis rubescens	pinegrass	CARU
Callitriche marginata	California water-starwort	CAMA
Castilleja attenuata	valley tassels	CAAT
Castilleja exserta	purple owl's-clover	CAEX
Ceanothus thyrsiflorus var. *griseus*	Carmel ceanothus	CETHG
Cicendia quadrangularis	timwort	CIQU
Cirsium sp.		
Cotula coronopifolia	brass buttons	COCO
Crassula aquatica	aquatic pygmy weed	CRAQ
Danthonia californica	California oat grass	DACA
Deinandra corymbosa	coastal tarweed	DECO
Deschampsia danthonioides	annual hair grass	DEDA
Diplacus aurantiacus	sticky monkey flower	DIAU
Drymocallis glandulosa var. *glandulosa*	sticky cinquefoil	DRGLG
Elatine californica	California waterwort	ELCA
Eleocharis acicularis	needle spikerush	ELAC
Eleocharis macrostachya	pale spikerush	ELMA
Elymus glaucus	blue wild-rye	ELGL
Erigeron canadensis	horseweed	ERCA
Eryngium armatum	coyote thistle	ERAR
Festuca myuros	rattail sixweeks grass	FEMY
Galium porrigens	climbing bedstraw	GAPO
Gamochaeta ustulata	purple cudweed	GAUS
Gastridium phleoides	nit grass	GAPH
Geranium dissectum	cut-leaved geranium	GEDI
Heteromeles arbutifolia	toyon	HEAR
Horkelia cuneata var. *cuneata*	wedge-leaved horkelia	HOCUC
Hypochaeris glabra	smooth cat's-ear	HYGL
Iris douglasiana	Douglas iris	IRDO
Juncus bufonius var. *bufonius*	common toad rush	JUBUB
Juncus capitatus	dwarf rush	JUCA
Juncus occidentalis	western rush	JUOC
Juncus phaeocephalus	brown-headed rush	JUPH
Juncus uncialis	inch-high rush	JUUN
Lasthenia conjugens	Contra Costa goldfields	LACO
Lasthenia glaberrima	smooth goldfields	LAGL
Lasthenia glabrata	yellow-rayed lasthenia	LAGL
Logfia filaginoides	California cottonrose	LOFI
Lysimachia arvensis	scarlet pimpernel	LYAR
Lysimachia minima	chaffweed	LYMI
Lythrum hyssopifolia	grass poly	LYHY
Madia exigua	small tarweed	MAEX
Madia gracilis	gumweed	MAGR
Madia sativa	coast tarweed	MASA
Microseris paludosa	marsh microseris	MIPA
Persicaria maculosa	lady's thumb	PEMA
Plagiobothrys chorisianus var. *hickmanii*	Hickman's popcornflower	PLCHH
Polypogon interruptus	ditch polypogon	POIN
Polypogon monspeliensis	rabbitfoot grass	POMO
Pseudognaphalium beneolens	fragrant everlasting	PSBE
Pseudognaphalium luteoalbum	weedy cudweed	PSLU
Pseudognaphalium ramosissimum	pink everlasting	PSRA
Pseudognaphalium stramineum	cottonbatting plant	PSST
Psilocarphus chilensis	round woolly-marbles	PSCH
Quercus agrifolia	coast live oak	QUAG
Senecio glomeratus	cutleaf burnweed	SEGL
Silene gallica	small-flower catchfly	SIGA
Sisyrinchium bellum	western blue-eyed grass	SIBE
Sonchus asper	prickly sow thistle	SOAS
Stachys bullata	California hedgenettle	STBU
Stipa cernua	nodding needle grass	STCE
Taraxia ovata	sun cups	TAOV
Toxicodendron diversilobum	poison oak	TODI
Trifolium dubium	little hop clover	TRDI
Triteleia laxa	common triteleia	TRLA
Zeltnera davyi	Davy's centuary	ZEDA
Groundcover Codes		
BG	Bare Ground	
TH	Thatch/Duff/Algae	

Table B-6. Pond 61 (Baseline) Wetland Vegetation Transect Data by Stratum

POND 61			
Date	5/4/2017, 5/11/2017		
Surveying Personnel	Chris Bronny, Kayti Christianson, Elena Loke		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water			

Notes

Pond had small isolated areas of inundation within the vernal pool basin at the time of the 5/11/2017 survey. Strata 1,3 and 4 and the corresponding transects were new in 2017. No transect was placed in stratum 2 due to the presence of Contra Costa goldfields (CCG); see CCG map for vegetative cover estimate. CCG comprised 5% relative cover of wetland. An upland stratum was mapped and comprised 33% relative cover of wetland, but was not included in the cover data.

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
1	10 m	1%	BRTET	1	ELMA	82	ELMA	55	ELMA	20	ELMA	50	ELMA	60
			ELMA	30	PLCHH	3	LAGL	8	LAGL	65	LAGL	48	LAGL	29
			ERAR	5	TH	5	TH	12	TH	5	TH	2	TH	1
			JUPH	3	BG	10	BG	25	BG	20	BG	10	BG	10
			LAGL	1										
			PLCHH	15										
			TH	20										
			BG	25										
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**110**	**TOTAL**	**110**	**TOTAL**	**100**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
3	10 m	7%	AGLAV	1	DEDA	15	DEDA	20	DEDA	20	DEDA	15	DEDA	12
			DACA	2	ELAC	1	ERAR	12	ERAR	2	ELAC	3	ERAR	20
			FEMY	1	ERAR	3	LAGL	1	JUPH	5	ERAR	25	JUPH	20
			JUPH	65	JUPH	25	LYMI	1	LAGL	3	JUPH	5	LAGL	1
			MIPA	2	LAGL	5	PLCHH	12	PLCHH	10	LAGL	8	PLCHH	13
			PLCHH	4	PLCHH	6	PSCH	1	TH	50	PLCHH	20	TH	15
			PSCH	1	TH	30	TH	35	BG	10	TH	15	BG	20
			Trifolium sp.	1	BG	15	BG	18			BG	10		
			TH	10										
			BG	15										
			TOTAL	**102**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**101**	**TOTAL**	**101**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	**% Cover**	**Species**	**% Cover**	**Species**	**% Cover**	**Species**	**% Cover**	**Species**	**% Cover**	**Species**	**% Cover**
4	**10 m**	**54%**	ALHI	1	AICA	1	AICA	1	AICA	2	BRMA	3	BRTET	1
			BRHO	3	BRHO	5	BRHO	5	BRHO	2	BRMI	1	ERAR	10
			BRMA	1	BRMA	2	BRMA	2	BRMA	5	BRTET	2	JUPH	45
			BRTET	2	BRTET	5	BRMI	1	BRMI	2	TAOV	1	PLCHH	1
			DACA	1	DACA	20	BRTET	1	BRTET	1	DACA	30	PSCH	2
			ERBO	1	ERAR	1	DACA	25	ERAR	1	ERBO	2	TH	20
			JUPH	80	ERBO	1	ERBO	2	ERBO	2	FEMY	1	BG	20
			MIPA	2	JUPH	30	JUPH	25	FEMY	2	JUPH	35		
			TH	5	MIPA	4	PSCH	1	JUPH	30	*Madia* sp.	3		
			BG	5	PSCH	1	TH	15	MIPA	1	MIPA	2		
					TH	25	BG	25	PSCH	1	PSCH	3		
					BG	5			TH	35	TH	10		
									BG	15	BG	10		
			TOTAL	**101**	**TOTAL**	**100**	**TOTAL**	**103**	**TOTAL**	**99**	**TOTAL**	**103**	**TOTAL**	**99**

Pond 61 Complete Species List

Species Name	Common Name	Species Code
Acaena pinnatifida var. *californica*	California acaena	ACPIC
Achillea millefolium	common yarrow	ACMI
Acmispon glaber	deerweed	ACGL
Acmispon parviflorus	hill lotus	ACPA
Adenostoma fasciculata	chamise	ADFA
Agoseris grandiflora var. *grandiflora*	large-flowered agoseris	AGGRG
Agrostis lacuna-vernalis	vernal pool bent grass	AGLAV
Aira caryophyllea	silvery hair-grass	AICA
Allium hickmanii	Hickman's onion	ALHI
Arctostaphylos tomentosa	woolly leaf manzanita	ARTO
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Briza maxima	rattlesnake grass	BRMA
Briza minor	annual quaking grass	BRMI
Brodiaea terrestris ssp. *terrestris*	dwarf brodiaea	BRTET
Bromus diandrus	ripgut grass	BRDI
Bromus hordeaceus	soft chess	BRHO
Calandrinia ciliata	red maids	CACI
Callitriche marginata	California water-starwort	CAMA
Calochortus uniflorus	pink star-tulip	CAUN
Calystegia subacaulis	hill morning glory	CAUN
Cardionema ramosissimum	sand mat	CARA
Castilleja ambigua ssp. *ambigua*	Johnny-Nip	CAAMA
Castilleja densiflora	dense flower owl's clover	CADE
Centaurea melitensis	Maltese star-thistle	CEME
Chlorogalum pomeridianum	wavyleaf soap plant	CHPO
Cicendia quadrangularis	timwort	CIQU
Cirsium sp.		
Corethrogyne filaginifolia	common sandaster	COFI
Cotula coronopifolia	brass buttons	COCO
Crassula aquatica	aquatic pygmy weed	CRAQ
Crocanthemum scoparium	peak rush-rose	CRSC
Danthonia californica	California oat grass	DACA
Deinandra corymbosa	coastal tarweed	DECO
Deschampsia danthonioides	annual hair grass	DEDA
Dichelostemma capitatum ssp. *capitatum*	bluedicks	DICAC
Eleocharis acicularis	needle spikerush	ELAC
Eleocharis macrostachya	pale spikerush	ELMA
Elymus glaucus	blue wild-rye	ELGL
Erodium cicutarium	redstem filaree	ERCI
Eryngium armatum	coyote thistle	ERAR
Eschscholzia californica	California poppy	ESCA
Festuca myuros	rattail sixweeks grass	FEMY
Festuca perennis	Italian rye grass	FEPE
Galium porrigens	climbing bedstraw	GAPO
Galium triflorum	fragrant bedstraw	GATR
Gamochaeta ustulata	purple cudweed	GAUS
Geranium dissectum	cut-leaved geranium	GEDI
Gnaphalium palustre	lowland cudweed	GNPA
Heteromeles arbutifolia	toyon	HEAR
Hordeum marinum ssp. *gussoneanum*	Mediterranean barley	HOMAG
Horkelia cuneata var. *cuneata*	wedge-leaved horkelia	HOCUC
Hypochaeris glabra	smooth cat's-ear	HYGL
Isoetes howellii	Howell's quillwort	ISHO
Isolepis cernua	low bulrush	ISCE
Juncus bufonius var. *bufonius*	common toad rush	JUBUB
Juncus capitatus	dwarf rush	JUCA
Juncus occidentalis	western rush	JUOC
Juncus phaeocephalus	brown-headed rush	JUPH
Juncus uncialis	inch-high rush	JUUN
Lasthenia conjugens	Contra Costa goldfields	LACO
Lasthenia glaberrima	smooth goldfields	LAGL
Leptosiphon androsaceus	false babystars	LEAN
Lupinus concinnus	bajada lupine	LUCO
Lupinus nanus	sky lupine	LUNA
Luzula comosa	Pacific woodrush	LUCO
Lysimachia arvensis	scarlet pimpernel	LYAR
Lysimachia minima	chaffweed	LYMI
Lythrum hyssopifolia	grass poly	LYHY
Madia elegans	common madia	MAEL
Madia sativa	coast tarweed	MASA
Microseris paludosa	marsh microseris	MIPA
Phalaris lemmonii	Lemmon's canary grass	PHLE
Plagiobothrys chorisianus var. *hickmanii*	Hickman's popcornflower	PLCHH
Plantago coronopus	cut-leaved plantain	PLCO
Plantago erecta	California plantain	PLER
Pogogyne zizyphoroides	Sacramento mesa mint	POZI
Primula clevelandii var. *patula*	Padre's shooting star	PRCLP
Pseudognaphalium californicum	California everlasting	PSCA
Psilocarphus chilensis	round woolly-marbles	PSCH
Pteridium aquilinum var. *pubescens*	western bracken fern	PTAQP
Quercus agrifolia	coast live oak	QUAG
Ranunculus californicus	California buttercup	RACA
Ribes speciosum	fuchsia-flower gooseberry	RISP
Rumex acetosella	sheep sorrel	RUAC
Sanicula crassicaulis	Pacific sanicle	SACR
Sidalcea malviflora ssp. *malviflora*	checkerbloom	SIMAM
Silene gallica	small-flower catchfly	SIGA
Sisyrinchium bellum	western blue-eyed grass	SIBE
Sonchus oleraceus	common sow thistle	SOOL
Stachys ajugoides	bugle hedge-nettle	STAJ
Stipa cernua	nodding needle grass	STCE
Stipa pulchra	purple needle grass	STPU
Toxicodendron diversilobum	poison oak	TODI
Trifolium sp.		
Trifolium barbigerum	bearded clover	TRBA
Trifolium depauperatum	sack clover	TRDE
Trifolium variegatum	variegated clover	TRVA
Triglochin scilloides	flowering quillwort	TRSC
Zeltnera davyi	Davy's centuary	ZEDA
Groundcover Codes		
BG	Bare Ground	
TH	Thatch/Duff/Algae	

Table B-7. Pond 16 (Year 1 Post-Mastication) Wetland Vegetation Transect Data by Stratum

POND 16			
Date	9/20/2017		
Surveying Personnel	Chris Bronny, Kayti Christianson, Elena Loke		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation	15	ELMA	
Floating Vegetation			
Submerged Vegetation	7	CEDE	
Open Water	78		Depth on 9/20/2017: 26 cm
Notes			
Pond was inundated in a small area near the staff gauge at the time of the survey. Stratum 2 consisted of inundated area and comprised 11% relative cover of wetland; dominant species composition changed from "standing dead stalks of horseweed and Italian thistle" to ELMA and CEDE (*Ceratophyllum demersum*). No transect was placed in stratum 2. Strata 1 through 5 were repeated from 2015, while strata 6 and 7 were new in 2017. Transects in strata 3 and 5 were repeated from 2015. Transects in strata 1, 4, 6, and 7 were new in 2017.			

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3	
			Species	% Cover	Species	% Cover	Species	% Cover
1	**5 m**	**2%**	CIVU	8	HECUO	15	HECUO	20
			HECUO	12	PSLU	1	PSLU	2
			PSLU	3	SCCA	60	SCCA	50
			SCCA	45	TH	3	TH	3
			TH	1	BG	21	BG	25
			BG	29				
			TOTAL	**98**	**TOTAL**	**100**	**TOTAL**	**100**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
3	**10 m**	**17%**	ELMA	94	CRSC	2	CRSC	3	CRSC	1	ELMA	80	ELMA	90
			RUAC	1	ELMA	63	ELMA	72	ELMA	59	BG	20	BG	10
			BG	5	BG	35	BG	25	BG	40				
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
4	**10 m**	**37%**	BRMI	1	AICA	1	BRMI	2	AICA	1	ACMI	2	AICA	1
			CAPR	84	BRMI	2	CAPR	58	BRMI	1	ACPA	2	CAPR	52
			ERCA	1	CAPR	73	ERCA	1	CAPR	54	AICA	2	ERCA	1
			JUBA	1	ERCA	1	HYRA	1	PSLU	1	CAPR	56	PSLU	15
			LYHY	1	PSLU	3	PSLU	2	RUAC	3	ERCA	1	RUUR	8
			PSLU	3	RUAC	2	RUAC	3	RUSA	7	FEMY	1	SOOL	3
			RUAC	2	RUUR	7	RUUR	9	RUUR	12	PSLU	5	TH	5
			TH	5	SOOL	1	SOOL	1	SOOL	1	RUAC	2	BG	15
			BG	2	TH	7	TH	18	TH	18	RUUR	20		
					BG	3	BG	5	BG	2	SOOL	1		
											TH	6		
											BG	2		
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
5	**10 m**	**28%**	CABA	38	CABA	50	CABA	70	CABA	95	CABA	89	CABA	65
			RUUR	2	TH	48	TH	28	TH	10	TH	10	RUUR	3
			TH	55	BG	2	BG	2	BG	1	BG	1	TH	20
			BG	5									BG	15
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**106**	**TOTAL**	**100**	**TOTAL**	**103**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3	
			Species	% Cover	Species	% Cover	Species	% Cover
6	**5 m**	**1%**	JUBA	80	CIVU	1	HECUO	1
			PSLU	2	JUBA	55	JUBA	56
			TH	3	PSLU	1	PSLU	1
			BG	15	SOAM	18	TH	17
					TH	5	BG	25
					BG	20		
			TOTAL	**103**	**TOTAL**	**100**	**TOTAL**	**100**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3	
			Species	% Cover	Species	% Cover	Species	% Cover
7	**5 m**	**4%**	CRSC	70	CRSC	57	CRSC	50
			ECCR	25	ECCR	35	ECCR	41
			GNPA	1	GNPA	5	GNPA	3
			BG	4	BG	3	BG	6
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 16 Complete Species List

Species Name	Common Name	Species Code
Achillea millefolium	common yarrow	ACMI
Acmispon parviflorus	hill lotus	ACPA
Aira caryophyllea	silvery hair-grass	AICA
Amsinckia menziesii	common fiddleneck	AMME
Artemisia douglasiana	mugwort	ARDO
Avena barbata	slender wild oat	AVBA
Azolla filiculoides	fern-like azolla	AZFI
Baccharis pilularis	coyote brush	BAPI
Briza maxima	rattlesnake grass	BRMA
Briza minor	annual quaking grass	BRMI
Bromus diandrus	ripgut grass	BRDI
Bromus hordeaceus	soft chess	BRHO
Bromus madritensis ssp. *rubens*	red brome	BRMAR
Cardionema ramosissimum	sand mat	CARA
Carduus pycnocephalus	Italian thistle	CAPY
Carex barbarae	Santa Barbara sedge	CABA
Carex praegracilis	clustered field sedge	CAPR
Carpobrotus edulis	ice plant	CAED
Cerastium glomeratum	sticky mouse-ear chickweed	CEGL
Ceratophyllum demersum	coon's tail	CEDE
Cirsium quercetorum	brownie thistle	CIQU
Cirsium vulgare	bull thistle	CIVU
Claytonia perfoliata	miner's lettuce	CLPE
Conium maculatum	poison hemlock	COMA
Crypsis alopecuroides	foxtail pricklegrass	CRAL
Crypsis schoenoides	swamp pricklegrass	CRSC
Cyperus eragrostis	tall cyperus	CYER
Echinochloa crus-galli	barnyard grass	ECCR
Eleocharis macrostachya	pale spikerush	ELMA
Elymus triticoides	beardless wild rye	ELTR
Erigeron canadensis	horseweed	ERCA
Erodium cicutarium	redstem filaree	ERCI
Festuca myuros	rattail sixweeks grass	FEMY
Galium aparine	goose grass	GAAP
Gamochaeta ustulata	purple cudweed	GAUS
Geranium dissectum	cut-leaved geranium	GEDI
Geranium molle	dove's foot geranium	GEME
Gnaphalium palustre	lowland cudweed	GNPA
Heliotropium curassavicum var. *oculatum*	Chinese pusley	HECUO
Helminthotheca echioides	bristly oxtongue	HECH
Heterotheca grandiflora	telegraph weed	HEGR
Horkelia cuneata var. *cuneata*	wedge-leaved horkelia	HOCUC
Hypochaeris glabra	smooth cat's-ear	HYGL
Hypochaeris radicata	rough cat's-ear	HYRA
Juncus balticus	Baltic rush	JUBA
Juncus bufonius var. *bufonius*	common toad rush	JUBUB
Juncus effusus	common rush	JUEF
Juncus occidentalis	western rush	JUOC
Juncus patens	spreading rush	JUPA
Juncus phaeocephalus	brown-headed rush	JUPH
Lupinus arboreus	yellow bush lupine	LUAR
Lupinus bicolor	miniature lupine	LUBI
Lysimachia arvensis	scarlet pimpernel	LYAR
Lythrum hyssopifolia	grass poly	LYHY
Madia elegans	common madia	MAEL
Malvella leprosa	alkali mallow	MALE
Marah fabacea	California man-root	MAFA
Medicago polymorpha	California burclover	MEPO
Nuttallanthus texanus	blue toadflax	NUTE
Persicaria hydropiperoides	waterpepper	PEHY
Petrorhagia dubia	hairypink	PEDU
Phacelia brachyloba	shortlobe phacelia	PHBR
Polypogon monspeliensis	rabbitfoot grass	POMO
Pseudognaphalium luteoalbum	weedy cudweed	PSLU
Pteridium aquilinum var. *pubescens*	western bracken fern	PTAQP
Quercus agrifolia	coast live oak	QUAG
Ranunculus californicus	California buttercup	RACA
Rosa californica	California wild rose	ROCA
Rubus ursinus	California blackberry	RUUR
Rumex acetosella	sheep sorrel	RUAC
Rumex crispus	curly dock	RUCR
Rumex salicifolius	willow dock	RUSA
Salix lasiandra var. *lasiandra*	shining willow	SALAL
Schoenoplectus californicus	California bulrush	SCCA
Senecio glomeratus	cutleaf burnweed	SEGL
Silene gallica	small-flower catchfly	SIGA
Silybum marianum	milk thistle	SIMA
Sisyrinchium bellum	western blue-eyed grass	SIBE
Solanum americanum	small-flowered nightshade	SOAM
Solidago canadensis	Canada goldenrod	SOCA
Solidago elongata	West Coast Canada goldenrod	SOEL
Solidago velutina ssp. *californica*	California goldenrod	SOVEC
Sonchus asper	prickly sow thistle	SOAS
Sonchus oleraceus	common sow thistle	SOOL
Toxicodendron diversilobum	poison oak	TODI
Trifolium hirtum	rose clover	TRHI
Trifolium sp.		
Groundcover Codes		
BG	Bare Ground	
TH	Thatch/Duff/Algae	

Table B-8. Pond 18 (Year 2 Post-Mastication) Wetland Vegetation Transect Data by Stratum

POND 18			
Date	7/5/2017		
Surveying Personnel	Chris Bronny, Elena Loke		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water			
Notes			
Pond was dry at the time of the survey. Strata 1 through 4 were repeated from 2016. Transect 3 was repeated from 2016. Transects 1, 2, and 4 were new in 2017 because they were relocated to a more representative location. An upland stratum was mapped and comprised 1% relative cover of wetland, but was not included in the cover data.			

