2021 ANNUAL REPORT
WETLAND VEGETATION AND WILDLIFE MONITORING
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FORMER FORT ORD

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CONTENTS

Section **Page**

FIGURES

TABLES

APPENDICES

A VEGETATION TRANSECT DATA
B STRATUM COVER BY VERNAL POOL
C CTS AND AQUATIC INVERTEBRATE DATA
D SITE PHOTOS
E VEGETATION SPECIES RICHNESS OF NATIVE AND NON-NATIVE SPECIES AND WETLAND INDICATOR CATEGORY BY VERNAL POOL
F SPECIES COMPOSITION OF FOLLOW-UP VEGETATION MONITORING BY VERNAL POOL
G RANK ABUNDANCE CURVES

ACRONYMS AND ABBREVIATIONS

BRAC	Base Realignment and Closure
Burleson	Burleson Consulting, Inc., A Terracon Company
CCG	Contra Costa goldfields
Chenega	Chenega Tri Services, LLC
cm	centimeter(s)
CTS	California Tiger Salamander
DQO	Data Quality Objective
FAC	Facultative Plant
FACU	Facultative Upland Plant
FACW	Facultative Wetland Plant
fairy shrimp	California Fairy Shrimp
HLA	Harding Lawson and Associates
HMP	Habitat Management Plan
m	meter(s)
MEC	Munitions and Explosives of Concern
NCEI	National Centers for Environmental Information
NL	Not Listed
NOAA	National Oceanic and Atmospheric Administration
NWSFO	National Weather Service Forecast Office
OBL	Obligate Wetland Plant
PBO	Programmatic Biological Opinion
RACs	rank abundance curves
sp.	species
UPL	Obligate Upland Plant
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
Wetland Plan	Wetland Monitoring and Restoration Plan for Munitions and Contaminated Soil Remediation
%	Percent

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1 INTRODUCTION

The United States Army Corps of Engineers (USACE) contracted Burleson Consulting Inc., A Terracon Company (Burleson) to conduct wetland vegetation and wildlife monitoring at former Fort Ord, Monterey County, California (see Figure 1-1). Wetland monitoring includes three types of monitoring: hydrology, vegetation, and wildlife. Burleson completed vegetation and wildlife monitoring. Hydrology monitoring was completed by Chenega Tri-Services, LLC (Chenega) and is reported separately (Chenega, 2022). These monitoring activities are centered around historical vernal pools on former Fort Ord.

The team monitored wetland vegetation including federally endangered Contra Costa goldfields (*Lasthenia conjugens;* CCG), the state and federally threatened California tiger salamander (*Ambystoma californiense*; CTS), California fairy shrimp (*Linderiella occidentalis*; 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 Programmatic Biological Opinion (PBO) issued to the Army to handle, capture, and relocate individuals on former Fort Ord (USFWS, 2017). These monitoring 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*; 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 2021 included reference ponds 5, 101 East (East), 997; and remediated ponds 3 North, 3 South, 16, 35, 39, 40 South, 41, 42, 43, 44, 54, 60, 61, 73, 74, 75, 101 East (West), and 101 West (see Figure 1-2 and Figure 1-3). The populations of CCG were mapped and evaluated at Ponds 997, 3 North, 3 South, and 61. Invertebrate and protocol-level CTS aquatic sampling surveys were completed only at vernal pools that held water long enough to trigger the wildlife surveys. For the 2020-2021 water-year, wildlife surveys were completed at Ponds 61 and 60. All other vernal pools did not hold sufficient depth to trigger the wildlife surveys.

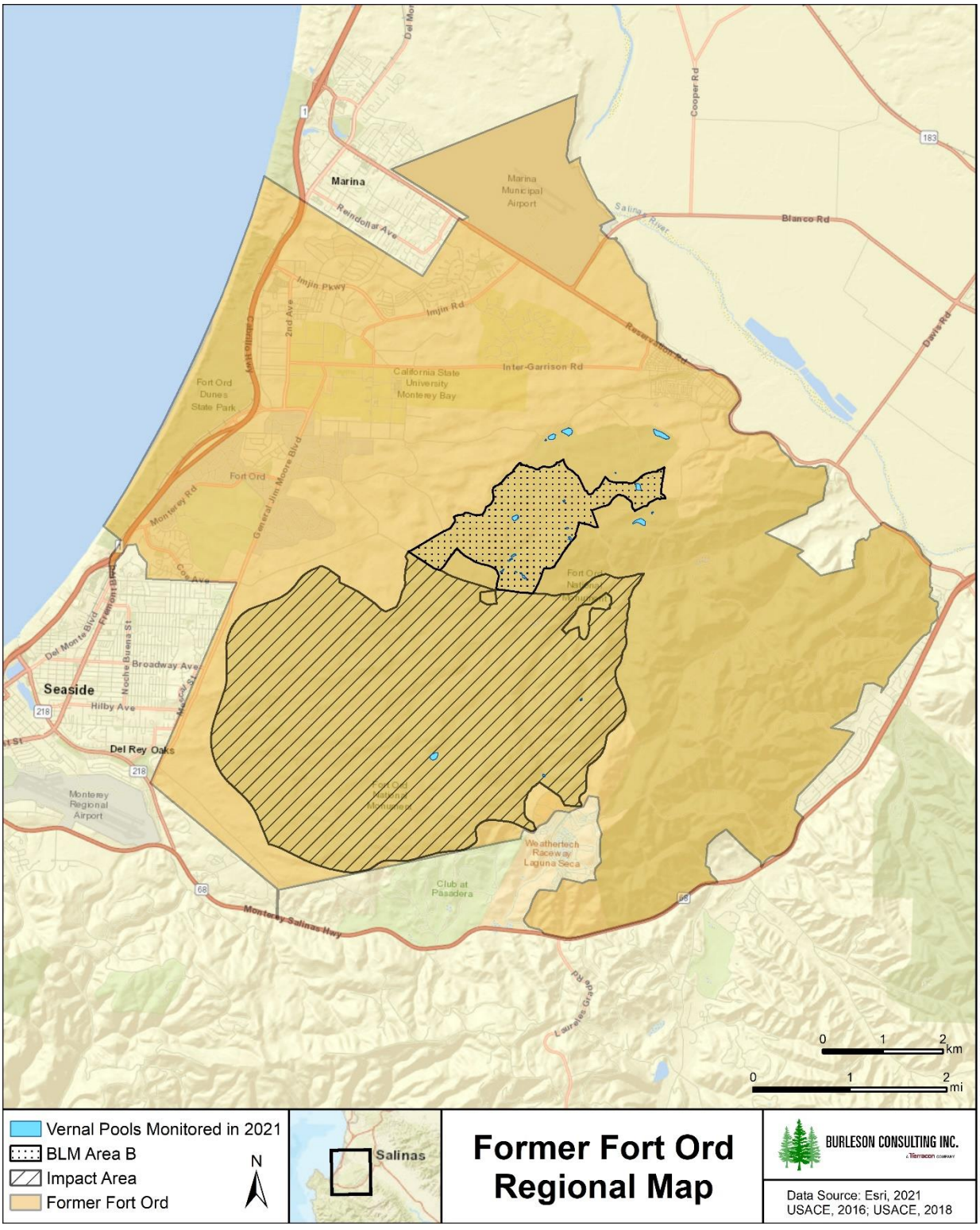

Figure 1-1. Location Map of Vernal Pools on Former Fort Ord Monitored in 2021

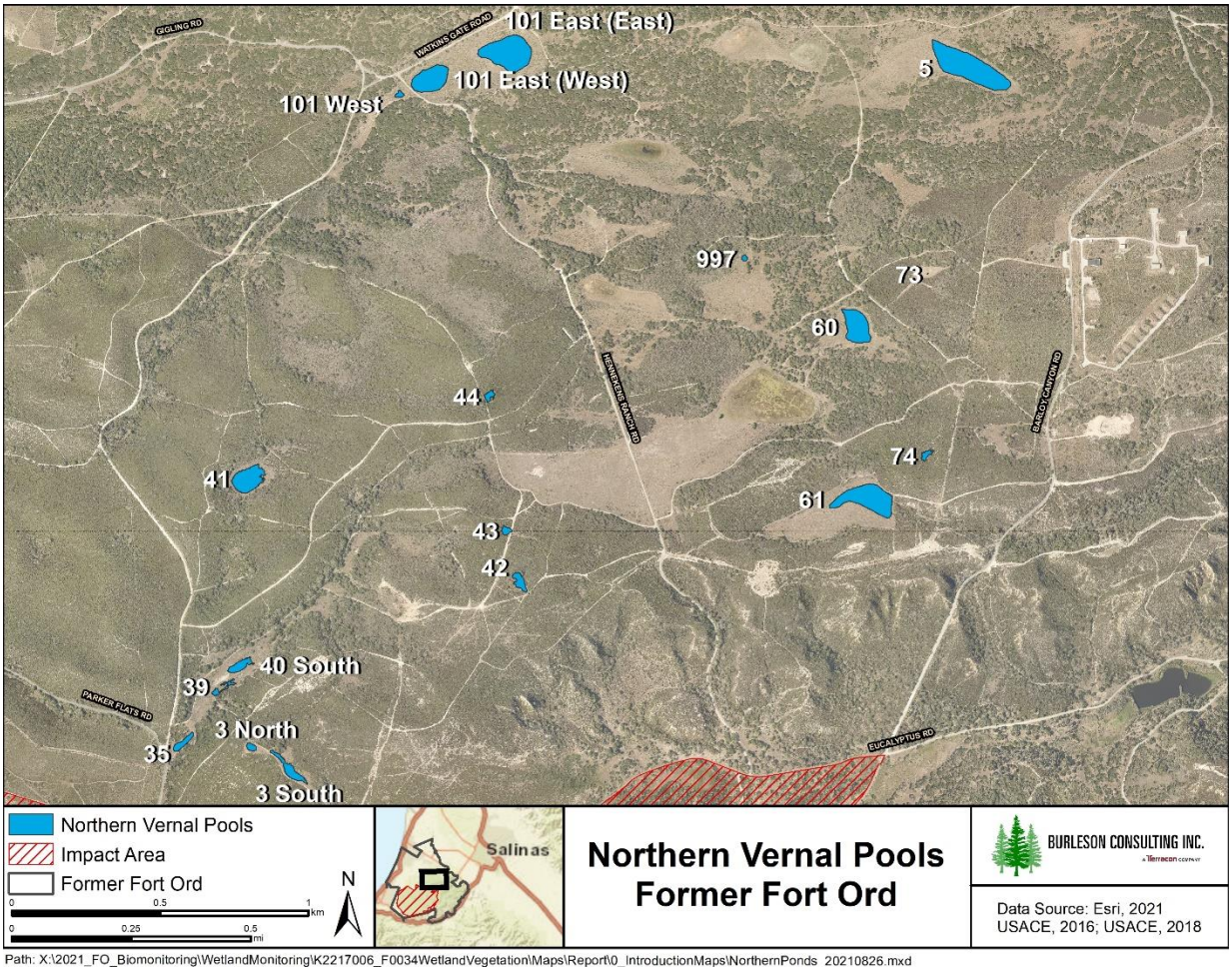

Figure 1-2. Location Map of Ponds 5, 101 East (East), 997, 3 North, 3 South, 35, 39, 40 South, 41, 42, 43, 44, 60, 61, 73, 74, 101 East (West), and 101 (West)

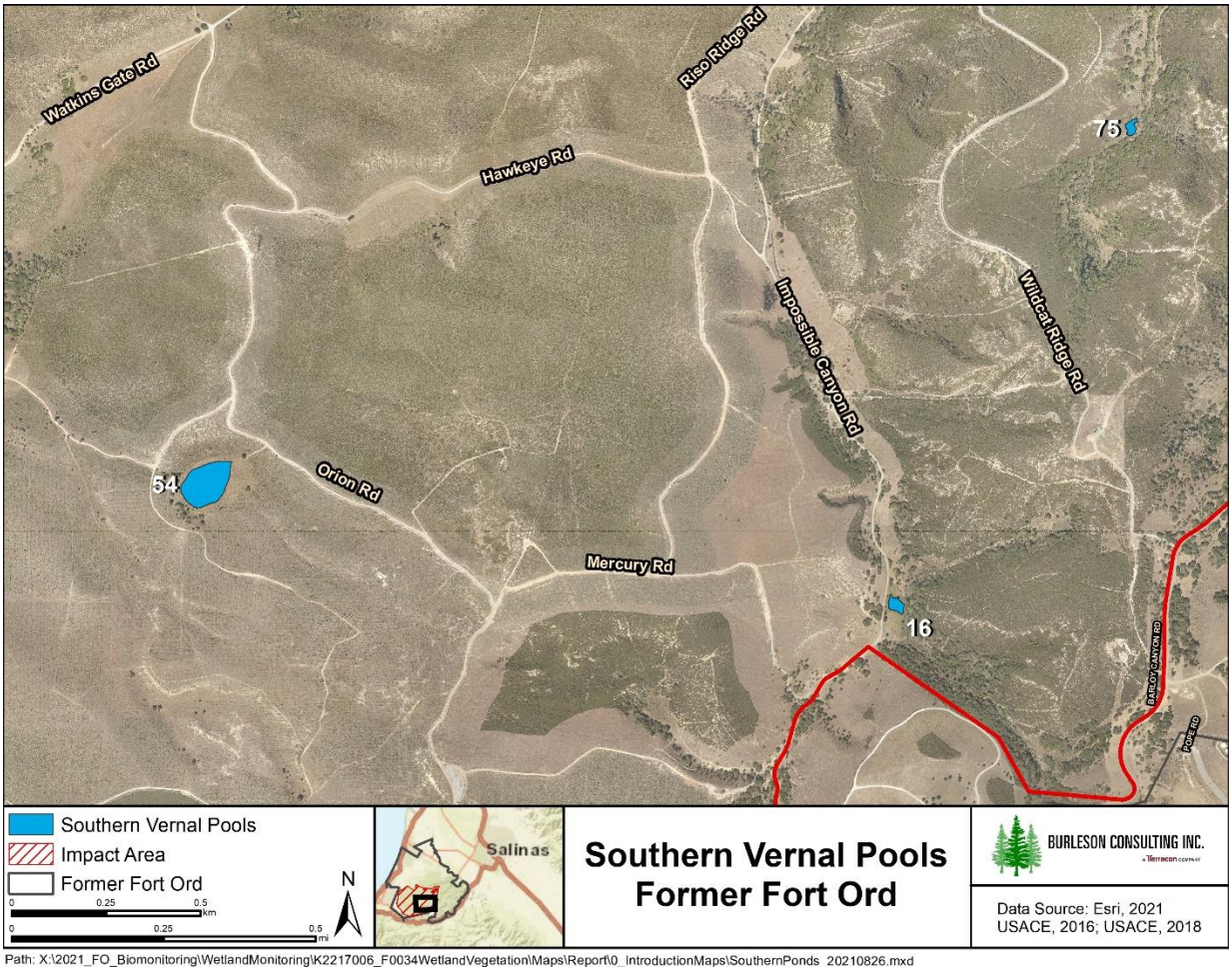

Figure 1-3. Location Map of Ponds 16, 54, and 75

In the 2020-2021 water-year, the Monterey Peninsula Regional Airport meteorological tower recorded precipitation that was approximately 24 centimeters (cm) less than normal cumulative precipitation. It was the lowest recorded cumulative precipitation in almost thirty years of data collection (Naval Postgraduate School Department of Meteorology, 2021; see Figure 1-4). The timing of precipitation started off following relatively normal patterns. After minimal rain accumulation in November and December, the heaviest rain events occurred in January, a month that typically receives the high rainfall, with precipitation values above normal. The heavier rains in January were followed however, by vastly below-normal precipitation in February. The remaining significant precipitation for the water-year occurred in March. Two small rain events occurred in April and June of 2021 and only contributed an additional 0.06 cm of precipitation (see Figure 1-5). The total cumulative precipitation was approximately 45 percent (%) of normal. The Monterey Peninsula Regional Airport meteorological towers is located approximately 5 miles southwest of Site 39 on former Fort Ord. The Monterey Peninsula Regional Airport tower replaced the National Weather Service Forecast Office (NWSFO) tower on April 1, 2019 and is located within 1 kilometer of the NWSFO tower. All 2020-2021 values in this report are from the new Monterey Peninsula Regional Airport tower.

National Weather Service Forecast Office determines normal rainfall based on a 30-year average that at the end of each decade is moved forward another 10 years. Previously the dataset was from 1981-2010.

In this report normal rainfall was updated resulting in some water-years to be recategorized based on their relationship to normal. The normal dataset used for comparison in this report is from the NWSFO tower and is defined as the mean precipitation from years 1991-2020. Water-years are categorized as normal if cumulative precipitation was within 1 inch of the NWSFO normal. The two water-years that were recategorized were 1998-1999 and 1999-2000, which changed from below-normal to normal.

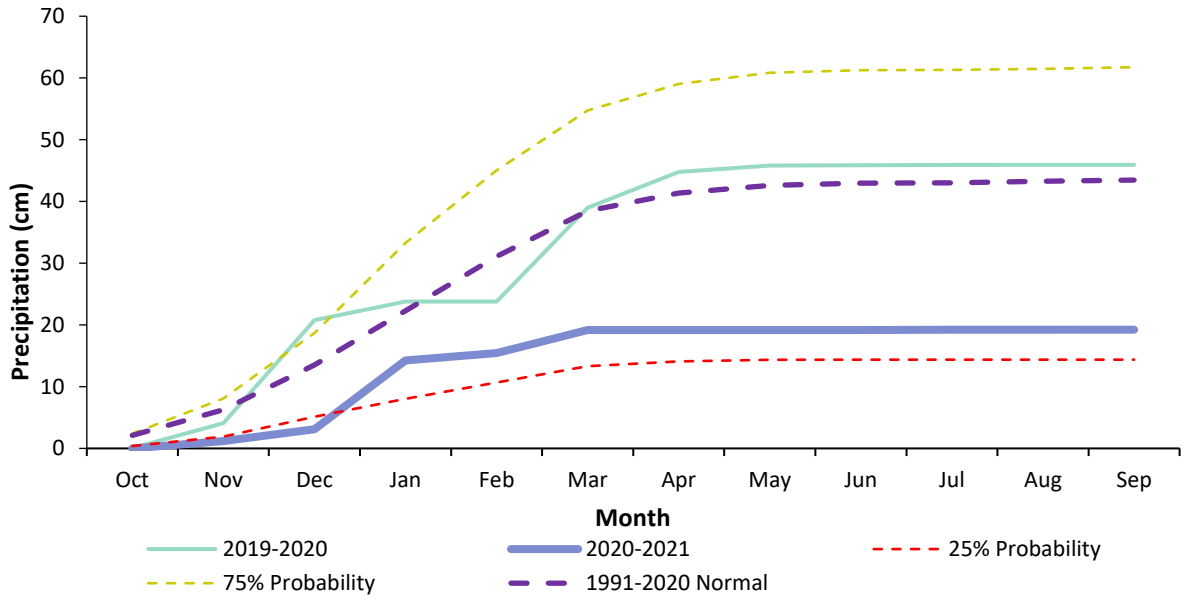

Figure 1-4. Cumulative Monthly Precipitation for the 2020-2021 Water-Year compared to the 30-Year Normal (mean 1991-2020), the 2019-2020 Water-Year, and the 25% and 75% Probabilities (NPS, 2021; National Centers for Environmental Information [NCEI] and National Oceanic and Atmospheric Administration [NOAA], 2021)

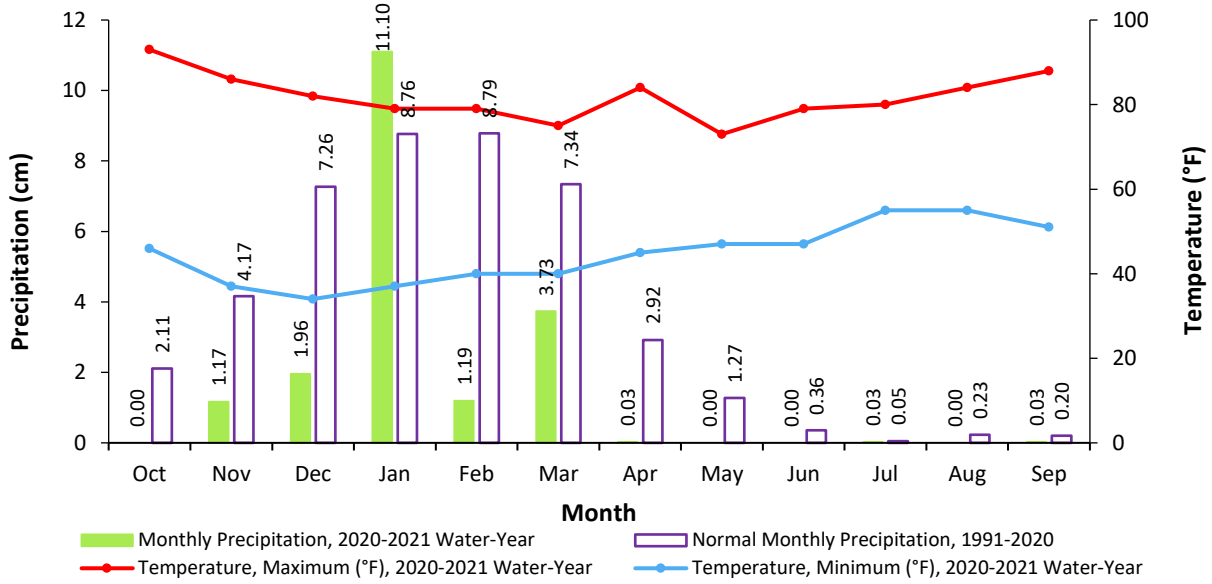

Figure 1-5. Monthly Precipitation, Maximum and Minimum Temperatures for the 2020-2021 Water-Year and Normal Monthly Precipitation (NPS, 2021).

The goal of hydrology, wetland vegetation, and wildlife monitoring efforts is to evaluate vernal pools potentially affected by remediation activities against success criteria identified in the HMP, PBO, and Wetland Plan (USACE, 1997; USFWS, 2017; Burleson, 2006). The Wetland Plan outlines the Data Quality Objectives (DQO) used to evaluate success criteria for this report. The DQOs focus on vernal pool depth, inundation, vegetation, water quality, and wildlife. The PBO outlines success criteria specifically for CTS and CCG. Reestablishment of these species will be considered successful if, at the end of monitoring, wetland function, wildlife usage, wetland plant cover, diversity and dominance, and CCG abundance are directly comparable to the conditions before remediation. Monitoring results guide decision-making to evaluate if and when corrective actions are necessary and to provide insight for potential mitigation or evaluation of monitoring methodologies. The objectives of monitoring were to document the ability of 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 in 2021 at former Fort Ord.

Table 1-1. 2021 Monitoring Status of Vernal Pools on Former Fort Ord

Vernal Pool	Monitoring Status
Pond 3 North	Year 3 Post-Subsurface Munitions Remediation (< 10 ft)
Pond 3 South	Year 3 Post-Subsurface Munitions Remediation (< 10 ft)
Pond 5	Reference
Pond 16	Year 3 Post-Subsurface Munitions Remediation (> 10 ft)
Pond 35	Year 3 Post-Subsurface Munitions Remediation (< 10 ft)
Pond 39	Year 3 Post-Subsurface Munitions Remediation (> 10 ft)
Pond 40 South	Year 3 Post-Subsurface Munitions Remediation (> 10 ft)
Pond 41	Year 3 Post-Subsurface Munitions Remediation (> 10 ft)
Pond 42	Year 3 Post-Subsurface Munitions Remediation (> 10 ft)
Pond 43	Year 3 Post-Subsurface Munitions Remediation (< 10 ft)
Pond 44	Year 3 Post-Subsurface Munitions Remediation (< 10 ft)
Pond 54	Year 3 Post-Subsurface Munitions Remediation (< 10 ft)
Pond 60	Year 3 Post-Subsurface Munitions Remediation (< 10 ft)
Pond 61	Year 3 Post-Subsurface Munitions Remediation (> 10 ft)
Pond 73	Year 3 Post-Subsurface Munitions Remediation (< 10 ft)
Pond 74	Year 3 Post-Mastication
Pond 75	Baseline
Pond 101 East (East)	Reference
Pond 101 East (West)	Year 3 Post-Mastication
Pond 101 West	Year 3 Post-Mastication
Pond 997	Reference

2 METHODS

Sampling methods for wetland vegetation monitoring and aquatic surveys were consistent with the PBO and Wetland Plan (USFWS, 2017; Burleson, 2006).

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 PBO, the Army will conduct two years of pre-activity larval CTS sampling, to the extent possible, in the ponds where more than 50% of the watershed is affected by prescribed burns; thus, vernal pools may be monitored multiple years for baseline (USFWS, 2017). Additionally, at some ponds, baseline surveys were conducted more than 10 years ago and were sampled again to account for any changes that may have occurred over that period.

Vernal pools are then monitored following any remedial activity for 3 to 5 years depending on the type of disturbance. Post-burn monitoring occurs in vernal pools if more than 50% of the watershed of a vernal pool is affected and is conducted annually for the first three years following a burn (USFWS, 2017). Although not specifically indicated in the PBO, the Army applies the same standard to vernal pools where more than 50% of the watershed was masticated, but no mastication of vegetation occurred within the inundation area. If vegetation is mowed within the inundation area, the vernal pool is monitored for vegetation in first, third, and fifth years, following mastication (Burleson, 2006). Vernal pools where subsurface munitions remediation activities disturbed less than 10 square feet and were shallower than four feet deep are monitored in first, third, and fifth years, following remediation, whereas vernal pools with greater and/or deeper disturbance are monitored annually for five years following remediation (Burleson 2006). In cases of vernal pools where more than one type of remedial activity occurred, the most stringent monitoring frequency is followed. Three reference vernal pools that were not remediated are also monitored for comparison on an annual basis.

In 2018, vegetation in Ponds 74, 101 West, and 101 East (West) was masticated. Ponds 3 North, 3 South, 16, 35, 39, 40 South, 41, 42, 43, 44, 54, 60, 61, and 73 were investigated for geophysical anomalies that potentially represented munitions and explosives of concern (MEC) items, and all had subsurface munitions remediation (KEMRON, 2020).

In 2021, Ponds 74, 101 West, and 101 East (West) were monitored for year 3 post-mastication. Ponds 3 North, 3 South, 16, 35, 39, 40 South, 41, 42, 43, 44, 54, 60, 61, and 73 were monitored for year 3 post-subsurface munitions remediation. Ponds 5, 101 East (East), and 997 are reference vernal pools. Pond 75 was monitored for baseline. Ponds 74, 101 West, and 101 East (West) were in the final year of monitoring in 2021.

2.1 Vegetation Monitoring

Prior to collecting transect data, vernal pools were visited in early spring to assess the condition and initiate a list of plant species present. Vernal 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 between May 4 and May 24, 2021. Data were collected as the vernal pools dried and the vegetation was sufficiently identifiable (see Appendices A, B, E, and F). Biologists visually assessed the historical 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, whereas outer portions at the highest elevations may not. The basin may vary from year to year from a combination of factors that include the amount of precipitation and timing, the duration of inundation, decaying vegetation from the previous season, sediment load, soil chemistry, and other stochastic processes. For some vernal pools, these variables only minimally impact the vernal pool basin and for others, it can expand, contract, and change dramatically. The basin boundary is identifiable in the field because the 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 this report, vegetative strata refer to the different homogenous vegetative communities that are distributed around the vernal pools in a zonate pattern. These are characteristically 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 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, whereas open water areas were characterized by standing water without vegetation. An upland stratum is characterized by upland species but is only mapped when it is within the vernal pool and therefore surrounded by wetland species, such as mima mounds. The upland transition on the periphery of the vernal pool is not mapped.

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 safety concern due to potential MEC presence, visual cover data were estimated 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, thatch, and bare ground (see Appendix A). Species percent cover was averaged for each stratum of the sampled vernal pools (see Appendix B). 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, 2021).

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), *Monterey County Wildflowers, a Field Guide, First Edition* (Matthews and Mitchell, 2016), *Plants of San Francisco Bay Region, Mendocino to Monterey, Third Edition* (Beidleman and Kozloff, 2003) 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 E Tables E-1 – E-22). 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 E Tables E-23 – E-44) (Lichvar *et al.*, 2016). When 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*) were mapped using a Trimble® Juno ® T41 Series GPS unit. Contra Costa goldfield populations were mapped by creating polygons and absolute cover was visually estimated.

2.2 Wildlife Monitoring

Following the HMP, PBO, and Wetland Plan, biologists conducted aquatic surveys for CTS and fairy shrimp (USACE, 1997; USFWS, 2017; Burleson, 2006). Wildlife surveys were completed in March, April, and May for CTS and fairy shrimp. 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. The criterion used to identify suitable CTS breeding habitat requires that a vernal pool retain an average depth of at least 25 cm from the first rain event through March (Burleson, 2006). Surveys began for fairy shrimp and CTS when the vernal pools maintained a minimum depth of 10 cm during the March hydrology events.

Nets, boots, and other equipment were scrubbed with 10% diluted bleach solution and completely dried between monitoring different vernal pools to reduce the possibility of spreading disease. Additionally, nets, boots, and equipment were treated with 10% diluted bleach solution and 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.

2.2.1 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 dip nets were used exclusively. Additional aquatic sampling was completed to provide additional insight into vernal pool function.

CTS larvae were collected using long-handled, fine-meshed, D-shaped dipnets to allow biologists to record individual metrics and derive an approximate 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 six 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 30 individual CTS larvae collected. When the total number of CTS collected was less than 30, all individuals were measured. California tiger salamander and other amphibian species encountered were identified and the total numbers recorded (see Appendix C Table C-1).

2.2.2 California Fairy Shrimp

Aquatic sampling for fairy shrimp and other aquatic invertebrates was conducted using a fine-meshed dip net and followed the *Interim Survey Guidelines to Permittees for Recovery Permits Under Section 10(a)(1)(A) of the Endangered Species Act for the Listed Vernal Pool Branchiopods* (USFWS and California

Department of Fish and Game, 1996). Representative portions of the bottom, edges, and vertical water column of each vernal pool were sampled. When fairy shrimp were present, the abundance was estimated by collecting 5-20 swipes throughout the vernal pool. The number of swipes relates to the size and complexity of the vernal pool and was consistent with the range of frequencies outlined in protocols from previous reports. More swipes occur at larger and/or more complex vernal pools than at small vernal pools. Following dip netting, the number of collected fairy shrimp were totaled and the abundance was reported as follows (see Appendix C Tables C-2 – C-3):

- Low abundance: 1 to 10 individuals;
- Moderate abundance: 11 to 100 individuals;
- High abundance: 101 to 300 individuals; and
- Very high abundance: greater than 300 individuals.

2.3 Evaluation for Data Quality Objectives and Success Criteria

Data quality objectives (DQO) 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 average of 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, inundation areas, and water quality were assessed by Chenega using DQO 1, DQO 2, and DQO 4 and are not included in this report (Chenega, 2022).

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 5. DQOs 1 and 4 apply to depths and the relationship between water quality and wildlife presence and were assessed as part of the Hydrology Monitoring Annual Report (Chenega, 2022). For 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 that supported CTS and fairy shrimp prior to remediation activities should continue to support those species following such activities (Burleson, 2006).

In addition to the Wetland Plan, the PBO outlines the following success criteria specifically for CTS and CCG (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 area and depth, pH, temperature, dissolved oxygen levels);
2. Wildlife usage, specifically CTS larval presence;
3. Plant cover and wetland plant species diversity and dominance; and
4. CCG abundance.

These four conditions were assessed in conjunction with the DQOs. Wetland function was assessed with DQO 1, DQO 2, and DQO 4 and was discussed in the Hydrology Monitoring Annual Report (Chenega, 2022). Wildlife usage was assessed with DQO 5. Plant cover and wetland plant species diversity and dominance were assessed with DQO 3. Contra Costa goldfield abundance was assessed with DQO 3.

Historical data for cumulative precipitation, wetland vegetation, and wildlife presence or absence for all reference and post-remediation vernal pools were summarized by vernal pool. 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 E, F, and G). Wildlife was evaluated using the presence or non-detection of CTS and fairy shrimp.

Rank-abundance curves (RACs) were generated to illustrate species composition and relative species abundance at the vernal pools. The species rank was plotted on the x-axis and the proportional abundance on the y-axis, with species identified using their species code. The RACs show the distribution of the species, relative abundance, species evenness, and species richness. They can characterize the species composition further than the community metrics such as the Shannon-Wiener diversity index or the species evenness index (Calow, 1999). We created rank abundance curves using the rankabundance function in the BiodiversityR package (Kindt, 2019). For RACs with species codes and individual years, the y-axis was put into log-10 scale and for the RACs with all years on one plot, the x-axis and y-axis were both in log-10 scale.

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3 RESULTS

Vegetation monitoring was conducted at Ponds 5, 101 East (East), 997, 3 North, 3 South, 16, 35, 39, 40 South, 41, 42, 43, 44, 54, 60, 61, 73, 74, 75, 101 East (West), and 101 West. Across all monitored vernal pools, the mean number of native plant species was 16 and non-native species was 15 (see Table 3-1). Of these species, a mean of 15 were wetland species, either obligate (OBL), facultative wetland (FACW), or facultative (FAC) (see Table 3-2). In addition to vegetative strata mapping and transect surveys, populations of CCG were surveyed at Ponds 3 North, 3 South, 61, and 997.

Table 3-1. Vegetation Species Richness of Native and Non-Native Species Observed on Transects at Vernal Pools Monitored in 2021

Vernal Pool	Monitoring Status	Native	Non-Native
Pond 5	Reference	16	15
Pond 101 East (East)	Reference	10	11
Pond 997	Reference	15	12
Mean (Reference)	-	**14**	**13**
3 North	Year 3 Post-Subsurface Munitions Remediation	23	22
3 South	Year 3 Post-Subsurface Munitions Remediation	25	20
16	Year 3 Post-Subsurface Munitions Remediation	14	9
35	Year 3 Post-Subsurface Munitions Remediation	12	17
39	Year 3 Post-Subsurface Munitions Remediation	11	18
40 South	Year 3 Post-Subsurface Munitions Remediation	8	17
41	Year 3 Post-Subsurface Munitions Remediation	19	12
42	Year 3 Post-Subsurface Munitions Remediation	17	20
43	Year 3 Post-Subsurface Munitions Remediation	21	17
44	Year 3 Post-Subsurface Munitions Remediation	27	21
54	Year 3 Post-Subsurface Munitions Remediation	12	8
60	Year 3 Post-Subsurface Munitions Remediation	13	9
61	Year 3 Post-Subsurface Munitions Remediation	21	13
73	Year 3 Post-Subsurface Munitions Remediation	19	11
74	Year 3 Post-Mastication	19	15
75	Baseline	10	6
101 East (West)	Year 3 Post-Mastication	20	17
101 West	Year 3 Post-Mastication	14	19
Mean (Remediated)	-	**17**	**15**
Mean (All)	-	**16**	**15**

Table 3-2. Vegetation Species Richness of Obligate and Facultative Wetland Species Observed on Transects at Vernal Pools Monitored in 2021

Vernal Pool	Monitoring Status	OBL	FACW	FAC	Wetland Species
Pond 5	Reference	4	6	3	13
Pond 101 East (East)	Reference	2	4	1	7
Pond 997	Reference	3	5	4	12
Mean (Reference)	-	**3**	**5**	**3**	**11**
3 North	Year 3 Post-Subsurface Munitions Remediation	6	9	6	21
3 South	Year 3 Post-Subsurface Munitions Remediation	6	9	7	22
16	Year 3 Post-Subsurface Munitions Remediation	2	7	4	13
35	Year 3 Post-Subsurface Munitions Remediation	4	3	3	10
39	Year 3 Post-Subsurface Munitions Remediation	4	3	6	13
40 South	Year 3 Post-Subsurface Munitions Remediation	3	3	5	11
41	Year 3 Post-Subsurface Munitions Remediation	5	5	5	15
42	Year 3 Post-Subsurface Munitions Remediation	6	7	3	16
43	Year 3 Post-Subsurface Munitions Remediation	6	8	4	18
44	Year 3 Post-Subsurface Munitions Remediation	7	9	5	21
54	Year 3 Post-Subsurface Munitions Remediation	5	5	2	12
60	Year 3 Post-Subsurface Munitions Remediation	5	4	4	13
61	Year 3 Post-Subsurface Munitions Remediation	6	9	3	18
73	Year 3 Post-Subsurface Munitions Remediation	5	8	1	14
74	Year 3 Post-Mastication	5	8	3	16
75	Baseline	1	5	4	10
101 East (West)	Year 3 Post-Mastication	7	8	6	21
101 West	Year 3 Post-Mastication	5	8	7	20
Mean (Remediated)	-	**5**	**7**	**4**	**16**
Mean (All)	-	**5**	**6**	**4**	**15**

Aquatic wildlife monitoring was conducted one time in March at Ponds 60 and 61 (see Appendix C Tables C-1 – C-3). All other vernal pools did not hold sufficient depth to trigger the wildlife surveys in 2021. Ponds 39, 42, and 3 North held water briefly in February but were dry by March. Pond 60 and 61 were dry in April and May. Neither CTS or fairy shrimp were detected in 2021 (see Table 3-3).

Table 3-3. California Tiger Salamander and Fairy Shrimp Detections at Vernal Pools in 2021

Vernal Pool	Monitoring Status	CTS Detected	Fairy Shrimp Detected
Pond 60	Year 3 Post-Subsurface Munitions Remediation	No	No
Pond 61	Year 3 Post-Subsurface Munitions Remediation	No	No

3.1 Pond 5

Pond 5 is a reference vernal pool that was monitored as a control for comparison to the remediated vernal pools. In 2021, Pond 5 was monitored for hydrology, vegetation, and wildlife. Hydrology results are reported separately in the Hydrology Monitoring Annual Report (Chenega, 2022).

3.1.1 Vegetation Monitoring

Vegetation monitoring was completed at Pond 5 on May 19, 2021. These monitoring data represent reference conditions. Pond 5 remained dry throughout the 2020-2021 water-year although shallow peripheral ponding was observed (Chenega, 2022). Biologists identified five vegetative strata at the vernal pool (see Table 3-4 and Figure 3-1). Stratum 1 was repeated from 2016, 2018, 2019, and 2020. Strata 2 and 3 were repeated from 2016-2020. Stratum 7 was repeated from 2019 and 2020. Stratum 8, and the associated transect 8, were established in 2021. Transect 1 was repeated from 2016, 2018, 2019, and 2020. Transect 2 was repeated from 2016 and 2020. Transect 3 was repeated from 2020 and Transect 7 was repeated from 2019 and 2020.

Table 3-4. Pond 5 (Reference) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage
1	29%
2	34%
3	9%
7	6%
8	22%

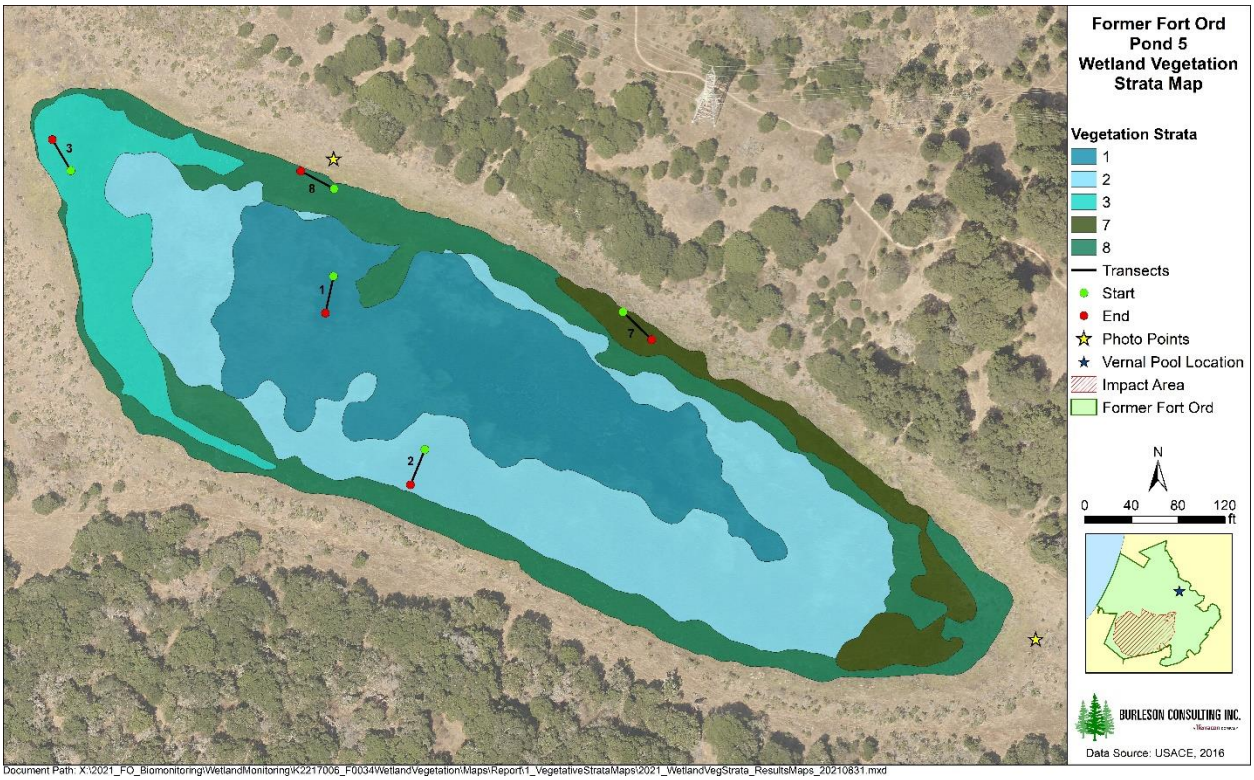

Figure 3-1. Pond 5 (Reference) Vegetation Strata and Transects on Former Fort Ord, 2021

Seventy plant species were observed within the vernal pool basin boundary. Of these species, 40 were native and 30 were non-native. Seven species were OBL wetland plants, 21 were FACW or FAC, 15 were FACU or UPL, and 27 were not listed. Appendix B provides the species cover results for each stratum. Appendix E 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 provides a summary of the dominant species cover results for each stratum.

Table 3-5. Pond 5 (Reference) Dominant Species by Stratum Results

Stratum	Transect Length (m)	Dominant Species	
		Common Name	Absolute Cover on Transect (%)
1	10	pale spikerush	30.7
2	10	salt grass	22.8
3	10	bugle hedge nettle	33.0
7	10	Baltic rush	36.0
8	10	cut-leaved geranium	20.5

3.1.2 Wildlife Monitoring

Wildlife surveys were not conducted at Pond 5 because the vernal pool did not have sufficient depth to trigger surveys.

3.2 Pond 101 East (East)

Pond 101 East (East) is a reference vernal pool that was monitored as a control for comparison to the remediated vernal pools. In 2021, Pond 101 East (East) was monitored for hydrology, vegetation, and wildlife. Hydrology results are reported separately in the Hydrology Monitoring Annual Report (Chenega, 2022).

3.2.1 Vegetation Monitoring

Vegetation monitoring was completed at Pond 101 East (East) on May 25, 2021. These monitoring data represent reference conditions. Pond 101 East (East) remained dry throughout the 2020-2021 water-year (Chenega, 2022). Biologists identified three strata at the vernal pool (see Table 3-6 and Figure 3-2). Stratum 3 was repeated from 2016. Stratum 4 was repeated from 2016 and 2020, whereas stratum 5 was repeated from 2017-2020. Transects 3, 4, and 5 were all relocated because the previous locations were no longer within the correct strata.

Table 3-6. Pond 101 East (East) (Reference) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage
3	57%
4	3%
5	40%

Figure 3-2. Pond 101 East (East) (Reference) Vegetation Strata and Transects on Former Fort Ord, 2021

Sixty-eight plant species were observed within the vernal pool basin boundary. Of these species, 32 were native and 36 were non-native. Five species were OBL wetland plants, 27 were FACW or FAC, 16 were FACU or UPL, and 20 were not listed. Appendix B provides the species cover results within each stratum. Appendix E 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 3-7 provides a summary of the dominant species cover results for each stratum.

Table 3-7. Pond 101 East (East) (Reference) Dominant Species by Stratum Results

Stratum	Transect Length (m)	Dominant Species	
		Common Name	Absolute Cover on Transect (%)
3	10	alkali mallow	24.5
4	10	Baltic rush	22.0
5	10	cut-leaved geranium bugle hedge nettle	18.0 11.0

3.2.2 Wildlife Monitoring

Wildlife surveys were not conducted at Pond 101 East (East) because the vernal pool did not have sufficient depth to trigger surveys.

3.3 Pond 997

Pond 997 is a reference vernal pool that was monitored as a control for comparison to the remediated vernal pools. In 2021, Pond 997 was monitored for hydrology, vegetation, and wildlife. Hydrology results are reported separately in the Hydrology Monitoring Annual Report (Chenega, 2022).

3.3.1 Vegetation Monitoring

Vegetation monitoring was completed at Pond 997 on May 5, 2021. These monitoring data represent reference conditions. Pond 997 remained dry throughout the 2020-2021 water-year (Chenega, 2022). Biologists identified three wetland strata at the vernal pool (see Table 3-8 and Figure 3-3). Strata and transects 1 and 3 were repeated from 2017-2020. Stratum 2 was repeated from the same range of years but consisted of CCG and no transects were placed in this stratum. Figure 3-4 illustrates the extent and density of the CCG population at Pond 997.

Table 3-8. Pond 997 (Reference) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage
1	9%
2 (CCG)	2%
3	89%

Figure 3-3. Pond 997 (Reference) Vegetation Strata and Transects on Former Fort Ord, 2021

Fifty-nine plant species were observed within the vernal pool basin boundary. Of these species, 36 were native and 23 were non-native. Seven species were OBL wetland plants, 22 were FACW or FAC, 7 were

FACU or UPL, and 23 were not listed. Appendix B provides the species cover results within each stratum. Appendix E 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 3-9 provides a summary of the dominant species cover results for each stratum.

Table 3-9. Pond 997 (Reference) Dominant Species by Stratum Results

Stratum	Transect Length (m)	Dominant Species	
		Common Name	Absolute Cover on Transect (%)
1	10	coyote thistle	27.2
2	N/A	Contra Costa goldfields	N/A
3	10	rattlesnake grass California oat grass	16.3 13.3

3.3.1.1 *Contra Costa Goldfields*

Contra Costa goldfields at Pond 997 were mapped on April 16, 2021; they occupied 0.005 acre, with a density of 10% cover. No transects were placed in stratum 2 to avoid disturbing the population. Figure 3-4 illustrates the extent of the CCG population at Pond 997.

Figure 3-4. Contra Costa Goldfields Populations at Pond 997 (Reference), 2021

3.3.2 Wildlife Monitoring

Wildlife surveys were not conducted at Pond 997 because the vernal pool did not have sufficient depth to trigger surveys.

3.4 Pond 3 North

Pond 3 North was in year 3 of monitoring for post-subsurface munitions remediation in 2021. Pond 3 North was monitored for hydrology, vegetation, and wildlife. Hydrology results are reported separately in the Hydrology Monitoring Annual Report (Chenega, 2022).

3.4.1 Vegetation Monitoring

Vegetation monitoring was completed at Pond 3 North on May 14, 2021. These monitoring data represent year 3 post-subsurface munitions remediation conditions. Pond 3 North was dry by the February 24 hydrology monitoring event (Chenega, 2022). Biologists identified three strata at the vernal pool (see Table 3-10 and Figure 3-5). Strata 2, 3, and 4 were repeated from 2015, 2018, 2019, and 2020. Transect 2 was relocated because the previous location was no longer within the stratum. Transect 3 was repeated from 2018 and 2020. Stratum 4 consisted of CCG and no transects were placed in this stratum. Figure 3-6 illustrates the extent and density of the CCG population at Pond 3 North.

Table 3-10. Pond 3 North (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage
2	12%
3	52%
4 (CCG)	35%
Upland	1%

Figure 3-5. Pond 3 North (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects on Former Fort Ord, 2021

Seventy-four plant species were observed within the vernal pool basin boundary. Of these species, 42 were native and 32 were non-native. Seven species were OBL wetland plants, 26 were FACW or FAC, 13 were FACU or UPL, and 28 were not listed. Appendix B provides the species cover results within each stratum. Appendix E 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 provides a summary of the dominant species cover results for each stratum.

Table 3-11. Pond 3 North (Year 3) Dominant Species by Stratum Results

Stratum	Transect Length (m)	Dominant Species	
		Common Name	Absolute Cover on Transect (%)
2	10	pale spikerush	45.8
3	10	coyote thistle Italian rye grass California oat grass marsh microseris	11.3 6.5 3.8 3.0
4	10	Contra Costa goldfields	N/A

3.4.1.1 *Contra Costa Goldfields*

Contra Costa goldfields at Pond 3 North were mapped on April 16 and April 23, 2021; they occupied 0.14 acre, with a density range of 10-60% cover. No transects were placed in stratum 4 to avoid disturbing the population. Figure 3-6 illustrates the extent of the CCG population at Pond 3 North.

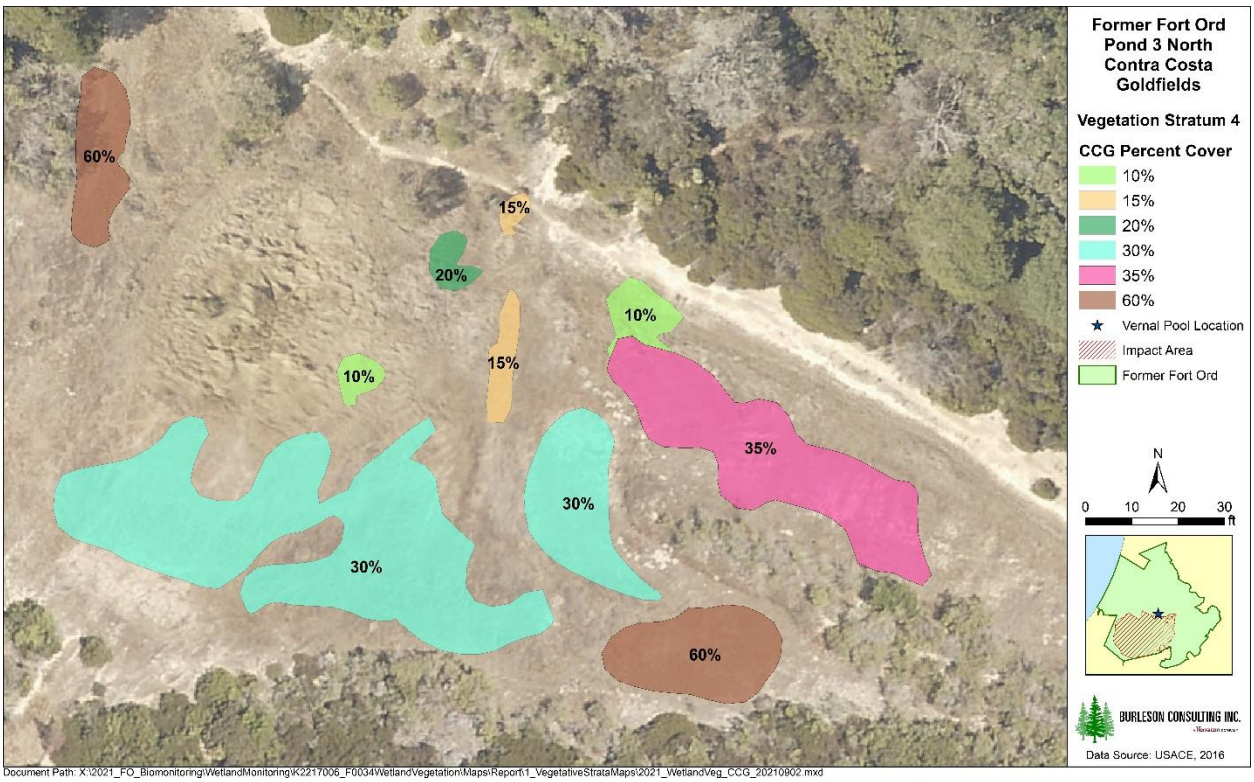

Figure 3-6. Contra Costa Goldfields Population at Pond 3 North (Year 3 Post-Subsurface Munitions Remediation), 2021

3.4.2 Wildlife Monitoring

Wildlife surveys were not conducted at Pond 3 North because the vernal pool did not have sufficient depth to trigger surveys.

3.5 Pond 3 South

Pond 3 South was in year 3 of monitoring for post-subsurface munitions remediation in 2021. Pond 3 South was monitored for hydrology, vegetation, and wildlife. Hydrology results are reported separately in the Hydrology Monitoring Annual Report (Chenega, 2022).

3.5.1 Vegetation Monitoring

Vegetation monitoring was completed at Pond 3 South on May 13, 2021. These monitoring data represent year 3 post-subsurface munitions remediation conditions. Pond 3 South remained dry throughout the 2020-2021 water-year (Chenega, 2022). Biologists identified six strata at the vernal pool (see Table 3-12 and Figure 3-7). Strata 1 through 4 were repeated from 2016, 2018, 2019, and 2020. Stratum 5 was repeated from 2020. Stratum 6 and the corresponding transect were established in 2021. Transect 1 was repeated from 2016, 2018, 2019, and 2020, whereas Transect 4 was repeated from 2016 and 2018. Transects 2 and 3 were relocated because the previous locations were no longer within the strata. Stratum 5 consisted of CCG and no transects were placed in this stratum. Figure 3-8 illustrates the extent and density of the CCG population at Pond 3 South.

Table 3-12. Pond 3 South (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage
1	28%
2	2%
3	37%
4	24%
5 (CCG)	0.1%
6	7%
Upland	2%

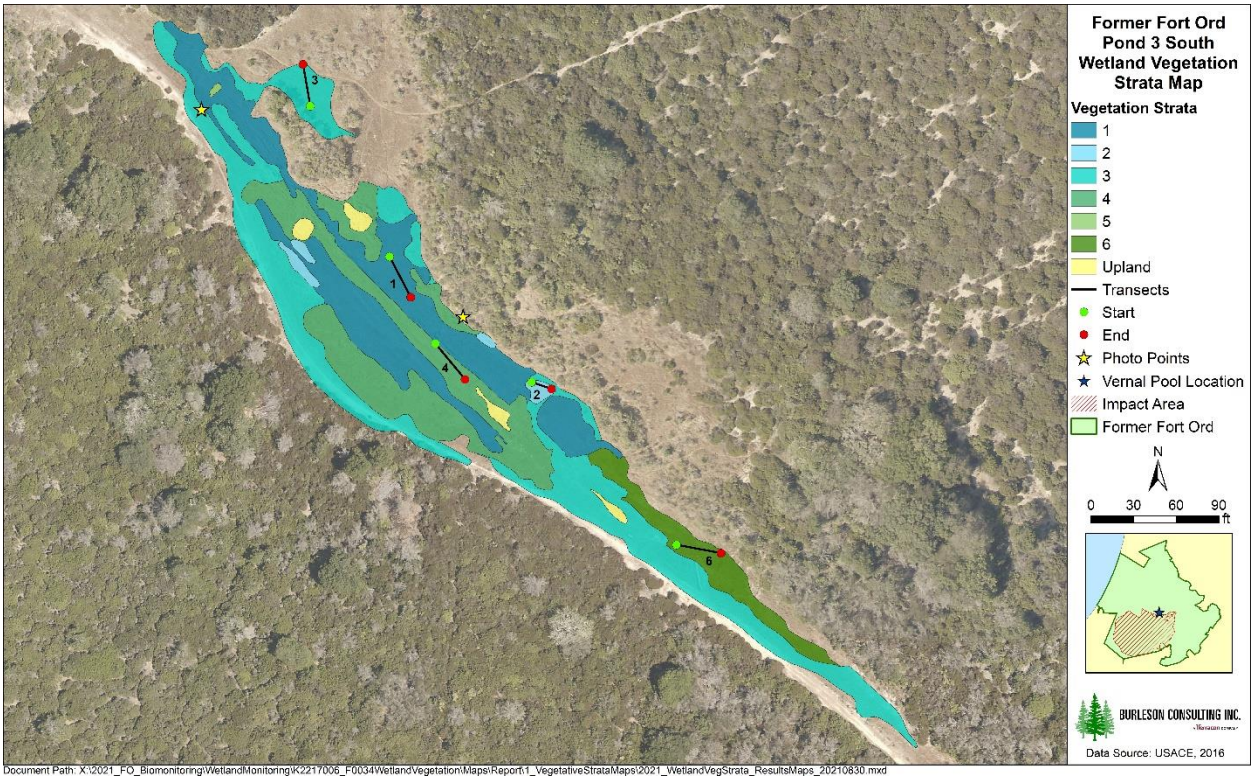

Figure 3-7. Pond 3 South (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects on Former Fort Ord, 2021

Eighty-six plant species were observed within the vernal pool basin boundary. Of these species, 55 were native and 31 were non-native. Seven species were OBL wetland plants, 28 were FACW or FAC, 16 were FACU or UPL, and 35 were not listed. Appendix B provides the species cover results within each stratum. Appendix E 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 3-13 provides a summary of the dominant species cover results for each stratum.

Table 3-13. Pond 3 South (Year 3) Dominant Species by Stratum Results

Stratum	Transect Length (m)	Dominant Species	
		Common Name	Absolute Cover on Transect (%)
1	10	pale spikerush coyote thistle smooth goldfields Hickman's popcornflower	6.3 5.5 4.7 3.8
2	5	brown-headed rush	23.0
3	10	California oat grass	15.3
4	10	Italian rye grass alkali mallow	11.2 3.2
5	N/A	Contra Costa goldfields	N/A
6	10	cut-leaved plantain falcate rush	17.0 6.8

3.5.1.1 *Contra Costa Goldfields*

Contra Costa goldfields at Pond 3 South were mapped on April 16, 2021; they occupied 0.001 acre, with a density of 15% cover. No transects were placed in stratum 5 to avoid disturbing the population. Figure 3-8 illustrates the extent of the CCG population at Pond 3 South.

Figure 3-8. Contra Costa Goldfield Population at Pond 3 South (Year 3 Post-Subsurface Munitions Remediation), 2021

3.5.2 Wildlife Monitoring

Wildlife surveys were not conducted at Pond 3 South because the vernal pool did not have sufficient depth to trigger surveys.

3.6 Pond 16

Pond 16 was in year 3 of monitoring for post-subsurface munitions remediation in 2021. Pond 16 was monitored for hydrology, vegetation, and wildlife. Hydrology results are reported separately in the Hydrology Monitoring Annual Report (Chenega, 2022).

3.6.1 Vegetation Monitoring

Vegetation monitoring was completed at Pond 16 on May 7 and May 18, 2021. These monitoring data represent year 3 post-subsurface munitions remediation conditions. Pond 16 remained dry throughout the 2020-2021 water-year (Chenega, 2022). Biologists identified six strata at the vernal pool (see Table 3-14 and Figure 3-9). Strata 3 and 5 were repeated from 2015, 2017, 2019, and 2020. Strata 1, 4, and 6 were repeated from 2017, 2019, and 2020. Stratum 8 and the associated transect were established in 2021. Transects 3 and 5 were repeated from 2015, 2017, 2019, and 2020. Transect 4 was repeated from 2019 and 2020, whereas Transect 6 was repeated from 2017, 2019, and 2020. No transect was placed in stratum 1 due to the height and density of the vegetation as well as the presence of a red-winged black bird nest at the transect start point. A visual cover estimate was conducted to assess vegetative cover.

Table 3-14. Pond 16 (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage
1	5%
3	38%
4	11%
5	30%
6	11%
8	5%

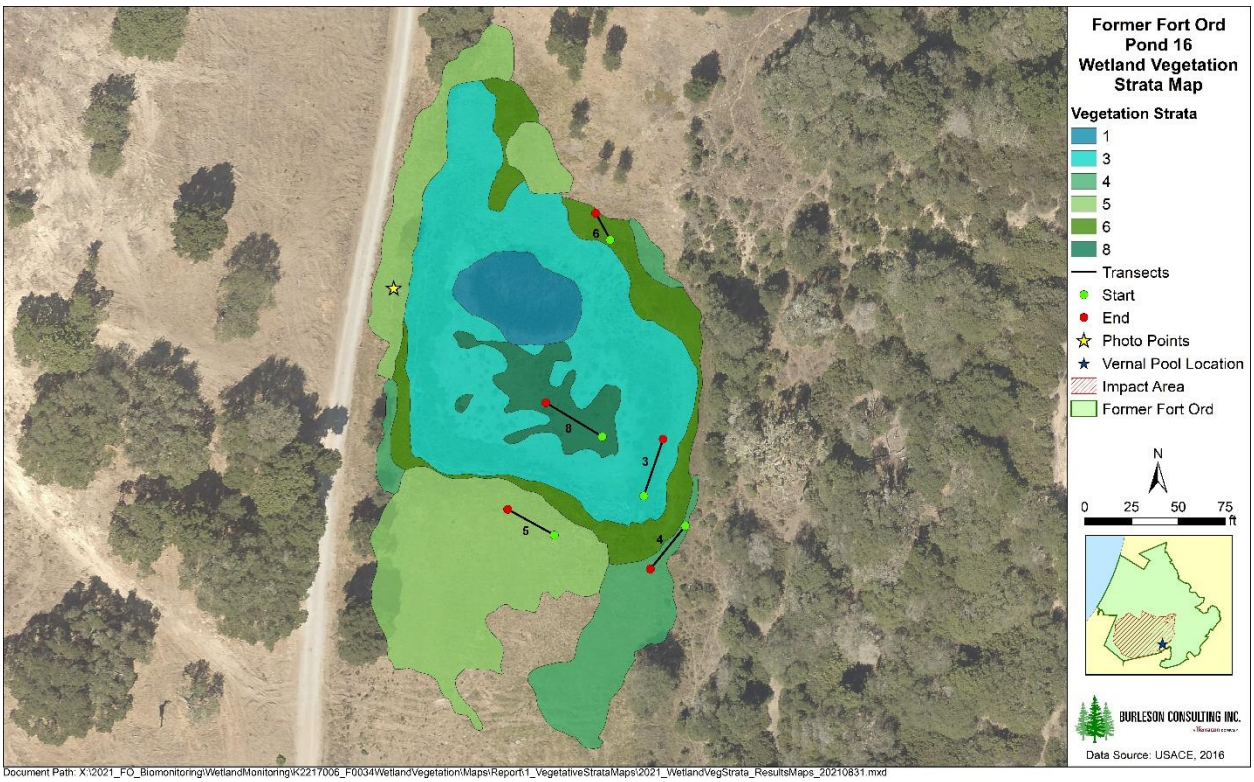

Figure 3-9. Pond 16 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects on Former Fort Ord, 2021

Eighty-two species were observed within the vernal pool basin boundary. Of these species, 50 were native and 32 were non-native. Five species were OBL wetland plants, 29 were FACW or FAC, 19 were FACU or UPL, and 29 were not listed. Appendix B provides the species cover results within each stratum. Appendix E 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 3-15 provides a summary of the dominant species cover results for each stratum.

Table 3-15. Pond 16 (Year 3) Dominant Species by Stratum Results

Stratum	Transect Length (m)	Dominant Species	
		Common Name	Absolute Cover on Transect (%)
1	N/A	California bulrush	60*
3	10	pale spikerush	66.8
4	10	clustered field sedge	47.8
5	10	whiteroot	34.3
6	5	Baltic rush	41.7
8	10	rabbitfoot grass	39.3

*visual cover estimate

3.6.2 Wildlife Monitoring

Wildlife surveys were not conducted at Pond 16 because the vernal pool did not have sufficient depth to trigger surveys.

3.7 Pond 35

Pond 35 was in year 3 of monitoring for post-subsurface munitions remediation in 2021. Pond 35 was monitored for hydrology, vegetation, and wildlife. Hydrology results are reported separately in the Hydrology Monitoring Annual Report (Chenega, 2022).

3.7.1 Vegetation Monitoring

Vegetation monitoring was completed at Pond 35 on May 4, 2021. These data represent year 3 post-subsurface munitions remediation conditions. Pond 35 remained dry throughout the 2020-2021 water-year (Chenega, 2022). Biologists identified four strata at the vernal pool (see Table 3-16 and Figure 3-10). Strata 1 and 2 were repeated from 2016, 2018, 2019, and 2020. Stratum 3 was repeated from 2016, 2018, 2019. Stratum 4 was repeated from 2018, 2019, and 2020. Transects 1 and 2 were repeated from 2016, 2018, 2019, and 2020. Transects 3 and 4 were relocated because the previous locations were no longer within the stratum.

Table 3-16. Pond 35 (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage
1	18%
2	42%
3	12%
4	28%

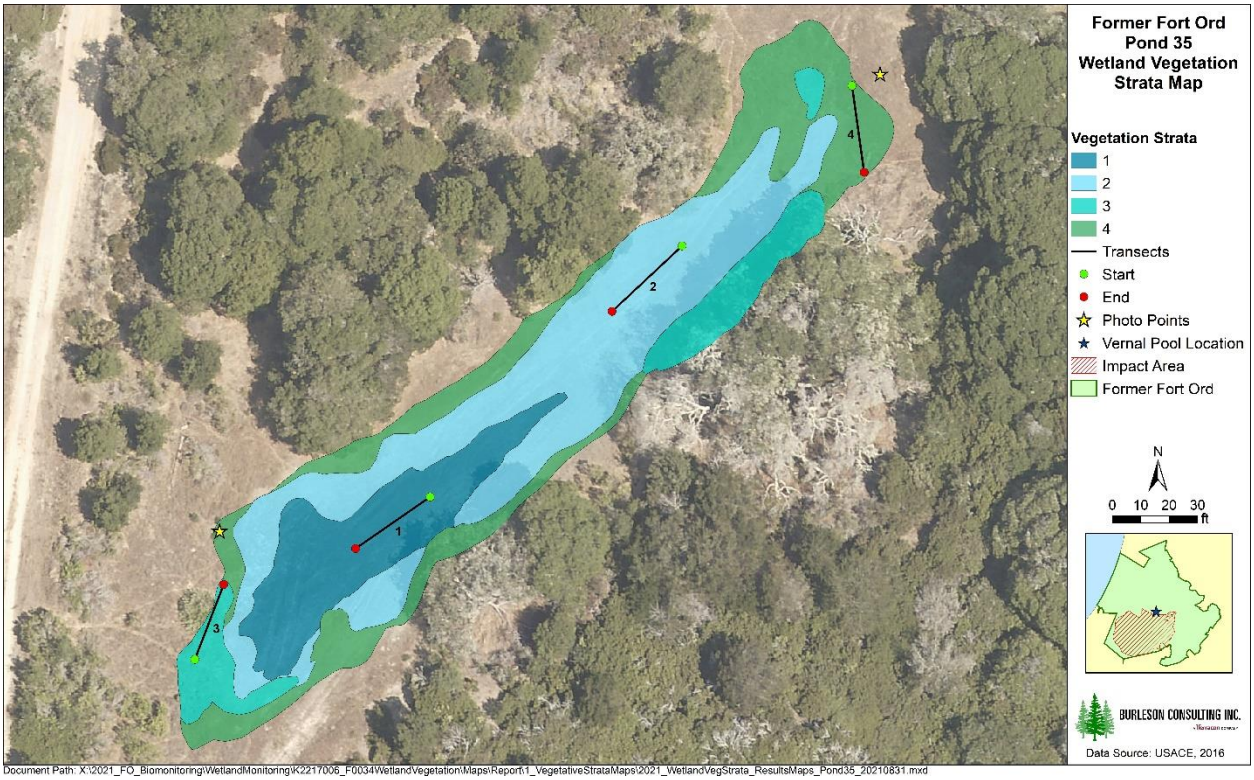

Figure 3-10. Pond 35 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects on Former Fort Ord, 2021

Sixty-three plant species were observed within the vernal pool basin boundary. Of these species, 29 were native, 33 were non-native, and one was unidentified. Seven species were OBL wetland plants, 15 were FACW or FAC, 15 were FACU or UPL, and 26 were not listed. Appendix B provides the species cover results within each stratum. Appendix E 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 provides a summary of the dominant species cover results for each stratum.

Table 3-17. Pond 35 (Year 3) Dominant Species by Stratum Results

Stratum	Transect Length (m)	Dominant Species	
		Common Name	Absolute Cover on Transect (%)
1	10	cut-leaved plantain Hickman's popcornflower	29.5 9.0
2	10	cut-leaved plantain	34.2
3	10	meadow barley Italian rye grass	15.2 15.0
4	10	cut-leaved plantain narrow-leaved clover long-beaked filaree brome fescue	6.5 6.5 4.8 2.7

3.7.2 Wildlife Monitoring

Wildlife surveys were not conducted at Pond 35 because the vernal pool did not have sufficient depth to trigger surveys.

3.8 Pond 39

Pond 39 was in year 3 of monitoring for post-subsurface munitions remediation in 2021. Pond 39 was monitored for hydrology, vegetation, and wildlife. Hydrology results are reported separately in the Hydrology Monitoring Annual Report (Chenega, 2022).

3.8.1 Vegetation Monitoring

Vegetation monitoring was completed at Pond 39 on May 10, 2021. These monitoring data represent year 3 post-subsurface munitions remediation conditions. Pond 39 was dry by the March 2 hydrology monitoring event (Chenega, 2022). Biologists identified three strata at the vernal pool (see Table 3-18 and Figure 3-11). Strata 1 and 3 were repeated from 2016, 2018, 2019, and 2020. Stratum 4 was repeated from 2018-2020. Transect 1 was repeated from 2016, 2018, and 2020. Transects 3 and 4 were relocated to areas with more representative vegetative composition.

Table 3-18. Pond 39 (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage
1	3%
3	3%
4	78%
Upland	16%

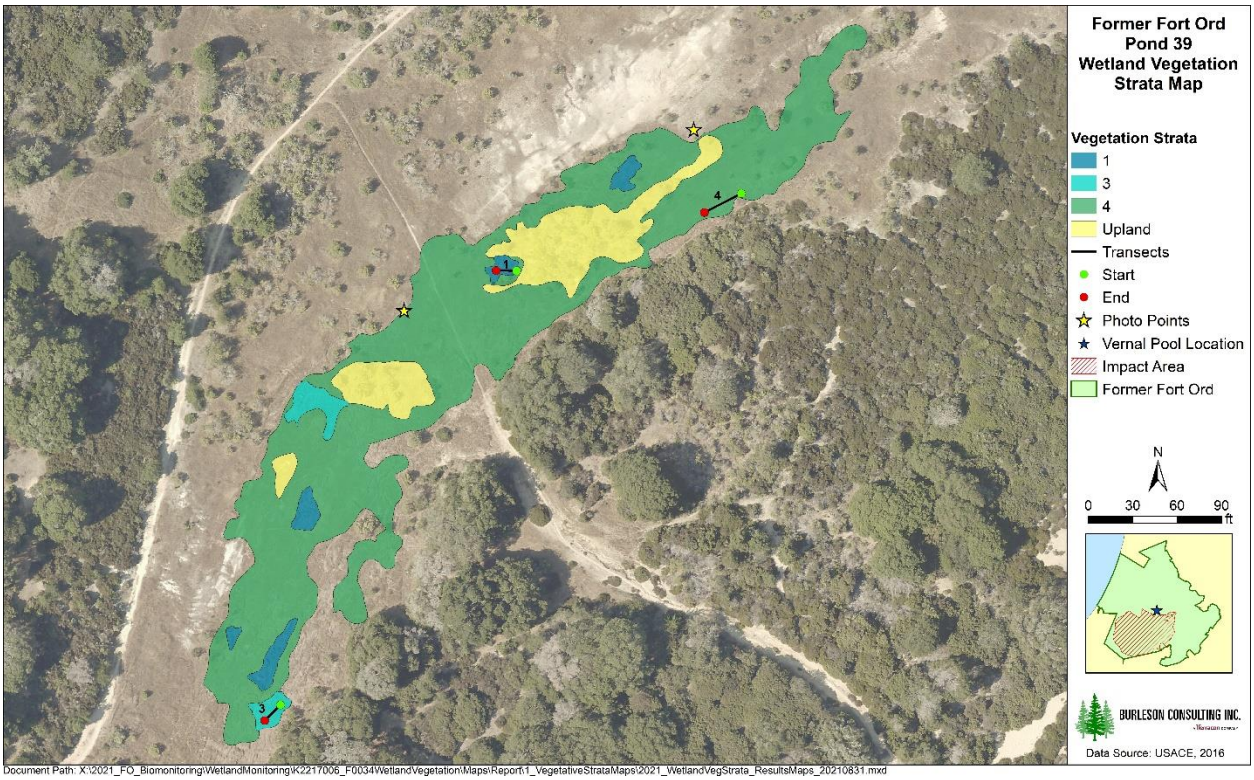

Figure 3-11. Pond 39 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects on Former Fort Ord, 2021

Seventy-three plant species were observed within the vernal pool basin boundary. Of these species, 41 were native and 32 were non-native. Six species were OBL wetland plants, 27 were FACW or FAC, 14 were FACU or UPL, and 26 were not listed. Appendix B provides the species cover results within each stratum. Appendix E 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 3-19 provides a summary of the dominant species cover results for each stratum.

Table 3-19. Pond 39 (Year 3) Dominant Species by Stratum Results

Stratum	Transect Length (m)	Dominant Species	
		Common Name	Absolute Cover on Transect (%)
1	5	pale spikerush	48.3
3	5	Italian rye grass	24.0
4	10	California oat grass	59.2

3.8.2 Wildlife Monitoring

Wildlife surveys were not conducted at Pond 39 because the vernal pool did not have sufficient depth to trigger surveys.

3.9 Pond 40 South

Pond 40 South was in year 3 of monitoring for post-subsurface munitions remediation in 2021. Pond 40 South was monitored for hydrology, vegetation, and wildlife. Hydrology results are reported separately in the Hydrology Monitoring Annual Report (Chenega, 2022).

3.9.1 Vegetation Monitoring

Vegetation monitoring was completed at Pond 40 South on May 10, 2021. These monitoring data represent year 3 post-subsurface munitions remediation conditions. Pond 40 South remained dry throughout the 2020-2021 water-year (Chenega, 2022). Biologists identified three strata at the vernal pool (see Table 3-20 and Figure 3-12). Strata 1 through 3 were repeated from 2016, 2018, 2019, and 2020. Transects 1 and 2 were repeated from 2016, 2018, 2019 and 2020. Transect 3 was relocated because the previous location was no longer within the stratum.

Table 3-20. Pond 40 South (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage
1	10%
2	55%
3	35%

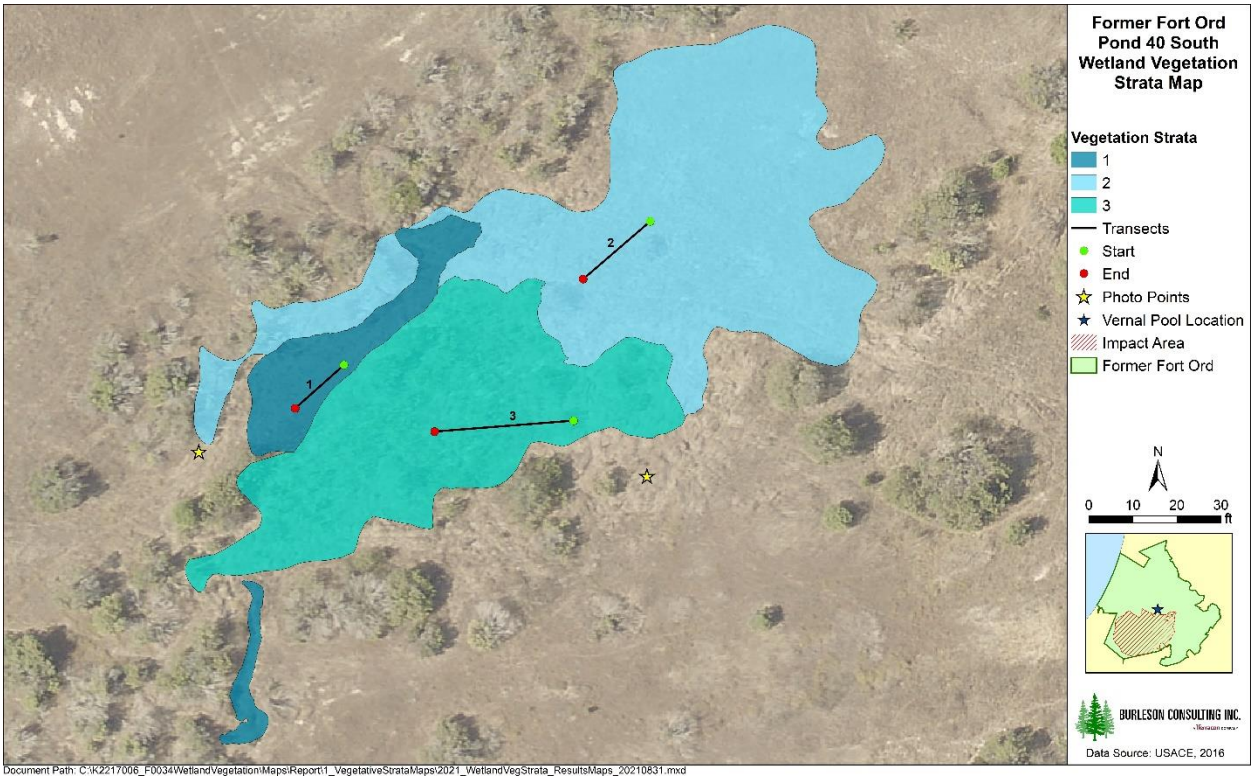

Figure 3-12. Pond 40 South (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects on Former Fort Ord, 2021

Fifty-three plant species were observed within the vernal pool basin boundary. Of these species, 24 were native and 29 were non-native. Three species were OBL wetland plants, 18 were FACW or FAC, 14 were FACU or UPL, and 18 were not listed. Appendix B provides the species cover results within each stratum. Appendix E 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 provides a summary of the dominant species cover results for each stratum.

Table 3-21. Pond 40 South (Year 3) Dominant Species by Stratum Results

Stratum	Transect Length (m)	Dominant Species	
		Common Name	Absolute Cover on Transect (%)
1	5	Hickman's popcornflower cut-leaved plantain pale spikerush	16.7 14.3 7.7
2	5	long-beaked filaree cut-leaved plantain smooth cat's-ear brown-headed rush	9.3 8.3 6.0 3.0
3	10	Italian rye grass	47.2

3.9.2 Wildlife Monitoring

Wildlife surveys were not conducted at Pond 40 South because the vernal pool did not have sufficient depth to trigger surveys.

3.10 Pond 41

Pond 41 was in year 3 of monitoring for post-subsurface munitions remediation in 2021. Pond 41 was monitored for hydrology, vegetation, and wildlife. Hydrology results are reported separately in the Hydrology Monitoring Annual Report (Chenega, 2022).

3.10.1 Vegetation Monitoring

Vegetation monitoring was completed at Pond 41 on May 6, 2021. These monitoring data represent year 3 post-subsurface munitions remediation conditions. Pond 41 remained dry throughout the 2020-2021 water-year (Chenega, 2022). Biologists identified four strata at the vernal pool (see Table 3-22 and Figure 3-13). Strata 1, 2, and 3 were repeated from 2016, 2019, and 2020. Stratum 4 was repeated from 2019 and 2020. Transect 1 was relocated because the previous location was no longer within the stratum. Transect 2 was repeated from 2016, 2019, and 2020. Transect 3 was repeated from 2020, whereas Transect 4 was repeated from 2019 and 2020.

Table 3-22. Pond 41 (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage
1	3%
2	87%
3	6%
4	4%

Figure 3-13. Pond 41 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects on Former Fort Ord, 2021

Sixty-three plant species were observed within the vernal pool basin boundary. Of these species, 38 were native, 24 were non-native, and one was unidentified. Six species were OBL wetland plants, 22 were FACW or FAC, 14 were FACU or UPL, and 21 were not listed. Appendix B provides the species cover results within each stratum. Appendix E 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 provides a summary of the dominant species cover results for each stratum.

Table 3-23. Pond 41 (Year 3) Dominant Species by Stratum Results

Stratum	Transect Length (m)	Dominant Species	
		Common Name	Absolute Cover on Transect (%)
1	5	smooth goldfields alkali mallow cut-leaved geranium	19.3 11.7 10.3
2	10	cut-leaved geranium soft chess Hickman's popcornflower bugle hedge nettle	11.2 10.2 9.7 5.3
3	10	brown-headed rush	27.8
4	10	California oat grass gumweed smooth cat's-ear cut-leaved geranium	6.0 5.8 5.5 3.5

3.10.2 Wildlife Monitoring

Wildlife surveys were not conducted at Pond 41 because the vernal pool did not have sufficient depth to trigger surveys.

3.11 Pond 42

Pond 42 was in year 3 of monitoring for post-subsurface munitions remediation in 2021. Pond 42 was monitored for hydrology, vegetation, and wildlife. Hydrology results are reported separately in the Hydrology Monitoring Annual Report (Chenega, 2022).

3.11.1 Vegetation Monitoring

Vegetation monitoring was completed at Pond 42 on May 19, 2021. These monitoring data represent year 3 post-subsurface munitions remediation conditions. Pond 42 was dry by the March 25 hydrology monitoring event (Chenega, 2022). Biologists identified five strata at the vernal pool (see Table 3-24 and Figure 3-14). Strata 1 through 4 were repeated from 2017-2020. Stratum 5 was repeated from 2019 and 2020. Transects 1 and 3 were relocated because the previous locations were no longer within the correct strata. Transect 2 was repeated from 2018, 2019, and 2020. Transect 4 was repeated from 2017-2020, whereas Transect 5 was repeated from 2020.

Table 3-24. Pond 42 (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage
1	17%
2	7%
3	28%
4	11%
5	11%
Upland	26%

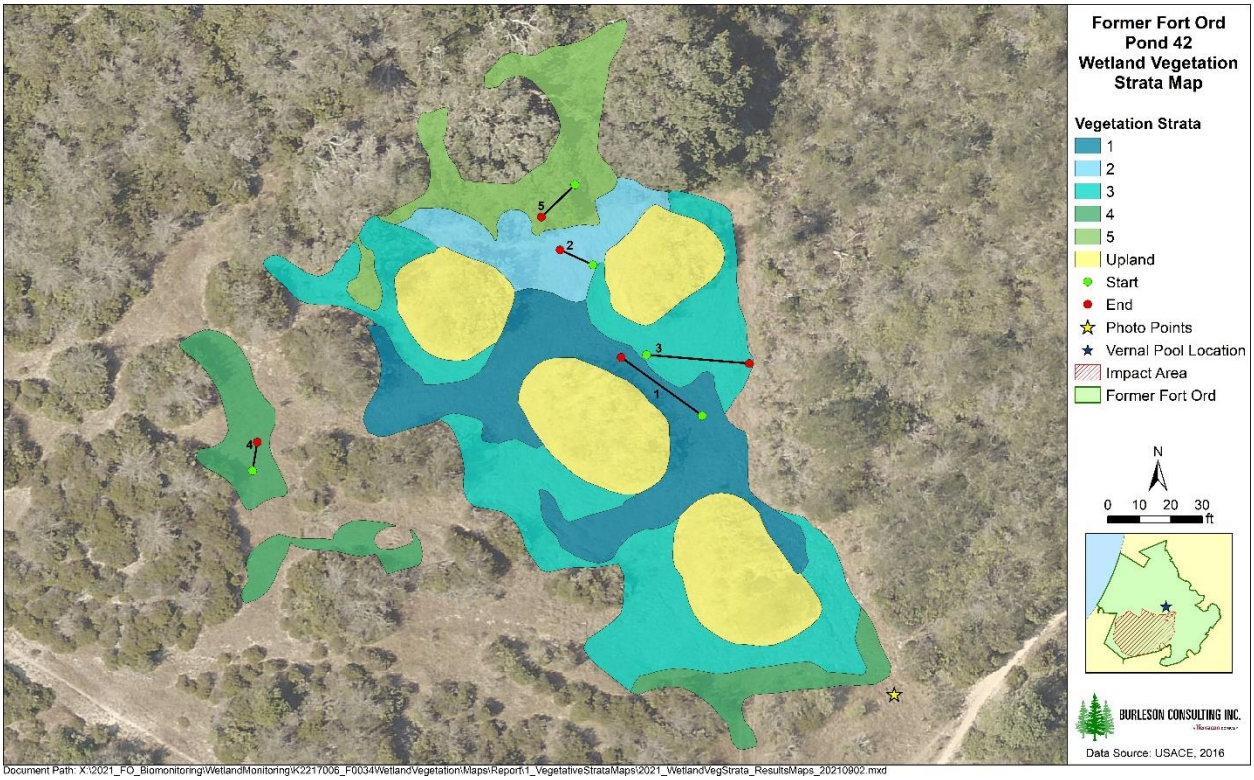

Figure 3-14. Pond 42 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects on Former Fort Ord, 2021

Eighty-two plant species were observed within the vernal pool basin boundary. Of these species, 50 were native, 30 were non-native, and two were unidentified. Eight species were OBL wetland plants, 24 were FACW or FAC, 15 were FACU or UPL, and 35 were not listed. Appendix B provides the species cover results within each stratum. Appendix E 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 3-25 provides a summary of the dominant species cover results for each stratum.

Table 3-25. Pond 42 (Year 3) Dominant Species by Stratum Results

Stratum	Transect Length (m)	Dominant Species	
		Common Name	Absolute Cover on Transect (%)
1	10	needle spikerush	42.0
2	5	pale spikerush	30.7
3	10	brown-headed rush needle spikerush coyote thistle	14.0 10.0 6.5
4	5	California oat grass	18.0
5	5	rabbitfoot grass	25.0

3.11.2 Wildlife Monitoring

Wildlife surveys were not conducted at Pond 42 because the vernal pool did not have sufficient depth to trigger surveys.

3.12 Pond 43

Pond 43 was in year 3 of monitoring for post-subsurface munitions remediation in 2021. Pond 43 was monitored for hydrology, vegetation, and wildlife. Hydrology results are reported separately in the Hydrology Monitoring Annual Report (Chenega, 2022).

3.12.1 Vegetation Monitoring

Vegetation monitoring was completed at Pond 43 on May 4, 2021. These monitoring data represent year 3 post-subsurface munitions remediation conditions. Pond 43 remained dry throughout the 2020-2021 water-year (Chenega, 2022). Biologists identified three strata at the vernal pool (see Table 3-26 and Figure 3-15). All three strata were repeated from 2016, 2018, 2019, and 2020. Transects 1 and 3 were repeated from 2016, 2018, 2019, and 2020. Transect 2 was repeated from 2020.

Table 3-26. Pond 43 (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage
1	71%
2	9%
3	12%
Upland	8%

Figure 3-15. Pond 43 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects on Former Fort Ord, 2021

Sixty-one plant species were observed within the vernal pool basin boundary. Of these species, 38 were native and 23 were non-native. Six species were OBL wetland plants, 20 were FACW or FAC, 9 were FACU or UPL, and 26 were not listed. Appendix B provides the species cover results within each stratum. Appendix E 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 provides a summary of the dominant species cover results for each stratum.

Table 3-27. Pond 43 (Year 3) Dominant Species by Stratum Results

Stratum	Transect Length (m)	Dominant Species	
		Common Name	Absolute Cover on Transect (%)
1	10	coyote thistle Hickman's popcornflower rough cat's-ear	13.7 5.0 4.7
2	5	brown-headed rush Hickman's popcornflower	23.0 5.7
3	5	California oat grass cut-leaved plantain	15.3 7.0

3.12.2 Wildlife Monitoring

Wildlife surveys were not conducted at Pond 43 because the vernal pool did not have sufficient depth to trigger surveys.

3.13 Pond 44

Pond 44 was in year 3 of monitoring for post-subsurface munitions remediation in 2021. Pond 44 was monitored for hydrology, vegetation, and wildlife. Hydrology results are reported separately in the Hydrology Monitoring Annual Report (Chenega, 2022).

3.13.1 Vegetation Monitoring

Vegetation monitoring was completed at Pond 44 on May 5 and May 6, 2021. These monitoring data represent year 3 post-subsurface munitions remediation conditions. Pond 44 remained dry throughout the 2020-2021 water-year (Chenega, 2022). Biologists identified two strata at the vernal pool (see Table 3-28 and Figure 3-16). Strata 1 and 3 were repeated from 2016, 2018, 2019, and 2020. Transect 1 was repeated from 2016, whereas Transect 3 was relocated to an area with more representative vegetative composition.

Table 3-28. Pond 44 (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage
1	63%
3	25%
Upland	12%

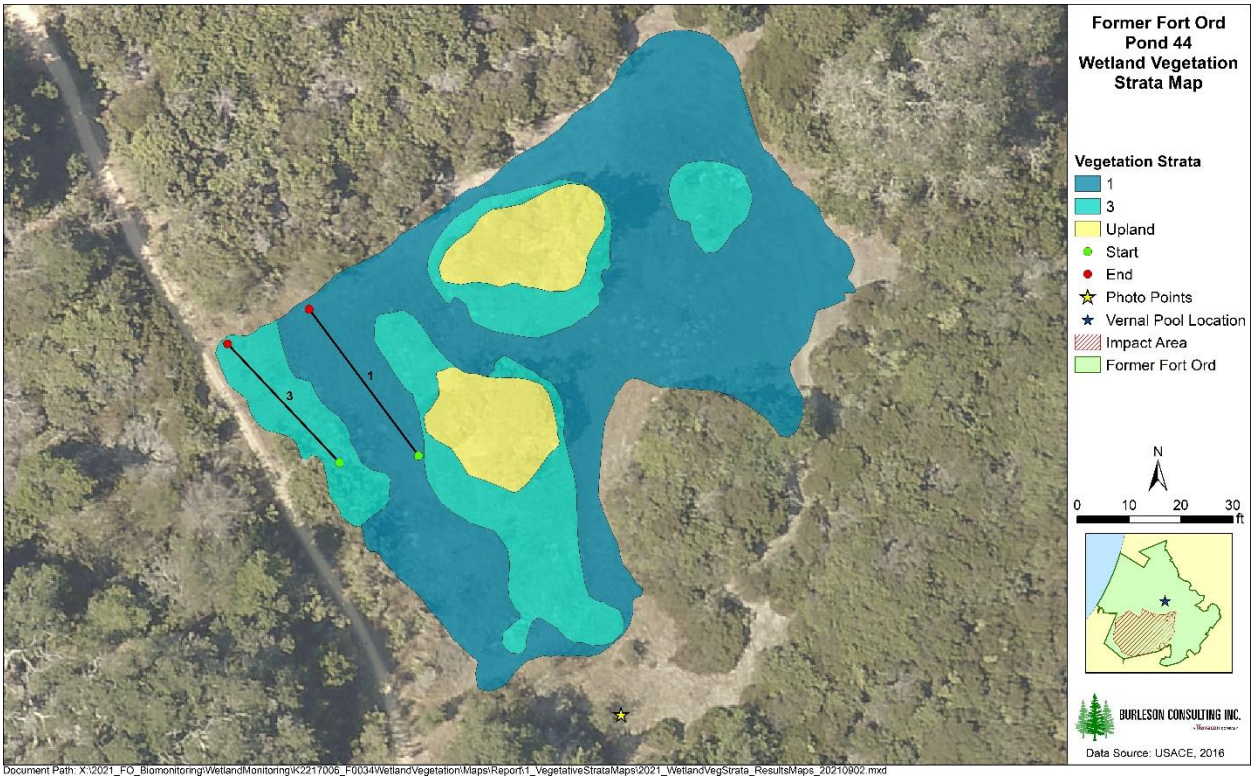

Figure 3-16. Pond 44 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects on Former Fort Ord, 2021

Seventy plant species were observed within the vernal pool basin boundary. Of these species, 43 were native and 27 were non-native. Eight species were OBL wetland plants, 18 were FACW or FAC, 14 were FACU or UPL, and 30 were not listed. Appendix B provides the species cover results within each stratum. Appendix E 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 3-29 provides a summary of the dominant species cover results for each stratum.

Table 3-29. Pond 44 (Year 3) Dominant Species by Stratum Results

Stratum	Transect Length (m)	Dominant Species	
		Common Name	Absolute Cover on Transect (%)
1	10	coyote thistle	8.5
		brown-headed rush	8.3
		cut-leaved plantain	5.3
		Hickman's popcornflower	4.2
3	10	cut-leaved plantain	8.2
		coast tarweed	5.2
		brome fescue	4.3
		California oat grass	4.0

3.13.2 Wildlife Monitoring

Wildlife surveys were not conducted at Pond 44 because the vernal pool did not have sufficient depth to trigger surveys.

3.14 Pond 54

Pond 54 was in year 3 of monitoring for post-subsurface munitions remediation in 2021. Pond 54 was monitored for hydrology, vegetation, and wildlife. Hydrology results are reported separately in the Hydrology Monitoring Annual Report (Chenega, 2022).

3.14.1 Vegetation Monitoring

Vegetation monitoring was completed at Pond 54 on May 17, 2021. These monitoring data represent year 3 post-subsurface munitions remediation conditions. Pond 54 remained dry throughout the 2020-2021 water-year (Chenega, 2022). Biologists identified three strata at the vernal pool (see Table 3-30 and Figure 3-17). Stratum 1 was repeated from 2019. Strata 5 and 6 were identified as new strata in 2021. The transects within strata 5 and 6 were established in 2021. Transect 1 was relocated because the previous location was no longer within the correct stratum.