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3	
			Species	% Cover	Species	% Cover	Species	% Cover
1	**5 m**	**26%**	ELMA	95	ELMA	85	ELMA	90
			TH	5	TH	15	TH	10
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
2	**10 m**	**11%**	ELMA	10	ELMA	40	ELMA	15	ELTR	70	ELTR	4	ELTR	75
			ELTR	35	ELTR	8	ELTR	40	TH	25	TH	90	TH	20
			TH	45	TH	32	TH	35	BG	10	BG	10	BG	5
			BG	10	BG	20	BG	10						
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**105**	**TOTAL**	**104**	**TOTAL**	**100**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
3	**10 m**	**59%**	AGPA	12	AGPA	1	AGPA	10	AGPA	25	AGPA	5	ELMA	15
			ELMA	3	ELMA	10	ELMA	20	BRMA	1	ELMA	10	HECUO	2
			LYHY	1	HECUO	6	ERAR	4	EUOC	1	ELTR	10	POMO	2
			PLCHH	1	LYHY	1	HECUO	15	LYHY	1	HECUO	8	RUPU	25
			RUAC	1	TH	57	RUAC	15	RUPU	20	RUPU	35	TH	46
			TH	20	BG	25	TH	26	TH	32	TH	20	BG	10
			BG	62			BG	10	BG	20	BG	15		
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3	
			Species	% Cover	Species	% Cover	Species	% Cover
4	5 m	3%	BRMA	10	BRMA	2	BRMA	1
			BRMI	2	BRMI	3	BRMI	2
			JUBUB	5	DECO	1	DECO	2
			LYHY	15	HYGL	1	JUBUB	7
			PLCO	20	JUBUB	5	JUPH	3
			ZEDA	1	JUPH	8	LYHY	2
			TH	27	LYHY	10	PLCO	52
			BG	20	PLCO	16	ZEDA	1
					ZEDA	1	TH	20
					TH	15	BG	10
					BG	38		
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 18 Complete Species List

Species Name	Common Name	Species Code
Acmispon americanus var. *americanus*	Spanish lotus	ACAMA
Agrostis pallens	seashore bent grass	AGPA
Baccharis pilularis	coyote brush	BAPI
Briza maxima	rattlesnake grass	BRMA
Briza minor	annual quaking grass	BRMI
Calamagrostis rubescens	pinegrass	CARU
Cirsium vulgare	bull thistle	CIVU
Cirsium sp.		
Cotula coronopifolia	brass buttons	COCO
Deinandra corymbosa	coastal tarweed	DECO
Eleocharis acicularis	needle spikerush	ELAC
Eleocharis macrostachya	pale spikerush	ELMA
Elymus condensatus	giant wild rye	ELCO
Elymus glaucus	blue wild-rye	ELGL
Elymus trachycaulus	slender wheat grass	ELTR
Elymus triticoides	beardless wild rye	ELTR
Eryngium armatum	coyote thistle	ERAR
Euthamia occidentalis	western goldenrod	EUOC
Festuca myuros	rattail sixweeks grass	FEMY
Heliotropium curassavicum var. *oculatum*	Chinese pusley	HECUO
Heterotheca grandiflora	telegraph weed	HEGR
Hypochaeris glabra	smooth cat's-ear	HYGL
Isolepis cernua	low bulrush	ISCE
Juncus balticus	Baltic rush	JUBA
Juncus bufonius var. *bufonius*	common toad rush	JUBUB
Juncus occidentalis	western rush	JUOC
Juncus phaeocephalus	brown-headed rush	JUPH
Lysimachia arvensis	scarlet pimpernel	LYAR
Lythrum hyssopifolia	grass poly	LYHY
Madia sativa	coast tarweed	MASA
Plagiobothrys chorisianus var. *hickmanii*	Hickman's popcornflower	PLCHH
Plantago coronopus	cut-leaved plantain	PLCO
Polypogon monspeliensis	rabbitfoot grass	POMO
Pseudognaphalium luteoalbum	weedy cudweed	PSLU
Rubus ursinus	California blackberry	RUUR
Rumex acetosella	sheep sorrel	RUAC
Rumex pulcher	fiddle dock	RUPU
Rumex salicifolius	willow dock	RUSA
Senecio glomeratus	cutleaf burnweed	SEGL
Sonchus asper	prickly sow thistle	SOAS
Toxicodendron diversilobum	poison oak	TODI
Zeltnera davyi	Davy's centuary	ZEDA
Groundcover Codes		
BG	Bare Ground	
TH	Thatch/Duff/Algae	

Table B-9. Pond 10 (Year 5 Post-Lead Remediation) Wetland Vegetation Transect Data by Stratum

POND 10			
Date	7/7/2017; 9/20/2017; 10/12/2017		
Surveying Personnel	Chris Bronny, Kayti Christianson, Elena Loke		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation	15	ELMA, TYLA, PEAM	
Floating Vegetation			
Submerged Vegetation			
Open Water	85		Depth on 10/12/2017: 54 cm
Notes			
No transects were placed in strata 1 and 2: stratum 1 consisted of inundated area (24% relative cover of wetland) and stratum 2 consisted of the island of California bulrush (3% relative cover of wetland). Strata 1 through 5 were repeated from 2016. Transects 3 and 5 were repeated from 2016. Transect 4 was new in 2017: it was relocated to a more representative location. An upland stratum was mapped and comprised 7% relative cover of wetland, but was not included in the cover data.			

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
3	**10 m**	**59%**	DISP	2	DISP	5	CAMA	1	CAMA	1	CAMA	1	CAMA	3
			ELAC	7	ELAC	30	DISP	3	ELMA	95	ELMA	97	ELMA	95
			ELMA	85	ELMA	54	ELAC	1	TH	2	TH	1	TH	2
			TH	1	TH	4	ELMA	80	BG	2	BG	1	BG	1
			BG	5	BG	7	TH	5						
							BG	10						
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**101**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
4	**10 m**	**5%**	DISP	1	DISP	2	AZFI	1	AZFI	1	AZFI	1	DISP	1
			ISCE	1	ISCE	1	DISP	1	DISP	1	DISP	1	EUOC	1
			JUPH	50	JUPH	40	JUPH	65	JUPH	60	EUOC	1	JUPH	50
			TH	43	STAJ	1	TH	5	TH	5	ISCE	1	TH	5
			BG	5	TH	15	BG	28	BG	33	JUPH	55	BG	42
					BG	40					TH	5		
											BG	36		
			TOTAL	**100**	**TOTAL**	**99**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**99**

Transect #	Transect Length	Relative % Cover Of Wetland	Quadrat #1		Quadrat #2		Quadrat #3	
			Species	% Cover	Species	% Cover	Species	% Cover
5	**5m**	**2%**	ERCA	1	JUBA	15	JUBA	30
			JUBA	50	SOAS	1	LYHY	3
			SOAS	1	*Vicia* sp.	1	POMO	1
			TH	18	TH	48	RUCR	1
			BG	30	BG	35	TH	35
							BG	30
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 10 Complete Species List

Species Name	Common Name	Species Code	Species Name	Common Name	Species Code
Aira caryophyllea	silvery hair-grass	AICA	*Lythrum hyssopifolia*	grass poly	LYHY
Artemisia douglasiana	mugwort	ARDO	*Madia elegans*	common madia	MAEL
Avena sp.	wild oat		*Madia sativa*	coast tarweed	MASA
Azolla filiculoides	fern-like azolla	AZFI	*Malvella leprosa*	alkali mallow	MALE
Baccharis douglasii	saltmarsh baccharis	BADO	*Persicaria amphibia*	water smartweed	PEAM
Baccharis glutinosa	marsh baccharis	BAGL	*Persicaria hydropiperoides*	waterpepper	PEHY
Baccharis pilularis	coyote brush	BAPI	*Plantago coronopus*	cut-leaved plantain	PLCO
Bromus diandrus	ripgut grass	BRDI	*Polypogon monspeliensis*	rabbitfoot grass	POMO
Bromus hordeaceus	soft chess	BRHO	*Pseudognaphalium luteoalbum*	weedy cudweed	PSLU
Callitriche marginata	California water-starwort	CAMA	*Pseudognaphalium stramineum*	cottonbatting plant	PSST
Carex barbarae	Santa Barbara sedge	CABA	*Quercus agrifolia*	coast live oak	QUAG
Carex praegracilis	clustered field sedge	CAPR	*Rorippa curvisiliqua*	western yellow cress	ROCU
Carpobrotus edulis	ice plant	CAED	*Rubus ursinus*	California blackberry	RUUR
Centromadia parryi ssp. *congdonii*	Congdon's tarweed	CEPAC	*Rumex crispus*	curly dock	RUCR
Cirsium quercetorum	brownie thistle	CIQU	*Rumex salicifolius*	willow dock	RUSA
Cirsium vulgare	bull thistle	CIVU	*Schoenoplectus californicus*	California bulrush	SCCA
Cyperus eragrostis	tall cyperus	CYER	*Sonchus asper*	prickly sow thistle	SOAS
Distichlis spicata	salt grass	DISP	*Sonchus oleraceus*	common sow thistle	SOOL
Eleocharis acicularis	needle spikerush	ELAC	*Stachys ajugoides*	bugle hedge-nettle	STAJ
Eleocharis macrostachya	pale spikerush	ELMA	*Toxicodendron diversilobum*	poison oak	TODI
Elymus triticoides	beardless wild rye	ELTR	*Typha latifolia*	broad-leaved cattail	TYLA
Erigeron canadensis	horseweed	ERCA	*Vicia* sp.		
Erodium botrys	long-beaked filaree	ERBO	*Zeltnera davyi*	Davy's centuary	ZEDA
Euthamia occidentalis	western goldenrod	EUOC	*Zeltnera muehlenbergii*	Monterey centaury	ZEMU
Festuca myuros	rattail sixweeks grass	FEMY	**Groundcover Codes**		
Gastridium phleoides	nit grass	GAPH	BG	Bare Ground	
Gnaphalium palustre	lowland cudweed	GNPA	TH	Thatch/Duff/Algae	
Heliotropium curassavicum var. oculatum	Chinese pusley	HECUO			
Heteromeles arbutifolia	toyon	HEAR			
Heterotheca grandiflora	telegraph weed	HEGR			
Horkelia cuneata	wedge-leaved horkelia	HOCU			
Isolepis cernua	low bulrush	ISCE			
Juncus balticus	Baltic rush	JUBA			
Juncus effusus	common rush	JUEF			
Juncus occidentalis	western rush	JUOC			
Juncus patens	spreading rush	JUPA			
Juncus phaeocephalus	brown-headed rush	JUPH			
Lysimachia arvensis	scarlet pimpernel	LYAR			

APPENDIX C

Stratum Cover by Vernal Pool

Table C-1. Pond 5 (Reference) Wetland Vegetation Cover by Stratum

POND 5			
Stratum	**Relative % Cover of Wetland**	**Species**	**% Cover**
Inundated	53%	-	-
2	12%	DISP	20.8
		ELMA	49.2
		LYAR	1.0
		PLCHH	0.5
		PSLU	2.2
		STAJ	1.8
		TH	15.8
		BG	12.0
		TOTAL	**103.3**
3	12%	BRMI	0.8
		DACA	4.2
		DISP	9.2
		FEMY	0.2
		ISCE	1.3
		JUPH	37.2
		LYHY	1.3
		POMO	0.2
		TH	9.0
		BG	36.7
		TOTAL	**100.0**
4	16%	AICA	1.2
		BRHO	0.3
		BRMI	2.5
		DACA	0.7
		DISP	3.8
		Erodium sp.	0.3
		FEMY	1.5
		JUBUB	3.2
		JUPH	6.5
		LYHY	4.0
		RUAC	3.3
		SIGA	0.2
		TH	56.5
		BG	16.5
		TOTAL	**100.5**

POND 5			
Stratum	**Relative % Cover of Wetland**	**Species**	**% Cover**
5	7%	DISP	35.8
		ELTR	3.3
		Galium sp.	0.3
		GNPA	2.0
		JUBA	5.0
		LYAR	0.2
		LYHY	4.5
		LYMI	1.5
		PLCHH	0.7
		PSLU	7.5
		PSST	10.5
		SEGL	0.3
		SOAM	12.8
		STAJ	0.3
		Vicia sp.	0.7
		ZEDA	0.2
		TH	2.7
		BG	12.5
		TOTAL	**100.8**

Table C-2. Pond 101 East West) (Reference) Wetland Vegetation Cover by Stratum

POND 101 East (West)			
Stratum	Relative % Cover of Wetland	Species	% Cover
1	6%	ALSA	3.2
		ELMA	32.5
		GNPA	1.8
		ISHO	4.3
		LYHY	0.3
		MALE	1.7
		ROCU	1.8
		RUSA	0.2
		TRSC	1.0
		VELAL	0.7
		TH	32.8
		BG	19.7
		TOTAL	**100.0**
2	48%	ELMA	86.3
		POMO	0.7
		LAGL	0.2
		PLCHH	0.2
		TH	0.3
		BG	12.5
		TOTAL	**100.2**
3	8%	DISP	17.3
		ERAR	1.7
		ERCI	0.2
		FEPE	1.7
		HECUO	0.3
		HYGL	0.2
		ISHO	24.2
		LAGL	0.3
		LYHY	3.7
		PLCHH	8.5
		PSLU	3.0
		RUAC	0.2
		RUCR	0.7
		RUSA	0.2
		TH	30.0
		BG	9.5
		TOTAL	**101.5**

POND 101 East (West)			
Stratum	Relative % Cover of Wetland	Species	% Cover
4	28%	BAPI	4.2
		BRHO	0.2
		BRMI	0.3
		DISP	0.2
		ELMA	1.8
		FEMY	1.2
		GNPA	1.2
		HECUO	1.3
		Isolepis sp.	0.5
		JUBUB	9.2
		JUPH	0.8
		LYHY	46.7
		MASA	1.5
		POMO	0.2
		PSLU	1.2
		PORI	0.5
		RUAC	3.8
		STAJ	0.2
		TH	7.5
		BG	17.7
		TOTAL	**99.2**
5	2%	BAPI	0.7
		BRMI	3.2
		ELMA	11.2
		FEMY	7.5
		FEPE	15.3
		HECUO	0.2
		JUBUB	9.8
		JUPH	0.2
		LYHY	11.2
		MALE	1.3
		MASA	2.0
		POMO	0.2
		RUAC	2.2
		RUSA	0.3
		TH	23.2
		BG	13.3
		TOTAL	**101.7**

Table C-2. Pond 101 East (West) (Reference) Wetland Vegetation Cover by Stratum

POND 101 East (West)			
Stratum	**Relative % Cover of Wetland**	**Species**	**% Cover**
6	1%	ERCA	0.7
		GNPA	7.5
		HECUO	0.2
		HYGL	0.3
		HYRA	0.8
		JUBA	7.0
		JUBUB	0.2
		JUPH	19.3
		LYHY	11.3
		PLCHH	0.2
		PSLU	0.2
		RUAC	19.2
		RUCR	1.2
		STAJ	1.3
		TH	6.2
		BG	24.7
		TOTAL	**100.2**
7	7%	CAPR	92.3
		TH	7.7
		TOTAL	**100.0**

Table C-3. Pond 101 East (East) (Reference)
Wetland Vegetation Cover by Stratum

POND 101 East (East)			
Stratum	**Relative % Cover of Wetland**	**Species**	**% Cover**
2	42%	-	-
5	28%	CYER	0.2
		ERBO	0.5
		GNPA	25.3
		HECUO	11.7
		JUBA	0.2
		JUBUB	1.3
		LYHY	8.8
		PSLU	16.3
		PORI	0.3
		ROCU	0.3
		RUAC	19.3
		STAJ	2.5
		BG	14.0
		TOTAL	**100.8**
6	30%	ACPA	0.2
		CAPR	13.3
		CYER	3.8
		DISP	0.3
		JUBA	46.3
		LYHY	2.0
		PORI	0.3
		PSLU	0.5
		PSST	7.8
		RUAC	6.5
		RUCR	0.7
		VELAL	0.5
		TH	7.0
		BG	12.2
		TOTAL	**101.5**

Table C-4. Pond 997 (Reference) Wetland Vegetation Cover by Stratum

POND 997			
Stratum	**Relative % Cover of Wetland**	**Species**	**% Cover**
1	3%	*Agrostis* sp.	15.3
		ELMA	3.0
		ERAR	20.3
		JUPH	2.7
		PLCHH	3.3
		PSCH	0.7
		TH	20.5
		BG	34.8
		TOTAL	**100.7**
2 (CCG)	2%	LACO	-
3	89%	BRMA	0.8
		BRMI	2.5
		CAAMA	1.3
		DACA	20.8
		DECO	0.7
		ELMA	0.2
		ERAR	5.3
		ERBO	0.3
		ERCI	0.8
		FEMY	0.2
		GEDI	0.2
		HYGL	0.7
		ISCE	2.8
		JUBUB	1.2
		JUPH	9.0
		JUUN	0.8
		LYHY	13.7
		LYMI	1.0
		RUAC	0.2
		TH	15.7
		BG	23.7
		TOTAL	**101.8**

POND 997			
Stratum	**Relative % Cover of Wetland**	**Species**	**% Cover**
4	2%	AGEX	16.0
		BRMI	0.7
		DEDA	1.7
		ELAC	6.7
		ERAR	5.7
		JUPH	4.7
		LYHY	0.3
		PLCHH	2.3
		POMO	26.0
		PSCH	6.7
		SIGA	0.3
		TH	7.7
		BG	21.7
		TOTAL	**100.3**
Upland	4%	-	-

Table C-5. Pond 42 (Baseline) Wetland Vegetation Cover by Stratum

POND 42			
Stratum	**Relative % Cover of Wetland**	**Species**	**% Cover**
Open Water	4%	-	-
1	8%	ELAC	3.0
		ERAR	4.7
		JUPH	14.0
		PLCHH	0.7
		POMO	3.0
		TH	74.7
		TOTAL	**100.0**
2	9%	ELMA	93.0
		POMO	0.7
		TH	6.3
		TOTAL	**100.0**
3	52%	ELAC	1.5
		ERAR	4.7
		JUPH	54.5
		LAGL	0.3
		POMO	0.3
		TH	42.2
		TOTAL	**103.5**
4	10%	DACA	40.0
		DECO	7.3
		ERAR	3.7
		FEMY	0.3
		GAPH	1.0
		JUBUB	18.0
		JUPH	1.0
		LYHY	1.0
		ZEDA	1.0
		TH	8.0
		BG	20.0
		TOTAL	**101.3**
Upland	17%	-	-

Table C-6. Pond 61 (Baseline) Wetland Vegetation Cover by Stratum

POND 61			
Stratum	**Relative % Cover of Wetland**	**Species**	**% Cover**
1	1%	BRTET	0.2
		ELMA	49.5
		ERAR	0.8
		JUPH	0.5
		LAGL	25.2
		PLCHH	3.0
		TH	7.5
		BG	16.7
		TOTAL	**103.3**
2 (CCG)	5%	LACO	-*
3	7%	AGLAV	0.2
		DACA	0.3
		DEDA	13.7
		ELAC	0.7
		ERAR	10.3
		FEMY	0.2
		JUPH	20.0
		LAGL	3.0
		LYMI	0.2
		MIPA	0.3
		PLCHH	10.8
		PSCH	0.3
		Trifolium sp.	0.2
		TH	25.8
		BG	14.7
		TOTAL	**100.7**

POND 61			
Stratum	**Relative % Cover of Wetland**	**Species**	**% Cover**
4	54%	ALHI	0.2
		AICA	0.7
		BRHO	2.5
		BRMA	2.2
		BRMI	0.7
		BRTET	2.0
		DACA	12.7
		ERAR	2.0
		ERBO	1.3
		FEMY	0.5
		JUPH	40.8
		Madia sp.	0.5
		MIPA	1.5
		PLCHH	0.2
		PSCH	1.3
		TAOV	0.2
		TH	18.3
		BG	13.3
		TOTAL	**100.8**
Upland	33%	-	-

Table C-7. Pond 16 (Year 1 Post-Mastication) Wetland Vegetation Cover by Stratum

POND 16			
Stratum	**Relative % Cover of Wetland**	**Species**	**% Cover**
1	2%	CIVU	2.7
		HECUO	15.7
		PSLU	2.0
		SCCA	51.7
		TH	2.3
		BG	25.0
		TOTAL	**99.3**
2	11%	-	-
3	17%	CRSC	1.0
		ELMA	76.3
		RUAC	0.2
		BG	22.5
		TOTAL	**100.0**
4	37%	ACMI	0.3
		ACPA	0.3
		AICA	0.8
		BRMI	1.0
		CAPR	62.8
		ERCA	0.8
		FEMY	0.2
		HYRA	0.2
		JUBA	0.2
		LYHY	0.2
		PSLU	4.8
		RUAC	2.0
		RUSA	1.2
		RUUR	9.3
		SOOL	1.2
		TH	9.8
		BG	4.8
		TOTAL	**100.0**