Table 3-30. Pond 54 (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage
1	12%
5	57%
6	31%

Figure 3-17. Pond 54 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects on Former Fort Ord, 2021

Fifty-three plant species were observed within the vernal pool basin boundary. Of these species, 34 were native and 19 were non-native. Six species were OBL wetland plants, 20 were FACW or FAC, 10 were FACU or UPL, and 17 were not-listed. Appendix B provides the species cover results within each stratum. Appendix E 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 3-31 provides a summary of the dominant species cover results for each stratum.

Table 3-31. Pond 54 (Year 3) Dominant Species by Stratum Results

Stratum	Transect Length (m)	Dominant Species	
		Common Name	Absolute Cover on Transect (%)
1	10	pale spikerush	12.5
		brown-headed rush	11.2
5	10	alkali mallow	8.5
		smooth goldfields	7.8
		brown-headed rush	5.8
6	10	cut-leaved geranium	23.7

3.14.2 Wildlife Monitoring

Wildlife surveys were not conducted at Pond 54 because the vernal pool did not have sufficient depth to trigger surveys.

3.15 Pond 60

Pond 60 was in year 3 of monitoring for post-subsurface munitions remediation in 2021. Pond 60 was monitored for hydrology, vegetation, and wildlife. Hydrology results are reported separately in the Hydrology Monitoring Annual Report (Chenega, 2022).

3.15.1 Vegetation Monitoring

Vegetation monitoring was completed at Pond 60 on May 24, 2021. These monitoring data represent year 3 post-subsurface munitions remediation. Pond 60 was dry by the April 16 hydrology monitoring event (Chenega, 2022). Biologists identified four strata at the vernal pool (see Table 3-32 and Figure 3-18). Strata 1 through 4 were repeated from 2015, 2018, 2019, and 2020. Transect 1 was repeated from 2020. Transect 2 was repeated from 2018, 2019 and 2020, while Transect 3 was repeated from 2018 and 2020. Transect 4 was relocated to an area with more representative vegetative composition.

Table 3-32. Pond 60 (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage
1	8%
2	44%
3	9%
4	39%

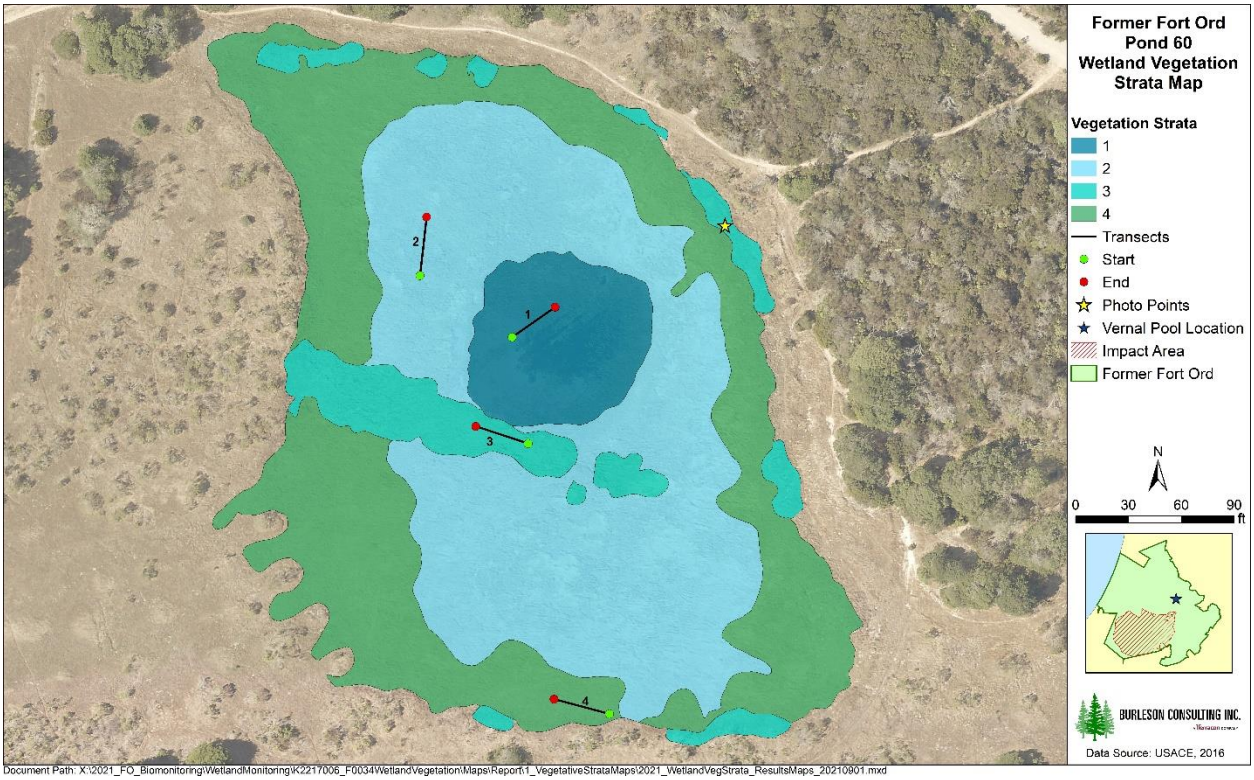

Figure 3-18. Pond 60 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects on Former Fort Ord, 2021

Sixty plant species were observed within the vernal pool basin boundary. Of these species, 29 were native, 30 were non-native, and one was unidentified. Seven species were OBL wetland plants, 18 were FACW or FAC, 12 were FACU or UPL, and 23 were not listed. Appendix B provides the species cover results within each stratum. Appendix E 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 3-33 provides a summary of the dominant species cover results for each stratum.

Table 3-33. Pond 60 (Year 3) Dominant Species by Stratum Results

Stratum	Transect Length (m)	Dominant Species	
		Common Name	Absolute Cover on Transect (%)
1	10	pale spikerush	50.2
2	10	salt grass pale spikerush	15.3 4.0
3	10	salt grass brown-headed rush	16.3 11.8
4	10	salt grass cut-leaved geranium Lemmon's canary grass bugle hedge nettle	10.5 3.7 3.7 3.2

3.15.2 Wildlife Monitoring

Pond 60 was surveyed for CTS and fairy shrimp on March 24, 2021. California tiger salamanders and fairy shrimp were not detected. No surveys were conducted in April or May due to insufficient vernal pool depth. Table 3-34 and Table 3-35 provide results of the CTS and fairy shrimp surveys completed in 2021. Invertebrate results for 2021 are provided in Appendix C (see Table C-2).

Table 3-34. Pond 60 (Year 3 Post-Subsurface Munitions Remediation) 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	
60	3/24/2021	0	-	-	-	-	-	-	-	58 mins

Table 3-35. Pond 60 (Year 3 Post-Subsurface Munitions Remediation) Fairy Shrimp Monitoring Results

Sampling Date	Abundance (# Individuals)
3/24/2021	Not detected

3.16 Pond 61

Pond 61 was in year 3 of monitoring for post-subsurface munitions remediation in 2021. Pond 61 was monitored for hydrology, vegetation, and wildlife. Hydrology results are reported separately in the Hydrology Monitoring Annual Report (Chenega, 2022).

3.16.1 Vegetation Monitoring

Vegetation monitoring was completed at Pond 61 on May 3, 2021. These monitoring data represent year 3 post-subsurface munitions remediation conditions. Pond 61 was dry by the April 5 hydrology monitoring event (Chenega, 2022). Biologists identified four strata at the vernal pool (see Table 3-36 and Figure 3-19). Strata 1 through 4 were repeated from 2017-2020. Transect 1 was repeated from 2018 and 2019, whereas Transect 3 was repeated from 2017-2020. Transect 4 was repeated from 2017 and 2018. Stratum 2 consisted of CCG and no transect was placed in this stratum. Figure 3-19 illustrates the extent and density of the CCG populations at Pond 61.

Table 3-36. Pond 61 (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage
1	0.2%
2 (CCG)	5%
3	4%
4	58%
Upland	33%

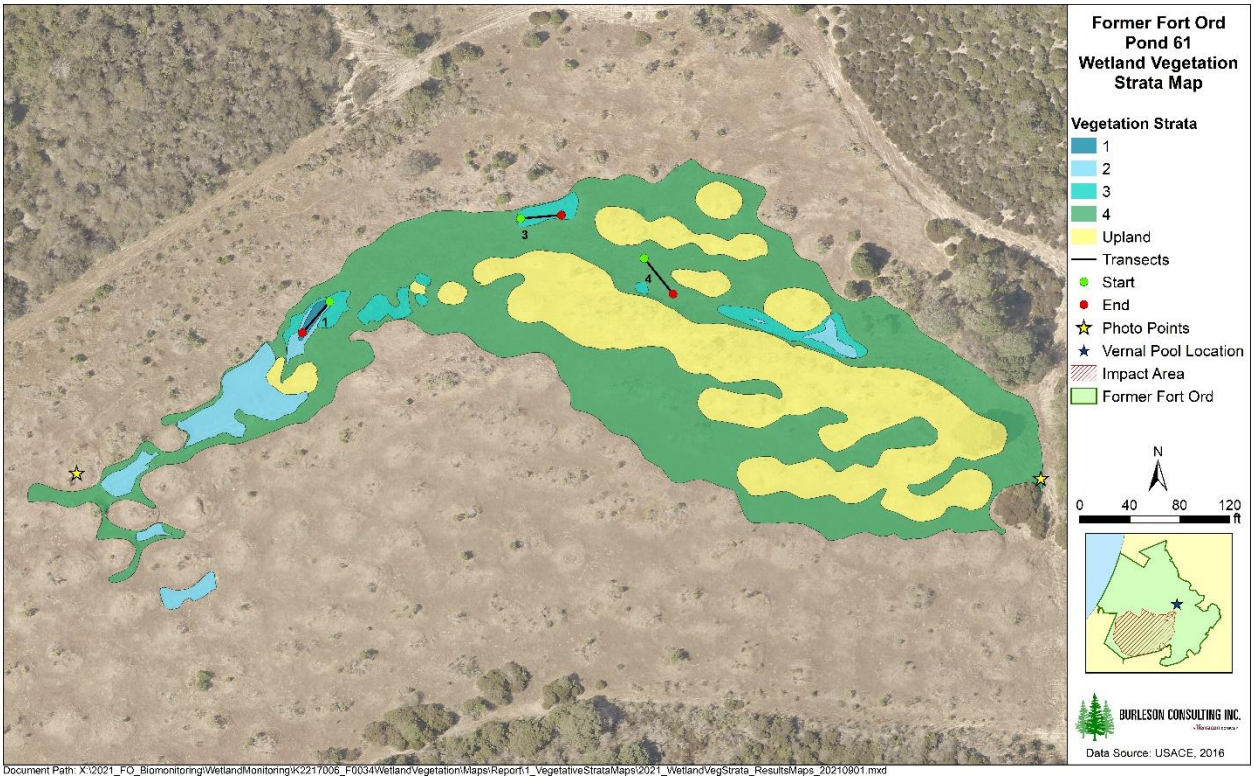

Figure 3-19. Pond 61 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects on Former Fort Ord, 2021

Ninety-seven plant species were observed within the vernal pool basin boundary. Of these species, 65 were native and 32 were non-native. Eleven species were OBL wetland plants, 29 were FACW or FAC, 15 were FACU or UPL, and 42 were not listed. Appendix B provides the species cover results within each stratum. Appendix E 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 3-37 provides a summary of the dominant species cover results for each stratum.

Table 3-37. Pond 61 (Year 3) Dominant Species by Stratum Results

Stratum	Transect Length (m)	Dominant Species	
		Common Name	Absolute Cover on Transect (%)
1	10	pale spikerush smooth goldfields Hickman's popcornflower	8.0 3.5 2.8
2	N/A	Contra Costa goldfields	N/A
3	10	Hickman's popcornflower dwarf brodiaea	16.5 6.5
4	10	rattlesnake grass California oat grass	25.5 9.0

3.16.1.1 *Contra Costa Goldfields*

Contra Costa goldfields at Pond 61 were mapped on April 16, 2021; they occupied 0.12 acre with a density of 5-70% cover. No transects were placed in stratum 2 to avoid disturbing the population. Figure 3-20 illustrates the extent of the CCG population at Pond 61.

Figure 3-20. Contra Costa Goldfields Populations at Pond 61 (Year 3 Post-Subsurface Munitions Remediation), 2021

3.16.2 Wildlife Monitoring

Pond 61 was surveyed for CTS and fairy shrimp on March 24, 2021. California tiger salamanders and fairy shrimp were not detected in March. No surveys were conducted in April or May due to insufficient vernal pool depth. Table 3-38 and Table 3-39 provide results of the CTS and fairy shrimp surveys completed in 2021. Invertebrate results for 2021 are provided in Appendix C (see Table C-2).

Table 3-38. Pond 61 (Year 3 Post-Subsurface Munitions Remediation) 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	
61	3/24/2021	0	-	-	-		-	-	-	6 mins

Table 3-39. Pond 61 (Year 3 Post-Subsurface Munitions Remediation) Fairy Shrimp Monitoring Results

Sampling Date	Abundance (# Individuals)
3/24/2021	Not detected

3.17 Pond 73

Pond 73 was in year 3 of monitoring for post-subsurface munitions remediation in 2021. Pond 73 was monitored for hydrology, vegetation, and wildlife. Hydrology results are reported separately in the Hydrology Monitoring Annual Report (Chenega, 2022).

3.17.1 Vegetation Monitoring

Vegetation monitoring was completed at Pond 73 on May 12, 2021. These monitoring data represent year 3 post-subsurface munitions remediation conditions. Pond 73 remained dry throughout the 2020-2021 water-year (Chenega, 2022). Biologists identified three strata at the vernal pool (see Table 3-40 and Figure 3-21). Strata 1 and 2 were repeated from 2017-2020, whereas stratum 4 was repeated from 2018-2020. Transect 1 was repeated from 2018, 2019, and 2020. Transect 2 was repeated from 2018. Transect 4 was repeated from 2018 and 2020.

Table 3-40. Pond 73 (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage
1	2%
2	27%
4	68%
Upland	3%

Figure 3-21. Pond 73 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects on Former Fort Ord, 2021

Sixty-six plant species were observed within the vernal pool basin boundary. Of these species, 41 were native and 25 were non-native. Eight species were OBL wetland plants, 25 were FACW or FAC, eleven were FACU or UPL, and 22 were not listed. Appendix B provides the species cover results within each stratum. Appendix E 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 3-41 provides a summary of the dominant species cover results for each stratum.

Table 3-41. Pond 73 (Year 3) Dominant Species by Stratum Results

Stratum	Transect Length (m)	Dominant Species	
		Common Name	Absolute Cover on Transect (%)
1	5	pale spikerush	34.3
2	10	brown-headed rush	23.8
4	10	coyote thistle	17.2
		smooth cat's-ear	6.8
		rough cat's-ear	3.2
		coastal tarweed	2.5
		cut-leaved geranium	2.2

3.17.2 Wildlife Monitoring

Wildlife surveys were not conducted at Pond 73 because the vernal pool did not have sufficient depth to trigger surveys.

3.18 Pond 74

Pond 74 was in year 3 of monitoring for post-mastication in 2021. Pond 74 was monitored for hydrology, vegetation, and wildlife. Hydrology results are reported separately in the Hydrology Monitoring Annual Report (Chenega, 2022).

3.18.1 Vegetation Monitoring

Vegetation monitoring was completed at Pond 74 on May 12, 2021. These monitoring data represent year 3 post-mastication conditions. Pond 74 remained dry throughout the 2020-2021 water-year (Chenega, 2022). Biologists identified three strata at the vernal pool (see Table 3-42 and Figure 3-22). Strata 1 and 3 were repeated from 2020; however, the associated transects were relocated because the previous locations were no longer within the correct strata. Stratum 4 was identified and the corresponding transect was established in 2021.

Table 3-42. Pond 74 (Year 3 Post-Mastication) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage
1	6%
3	21%
4	68%
Upland	5%

Figure 3-22. Pond 74 (Year 3 Post-Mastication) Vegetation Strata and Transects on Former Fort Ord, 2021

Fifty-two species were observed within the vernal pool basin boundary. Of these species, 32 were native and 20 were non-native. Seven species were OBL wetland plants, 18 were FACW or FAC, 9 were FACU or UPL, and 18 were not listed. Appendix B provides the species cover results within each stratum. Appendix E 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 3-43 provides a summary of the dominant species cover results for each stratum.

Table 3-43. Pond 74 (Year 3) Dominant Species by Stratum Results

Stratum	Transect Length (m)	Dominant Species	
		Common Name	Absolute Cover on Transect (%)
1	5	coyote thistle	26.7
		Sacramento mesa mint	9.7
3	5	coastal tarweed	23.0
4	10	coyote thistle	38.8

3.18.2 Wildlife Monitoring

Wildlife surveys were not conducted at Pond 74 because the vernal pool did not have sufficient depth to trigger surveys.

3.19 Pond 75

Pond 75 was in baseline monitoring in 2021. Pond 75 was monitored for hydrology, vegetation, and wildlife. Hydrology results are reported separately in the Hydrology Monitoring Annual Report (Chenega, 2022).

3.19.1 Vegetation Monitoring

Vegetation monitoring was completed at Pond 75 on May 7, 2021. These monitoring data represent baseline conditions. Pond 75 remained dry throughout the 2020-2021 water-year (Chenega, 2022). Biologists identified four strata at the vernal pool (see Table 3-44 and Figure 3-23). Strata 1 through 4 were identified and the corresponding transects were established in 2021.

Table 3-44. Pond 75 (Baseline) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage
1	25%
2	65%
3	6%
4	4%

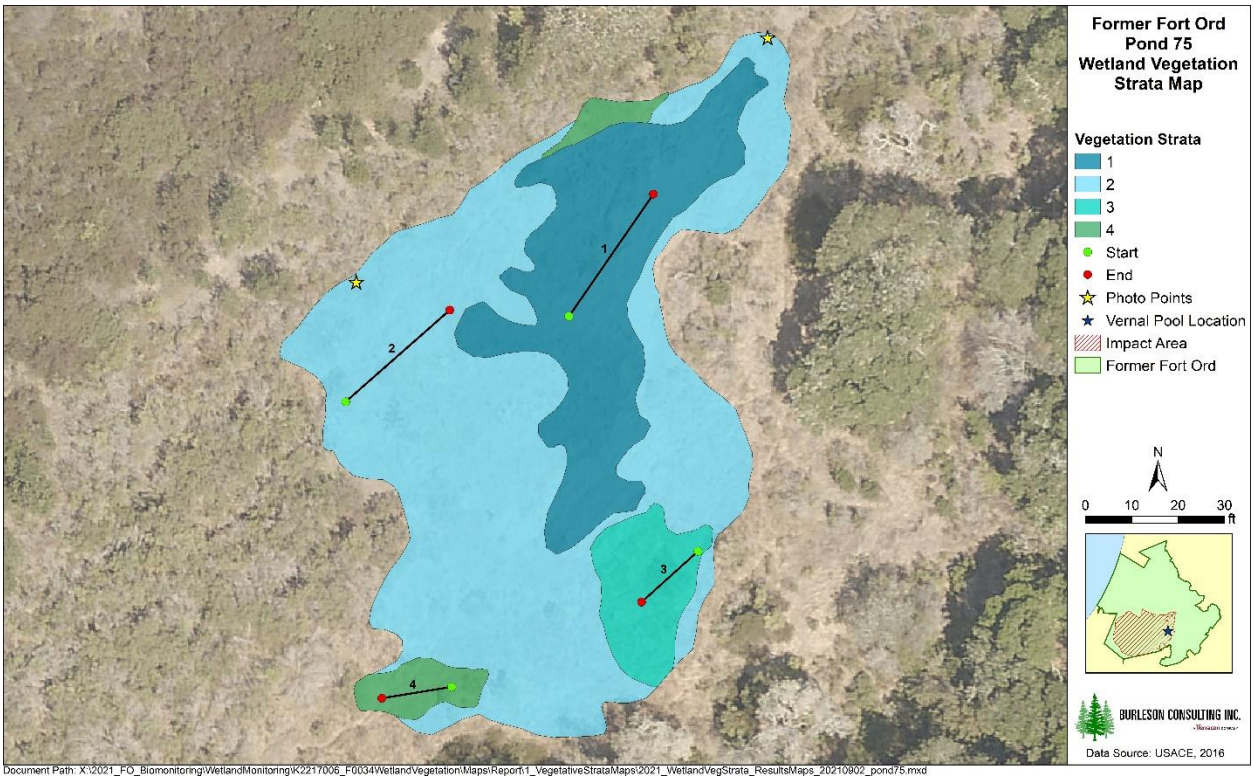

Figure 3-23. Pond 75 (Baseline) Vegetation Strata and Transects on Former Fort Ord, 2021

Thirty-five species were observed within the vernal pool basin boundary. Of these species, 23 were native and 12 were non-native. One species was an OBL wetland plant, 15 were FACW or FAC, 7 were FACU or UPL, and 12 were not listed. Appendix B provides the species cover results within each stratum. Appendix E 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 3-45 provides a summary of the dominant species cover results for each stratum.

Table 3-45. Pond 75 (Baseline) Dominant Species by Stratum Results

Stratum	Transect Length (m)	Dominant Species	
		Common Name	Absolute Cover on Transect (%)
1	10	pale spikerush	46.5
2	10	beardless wild rye	36.3
3	5	western goldenrod	43.3
4	5	brown-headed rush	40.3

3.19.2 Wildlife Monitoring

Wildlife surveys were not conducted at Pond 75 because the vernal pool did not have sufficient depth to trigger surveys.

3.20 Pond 101 East (West)

Pond 101 East (West)[1] was in year 3 of monitoring for post-mastication in 2021. Pond 101 East (West) was monitored for hydrology, vegetation, and wildlife. Hydrology results are reported separately in the Hydrology Monitoring Annual Report (Chenega, 2022). Prior to 2019, Pond 101 East (West) was a reference vernal pool.

3.20.1 Vegetation Monitoring

Vegetation monitoring was completed at Pond 101 East (West) on May 20, 2021. These monitoring data represent year 3 post-mastication conditions. Pond 101 East (West) remained dry throughout the 2020-2021 water-year (Chenega, 2022). Biologists identified eight strata at the vernal pool (see Table 3-46 and Figure 3-24). Strata 1, 2, 4, and 5 were repeated from 2016-2020. Stratum 3 was repeated from 2016-2019. Stratum 6 was repeated from 2017-2020. Stratum 8 was repeated from 2019 and 2020. Stratum 9 was repeated from 2020. Transects 1, 2, 4 and 5 were repeated from 2020. Transects 3 and 6 were relocated because the previous locations were no longer within the correct strata. Transect 8 was repeated from 2019 and 2020. Transect 9 was relocated to a more representative vegetative composition.

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

Table 3-46. Pond 101 East (West) (Year 3 Post-Mastication) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage
1	1%
2	22%
3	6%
4	2%
5	46%
6	4%
8	6%
9	13%

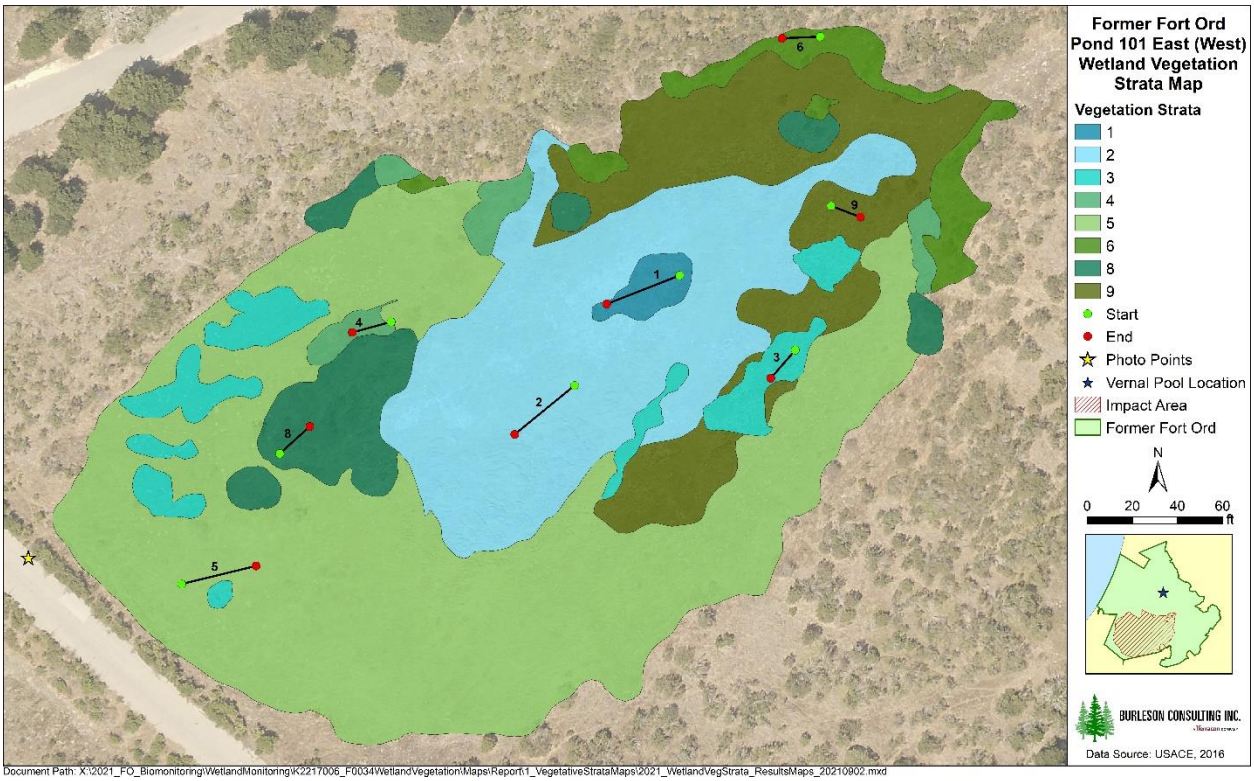

Figure 3-24. Pond 101 East (West) (Year 3 Post-Mastication) Vegetation Strata and Transects on Former Fort Ord, 2021

Seventy-one plant species were observed within the vernal pool basin boundary. Of these species, 37 were native and 33 were non-native. Eight species were OBL wetland plants, 29 were FACW or FAC, 15 were FACU or UPL, and 19 were not listed. Appendix B provides the species cover results within each stratum. Appendix E 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 3-47 provides a summary of the dominant species cover results for each stratum.

Table 3-47. Pond 101 East (West) (Year 3) Dominant Species by Stratum Results

Stratum	Transect Length (m)	Dominant Species	
		Common Name	Absolute Cover on Transect (%)
1	10	alkali mallow western yellowcress Lemmon's canary grass pale spikerush	12.0 7.3 6.3 5.0
2	10	pale spikerush	22.7
3	5	Hickman's popcornflower Chinese pusley curly dock pale spikerush	7.3 5.3 5.3 4.7
4	5	gumweed cut-leaved geranium sheep sorrel brown-headed rush	7.0 6.3 6.3 6.0
5	10	brome fescue Italian rye grass	17.5 9.2
6	5	brown-headed rush	27.7
8	5	western goldenrod	41.0
9	5	curly dock pale spikerush	21.0 15.7

3.20.2 Wildlife Monitoring

Wildlife surveys were not conducted at Pond 101 East (West) because the vernal pool did not have sufficient depth to trigger surveys.

3.21 Pond 101 West

Pond 101 West was in year 3 of monitoring for post-mastication in 2021. Pond 101 West was monitored for hydrology, vegetation, and wildlife. Hydrology results are reported separately in the Hydrology Monitoring Annual Report (Chenega, 2022).

3.21.1 Vegetation Monitoring

Vegetation monitoring was completed at Pond 101 West on May 11, 2021. These monitoring data represent year 3 post-mastication conditions. Pond 101 West remained dry throughout the 2020-2021 water-year (Chenega, 2022). Biologists identified three strata at the vernal pool (see Table 3-48 and Figure 3-25). Strata 1 and 2 were repeated from 2016 and 2019. Stratum 4 and the associated transect were established in 2021. Transect 1 was relocated to an area with more representative vegetative composition, whereas transect 2 was relocated because the previous location was no longer within the correct stratum.

Table 3-48. Pond 101 West (Year 3 Post-Mastication) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage
1	40%
2	33%
4	27%

Figure 3-25. Pond 101 West (Year 3 Post-Mastication) Vegetation Strata and Transects on Former Fort Ord, 2021

Fifty-one species were observed within the vernal pool basin boundary. Of these species, 22 were native and 29 were non-native. Eight species were OBL wetland plants, 20 were FACW or FAC, 10 were FACU or UPL, and 13 were not listed. Appendix B provides the species cover results within each stratum. Appendix E 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 3-49 provides a summary of the dominant species cover results for each stratum.

Table 3-49. Pond 101 West (Year 3) Dominant Species by Stratum Results

Stratum	Transect Length (m)	Dominant Species	
		Common Name	Absolute Cover on Transect (%)
1	10	Hickman's popcornflower	13.8
		smooth goldfields	9.2
		curly dock	9.0
		pale spikerush	5.0
2	10	Italian rye grass	22.7
4	10	western goldenrod	34.5

3.21.2 Wildlife Monitoring

Wildlife surveys were not conducted at Pond 101 West because the vernal pool did not have sufficient depth to trigger surveys.

4 DISCUSSION

Data quality objectives (DQO) and performance standards outlined in the Wetland Plan were used to measure successful wetland function following MEC and soil remediation activities (Burleson, 2006). Evaluation for the DQOs was included in the Methods Section 2.4. DQOs for wetland vegetation and wildlife are summarized below:

- DQO 3: vegetation – similar hydrophytic vegetation as reference control wetlands
- DQO 5: wildlife – consistent with baseline and similar to reference control wetland trends

4.1 Pond 5 – Reference

Pond 5 has been monitored for thirteen years as a reference vernal pool. Table 4-1 summarizes the years in which monitoring occurred and surveys were conducted. The cumulative precipitation graph shows precipitation for years in which hydrology monitoring was conducted at Pond 5 (see Figure 4-1). Above-normal water-years were 1994-1995, 2015-2016, 2016-2017, and 2018-2019. All other monitoring was conducted either in a normal or below-normal water-year, drought year, or consecutive drought year.

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

Survey	Water-Year												
	1993-1994	1994-1995	1995-1996	2006-2007	2009-2010	2012-2013	2013-2014	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
Hydrology	●	●	●	●		●	●	●	●	●	●	●	●
Vegetation	●	●	●	●				●	●	●	●	●	●
Wildlife	●	●	●	●	●			●	●	●	●	●	

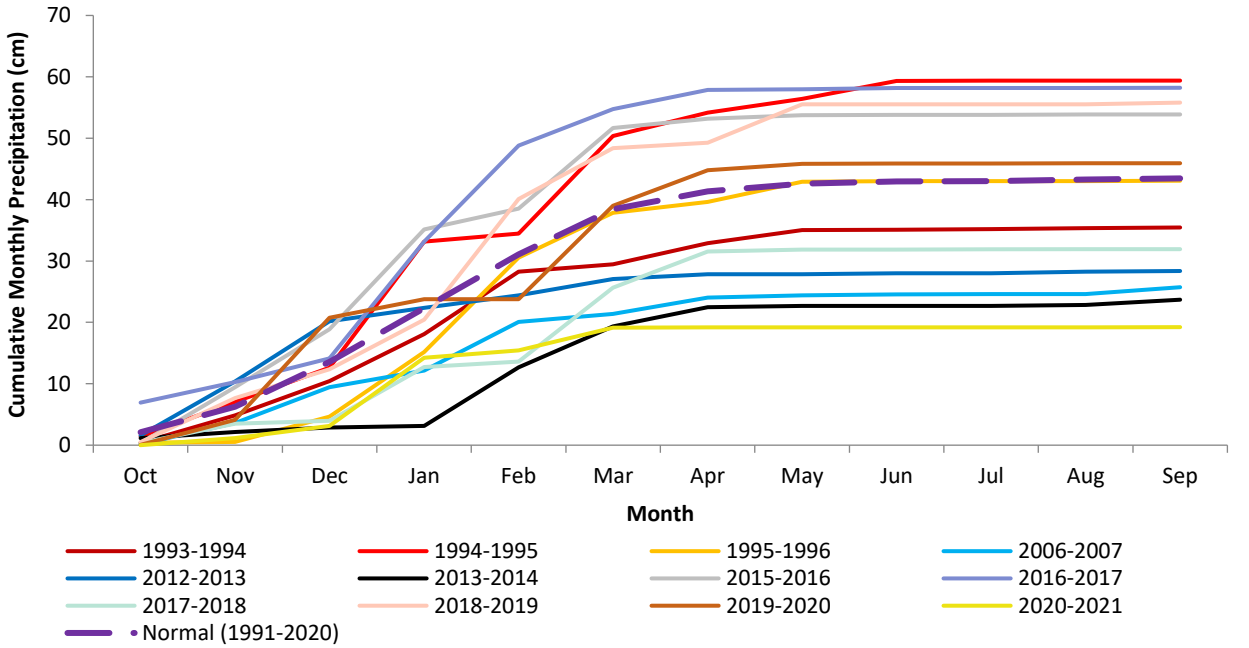

Figure 4-1. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 5 (Reference) Compared to the 30-Year Normal (mean 1991-2020) (NPS, 2021; NCEI NOAA, 2022)

4.1.1 Vegetation Monitoring

Vegetation data were collected at Pond 5 in 2007, 2016, 2017, 2018, 2019, 2020, and 2021 (Shaw, 2008; Burleson, 2017, 2018, 2019, 2020, and 2021). 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 subsequent years (Jones and Stokes, 1996). In 2007, data were collected in three zones using a 1.0 m^2 quadrat placed at three locations within each zone, and data for all strata were combined for the entire pool to allow for comparison to other years. In years 2016-2021, data were collected using methodologies described in the Methods section of this report. Data from 2016 and 2021 were compared stratum-to-stratum in Table 4-2 as well as visually in Figure 4-2.

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

Stratum	Percentage	
	2016	2021
1	26%	29%
2	32%	34%
3	38%	9%
4	4%	N/A
7	N/A	6%
8	N/A	22%

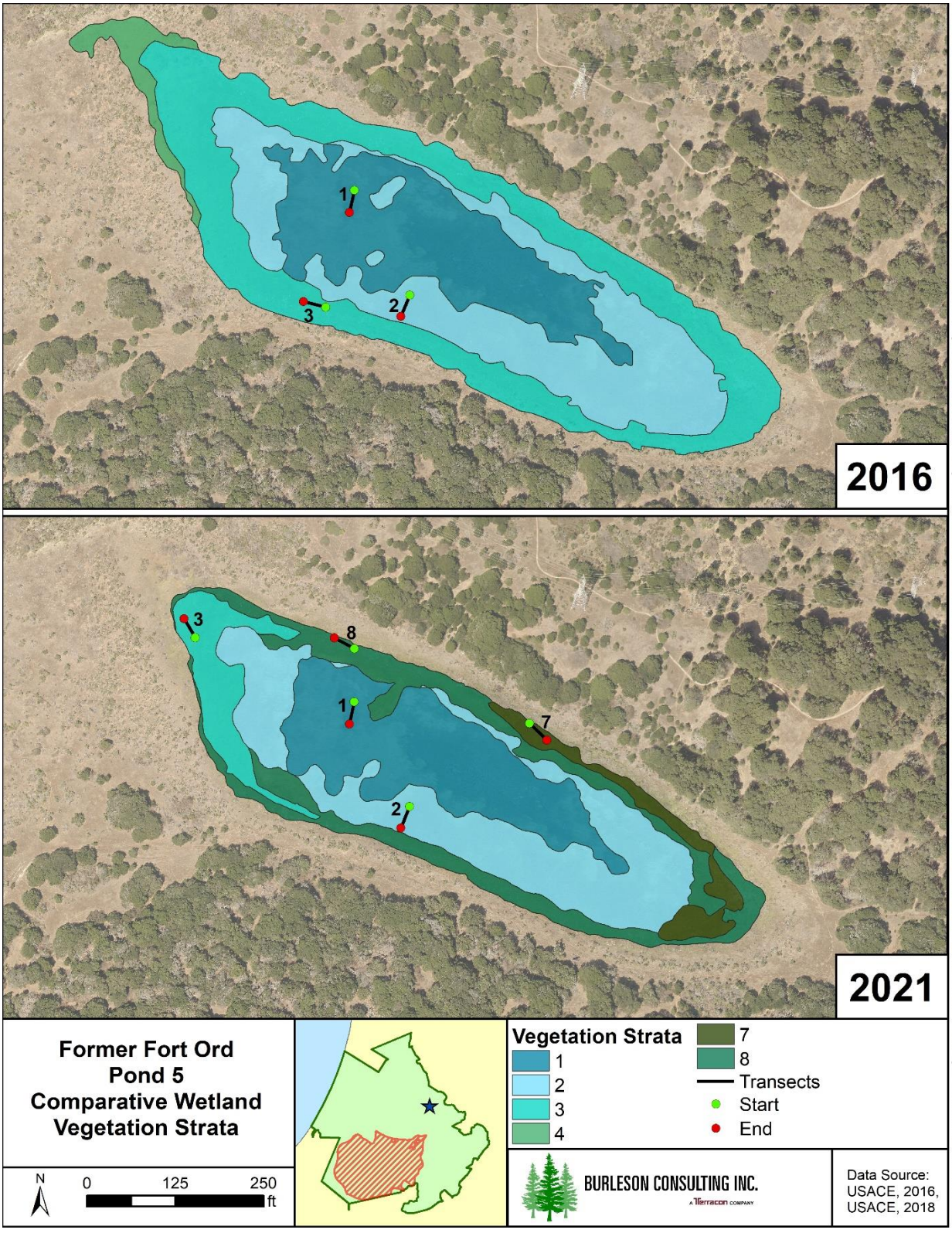

Figure 4-2. Pond 5 (Reference) Vegetation Strata and Transects for 2016 and 2021

The absolute percent vegetative cover observed in 2021 was generally less than previous years and similar to 2007 (see Table 4-3). Vegetative cover ranged from 36.3% in 2007 to 76.0% in 2019, whereas thatch/bare ground ranged from 24.0% in 2019 to 63.7% in 2007.

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

Year	Vegetative Cover	Thatch/Bare Ground
2007	36.3%	63.7%
2016	75.1%	25.2%
2017	60.5%	40.4%
2018	54.6%	45.5%
2019	76.0%	24.0%
2020	47.6%	52.4%
2021	39.3%	60.7%

Species richness on transects and for the overall basin has fluctuated between 2007 and 2021 with the highest richness observed on transects in 2018 and for the overall basin in 2019. Species richness on transects was 4, 7, 29, 41, 35, 23, and 31 species in 2007 and 2016, 2017, 2018, 2019, 2020, and 2021 respectively, whereas overall basin species richness was 26, 40, 73, 88, 94, 69 and 70 species, respectively (see Table 4-4, and Appendix A Table A-1). The species richness is represented on the RACs as the length of the curve and number of species along the curve (see Figure 4-3 and Figure 4-4).

Species composition at Pond 5 varied between monitoring years. This variability of species composition is illustrated on the RACs as the species codes shift along the curve and losses and gains occur from year to year (see Figure 4-3). Despite overall composition variability, the dominant species in the vernal pool were pale spikerush (*Eleocharis macrostachya*) and salt grass (*Distichlis spicata*) in the majority of monitoring years. Both species are in the top five for all of the RACs. Baltic rush (*Juncus balticus*) and bugle hedge nettle (*Stachys ajugoides*) contributed greater cover in 2020 and 2021 than was previously observed (Figure 4-4).

The evenness from each year is represented by the slope of the RACs. The evenness is fairly similar from year to year with richness uniformly distributed along the entire curve with a slightly higher concentration or plateau of species toward the tail end. This plateau illustrates that there are a high number of species with low abundance. “Structurally complex systems, such as a fen [or vernal pool] system,” as explained in Verberk, 2011, “are species rich and have a more even community abundance pattern, possibly owing to a fine partitioning of available niches.” When comparing year to year, a more even distribution of the top species occurs in 2017, 2018, and 2021 at Pond 5 (see Figure 4-5). Whereas, 2016, 2019, and 2020 has a less even slope and higher abundance of the dominant species at the top of the curve. A complete comparison of species composition observed during the surveys at Pond 5 in 2007 and 2016-2021 can be found in Appendix F. Figure 4-6 shows a subset of this comparison for species observed with a 2% cover or greater.

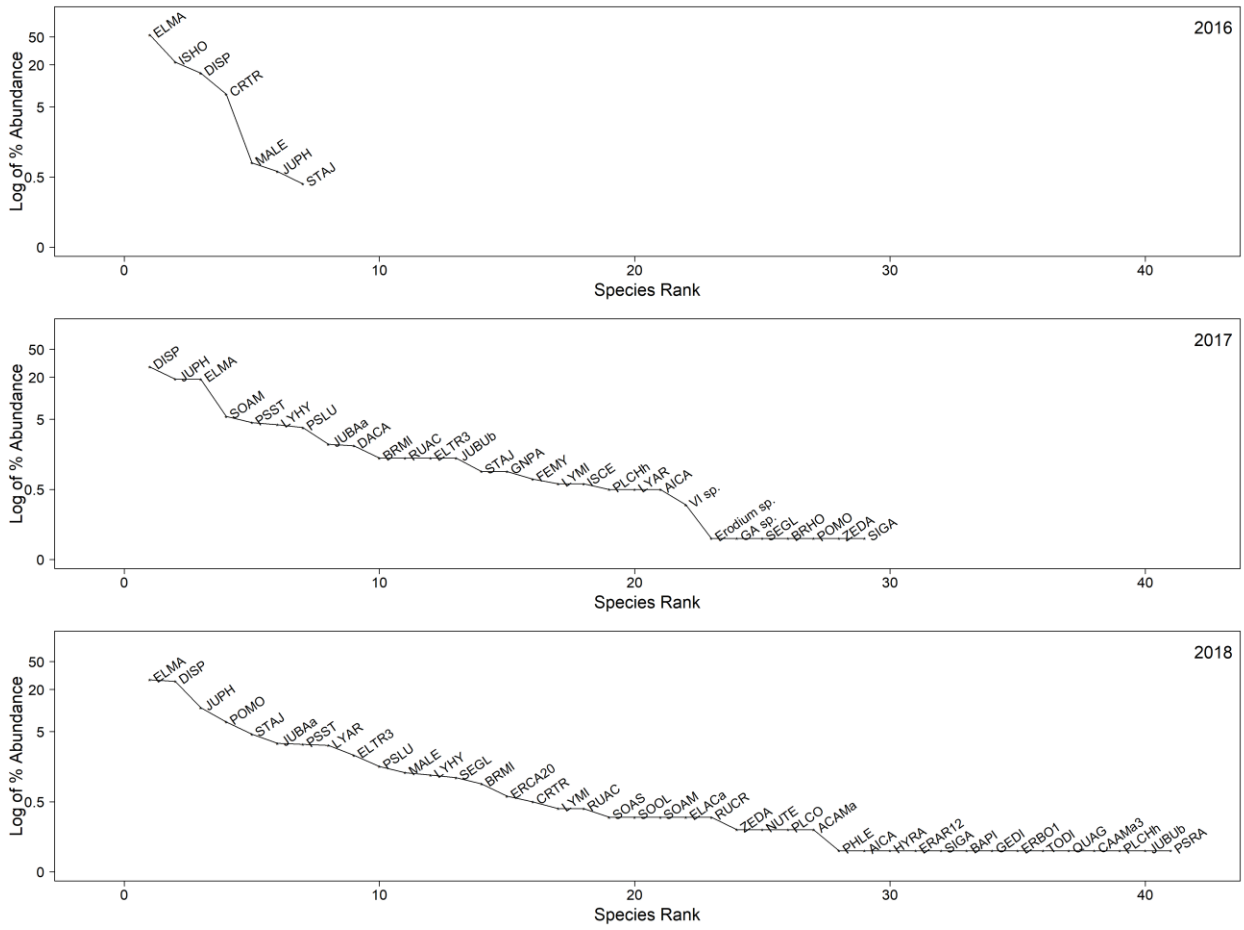

Figure 4-3. Rank Abundance Curves at Pond 5 (Reference) in 2016-2018. Note that the y-axis is in log-10 scale.

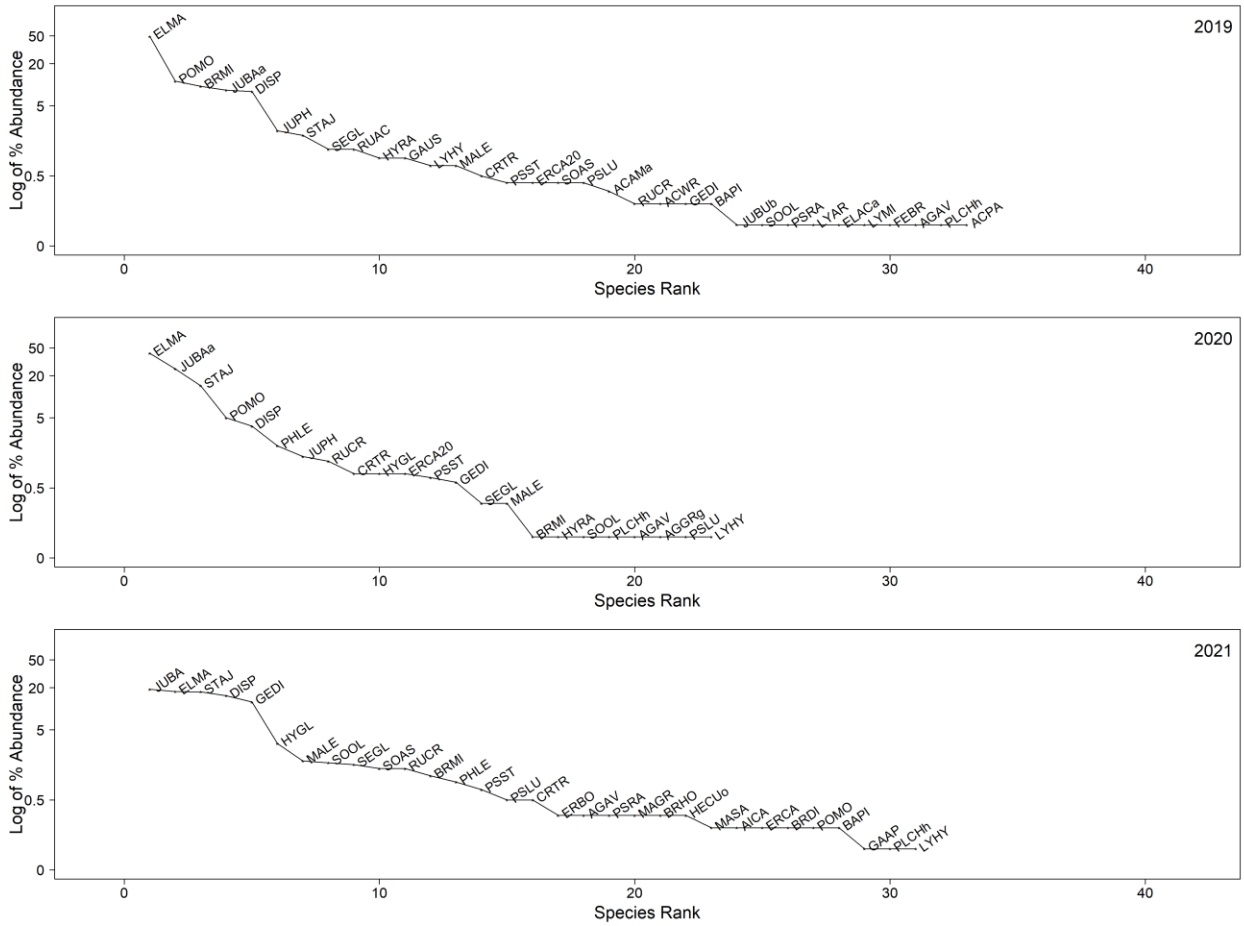

Figure 4-4. Rank Abundance Curves at Pond 5 (Reference) in 2019-2021. Note that the y-axis is in log-10 scale.