POND 16			
Stratum	**Relative % Cover of Wetland**	**Species**	**% Cover**
5	28%	CABA	67.8
		RUUR	0.8
		TH	28.5
		BG	4.3
		TOTAL	**101.5**
6	1%	CIVU	0.3
		HECUO	0.3
		JUBA	63.7
		PSLU	1.3
		SOAM	6.0
		TH	8.3
		BG	20.0
		TOTAL	**100.0**
7	4%	CRSC	59.0
		ECCR	33.7
		GNPA	3.0
		BG	4.3
		TOTAL	**100.0**

Table C-8. Pond 18 (Year 2 Post-Mastication) Wetland Vegetation Cover by Stratum

POND 18			
Stratum	**Relative % Cover of Wetland**	**Species**	**% Cover**
1	26%	ELMA	90
		TH	10
		TOTAL	**100**
2	11%	ELMA	10.8
		ELTR	38.7
		TH	41.2
		BG	10.8
		TOTAL	**101.5**
3	59%	AGPA	8.8
		BRMA	0.2
		ELMA	9.7
		ELTR	1.7
		ERAR	0.7
		EUOC	0.2
		HECUO	5.2
		LYHY	0.5
		PLCHH	0.2
		POMO	0.3
		RUAC	2.7
		RUPU	13.3
		TH	33.5
		BG	23.7
		TOTAL	**100.5**
4	3%	BRMA	4.3
		BRMI	2.3
		DECO	1.0
		HYGL	0.3
		JUBUB	5.7
		JUPH	3.7
		LYHY	9.0
		PLCO	29.3
		ZEDA	1.0
		TH	20.7
		BG	22.7
		TOTAL	**100.0**
Upland	1%	-	-

Table C-9. Pond 10 (Year 5 Post-Lead Remediation) Wetland Vegetation Cover by Stratum

POND 10			
Stratum	**Relative % Cover of Wetland**	**Species**	**% Cover**
1	24%	ELMA, TYLA, PEAM	-
2	3%	SCCA	-
3	59%	CAMA	1.0
		DISP	1.7
		ELAC	6.3
		ELMA	84.3
		TH	2.5
		BG	4.3
		TOTAL	**100.2**
4	5%	AZFI	0.5
		DISP	1.2
		EUOC	0.3
		ISCE	0.5
		JUPH	53.3
		STAJ	0.2
		TH	13.0
		BG	30.7
		TOTAL	**99.7**
5	2%	ERCA	0.3
		JUBA	31.7
		LYHY	1.0
		POMO	0.3
		RUCR	0.3
		SOAS	0.7
		Vicia sp.	0.3
		TH	33.7
		BG	31.7
		TOTAL	**100.0**
Upland	7%	-	-

APPENDIX D

CTS and Aquatic Invertebrate Data from Aquatic Surveys at Vernal Pools Monitored in 2017

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Table D-1. CTS Aquatic Survey Results for Vernal Pools Monitored in 2017 at Former Fort Ord

Vernal Pool	Sampling Date	# of Larvae Observed	# of Larvae Measured	Total Length of Larvae (mm)			Snout-Vent Length of Larvae (mm)			Survey Hours	Comments
				Mean*	Range	Mode	Mean*	Range	Mode		
5	3/28/2017	12	12	50	40-67	50	27	22-35	25	3 hrs 52 min	
	4/26/2017	18	18	95	72-119	95	51	-	58	4 hrs	
	5/30/2017	16	16	128	114-140	125	65	58-73	65	2 hrs	
101 East (West)	3/28/2017	21	21	43	11-57	45	24	8-32	25	2 hrs	Damaged tail on one individual
	4/24/2017	39	30	76	43-103	76	43	30-61	42	1 hr 41 min	
	5/30/2017	47	30	107	74-127	95	57	37-71	60	53 min	
101 East (East)	3/28/2017	36	30	47	25-61	41	25	11-35	27	2 hrs 55 min	
	4/24/2017	70	30	95	65-14	96	50	35-63	55	3 hrs 5 min	
	5/30/2017	5	5	120	111-126	N/A	61	56-66	N/A	2 hrs	
997	3/27/2017	0	-	-	-	-	-	-	-	54 min	
61	3/30/2017	0	-	-	-	-	-	-	-	1 hr 10 min	
18	3/29/2017	0	-	-	-	-	-	-	-	1 hr 30 min	
	4/25/2017	0	-	-	-	-	-	-	-	43 min	
	5/31/2017	0	-	-	-	-	-	-	-	20 min	
54	3/29/2017	1	1	54	-	N/A	-	-	-	1hr	
	4/25/2017	4	4	94	83-112	N/A	43	30-60	N/A	2hrs	
	5/31/2017	2	2	135	122-147	N/A	72	68-76	N/A	1 hr 39 mins	
10	3/30/2017	30	30	39	25-50	46	23	9-30	20	4 hrs	
	4/26/2017	25	24	64	39-101	66	35	19-58	35	4 hrs	CB lost one CTS leaving pond
	5/31/2017	2	2	79	78-79	N/A	79	41-55	N/A	4 hrs	

*The mean was rounded to the nearest whole number

Table D-2. Aquatic Invertebrates Observed During Aquatic Surveys at Vernal Pools Monitored in 2017

Aquatic Invertebrate	Vernal Pool							
	5	101 East (West)	101 East (East)	997	61	18	54	10
CA Fairy Shrimp	-	-	-	-	-	-	-	-
Clam Shrimp (Order Conchostraca)	●	●	●	●	●	●	●	●
Water Flea (Order Cladocera)	●	●	●	●	-	●	●	●
Seed Shrimp (Order Ostracoda)	●	●	●	●	-	●	●	●
Copepods (Order Eucopepoda)	●	●	●	●	●	●	●	●
Scuds	-	●	●	-	-	-	-	●
Mayfly Larvae (Order Ephemeroptera)	●	●	●	-	-	●	●	●
Dragonfly Larvae (Order Anisoptera)	●	●	●	-	-	●	●	●
Damselfly Larvae (Order Zygoptera)	●	●	●	●	●	●	●	●
Backswimmer (Family Corixidae)	●	●	●	●	-	●	●	●
Waterboatmen (Family Corixidae)	●	●	●	●	●	●	●	●
Predacious Diving Beetle (Family Dytiscidae)	●	●	●	●	-	●	●	●
Giant Water Bug (Family Belostomatidae)	-	-	-	-	-	-	-	●
Mosquito (Family Culicidae)	●	●	-	●	-	●	●	●
Water Scavenger Beetle (Family Hydrophilidae)	●	●	●	-	-	●	●	●
Snail	-	-	-	-	-	-	-	●
Dipteran Larvae (Order Diptera)	●	●	●	●	-	●	●	●

APPENDIX E

Site Photos

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Figure E-1. Pond 5 (Reference): Hydrology Photo Point on 4/20/2017

Figure E-2. Pond 5 (Reference): Vegetation Photo Point 1 on 9/21/2017

Figure E-3. Pond 5 (Reference): Vegetation Photo Point 2 on 9/21/2017

Figure E-4. Pond 101 East (West) (Reference): Hydrology Photo Point on 2/27/2017

Figure E-5. Pond 101 East (West) (Reference): Vegetation Photo Point on 9/21/2017

Figure E-6. Pond 101 East (East) (Reference): Hydrology Photo Point on 4/20/2017

Figure E-7. Pond 101 East (East) (Reference): Vegetation Photo Point on 9/21/2017

Figure E-8. Pond 997 (Reference): Hydrology Photo Point on 2/27/2017

Figure E-9. Pond 997 (Reference): Vegetation Photo Point on 5/24/2017

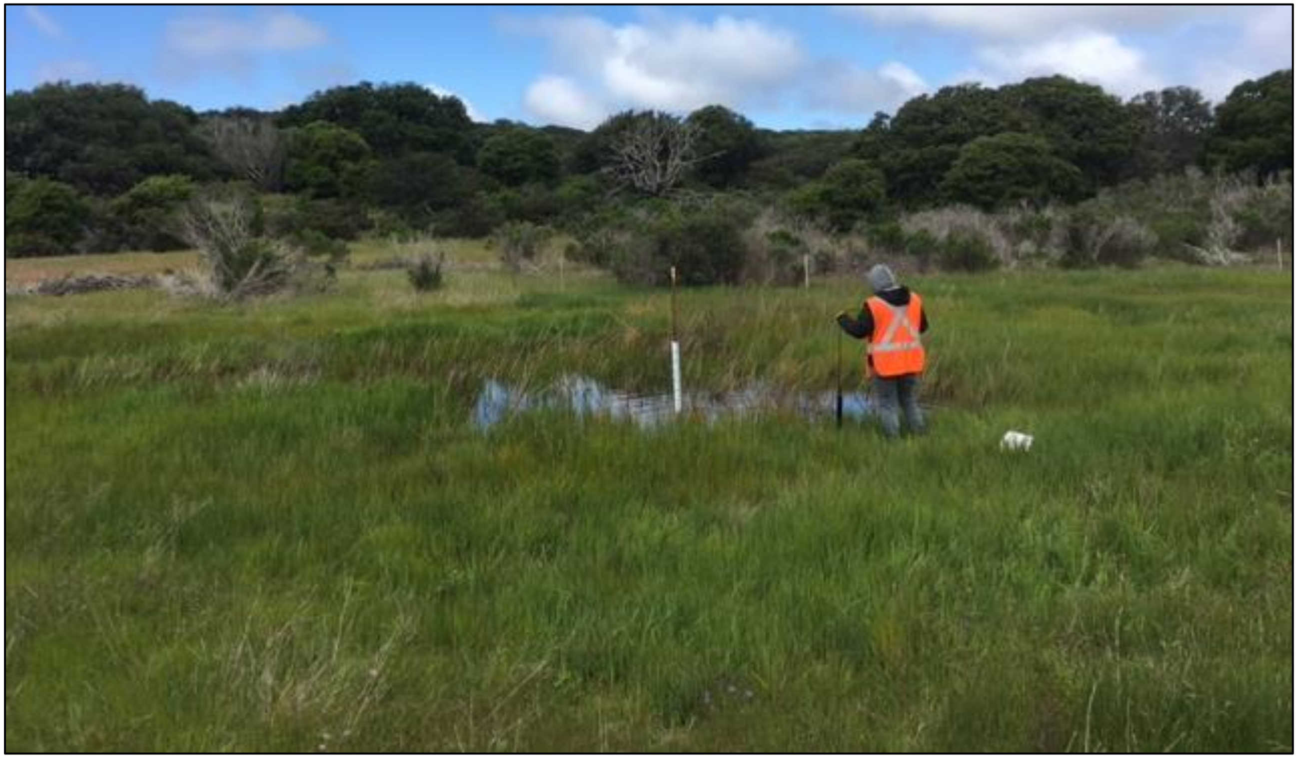

Figure E-10. Pond 40 South (Baseline): Hydrology Photo Point on 4/18/2017

Figure E-11. Pond 42 (Baseline): Hydrology Photo Point on 2/28/2017

Figure E-12. Pond 42 (Baseline): Vegetation Photo Point on 5/25/2017

Figure E-13. Pond 61 (Baseline): Hydrology Photo Point on 3/22/2017

Figure E-14. Pond 61 (Baseline): Vegetation Photo Point on 5/25/2017

Figure E-15. Contra Costa Goldfields (*Lasthenia conjugens*) at Pond 61 (Baseline), 4/27/2017

Figure E-16. Pond 16 (Year 1 Post-Mastication): Hydrology Photo Point on 4/18/2017

Figure E-17. Pond 16 (Year 1 Post-Mastication): Vegetation Photo Point on 9/20/2017

Figure E-18. Pond 18 (Year 2 Post-Mastication): Hydrology Photo Point on 4/18/2017

Figure E-19. Pond 18 (Year 2 Post-Mastication): Vegetation Photo Point on 9/6/2017

Figure E-20. Pond 54 (Year 2 Post-Mastication): Hydrology Photo Point on 3/22/2017

Figure E-21. Pond 10 (Year 5 Post-Lead Remediation): Hydrology Photo Point on 4/19/2017

Figure E-22. Pond 10 (Year 5 Post-Lead Remediation): Vegetation Photo Point 1 on 9/21/2017

Figure E-23. Pond 10 (Year 5 Post-Lead Remediation): Vegetation Photo Point 2 on 9/21/2017

Figure E-24. Pond 30A (Year 5 Post-Fire-Retardant): Hydrology Photo Point on 3/1/2017

Figure E-25. Pond 30B (Year 5 Post-Fire-Retardant): Hydrology Photo Point on 4/19/2017

Figure E-26. Pond 30C (Year 5 Post-Fire-Retardant): Hydrology Photo Point on 1/23/2017

APPENDIX F

Historic Hydrology Monitoring Results for Reference and Remediated Vernal Pools

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Table F-1. Pond 5 (Reference) Historic Hydrology Results on Former Fort Ord from 1994-2017

Water-Year	Date	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Depth (cm)	Inundated Surface Area (acres)
1993-1994	3/29/1994	-	17.0	-	-	31	2.75
	4/13/1994	-	20.0	-	-	20	-
1994-1995	1/11/1995	-	16.0	-	-	28	0.17
	1/26/1995	-	14.0	-	-	43	0.52
	2/10/1995	-	15.0	-	-	51	0.50
	2/24/1995	-	13.0	-	-	51	0.52
	3/10/1995	-	-	-	-	76	1.72
	3/24/1995	-	22.0	-	-	>100	6.89
1995-1996	1/3/1996	-	-	-	-	DRY	-
	1/18/1996	-	-	-	-	5	-
	1/31/1996	-	-	-	-	5	-
	2/14/1996	-	-	-	-	15	-
	2/29/1996	-	-	-	-	28	-
	3/14/1996	-	-	-	-	38	-
	3/28/1996	-	-	-	-	38	-
	4/11/1996	-	-	-	-	15	-
	4/25/1996	-	-	-	-	13	-
	5/9/1996	-	-	-	-	DRY	-
2006-2007	12/1/2006	-	-	-	-	0	-
	1/23/2007	-	-	-	-	0	-
	3/6/2007	7.2	-	-	5.1 (NTU)	17	1.58
2012-2013	11/26/2012	-	-	-	-	0	-
	12/19/2012	-	-	-	-	0	0.01
	1/22/2013	-	-	-	-	11	0.91
	2/25/2013	-	-	-	-	DRY	0.00
	3/15/2013	-	-	-	-	DRY	0.00
	4/12/2013	-	-	-	-	DRY	0.00
	5/10/2013	-	-	-	-	DRY	0.00
2013-2014	12/11/2013	-	-	-	-	DRY	0.00
	2/18/2014	-	-	-	-	DRY	0.00
	3/17/2014	-	-	-	-	DRY	0.00
	4/7/2014	-	-	-	-	DRY	0.00
	5/6/2014	-	-	-	-	DRY	0.00
	6/3/2014	-	-	-	-	DRY	0.00

Table F-1. Pond 5 (Reference) Historic Hydrology Results on Former Fort Ord from 1994-2017

Water-Year	Date	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Depth (cm)	Inundated Surface Area (acres)
2015-2016	4/5/2016	6.41	25.1	6.91	63.4	no gauge, ~100	5.33
	4/19/2016	6.51	20.3	5.73	23.8	no gauge, ~100	5.14
	5/9/2016	6.45	18.0	7.3	19.6	no gauge, ~100	4.86
	6/8/2016	6.48	21.3	0.34	17.7	no gauge, ~80	4.44
	7/7/2016	6.37	23.0	6.65	83.2	no gauge, ~60	3.19
	8/10/2016	6.85	16.4	0.97	295	4	0.36
	9/12/2016	-	-	-	-	DRY	0.00
2016-2017	1/25/2017	6.09	8.9	2.13	4.00	58	5.32
	2/27/2017	6.24	11.8	4.52	6.4	gauge submerged, ~130	7.78
	3/23/2017	6.54	15.3	1.55	8.3	gauge submerged, ~130	7.30
	4/20/2017	6.38	17.2	0.00	5.9	gauge submerged, ~130	7.24
	5/25/2017	6.28	21.9	2.73	4.5	110	6.49
	6/20/2017	7.12	24.2	3.54	7.4	98	5.74
	7/28/2017	-	-	-	-	94	-
	8/16/2017	-	-	-	-	57	-
	9/6/2017	-	-	-	-	45	-

Pond 5 was monitored eight years between 1994 and 2017. It is a reference vernal pool and no remediation has occurred here. The historic data and precipitation are summarized below:

- 1993-1994 (Jones & Stokes, 1996)
  - In a precipitation year below-normal, Pond 5 held water during both monitoring events in March and April with a maximum recorded inundation of 2.75 acres. The temperatures were within a normal range.
  - yearly cumulative precipitation 13.96 inches
  - data collected only in March and April
  - inundated during both monitoring events

  - recorded inundation maximum 2.75 acres in March
  - depth range 20.32-30.48 cm, mean 25.4
  - temperature 17°-20° C, mean 18.5° C
- 1994-1995 (Jones & Stokes, 1996)
  - In a water-year that was above-normal, Pond 5 was inundated by January monitoring and stayed inundated through March. Pond 5 inundation area was large compared to other monitored years and filled to 6.89 acres with a maximum depth of 101.6 cm. The temperature fluctuated greatly, which can be expected.
  - yearly cumulative precipitation 23.38 inches
  - data collected January-March, six monitoring events
  - inundated during all monitoring events
  - inundation range 0.17-6.89 acres, mean 1.72 acres
  - depth range 27.94-101.6 cm, mean 58.42 cm
  - temperature range 13°-22° C, mean 16° C
- 1995-1996 (Jones & Stokes, 1996)
  - In a water-year that was approximately normal, ponding occurred from January-May. The maximum depth was much lower than the previous year but similar to the 1993-1994 water-year.
  - yearly cumulative precipitation 16.96 inches
  - data collected January-May, ten monitoring events
  - inundated mid-January to early-May
  - no inundation area recorded
  - depth range 5.08-38.1 cm, mean 19.69 cm
  - no water quality data collected
- 2006-2007 (Shaw, 2008)
  - In a below-normal rain year, Pond 5 was inundated to 1.58 acres. The pH at Pond 5 was neutral and the turbidity was relatively low.
  - yearly cumulative precipitation 10.13 inches
  - data collected December-March, three monitoring events
  - some inundation in March, which comprised an area of 1.58 acres
  - depth of 17 cm
  - one water quality sample 7.2 pH, 5.1 FNU turbidity
- 2012-2013 (Tetra Tech, 2014)
  - In a drought year with below-normal precipitation, Pond 5 was only inundated in December and January and was a fraction of the size with a maximum inundation of 0.91 acres.
  - drought year with yearly cumulative precipitation of 11.17 inches
  - data collected November-May, seven monitoring events
  - inundated in December and January
  - inundation range 0.01-0.91 acres, mean 0.46 acres
  - depth of 11 cm, only one depth recorded
  - no water quality data collected
- 2013-2014 (Tetra Tech, 2015)
  - In a dry, consecutive drought year Pond 5 did not fill.
  - consecutive drought year with yearly cumulative precipitation 9.33 inches
  - data collected December-June, six monitoring events
  - dry though the entire monitoring season

- 2015-2016 (Burleson, 2017)
    - In a consecutive drought with precipitation above-normal, Pond 5 was inundated from the first recorded monitoring in April through August. The maximum inundation area was 5.33 acres. Water quality was within normal ranges. Neutral to slightly acidic pH values were observed. Temperature was higher on average than some of the other large vernal pools, however, Pond 5 was often monitored in the late afternoon. Dissolved oxygen had a large range. Turbidity was low on average with a few high readings at the end of the season. It is likely that Pond 5 was inundated earlier in the water-year and maximum inundation was most likely not captured. It should be noted that data collection did not start with the first storm or inundation.
    - consecutive drought year with yearly cumulative precipitation 21.21 inches
    - data collected April-September, seven monitoring events
    - inundated April through August
    - inundation range 0.36-5.33 acres, mean 3.89 acres
    - depth range 4-100 cm, mean 74 cm
    - pH range 6.37-6.85, mean 6.51
    - temperature range 16.4°-25.1° C, mean 20.7° C
    - dissolved oxygen range 0.34-7.3 mg/L, mean 4.65 mg/L
    - turbidity range 17.7-295 FNU, mean 83.78 FNU
- 2016-2017
    - After the end of a historic drought with precipitation above-normal, Pond 5 was inundated from the first recorded monitoring in January through September (Pond 5 did not dry by last recorded monitoring in September). The maximum inundation area was 7.78 acres. Water quality was within normal ranges. Neutral to slightly acidic pH values were observed. Temperature was within normal averages for Fort Ord, with a few high readings in the middle of the season. Dissolved oxygen had a small range, with moderate levels. Turbidity was low on average.
    - Yearly cumulative precipitation 22.92 inches
    - Data collected January – September, ten monitoring events
    - Inundated January through September (pond did not dry at last reading in September)
    - Inundation range 5.324-7.784 acres, mean 6.648 acres
    - Depth range 45-~130 cm, mean 95 cm
    - pH range 6.09-7.12, mean 6.44
    - temperature range 8.9°-24.2° C, mean 16.5° C
    - dissolved oxygen range 0.00-4.52 mg/L, mean 2.41 mg/L
    - turbidity range 4.0-8.3 FNU, mean 6.08 FNU

Table F-2. Pond 101 East (West) (Reference) Historic Hydrology Results on Former Fort Ord from 2001-2017

Water-Year	Date	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Depth (cm)	Inundated Surface Area (acres)
2000-2001	Jan	-	-	-	-	-*	-
	Feb	-	-	-	-	36*	0.11
	Mar	-	-	-	-	>46*	0.14
	Apr	-	-	-	-	>5*	-
	May	-	-	-	-	-*	-
2006-2007	-	-	-	-	-	DRY	-
2014-2015	3/18/2015	-	-	-	-	DRY	0.00
	4/16/2015	-	-	-	-	DRY	0.00
	5/28/2015	-	-	-	-	DRY	0.00
2015-2016	4/5/2016	6.43	14.0	0.0	5.7	70	1.89
	4/18/2016	6.67	23.3	6.4	204	58	0.20
	5/9/2016	6.22	17.2	2.9	77.1	54	0.67
	6/8/2016	6.55	22.9	3.4	525	20	0.07
	7/7/2016	-	-	-	-	DRY	0.00
2016-2017	1/24/2017	5.81	10.6	1.99	13.7	79	Connected to 101 East (East), total 5.02
	2/27/2017	6.21	10.4	6.18	10.8	88	Connected to 101 East (East), total 9.37
	3/20/2017	6.13	14.7	5.80	2.8	84	Connected to 101 East (East), total 8.89
	4/20/2017	6.10	15.3	5.28	10.0	86	Connected to 101 East (East), total 9.38
	5/25/2017	6.02	18.7	1.68	36.6	74	0.95
	6/21/2017	6.53	26.6	2.97	79.8	18	0.17
	7/27/2017	-	-	-	-	DRY	0.00

*In 2000-2001, depths were recorded for Waterbody 53, which includes the ponds currently named Pond 101 West, Pond 101 East (West), and 101 East (East). It is unknown which pond was sampled for depth.