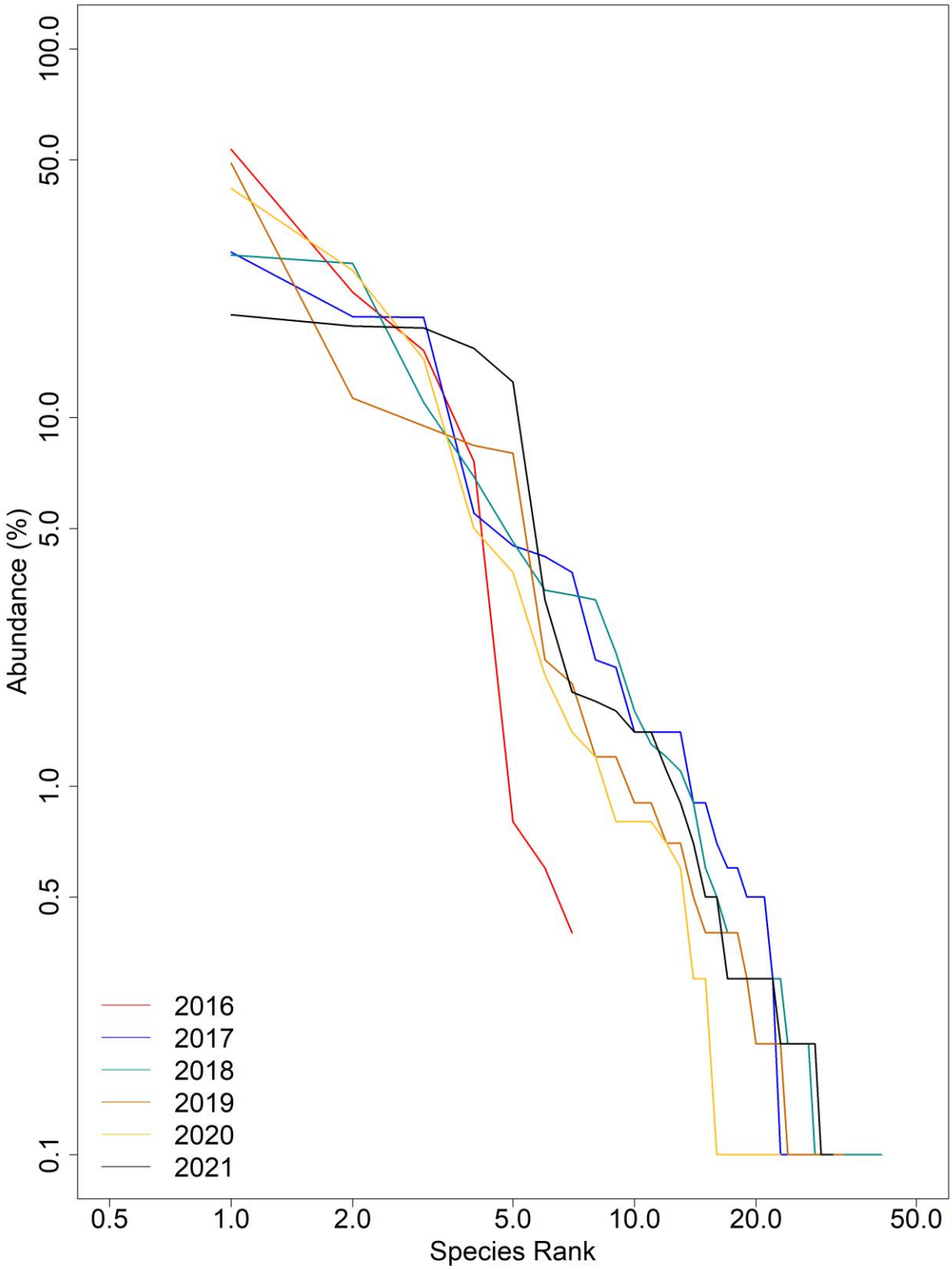

Figure 4-5. Rank Abundance Curves at Pond 5 (Reference) in 2016-2021. Note that both the x-axis and y-axis are in log-10 scale.

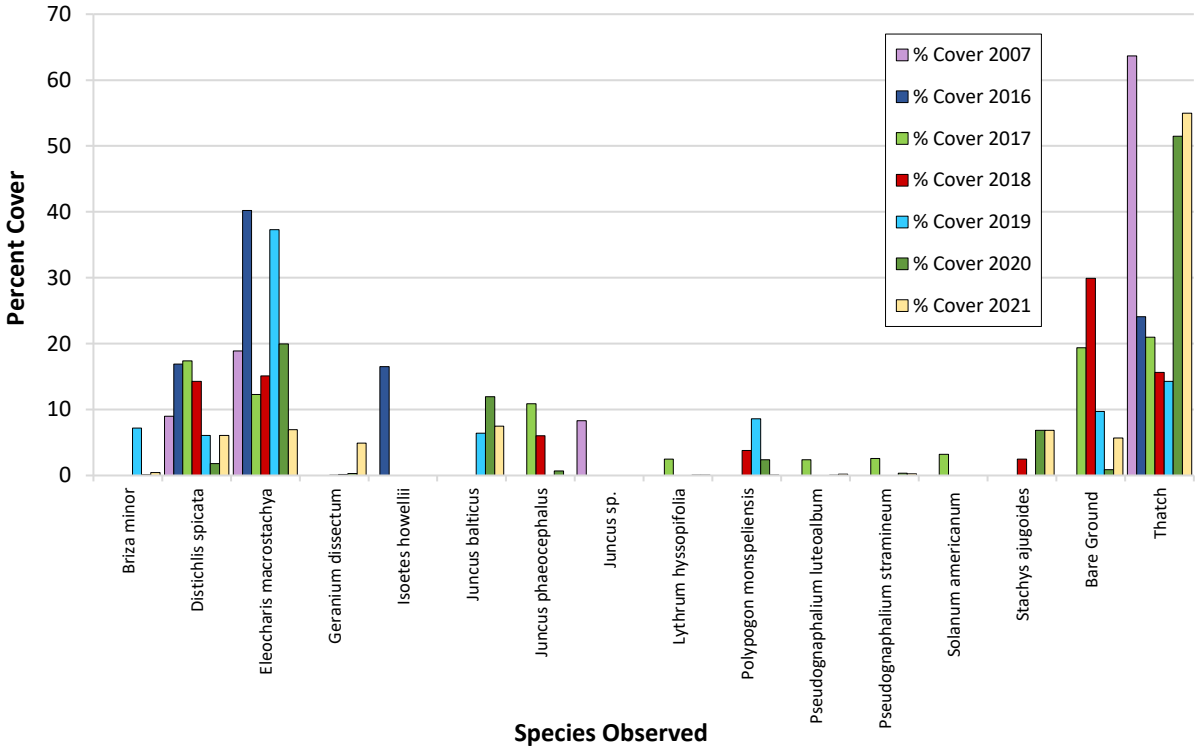

Figure 4-6. Percent Cover of Dominant Species at Pond 5 (Reference)

Native and non-native species richness on Pond 5 transects increased through time until 2018, after which, richness decreased in 2019 and 2020 then increased slightly in 2021 (see Table 4-4). The relative percent cover of native species varied through time, with the highest native cover observed in 2016 at 100% and the lowest value observed in 2019 at 73.6%. Values for relative percent cover in 2021 were most similar to years 2007 and 2019 (see Table 4-5).

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
2018	25	16	0
2019	21	14	0
2020	12	11	0
2021	16	15	0

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%
2018	83.3%	16.7%	0.0%
2019	73.6%	26.4%	0.0%
2020	91.3%	8.7%	0.0%
2021	75.0%	25.0%	0.0%

Wetland species richness on Pond 5 transects increased through time until 2018, then decreased in years 2019-2021. The non-wetland species richness was more variable with the highest value recorded in 2018 (see Table 4-6). The relative percent cover of wetland and non-wetland species were slightly beyond the range of previously observed values. Wetland cover in 2021 was similar to 2007 and non-wetland cover was similar to 2017 (see Table 4-7).

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	1	0	1	0	1
2016	3	3	0	1	0	0
2017	5	8	5	5	0	6
2018	5	11	7	8	1	9
2019	5	9	4	5	1	11
2020	4	7	3	3	1	5
2021	4	6	3	7	1	10

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%	24.8%	0.0%	0.3%	0.0%	22.9%
2016	75.9%	23.3%	0.0%	0.8%	0.0%	0.0%
2017	26.3%	55.3%	9.6%	8.0%	0.0%	0.8%
2018	33.7%	50.5%	10.2%	3.3%	0.3%	2.0%
2019	51.9%	31.0%	10.3%	3.4%	0.1%	3.3%
2020	56.5%	38.1%	2.0%	1.2%	0.1%	2.0%
2021	35.3%	36.5%	3.1%	4.2%	1.7%	19.1%

4.1.1.1 *Data Quality Objective 3*

Observable changes in hydrophytic vegetation between surveys were largely associated with precipitation fluctuations. This is expected given the dynamic nature of vernal pools and the close

relationship between the hydroperiod and wetland vegetation composition. As a reference vernal pool, Pond 5 is used for comparison to remediated vernal pools.

4.1.1.2 *Performance Standard: Plant Cover and Species Diversity*

Pond 5 is a reference vernal pool and not required to meet performance standards. The vernal pool provides a control for comparison to the remediated vernal pools.

4.1.2 Wildlife Monitoring

Wildlife data were collected at Pond 5 in 1994, 1995, 1996, 2007, 2010, 2016, 2017, 2018, 2019, and 2020 (Jones and Stokes, 1996; Shaw, 2008, 2011; Burleson, 2017, 2018, 2019, 2020, 2021). Fairy shrimp were present in 1995 and 2019. California tiger salamander larvae were observed in 1995, 2010, 2016, 2017, and 2019. The vernal pool did not hold sufficient depth for surveys to be completed in 2021. Therefore, DQO 5 and the applicable wildlife usage performance standard cannot be assessed. Table 4-8 shows historical wildlife monitoring results.

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

Sampling Year	CTS Larvae Abundance (# Individuals)	Fairy Shrimp Abundance (# Individuals)
1994	Not detected	Not detected
1995	Abundant	Very low – moderate
1996	Not detected	Not detected
2007	Not detected	Not detected
2010	Few - Common	Not detected
2016	Common - Abundant (101, 75, 100)	Not detected
2017	Common (12, 18, 16)	Not detected
2018	Not detected	Not detected
2019	Common - Abundant (0, 165, 46)	Low (3)
2020	Not detected	Not detected

4.1.3 Conclusion

Pond 5 is 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
Plant Cover & Species Diversity	DQO 3	Suitable for Comparison
Wildlife Usage	N/A*	N/A*

*Not applicable; wildlife surveys were not conducted due to insufficient depth

4.2 Pond 101 East (East) – Reference

Pond 101 East (East) was monitored for thirteen years as a reference vernal pool. Table 4-10 summarizes the years that monitoring occurred and surveys were conducted. The cumulative precipitation graph shows precipitation for years in which hydrology monitoring was conducted at Pond 101 East (East) (see Figure 4-7). Above-normal water-years were 2015-2016, 2016-2017, and 2018-2019.

All other monitoring was conducted either in a normal or below-normal water-year, drought year, or consecutive drought year.

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

Survey	Water-Year												
	1991-1992	2000-2001	2006-2007	2009-2010	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
Hydrology		●	●		●	●	●	●	●	●	●	●	●
Vegetation								●	●	●	●	●	●
Wildlife	●	●	●	●				●	●	●	●	●	

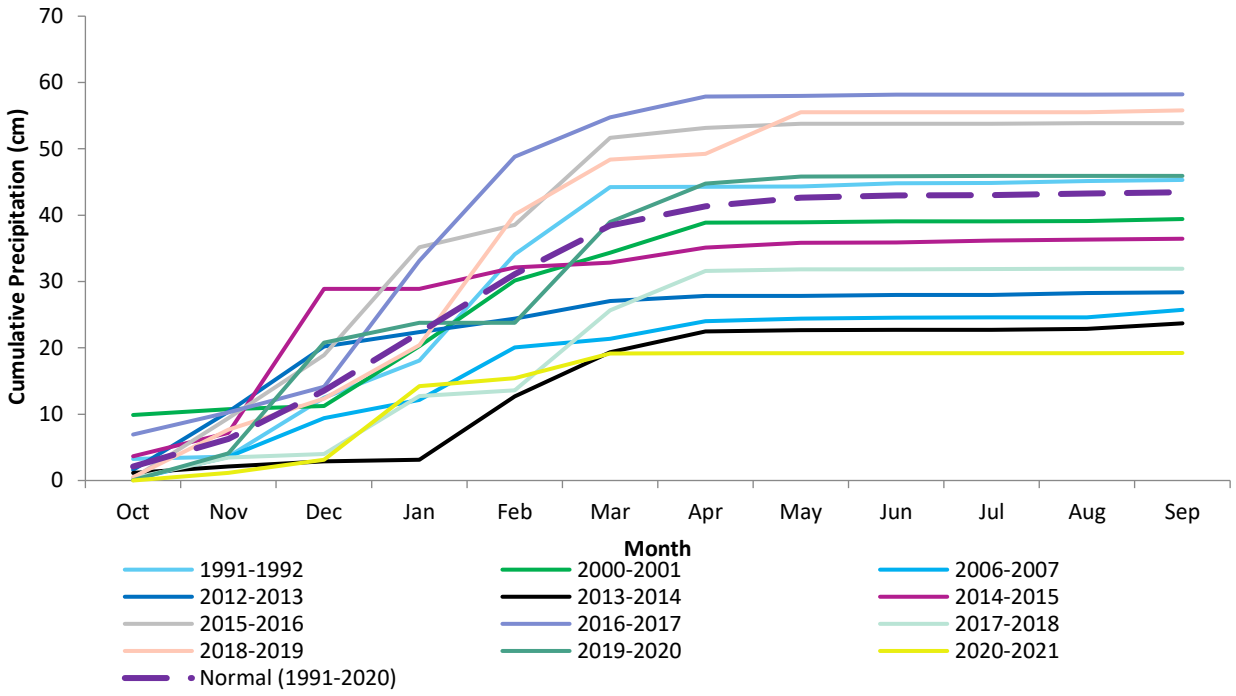

Figure 4-7. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 101 East (East) (Reference) Compared to the 30-Year Normal (mean 1991-2020) (NPS, 2021; NCEI NOAA, 2022)

4.2.1 Vegetation Monitoring

Vegetation data were collected at Pond 101 East (East) in 2016, 2017, 2018, 2019, 2020, and 2021 (Burleson, 2017, 2018, 2019, 2020, 2021). Data were collected using the methodology described in the Methods section of this report. Data from 2016 and 2021 were compared stratum-to-stratum in Table 4-11 as well as visually in Figure 4-8.

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

Stratum	Percentage	
	2016	2021
1	0.4%	N/A
2	48%	N/A
3	44%	57%
4	8%	3%
5	N/A	40%

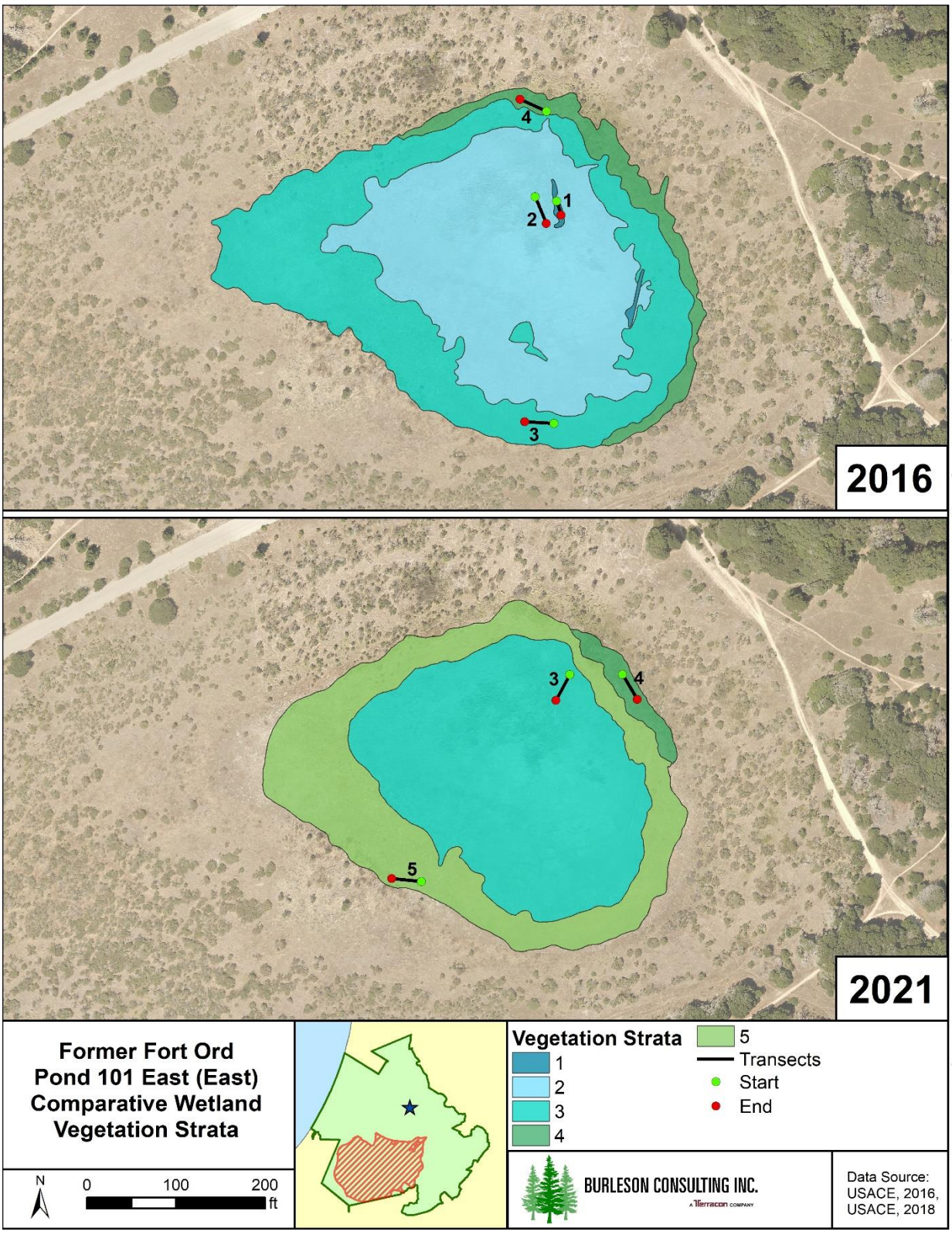

Figure 4-8. Pond 101 East (East) (Reference) Vegetation Strata and Transects for 2016 and 2021

The absolute percent vegetative cover observed in 2021 was dramatically less than previous years (see Table 4-12). Vegetative cover in previous years ranged from 60.7% in 2016 to 84.6% in 2017, whereas thatch/bare ground ranged from 16.6% in 2017 to 41.0% in 2016. In 2021, vegetative cover was 38.5% and thatch/bare ground was 61.6%.

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

Year	Vegetative Cover	Thatch/Bare Ground
2016	60.7%	41.0%
2017	84.6%	16.6%
2018	68.7%	32.6%
2019	72.6%	28.6%
2020	63.4%	36.6%
2021	38.5%	61.6%

Species richness increased between 2016 and 2020 and decreased in 2021 on the transects. For the overall basin, the species richness fluctuated between 2016 and 2021 with the highest richness observed in 2018. Species richness on transects was 18, 18, 32, 37, 43, and 21 species in 2016, 2017, 2018, 2019, 2020, and 2021, respectively, whereas overall basin species richness was 37, 59, 89, 84, 86, and 68 species, respectively (see Table 4-13 and Appendix A Table A-2). The species richness is represented on the RACs as the length of the curve and number of species along the curve (see Figure 4-9 and Figure 4-10).

Species composition and dominant species at Pond 101 East (East) varied between monitoring years. This variability of species composition is illustrated on the RACs as the species codes shift along the curve and losses and gains occur from year to year (see Figure 4-9 and Figure 4-10). The dominant species shift is shown through the changes in the species at the top of the curve. Pale spikerush (*Eleocharis macrostachya*) and Baltic rush (*Juncus balticus*) were the dominant species in 2016 and 2020; Baltic rush (*Juncus balticus*), sheep sorrel (*Rumex acetosella*), and purple cudweed (*Gnaphalium palustre*) were the dominant species in 2017; pale spikerush (*Eleocharis macrostachya*), common toadrush (*Juncus bufonius* var. *bufonius*) and alkali mallow (*Malvella leprosa*) were dominant in 2018, pale spikerush (*Eleocharis macrostachya*), sheep sorrel (*Rumex acetosella*), and Baltic rush (*Juncus balticus*) were dominant in 2019; and alkali mallow (*Malvella leprosa*), Baltic rush (*Juncus balticus*), and cut-leaved geranium (*Geranium dissectum*) were the dominant species in 2021. A complete comparison of species composition observed at Pond 101 East (East) from 2016-2021 can be found in Appendix F. Figure 4-6 shows a subset of this comparison for species observed with a 2% cover or greater.

The evenness from each year is represented by the slope of the RACs. The evenness is fairly similar from year to year with richness uniformly distributed along the entire curve and a slightly higher concentration or plateau of species toward the tail end. This plateau illustrates that there are a high number of species with low abundance. “Structurally complex systems, such as a fen [or vernal pool] system,” as explained in Verberk, 2011, “are species rich and have a more even community abundance pattern, possibly owing to a fine partitioning of available niches.” When comparing year to year, a more even distribution of the top species occurs in 2018, 2020, and 2021 at Pond 101 East (East) (see Figure 4-11). Whereas 2016, 2017, and 2019 have a less even slope and higher abundance of the dominant species at the top of the curve. A complete comparison of species composition observed during the surveys at Pond 101 East (East) in 2016, 2017, 2018, 2019, 2020, and 2021 can be found in Appendix F. Figure 4-12 shows a subset of this comparison for species observed with a 2% cover or greater.

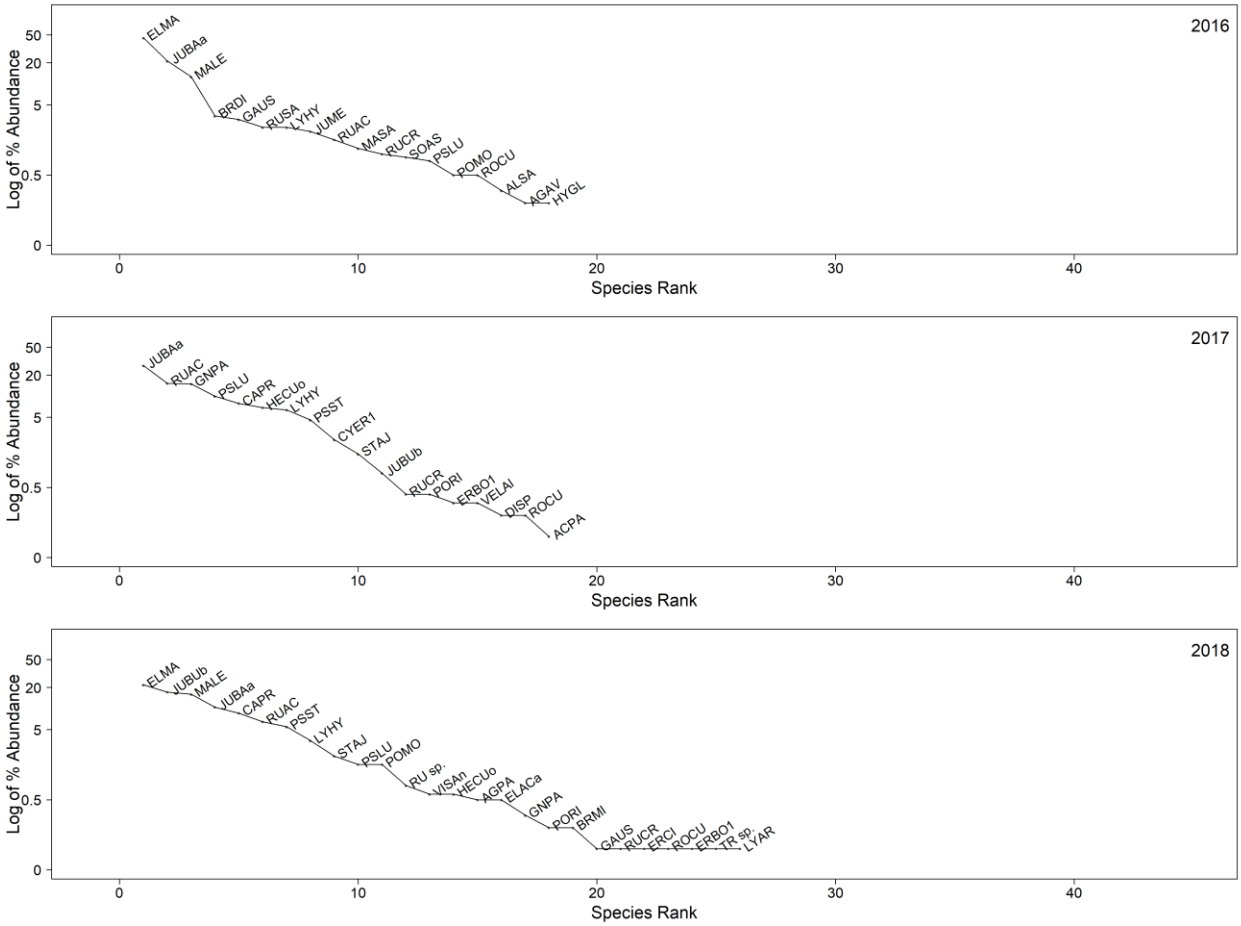

Figure 4-9. Rank Abundance Curves at Pond 101 East (East) (Reference) in 2016-2018. Note that the y-axis is in log-10 scale.

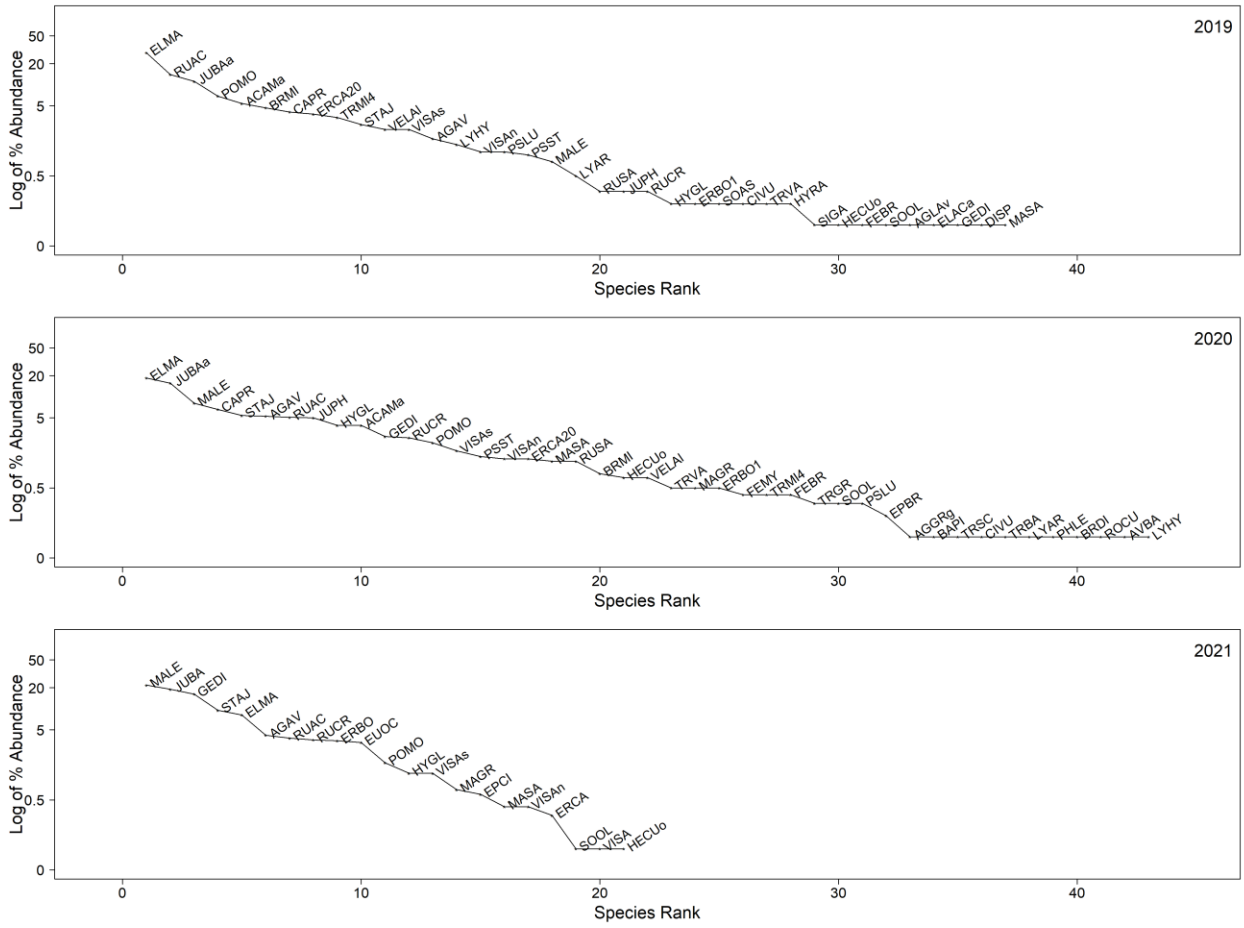

Figure 4-10. Rank Abundance Curves at Pond 101 East (East) (Reference) in 2019-2021. Note that the y-axis is in log-10 scale.

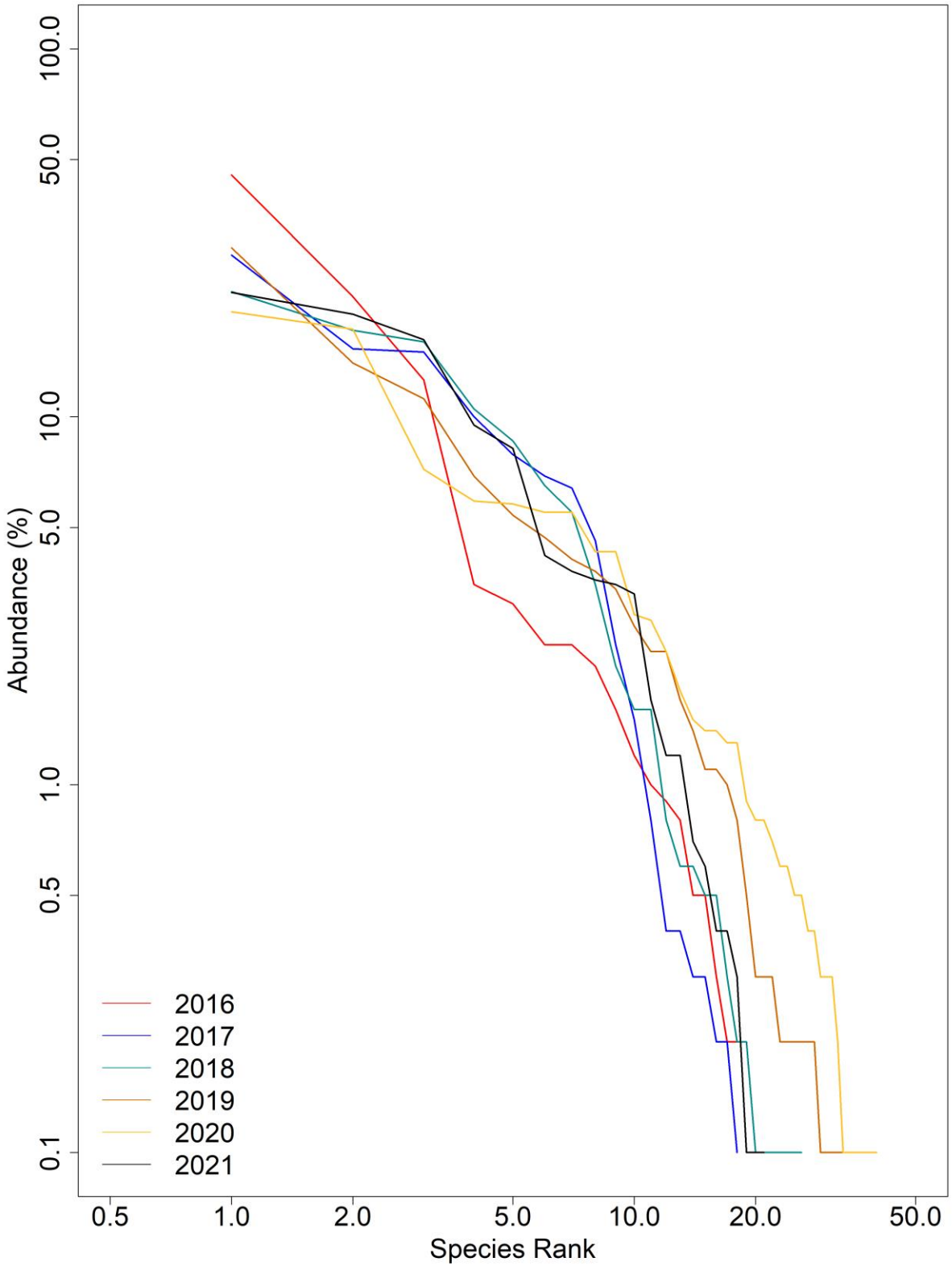

Figure 4-11. Rank Abundance Curves at Pond 101 East (East) (Reference) in 2016-2021. Note that the x-axis and the y-axis are in log-10 scale.

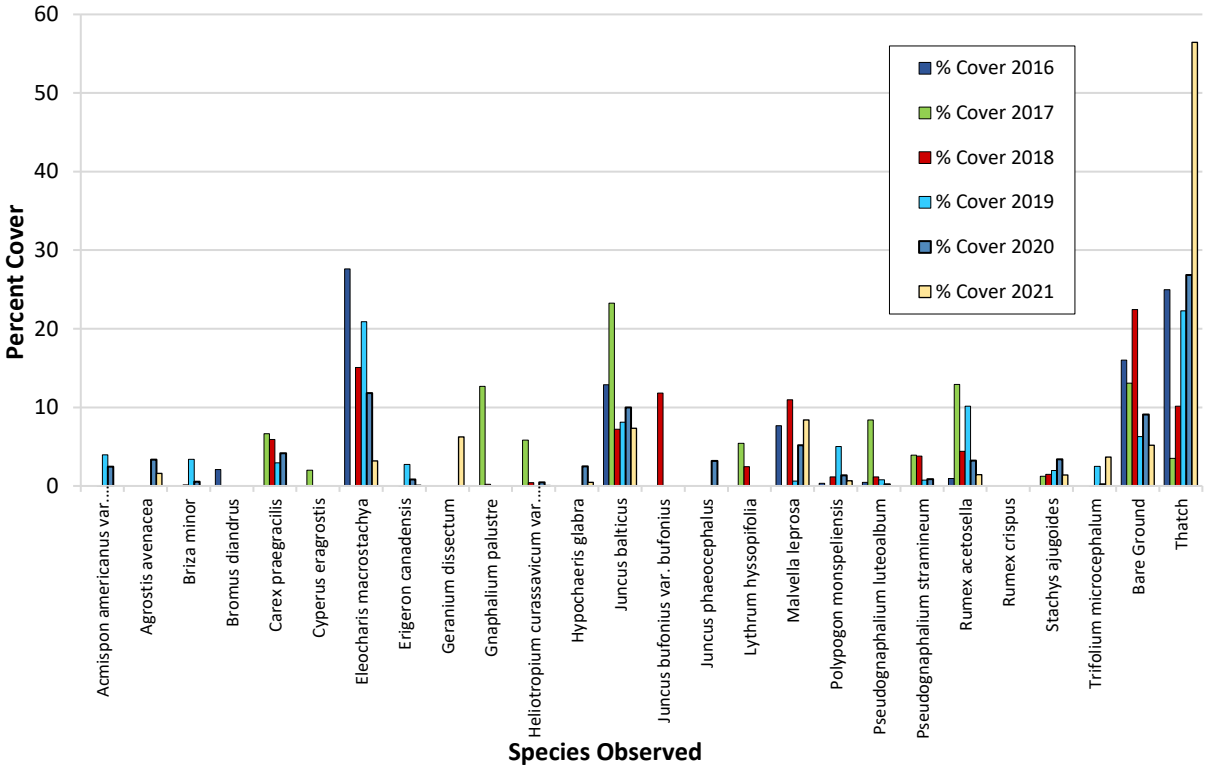

Figure 4-12. Percent Cover of Dominant Species at Pond 101 East (East) (Reference)

Native species richness on Pond 101 East (East) transects increased between 2016 and 2018, remained the same in 2019, increased in 2020, and decreased in 2021 (see Table 4-13). Non-native species richness generally increased by 2020 but decreased in 2021. Richness values for native and non-native species in 2021 were most similar to 2016. Native and non-native species relative percent cover were variable. Values recorded in 2021 were most similar to 2017 and 2019 (see Table 4-14).

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

Year	Native	Non-Native	Unidentified
2016	9	9	0
2017	13	5	0
2018	18	11	3
2019	18	19	0
2020	24	19	0
2021	10	11	0

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

Year	Native	Non-Native	Unidentified
2016	88.9%	11.1%	0.0%
2017	67.7%	32.3%	0.0%
2018	84.4%	14.7%	0.9%
2019	64.7%	35.3%	0.0%
2020	72.2%	27.8%	0.0%
2021	64.1%	35.9%	0.0%

Wetland species richness on Pond 101 East (East) transects increased between 2016 and 2020 but decreased to the lowest recorded value in 2021 (see Table 4-15). Non-wetland species on transects generally increased from 2016 to 2019 and decreased in 2020 and 2021. The relative percent cover of wetland species was variable between surveys with a decrease in 2019 and 2020. Like the wetland richness, wetland species cover was at the lowest recorded value in 2021 (see Table 4-16). The relative percent cover of non-wetland species was relatively static between surveys with a slight increase in 2018 and 2019, a decrease in 2020, and increase in 2021. The values have ranged from 15.1% to 31.2%.

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

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2016	3	6	1	3	0	5
2017	3	8	3	2	0	2
2018	5	9	5	4	2	7
2019	4	8	7	7	3	8
2020	5	8	7	6	3	14
2021	2	4	1	4	4	6

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

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2016	48.4%	27.3%	1.0%	15.1%	0.0%	8.2%
2017	8.1%	64.0%	5.3%	15.6%	0.0%	7.0%
2018	28.2%	40.2%	6.0%	22.6%	1.1%	1.8%
2019	32.9%	24.0%	12.5%	19.4%	3.4%	7.7%
2020	24.2%	31.1%	6.5%	15.5%	3.3%	19.5%
2021	17.7%	24.7%	3.6%	29.3%	1.9%	22.8%

4.2.1.1 *Data Quality Objective 3*

Observable changes in hydrophytic vegetation between surveys were largely associated with precipitation fluctuations. This is expected given the dynamic nature of vernal pools and the close

relationship between the hydroperiod and wetland vegetation composition. As a reference vernal pool, Pond 101 East (East) is used for comparison to remediated vernal pools.

4.2.1.2 *Performance Standard: Plant Cover and Species Diversity*

Pond 101 East (East) is a reference vernal pool and not required to meet performance standards. The vernal pool provides a control for comparison to the remediated vernal pools.

4.2.2 Wildlife Monitoring

Wildlife data were collected at Pond 101 East (East) in 1992, 2001, 2007, 2010, 2016, 2017, 2018, 2019, and 2020 (Jones and Stokes, 1992; Harding ESE, 2002; Shaw, 2007; Shaw, 2011; Burleson, 2017, 2018, 2019, 2020, 2021). California tiger salamander larvae were observed in 1992, 2010, 2016, 2017, 2018, and 2019. Fairy shrimp were present in 2001, 2019, and 2020. The vernal pool did not hold sufficient depth for surveys to be completed in 2021. Therefore, DQO 5 and the applicable wildlife usage performance standard cannot be assessed. Table 4-17 shows historical wildlife monitoring results.

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

Sampling Year	CTS Larvae Abundance (# Individuals)	Fairy Shrimp Abundance (# Individuals)
1992	Present*	Not detected*
2001	Not detected*	Moderate (100, 12)
2007	Not detected	Not detected
2010	Common*	Not detected*
2016	Common – Abundant (>101, 101, 67)	Not detected
2017	Common (36, 70, 5)	Not detected
2018	Few (2)	Not detected
2019	Common – Abundant (38, 212, 225)	Moderate (32)
2020	Not detected	Moderate (15)

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

4.2.3 Conclusion

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

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

Performance Standard	Applicable DQO	Success
Plant Cover & Species Diversity	DQO 3	Suitable for Comparison
Wildlife Usage	N/A*	N/A*

*Not applicable; wildlife surveys were not conducted due to insufficient depth

4.3 Pond 997 – Reference

Pond 997 was monitored for five years as a reference vernal pool, although approximately 13% of vegetation within the Pond 997 watershed was masticated in 2017. Table 4-19 summarizes the years that monitoring occurred and surveys were conducted. The cumulative precipitation graph shows precipitation for years in which hydrology monitoring was conducted at Pond 997 (see Figure 4-13). The 2016-2017 and 2018-2019 water-years were above-normal, whereas the 2019-2020 water-year was similar to the cumulative normal, and 2017-2018 and 2020-2021 water-years were below normal.

Table 4-19. Pond 997 (Reference) Summary of Historical Surveys for Hydrology, Vegetation, and Wildlife

Survey	Water-Year				
	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
Hydrology	●	●	●	●	●
Vegetation	●	●	●	●	●
Wildlife	●		●		

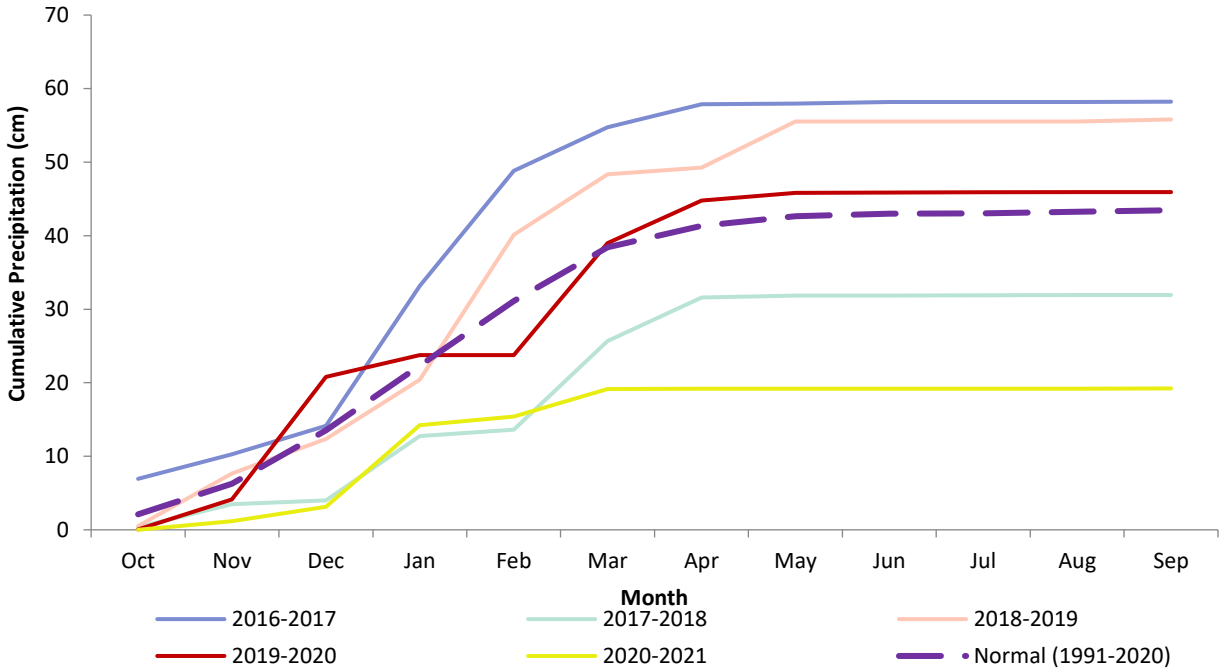

Figure 4-13. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 997 (Reference) Compared to the 30-Year Normal (mean 1991-2020) (NPS, 2021; NCEI NOAA, 2021)

4.3.1 Vegetation Monitoring

Vegetation data were collected at Pond 997 in 2017, 2018, 2019, 2020, and 2021 (Burleson, 2018, 2019, 2020, 2021). Data were collected using the methodology described in the Methods section of this report. Data from 2017 and 2021 were compared stratum-to-stratum in Table 4-20 as well as visually in Figure 4-14.

Pond 997 also supports a CCG population located in stratum 2. The population was mapped and a visual estimate of percent cover was recorded in 2021 to compare to past years (see Figure 4-19 in Section 4.3.1.1).