Pond 101 East (West) was monitored five years between 2001 and 2017. It is a reference vernal pool and no remediation has occurred there. The historic data and precipitation are summarized below:

- 2000-2001 (Harding ESE, 2002)
  - In a year with early storms followed by below-normal precipitation, Pond 101 East (West) was recorded as inundated 0.10 acres in February
  - early storms with cumulative precipitation below-normal (15.52 inches)
  - data collected in February

  - inundated for one monitoring event, 0.10 acres
  - no water quality data collected
- 2006-2007 (Shaw, 2008)
  - In a below-normal water-year, Pond 101 East (West) was not inundated
  - cumulative precipitation was a below-normal (10.13 inches)
  - no water quality data collected specifically for 101 East (West)
- 2014-2015 (Burleson, 2016)
  - In a dry consecutive drought year with below-normal precipitation, Pond 101 East (West) did not hold water.
  - early storms pushed early cumulative precipitation above-normal while total yearly cumulative precipitation fell below-normal (14.35 inches)
  - data collected March to May, three monitoring events
  - dry in all monitoring events
  - no water quality data collected
- 2015-2016 (Burleson, 2017)
  - In a consecutive drought year with cumulative precipitation above-normal, Pond 101 East (West) held water from April-June. Water quality results had a slightly acidic to neutral pH, normal temperature, low to moderate dissolved oxygen, and low to moderate turbidity. It should be noted that data collection did not start with the first storms or inundation. Maximum inundation could have been missed.
  - drought year with cumulative precipitation above-normal (21.21 inches)
  - data collected April-July, five monitoring events
  - inundated from April-June
  - inundation range from 0.07-1.89 acres, mean 0.71 acres
  - depth range from 20-70 cm, mean 51 cm
  - pH range 6.22-6.67, mean 6.47
  - temperature range 14.0°-23.3° C, mean 19.3° C
  - dissolved oxygen range 0.00-6.40 mg/L, mean 3.18 mg/L
  - turbidity range 5.7-525 FNU, mean 203 FNU
- 2016-2017
  - After the end of a historic drought with precipitation above-normal, Pond 101 East (West) was inundated from the first recorded monitoring in January through June. The maximum inundation area was 9.37 acres (101EW was connected to 101EE). Water quality was within normal ranges. Slightly acidic pH values were observed. Temperature was within normal averages for Fort Ord. Dissolved oxygen had a small range, with moderate levels. Turbidity had a small range, with moderate levels.
  - Yearly cumulative precipitation 22.92 inches
  - Data collected January – July, nine monitoring events
  - Inundated January through June
  - Inundation range 0.17-9.37 acres, mean 4.83 acres (pond connected to 101EE for upper range value and mean acreage)
  - Depth range 18-88 cm, mean 71.5 cm
  - pH range 5.81-6.53, mean 6.13
  - temperature range 10.4°-26.6° C, mean 16.0° C
  - dissolved oxygen range 1.68-6.18 mg/L, mean 3.98 mg/L
  - turbidity range 2.8-79.8 FNU, mean 25.6 FNU

Table F-3. Pond 101 East (East) (Reference) Historic Hydrology Results on Former Fort Ord from 2001-2017

Water-Year	Date	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Depth (cm)	Inundated Surface Area (acres)
2000-2001	Jan	-	-	-	-	-*	-
	Feb	-	-	-	-	36*	1.47
	Mar	6.30	-	-	-	>46*	1.26
	Apr	6.81	-	-	-	>5*	-
	May	-	-	-	-	-*	-
2006-2007	Dec	-	-	-	-	DRY	0.00
	Jan	-	-	-	-	DRY	0.00
	Feb	-	-	-	-	-	-
	Mar	7.61	-	-	6.1 (NTU)	20	0.32
	Apr	-	-	-	-	DRY	0.00
	May	-	-	-	-	DRY	0.00
	June	-	-	-	-	DRY	0.00
2012-2013	11/26/2012	-	-	-	-	DRY*	0.00
	12/19/2012	-	-	-	-	DRY*	0.00
	1/22/2013	-	-	-	-	11*	0.08
	2/25/2013	-	-	-	-	DRY*	0.00
	3/15/2013	-	-	-	-	DRY*	0.00
	4/12/2013	-	-	-	-	DRY*	0.00
	5/10/2013	-	-	-	-	DRY*	0.00
2013-2014	12/11/2014	-	-	-	-	DRY*	0.00
	2/18/2014	-	-	-	-	DRY*	0.00
	3/17/2014	-	-	-	-	DRY*	0.00
	4/7/2014	-	-	-	-	DRY*	0.00
	5/6/2014	-	-	-	-	DRY*	0.00
	6/3/2014	-	-	-	-	DRY*	0.00
2014-2015	3/18/2015	-	-	-	-	DRY	0.00
	4/16/2015	-	-	-	-	DRY	0.00
	5/28/2015	-	-	-	-	DRY	0.00
2015-2016	4/5/2016	6.44	17.1	7.93	138.0	68	3.24
	4/18/2016	6.38	22.7	6.50	112.0	68	3.13
	5/9/2016	7.07	23.0	6.92	106.0	55	2.77
	6/8/2016	6.49	23.0	4.36	53.0	32	1.23
	7/7/2016	-	-	-	-	DRY	0.00

Table F-3. Pond 101 East (East) (Reference) Historic Hydrology Results on Former Fort Ord from 2001-2017

Water-Year	Date	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Depth (cm)	Inundated Surface Area (acres)
2016-2017	1/24/2017	5.50	10.0	1.95	1.9	~155, gauge submerged	Connected to 101 East (West), total 5.02
	2/27/2017	6.23	12.2	3.68	21.8	~160, gauge submerged	Connected to 101 East (West), total 9.37
	3/20/2017	6.23	15.3	1.07	39.2	~160, gauge submerged	Connected to 101 East (West), total 8.89
	4/20/2017	6.49	17.3	0.00	43.2	~160, gauge submerged	Connected to 101 East (West), total 9.38
	5/25/2017	6.89	19.0	2.38	4.0	~160, gauge submerged	6.52
	6/21/2017	6.91	20.1	3.58	10.7	~150, gauge submerged	5.57
	7/28/2017	-	-	-	-	100	-
	8/16/2017	-	-	-	-	95	-
	9/6/2017	-	-	-	-	77	-

*In 2000-2001, depths were recorded for Waterbody 53, which includes the currently named ponds of Pond 101 West, Pond 101 East (West), and 101 East (East). It is unknown which pond was sampled for depth.

Pond 101 East (East) was monitored seven years between 2001 and 2017. It is a reference vernal pool and no remediation has occurred there. The historic data and precipitation are summarized below:

- 2000-2001 (Harding ESE, 2002)
  - In a year with early storms followed by below-normal precipitation, Pond 101 East (East) was recorded as inundated from February through May with a maximum inundation of 1.47 acres. The water quality results indicate a slightly acidic to neutral pH.
  - early storms with cumulative precipitation below-normal (15.52 inches)
  - data collected in February-May
  - inundated for all monitoring events
  - inundation range 0.24-1.61 acres, mean 0.92 acres
  - depth range 2-18 cm, mean 11.3 cm
  - water quality data was collected twice, pH 6.3-6.81, mean 6.56
- 2006-2007 (Shaw, 2008)

  - In a below-normal water-year, Pond 101 East (East) was inundated only in the month of March. The water quality results indicated a slightly alkaline pH.
  - cumulative precipitation was below-normal (10.13 inches)
  - data collected from December-June, 6 monitoring events
  - inundated only in March to 0.32 acres and 20 cm depth
  - inundation area was not recorded
  - pH 7.61
- 2012-2013 (Tetra Tech, 2014)
  - In a dry consecutive drought year with below-normal cumulative precipitation, Pond 101 East (East) is thought to have held water briefly in January. It is unconfirmed if the brief inundation was at Pond 101 East (West) or 101 East (East) since the data were documented under Pond 101 East, with no further signification of East or West.
  - consecutive drought year with cumulative precipitation below-normal (11.17 inches)
  - data collected November-May, seven monitoring events
  - inundated in January, 0.08 acres
  - depth 11 cm in January
  - no water quality data collected
- 2013-2014 (Tetra Tech, 2015)
  - In a dry consecutive drought year with below-normal cumulative precipitation, Pond 101 East (East) did not hold water the entire year.
  - consecutive drought year with cumulative precipitation below-normal (9.33 inches)
  - data collected December-June, six monitoring events
  - dry in all monitoring events
  - no water quality data collected
- 2014-2015 (Burleson, 2016)
  - In a dry consecutive drought year with below-normal cumulative precipitation, Pond 101 East (East) did not hold water.
  - consecutive drought year with early storms above-normal and cumulative precipitation slightly below-normal (14.35 inches)
  - data collected March to May, three monitoring events
  - dry in all monitoring events
  - no water quality data collected
- 2015-2016 (Burleson, 2017)
  - In a consecutive drought year with cumulative precipitation above-normal, Pond 101 East (East) held water from April-June. Water quality results indicated a slightly acidic to neutral pH, normal temperatures, moderate to high dissolved oxygen and moderate turbidity. It should be noted that data collection did not start with the first storms or inundation. Maximum inundation could have been missed.
  - drought year with cumulative precipitation above-normal (21.21 inches)
  - data collected April-July, five monitoring events
  - inundated from April-June
  - inundation range from 1.23-3.24 acres, mean 2.59 acres
  - depth range from 32-68 cm, mean 56 cm
  - pH range 6.38-7.07, mean 6.60
  - temperature range 17.1°-23.0° C, mean 21.4° C
  - dissolved oxygen range 4.36-7.93 mg/L, mean 6.43 mg/L
  - turbidity range 106-553 FNU, mean 227 FNU

- 2016-2017
  - After the end of a historic drought with precipitation above-normal, Pond 101 East (East) was inundated from the first recorded monitoring in January through September (Pond 101EE did not dry at last recorded monitoring in September). The maximum inundation area was 9.374 acres (101EE was connected to 101EW). Water quality was within normal ranges. Slightly acidic pH values were observed. Temperature was within normal averages for Fort Ord. Dissolved oxygen had a small range, with moderate levels. Turbidity had a large range, with moderate levels.
  - Yearly cumulative precipitation 22.92 inches
  - Data collected January – September, ten monitoring events
  - Inundated January through September (pond did not dry by last recorded monitoring in September)
  - Inundation range 5.02-9.40 acres, mean 7.46 acres (pond was connected to 101 East (West) for range and mean values)
  - Depth range 77-~160 cm, mean 152 cm
  - pH range 5.5-6.91, mean 6.38
  - temperature range 10.0°-20.1° C, mean 15.7° C
  - dissolved oxygen range 0.0-3.68 mg/L, mean 2.11 mg/L
  - turbidity range 1.9-43.2 FNU, mean 20.13 FNU

Table F-4. Pond 997 (Reference) Historic Hydrology Results on Former Fort Ord from 2017

Water-Year	Date	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Depth (cm)	Inundated Surface Area (acres)
2016-2017	1/25/2017	6.40	10.2	7.17	25.6	13	0.33
	2/27/2017	6.78	16.9	12.20	14.1	15	0.23
	3/23/2017	6.43	13.0	7.88	72.4	12	0.10
	4/19/2017	7.07	25.4	7.14*	25.5*	6	0.02
	5/24/2017	-	-	-	-	DRY	0.00

*Water quality meter probe was on its side

Pond 997 was monitored for baseline in 2017. It is a reference vernal pool and no remediation has occurred here. It is in the baseline year of monitoring and there are no other historic wetland monitoring data. The 2017 data and precipitation are summarized below:

- 2016-2017
  - After the end of a historic drought with precipitation above-normal, Pond 997 was inundated from the first recorded monitoring in January through April. The maximum inundation area was 0.33 acres. Water quality was within normal ranges. Slightly acidic pH values were observed. Temperature was within normal averages for Fort Ord. Dissolved oxygen had a small range, with moderate levels. Turbidity had a large range, with moderate levels.
  - Yearly cumulative precipitation 22.92 inches
  - Data collected January – May, seven monitoring events
  - Inundated January through April
  - Inundation range 0.020-0.331 acres, mean 0.14 acres
  - Depth range 6-15 cm, mean 11.5 cm
  - pH range 6.4-7.07, mean 6.67
  - temperature range 10.2°-25.4° C, mean 16.4° C
  - dissolved oxygen range 7.14-12.2 mg/L, mean 8.60 mg/L
  - turbidity range 14.1-72.4 FNU, mean 37.37 FNU

Table F-5. Pond 40 South (Baseline) Historic Hydrology Results on Former Fort Ord from 1997-2017

Water-Year	Date	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Depth (cm)	Inundated Surface Area (acres)
1997-1998	Dec	8.67	-	-	>100	27.3	0.12
	Jan	-	-	-	27	27.3	0.21
	Feb	7.60	-	-	50.4	31.75	0.21
	April	-	-	-	-	33.02	0.21
2014-2015	12/22/2014-12/23/2014	-	-	-	-	DRY	0.00
	2/24/2015	-	-	-	-	DRY	0.00
	3/18/2015	-	-	-	-	DRY	0.00
	4/16/2015	-	-	-	-	DRY	0.00
	5/28/2015	-	-	-	-	DRY	0.00
2015-2016	3/31/2016	6.71	16.6	0.08	84.6	20	0.08
	4/18/2016	-	-	-	-	DRY	0.00
2016-2017	1/23/2017	6.36	10.3	1.83	135.0	29	0.30
	2/28/2017	6.79	6.6	11.62	56.1	31	0.61
	3/22/2017	6.47	13.5	4.88	596.0	34	0.96
	4/18/2017	6.57	16.6	4.81	37.6	28	0.12
	5/25/2017	-	-	-	-	DRY	0.00

Pond 40 South was monitored four years between 1997 and 2017 (all for baseline). The historic data and precipitation are summarized below:

- 1997-1998 (HLA, 1998)
  - In an El Niño year with yearly cumulative precipitation significantly above-normal, Pond 40 South held water through April. Turbidity and pH were collected December through February.
  - El Niño year with yearly cumulative precipitation above-normal (40.54 inches)
  - Data collected December-April, four monitoring events
  - Inundated from December through April
  - Inundation range 0.12-0.21 acres, mean 0.19 acres
  - Depth range 27.3-33.02 cm, mean 29.85 cm
  - pH range 7.6-8.67, mean 8.14
    turbidity range 27- >100 NTU, mean 59.1 NTU
- 2014-2015 (Burleson, 2016)
  - In a dry, consecutive drought year with cumulative precipitation below-normal, Pond 40 South did not fill.
  - consecutive drought year with yearly cumulative precipitation 14.35 inches
  - data collected December-May, five monitoring events
  - dry though the entire monitoring season

- 2015-2016 (Burleson, 2017)
  - In a consecutive drought year with cumulative precipitation above-normal, Pond 40 South held water through March. Water quality data were collected once, in March. It is likely that Pond 40 South was inundated earlier in the water-year and maximum inundation was not captured. It should be noted that data collection did not start with the first storm or inundation.
  - drought year with cumulative precipitation above-normal (21.21 inches)
  - data collected March-April, two monitoring events
  - inundated from March-April
  - inundation 0.08 acres in March
  - depth 20 cm in March
  - pH 6.71 in March
  - temperature 16.59° C
  - dissolved oxygen 0.08 mg/L
  - turbidity range 84.6 FNU
- 2016-2017
  - After the end of a historic drought with precipitation above-normal, Pond 40 South was inundated from the first recorded monitoring in January through May. The maximum inundation area was 0.958 acres. Water quality was within normal ranges. Slightly acidic pH values were observed. Temperature was within normal averages for Fort Ord. Dissolved oxygen had a large range. Turbidity was moderate on average, with a few high readings in January and March.
  - Yearly cumulative precipitation 22.92 inches
  - Data collected January - May, six monitoring events
  - Inundated January through April
  - Inundation range 0.12-0.96 acres, mean 0.40 acres
  - Depth range 28-34 cm, mean 30.5 cm
  - pH range 6.36-6.79, mean 6.55
  - temperature range 6.6°-16.6° C, mean 11.7° C
  - dissolved oxygen range 1.83-11.62 mg/L, mean 5.79 mg/L
    turbidity range 37.6-596.0 FNU, mean 206.2 FNU

Table F-6. Pond 42 (Baseline) Historic Hydrology Results on Former Fort Ord from 1997-2017

Water-Year	Date	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Depth (cm)	Inundated Surface Area (acres)
1997-1998	Dec	8.9	-	-	40.0 (NTU)	67.95	0.46
	Jan	-	-	-	4.5-5.0 (NTU)	74.9	0.77
	Feb	7.4	-	-	3.0 (NTU)	76.2	0.96
	April	-	-	-	-	73.7	0.96
1999-2000	1/26/2000	-	-	-	-	16	0.46
	2/23/2000	-	-	-	-	-	0.69
	3/13/2000	5.91	-	-	2.42 (NTU)	>30	0.82
	6/15/2000	-	-	-	-	8	0.01
2000-2001	1/12/2001	-	-	-	-	16	0.34
	2/12/2001-2/13/2001	-	-	-	-	-	-
	3/26/2001	6.3	-	-	-	18	0.11
	04/18/2001-4/19/2001	7.4	-	-	-	6	-
	05/23/2001-05/24/2001	-	-	-	-	DRY	0.00
2001-2002	1/23/2002	-	-	-	10.8 (NTU)	7	0.07
	2/25/2002	-	-	-	12.0 (NTU)	5	0.04
	3/27/2002	-	-	-	0	DRY	0.00
	4/17/2002	-	-	-	0	DRY	0.00
	5/1/2002	-	-	-	0	DRY	0.00
2002-2003	1/28/2003	6.3	-	-	16.0 (NTU)	10	0.11
	2/24/2003	-	-	-	-	6	0.05
	3/29/2003	-	-	-	0	DRY	0.00
	4/1/2003	-	-	-	-	-	-
	5/1/2003	-	-	-	-	-	-
2014-2015	3/18/2015	-	-	-	-	DRY	0.000
	4/16/2015	-	-	-	-	DRY	0.00
	5/28/2015	-	-	-	-	DRY	0.00
2016-2017	1/23/2017	6.47	10.4	2.60	51.3	58	0.52
	2/28/2017	6.86	9.4	6.55	2.0	76	0.81
	3/22/2017	6.08	13.3	4.26	>1000	72	0.77
	4/18/2017	6.97	16.5	11.15	57.3	62	0.58

	5/25/2017	5.97	17.6	5.27	60.1	38	0.30
	6/15/2017	5.54	17.0	2.63	70.4	~28*	0.34
	7/7/2017	-	-	-	-	DRY	0.00

*decreased visibility due to emergent vegetation

Pond 42 was monitored seven years between 1997 and 2017 (all for baseline). The historic data and precipitation are summarized below:

- 1997-1998 (HLA, 1998)
    - In an El Niño year with yearly cumulative precipitation significantly above-normal, Pond 42 held water through April. Turbidity and pH were collected December through February.
    - El Niño year with yearly cumulative precipitation above-normal (40.54 inches)
    - Data collected December-April, four monitoring events
    - Inundated from December through April
    - Inundation range 0.46-0.96 acres, mean 0.79 acres
    - Depth range 67.95-76.2 cm, mean 73.2 cm
    - pH range 7.4-8.9, mean 8.15
      turbidity range 3.0-40.0 NTU, mean 15.9 NTU
- 1999-2000 (Harding Lawson Associates, 2001)
    - In a precipitation year below-normal, Pond 42 held water from January through June with a maximum recorded inundation of 0.82 acres. Water quality data were only collected once, in March.
    - yearly cumulative precipitation 16.13 inches
    - data collected only in March, four monitoring events
    - Inundated January through April
    - Inundation range 0.01-0.82 acres, mean 0.49 acres
    - Depth range 8- >30 cm, mean 18 cm
    - pH 5.91 in March
    - turbidity 2.42 NTU in March
- 2000-2001 (Harding ESE, 2002)
    - In a precipitation year below-normal, Pond 42 held water from January through April with a maximum recorded inundation of 0.11 acres. Water quality data were only collected twice.
    - yearly cumulative precipitation 15.52 inches
    - data collected January- May, five monitoring events
    - Inundated January through April
    - Inundation 0.11 acres in March
    - Depth range 6-18 cm, mean 10 cm
    - pH range 6.3-7.4, mean 6.85
- 2001-2002 (Mactec, 2003)
    - In a precipitation year below-normal, Pond 42 held water from January through April with a maximum recorded inundation of 0.07 acres. Turbidity was the only water quality parameter measured.
    - yearly cumulative precipitation 11.42 inches
    - data collected January-May, five monitoring events
    - Inundated January through February
    - Inundation range 0.04-0.07 acres, mean 0.055 acres

  - Depth range 5-7 cm, mean 6 cm
  - Turbidity range 10.8-12.0 NTU, mean 11.4 NTU
- 2002-2003 (Mactec, 2004)
  - In a precipitation year below-normal, Pond 42 held water from January through April with a maximum recorded inundation of 0.11 acres. Water quality data were only collected once, in January.
  - yearly cumulative precipitation 15.02 inches
  - data collected January-May, five monitoring events
  - Inundated January through February
  - Inundation range 0.05-0.11 acres, mean 0.08 acres
  - Depth range 6-10 cm, mean 8 cm
  - pH 6.3 in January
  - turbidity 16.0 NTU in January
- 2014-2015 (Burleson, 2016)
  - In a dry, consecutive drought year with cumulative precipitation below-normal, Pond 42 did not fill.
  - consecutive drought year with yearly cumulative precipitation 14.35 inches
  - data collected March-May, three monitoring events
  - dry though the entire monitoring season
- 2016-2017
  - After the end of a historic drought with precipitation above-normal, Pond 42 was inundated from the first recorded monitoring in January through July. The maximum inundation area was 0.806 acres. Water quality was within normal ranges. Slightly acidic pH values were observed. Temperature was within normal averages for Fort Ord. Dissolved oxygen had a small range, with moderate levels. Turbidity had a large range, with a very high reading in March.
  - Yearly cumulative precipitation 22.92 inches
  - Data collected January – July, eight monitoring events
  - Inundated January through June
  - Inundation range 0.30-0.81 acres, mean 0.55 acres
  - Depth range ~28-76 cm, mean 61.2 cm
  - pH range 5.54-6.97, mean 6.32
  - temperature range 9.4°-17.6° C, mean 14.0° C
  - dissolved oxygen range 2.60-11.15 mg/L, mean 5.41 mg/L
  - turbidity range 2.0 - >1000 FNU, mean 206.9 FNU

Table F-7. Pond 61 (Baseline) Historic Hydrology Results on Former Fort Ord for 2017

Water-Year	Date	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Depth (cm)	Inundated Surface Area (acres)
2016-2017	1/24/2017	5.61	7.0	1.76	59.1	21	0.70
	2/28/2017	6.66	11.1	10.54	31.3	21	0.52
	3/22/2017	6.16	15.9	4.08	76.7	21	0.62
	4/19/2017	6.48	12.3	4.31	28.8	10	0.05
	5/25/2017	-	-	-	-	DRY	0.00

Pond 61 was monitored for baseline in 2017 and there are no other historic wetland monitoring data. The 2017 data and precipitation are summarized below:

- 2016-2017
  - After the end of a historic drought with precipitation above-normal, Pond 61 was inundated from the first recorded monitoring in January through April. The maximum inundation area was 0.695 acres. Water quality was within normal ranges. Slightly acidic pH values were observed. Temperature was within normal averages for Fort Ord. Dissolved oxygen had a small range, with moderate levels. Turbidity had a large range, with moderate levels.
  - Yearly cumulative precipitation 22.92 inches
  - Data collected January – May, six monitoring events
  - Inundated January through April
  - Inundation range 0.05-0.70 acres, mean 0.38 acres
  - Depth range 10-21 cm, mean 18.25 cm
  - pH range 5.61-6.66, mean 6.23
  - temperature range 7.0°-15.9° C, mean 11.6° C
  - dissolved oxygen range 1.76-10.54 mg/L, mean 5.17 mg/L
  - turbidity range 28.8-76.7 FNU, mean 48.98 FNU

Table F-8. Pond 16 (Year 1 Post-Mastication) Historic Hydrology Results on Former Fort Ord from 1994-2017

Water-Year	Date	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Depth (cm)	Inundated Surface Area (acres)
1993-1994	3/15/1994	-	-	-	-	>102	
	3/29/1994	-	-	-	-	>102	
	4/13/1994-4/14/1994	-	-	-	-	>102	
1994-1995	1/11/1995	-	-	-	-	>102	
	1/26/1995	-	-	-	-	>102	
	2/10/1995	-	-	-	-	>102	
	2/24/1995	-	-	-	-	>102	
	3/10/1995	-	-	-	-	>102	
	3/24/1995	-	-	-	-	>102	
1995-1996	1/3/1996	-	-	-	-	15	
	1/18/1996	-	-	-	-	-	
	1/31/1996	-	-	-	-	>91	
	2/14/1996	-	-	-	-	>91	
	2/29/1996	-	-	-	-	>91	
	3/14/1996	-	-	-	-	>91	
	3/28/1996	-	-	-	-	>91	
	4/11/1996	-	-	-	-	>91	
	4/25/1996	-	-	-	-	>91	
	5/9/1996	-	-	-	-	-	

	12/22/2014-12/23/2014	-	-	-	-	~43	-
	2/24/2015	-	-	-	-	~45	-
2014-2015	3/18/2015	-	-	-	-	20-30	0.27
	4/16/2015	6.4	18.3	13.9	572 (NTU)	15-20	0.16
	5/28/2015	-	-	-	-	DRY	0.00
	1/23/2017	6.84	8.9	1.80	188	142	1.30
	2/21/2017	6.09	12.4	4.87	584	144	2.57
	3/22/2017	6.22	13.5	0.66	182	142	2.17
	4/18/2017	6.78	14.4	0.05	66.6	140	0.80
2016-2017	5/25/2017	6.96	18.6	1.55	33.8	109	0.57
	6/21/2017	6.98	20.0	1.40	121	98	0.51
	7/27/2017	-	-	-	-	90	-
	8/15/2017	-	-	-	-	40	-
	9/6/2017	-	-	-	-	28	-

Pond 16 was monitored five years between 1994 and 2017. Mastication activities occurred in 2015. It is a post-mastication remediation vernal pool and is in year 1 of monitoring. The historic data and precipitation are summarized below:

- 1993-1994 (Jones & Stokes, 1996)
  - In a precipitation year below-normal, Pond 16 held water during both monitoring events in March and April.
  - yearly cumulative precipitation 13.96 inches
  - data collected in March and April, three monitoring events
  - inundated during all monitoring events
  - no inundation areas recorded
  - depth during all monitoring events >102 cm
  - no water quality data were collected
- 1994-1995 (Jones & Stokes, 1996)
  - In a water-year that was above-normal, Pond 16 was inundated by January monitoring and stayed inundated through March.
  - yearly cumulative precipitation 23.38 inches
  - data collected January-March, six monitoring events
  - inundated during all monitoring events
  - no inundation areas recorded
  - depth during all monitoring events >102 cm
  - no water quality data were collected
- 1995-1996 (Jones & Stokes, 1996)
  - In a water-year that was approximately normal, Pond 16 was inundated from January to May. The maximum depth was much lower than the previous year but similar to the 1993-1994 water-year.
  - yearly cumulative precipitation 16.96 inches
  - data collected January-May, ten monitoring events
  - inundated early-January to early-May

  - no inundation areas recorded
  - depth range 15- >91 cm, mean 72.5 cm
  - no water quality data collected
- 2014-2015 (Burleson, 2016)
  - In a consecutive drought year with cumulative precipitation below-normal, Pond 16 was inundated at the first survey in April and held water through April. Maximum inundation was 0.27 acres. Water quality data were collected once, in April.
  - consecutive drought year with yearly cumulative precipitation of 14.35 inches
  - data collected December 2014 – May 2015, five monitoring events
  - inundated December - April
  - inundation range 0-0.27 acres, mean 0.14 acres
  - depth range from ~15-~45 cm, mean 26 cm
  - pH 6.4 in April
  - temperature 18.3°C in April
  - dissolved oxygen 13.9 mg/L in April
  - turbidity 572 NTU in April
- 2016-2017
  - After the end of a historic drought with precipitation above-normal, Pond 16 was inundated from the first recorded monitoring in January through September (pond did not dry by last recorded monitoring in September). The maximum inundation area was 2.57 acres. Water quality was within normal ranges. Slightly acidic pH values were observed. Temperature was within normal averages for Fort Ord, with a few high readings in the middle of the season. Dissolved oxygen had a small range, with moderate levels. Turbidity had a large range, with high readings at the beginning of the season.
  - Yearly cumulative precipitation 22.92 inches
  - Data collected January – September, ten monitoring events
  - Inundated January through September (pond did not dry by last recorded monitoring in September)
  - Inundation range 0.51-2.57 acres, mean 1.32 acres
  - Depth range 28-144 cm, mean 104 cm
  - pH range 6.09-6.98, mean 6.65
  - temperature range 8.9°-20.0° C, mean 14.6° C
  - dissolved oxygen range 0.05-4.87 mg/L, mean 1.72 mg/L
  - turbidity range 33.8-584.0 FNU, mean 195.9 FNU

Table F-9. Pond 18* (Year 2 Post-Mastication) Historic Hydrology Results on Former Fort Ord from 1999-2017

Water-Year	Date	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Depth (cm)	Inundated Surface Area (acres)
1998-1999	Jan	-	-	-	-	DRY	0.00
	Feb	-	-	-	-	24.1	0.09
	March	6.50	-	-	10-50 (NTU)	30.5	0.20
	April	6.94	-	-	6.0 (NTU)	30.5	0.20
2014-2015	2/24/2015	-	-	-	-	>0	-
	3/18/2015	-	-	-	-	DRY	0.00
	4/16/2015	-	-	-	-	DRY	0.00
	5/28/2015	-	-	-	-	DRY	0.00
2015-2016	4/5/2016	6.36	13.9	0.50	111	38	0.27
	4/18/2016	6.50	18.1	0.85	178	36	0.18
	5/10/2016	6.26	15.5	1.20	155	34	0.13
	6/8/2016	6.05	20.8	4.36	34.1	9	0.01
	7/7/2016	-	-	-	-	DRY	0.00
2016-2017	1/23/2017	6.14	8.6	4.20	40.12	27	0.14
	2/21/2017	5.97	13.8	4.72	47.8	41	0.20
	3/22/2017	6.23	13.3	0.22	81.1	42	0.22
	4/18/2017	6.21	13.6	0.29	46.6	42	0.21
	5/25/2017	5.98	15.2	9.69	13.9	40	0.09
	6/21/2017	6.46	16.5	0.00	401	8	0.00
	7/5/2017	-	-	-	-	DRY	0.00

*Pond 18 is identified as "Waterbody 50" in HLA (1999)

Pond 18 (formerly Pond 50) was monitored four years between 1999 and 2017. In 2014, about 33 acres in Unit 5A of the Pond 18 watershed were masticated. It is a post-mastication remediation vernal pool and is in year 2 of monitoring. The historic data and precipitation are summarized below:

- 1998-1999 (HLA, 1999)
  - In a precipitation year slightly below-normal, Pond 18 was inundated from February to April with a maximum inundation of 0.20 acres. The water quality results indicate that pH was slightly acidic to neutral and turbidity was relatively low.
  - yearly cumulative precipitation 16.31 inches
  - data collected Jan-April, four monitoring events
  - inundated February- March
  - inundation range from 0.09-0.20 acres, mean 0.17 acres
  - depth range from 24.13-30.5 cm, mean 28.4 cm
  - pH range 6.5-6.94, mean 6.72
  - turbidity range 6-50 FNU, only ranges provided in March, no mean calculated
- 2014
  - Unit 5A was masticated, which includes Pond 18.

- 2014-2015 (Burleson, 2016)
  - In a dry, consecutive drought year, Pond 18 did not fill.
  - drought year with early storms above-normal and yearly cumulative precipitation of 14.35 inches, which were slightly below-normal
  - data collected February-May, four monitoring events
  - dry in all monitoring events except February, reported as >0
  - no inundation recorded
  - one depth recorded as >0 in February
  - no water quality data collected
- 2015-2016 (Burleson, 2017)
  - In a consecutive drought year with yearly cumulative precipitation above-normal, Pond 18 was inundated at the first survey in April and held water through June. Maximum inundation was 0.265 acres. Water quality data were within normal ranges. However, pH was slightly acidic. This could be due to the types of vegetation surrounding the vernal pool. Dissolved oxygen values had a wide range but were generally low-moderate. Temperature and turbidity were relatively low. It is likely that Pond 18 was inundated earlier in the water-year and maximum inundation was most likely not captured. It should be noted that data collection did not start with the first storm or inundation.
  - drought year with yearly cumulative precipitation 21.21 inches
  - data collected April-July, five monitoring events
  - inundated from April-June
  - inundation range from 0.01-0.27 acres, mean 0.14 acres
  - depth range from 9-38 cm, mean 29 cm
  - pH range 6.05-6.50, mean 6.29
  - temperature range 13.9°-20.8° C, mean 17.1° C
  - dissolved oxygen range 0.50-4.36 mg/L, mean 1.73 mg/L
  - turbidity range 34.1-178.0 FNU, mean 119.5 FNU
- 2016-2017
  - After the end of a historic drought with precipitation above-normal, Pond 18 was inundated from the first recorded monitoring in January through June. The maximum inundation area was 0.222 acres. Water quality was within normal ranges. Slightly acidic pH values were observed. Temperature was within normal averages for Fort Ord. Dissolved oxygen had a small range, with moderate levels. Turbidity was low on average, with a few high readings at the end of the season.
  - Yearly cumulative precipitation 22.92 inches
  - Data collected January – July, eight monitoring events
  - Inundated January through June
  - Inundation range 0.001-0.22 acres, mean 0.12 acres
  - Depth range 8-42 cm, mean 33 cm
  - pH range 5.97-6.46, mean 6.17
  - temperature range 8.6°-16.5° C, mean 13.5° C
  - dissolved oxygen range 0.00-9.69 mg/L, mean 3.19 mg/L
  - turbidity range 13.9-401 FNU, mean 105.09 FNU

Table F-10. Pond 54 (Year 2 Post-Mastication) Historic Hydrology Results on Former Fort Ord for 2017

Water-Year	Date	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Depth (cm)	Inundated Surface Area (acres)
2003-2004	January	7.12	-	-	120 (NTU)	12.7	0.001
	February	7.42	-	-	143.7 (NTU)	22.9	1.37
	March	6.83	-	-	1000 (NTU)	15.2	0.003
	April	-	-	-	-	DRY	0.00
	May	-	-	-	-	-	-
2016-2017	1/23/2017	6.64	10.1	2.82	8.4	54	1.60
	2/28/2017	6.63	8.3	4.92	5.3	112	3.09
	3/22/2017	6.51	13.8	0.04	29.7	111	3.10
	4/18/2017	6.85	15.1	5.55	37.6	108	2.95
	5/25/2017	6.69	17.3	6.08	69.3	78	2.21
	6/21/2017	6.98	23.3	7.22	10.5	~60*	1.90
	7/31/2017	-	-	-	-	DRY	0.00

*decreased visibility due to emergent vegetation

Pond 54 was monitored two years between 2004 and 2017. Mastication activities occurred in 2014. It is a post-mastication remediation vernal pool and is in year 2 of monitoring. The historic data and precipitation are summarized below:

- 2003-2004 (Mactec, 2005)
  - The water-year had precipitation below-normal. Pond 54 was inundated from the first recorded monitoring in January through March. The maximum inundation area was 1.37 acres. Water quality was within normal ranges, with slightly acidic pH values and relatively high turbidity. Temperature and dissolved oxygen were not measured.
  - Yearly cumulative precipitation 13.45 inches
  - Data collected January – May, five monitoring events
  - Inundated January through March
  - Inundation range 0-1.37 acres, mean 0.34 acres
  - Depth range 12.7-22.9 cm, mean 16.9 cm
  - pH range 6.83-7.42, mean 7.12
  - turbidity range 120-1000 NTU, mean 421 NTU
- 2016-2017
  - After the end of a historic drought with precipitation above-normal, Pond 54 was inundated from the first recorded monitoring in January through July. The maximum inundation area was 3.10 acres. Water quality was within normal ranges. Slightly acidic pH values were observed. Temperature was within normal averages for Fort Ord. Dissolved oxygen had a small range, with moderate levels. Turbidity had a large range.
  - Yearly cumulative precipitation 22.92 inches

- Data collected January – July, eight monitoring events
- Inundated January through June
- Inundation range 1.60-3.10 acres, mean 2.47 acres
- Depth range 54-111 cm, mean 88.2 cm
- pH range 6.51-6.98, mean 6.72
- temperature range 8.3°-23.3° C, mean 14.6° C
- dissolved oxygen range 0.04-7.22 mg/L, mean 4.44 mg/L
- turbidity range 5.3-69.3 FNU, mean 26.8 FNU

Table F-11. Pond 10 (Year 5 Post-Lead Remediation) Historic Hydrology Results on Former Fort Ord from 1997-2017

Water-Year	Date	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Depth (cm)	Inundated Surface Area (acres)
1996-1997	June	7.45	-	-	3.5 inches (Secchi disk reading)	-	-
	August	-	-	-	-	-	5.60
2006-2007	Dec	-	-	-	-	-	-
	Jan	-	-	-	-	50	-
	Feb	-	-	-	-	-	-
	March	7.71	-	-	461 (NTU)	65	2.08
	April	-	-	-	-	-	-
	May	-	-	-	-	-	-
	June	-	-	-	-	-	-
2012-2013	11/26/2012	-	-	-	-	damp	0.00
	12/19/2012	-	-	-	-	54	2.06
	1/22/2013	-	-	-	-	66	4.99
	2/25/2013	7.07	9.7	9.82	642 (NTU)	63.5	4.86
	3/15/2013	7.04	16.5	8.98	633 (NTU)	60	4.43
	4/12/2013	-	-	-	-	51	1.90
	5/10/2013	-	-	-	-	40	1.53
2013-2014	12/11/2014	-	-	-	-	DRY	-
	2/18/2014	-	-	-	-	4	0.05
	3/17/2014	-	-	-	-	47	1.77
	4/7/2014	6.6	22.0	9.3	378 (NTU)	53	2.03
	5/6/2014	-	-	-	-	41	1.06
	6/3/2014	-	-	-	-	29	1.33
2015-2016	4/5/2016	7.03	14.5	8.72	134	gauge submerged, ~100	6.20
	4/18/2016	6.91	16.2	5.56	100	no gauge visible, ~100	5.92
	5/10/2016	7.00	16.9	3.9	89.6	no gauge visible, ~100	5.81
	6/8/2016	7.13	21.2	5.69	47.0	no gauge visible, ~100	5.63
	7/7/2016	7.3	18.2	6.66	61.5	84	5.27
	8/10/2016	8.29	18.7	5.44	398	58	3.03
	9/12/2016	7.35	18.4	0.51	410	54	1.70
	10/11/2016	7.48	15.3	2.40	118	34	1.39

Table F-11. Pond 10 (Year 5 Post-Lead Remediation) Historic Hydrology Results on Former Fort Ord from 1997-2017

Water-Year	Date	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Depth (cm)	Inundated Surface Area (acres)
2016-2017	1/23/2017	7.45	9.3	2.77	262	79	5.71
	3/1/2017	6.94	10.6	4.64	126	144	6.21
	3/20/2017	6.74	15.1	2.95	129	140	6.11
	4/19/2017	6.81	14.8	4.03	55.8	156	6.14
	5/24/2017	7.05	18.7	3.99	37.0	127	6.03
	6/20/2017	7.08	20.1	4.48	27.4	112	5.73
	7/28/2017	-	-	-	-	94	-
	8/16/2017	-	-	-	-	80	-
	9/6/2017	-	-	-	-	70	-

Pond 10 was monitored six years between 1997 and 2017. It is a post-lead remediation pond and is in year 5 of monitoring. Lead remediation activities occurred in 2013 at the adjacent HA 37 which resulted in the excavation of approximately 19,500 cubic yards of soil within the Pond 10 watershed. No excavations occurred within the Pond 10 inundation area (Burleson, 2012). The historic data and precipitation are summarized below:

- 1996-1997 (HLA, 1997)
  - The water-year was above-normal prior to February, but fell to approximately normal by the end of the season. Pond 10 held water through August with a reasonably large inundation. The water quality results indicate that the pH was slightly alkaline with relatively turbid water.
  - yearly cumulative precipitation 17.45 inches (0.4 in below-normal)
  - data collected in June and August
  - inundated in both months
  - inundation recorded in August as 5.6 acres
  - no depths recorded
  - pH 7.45 in June
  - turbidity was 3.5 inches, based on Secchi disk reading in June
- 2006-2007 (Shaw, 2008)
  - In a water-year that was below-normal, Pond 10 inundated to a maximum area of 2.1 acres. The water quality results indicate that the pH was slightly alkaline with a relatively moderate turbidity.
  - yearly cumulative precipitation 10.13 inches
  - data collected December-June, seven monitoring events
  - inundated in January and March
  - inundation recorded in March as 2.08 acres
  - depth range 50-85 cm, mean 68 cm
  - pH 7.71 in March
  - turbidity 461 NTU in March