Table 4-20. Pond 997 (Reference) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage	
	2017	2021
1	3%	9%
2 (CCG)	2%	2%
3	89%	89%
4	2%	N/A
Upland	4%	N/A

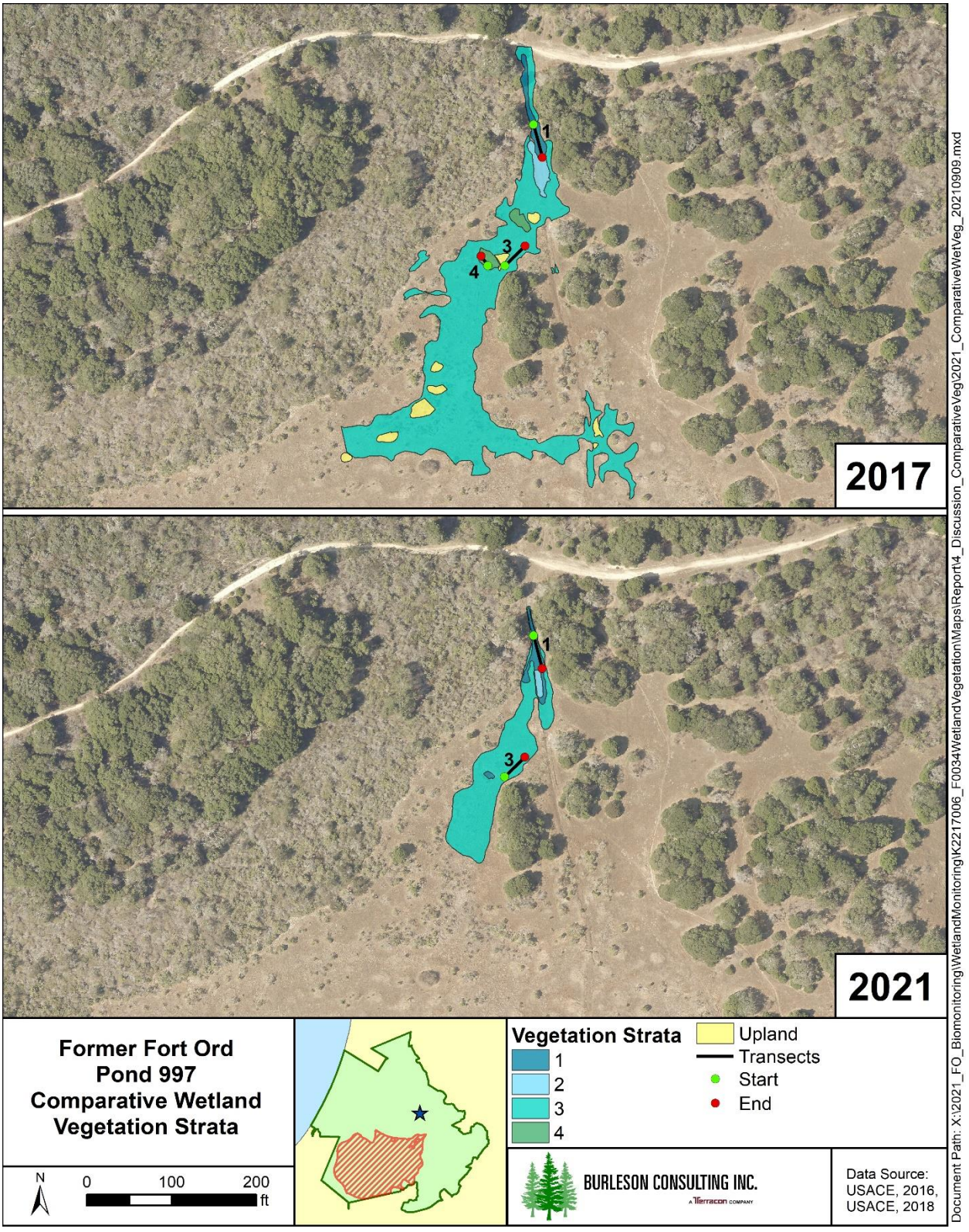

Figure 4-14. Pond 997 (Reference) Vegetation Strata and Transects for 2017 and 2021

The absolute percent vegetative cover observed in 2021 was comparable to previous years and most similar to 2018 (see Table 4-21). Vegetative cover ranged from 44.7% in 2018 to 73.3% in 2019, whereas thatch/bare ground ranged from 28.6% in 2019 to 55.4% in 2018.

Table 4-21. Pond 997 (Reference) Absolute Percent Cover

Year	Vegetative Cover	Thatch/Bare Ground
2017	57.3%	43.7%
2018	44.7%	55.4%
2019	73.3%	28.6%
2020	70.2%	29.8%
2021	45.1%	55.0%

Species richness on transects increased between 2017 and 2019 and decreased in 2020 and 2021. Species richness on transects in 2021 was similar to 2017. Species richness in the overall basin was the lowest value record in 2021 with six fewer species than the most similar year, 2017. Species richness on transects was 27, 45, 48, 42, and 27 species in 2017, 2018, 2019, 2020, and 2021, respectively, whereas overall basin species richness was 65, 87, 82, 82, and 59 species, respectively (see Table 4-22 and Appendix A Table A-3). The species richness is represented on the RACs as the length of the curve and number of species along the curve (see Figure 4-15 and Figure 4-16).

Species composition at Pond 997 varied between monitoring years. This variability of species composition is illustrated on the RACs as the species codes shift along the curve and losses and gains occur from year to year (see Figure 4-15 and Figure 4-16). Despite overall composition variability, the dominant species in the vernal pool were fairly consistent. Coyote thistle (*Eryngium armatum*) and brown-headed rush (*Juncus phaeocephalus*) were the dominant species in 2018, 2019, and 2020, while coyote thistle (*Eryngium armatum*) and California oatgrass (*Danthonia californica*), were dominant in 2017 and 2021. Rattlesnake grass (*Briza maxima*) was an additional dominant species in 2021. A complete list of species observed at Pond 997 in 2017, 2018, 2019, 2020, and 2021 can be found in Appendix F. Figure 4-18 shows a subset of the observed species with a 2% cover or greater.

The evenness from each year is represented by the slope of the RACs. The evenness is fairly similar from year to year with richness distributed along the entire curve. “Structurally complex systems, such as a fen [or vernal pool] system,” as explained in Verberk, 2011, “are species rich and have a more even community abundance pattern, possibly owing to a fine partitioning of available niches.” When comparing year to year, a more even distribution of the top species occurs in 2017 at Pond 997 (see Figure 4-17). Whereas, 2021 has a less even slope and higher abundance of the dominant species at the top of the curve.

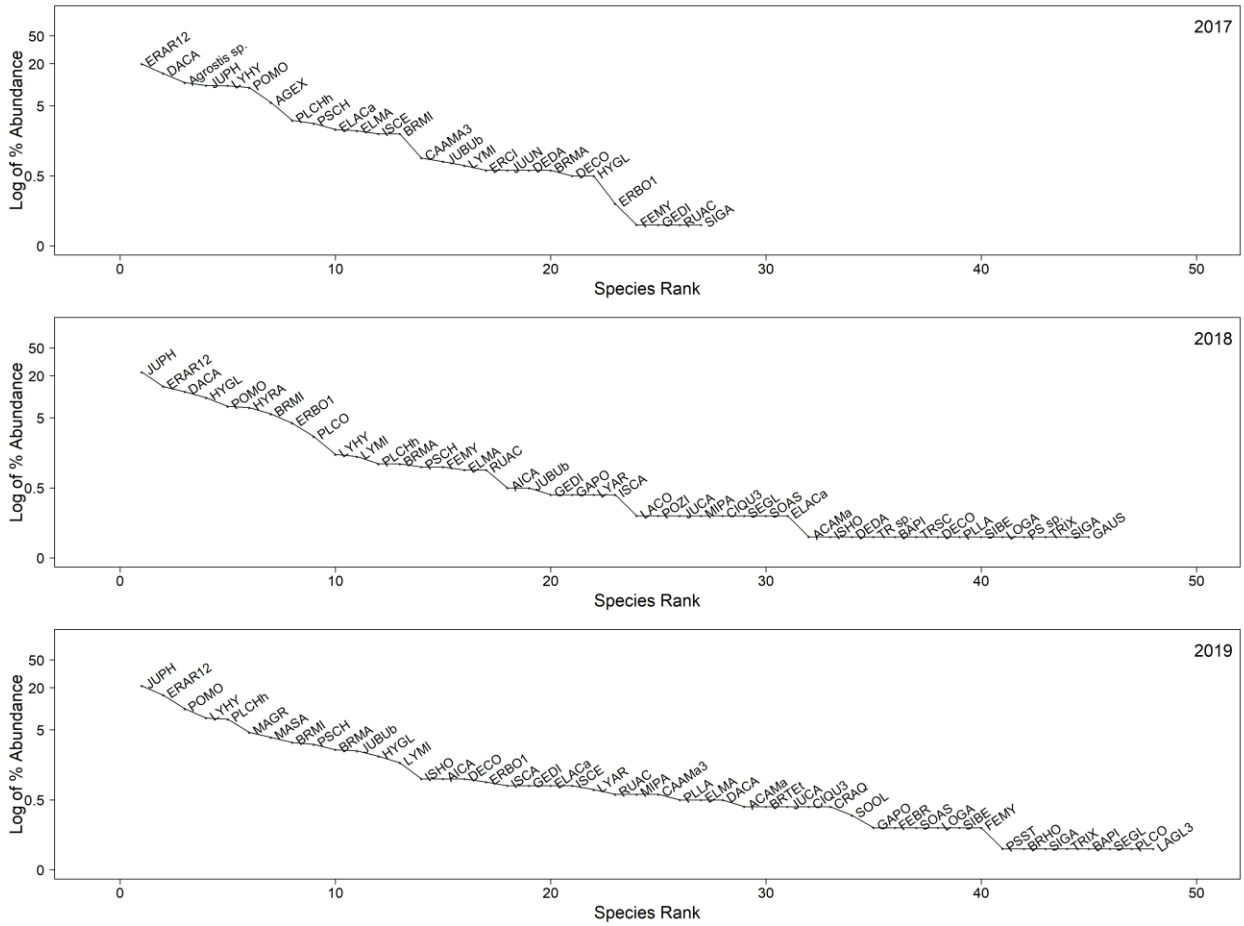

Figure 4-15. Rank Abundance Curves at Pond 997 (Reference) in 2017-2019. Note that the y-axis is in log-10 scale.

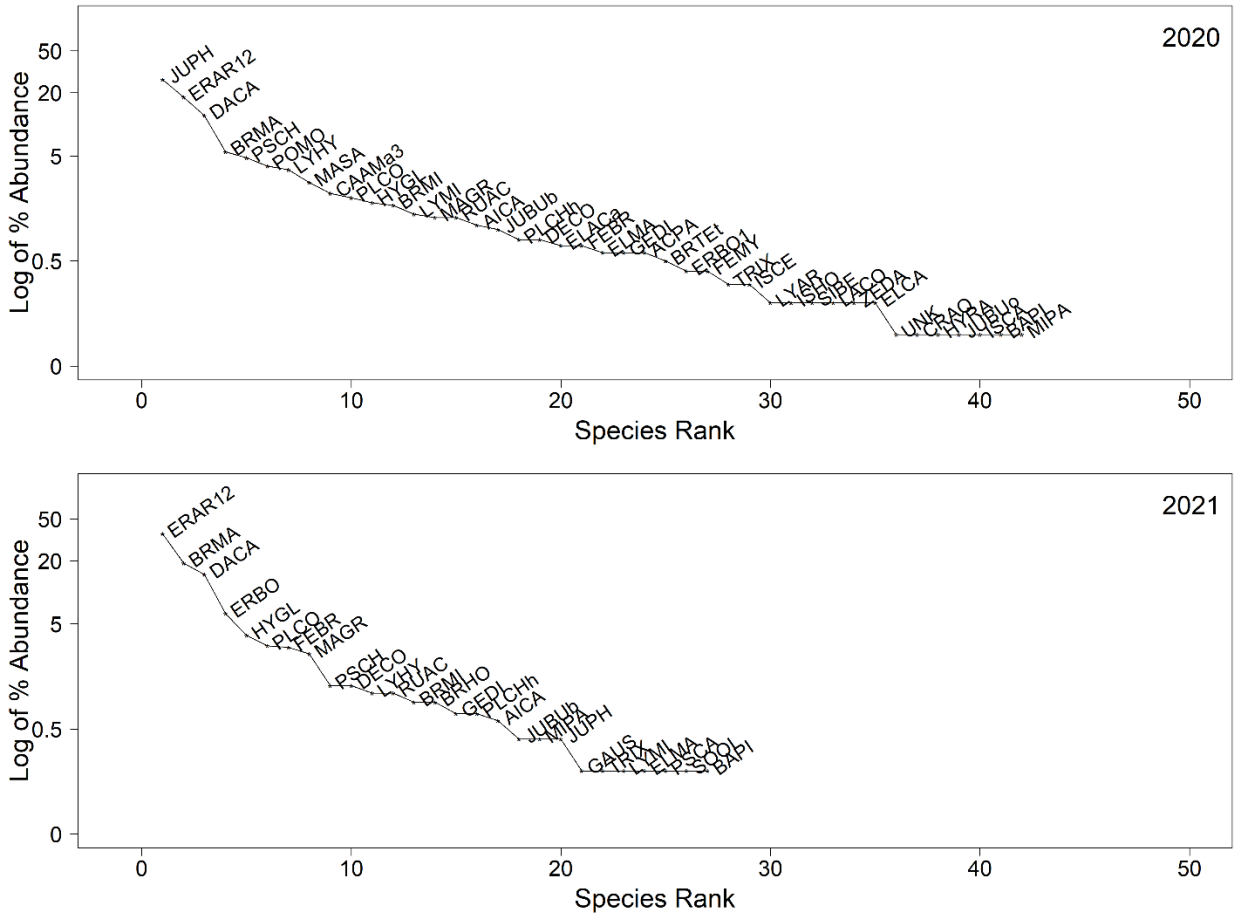

Figure 4-16. Rank Abundance Curves at Pond 997 (Reference) in 2020 and 2021. Note that the y-axis is in log-10 scale.

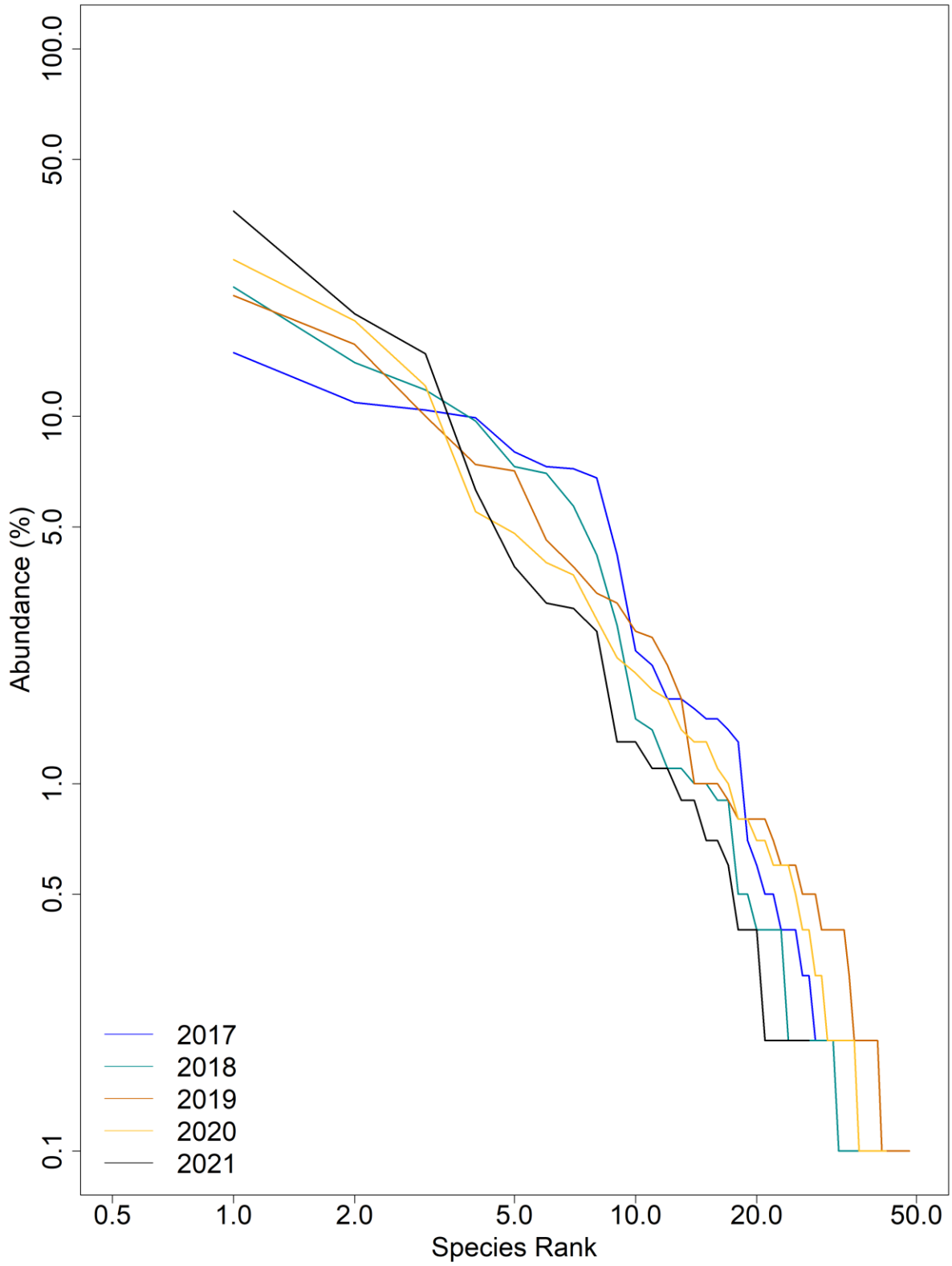

Figure 4-17. Rank Abundance Curves at Pond 997 (Reference) in 2017-2021. Note that the x-axis and y-axis are in log-10 scale.

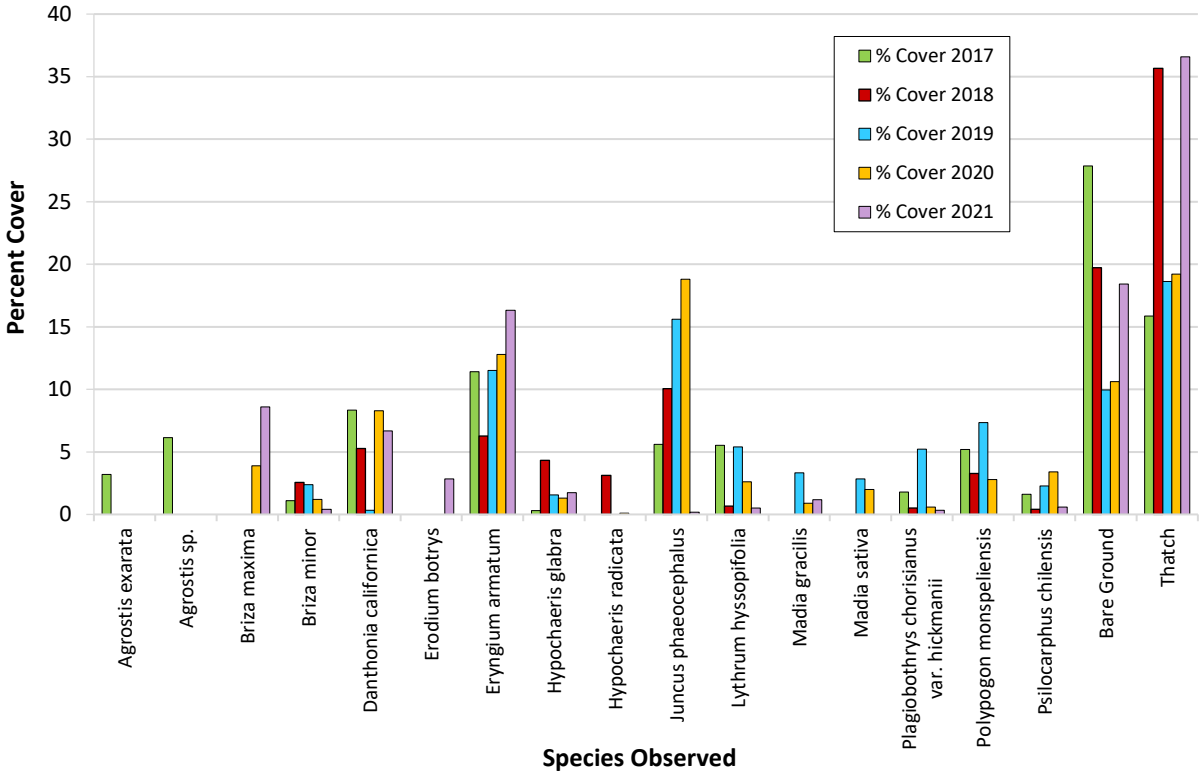

Figure 4-18. Percent Cover of Dominant Species at Pond 997 (Reference)

Native species richness on Pond 997 transects increased from 2017 to 2020 and decreased in 2021. Native and non-native richness values were similar to 2017 (see Table 4-22). Non-native species richness increased from 2017-2019 and decreased in 2020 and 2021. Native relative percent cover has fluctuated from year to year. In 2021, native and non-native cover were similar to 2018 and within the range of values observed in previous years (see Table 4-23).

Table 4-22. Pond 997 (Reference) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
2017	15	11	1
2018	24	19	2
2019	27	21	0
2020	27	14	1
2021	15	12	0

Table 4-23. Pond 997 (Reference) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
2017	66.3%	23.0%	10.7%
2018	56.3%	43.5%	0.2%
2019	68.5%	31.5%	0.0%
2020	76.3%	23.6%	0.1%
2021	59.1%	40.9%	0.0%

Wetland and non-wetland species richness on Pond 997 transects increased from 2017 to 2020 and decreased in 2021 (see Table 4-24). The relative percent cover of wetland and non-wetland species fluctuated between 2017 and 2021 with the lowest recorded value of wetland cover observed in 2021. Non-wetland cover was within the range of values in previous years (see Table 4-25).

Table 4-24. Pond 997 (Reference) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2017	5	10	2	3	0	7
2018	8	10	5	8	0	14
2019	9	9	6	8	1	15
2020	9	10	5	5	0	13
2021	3	5	4	4	1	10

Table 4-25. Pond 997 (Reference) Relative Percent Cover of Wetland and Non-Wetland Species

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2017	19.3%	50.7%	16.5%	0.5%	0.0%	13.0%
2018	4.6%	47.5%	20.7%	14.2%	0.0%	13.0%
2019	18.7%	55.4%	4.6%	3.8%	0.3%	17.1%
2020	6.7%	59.0%	16.1%	3.2%	0.0%	15.0%
2021	2.0%	38.4%	19.0%	8.9%	0.2%	31.4%

4.3.1.1 *Contra Costa Goldfields*

Populations and cover estimates of CCG have been collected from 2017-2021, whereas in previous years only its presence was noted (Burleson, 2018, 2019, 2020, 2021). The area of CCG at Pond 997 has varied from 0.02 acre in 2017, 0.01 acre in 2018, and 0.01 acre in 2019. The area then increased in 2020 to 0.02 acre and decreased back to 0.01 acre in 2021 (see Figure 4-19). The density increased from 10% cover in 2017 to 25% cover in 2018 to 35% in 2019 and back to 10% cover in 2020 and 2021. The CCG population was in a similar location in all survey years. Minor changes in population size can be attributed to natural fluctuation as no remediation has occurred at Pond 997 apart from mastication of a small portion of its watershed in 2017.

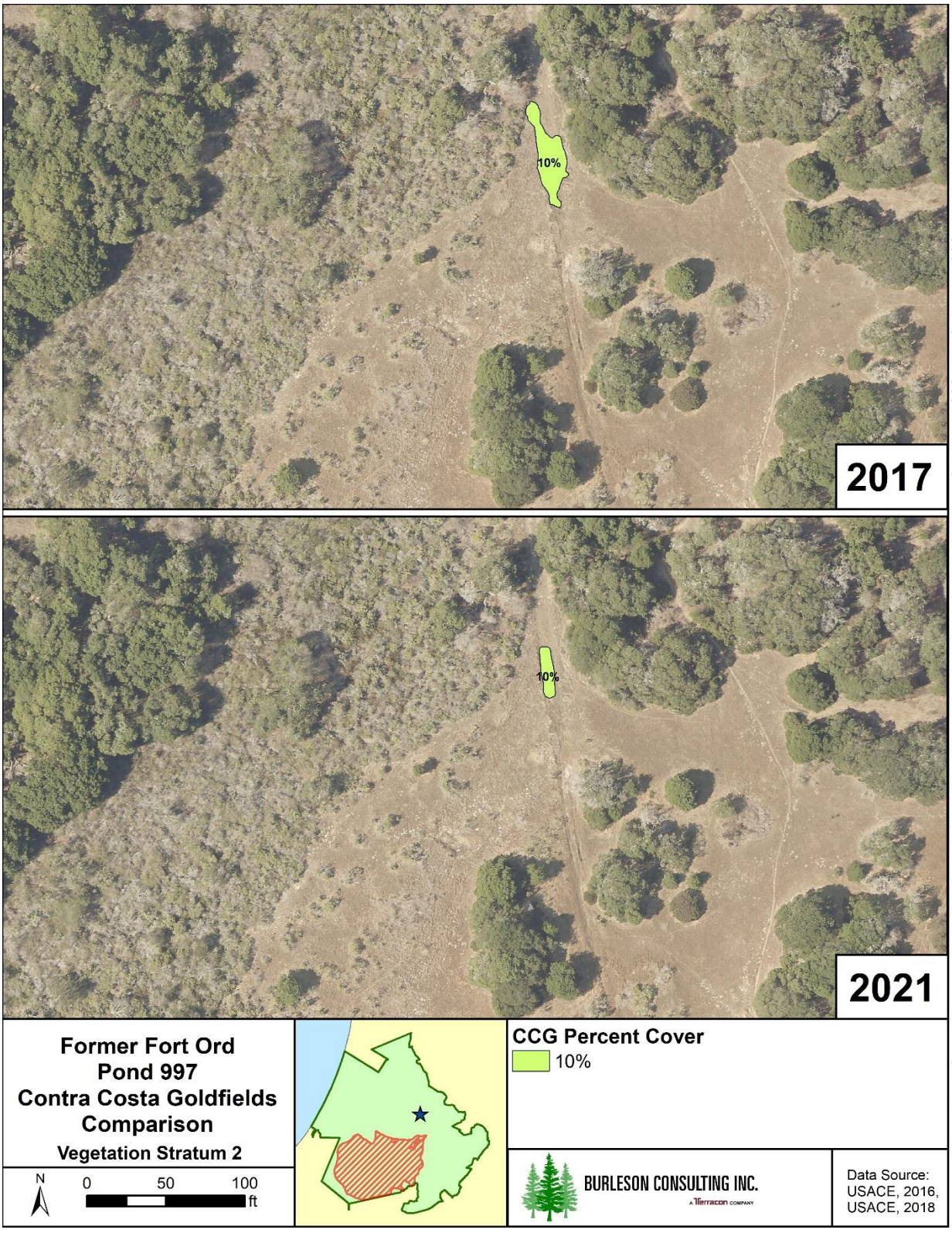

Figure 4-19. Contra Costa Goldfields Populations at Pond 997 (Reference) in 2017 and 2021

4.3.1.2 *Data Quality Objective 3*

Observable changes in hydrophytic vegetation between surveys were largely associated with precipitation fluctuations. This is expected given the dynamic nature of vernal pools and the close relationship between the hydroperiod and wetland vegetation composition. As a reference vernal pool, Pond 997 was used for comparison to remediated vernal pools.

4.3.1.3 *Performance Standard: Plant Cover and Species Diversity*

Pond 997 is a reference vernal pool and not required to meet performance standards. The vernal pool provides a control for comparison to the remediated vernal pools.

4.3.2 Wildlife Monitoring

Wildlife data were collected at Pond 997 in 2017 and 2019 (Burleson, 2018, 2020). California tiger salamander and fairy shrimp were not detected. The vernal pool did not hold sufficient depth for surveys to be completed in 2018, 2020, or 2021. Therefore, DQO 5 and the applicable wildlife usage performance standard cannot be assessed. Table 4-26 shows historical wildlife monitoring results.

Table 4-26. Pond 997 (Reference) Historical Wildlife Monitoring Results

Sampling Year	CTS Larvae Abundance (# Individuals)	Fairy Shrimp Abundance (# Individuals)
2017	Not detected	Not detected
2019	Not detected	Not detected

4.3.3 Conclusion

Pond 997 is used for comparison to remediated vernal pools (see Table 4-27).

Table 4-27. Success at Pond 997 (Reference) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Plant Cover & Species Diversity	DQO 3	Suitable for Comparison
Wildlife Usage	N/A*	N/A*

*Not applicable; wildlife surveys were not conducted due to insufficient depth

4.4 Pond 3 North – Year 3

Pond 3 North was monitored in 2021 as a year 3 post-subsurface munitions remediation vernal pool. Pond 3 North was monitored for baseline conditions in 1998, 2015, and 2016. Vegetation in Pond 3 North and within its watershed was burned in October 2017 as part of the prescribed burn of BLM Area B Subunit B. Pond 3 North had intrusive anomaly investigations in 2018. Table 4-28 summarizes the years that monitoring occurred and surveys were conducted. The cumulative precipitation graph shows precipitation for years in which hydrology monitoring was conducted at Pond 3 North (see Figure 4-20). The 1997-1998, 2015-2016, and 2018-2019 water-years were above normal, whereas 2014-2015, 2017-2018, and 2020-2021 water-years were below normal. Water year 2019-2020 was similar to the cumulative normal water-year.

Table 4-28. Pond 3 North (Year 3 Post-Subsurface Munitions Remediation) Summary of Historical Surveys for Hydrology, Vegetation, and Wildlife

Survey	Water-Year						
	1997-1998	2014-2015	2015-2016	2017-2018	2018-2019	2019-2020	2020-2021
Hydrology	●	●	●	●	●	●	●
Vegetation	●	●		●	●	●	●
Wildlife	●	●	●	●	●	●	

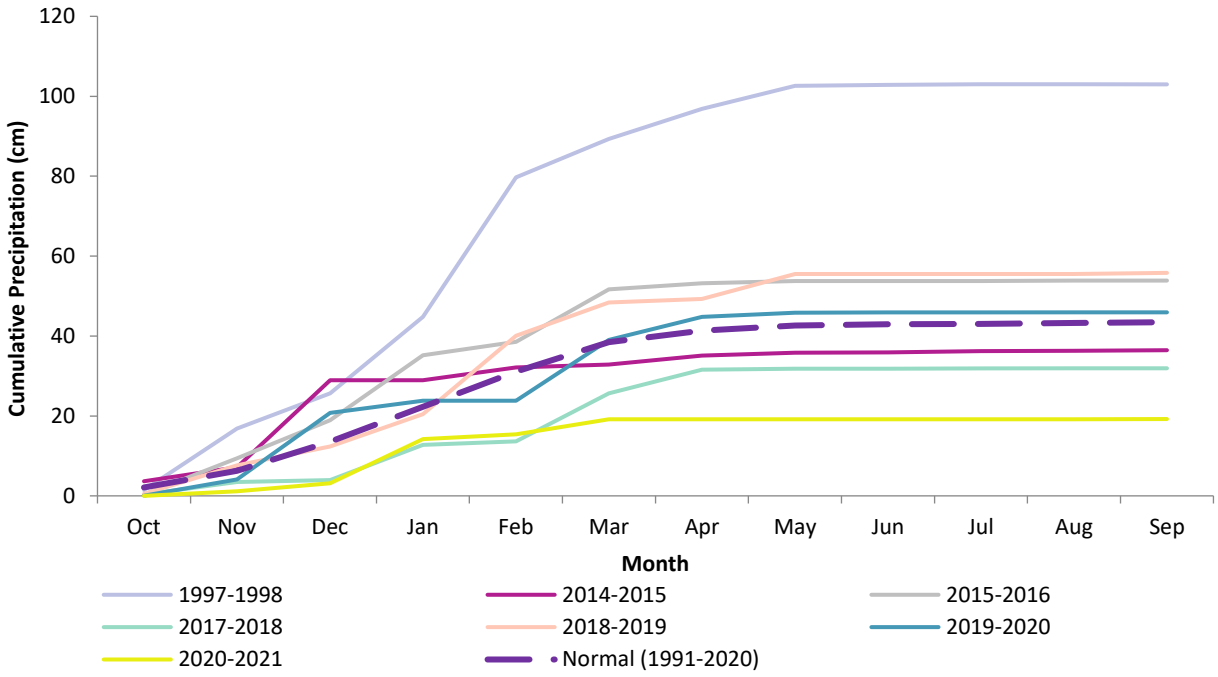

Figure 4-20. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 3 North (Year 3 Post-Subsurface Munitions Remediation) Compared to the 30-Year Normal (mean 1991-2020) (NPS, 2021; NCEI NOAA, 2021)

4.4.1 Vegetation Monitoring

Vegetation data were collected at Pond 3 North in 1998, 2015, 2018, 2019, 2020, and 2021 (HLA, 1998; Burleson, 2016, 2019, 2020, 2021). In 1998, data were collected along one transect with a length of 116 feet. Quadrats were placed at 10-foot intervals, alternating from right to left along the transect. Because 1998 data were collected differently than in other years, strata were combined across the vernal pool to allow for comparison. In 2015, 2018, 2019, 2020, and 2021, data were collected using the methodology described in the Methods section of this report. Data from 2015 and 2021 were compared stratum-to-stratum in Table 4-29 as well as visually in Figure 4-21.

Pond 3 North also supports a CCG population located in stratum 4. The population was mapped and a visual estimate of percent cover was recorded in 2021 to compare to 2015, 2016, 2018, 2019, and 2020 (see Figure 4-23 in Section 4.4.1.1). In 2015, vegetation monitoring was completed on April 22 and CCG

monitoring was completed later, on May 19. The CCG was mapped as an overlay on top of the other strata, not as a separate stratum. Therefore, the acreage percentages for the basin did not include CCG.

Table 4-29. Pond 3 North (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage	
	2015	2021
1	16%	N/A
2	14%	12%
3	70%	52%
4 (CCG)	N/A	35%
Upland	N/A	1%

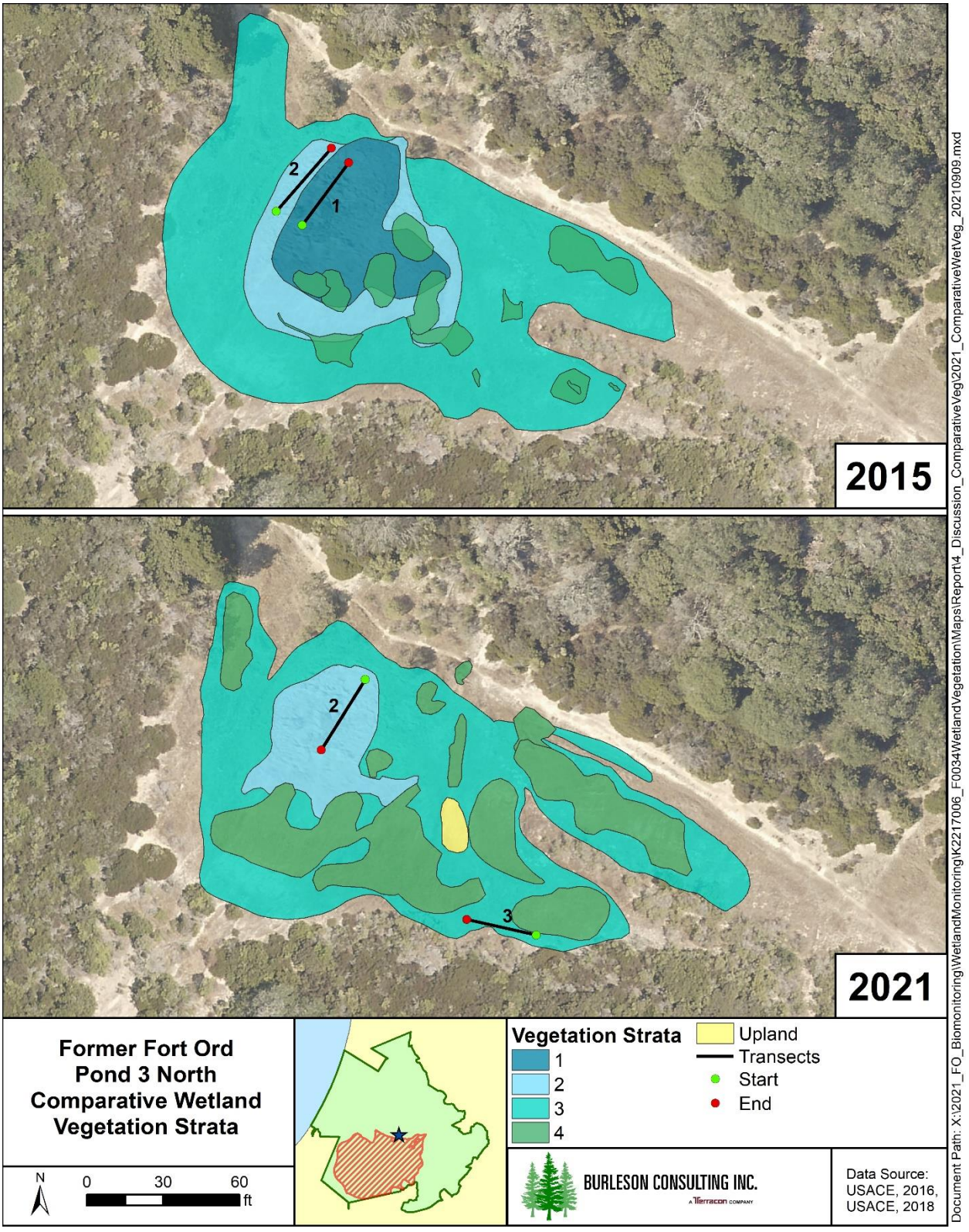

Figure 4-21. Pond 3 North (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects for 2015 and 2021

The absolute percent vegetative cover observed in 2021 was within the range of values in baseline years and most similar to 1998 (see Table 4-30). Vegetative cover ranged in baseline years from 46.1% in 1998 to 80.6% in 2015, whereas thatch/bare ground ranged from 14.8% in 2015 to 54.0% in 1998. The absolute percent vegetative cover was greater than the reference vernal pools and thatch/bare ground was slightly less than reference (see Table 4-31).

Table 4-30. Pond 3 North (Year 3 Post-Subsurface Munitions Remediation) Absolute Percent Cover

Year	Vegetative Cover	Thatch/Bare Ground
1998*	46.1%	54.0%
2015*	80.6%	14.8%
2018	60.2%	40.1%
2019	72.7%	27.3%
2020	57.9%	42.1%
2021	47.8%	52.3%

*baseline year

Table 4-31. Pond 3 North (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Absolute Percent Cover in 2021

Vernal Pool	Vegetative Cover	Thatch/Bare Ground
5	39.3%	60.7%
101 East (East)	38.5%	61.6%
997	45.1%	55.0%
3 North	**47.8%**	**52.3%**

Species richness in 2021 was greater than in baseline years. Species richness on transects was 16, 9, 38, 22, 40, and 45 species in 1998, 2015, 2018, 2019, 2020, and 2021 respectively, whereas overall basin species richness was 24, 82, 90, 74, and 74 species in 2015, 2018, 2019, 2020, and 2021 respectively (see Table 4-32 and Appendix A Table A-4). The 1998 survey was limited to species observed on the transect and overall basin species richness was not recorded. Pond 3 North species richness was greater than the values observed at the reference vernal pools (see Table 4-33 and Appendix E Tables E-22 and E-44).

Species composition at Pond 3 North was similar across monitoring years; the dominant species every year was pale spikerush (*Eleocharis macrostachya*). Other important species in 2015 were brass buttons (*Cotula coronopifolia*) and Hickman's popcornflower (*Plagiobothrys chorisianus* var. *hickmanii*). Coyote thistle (*Eryngium armatum*) and rabbitfoot grass (*Polygonum monspeliensis*) provided moderate cover in 2019. In 2020 and 2021, coyote thistle (*Eryngium armatum*), California oatgrass (*Danthonia californica*), and Italian ryegrass (*Festuca perennis*) were other important contributors. A complete comparison of species composition observed at Pond 3 North in 1998, 2015, 2018, 2019, 2020, and 2021 can be found in Appendix F. Figure 4-22 shows a subset of this comparison for species observed with a 2% cover or greater.

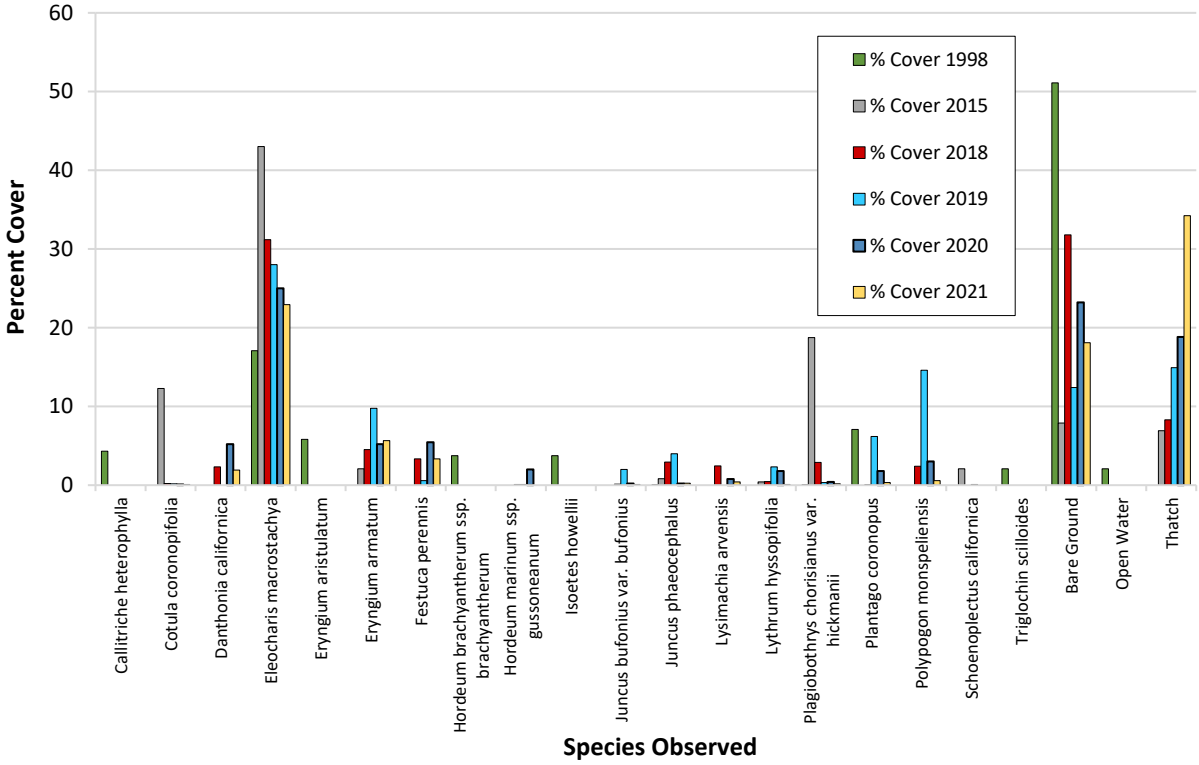

Figure 4-22. Percent Cover of Dominant Species at Pond 3 North (Year 3 Post-Subsurface Munitions Remediation)

Native and non-native species richness in 2021 were greater than baseline and greater than the range of values observed in reference vernal pools (see Table 4-32 and Table 4-33). The relative percent cover of native species was less, and non-native species was greater than the values observed in baseline years of monitoring (see Table 4-34). Conversely, the relative percent cover of native species was greater, and non-native species cover was less than the range of values observed in reference vernal pools (see Table 4-35).

Table 4-32. Pond 3 North (Year 3 Post-Subsurface Munitions Remediation) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
1998*	9	6	1
2015*	7	2	0
2018	22	16	0
2019	13	9	0
2020	23	16	1
2021	23	22	0

*baseline year

Table 4-33. Pond 3 North (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Native and Non-Native Species Richness in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	16	15	0
101 East (East)	10	11	0
997	15	12	0
3 North	**23**	**22**	**0**

Table 4-34. Pond 3 North (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
1998*	81.9%	17.7%	0.4%
2015*	84.2%	15.8%	0.0%
2018	79.0%	21.0%	0.0%
2019	66.3%	33.7%	0.0%
2020	70.9%	28.9%	0.2%
2021	78.2%	21.8%	0.0%

*baseline year

Table 4-35. Pond 3 North (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Native and Non-Native Plants in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	75.0%	25.0%	0.0%
101 East (East)	64.1%	35.9%	0.0%
997	59.1%	40.9%	0.0%
3 North	**78.2%**	**21.8%**	**0.0%**

Wetland and non-wetland species richness on Pond 3 North transects was greater than the baseline years and greater than the range of values observed at reference vernal pools (see Table 4-36 and Table 4-37). The relative percent cover of wetland species was less than the values observed in baseline, while non-wetland cover was greater than baseline (see Table 4-38). However, the relative percent cover of wetland species was greater than the range of values observed at reference vernal pools and non-wetland cover was less than the reference values (see Table 4-39).

Table 4-36. Pond 3 North (Year 3 Post-Subsurface Munitions Remediation) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
1998*	6	2	1	1	0	6
2015*	7	2	0	0	0	0
2018	10	8	5	6	0	9
2019	6	6	5	0	1	4
2020	7	10	6	5	1	11
2021	6	9	6	5	4	15

*baseline year

Table 4-37. Pond 3 North (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Wetland and Non-Wetland Species Richness in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	4	6	3	7	1	10
101 East (East)	2	4	1	4	4	6
997	3	5	4	4	1	10
3 North	**6**	**9**	**6**	**5**	**4**	**15**

Table 4-38. Pond 3 North (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Wetland and Non-Wetland Species

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
1998*	71.9%	8.2%	15.4%	0.2%	0.0%	4.4%
2015*	96.4%	3.6%	0.0%	0.0%	0.0%	0.0%
2018	59.9%	17.1%	15.1%	3.6%	0.0%	4.3%
2019	45.2%	42.0%	10.9%	0.0%	0.2%	1.7%
2020	48.6%	18.4%	26.8%	2.2%	0.1%	3.8%
2021	50.8%	18.2%	13.8%	4.4%	1.4%	11.5%

*baseline year

Table 4-39. Pond 3 North (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Wetland and Non-Wetland Species in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	35.3%	36.5%	3.1%	4.2%	1.7%	19.1%
101 East (East)	17.7%	24.7%	3.6%	29.3%	1.9%	22.8%
997	2.0%	38.4%	19.0%	8.9%	0.2%	31.4%
3 North	**50.8%**	**18.2%**	**13.8%**	**4.4%**	**1.4%**	**11.5%**

4.4.1.1 *Contra Costa Goldfields*

The area of CCG at Pond 3 North increased between 2015 and 2019, then decreased slightly in 2020 and 2021 (Burleson, 2016, 2017, 2019, 2020, 2021). The population occupied 0.04 acre in 2015, 0.13 acre in 2016, 0.14 acre in 2018, 0.18 acre in 2019, 0.16 acre in 2020, and 0.14 acre in 2021 (see Figure 4-23). The densities ranged between 5-75% cover. In all follow-up monitoring years, the CCG population has been in similar locations to the baseline years. This suggests that post-subsurface munitions remediation in 2018 likely did not affect the population. Minor changes in population size can be attributed to natural fluctuation.