- 2012-2013 (Tetra Tech, 2014)
  - In a dry, consecutive drought year with below-normal precipitation, Pond 10 inundated from December-May with a maximum inundation of 4.99 acres. The water quality results indicate that pH was neutral, temperature was within a normal range but generally cooler than other vernal pools, turbidity was consistently high.
  - consecutive drought year with yearly cumulative precipitation 11.17 inches
  - data collected from November to May, seven monitoring events
  - inundated from December-May
  - inundation range 1.53-4.99 acres, mean 3.30 acres
  - depth range 40-66 cm, mean 56 cm
  - pH range 7.04-7.07, mean 7.06
  - temperature range 9.7°-16.5° C, mean 13.1° C
  - dissolved oxygen range 8.98-9.82 mg/L, mean 9.4 mg/L
  - turbidity range 633-642 FNU, mean 638 FNU
- 2013
  - Lead remediation activities completed at the adjacent HA 37.
- 2013-2014 (Tetra Tech, 2015)
  - In a dry, consecutive drought year with below-normal precipitation, Pond 10 inundated from February to June. However, the maximum inundation was only 2.03 acres. Water quality results indicate that pH was neutral, temperature was within normal range, dissolved oxygen was high, and turbidity was moderate.
  - consecutive drought year with yearly cumulative precipitation of 9.33 inches
  - data collected December-June, six monitoring events
  - inundated February-June
  - inundation range 0.05-2.03 acres, mean 1.25 acres
  - depth range 4-53 cm, mean 35 cm
  - pH 6.6 in April
  - temperature 22.0° C in April
  - dissolved oxygen 9.3 mg/L in April
  - turbidity 378 FNU in April
- 2015-2016 (Burleson, 2017)
  - In a consecutive drought year with cumulative precipitation above-normal, Pond 10 was inundated at the first survey in April and held water through October at the end of surveying. Maximum inundation was 6.2 acres. Water quality data were within normal ranges. However, pH was neutral to slightly alkaline. Dissolved oxygen had a wide range but generally moderate levels. Temperature was within average ranges for Fort Ord vernal pools. Turbidity values were generally low with a couple moderate recorded values. It is likely that Pond 10 was inundated earlier in the water-year and maximum inundation was most likely not captured. It should be noted that data collection did not start with the first storm or inundation.
  - consecutive drought year with yearly cumulative precipitation of 21.21 inches
  - data collected April-October, eight monitoring events
  - inundated in all monitoring events
  - inundation range from 1.39-6.20 acres, mean 4.37 acres
  - depth range from 34-~100 cm, mean 79 cm
  - pH range 6.91-8.29, mean 7.31
  - temperature range 14.5°-21.2° C, mean 17.4° C
  - dissolved oxygen range 0.51-8.72 mg/L, mean 4.86 mg/L

  - turbidity range 47-410 FNU, mean 170 FNU
- 2016-2017
  - After the end of a historic drought with precipitation above-normal, Pond 10 was inundated from the first recorded monitoring in January through September (Pond 10 did not dry by the last recorded monitoring in September). The maximum inundation area was 6.21 acres. Water quality was within normal ranges. Neutral to slightly acidic pH values were observed. Temperature was within normal averages for Fort Ord, with a few high readings in the middle of the season. Dissolved oxygen had a small range, with moderate levels. Turbidity was low on average.
  - Yearly cumulative precipitation 22.92 inches
  - Data collected January – September, ten monitoring events
  - Inundated January through September (pond did not dry by last monitoring in September)
  - Inundation range 5.71-6.21 acres, mean 5.99 acres
  - Depth range 70-156 cm, mean 111 cm
  - pH range 6.74-7.45, mean 7.01
  - temperature range 9.3°-20.1° C, mean 14.8° C
  - dissolved oxygen range 2.77-4.64 mg/L, mean 3.81 mg/L
  - turbidity range 27.4-262 FNU, mean 106.2 FNU

Table F-12. Pond 30A* (Year 5 Post-Fire-Retardant) Historic Hydrology Results on Former Fort Ord from 1999-2017

Water-Year	Date	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Depth (cm)	Inundated Surface Area (acres)
1998-1999	Jan	6.64	-	-	5. (NTU)	45.72	1.15
	Feb	-	-	-	-	50.8	1.29
	March	6.4	-	-	<5.0 (NTU)	53.34	3.57
	April	7.53	-	-	3.0 (NTU)	53.34	3.57
2006-2007	Dec	-	-	-	-	DRY	-
	Jan	-	-	-	-	DRY	-
	Feb	-	-	-	-	DRY	-
	March	-	-	-	-	DRY	-
	April	-	-	-	-	DRY	-
	May	-	-	-	-	DRY	-
	June	-	-	-	-	DRY	-
2009-2010	-	-	-	-	-	-	6.27
2012-2013	11/26/2012	-	-	-	-	DRY	-
	12/19/2012	-	-	-	-	DRY	-
	1/22/2013	-	-	-	-	DRY	-
	2/25/2013	-	-	-	-	DRY	-
	3/15/2013	-	-	-	-	DRY	-
	4/12/2013	-	-	-	-	DRY	-
	5/10/2013	-	-	-	-	DRY	-
2013-2014	12/11/2014	-	-	-	-	DRY	-
	2/18/2014	-	-	-	-	DRY	-
	3/17/2014	-	-	-	-	DRY	-
	4/7/2014	-	-	-	-	DRY	-
	5/6/2014	-	-	-	-	DRY	-
	6/3/2014	-	-	-	-	DRY	-
2014-2015	11/25/2014-12/5/2014	-	-	-	-	-	-
	12/22/2014-12/23/2014	-	-	-	-	-	-
	2/24/2015	-	-	-	-	22	-
	3/18/2015	-	-	-	-	DRY	0.00
	4/16/2015	-	-	-	-	DRY	0.00
	5/28/2015	-	-	-	-	DRY	0.00
2015-2016	4/5/2016	6.53	13.9	1.32	14.4	50	0.62
	4/18/2016	6.38	15.4	2.37	168	40	0.48
	5/10/2016	6.23	15.7	0.13	99.5	20	0.34
	6/8/2016	-	-	-	-	DRY	-

Table F-12. Pond 30A* (Year 5 Post-Fire-Retardant) Historic Hydrology Results on Former Fort Ord from 1999-2017

Water-Year	Date	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Depth (cm)	Inundated Surface Area (acres)
2016-2017	1/24/2017	6.22	13.0	1.82	29.6	14	0.32
	3/1/2017	6.52	11.3	4.05	47.6	86	connected to 30B and 30C, total 1.12
	3/20/2017	6.58	14.9	1.50	150	73	connected to 30B and 30C, total 1.07
	4/19/2017	6.61	14.3	4.19	9.7	83	connected to 30B and 30C, total 1.06
	5/24/2017	6.93	19.1	5.42	17.8	44	connected to 30B and 30C, total 0.74
	6/20/2017	6.69	21.9	7.68	47.2	~35**	0.44
	7/27/2017	-	-	-	-	DRY	0.00

* Pond 30 as a complex of Ponds 30A, 30B, and 30C is identified as “Waterbody 47” in HLA (1999)

**decreased visibility due to emergent vegetation

Table F-13. Pond 30B (Year 5 Post-Fire-Retardant) Historic Hydrology Results on Former Fort Ord from 2012-2017

Water-Year	Date	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Depth (cm)	Inundated Surface Area (acres)
2012-2013	11/26/2012	-	-	-	-	DRY	0.00
	12/19/2012	-	-	-	-	~6*	0.01
	1/22/2013	-	-	-	-	~10*	0.01
	2/25/2013	6.9	19.27	9.66	606 (NTU)	~10*	0.01
	3/15/2013	-	-	-	-	8	0.002
	4/12/2013	-	-	-	-	DRY	0.00
	5/10/2013	-	-	-	-	DRY	0.00
2013-2014	12/11/2014	-	-	-	-	DRY	0.00
	2/18/2014	-	-	-	-	DRY	0.00
	3/17/2014	-	-	-	-	1	0.00009
	4/7/2014	7	24.4	8.8	476 (NTU)	3	0.01
	5/6/2014	-	-	-		DRY	0.00
	6/3/2014	-	-	-	-	DRY	0.00
2014-2015	11/25/2014-12/5/2014	-	-	-	-	~10	0.002
	12/22/2014-12/23/2014	-	-	-	-	-	-
	2/24/2015	-	-	-	-	~2	0.0002
	3/18/2015	-	-	-	-	5	0.0007
	4/16/2015	-	-	-	-	DRY	0.00
	5/28/2015	-	-	-	-	DRY	0.00
2015-2016	4/5/2016	-	-	-	-	50, connected to 30A	-
	4/18/2016	7.29	25.23	4.05	28.2	25	0.012
	5/10/2016	6.98	17.22	6.31	83.8	6	0.003
	6/8/2016	-	-	-	-	DRY	0
2016-2017	1/24/2017	6.35	7.38	1.99	171	28	0.014
	3/1/2017	6.53	8.89	4.80	53.9	74	connected to 30A and 30C, total 1.12
	3/20/2017	6.33	13.08	1.91	54.2	81	connected to 30A and 30C, total 1.07

Table F-13. Pond 30B (Year 5 Post-Fire-Retardant) Historic Hydrology Results on Former Fort Ord from 2012-2017

Water-Year	Date	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Depth (cm)	Inundated Surface Area (acres)
2016-2017	4/19/2017	6.57	12.53	2.46	15.9	71	connected to 30A and 30C, total 1.06
	5/24/2017	6.52	18.19	3.53	23.4	40	connected to 30A and 30C, total 0.74
	6/20/2017	7.24	22.32	4.77	47.1	18	0.01
	7/27/2017	-	-	-	-	DRY	0.00

* Pond 30 as a complex of Ponds 30A, 30B, and 30C is identified as "Waterbody 47" in HLA (1999)

Table F-14. Pond 30C (Year 5 Post-Fire-Retardant) Historic Hydrology Results on Former Fort Ord from 2012-2017

Water-Year	Date	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Depth (cm)	Inundated Surface Area (acres)
2012-2013	11/26/2012	-	-	-	-	DRY	0.00
	12/19/2012	-	-	-	-	~6*	0.04
	1/22/2013	-	-	-	-	~10*	0.05
	2/25/2013	7.05	18.77	9.55	590 (NTU)	~10*	0.04
	3/15/2013	7.29	24.5	9.35	821 (NTU)	16	0.03
	4/12/2013	-	-	-	-	5	0.001
	5/10/2013	-	-	-	-	DRY	0.00
2013-2014	12/11/2014	-	-	-	-	DRY	0.00
	2/18/2014	-	-	-	-	DRY	0.00
	3/17/2014					3	0.01
	4/7/2014	6.3	26.5	9.5	345 (NTU)	7	0.02
	5/6/2014	-	-	-	-	DRY	0.00
	6/3/2014	-	-	-	-	DRY	0.00
2014-2015	12/22/2014-12/23/2014	-	-	-	-	~43	-
	2/24/2015	-	-	-	-	~20	-
	3/18/2015	-	-	-	-	10	0.03
	4/16/2015	-	-	-	-	0	0.00
	5/28/2015	-	-	-	-	0	0.00
2015-2016	4/5/2016	7.17	14.44	2.65	26.1	28	0.13
	4/18/2016	6.67	23.32	0.45	199	23	0.11
	5/10/2016	7.61	18.27	6.10	156	15	0.05
	6/8/2016	-	-	-	-	DRY	0.00
2016-2017	1/23/2017-1/25/2017	5.98	8.59	2.66	122	38	0.16
	3/1/2017	6.69	9.14	4.29	44.7	75	connected to 30A and 30B, total 1.12
	3/20/2017	6.31	13.62	0.87	30.9	73	connected to 30A and 30B, total 1.07

Table F-14. Pond 30C (Year 5 Post-Fire-Retardant) Historic Hydrology Results on Former Fort Ord from 2012-2017

Water-Year	Date	pH	Temperature (°C)	Dissolved Oxygen (mg/L)	Turbidity (FNU)	Depth (cm)	Inundated Surface Area (acres)
2016-2017	4/19/2017	6.65	13.89	3.46	19.2	72	connected to 30A and 30B, total 1.06
	5/24/2017	6.52	18.74	4.63	19.2	45	connected to 30A and 30B, total 0.74
	6/20/2017	7.03	20.64	6.26	11.7	22	0.11
	7/27/2017	-	-	-	-	DRY	0.00

*Exact depth was not measured.

Pond 30 (formerly Pond 47) was monitored eight years between 1999 and 2017. In 2011 lead remediation activities at HA 28 resulted in excavation of soil creating Ponds 30B and 30C. During the prescribed burn of unit 7 in the Fall of 2013, there was an emergency application of fire retardant within 300 feet of Pond 30. Thus, Pond 30 is a post-fire-retardant remediation vernal pool in Year 5 of monitoring. As discussed previously in the report Pond 30 can be separated into three different water bodies. Pond 30A is the largest pool within the area. For this reason, the first recorded historic data for Ponds 30B and 30C started in 2012-2013. Ponds 30B and 30C are distinguished from Pond 30A by the abrupt change in elevation where the excavation occurred; however, at times, these three vernal pools are hydrologically connected. The historic data and precipitation are summarized below:

Pond 30A

- 1998-1999 (HLA, 1999)
  - In an approximately normal water-year, Pond 30A (as well as the areas which became 30B and 30C after 2011) filled in January and held water through April with inundation reaching a maximum of 3.57 acres. The pH was within normal range but fluctuated from a slightly acidic to slightly alkaline. The water had very low turbidity.
  - yearly cumulative precipitation 16.31 inches
  - data collected January-April, four monitoring events
  - inundated January-April
  - inundation range 1.15-3.57 acres, mean 2.40 acres
  - depth range 45.72-53.34 cm, mean 50.8 cm
  - pH range 6.40-7.53, mean 6.86
  - turbidity range from 3-5 FNU
- 2006-2007 (Shaw, 2008)
  - In a drier year, Pond 30A did not fill.
  - yearly cumulative precipitation 10.13 inches
  - data collected December-June, seven monitoring events

    - dry though the entire monitoring season
    - no water quality data were recorded
- 2009-2010 (USACE, 2016)
    - With heavy early storms, the maximum inundation at Pond 30A can be as high as 6.27 acres.
    - early storms brought cumulative precipitation above-normal in January and February but did not stay above-normal as the water-year continued (14.61 inches)
    - only recorded data for 2010 is an inundation recording of 6.27 acres taken during wildlife surveys
- 2012-2013 (Tetra Tech, 2014)
    - In a dry, drought year Pond 30A did not fill.
    - drought year with yearly cumulative precipitation below-normal 11.17 inches
    - data collected November-May, seven monitoring events
    - dry though the entire monitoring season
- 2013-2014 (Tetra Tech, 2015)
    - In a dry, drought year Pond 30A did not fill
    - drought year with yearly cumulative precipitation below-normal 9.33 inches
    - data collected December-June, six monitoring events
    - dry though the entire monitoring season
- 2014-2015 (Burleson, 2016)
    - With early storms, even in a dry drought year, Pond 30A briefly held water
    - drought year with above-normal precipitation from early season storms, yielding to below-normal cumulative precipitation 14.35 inches
    - data collected February-May, four monitoring events
    - inundated in February with 22 cm depth, but area not recorded
    - no water quality data were collected
- 2015-2016 (Burleson, 2017)
    - In an above-normal water-year Pond 30A held water through May with a maximum inundation of 0.618 acres. Water quality data were all within normal ranges, except for slightly acidic pH values. It should be noted that data collection did not start with the first storms or inundation. Maximum inundation could have been missed.
    - drought year with yearly cumulative precipitation 21.21 inches
    - data collected April-June, four monitoring events
    - inundated from April-May
    - Inundation range from 0.335-0.618 acres, mean 0.479 acres
    - depth range from 20-50 cm, mean 37 cm
    - pH range 6.23-6.53, mean 6.38
    - temperature range 13.9°-15.7° C, mean 15.0° C
    - dissolved oxygen range 0.13-2.37 mg/L, mean 1.27 mg/L
    - turbidity range 14.4-168.0 FNU, mean 94.0 FNU
- 2016-2017
    - After the end of a historic drought with precipitation above-normal, Pond 30A was inundated from the first recorded monitoring in January through June. The maximum inundation area was 1.12 acres (Pond 30A was connected to Ponds 30B and 30C). Water quality was within normal ranges. Slightly acidic pH values were observed. Temperature was within normal averages for Fort Ord. Dissolved oxygen had a small range, with moderate levels. Turbidity was low on average, with a high reading in March.

- Yearly cumulative precipitation 22.92 inches
- Data collected January – July, eight monitoring events
- Inundated January through June
- Inundation range 0.32-1.12 acres, mean 0.68 acres (Ponds 30A, 30B, and 30C all connected for upper range value and mean acreage)
- Depth range 14-86 cm, mean 55.8 cm
- pH range 6.22-6.93, mean 6.59
- temperature range 11.3°-21.9° C, mean 16.0° C
- dissolved oxygen range 1.5-7.68 mg/L, mean 4.11 mg/L
- turbidity range 9.7-150 FNU, mean 50.3 FNU

Pond 30B

- 2011
  - Soil remediation activities at HA 28 caused a depression that has become Pond 30B.
- 2012-2013 (Tetra Tech, 2014)
  - Even in a drought year, Pond 30B held a small amount of water from December through March. Water quality data had a normal with a neutral pH, high dissolved oxygen, normal temperature, and high turbidity
  - drought year with yearly cumulative precipitation 11.17 inches (below-normal)
  - data collected November-May, seven monitoring events
  - inundated December-March
  - inundation range from 0.002-0.009 acres, mean 0.006 acres
  - depth range ~6-10 cm, mean ~8.5 cm
  - pH 6.9 in February
  - temperature 19.27° C in February
  - dissolved oxygen 9.66 mg/L in February
  - turbidity 606 FNU in February
- 2013-2014 (Tetra Tech, 2015)
  - In a consecutive drought year, Pond 30B held a small amount of water in March and April. Water quality data had a neutral pH, high dissolved oxygen, relatively high temperature, and high turbidity. The high temperature is not surprising considering the small amount of water. The temperature likely fluctuated dramatically with air temperature.
  - drought year with yearly cumulative precipitation 9.33 inches (below-normal)
  - data collected December-June, six monitoring events
  - inundated in March and April
  - inundation range from 0.00009-0.01 acres, mean 0.005 acres
  - depth range 1-3 cm, mean 2 cm
  - pH 7.0 in February
  - temperature 24.4° C in February
  - dissolved oxygen 8.8 mg/L in February
  - turbidity 476 FNU in February
- 2014-2015 (Burleson, 2016)
  - In a consecutive drought year with early storms and overall low precipitation Pond 30B both filled and dried quickly. It did not hold water throughout the rain season.
  - drought year with early storms above-normal and cumulative precipitation slightly below-normal (14.35 inches)
  - data collected November-May excluding December and January, five monitoring events

  - inundated in November, February and March
  - inundation range from 0.0002-0.002 acres, mean 0.001 acres
  - depth range ~2-10 cm, mean ~5.7 cm
  - no water quality data collected
- 2015-2016 (Burleson, 2017)
  - In a consecutive drought year with precipitation above-normal Pond 30B connected with Pond 30A. Additionally it held water through May. The water quality data had a neutral pH, a fairly dramatic temperature range with a relatively high mean, moderate to high dissolved oxygen levels and relatively low turbidity. It should be noted that data collection did not start with the first storms or inundation. Maximum inundation could have been missed.
  - drought year with yearly cumulative precipitation 21.21 inches
  - data collected April-June, four monitoring events
  - inundated from April-May, connected with Pond 30A in first April survey
  - inundation range from 0.003-0.01 acres when isolated, mean 0.007
  - depth range from 6-25 cm when isolated, mean 16 cm
  - pH range 6.98-7.29, mean 7.14
  - temperature range 17.2°-25.2° C, mean 21.2° C
  - dissolved oxygen range 4.05-6.31 mg/L, mean 5.18 mg/L
  - turbidity range 28.2-83.8 FNU, mean 56.0 FNU
- 2016-2017
  - After the end of a historic drought with precipitation above-normal, Pond 30B was inundated from the first recorded monitoring in January through June. The maximum inundation area was 1.123 acres (Pond 30B was connected to Ponds 30A and 30C). Water quality was within normal ranges. Slightly acidic to neutral pH values were observed. Temperature was within normal averages for Fort Ord. Dissolved oxygen had a small range, with moderate levels. Turbidity was low on average, with a high reading in March.
  - Yearly cumulative precipitation 22.92 inches
  - Data collected January –July, eight monitoring events
  - Inundated January through June
  - Inundation range 0.01-1.12 acres, mean 0.67 acres (Ponds 30A, 30B, and 30C all connected for upper range value and mean acreage)
  - Depth range 18-81 cm, mean 52 cm
  - pH range 6.33-7.24, mean 6.59
  - temperature range 7.4°-22.3° C, mean 13.7° C
  - dissolved oxygen range 1.91-4.8 mg/L, mean 3.24 mg/L
  - turbidity range 15.9-171 FNU, mean 60.9 FNU

Pond 30C

- 2011
  - Soil remediation activities at HA 28 caused a depression that has become Pond 30C.
- 2012-2013 (Tetra Tech, 2014)
  - Even in a drought year, Pond 30C held a small amount of water from December through April. Water quality data had a neutral pH, high dissolved oxygen, relatively high temperature, and high turbidity.
  - drought year with yearly cumulative precipitation below-normal (11.17 inches)
  - data collected November-May, seven monitoring events

  - inundated December-April
  - inundation range from 0.001-0.05 acres, mean 0.03 acres
  - depth range 5-16 cm, mean 9.4 cm
  - pH range 7.05-7.29, mean 7.17
  - temperature range 18.8°-24.5° C, mean 21.6° C
  - dissolved oxygen range 9.35-9.55 mg/L, mean 9.45 mg/L
  - turbidity range 590-821 FNU, mean 706 FNU
- 2013-2014 (Tetra Tech, 2015)
  - Even in a consecutive drought year, Pond 30C held a small amount of water late in the rain season. Water quality data had a slightly acidic pH, high dissolved oxygen, high temperature, and moderate turbidity in April.
  - drought year with yearly cumulative precipitation below-normal (9.33 inches)
  - data collected December-June, six monitoring events
  - inundated from March-April
  - inundation range 0.01-0.02 acres, mean 0.015 acres
  - depth range 3-7 cm, mean 5 cm
  - pH 6.3 in April
  - temperature 26.5° C in April
  - dissolved oxygen 9.5 mg/L in April
  - turbidity 345 FNU in April
- 2014-2015 (Burleson, 2015)
  - In another drought year with below-normal precipitation, Pond 30C held water between December and March. Water quality data had a slightly acidic pH, high dissolved oxygen, high temperature, and moderate turbidity in April.
  - early storms yielded above-normal cumulative precipitation which fell below-normal by February (14.35 inches yearly total)
  - data collected December-May, five monitoring events
  - inundated in December-March
  - inundation recorded only in March, 0.03 acres
  - depth range 10-~43 cm, mean ~24 cm
  - no water quality data were collected
- 2015-2016 (Burleson, 2017)
  - In a consecutive drought year with cumulative precipitation above-normal, Pond 30C held water through May. It was likely connected to Pond 30A early in the rain season. Water quality results had a neutral to slightly alkaline pH, normal temperature, moderate dissolved oxygen and low to moderate turbidity. It should be noted that data collection did not start with the first storms or first inundation. Maximum inundation could have been missed.
  - drought year with cumulative precipitation above-normal (21.21 inches)
  - data collected April-June, four monitoring events
  - inundated from April-May
  - inundation range from 0.05-0.13 acres, mean 0.10 acres
  - depth range from 15-28 cm, mean 22 cm
  - pH range 6.67-7.61, mean 7.15
  - temperature range 14.4°-23.3° C, mean 18.7° C
  - dissolved oxygen range 0.45-6.10 mg/L, mean 3.07 mg/L
  - turbidity range 26.1-199.0 FNU, mean 127.0 FNU
- 2016-2017