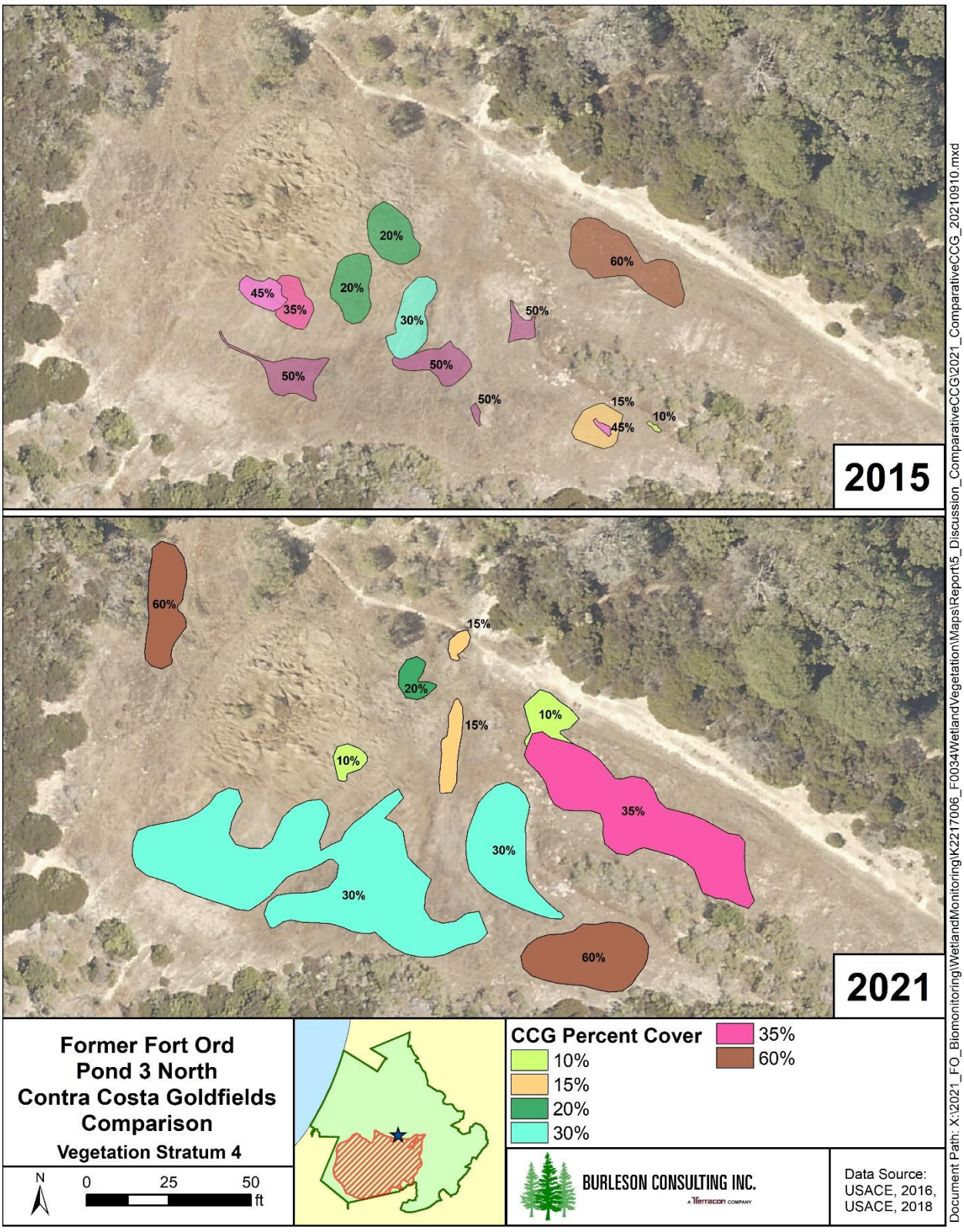

Figure 4-23. Contra Costa Goldfields Populations at Pond 3 North (Year 3 Post-Subsurface Munitions Remediation) in 2015 and 2021

4.4.1.2 *Data Quality Objective 3*

Observable changes in hydrophytic vegetation between surveys were largely associated with precipitation fluctuations. This is expected given the dynamic nature of vernal pools and the close relationship between the hydroperiod and wetland vegetation composition. This year was a historic dry water-year. Below-normal water-years can result in upland and non-native herbs and grasses exploiting a greater portion of a vernal pool and distributing more evenly (Bauder, 2000).

Vegetative cover in Pond 3 North was dominated by native and wetland plant species during year 3 post-subsurface munitions remediation monitoring in 2021. Pond 3 North wetland vegetation results were generally within range of either baseline and/or reference vernal pools with a few exceptions. The native and non-native richness as well as wetland and non-wetland richness were all greater than the baseline years and greater than the range of values observed at reference vernal pools. The increase in native and wetland richness is not concerning. Both support a healthy vernal pool ecosystem. The relatively high numbers of non-native and non-wetland richness is a trend observed across many vernal pools this year including reference Pond 5. This is likely related to a low water-year rather than remediation, but it should be observed closely in future monitoring years. The cover values for native, non-native, wetland and non-wetland were variable in relation to baseline and reference. Of these values, the non-native and non-wetland cover were greater than baseline but were within the range of values observed at reference vernal pools in 2021.

4.4.1.3 *Performance Standard: Plant Cover and Species Diversity*

Pond 3 North, a post-subsurface munitions remediation vernal pool, is not on track to meet the performance standard for year 3 in 2021. The species composition and native and wetland species relative abundances were similar to baseline and/or reference vernal pool conditions. However, non-native and non-wetland species richness was greater than the range of values observed in baseline years and the reference vernal pools. This vernal pool should continue to be monitored as recommended in the PBO (see USFWS, 2017).

4.4.2 Wildlife Monitoring

Wildlife data were collected at Pond 3 North in 1998, 2015, 2016, 2018, 2019, and 2020 (HLA, 1998; Burleson, 2016, 2017, 2019, 2020, 2021). California tiger salamander larvae were not detected in any survey year. Fairy shrimp were present in 1998, 2019, and 2020. The vernal pool did not hold sufficient depth for surveys to be completed in 2021. Therefore, DQO 5 and the applicable wildlife usage performance standard cannot be assessed. Table 4-40 shows historical wildlife monitoring results.

Table 4-40. Pond 3 North (Year 3 Post-Subsurface Munitions Remediation) Historical Wildlife Monitoring Results

Sampling Year	CTS Larvae Abundance (# Individuals)	Fairy Shrimp Abundance (# Individuals)
1998*	Not detected	High
2015*	Not detected	Not detected
2016*	Not detected	Not detected
2018	Not detected	Not detected
2019	Not detected	Low – Moderate (36, 72, 3)
2020	Not detected	Low (6)

*baseline year

4.4.3 Conclusion

Pond 3 North, a post-subsurface munitions remediation vernal pool, was in year 3 of monitoring in 2021. The vernal pool is not on track to meet the plant cover and species diversity performance standard due to high non-native and non-wetland richness (see Table 4-41). Pond 3 North will continue to be monitored in the future.

Table 4-41. Success at Pond 3 North (Year 3 Post-Subsurface Munitions Remediation) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Plant Cover & Species Diversity	DQO 3	Not on track
Wildlife Usage	N/A*	N/A*

*Not applicable; wildlife surveys were not conducted due to insufficient depth

4.5 Pond 3 South – Year 3

Pond 3 South was monitored in 2021 as a year 3 post-subsurface munitions remediation vernal pool. Pond 3 South was monitored for baseline conditions in 1998, 2015, and 2016. Vegetation in Pond 3 South and within its watershed was burned in October 2017 as part of the prescribed burn of BLM Area B Subunit B. Pond 3 South had intrusive anomaly investigations in 2018. Table 4-42 summarizes the years that monitoring occurred and surveys were conducted. The cumulative precipitation graph shows precipitation for years in which hydrology monitoring was conducted at Pond 3 South (see Figure 4-24). The 1997-1998, 2015-2016, and 2018-2019 water-years were above-normal, whereas the 2014-2015, 2017-2018, and 2020-2021 water-years were below-normal. Water-year 2019-2020 was similar to the cumulative normal water-year.

Table 4-42. Pond 3 South (Year 3 Post-Subsurface Munitions Remediation) Summary of Historical Surveys for Hydrology, Vegetation, and Wildlife

Survey	Water-Year						
	1997-1998	2014-2015	2015-2016	2017-2018	2018-2019	2019-2020	2020-2021
Hydrology	●	●	●	●	●	●	●
Vegetation	●		●	●	●	●	●
Wildlife	●		●		●	●	

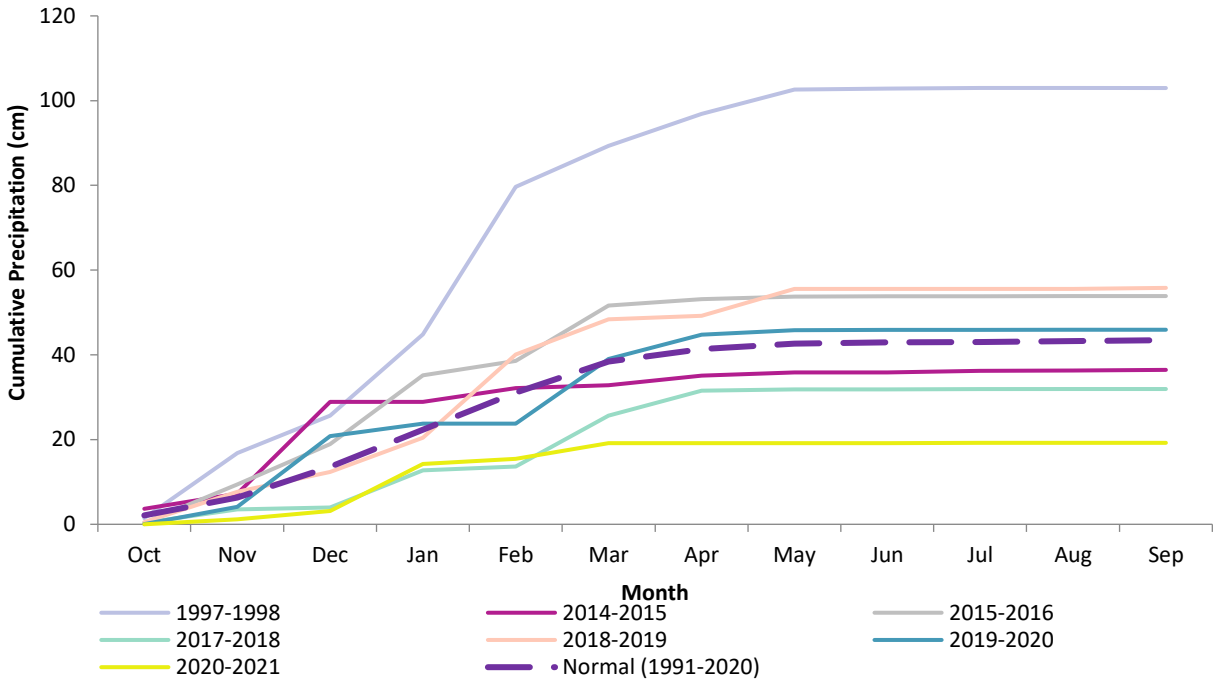

Figure 4-24. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 3 South (Year 3 Post-Subsurface Munitions Remediation) Compared to the 30-Year Normal (mean 1991-2020) (NPS, 2021; NCEI NOAA, 2021)

4.5.1 Vegetation Monitoring

Vegetation data were collected at Pond 3 South in 1998, 2016, 2018, 2019, 2020, and 2021 (HLA, 1998; Burleson, 2017, 2019, 2020, 2021). In 1998, data were collected along one transect with a length of 116 feet. Quadrats were placed at 10-foot intervals, alternating from right to left along the transect. Because 1998 data were collected differently than in other years, strata were combined across the vernal pool to allow for comparison. In 2016, 2018, 2019, 2020, and 2021, data were collected using the methodology described in the Methods section of this report. Data from 2016 and 2021 were compared stratum-to-stratum in Table 4-43 as well as visually in Figure 4-25.

Pond 3 South also supports a CCG population, located in stratum 5. The population was mapped and a visual estimate of percent cover was recorded in 2021 to compare to 2018-2020 (see Figure 4-27 in Section 4.5.1.1).

Table 4-43. Pond 3 South (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage	
	2016	2021
1	20%	29%
2	38%	2%
3	35%	37%
4	5%	24%
5 (CCG)	N/A	0.1%
6	N/A	7%
Upland	2%	2%

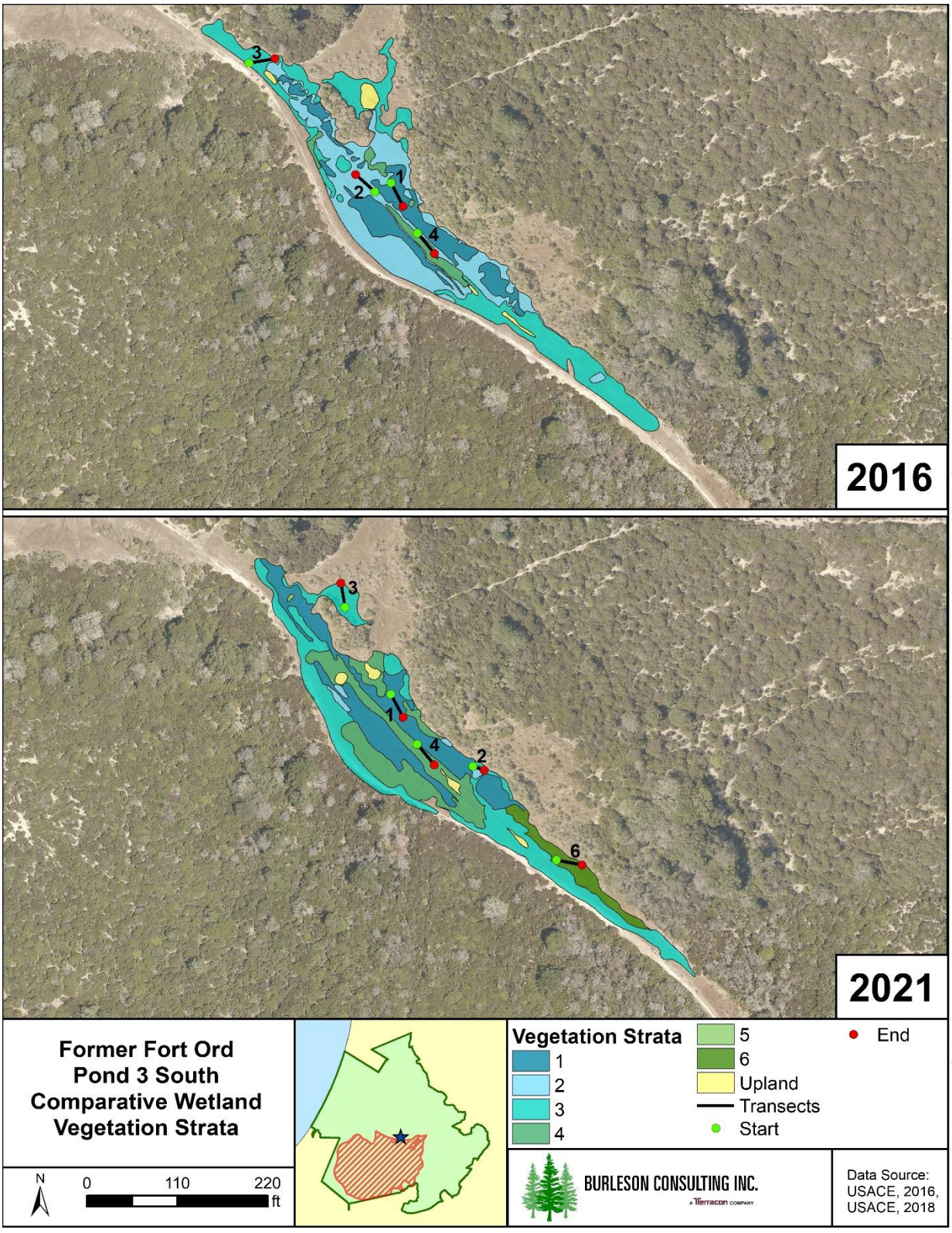

Figure 4-25. Pond 3 South (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects for 2016 and 2021

The absolute percent vegetative cover observed in 2021 was drastically less than baseline years (see Table 4-44). Vegetative baseline cover ranged from 82.8% in 2016 to 90.2% in 1998, whereas thatch/bare ground ranged from 13.9% in 1998 to 15.1% in 2016. Pond 3 South vegetative cover in 2021 was also less than the range of values observed at the reference vernal pools while thatch was greater (Table 4-45).

Table 4-44. Pond 3 South (Year 3 Post-Subsurface Munitions Remediation) Absolute Percent Cover

Year	Vegetative Cover	Thatch/Bare Ground
1998*	90.2%	13.9%
2016*	82.8%	15.1%
2018	59.4%	41.0%
2019	68.9%	31.2%
2020	69.8%	30.6%
2021	31.4%	68.7%

*baseline year

Table 4-45. Pond 3 South (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Absolute Percent Cover in 2021

Vernal Pool	Vegetative Cover	Thatch/Bare Ground
5	39.3%	60.7%
101 East (East)	38.5%	61.6%
997	45.1%	55.0%
3 South	**31.4%**	**68.7%**

Species richness in 2021 was greater than baseline years. Species richness on transects was 38, 30, 49, 55, 54, and 45 species in 1998, 2016, 2018, 2019, 2020, and 2021, respectively, whereas overall basin species richness was 69, 106, 105, 92, and 86 species in 2016, 2018, 2019, 2020, and 2021, respectively (see Table 4-46 and Appendix A Table A-5). The 1998 survey was limited to species on the transect and total vernal pool species richness was not recorded. Pond 3 South species richness in 2021 was greater than the values observed at the reference vernal pools (see Table 4-47 and Appendix E Tables E-22 and E-44).

Species composition at Pond 3 South varied between monitoring years. Brown-headed rush (*Juncus phaeocephalus*) was an abundant species in all years. Pale spikerush (*Eleocharis macrostachya*) was the dominant species in 1998, whereas Italian rye grass (*Festuca perennis*) was dominant in 2016. Coyote thistle (*Eryngium armatum*) and Italian rye grass were the dominant species in 2018. Pale spikerush and Italian ryegrass were also major contributors to cover in 2020. This year, 2021, California oatgrass (*Danthonia californica*) and cut-leaf plantain (*Plantago coronopus*) were most abundant. A complete comparison of species composition observed at Pond 3 South in 1998, 2016, 2018, 2019, 2020, and 2021 can be found in Appendix F. Figure 4-26 shows a subset of this comparison for species observed with a 2% cover or greater.

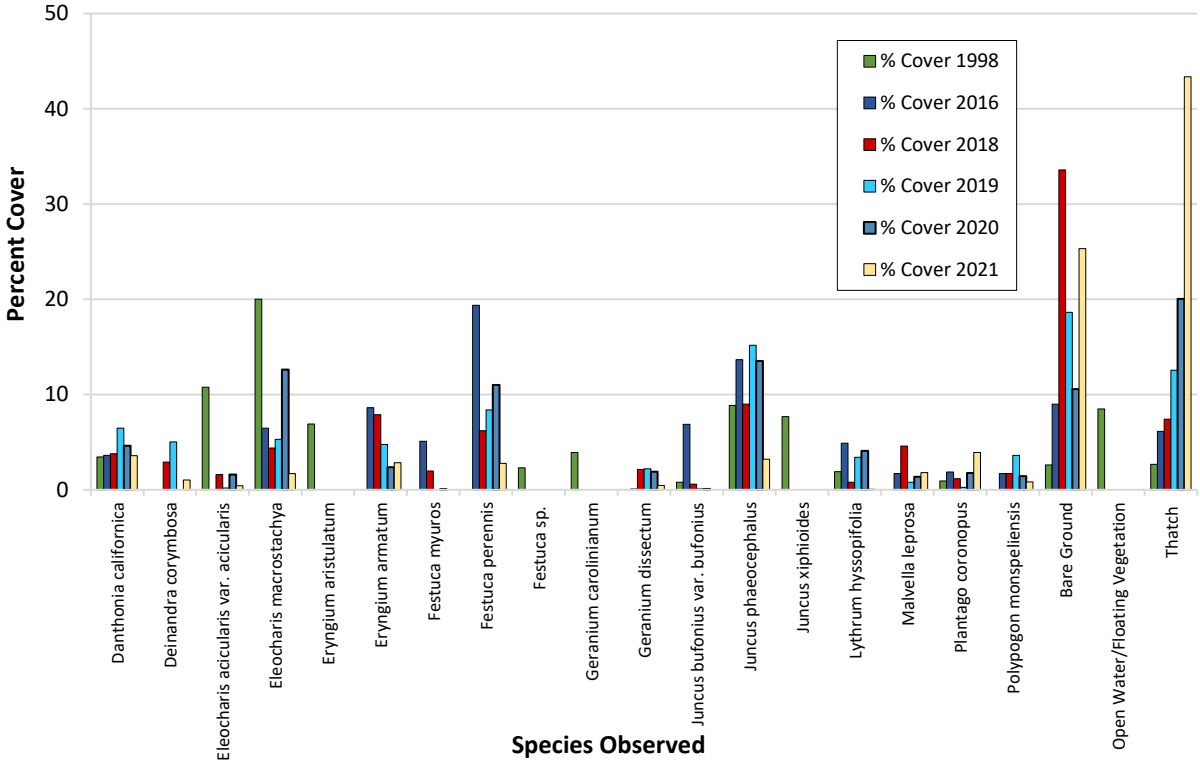

Figure 4-26. Percent Cover of Dominant Species at Pond 3 South (Year 3 Post-Subsurface Munitions Remediation)

Native species richness in 2021 was within the range of values of baseline years and most similar to 1998, whereas non-native species richness was greater than baseline values (see Table 4-46). Native and non-native species richness in 2021 were both greater than the values observed at the reference vernal pools (see Table 4-47). The relative percent cover of native and non-native species were within the range of values observed in baseline years and at reference vernal pools (see Table 4-48 and Table 4-49).

Table 4-46. Pond 3 South (Year 3 Post-Subsurface Munitions Remediation) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
1998*	26	9	3
2016*	16	13	1
2018	26	23	0
2019	34	20	1
2020	33	21	0
2021	25	20	0

*baseline year

Table 4-47. Pond 3 South (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Native and Non-Native Species Richness in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	16	15	0
101 East (East)	10	11	0
997	15	12	0
3 South	**25**	**20**	**0**

Table 4-48. Pond 3 South (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
1998*	84.1%	10.4%	5.5%
2016*	55.0%	44.9%	0.1%
2018	65.7%	34.3%	0.0%
2019	65.9%	34.0%	0.2%
2020	61.7%	38.3%	0.0%
2021	64.7%	35.3%	0.0%

*baseline year

Table 4-49. Pond 3 South (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Native and Non-Native Plants in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	75.0%	25.0%	0.0%
101 East (East)	64.1%	35.9%	0.0%
997	59.1%	40.9%	0.0%
3 South	**64.7%**	**35.3%**	**0.0%**

Wetland and non-wetland species richness in Pond 3 South were greater than baseline and reference vernal pools (see Table 4-50 and Table 4-51). The relative percent cover of wetland species in 2021 was slightly less than baseline while non-wetland cover was within the range of values observed in baseline (see Table 4-52). The relative percent cover of wetland species was greater than the range of values at reference pools, while non-wetland relative percent cover was within the range of values at reference (see Table 4-53).

Table 4-50. Pond 3 South (Year 3 Post-Subsurface Munitions Remediation) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
1998*	9	6	5	4	0	14
2016*	5	7	5	5	0	8
2018	9	11	6	10	1	12
2019	10	13	9	9	1	13
2020	9	12	8	10	1	14
2021	6	9	7	8	1	14

*baseline year

Table 4-51. Pond 3 South (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Wetland and Non-Wetland Species Richness in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	4	6	3	7	1	10
101 East (East)	2	4	1	4	4	6
997	3	5	4	4	1	10
3 South	**6**	**9**	**7**	**8**	**1**	**14**

Table 4-52. Pond 3 South (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Wetland and Non-Wetland Species

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
1998*	55.8%	14.5%	10.0%	3.8%	0.0%	15.9%
2016*	14.8%	39.5%	32.4%	10.1%	0.0%	3.2%
2018	14.1%	33.6%	22.5%	16.1%	0.2%	13.5%
2019	15.4%	37.9%	25.8%	2.4%	1.3%	17.2%
2020	27.9%	27.2%	28.0%	6.3%	1.2%	9.4%
2021	13.5%	29.8%	34.7%	9.7%	0.2%	12.2%

*baseline year

Table 4-53. Pond 3 South (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Wetland and Non-Wetland Species in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	35.3%	36.5%	3.1%	4.2%	1.7%	19.1%
101 East (East)	17.7%	24.7%	3.6%	29.3%	1.9%	22.8%
997	2.0%	38.4%	19.0%	8.9%	0.2%	31.4%
3 South	**13.5%**	**29.8%**	**34.7%**	**9.7%**	**0.2%**	**12.2%**

4.5.1.1 *Contra Costa Goldfields*

The area of CCG at Pond 3 South increased between 2018 and 2019 then decreased in 2020 and 2021 (Burleson, 2019, 2020, 2021). A single CCG plant was documented at Pond 3 South for the first time in 2018. The population occupied 0.003 acre in 2019, 0.002 acre in 2020, and 0.001 acre in 2021. The densities ranged between 5-15% (see Figure 4-27). In 2021, the CCG population was in a similar location to previous years indicating that post-subsurface munitions remediation likely did not affect the population. Minor changes in population size can be attributed to natural fluctuation.

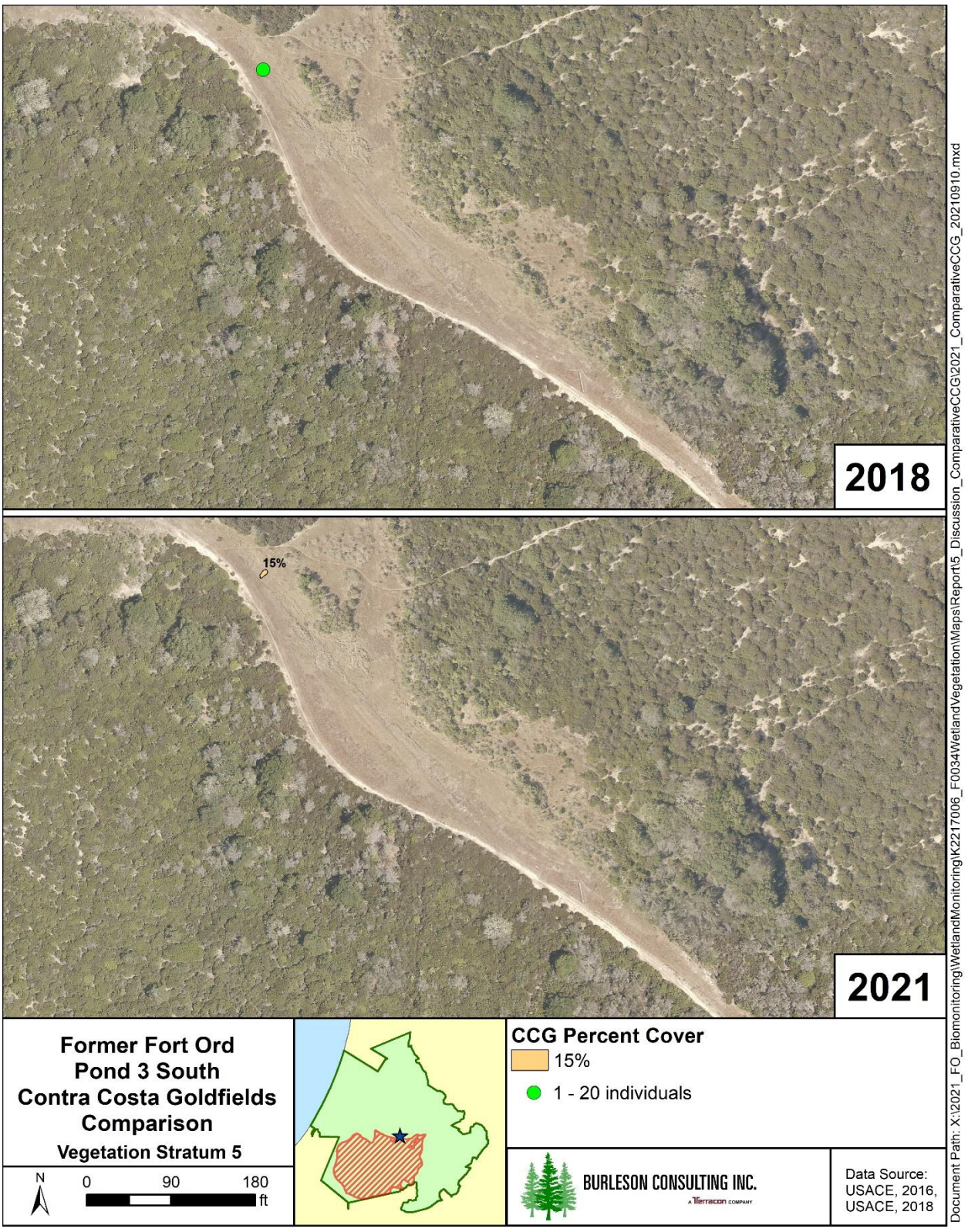

Figure 4-27. Contra Costa Goldfields Populations at Pond 3 South (Year 3 Post-Subsurface Munitions Remediation) in 2018 and 2021

4.5.1.2 *Data Quality Objective 3*

Observable changes in hydrophytic vegetation between surveys were largely associated with precipitation fluctuations. This is expected given the dynamic nature of vernal pools and the close relationship between the hydroperiod and wetland vegetation composition. This year was a historic dry water-year. Below-normal water-years can result in upland and non-native herbs and grasses exploiting a greater portion of a vernal pool and distributing more evenly (Bauder, 2000).

Vegetative cover in Pond 3 South was dominated by native and wetland plant species during year 3 post-subsurface munitions remediation monitoring in 2021. Pond 3 South wetland vegetation results were generally within range of baseline and/or reference vernal pools with a few exceptions. The non-native richness as well as wetland and non-wetland richness were all greater than the baseline years and greater than the range of values observed at reference vernal pools. The increase in wetland richness is not concerning since wetland species generally support a healthy vernal pool ecosystem. The relatively high non-native and non-wetland richness is a trend observed across many vernal pools this year. Another exception was the relative percent cover of wetland species in 2021 for Pond 3 South was slightly less than baseline but was greater than reference. These trends are likely related to a below-normal water-year rather than remediation but should be observed closely in future monitoring years.

4.5.1.3 *Performance Standard: Plant Cover and Species Diversity*

Pond 3 South, a post-burn and post-subsurface munitions remediation vernal pool, is not on track to meet the performance standard for year 3 in 2021. The species composition, and native and wetland species relative abundances were similar to baseline and/or reference vernal pool conditions; however, non-native richness and non-wetland richness were greater. This vernal pool should continue to be monitored as recommended in the PBO (USFWS, 2017).

4.5.2 Wildlife Monitoring

Wildlife data were collected at Pond 3 South in 1998, 2016, 2019, and 2020 (HLA, 1998; Burleson, 2017, 2020, 2021). California tiger salamander larvae were not detected in any survey year. Fairy shrimp were present in 1998, 2019, and 2020. The vernal pool did not hold sufficient depth for surveys to be completed in 2021. Therefore, DQO 5 and the applicable wildlife usage performance standard cannot be assessed. Table 4-54 shows historical wildlife monitoring results.

Table 4-54. Pond 3 South (Year 3 Post-Subsurface Munitions Remediation) Historical Wildlife Monitoring Results

Sampling Year	CTS Larvae Abundance (# Individuals)	Fairy Shrimp Abundance (# Individuals)
1998*	Not detected	Moderate
2016*	Not detected	Not detected
2019	Not detected	Low – Moderate (21, 44, 5)
2020	Not detected	Moderate (13)

*baseline year

4.5.3 Conclusion

Pond 3 South, a post-subsurface munitions remediation vernal pool, was in year 3 of monitoring in 2021. The vernal pool is not on track to meet the plant cover and species diversity performance standard due

to high non-native and non-wetland richness (see Table 4-55). Pond 3 South will continue to be monitored in the future.

Table 4-55. Success at Pond 3 South (Year 3 Post-Subsurface Munitions Remediation) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Plant Cover & Species Diversity	DQO 3	Not on track
Wildlife Usage	N/A*	N/A*

*Not applicable; wildlife surveys were not conducted due to insufficient depth

4.6 Pond 16 –Year 3

Pond 16 was monitored in 2021 as a year 3 post-subsurface munitions remediation vernal pool. Pond 16 was monitored for baseline conditions in 1992, 1994, 1995, 1996, 2009, and 2015. Vegetation within Pond 16 and immediately around it was masticated in the summer of 2016 in preparation for a prescribed burn in Unit 31. Less than 50 percent of the Pond 16 watershed was masticated, and limited vegetation mastication occurred within the inundation area. Pond 16 had intrusive anomaly investigations in 2018. Table 4-56 summarizes the years that monitoring occurred and surveys were conducted. The cumulative precipitation graph shows precipitation for years in which hydrology monitoring was conducted at Pond 16 (see Figure 4-28). The 1994-1995, 2016-2017, and 2018-2019 water-years were above normal. Water-year 2019-2020, as well as 1991-1992 and 1995-1996, were similar to the cumulative normal water-year. Below-normal and drought water years occurred in 1993-1994, 2014-2015, and 2020-2021.

Table 4-56. Pond 16 (Year 3 Post-Subsurface Munitions Remediation) Summary of Historical Surveys for Hydrology, Vegetation, and Wildlife

Survey	Water-Year										
	1991-1992	1993-1994	1994-1995	1995-1996	2008-2009	2014-2015	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
Hydrology	●	●	●	●		●	●	●	●	●	●
Vegetation		●	●	●		●	●		●	●	●
Wildlife	●	●	●	●	●	●			●	●	

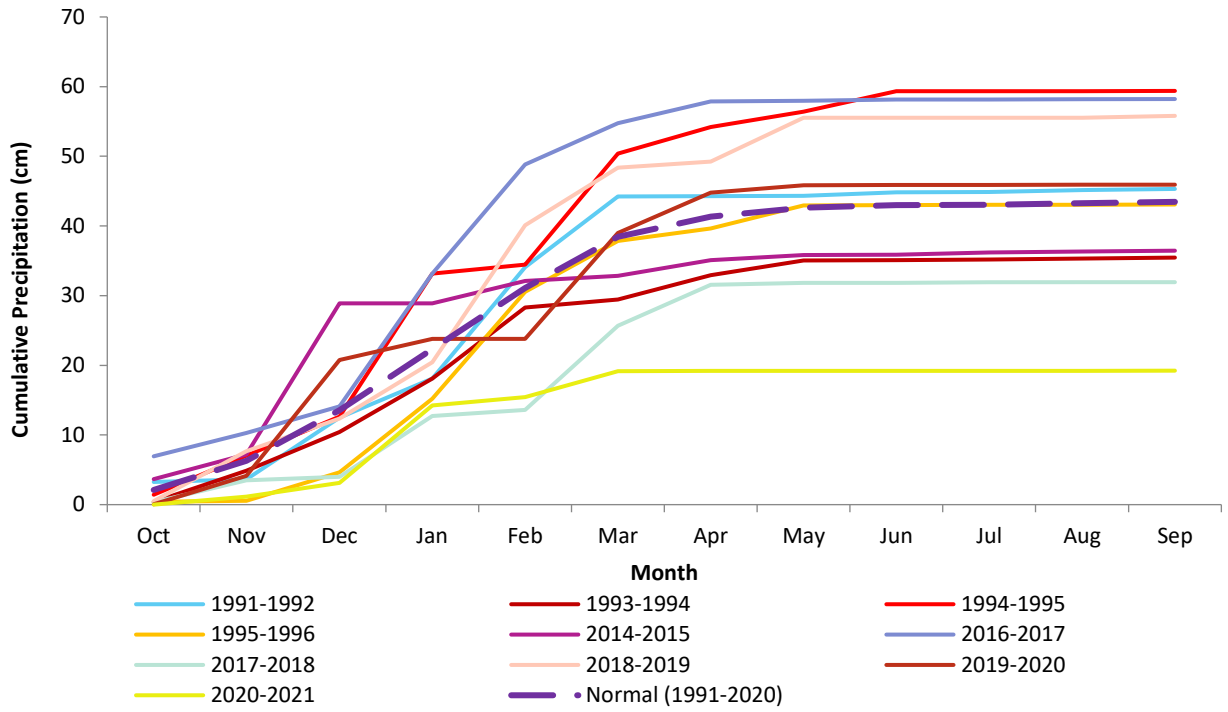

Figure 4-28. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 16 (Year 3 Post-Subsurface Munitions Remediation) Compared to the 30-Year Normal (mean 1991-202p0) (NPS, 2021; NCEI NOAA, 2021)

4.6.1 Vegetation Monitoring

Vegetation data were collected at Pond 16 in 2015, 2017, 2019, 2020, and 2021 (Burleson, 2016, 2018, 2020, 2021). 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). In 2015, 2017, 2019, 2020, and 2021, data were collected using the methodology described in the Methods section of this report. Data from 2015 and 2021 were compared stratum-to-stratum in Table 4-57 as well as visually in Figure 4-29.

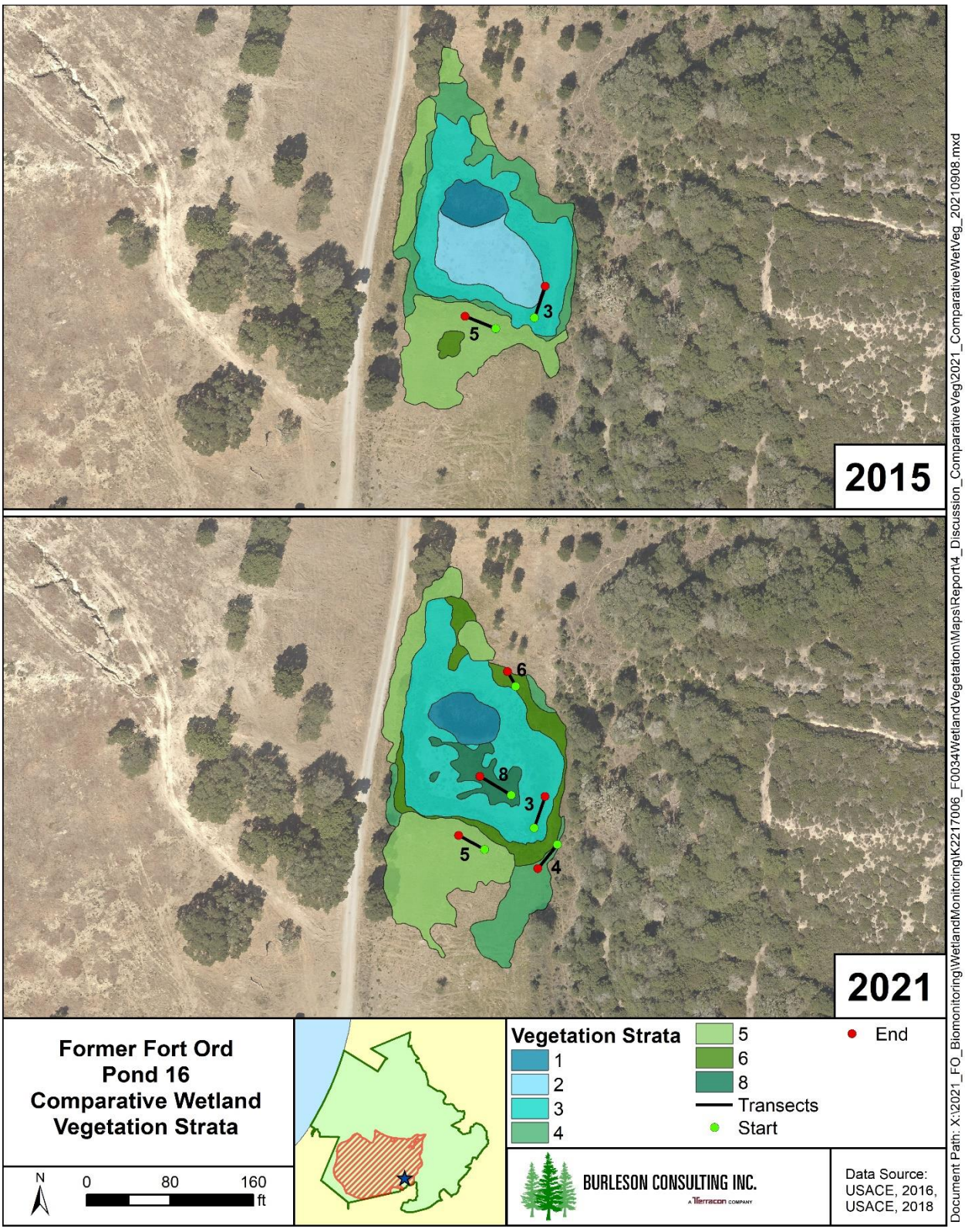

Figure 4-29. Pond 16 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects for 2015 and 2021

Table 4-57. Pond 16 (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage	
	2015	2021
1	8%	5%
2	24%	N/A
3	44%	38%
4	24%	11%
5	N/A	30%
6	N/A	11%
8	N/A	5%

Absolute percent vegetative cover for Pond 16 decreased between baseline and 2021 (see Table 4-58). Conversely, when compared to reference vernal pools the absolute percent vegetative cover was greater while thatch/bare ground cover was less (see Table 4-59).

Table 4-58. Pond 16 (Year 3 Post-Subsurface Munitions Remediation) Absolute Percent Cover

Year	Vegetative Cover	Thatch/Bare Ground
2015*	59.1%	38.8%
2017	77.8%	21.8%
2019	70.6%	29.5%
2020	72.1%	27.8%
2021	56.5%	43.6%

*baseline year

Table 4-59. Pond 16 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Absolute Percent Cover in 2021

Vernal Pool	Vegetative Cover	Thatch/Bare Ground
5	39.3%	60.7%
101 East (East)	38.5%	61.6%
997	45.1%	55.0%
16	**56.5%**	**43.6%**

Species richness in 2021 was greater than the baseline year of monitoring. Species richness on transects was 8, 24, 29, 17, and 23 species in 2015, 2017, 2019, 2020, and 2021 respectively, whereas overall basin species richness was 49, 86, 83, 81, and 82, respectively (see Table 4-60 and Appendix A Table A-6). Pond 16 species richness was less than the values observed on transects at the reference vernal pools but was within the ranges observed for the entire basin (see Table 4-61 and Appendix E Tables E-22 and E-44).

Species composition and the dominant species at Pond 16 were similar between the monitoring years. The dominant species in 2015 was whiteroot (*Carex barbarae*) and the dominant species in 2017, 2019, 2020, and 2021 was pale spike rush (*Eleocharis macrostachya*). Whiteroot and clustered field sedge (*Carex praegracilis*) were also important species in 2017, 2019, and 2020. Rabbitfoot grass (*Polypogon*

monspeliensis) was an important species in 2021. A complete comparison of species composition observed at Pond 16 in 2015, 2017, 2019, 2020, and 2021 can be found in Appendix F. Figure 4-30 shows a subset of this comparison for species observed with a 2% cover or greater.

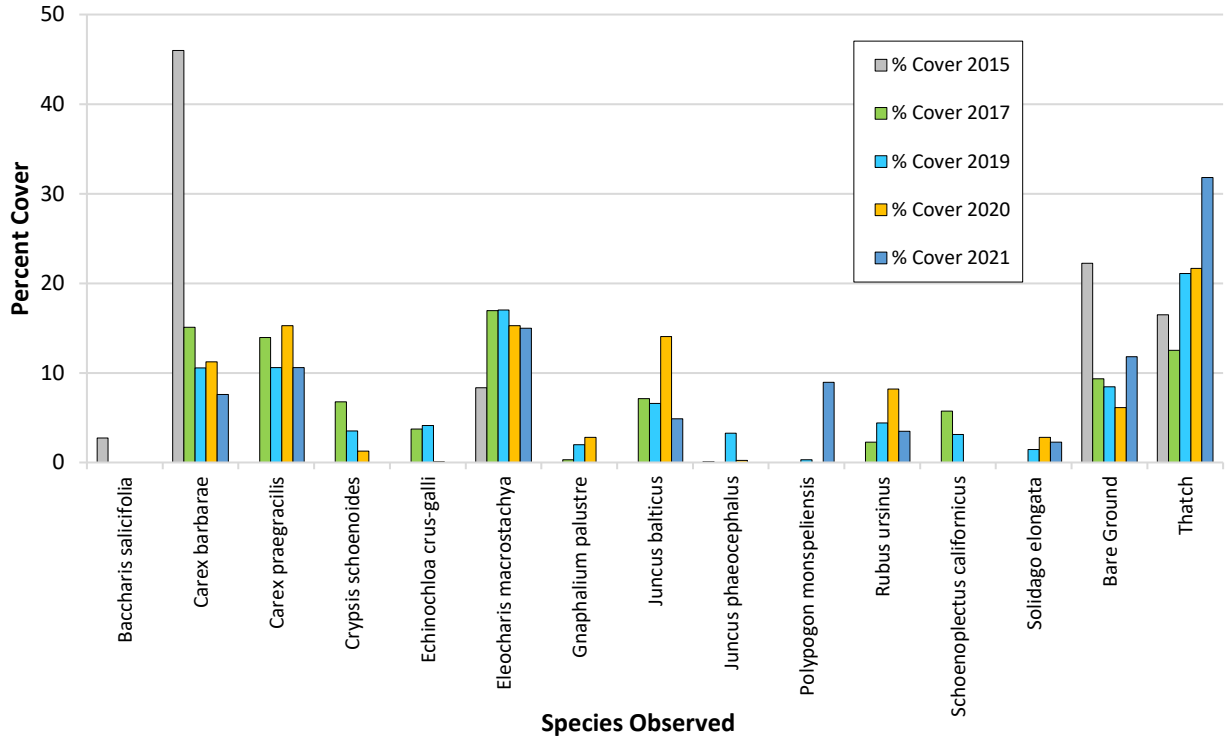

Figure 4-30. Percent Cover of Dominant Species at Pond 16 (Year 3 Post-Subsurface Munitions Remediation)

Native and non-native species richness on Pond 16 transects were greater in 2021 than the baseline year of monitoring (see Table 4-60). Pond 16 native species richness in 2021 was within the range observed at the reference vernal pools and non-native species richness was less than reference values (see Table 4-61). The relative percent cover of native species was less than baseline, while the relative percent cover of non-native species was greater (see Table 4-62). Pond 16 native relative percent cover was greater than the value observed at reference vernal pools and the non-native relative percent cover was less than reference (see Table 4-63).

Table 4-60. Pond 16 (Year 3 Post-Subsurface Munitions Remediation) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
2015*	5	2	1
2017	13	11	0
2019	16	10	3
2020	11	6	0
2021	14	9	0

*baseline year

Table 4-61. Pond 16 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Native and Non-Native Species Richness in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	16	15	0
101 East (East)	10	11	0
997	15	12	0
16	**14**	**9**	**0**

Table 4-62. Pond 16 (Year 3 Post-Subsurface Munitions Remediation) 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%
2019	85.1%	14.5%	0.4%
2020	97.3%	2.7%	0.0%
2021	80.1%	19.9%	0.0%

*baseline year

Table 4-63. Pond 16 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Native and Non-Native Plants in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	75.0%	25.0%	0.0%
101 East (East)	64.1%	35.9%	0.0%
997	59.1%	40.9%	0.0%
16	**80.1%**	**19.9%**	**0.0%**

Wetland and non-wetland species richness on Pond 16 transects were greater in 2021 than in baseline (see Table 4-64). Wetland and non-wetland species richness were within the range of reference vernal pool values (see Table 4-65). The relative percent cover of wetland species was lower than the baseline year whereas non-wetland species cover was greater (see Table 4-66). Relative percent cover of wetland species was greater than the range of values observed at the reference pools, while non-wetland species were within the range of values observed at the reference vernal pools (see Table 4-67).

Table 4-64. Pond 16 (Year 3 Post-Subsurface Munitions Remediation) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC*	FACU*	UPL	
2015†	1	3	1	1	0	2
2017	4	5	3	9	1	2
2019	4	6	5	9	1	5
2020	2	5	5	4	1	0
2021	2	7	4	5	1	4

†baseline year

Table 4-65. Pond 16 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Wetland and Non-Wetland Species Richness in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	4	6	3	7	1	10
101 East (East)	2	4	1	4	4	6
997	3	5	4	4	1	10
16	**2**	**7**	**4**	**5**	**1**	**4**

Table 4-66. Pond 16 (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Wetland and Non-Wetland Species

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC*	FACU*	UPL	
2015†	14.1%	5.2%	77.9%	1.4%	0.0%	1.4%
2017	37.9%	29.4%	24.5%	5.5%	0.4%	2.4%
2019	33.6%	34.1%	21.1%	9.8%	0.0%	1.5%
2020	23.0%	45.0%	16.0%	16.0%	0.1%	0.0%
2021	27.1%	46.1%	14.7%	10.7%	0.1%	1.2%

†baseline year

Table 4-67. Pond 16 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Wetland and Non-Wetland Species in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	35.3%	36.5%	3.1%	4.2%	1.7%	19.1%
101 East (East)	17.7%	24.7%	3.6%	29.3%	1.9%	22.8%
997	2.0%	38.4%	19.0%	8.9%	0.2%	31.4%
16	**27.1%**	**46.1%**	**14.7%**	**10.7%**	**0.1%**	**1.2%**

4.6.1.1 *Data Quality Objective 3*

Observable changes in hydrophytic vegetation between surveys were largely associated with precipitation fluctuations. This is expected given the dynamic nature of vernal pools and the close relationship between the hydroperiod and wetland vegetation composition. This year was a historic dry water-year. Below-normal water-years can result in upland and non-native herbs and grasses exploiting a greater portion of a vernal pool and distributing more evenly (Bauder, 2000).

Vegetative cover in Pond 16 was dominated by native and wetland plant species during year 3 post-subsurface munitions remediation monitoring in 2021. Pond 16 wetland vegetation results were generally within range of either baseline and/or reference vernal pools with a few exceptions. Non-native species richness was greater than baseline but less than reference. The cover values for native, non-native, wetland and non-wetland were variable in relation to baseline and reference. However, the non-native and non-wetland cover values, although greater than baseline, were less than or within the range of values observed at reference vernal pools in 2021. None of the exceptions are concerning but rather are likely related to a below-normal water-year rather than remediation and should be observed closely in future monitoring years.

4.6.1.2 *Performance Standard: Plant Cover and Species Diversity*

Pond 16, a post-subsurface munitions remediation vernal pool, is on track to meet the performance standard for year 3. The species composition, richness, and native and wetland species relative abundances, although not similar to baseline, were within in range of the reference vernal pool conditions or differed in a favorable trajectory for native and wetland species. This vernal pool should continue to be monitored as recommended in the PBO (see USFWS, 2017).

4.6.2 Wildlife Monitoring

Wildlife data were collected at Pond 16 in 1992, 1994, 1995, 1996, 2009, 2015, 2019, and 2020 (USACE 1992, Jones & Stokes 1996; Shaw, 2010; Burleson, 2016, 2020, 2021). California tiger salamander larvae were observed in 2009, 2015, and 2019. Fairy shrimp were present at Pond 16 in every monitoring year except 2015. The vernal pool did not hold sufficient depth for surveys to be completed in 2021. Therefore, DQO 5 and the applicable wildlife usage performance standard cannot be assessed. Table 4-68 shows historical wildlife monitoring results.

Table 4-68. Pond 16 (Year 3 Post-Subsurface Munitions Remediation) Historical Wildlife Monitoring Results

Sampling Year	CTS Larvae Abundance (# Individuals)	Fairy Shrimp Abundance (# Individuals)
1992	Not detected	Present
1994	Not detected	Very Low - High
1995	Not detected	Low - High
1996	Not detected	Present
2009	Common	Moderate - High (32, 105)
2015†	Few – Common (13, 1)	Not detected
2019	Few – Common (5, 87, 46)	Present*
2020	Not detected	High (267)

*Fairy shrimp detected during CTS survey, no fairy shrimp survey was conducted in March due to the presence of CTS eggs.
†baseline year

4.6.3 Conclusion

Pond 16, a post-subsurface munitions remediation vernal pool, was in year 3 of monitoring in 2021. The vernal pool is on track to meet the plant cover and species diversity performance standard (see Table 4-69). Pond 16 will continue to be monitored in the future.

Table 4-69. Success at Pond 16 (Year 3 Post-Subsurface Munitions Remediation) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Plant Cover & Species Diversity	DQO 3	On track
Wildlife Usage	N/A*	N/A*

*Not applicable; wildlife surveys were not conducted due to insufficient depth

4.7 Pond 35 – Year 3

Pond 35 was monitored in 2021 as a year 3 post-subsurface munitions remediation vernal pool. Pond 35 was monitored for baseline conditions in 1992, 1994, 1995, 1996, 2015, and 2016. Vegetation within the Pond 35 watershed was masticated in summer of 2017 in preparation for a prescribed burn of BLM Area B Subunit B. Vegetation within and immediately around Pond 35 was not burned, although parts of the Pond 35 watershed were burned in October 2017. Pond 35 had intrusive anomaly investigations in 2018. Table 4-70 summarizes the years that monitoring occurred and surveys were conducted. The cumulative precipitation graph indicates precipitation for the years that monitoring was conducted at Pond 35 (see Figure 4-31). The 1991-1992, 1994-1995, 1995-1996, 2015-2016, 2018-2019, and 2019-2020 water-years were either normal or above-normal, whereas all other monitoring, including 2020-2021, was conducted during a below-normal water-year, drought year, or consecutive drought year.

Table 4-70. Pond 35 (Year 3 Post-Subsurface Munitions Remediation) Summary of Historical Surveys for Hydrology, Vegetation, and Wildlife

Survey	Water-Year									
	1991-1992	1993-1994	1994-1995	1995-1996	2014-2015	2015-2016	2017-2018	2018-2019	2019-2020	2020-2021
Hydrology	●	●	●	●	●	●	●	●	●	●
Vegetation		●	●	●		●	●	●	●	●
Wildlife		●	●	●				●	●	

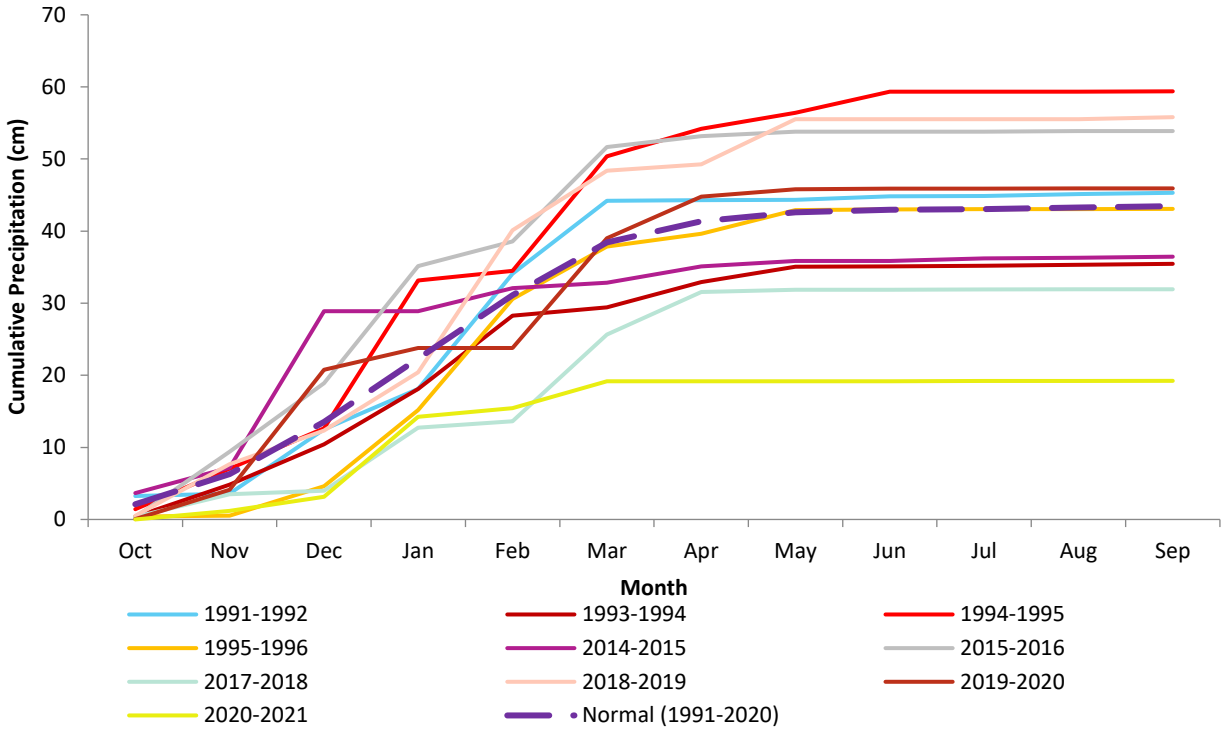

Figure 4-31. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 35 (Year 3 Post-Subsurface Munitions Remediation) Compared to the 30-Year Normal (mean 1991-2020) (NPS, 2021; NCEI NOAA, 2021)

4.7.1 Vegetation Monitoring

Vegetation data were collected at Pond 35 in 2016, 2018, 2019, 2020, and 2021 (Burleson, 2017, 2019, 2021). 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 more recent years (Jones and Stokes, 1996). In 2016, 2018, 2019, 2020, and 2021, data were collected using the methodology described in the Methods section of this report. Data from 2016 and 2021 were compared stratum-to-stratum in Table 4-71 as well as visually in Figure 4-32.

Table 4-71. Pond 35 (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage	
	2016	2021
1	28%	18%
2	39%	42%
3	33%	12%
4	N/A	28%

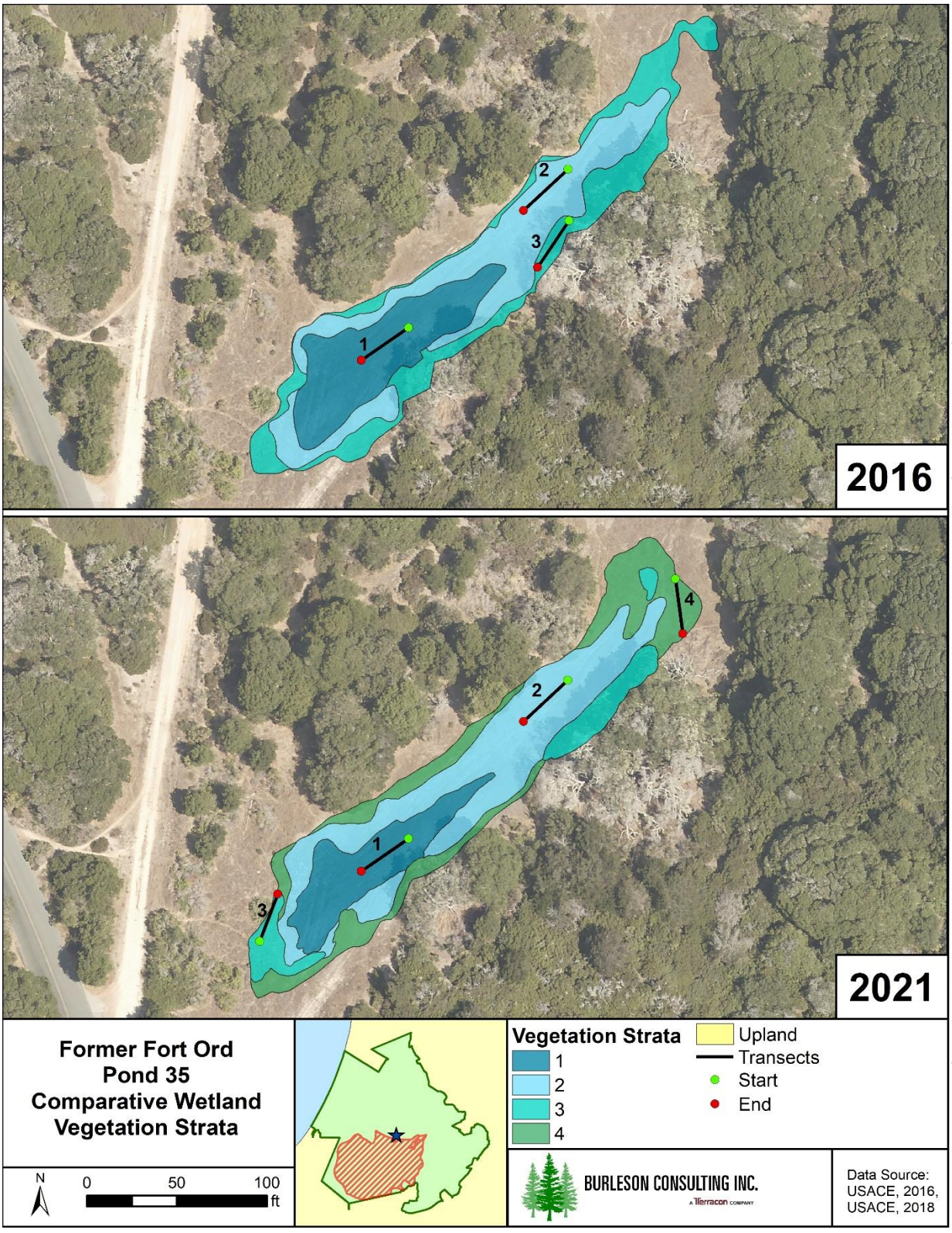

Figure 4-32. Pond 35 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects for 2016 and 2021

Absolute percent vegetative cover observed in 2021 was less than the baseline year and within the range of values observed at the reference vernal pools and was most similar to Pond 101 East (East). (see Table 4-72 and Table 4-73).

Table 4-72. Pond 35 (Year 3 Post-Subsurface Munitions Remediation) Absolute Percent Cover

Year	Vegetative Cover	Thatch/Bare Ground
2016*	52.1%	48.9%
2018	74.3%	27.7%
2019	59.5%	39.8%
2020	66.3%	33.7%
2021	38.7%	61.3%

*baseline year

Table 4-73. Pond 35 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Absolute Percent Cover in 2021

Vernal Pool	Vegetative Cover	Thatch/Bare Ground
5	39.3%	60.7%
101 East (East)	38.5%	61.6%
997	45.1%	55.0%
35	**38.7%**	**61.3%**

Species richness in 2021 was greater than the baseline year of monitoring. Species richness on transects was 12, 38, 25, 26, and 29 species in 2016, 2018, 2019, 2020, and 2021, respectively, whereas overall basin species richness was 35, 64, 79, 60, and 63 species, respectively (see Table 4-74 and Appendix A Table A-7). Pond 35 species richness was within the range observed at the reference vernal pools (see Table 4-75 and Appendix E Tables E-22 and E-44).

Species composition at Pond 35 was similar across years, and the dominant species was either cut-leaved plantain (*Plantago coronopus*) or Hickman's popcornflower (*Plagiobothrys chorisianus* var. *hickmanii*) with fluctuations between years. Other dominant species included meadow barley (*Hordeum brachyantherum*) in 2016 and Italian rye grass (*Festuca perennis*) in 2020. Both meadow barley (*Hordeum brachyantherum*) and Italian rye grass (*Festuca perennis*) were prevalent in 2021. A complete comparison of species composition observed at Pond 35 in 2016, 2018, 2019, 2020, and 2021 can be found in Appendix F. Figure 4-33 shows a subset of this comparison for species observed with a 2% cover or greater.

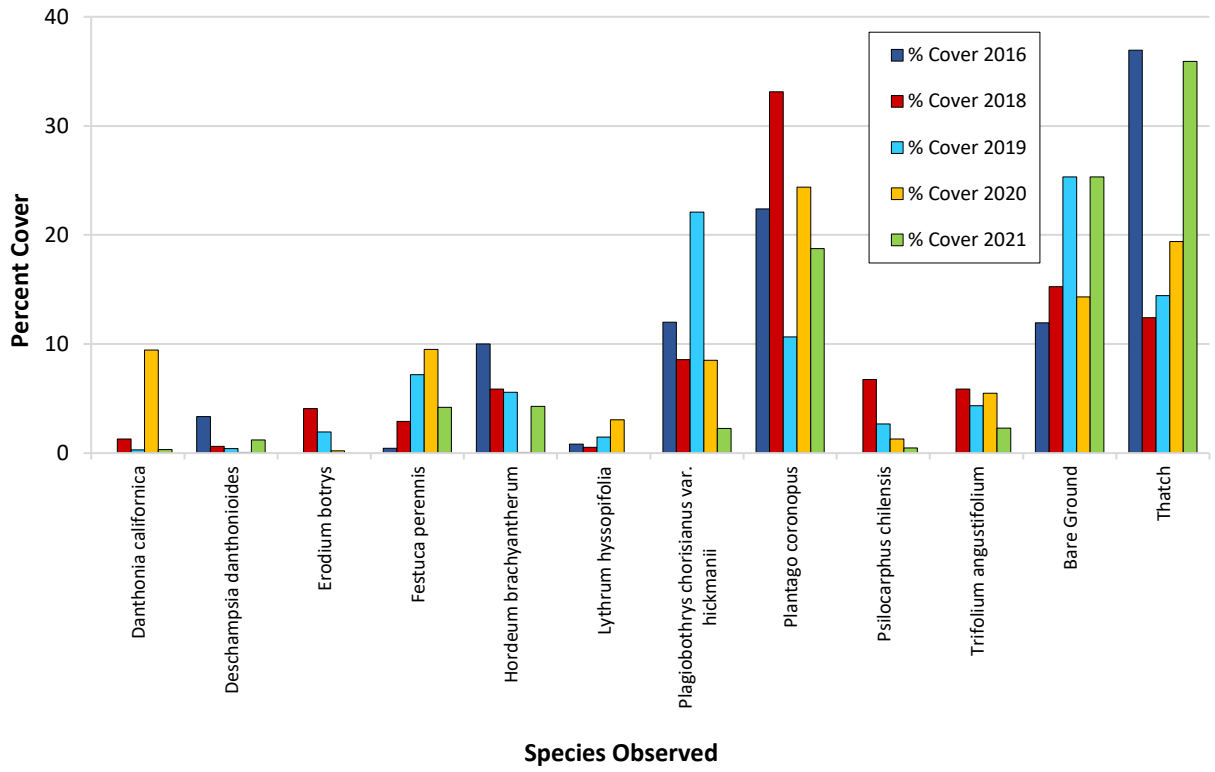

Figure 4-33. Percent Cover of Dominant Species at Pond 35 (Year 3 Post-Subsurface Munitions Remediation)

Native and non-native species richness on Pond 35 transects were greater than baseline in 2021 (see Table 4-74). Pond 35 native species richness was within the range of reference vernal pool values in 2021, while non-native species richness was greater than reference vernal pools (see Table 4-75). The relative percent cover of native species was less than baseline and reference values, and non-native cover was greater (see Table 4-76 and Table 4-77).

Table 4-74. Pond 35 (Year 3 Post-Subsurface Munitions Remediation) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
2016*	6	6	0
2018	14	23	1
2019	10	15	0
2020	10	16	0
2021	12	17	0

*baseline year

Table 4-75. Pond 35 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Native and Non-Native Species Richness in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	16	15	0
101 East (East)	10	11	0
997	15	12	0
35	**12**	**17**	**0**

Table 4-76. Pond 35 (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
2016*	52.0%	48.0%	0.0%
2018	33.2%	66.7%	0.1%
2019	53.8%	46.2%	0.0%
2020	31.4%	68.6%	0.0%
2021	21.7%	78.3%	0.0%

*baseline year

Table 4-77. Pond 35 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Native and Non-Native Plants in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	75.0%	25.0%	0.0%
101 East (East)	64.1%	35.9%	0.0%
997	59.1%	40.9%	0.0%
35	**21.7%**	**78.3%**	**0.0%**

Wetland species richness on Pond 35 transects in 2021 was the same as species richness in baseline, while non-wetland species richness was greater than baseline. (see Table 4-78). The relative percent cover of wetland species was lower and the non-wetland cover was greater than the baseline values (see Table 4-80). The wetland and non-wetland species richness, as well as relative cover of non-wetland species, were within the range of values observed at reference vernal pools, while relative cover of wetland species was greater than the values observed at the reference vernal pools (see Table 4-79 and Table 4-81).

Table 4-78. Pond 35 (Year 3 Post-Subsurface Munitions Remediation) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2016*	5	2	3	0	0	2
2018	7	5	6	7	0	13
2019	6	3	5	4	0	7
2020	6	3	4	5	0	8
2021	4	3	3	7	1	11

*baseline year

Table 4-79. Pond 35 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Wetland and Non-Wetland Species Richness in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	4	6	3	7	1	10
101 East (East)	2	4	1	4	4	6
997	3	5	4	4	1	10
35	**4**	**3**	**3**	**7**	**1**	**11**

Table 4-80. Pond 35 (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Wetland and Non-Wetland Species

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2016*	28.1%	25.6%	45.7%	0.0%	0.0%	0.5%
2018	14.4%	18.0%	50.8%	7.0%	0.0%	9.8%
2019	41.7%	14.5%	30.9%	4.0%	0.0%	9.0%
2020	19.8%	2.1%	65.5%	1.8%	0.0%	10.9%
2021	8.2%	12.4%	60.2%	6.0%	0.2%	12.9%

*baseline year

Table 4-81. Pond 35 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Wetland and Non-Wetland Species in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	35.3%	36.5%	3.1%	4.2%	1.7%	19.1%
101 East (East)	17.7%	24.7%	3.6%	29.3%	1.9%	22.8%
997	2.0%	38.4%	19.0%	8.9%	0.2%	31.4%
35	**8.2%**	**12.4%**	**60.2%**	**6.0%**	**0.2%**	**12.9%**

4.7.1.1 *Data Quality Objective 3*

Observable changes in hydrophytic vegetation between surveys were largely associated with precipitation fluctuations and possibly historical disturbance to this area. Some variability is expected given the dynamic nature of vernal pools and the close relationship between the hydroperiod and wetland vegetation composition. This year was a historic dry water-year. Below-normal water-years can result in upland and non-native herbs and grasses exploiting a greater portion of a vernal pool and distributing more evenly (Bauder, 2000).

Vegetative cover in Pond 35 was dominated by non-native and wetland plant species during year 3 post-subsurface munitions remediation monitoring in 2021. Pond 35 had higher non-native richness and cover compared to baseline and reference vernal pools. These results were similar to those observed in 2018 and 2020. It is unclear whether subsurface munitions remediation caused these changes. More likely it is related to a prolonged drought prior to baseline monitoring as well as historical disturbance and drought conditions in 2021. As mentioned in previous reports, Pond 35 may have high non-native cover and richness due to close proximity to Parker Flats Road and Watkin's Gate Road. The 1996 Annual Wetland Monitoring Report noted Pond 35 as slightly to moderately disturbed, that it may have silt from erosion of adjacent roads, and that it ponded in old tire depressions (Jones and Stokes, 1996). Pale spikerush, an obligate native species, and English plantain (*Plantago lanceolata*), a facultative non-native species, were noted as the two dominant species in 1994. English plantain is indicative of disturbance (Cal-IPC, 2020). Another difference, compared to baseline and reference, was that wetland species cover was less than baseline but greater than the values observed at reference vernal pools. This result is not concerning as it is likely related to a below-normal water-year rather than remediation.

4.7.1.2 *Performance Standard: Plant Cover and Species Diversity*

Pond 35, a post-mastication and post-subsurface munitions remediation vernal pool, is not on track to meet the performance standard for year 3 in 2021. Species composition and wetland species richness were similar to baseline and/or reference, but Pond 35 differed from baseline and reference vernal pools regarding non-native species richness and cover as well as wetland species cover. Non-native species richness and cover increased between 2016 and 2021 and should be closely monitored in future years. The valley in Unit B where Pond 35 is located has historically been heavily disturbed which is likely why, in some years, non-native richness and cover are high. Additionally, a below-normal water-year likely contributed to favorable conditions for non-native species at Pond 35. However, it may also be related to historical disturbance and proximity to roads which was exacerbated by dry conditions. This vernal pool should continue to be monitored as recommended in the PBO (see USFWS, 2017).

4.7.2 Wildlife Monitoring

Wildlife data were collected at Pond 35 in 1992, 1994, 1995, 1996, 2019, and 2020 (Jones and Stokes, 1992, 1996; Burleson, 2020, 2021). California tiger salamander larvae were not detected in any previous survey year. Fairy shrimp were present in 1994, 1995, 1996, 2019, and 2020. The vernal pool did not hold sufficient depth for surveys to be completed in 2021. Therefore, DQO 5 and the applicable wildlife usage performance standard cannot be assessed. Table 4-82 shows historical wildlife monitoring results.

Table 4-82. Pond 35 (Year 3 Post-Subsurface Munitions Remediation) Historical Wildlife Monitoring Results

Sampling Year	CTS Larvae Abundance (# Individuals)	Fairy Shrimp Abundance (# Individuals)
1992*	Not detected	Not detected
1994*	Not detected	Low-High
1995*	Not detected	Moderate-High
1996*	Not detected	Low (1)
2019	Not detected	Moderate (74, 50)
2020	Not detected	High (186)

*baseline year

4.7.3 Conclusion

Pond 35, a post-subsurface munitions remediation vernal pool, was in year 3 of monitoring in 2021. The vernal pool was not on track for the plant cover and species diversity performance standard due to high non-native richness and cover (see Table 4-83). Pond 35 will continue to be monitored in the future.

Table 4-83. Success at Pond 35 (Year 3 Post-Subsurface Munitions Remediation) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Plant Cover & Species Diversity	DQO 3	Not on track
Wildlife Usage	N/A*	N/A*

*Not applicable; wildlife surveys were not conducted due to insufficient depth

4.8 Pond 39 – Year 3

Pond 39 was monitored in 2021 as a year 3 post-subsurface munitions remediation vernal pool. Pond 39 was monitored for baseline conditions in 1998, 2015, and 2016. Vegetation in Pond 39 and within its watershed was burned in October 2017 as part of the prescribed burn of BLM Area B Subunit B. Pond 39 had intrusive anomaly investigations in 2018. Table 4-84 summarizes the years that monitoring occurred and surveys were conducted. The cumulative precipitation graph shows precipitation for years in which hydrology monitoring was conducted at Pond 39 (see Figure 4-34). The 1997-1998, 2015-2016, and 2018-2019 water-years were above normal, whereas the 2014-2015, 2017-2018, and 2020-2021 water-years were below normal. Water-year 2019-2020 was similar to the cumulative normal water-year.

Table 4-84. Pond 39 (Year 3 Post-Subsurface Munitions Remediation) Summary of Historical Surveys for Hydrology, Vegetation, and Wildlife

Survey	Water-Year						
	1997-1998	2014-2015	2015-2016	2017-2018	2018-2019	2019-2020	2020-2021
Hydrology	●	●	●	●	●	●	●
Vegetation	●		●	●	●	●	●
Wildlife	●		●	●	●	●	

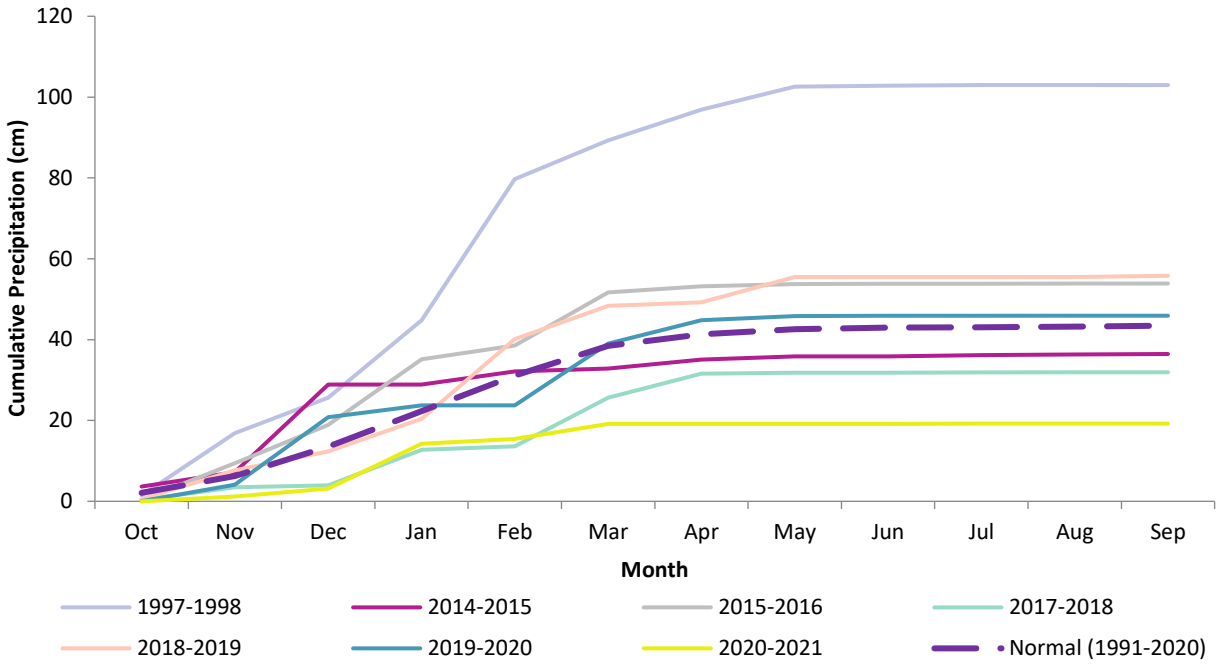

Figure 4-34. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 39 (Year 3 Post-Subsurface Munitions Remediation) Compared to the 30-Year Normal (mean 1991-2020) (NPS, 2021; NCEI NOAA, 2021)

4.8.1 Vegetation Monitoring

Vegetation data were collected at Pond 39 in 1998, 2016, 2018, 2019, 2020, and 2021 (HLA, 1998; Burleson, 2017, 2019, 2020, 2021). In 1998, data were collected along one transect with a length of 239 feet. Quadrats were placed at 10-foot intervals, alternating from right to left along the transect. Because 1998 data were collected differently than in other years, strata were combined across the vernal pool to allow for comparison. In 2016, 2018, 2019, 2020, and 2021, data were collected using the methodology described in the Methods section of this report. Data from 2016 and 2021 were compared stratum-to-stratum in Table 4-85 as well as visually in Figure 4-35.

Table 4-85. Pond 39 (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage	
	2016	2021
1	5%	3%
2	8%	N/A
3	87%	3%
4	N/A	78%
Upland	N/A	16%

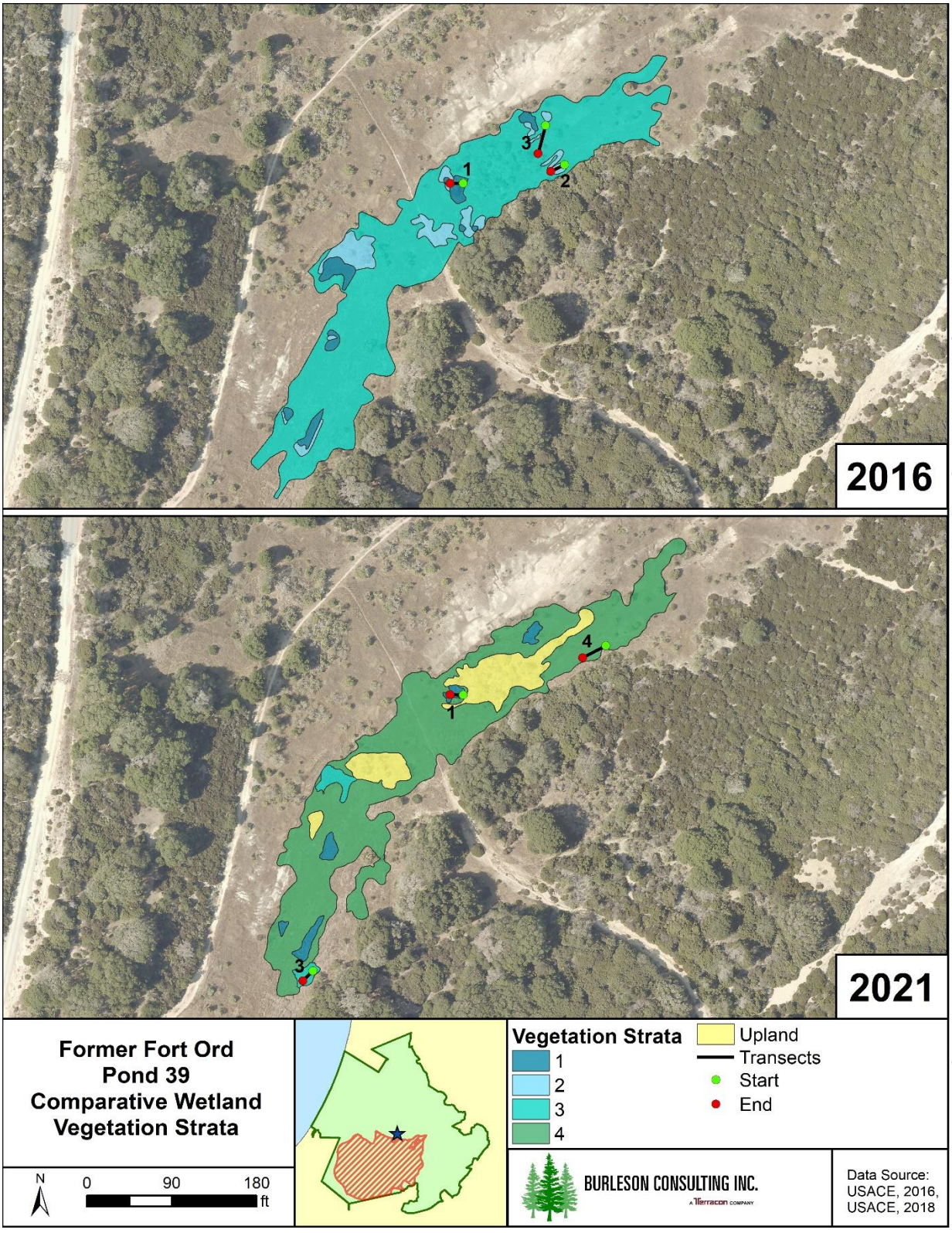

Figure 4-35. Pond 39 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects for 2016 and 2021

Absolute percent vegetative cover was greater in 2021 than in baseline years (see Table 4-86). Vegetative cover ranged in baseline years from 48.7% in 1998 to 61.9% in 2016, whereas thatch/bare ground ranged from 37.4% in 2016 to 51.8% in 1998. The absolute percent vegetative cover of Pond 39 in 2021 was also greater than values observed at the reference vernal pools (see Table 4-87).

Table 4-86. Pond 39 (Year 3 Post-Subsurface Munitions Remediation) Absolute Percent Cover

Year	Vegetative Cover	Thatch/Bare Ground
1998*	48.7%	51.8%
2016*	61.9%	37.4%
2018	59.1%	41.3%
2019	75.2%	25.3%
2020	73.4%	26.6%
2021	64.3%	35.8%

*baseline year

Table 4-87. Pond 39 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Absolute Percent Cover in 2021

Vernal Pool	Vegetative Cover	Thatch/Bare Ground
5	39.3%	60.7%
101 East (East)	38.5%	61.6%
997	45.1%	55.0%
39	**64.3%**	**35.8%**

Species richness in 2021 was within the range of values observed on transects but greater than the values seen in the overall basin in baseline years. Species richness on transects was 22, 30, 35, 46, 32, and 29 species in 1998, 2016, 2018, 2019, 2020, and 2021, respectively, whereas overall basin species richness was 61, 90, 98, 85, and 73 species in 2016, 2018, 2019, 2020, and 2021, respectively (see Table 4-88 and Appendix A Table A-8). The 1998 survey was limited to species on the transect and overall basin species richness was not recorded. Pond 39 species richness was similar to reference vernal pools, with overall basin species richness being slightly higher than the values observed at reference (see Table 4-89 and Appendix E Tables E-22 and E-44).

Species composition varied from year to year at Pond 39. The dominant species were similar between monitoring years; two of the dominant species were pale spikerush (*Eleocharis macrostachya*) and Italian rye grass (*Festuca perennis*) in all monitoring years. Cut-leaved plantain (*Plantago coronopus*) and California oat grass (*Danthonia californica*) were also dominant in 1998, 2018, 2019, and 2020. Narrow-leaved clover (*Trifolium angustifolium*) was dominant in 2019. California oat grass had its greatest presence this year, 2021, comprising a third of the vernal pool absolute cover. A complete comparison of species composition observed at Pond 39 in 1998, 2016, 2018, 2019, 2020, and 2021 can be found in Appendix F. Figure 4-36 shows a subset of this comparison for species observed with a 2% cover or greater.

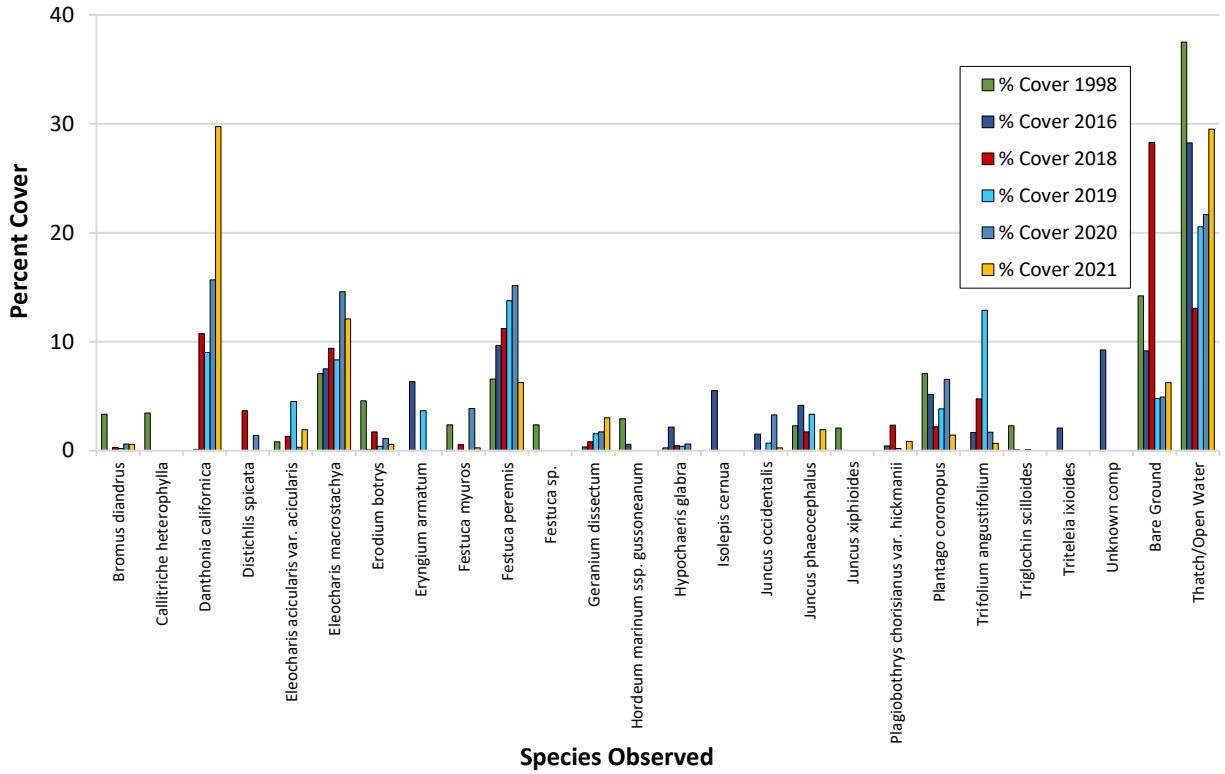

Figure 4-36. Percent Cover of Dominant Species at Pond 39 (Year 3 Post-Subsurface Munitions Remediation)

Native species richness on Pond 39 transects was within the range of values observed in baseline years and values at reference vernal pools. Non-native richness was greater than baseline and reference richness (see Table 4-88 and see Table 4-89). The relative percent cover of native species was greater than the values observed in baseline, while non-native cover was less than the range of values observed in baseline years (see Table 4-90). Pond 39 native and non-native cover were within the range of values observed at reference vernal pools (see Table 4-91).

Table 4-88. Pond 39 (Year 3 Post-Subsurface Munitions Remediation) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
1998*	10	11	1
2016*	14	13	3
2018	16	19	0
2019	25	19	2
2020	12	20	0
2021	11	18	0

*baseline year

Table 4-89. Pond 39 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Native and Non-Native Species Richness in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	16	15	0
101 East (East)	10	11	0
997	15	12	0
39	**11**	**18**	**0**

Table 4-90. Pond 39 (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
1998*	39.8%	60.2%	0.0%
2016*	47.1%	37.1%	15.7%
2018	54.3%	45.7%	0.0%
2019	46.8%	53.0%	0.2%
2020	52.0%	48.0%	0.0%
2021	74.3%	25.7%	0.0%

*baseline year

Table 4-91. Pond 39 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Native and Non-Native Plants in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	75.0%	25.0%	0.0%
101 East (East)	64.1%	35.9%	0.0%
997	59.1%	40.9%	0.0%
39	**74.3%**	**25.7%**	**0.0%**

Wetland species richness on Pond 39 transects was less than baseline and non-wetland species richness was greater than baseline (see Table 4-92). Pond 39 wetland and non-wetland species richness were within the range of values observed at reference vernal pools in 2021 (see Table 4-93). The relative percent cover of wetland species was greater than baseline years and non-wetland cover was within the range of baseline (see Table 4-94). The relative percent cover of wetland species was greater than reference vernal pools and non-wetland cover was less than reference vernal pools (Table 4-95).

Table 4-92. Pond 39 (Year 3 Post-Subsurface Munitions Remediation) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
1998*	7	2	6	3	0	4
2016*	5	5	7	3	0	10
2018	4	7	6	5	1	12
2019	6	9	6	4	2	19
2020	2	2	5	7	2	14
2021	4	3	6	4	3	9

*baseline year

Table 4-93. Pond 39 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Wetland and Non-Wetland Species Richness in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	4	6	3	7	1	10
101 East (East)	2	4	1	4	4	6
997	3	5	4	4	1	10
39	**4**	**3**	**6**	**4**	**3**	**9**

Table 4-94. Pond 39 (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Wetland and Non-Wetland Species

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
1998*	32.8%	5.8%	38.9%	14.5%	0.0%	7.9%
2016*	24.2%	20.1%	28.9%	2.4%	0.0%	24.4%
2018	23.0%	12.4%	41.9%	6.1%	1.2%	15.3%
2019	18.2%	14.7%	36.4%	2.1%	1.3%	27.3%
2020	20.3%	6.4%	51.7%	10.3%	0.3%	11.1%
2021	23.2%	3.8%	58.8%	3.1%	1.9%	9.2%

*baseline year

Table 4-95. Pond 39 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Wetland and Non-Wetland Species in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	35.3%	36.5%	3.1%	4.2%	1.7%	19.1%
101 East (East)	17.7%	24.7%	3.6%	29.3%	1.9%	22.8%
997	2.0%	38.4%	19.0%	8.9%	0.2%	31.4%
39	**23.2%**	**3.8%**	**58.8%**	**3.1%**	**1.9%**	**9.2%**

4.8.1.1 *Data Quality Objective 3*

Observable changes in hydrophytic vegetation between surveys were largely associated with precipitation fluctuations and possibly historical disturbance to this area. Some variability is expected given the dynamic nature of vernal pools and the close relationship between the hydroperiod and wetland vegetation composition. This year was a historic dry water-year. Below-normal water-years can result in upland and non-native herbs and grasses exploiting a greater portion of a vernal pool and distributing more evenly (Bauder, 2000).

Vegetative cover in Pond 39 was dominated by native and wetland plant species during year 3 post-subsurface munitions remediation monitoring in 2021. Non-native richness was greater than the values observed in baseline years of monitoring and reference vernal pools. This was the case in 2020 as well. The relatively high numbers of non-native richness was a trend observed across many vernal pools this year. This is likely related to a below-normal water-year rather than remediation, but it should be observed closely in future monitoring years. Despite high non-native richness, the relative percent cover of native plants was greater than baseline and non-native cover was less. Native and non-native plants were within the range of reference values. Also, the relative percent cover of wetland plants was higher than baseline and reference.

4.8.1.2 *Performance Standard: Plant Cover and Species Diversity*

Pond 39, a post-subsurface munitions remediation vernal pool, was not on track to meet the performance standard for year 3 in 2021. The species composition and native and wetland species relative abundances were similar to baseline and/or reference vernal pool conditions. However, there was an increase in non-native species richness. The valley in Unit B where Pond 39 is located has historically been heavily disturbed which is likely why, in some years, non-native and non-wetland richness is high. A low water-year likely contributed to favorable conditions for non-native species at Pond 39. Fortunately, the relative abundance of native and wetland species increased when compared to baseline. This vernal pool should continue to be monitored as recommended in the PBO (see USFWS, 2017).