- After the end of a historic drought with precipitation above-normal, Pond 30C was inundated from the first recorded monitoring in January through June. The maximum inundation area was 1.12 acres (Pond 30C was connected to Ponds 30A and 30C). Water quality was within normal ranges. Neutral to slightly acidic pH values were observed. Temperature was within normal averages for Fort Ord. Dissolved oxygen had a small range, with moderate levels. Turbidity was low on average, with a few high readings at the beginning and end of the season.
- Yearly cumulative precipitation 22.92 inches
- Data collected January – July, eight monitoring events
- Inundated January through June
- Inundation range 0.11-1.12 acres, mean 0.71 acres (Ponds 30A, 30B, and 30C all connected for upper range value and mean acreage)
- Depth range 22-75 cm, mean 54 cm
- pH range 5.98-7.03, mean 6.53
- temperature range 8.6°-20.6° C, mean 14.1° C
- dissolved oxygen range 0.87-6.26 mg/L, mean 3.70 mg/L
- turbidity range 11.7-122.0 FNU, mean 41.3 FNU

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APPENDIX G

Vegetation Species Richness of Native and Non-Native Species and Wetland Indicator Category by Vernal Pool

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Table G-1. Pond 5 (Reference) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 5			
Stratum	**Native**	**Non-Native**	**Unidentified**
2	4	2	0
3	4	4	0
4	4	7	1
5	10	4	2
Basin Total	46	24	3

Table G-2. Pond 101 East (West) (Reference) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 101 East (West)			
Stratum	**Native**	**Non-Native**	**Unidentified**
1	9	1	0
2	3	1	0
3	7	6	1
4	10	7	1
5	8	6	0
6	8	6	0
7	1	0	0
Basin Total	44	22	2

Table G-3. Pond 101 East (East) (Reference) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 101 East (East)			
Stratum	**Native**	**Non-Native**	**Unidentified**
5	8	4	0
6	8	4	0
Basin Total	35	23	1

Table G-4. Pond 997 (Reference) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 997			
Stratum	**Native**	**Non-Native**	**Unidentified**
1	6	0	0
3	10	9	0
4	7	4	0
Basin Total	43	20	2

Table G-5. Pond 42 (Baseline) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 42			
Stratum	**Native**	**Non-Native**	**Unidentified**
1	4	1	0
2	2	1	0
3	4	1	0
4	6	3	0
Basin Total	57	20	1

Table G-6. Pond 61 (Baseline) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 61			
Stratum	**Native**	**Non-Native**	**Unidentified**
1	8	6	2
3	11	1	1
4	6	0	0
Basin Total	77	21	2

Table G-7. Pond 16 (Year 1 Post-Mastication) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 16			
Stratum	**Native**	**Non-Native**	**Unidentified**
1	2	2	0
3	1	2	0
4	7	8	0
5	2	0	0
6	3	2	0
7	1	2	0
Basin Total	49	37	1

Table G-8. Pond 18 (Year 2 Post-Mastication) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 18			
Stratum	**Native**	**Non-Native**	**Unidentified**
1	1	0	0
2	2	0	0
3	7	5	0
4	4	5	0
Basin Total	26	15	1

Table G-9. Pond 10 (Year 5 Post-Lead Remediation) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 10			
Stratum	**Native**	**Non-Native**	**Unidentified**
3	4	0	0
4	6	0	0
5	2	4	1
Basin Total	43	17	2

Table G-10. Vegetation Species Richness of Native and Non-Native Species in Vernal Pools Monitored in 2017

Vernal Pool	Native	Non-Native	Unknown	Total
5	46	24	2	73
101 East (West)	44	22	2	68
101 East (East)	35	23	1	59
997	43	20	2	65
42	57	20	1	78
61	77	21	2	100
16	49	37	1	87
18	26	15	1	42
10	43	17	2	62

Table G-11. Pond 5 (Reference) Number of Wetland Plants by Indicator Category by Stratum

Pond 5						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
2	3	0	3	0	0	0
3	2	2	2	2	0	0
4	1	2	2	5	0	2
5	3	3	5	1	0	4
Basin Total	13	15	10	13	1	21

Table G-12. Pond 101 East (West) (Reference) Number of Wetland Plants by Indicator Category by Stratum

Pond 101 East (West)						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
1	5	3	1	1	0	0
2	3	1	0	0	0	0
3	4	3	3	2	0	2
4	2	6	2	4	0	3
5	2	4	1	4	0	1
6	3	5	1	3	0	1
7	0	1	0	0	0	0
Basin Total	12	19	8	12	0	17

Table G-13. Pond 101 East (East) (Reference) Number of Wetland Plants by Indicator Category by Stratum

Pond 101 East (East)						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
5	3	5	1	3	0	0
6	1	4	5	1	0	1
Basin Total	8	13	9	11	2	16

Table G-14. Pond 997 (Reference) Number of Wetland Plants by Indicator Category by Stratum

Pond 997						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
1	2	2	0	0	0	1
3	3	3	1	4	0	5
4	3	3	1	0	0	1
Basin Total	9	16	7	10	0	23

Table G-15. Pond 42 (Baseline) Number of Wetland Plants by Indicator Category by Stratum

Pond 42						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
1	2	3	0	0	0	0
2	2	1	0	0	0	0
3	1	4	0	0	0	0
4	1	3	1	3	0	1
Basin Total	9	16	6	11	1	35

Table G-16. Pond 61 (Baseline) Number of Wetland Plants by Indicator Category by Stratum

Pond 61						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
1	2	0	0	0	0	1
3	3	1	1	1	0	1
4	1	2	2	4	0	7
Basin Total	13	19	9	12	1	46

Table G-17. Pond 16 (Year 1 Post-Mastication) Number of Wetland Plants by Indicator Category by Stratum

Pond 16						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
1	1	0	1	2	0	0
3	2	0	0	1	0	0
4	1	3	2	7	1	1
5	0	0	1	1	0	0
6	0	1	1	3	0	0
7	1	1	1	0	0	0
Basin Total	8	15	14	20	1	30

Table G-18. Pond 18 (Year 2 Post-Mastication) Number of Wetland Plants by Indicator Category by Stratum

Pond 18						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
1	1	0	0	0	0	0
2	1	0	1	0	0	0
3	3	3	2	2	1	1
4	1	3	2	0	0	3
Basin Total	6	9	7	8	1	11

Table G-19. Pond 10 (Year 5 Post-Lead Remediation) Number of Wetland Plants by Indicator Category by Stratum

Pond 10						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
3	3	0	1	0	0	0
4	3	2	1	0	0	0
5	1	2	1	2	0	1
Basin Total	11	14	9	11	1	16

Table G-20. Wetland Plants by Indicator Category by Stratum in Vernal Pools Monitored in 2017

Number of Wetland Plants Observed at Vernal Pools Monitored in 2017							
Vernal Pool	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**	**Total**
5	13	15	10	13	1	21	73
101 East (West)	12	19	8	12	0	17	68
101 East (East)	8	13	9	11	2	16	59
997	9	16	7	10	0	23	65
42	9	16	6	11	1	35	78
61	13	19	9	12	1	46	100
16	8	15	14	20	1	30	88
18	6	9	7	8	1	11	42
10	11	14	9	11	1	16	62

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APPENDIX H

Species Composition of Follow-Up Wetland Vegetation Monitoring by Vernal Pool

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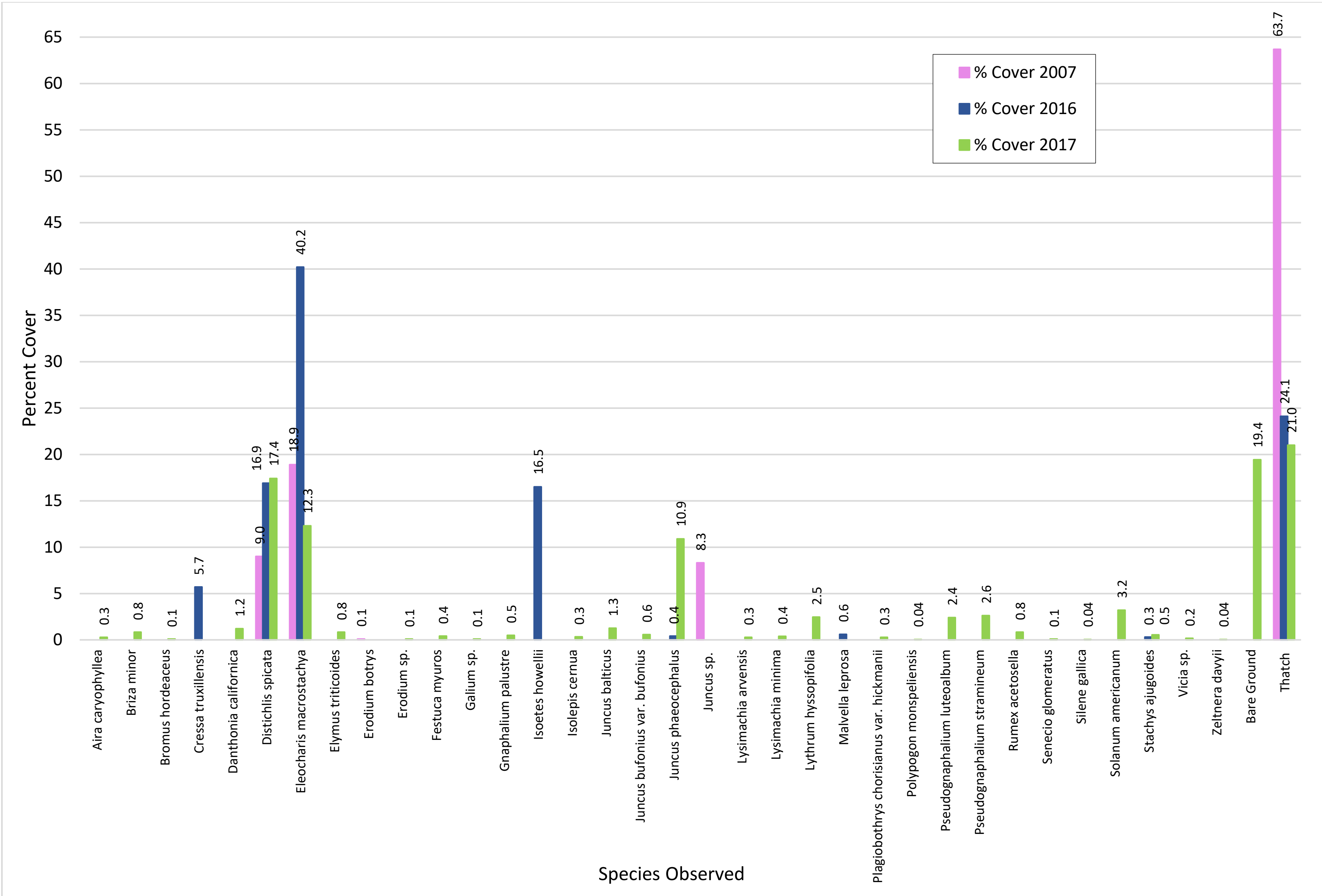


Figure H-1. Comparison Graph of Percent Cover by Wetland Plant Species for 2007, 2016, and 2017 at Pond 5 (Reference)

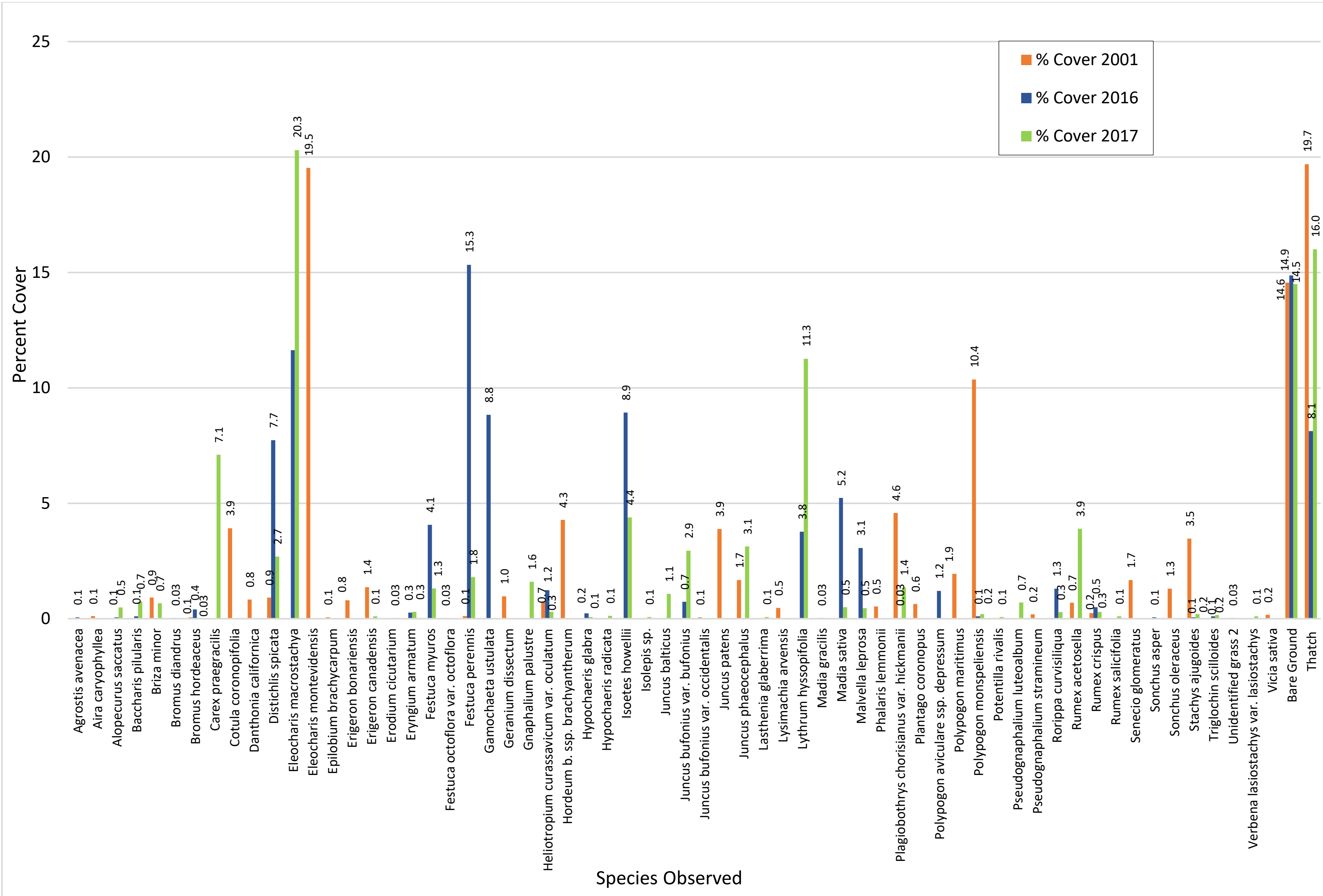


Figure H-2. Comparison Graph of Percent Cover by Wetland Plant Species for 2001, 2016, and 2017 at Pond 101 East (West) (Reference)

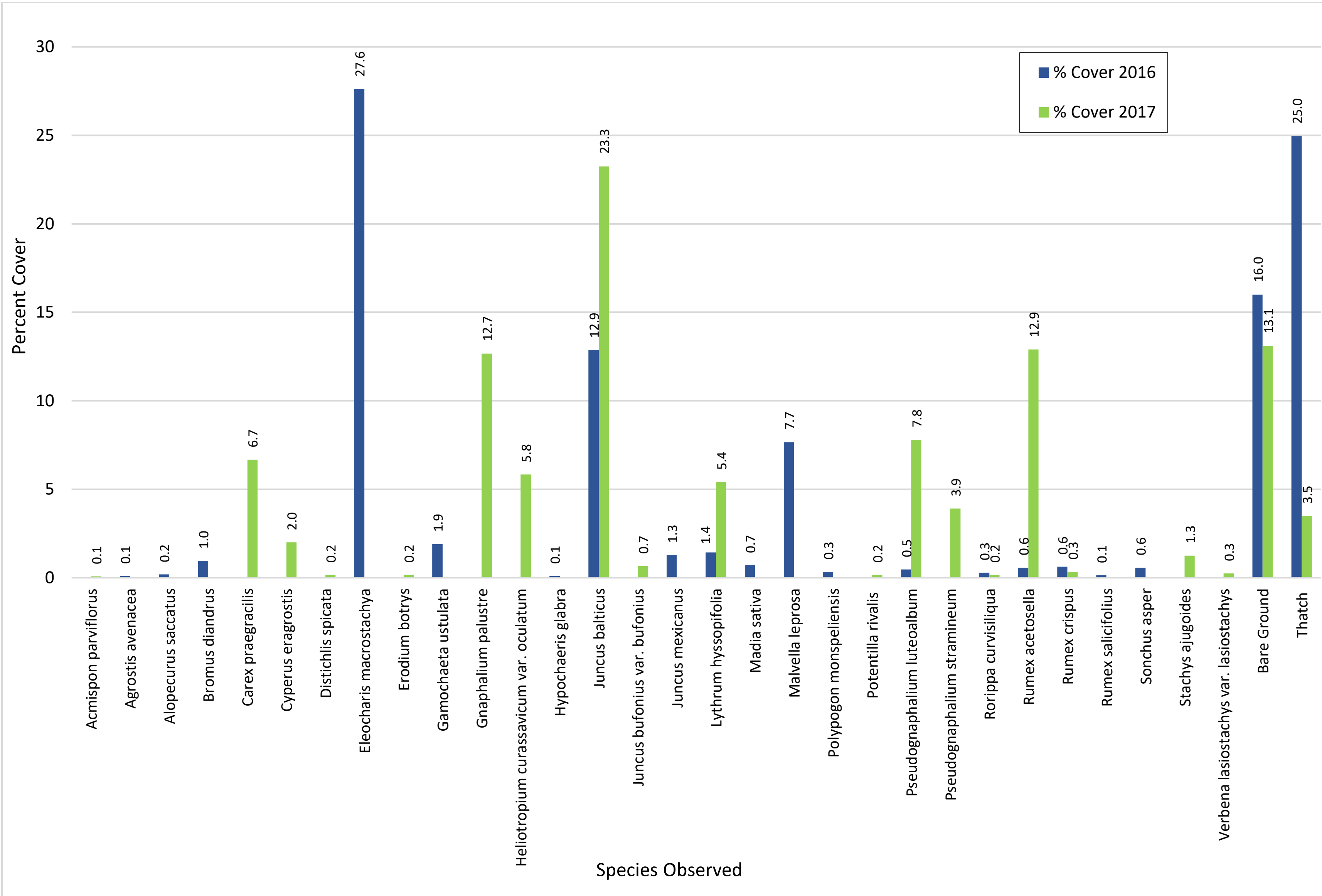


Figure H-3. Comparison Graph of Percent Cover by Wetland Plant Species for 2016 and 2017 at Pond 101 East (East) (Reference)

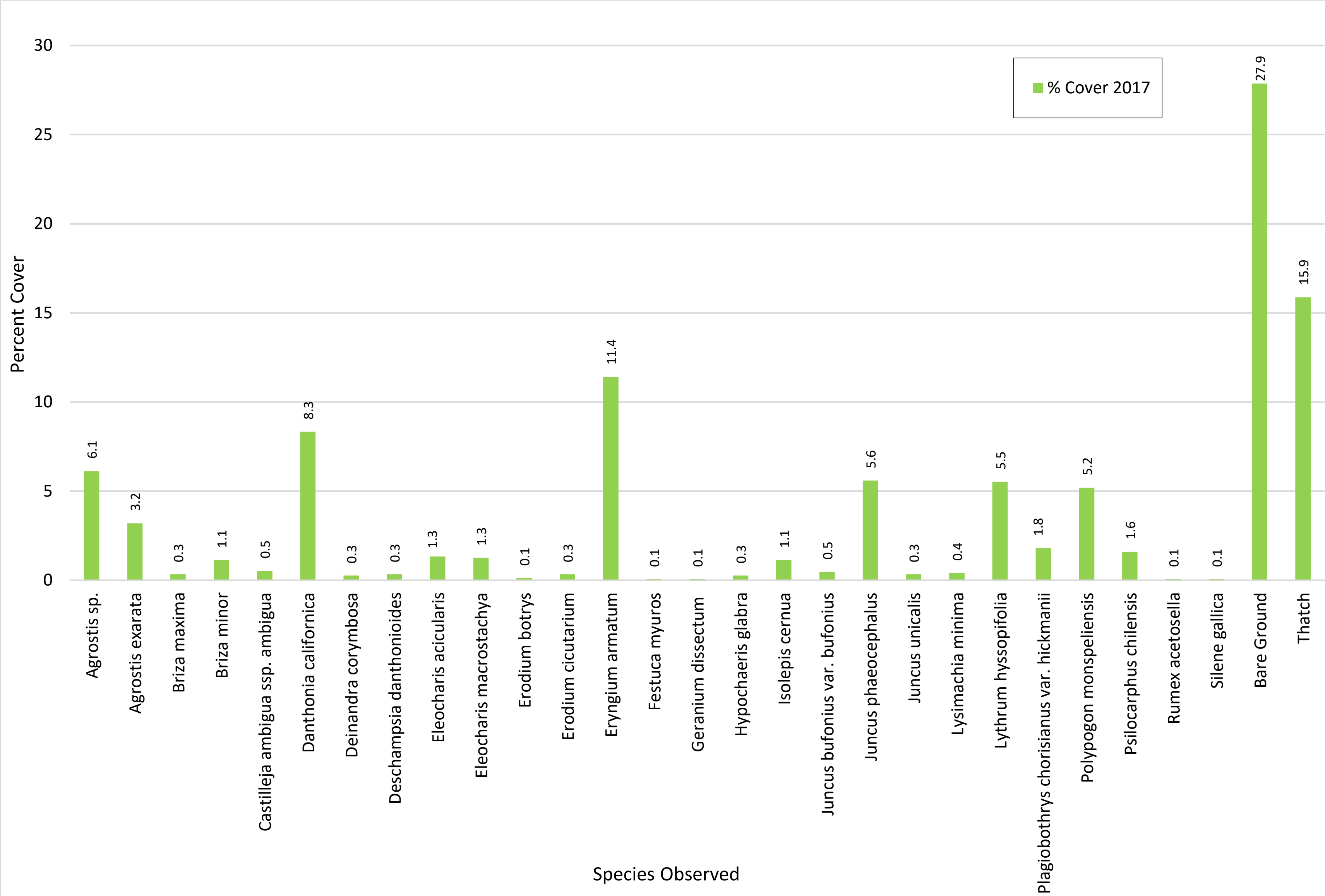
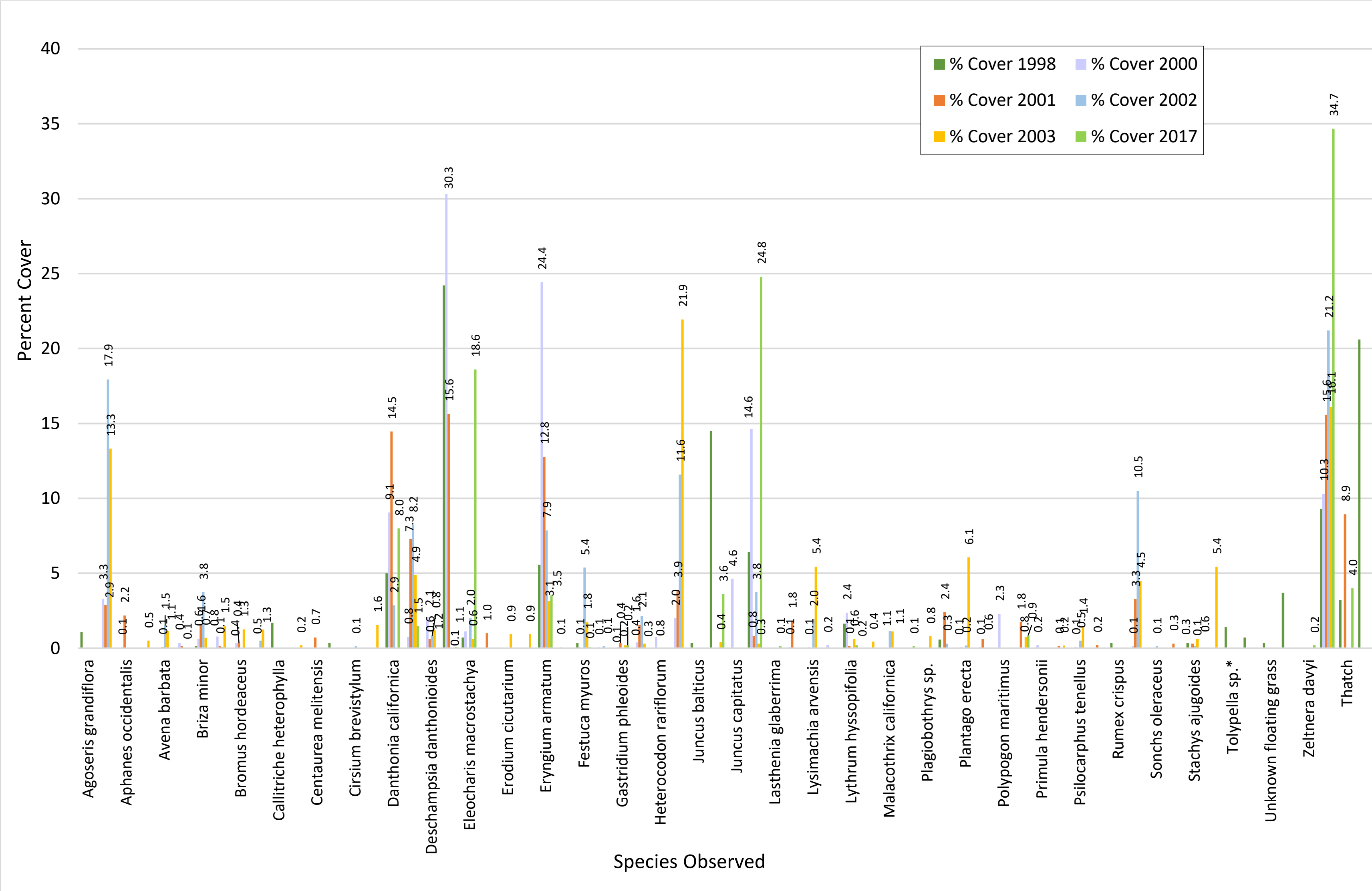


Figure H-4. Graph of Percent Cover by Wetland Plant Species for 2017 at Pond 997 (Reference)



**This plant is not listed in the Jepson Manual, CalFlora, or USDA Plants databases

Figure H-5. Comparison Graph of Percent Cover by Wetland Plant Species for 1998, 2000, 2001, 2002, 2003, and 2017 at Pond 42 (Baseline)

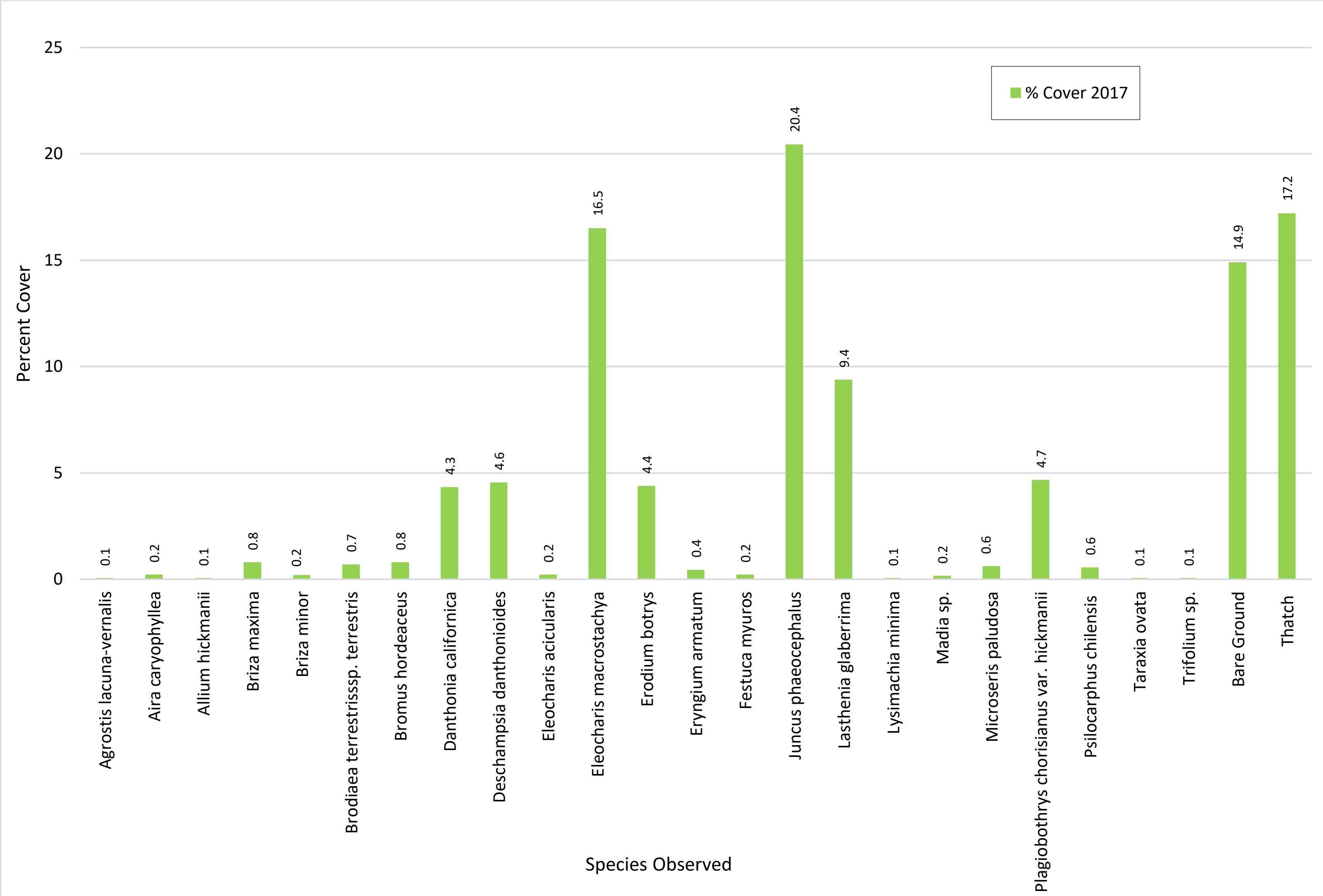


Figure H-6. Graph of Percent Cover by Wetland Plant Species for 2017 at Pond 61 (Baseline)

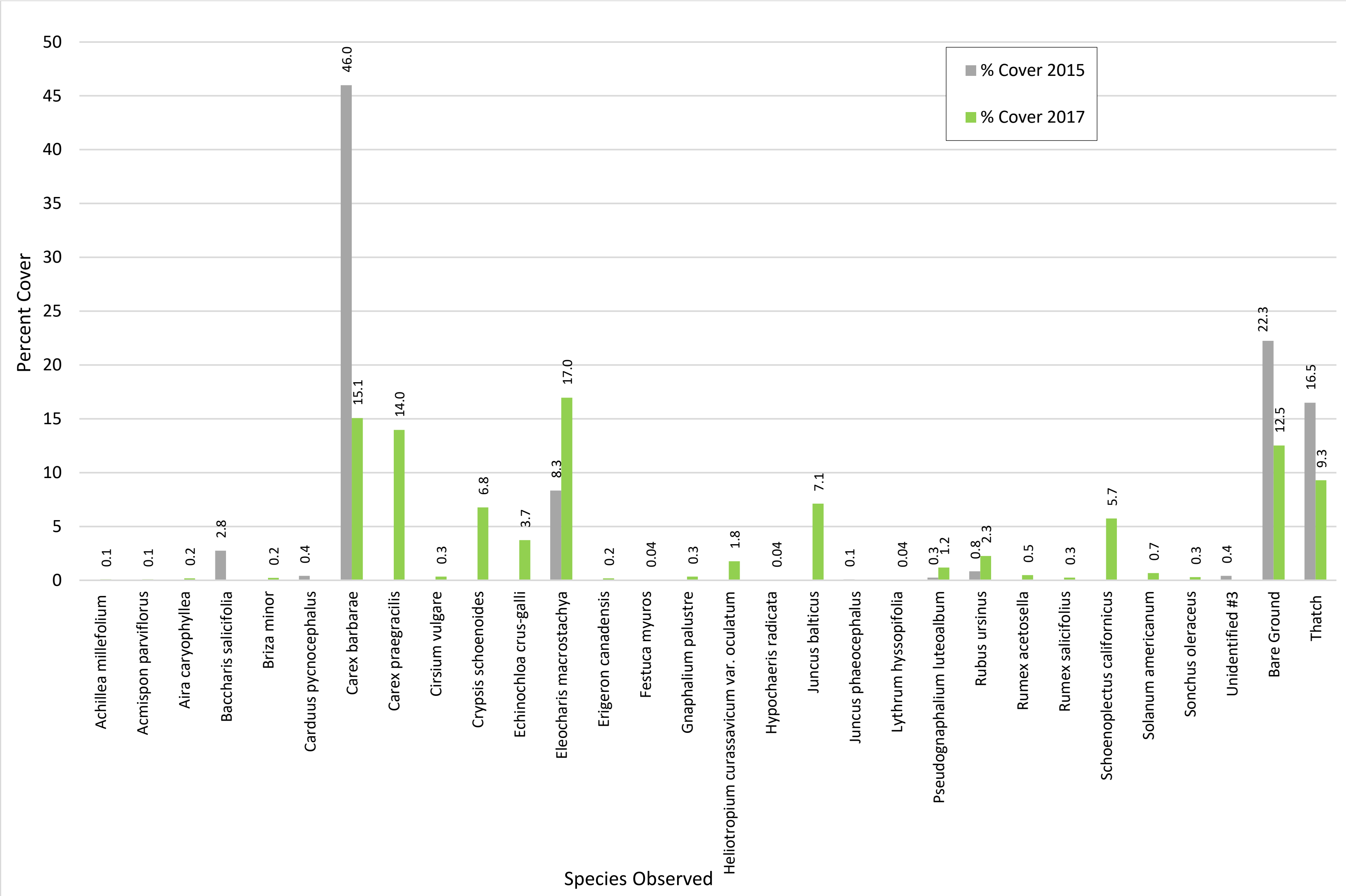


Figure H-7. Comparison Graph of Percent Cover by Wetland Plant Species for 2015 and 2017 at Pond 16 (Year 1 Post-Mastication)

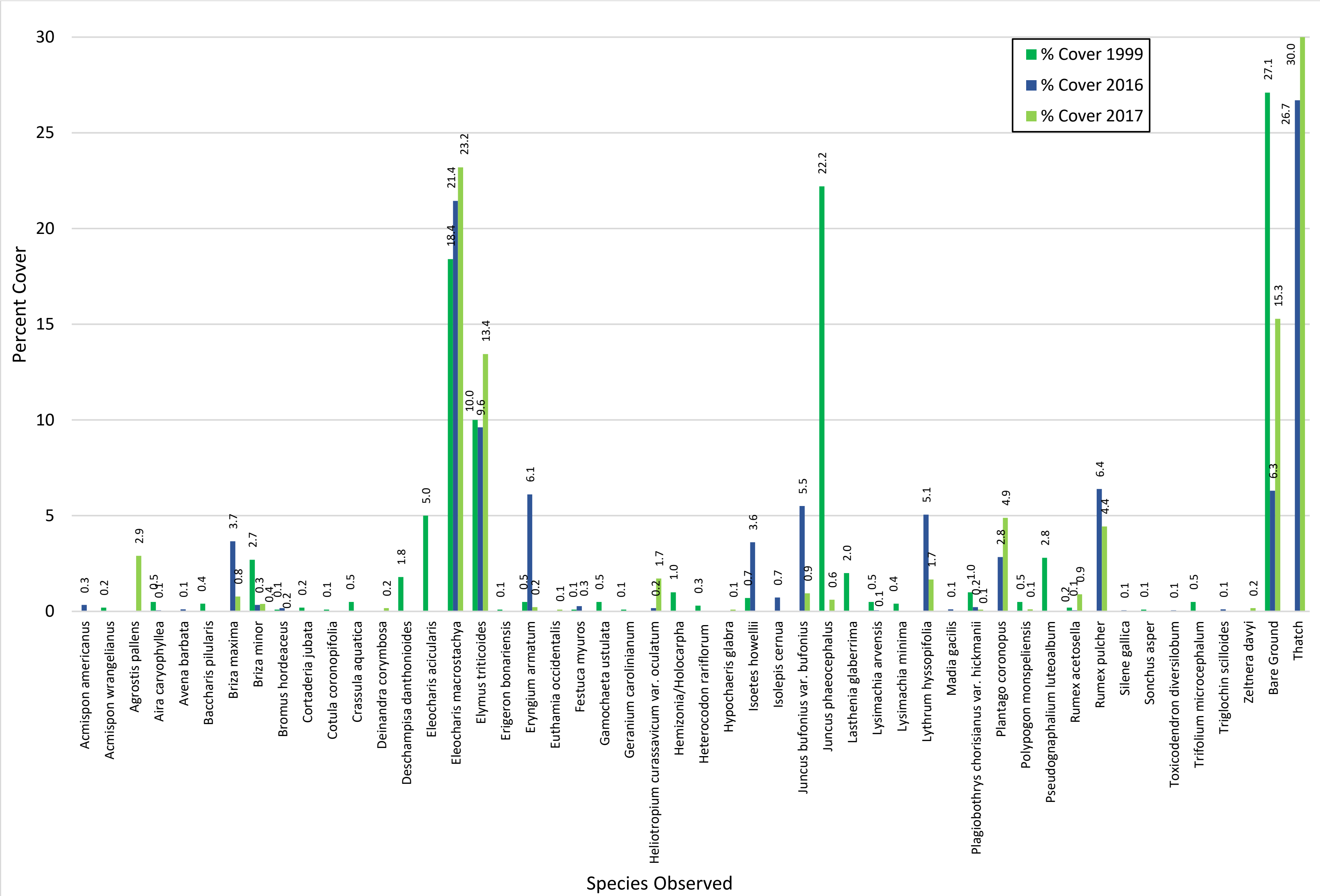


Figure H-8. Comparison Graph of Percent Cover by Wetland Plant Species for 1999, 2016, and 2017 at Pond 18 (Year 2 Post-Mastication)

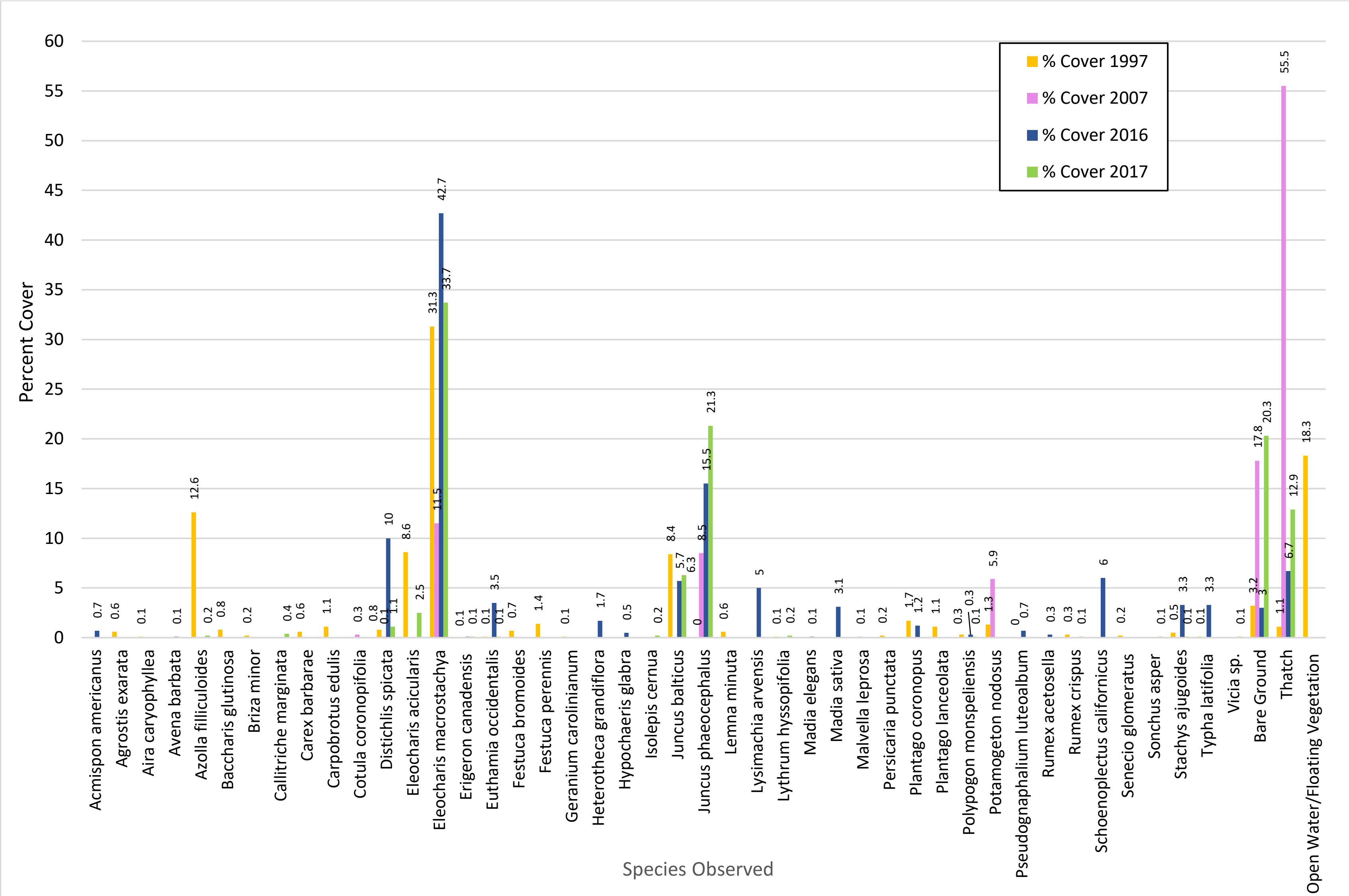


Figure H-9. Comparison Graph of Percent Cover by Wetland Plant Species for 1997, 2007, 2016, and 2017 at Pond 10 (Year 5 Post-Lead Remediation