4.8.2 Wildlife Monitoring

Wildlife data were collected at Pond 39 in 1998, 2016, 2018, 2019, and 2020 (HLA, 1998; Burleson, 2017, 2019, 2020, 2021). California tiger salamander larvae were not detected in any survey year. Fairy shrimp were present in 1998, 2018, 2019, and 2020. The vernal pool did not hold sufficient depth for surveys to be completed in 2021. Therefore, DQO 5 and the applicable wildlife usage performance standard cannot be assessed. Table 4-96 shows historical wildlife monitoring results.

Table 4-96. Pond 39 (Year 3 Post-Subsurface Munitions Remediation) Historical Wildlife Monitoring Results

Sampling Year	CTS Larvae Abundance (# Individuals)	Fairy Shrimp Abundance (# Individuals)
1998*	Not detected	Moderate
2016*	Not detected	Not detected
2018	Not detected	Low (8)
2019	Not detected	Low – Moderate (71, 37, 7)
2020	Not detected	Low (5)

*baseline year

4.8.3 Conclusion

Pond 39, a post-subsurface munitions remediation vernal pool, was in year 3 of monitoring in 2021. The vernal pool was not on track to meet the plant cover and species diversity performance standard due to high non-native richness (see Table 4-97). Pond 39 will continue to be monitored in the future.

Table 4-97. Success at Pond 39 (Year 3 Post-Subsurface Munitions Remediation) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Plant Cover & Species Diversity	DQO 3	Not on track
Wildlife Usage	N/A*	N/A*

*Not applicable; wildlife surveys were not conducted due to insufficient depth

4.9 Pond 40 South – Year 3

Pond 40 South was monitored in 2021 as a year 3 post-subsurface munitions remediation vernal pool. Pond 40 South was monitored for baseline conditions in 1998, 2015, 2016, and 2017. Vegetation in Pond 40 South and within its watershed was burned in October 2017 as part of the prescribed burn of BLM Area B Subunit B. Pond 40 South had intrusive anomaly investigations in 2018. Table 4-98 summarizes the years that monitoring occurred and surveys were conducted. The cumulative precipitation graph shows precipitation for years in which hydrology monitoring was conducted at Pond 40 South (see Figure 4-37). The 1997-1998, 2015-2016, 2016-2017, and 2018-2019 water-years were above normal, whereas 2014-2015, 2017-2018, and 2020-2021 water-years were below normal. Water-year 2019-2020 was similar to the cumulative normal water-year.

Table 4-98. Pond 40 South (Year 3 Post-Subsurface Munitions Remediation) Summary of Historical Surveys for Hydrology, Vegetation, and Wildlife

Survey	Water-Year							
	1997-1998	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
Hydrology	●	●	●	●	●	●	●	●
Vegetation	●		●		●	●	●	●
Wildlife	●		●			●	●	

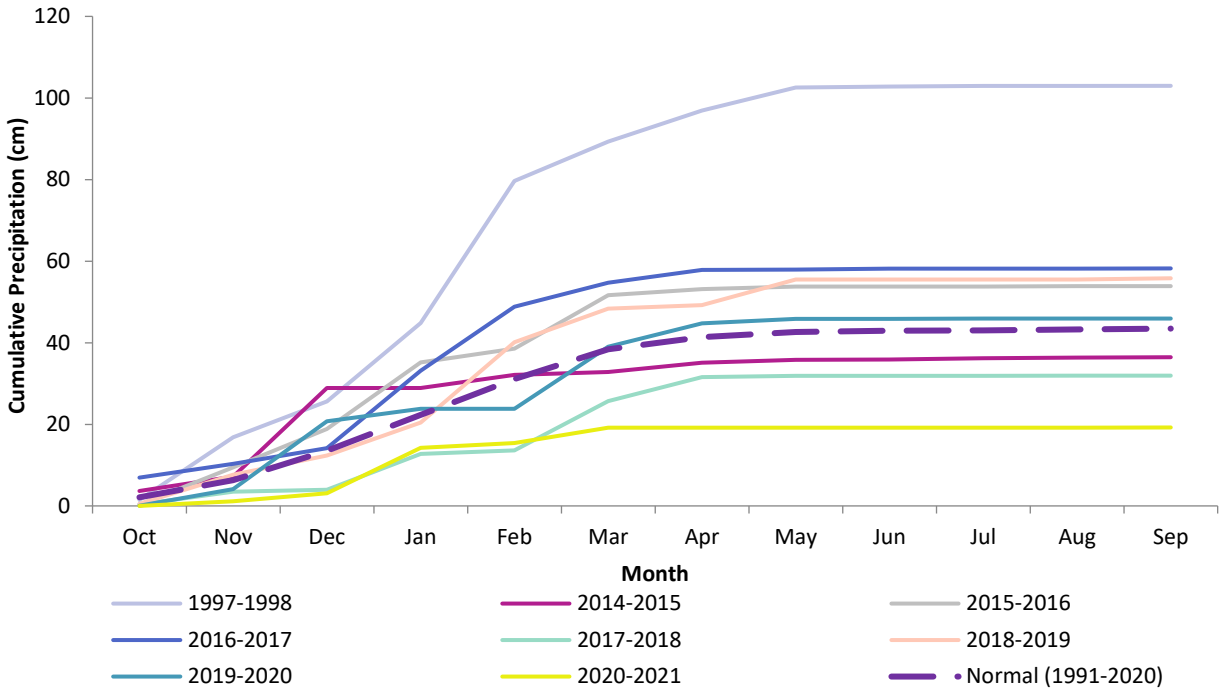

Figure 4-37. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 40 South (Year 3 Post-Subsurface Munitions Remediation) Compared to the 30-Year Normal (mean 1991-2020) (NPS, 2021; NCEI NOAA, 2021)

4.9.1 Vegetation Monitoring

Vegetation data were collected at Pond 40 South in 1998, 2016, 2018, 2019, 2020, and 2021 (HLA, 1998; Burleson, 2017, 2019, 2020, 2021). In 1998, data were collected along one transect with a length of 135 feet. Quadrats were placed at 10-foot intervals, alternating from right to left along the transect. Because 1998 data were collected differently than in other years, strata were combined across the vernal pool to allow for comparison. In 2016, 2018, 2019, 2020, and 2021 data were collected using the methodology described in the Methods section of this report. Data from 2016 and 2021 were compared stratum-to-stratum in Table 4-99 as well as visually in Figure 4-38.

Table 4-99. Pond 40 South (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage	
	2016	2021
1	9%	10%
2	26%	55%
3	65%	35%

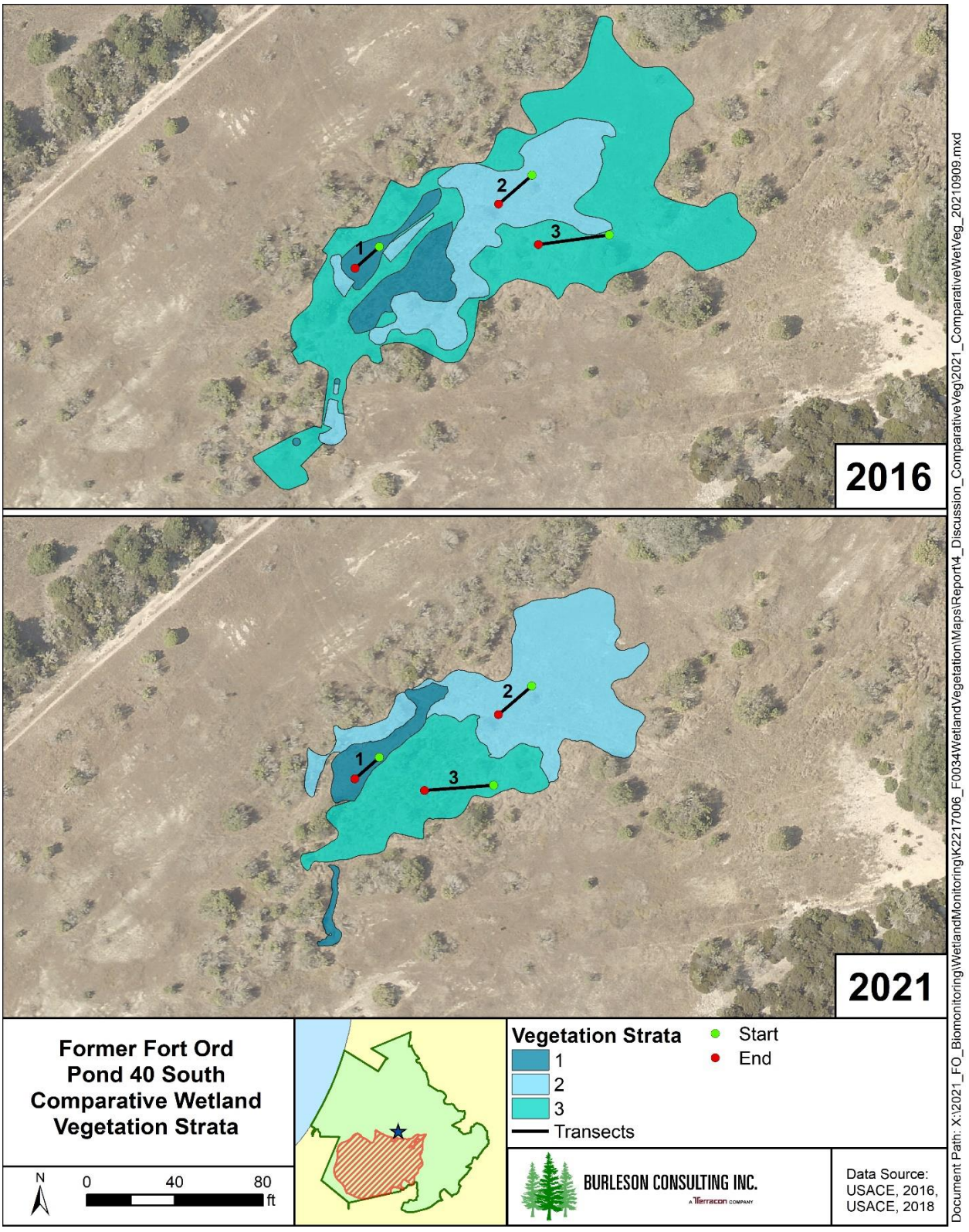

Figure 4-38. Pond 40 South (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects for 2016 and 2021

Absolute percent vegetative cover observed in 2021 was less than the range of values observed in the baseline years of monitoring (see Table 4-100). Vegetative cover ranged in baseline years from 66.7% in 2016 to 72.7% in 1998, whereas thatch/bare ground ranged from 27.1% in 1998 to 33.9% in 2016. The 2021 Pond 40 South vegetative cover value was slightly greater than reference vernal pools and bare ground was slightly less than reference values (see Table 4-101).

Table 4-100. Pond 40 South (Year 3 Post-Subsurface Munitions Remediation) Absolute Percent Cover

Year	Vegetative Cover	Thatch/Bare Ground
1998*	72.7%	27.1%
2016*	66.7%	33.9%
2018	51.9%	50.3%
2019	78.6%	22.6%
2020	61.2%	38.8%
2021	48.9%	51.1%

*baseline year

Table 4-101. Pond 40 South (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Absolute Percent Cover in 2021

Vernal Pool	Vegetative Cover	Thatch/Bare Ground
5	39.3%	60.7%
101 East (East)	38.5%	61.6%
997	45.1%	55.0%
40 South	**48.9%**	**51.1%**

Overall species richness in 2021 was greater than the baseline years of monitoring. Species richness on transects was 21, 20, 32, 41, 26, and 25 species in 1998, 2016, 2018, 2019, 2020, and 2021, respectively, whereas overall basin species richness was 27, 55, 75, 66, and 53 species in 2016, 2018, 2019, 2020, and 2021, respectively (see Table 4-102 and Appendix A Table A-9). The 1998 survey was limited to species on the transect and overall basin species richness was not recorded. Pond 40 South species richness was within the range observed on transects at the reference vernal pools but below the ranges observed for the entire basin (see Table 4-103 and Appendix E Tables E-22 and E-44).

Species composition in Pond 40 South varied between monitoring years, as did the dominant species. The dominant species included iris-leaved rush (*Juncus xiphioides*) in 1998, Italian rye grass (*Festuca perennis*) in 2016 and 2021 and cut-leaved plantain *(Plantago coronopus*) and Italian rye grass co-dominance in 2018. In 2019 and 2020, Italian rye grass and Hickman's popcornflower (*Plagiobothrys chorisianus* var. *hickmanii*) were codominant species. Pale spikerush (*Eleocharis macrostachya*) was present at moderate cover from 1998 to 2019, while cut-leaved plantain was prevalent in all six years. A complete comparison of species composition observed at Pond 40 South in 1998, 2016, 2018, 2019, 2020, and 2021 can be found in Appendix F. Figure 4-39 shows a subset of this comparison for species observed with a 2% cover or greater.

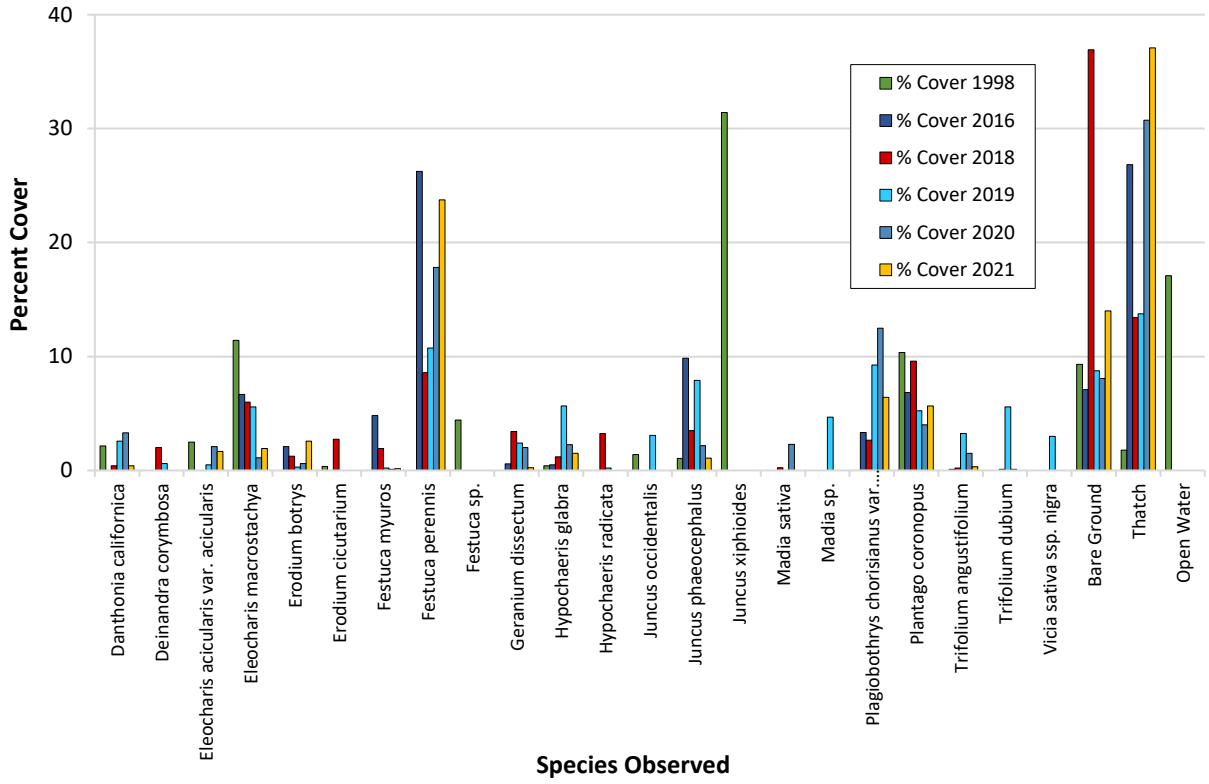

Figure 4-39. Percent Cover of Dominant Species at Pond 40 South (Year 3 Post-Subsurface Munitions Remediation)

Native species richness on Pond 40 South transects was within the range of values observed in baseline years, while non-native species richness was greater than baseline (see Table 4-102). Pond 40 South native species richness in 2021 was less than reference pools, whereas non-native species richness was greater than reference (see Table 4-103). The relative percent cover of native species was less than the range of values observed in baseline years and reference, while non-native species cover was greater than baseline and reference (see Table 4-104 and Table 4-105).

Table 4-102. Pond 40 South (Year 3 Post-Subsurface Munitions Remediation) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
1998*	12	6	3
2016*	5	14	1
2018	9	22	1
2019	17	23	1
2020	8	18	0
2021	8	17	0

*baseline year

Table 4-103. Pond 40 South (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Native and Non-Native Species Richness in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	16	15	0
101 East (East)	10	11	0
997	15	12	0
40 South	**8**	**17**	**0**

Table 4-104. Pond 40 South (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
1998*	75.7%	15.7%	8.5%
2016*	30.1%	69.0%	0.9%
2018	29.4%	70.5%	0.2%
2019	41.5%	52.6%	5.9%
2020	39.0%	61.0%	0.0%
2021	24.0%	76.0%	0.0%

*baseline year

Table 4-105. Pond 40 South (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Native and Non-Native Plants in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	75.0%	25.0%	0.0%
101 East (East)	64.1%	35.9%	0.0%
997	59.1%	40.9%	0.0%
40 South	**24.0%**	**76.0%**	**0.0%**

Wetland species richness on Pond 40 South transects in 2021 was within the range of values in baseline years, while non-wetland species were greater than baseline years (see Table 4-106). The wetland species richness at Pond 40 South was less than the values observed at the reference vernal pools, while non-wetland species were within the range observed at reference vernal pools (see Table 4-107). The relative percent cover of wetland and non-wetland species in 2021 were within the range of values observed in baseline years (see Table 4-108). The relative percent cover of wetland species in 2021 was greater than the range of values observed at reference vernal pools, while non-wetland species cover was within the range of reference values (see Table 4-109).

Table 4-106. Pond 40 South (Year 3 Post-Subsurface Munitions Remediation) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
1998*	4	4	3	1	0	9
2016*	3	2	3	5	1	6
2018	3	5	6	7	2	9
2019	4	6	5	8	2	16
2020	4	3	5	6	0	8
2021	3	3	5	7	1	6

*baseline year

Table 4-107. Pond 40 South (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Wetland and Non-Wetland Species Richness in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	4	7	3	3	1	5
101 East (East)	5	8	7	6	3	14
997	9	10	5	5	0	13
40 South	**3**	**3**	**5**	**7**	**1**	**6**

Table 4-108. Pond 40 South (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Wetland and Non-Wetland Species

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
1998*	62.6%	4.9%	18.6%	0.2%	0.0%	13.8%
2016*	15.3%	14.9%	50.1%	14.8%	1.1%	3.9%
2018	17.2%	9.3%	36.6%	14.9%	2.2%	19.7%
2019	19.7%	15.7%	24.9%	9.7%	3.9%	26.1%
2020	26.0%	4.1%	44.1%	7.5%	0.0%	18.3%
2021	20.4%	2.6%	61.5%	8.2%	0.3%	7.0%

*baseline year

Table 4-109. Pond 40 South (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Wetland and Non-Wetland Species in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	35.3%	36.5%	3.1%	4.2%	1.7%	19.1%
101 East (East)	17.7%	24.7%	3.6%	29.3%	1.9%	22.8%
997	2.0%	38.4%	19.0%	8.9%	0.2%	31.4%
40 South	**20.4%**	**2.6%**	**61.5%**	**8.2%**	**0.3%**	**7.0%**

4.9.1.1 *Data Quality Objective 3*

Observable changes in hydrophytic vegetation between surveys were largely associated with precipitation fluctuations. This is expected given the dynamic nature of vernal pools and the close relationship between the hydroperiod and wetland vegetation composition. This year was a historic dry water-year. Below-normal water-years can result in upland and non-native herbs and grasses exploiting a greater portion of a vernal pool and distributing more evenly (Bauder, 2000).

Vegetative cover in Pond 40 South was dominated by non-native and wetland plant species during year 3 post-subsurface munitions remediation monitoring in 2021. Pond 40 South typically has high non-native richness and cover, even in the baseline year of monitoring. However, Pond 40 South wetland vegetation results differed from baseline and reference vernal pools, in that the non-native species richness was greater than baseline and reference. In addition, the relative percent cover of native species was less than the range of values observed in baseline years and reference, and non-native species was greater than baseline and reference. The relatively high numbers of non-native richness was a trend observed across many vernal pools this year. Non-native cover and richness at Pond 40 South was likely exacerbated by a below-normal water-year rather than remediation, but it should be observed closely in future monitoring years.

4.9.1.2 *Performance Standard: Plant Cover and Species Diversity*

Pond 40 South, a post-subsurface munitions remediation vernal pool, was not on track to meet the performance standard for year 3 in 2021. The species composition, and wetland species richness and relative abundances were similar to baseline and/or the reference vernal pools. However, non-native species richness and cover increased between baseline and 2021, while native cover decreased. The valley in Unit B where Pond 40 South is located has historically been heavily disturbed which is likely why non-native richness and cover is high. Additionally, a low water-year likely contributed to favorable conditions for non-native species at Pond 40 South. This vernal pool should continue to be monitored as recommended in the PBO (see USFWS, 2017).

4.9.2 Wildlife Monitoring

Wildlife data were collected at Pond 40 South in 1998, 2016, 2019, and 2020 (HLA, 1998; Burleson, 2017, 2020, 2021). California tiger salamander larvae were not detected in any survey year. Fairy shrimp were present in 2019 and 2020. The vernal pool did not hold sufficient depth for surveys to be completed in 2021. Therefore, DQO 5 and the applicable wildlife usage performance standard cannot be assessed. Table 4-110 shows historical wildlife monitoring results.

Table 4-110. Pond 40 South (Year 3 Post-Subsurface Munitions Remediation) Historical Wildlife Monitoring Results

Sampling Year	CTS Larvae Abundance (# Individuals)	Fairy Shrimp Abundance (# Individuals)
1998*	Not detected	Not detected
2016*	Not detected	Not detected
2019	Not detected	Moderate (13, 12)
2020	Not detected	Low (1)

*baseline year

4.9.3 Conclusion

Pond 40 South, a post-subsurface munitions remediation vernal pool, was in year 3 of monitoring in 2021. The vernal pool was not on track to meet the plant cover and species diversity performance standard due to high non-native richness and cover and low native cover (see Table 4-111). Pond 40 South will continue to be monitored in the future.

Table 4-111. Success at Pond 40 South (Year 3 Post-Subsurface Munitions Remediation) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Plant Cover & Species Diversity	DQO 3	Not on track
Wildlife Usage	N/A*	N/A*

*Not applicable; wildlife surveys were not conducted due to insufficient depth

4.10 Pond 41 – Year 3

Pond 41 was monitored in 2021 as a year 3 post-subsurface munitions remediation vernal pool. Pond 41 was monitored for baseline conditions in 1998, 2015, and 2016 and cleared of munitions in 2018. Table 4-112 summarizes surveys conducted. The cumulative precipitation graph shows precipitation for years in which hydrology monitoring was conducted at Pond 41 (see Figure 4-40). The normal or above-normal water-years were 1997-1998, 2015-2016, 2018-2019, and 2019-2020. Monitoring in 2014-2015 and 2020-2021 was conducted in below-normal water-years.

Table 4-112. Pond 41 (Year 3 Post-Subsurface Munitions Remediation) Summary of Historical Surveys for Hydrology, Vegetation, and Wildlife

Survey	Water-Year					
	1997-1998	2014-2015	2015-2016	2018-2019	2019-2020	2020-2021
Hydrology	●	●	●	●	●	●
Vegetation			●	●	●	●
Wildlife	●		●	●	●	

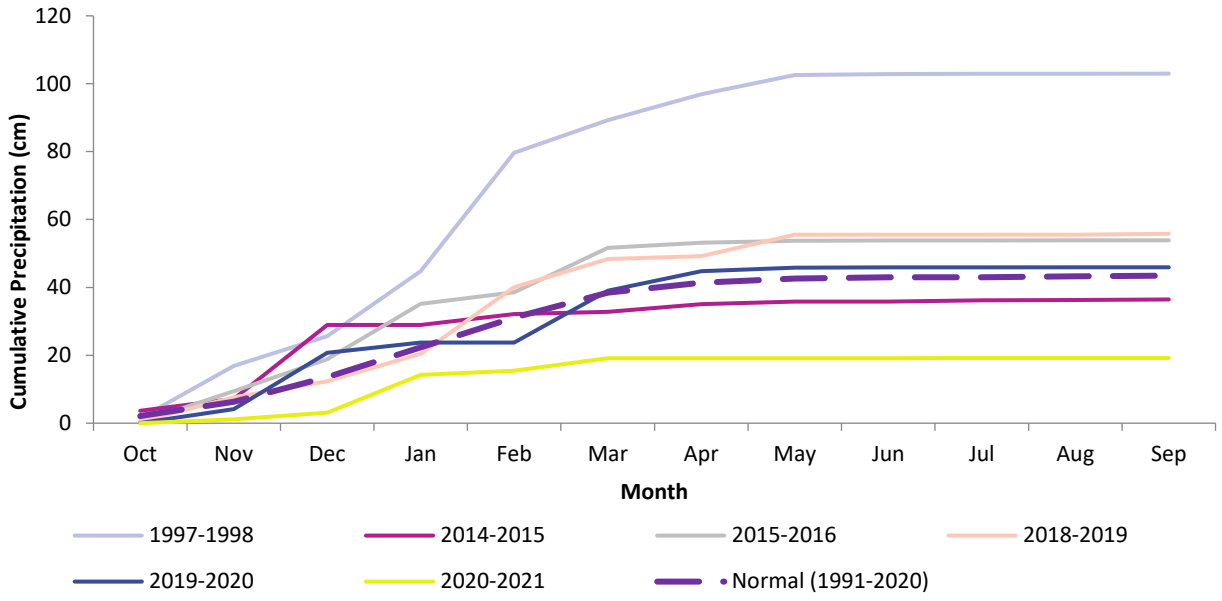

Figure 4-40. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 41 (Year 3 Post-Subsurface Munitions Remediation) Compared to the 30-Year Normal (mean 1991-2020) (NPS, 2021; NCEI NOAA, 2021)

4.10.1 Vegetation Monitoring

Vegetation data were collected at Pond 41 in 2016, 2019, 2020, and 2021 (Burleson, 2017, 2020, 2021). Data were collected using the methodology described in the Methods section of this report. Data from 2016 and 2021 were compared stratum-to-stratum in Table 4-113 as well as visually in Figure 4-41.

Table 4-113. Pond 41 (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage	
	2016	2021
1	29%	3%
2	52%	87%
3	27%	6%
4	N/A	4%
Upland	3%	N/A

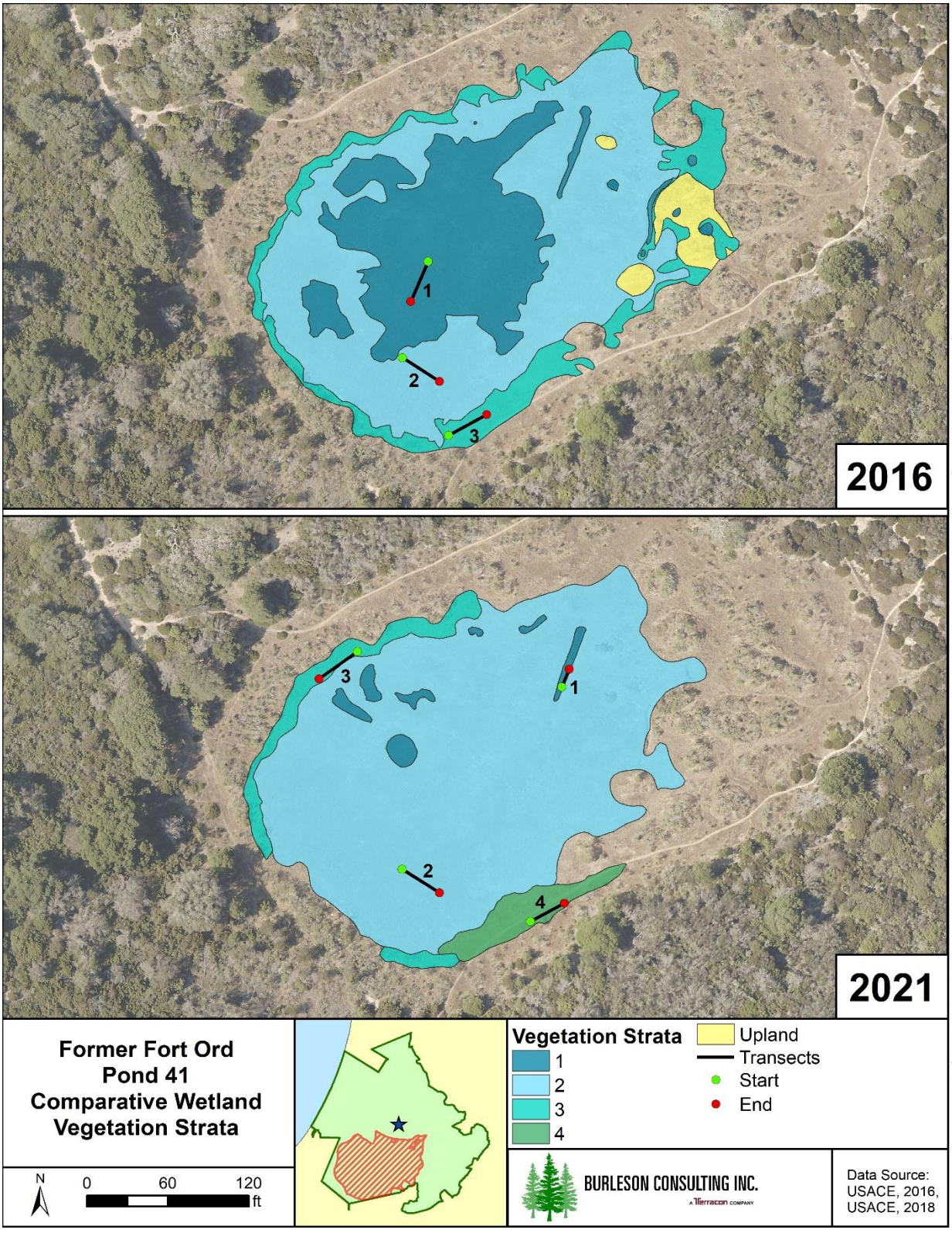

Figure 4-41. Pond 41 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects for 2016 and 2021

The absolute percent vegetative cover observed in 2021 was less than baseline but was within the range of values observed at the reference vernal pools (see Table 4-114). Pond 41 was most similar to reference vernal pool 997 (see Table 4-115).

Table 4-114. Pond 41 (Year 3 Post-Subsurface Munitions Remediation) Absolute Percent Cover

Year	Vegetative Cover	Thatch/Bare Ground
2016*	71.7%	28.3%
2019	69.7%	30.3%
2020	68.9%	31.2%
2021	44.1%	55.9%

*baseline year

Table 4-115. Pond 41 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Absolute Percent Cover in 2021

Vernal Pool	Vegetative Cover	Thatch/Bare Ground
5	39.3%	60.7%
101 East (East)	38.5%	61.6%
997	45.1%	55.0%
41	**44.1%**	**55.9%**

Species richness in 2021 was greater than the baseline year of monitoring. Species richness on transects was 16, 33, 35, and 32 species in 2016, 2019, 2020, and 2021, respectively. Basin species richness was 28, 75, 60, and 63 species in 2016, 2019, 2020, and 2021, respectively (see Table 4-116 and Appendix A Table A-10). Pond 41 overall species richness was within the range of values observed at the reference vernal pools but one species greater at Pond 41 for transect values (see Table 4-117 and Appendix E Tables E-22 and E-44).

Species composition at Pond 41 was similar for all three monitoring years; the dominant species was either pale spikerush (*Eleocharis macrostachya*) or brown-headed rush (*Juncus phaeocephalus*). Other important species in 2016 were hedge nettle (*Stachys ajugoides*), alkali mallow (*Malvella leprosa*), Hickman's popcornflower (*Plagiobothrys chorisianus* var. *hickmanii*), and smooth goldfields (*Lasthenia glaberrima*). California oatgrass (*Danthonia californica*) and rabbitfoot grass (*Polygonum monspeliensis*) were prevalent in 2019 and 2020. This year, 2021, cut-leaved geranium (*Geranium dissectum*) was a moderate source of cover. A complete comparison of species composition observed at Pond 41 in 2016, 2019, 2020, and 2021 can be found in Appendix F. Figure 4-42 shows a subset of this comparison for species observed with a 2% cover or greater.

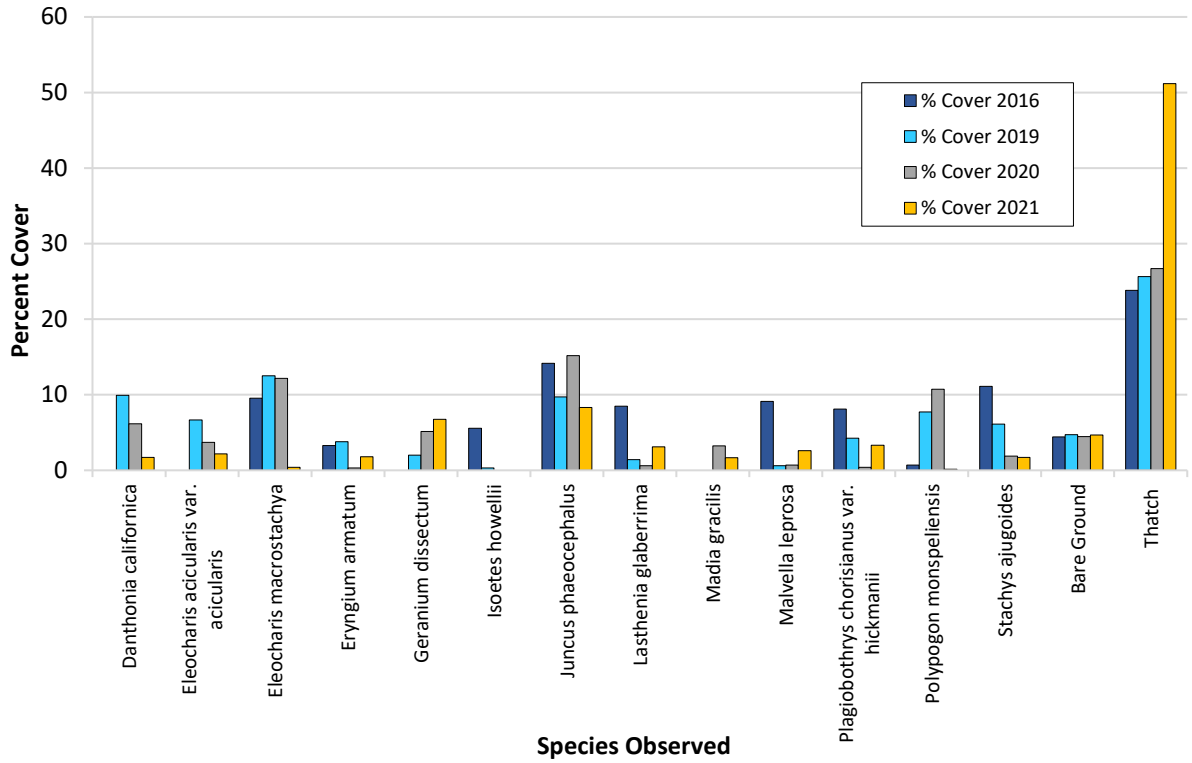

Figure 4-42. Percent Cover of Dominant Species at Pond 41 (Year 3 Post-Subsurface Munitions Remediation)

Native and non-native species richness on Pond 41 transects in 2021 were greater than baseline (see Table 4-116). Native species richness was greater than the reference vernal pools and non-native species richness was within the range of values observed at reference (see Table 4-117). The relative percent cover of native species decreased, and non-native species increased each year between 2016 and 2021 (see Table 4-118). The relative percent cover values of native and non-native species in Pond 41 were within the range of values observed in reference vernal pools and most similar to Pond 101 East (East) (see Table 4-119).

Table 4-116. Pond 41 (Year 3 Post-Subsurface Munitions Remediation) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
2016*	9	7	0
2019	21	12	0
2020	21	14	0
2021	19	12	1

*baseline year

Table 4-117. Pond 41 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Native and Non-Native Species Richness in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	16	15	0
101 East (East)	10	11	0
997	15	12	0
41	**19**	**12**	**1**

Table 4-118. Pond 41 (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
2016*	97.1%	2.9%	0.0%
2019	82.8%	17.2%	0.0%
2020	71.1%	28.9%	0.0%
2021	64.7%	35.2%	0.1%

*baseline year

Table 4-119. Pond 41 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Native and Non-Native Plants in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	75.0%	25.0%	0.0%
101 East (East)	64.1%	35.9%	0.0%
997	59.1%	40.9%	0.0%
41	**64.7%**	**35.2%**	**0.1%**

Wetland and non-wetland species richness on Pond 41 transects were greater in 2021 than baseline (see Table 4-120). Wetland species richness was slightly greater than reference vernal pools, while non-wetland species richness was within the range of values observed at the reference vernal pools (see Table 4-121). The relative percent cover of wetland species was less than baseline values, while non-wetland cover was greater than baseline (see Table 4-122). The wetland and non-wetland species relative percent cover values were within the ranges observed at the reference vernal pools (see Table 4-123).

Table 4-120. Pond 41 (Year 3 Post-Subsurface Munitions Remediation) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2016*	6	3	1	3	0	3
2019	7	7	5	6	2	6
2020	5	8	6	7	1	8
2021	5	5	4	7	1	10

*baseline year

Table 4-121. Pond 41 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Wetland and Non-Wetland Species Richness in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	4	6	3	7	1	10
101 East (East)	2	4	1	4	4	6
997	3	5	4	4	1	10
41	**5**	**5**	**4**	**7**	**1**	**10**

Table 4-122. Pond 41 (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Wetland and Non-Wetland Species

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2016*	59.8%	25.4%	0.2%	12.9%	0.0%	1.7%
2019	45.1%	32.5%	15.7%	1.6%	0.5%	4.5%
2020	27.3%	42.3%	11.4%	2.4%	0.7%	15.8%
2021	24.3%	24.8%	8.7%	16.8%	0.5%	24.7%

*baseline year

Table 4-123. Pond 41 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Wetland and Non-Wetland Species in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	35.3%	36.5%	3.1%	4.2%	1.7%	19.1%
101 East (East)	17.7%	24.7%	3.6%	29.3%	1.9%	22.8%
997	2.0%	38.4%	19.0%	8.9%	0.2%	31.4%
41	**24.3%**	**24.8%**	**8.7%**	**16.8%**	**0.5%**	**24.7%**

4.10.1.1 *Data Quality Objective 3*

Observable changes in hydrophytic vegetation between surveys were largely associated with precipitation fluctuations. This is expected given the dynamic nature of vernal pools and the close relationship between the hydroperiod and wetland vegetation composition. This year was a historic dry water-year. Below-normal water-years can result in upland and non-native herbs and grasses exploiting a greater portion of a vernal pool and distributing more evenly (Bauder, 2000).

Vegetative cover in Pond 41 was dominated by native and wetland plant species during year 3 post-subsurface munitions remediation monitoring in 2021. Pond 41 wetland vegetation results were generally within range of either baseline and/or reference vernal pools, except that the native and wetland species richness was greater than baseline and reference. The increase in native and wetland richness is not concerning. Both support a healthy vernal pool ecosystem.

4.10.1.2 *Performance Standard: Plant Cover and Species Diversity*

Pond 41, a post-subsurface munitions remediation vernal pool, was on track to meet the performance standard for year 3 in 2021. The species composition and native and wetland species relative abundances were similar to baseline and/or reference vernal pool conditions. Native and wetland species richness were greater than baseline and the range of values observed at reference vernal pools. This is an acceptable difference since species richness has increased. This vernal pool should continue to be monitored as recommended in the PBO (see USFWS, 2017).

4.10.2 Wildlife Monitoring

Wildlife data were collected at Pond 41 in 1998, 2016, 2019, and 2020 (HLA, 1998; Burleson, 2017, 2020, 2021). California tiger salamander larvae were observed in 2016 and 2019. Fairy shrimp were detected in 1998, 2019, and 2020. The vernal pool did not hold sufficient depth for surveys to be completed in 2021. Therefore, DQO 5 and the applicable wildlife usage performance standard cannot be assessed. Table 4-124 shows historical wildlife monitoring results.

Table 4-124. Pond 41 (Year 3 Post-Subsurface Munitions Remediation) Historical Wildlife Monitoring Results

Sampling Year	CTS Larvae Abundance (# Individuals)	Fairy Shrimp Abundance (# Individuals)
1998*	Not detected	Low
2016*	Few (3)	Not detected
2019	Few – Common (2, 13, 9)	Low – High (122, 6)
2020	Not detected	Moderate (15)

*baseline year

4.10.3 Conclusion

Pond 41, a post-subsurface munitions remediation vernal pool, was in year 3 of monitoring in 2021. The vernal pool was on track to meet the plant cover and species diversity performance standard (see Table 4-125). Pond 41 will continue to be monitored in the future.

Table 4-125. Success at Pond 41 (Year 3 Post-Subsurface Munitions Remediation) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Plant Cover & Species Diversity	DQO 3	On track
Wildlife Usage	N/A*	N/A*

*Not applicable; wildlife surveys were not conducted due to insufficient depth

4.11 Pond 42 – Year 3

Pond 42 was monitored in 2021 as a year 3 post-subsurface munitions remediation vernal pool. Vegetation in Pond 42 and within its watershed was masticated in the summer of 2018 and burned in October 2017 as part of the prescribed burn of BLM Area B Subunit B. Pond 42 had intrusive anomaly investigations in 2018. Pond 42 was first monitored for baseline in 1998. Following MEC remediation activities, Pond 42 was monitored annually from 2000 to 2003. Additional baseline surveys occurred in 2015 and 2017. Table 4-126 summarizes the years that monitoring occurred and surveys were conducted. The cumulative precipitation graph indicates precipitation for the years that monitoring was conducted at Pond 42 (see Figure 4-43). The above-normal water-years were 1997-1998, 2016-2017,

and 2018-2019. Water-years 1999-2000 and 2019-2020 were similar to the cumulative normal water-year. All other monitoring years, including this year, 2020-2021, were a below-normal water-year, drought year, or consecutive drought year.

Table 4-126. Pond 42 (Year 3 Post-Subsurface Munitions Remediation) Summary of Historical Surveys for Hydrology, Vegetation, and Wildlife

Survey	Water-Year										
	1997-1998	1999-2000	2000-2001	2001-2002	2002-2003	2014-2015	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
Hydrology	●	●	●	●	●	●	●	●	●	●	●
Vegetation	●	●	●	●	●		●	●	●	●	●
Wildlife	●	●	●	●	●			●	●	●	

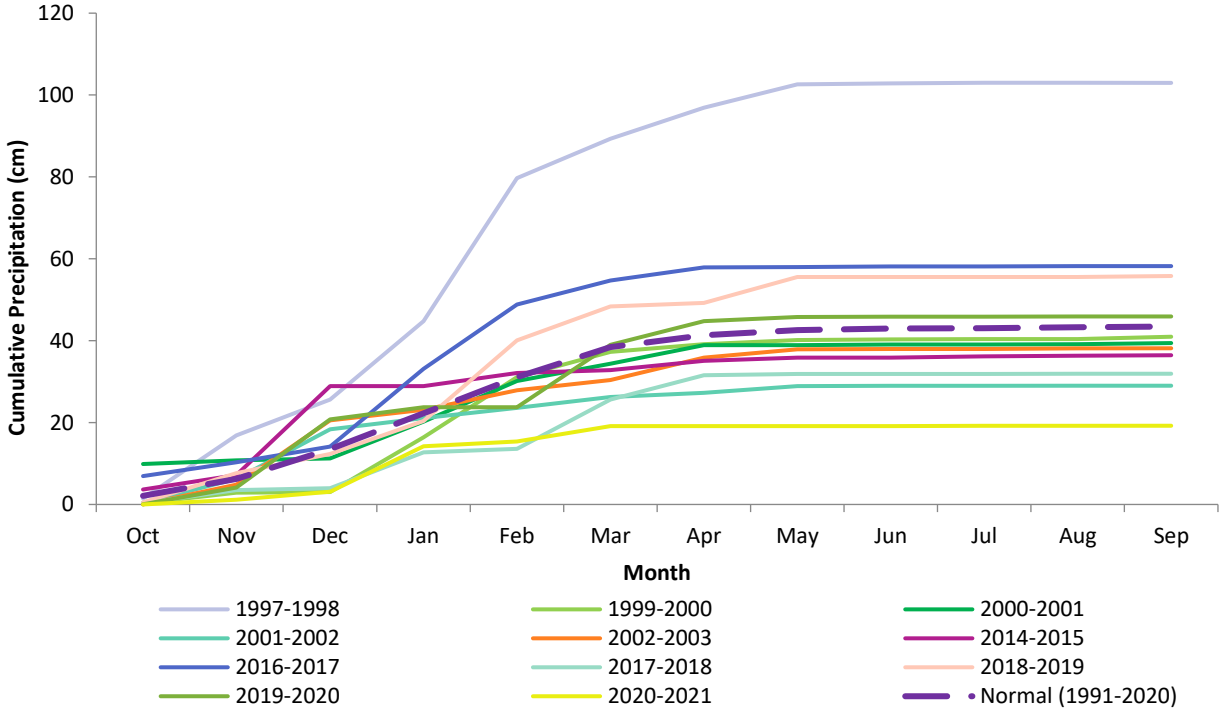

Figure 4-43. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 42 (Year 3 Post-Subsurface Munitions Remediation) Compared to the 30-Year Normal (mean 1991-2020) (NPS, 2021; NCEI NOAA, 2021)

4.11.1 Vegetation Monitoring

Vegetation data were collected at Pond 42 in 1998, 2000, 2001, 2002, 2003, 2017, 2018, 2019, 2020, and 2021 (HLA, 1998, 2001; Harding ESE, 2002; MACTEC, 2003, 2004; Burleson, 2018, 2019, 2020, 2021). 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, whereas 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 in areas of representative transitional and emergent habitats. Due to differing methodologies, data for all strata in each respective year before 2017 were combined to compare to

2017 through 2021. From 2017-2021, data were collected using the methodology described in the Methods section of this report. Data from 2017 and 2021 were compared stratum-to-stratum in Table 4-127 as well as visually in Figure 4-44.

Table 4-127. Pond 42 (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage	
	2017	2021
Open Water	4%	N/A
1	8%	18%
2	9%	7%
3	52%	28%
4	10%	11%
5	N/A	11%
Upland	17%	26%

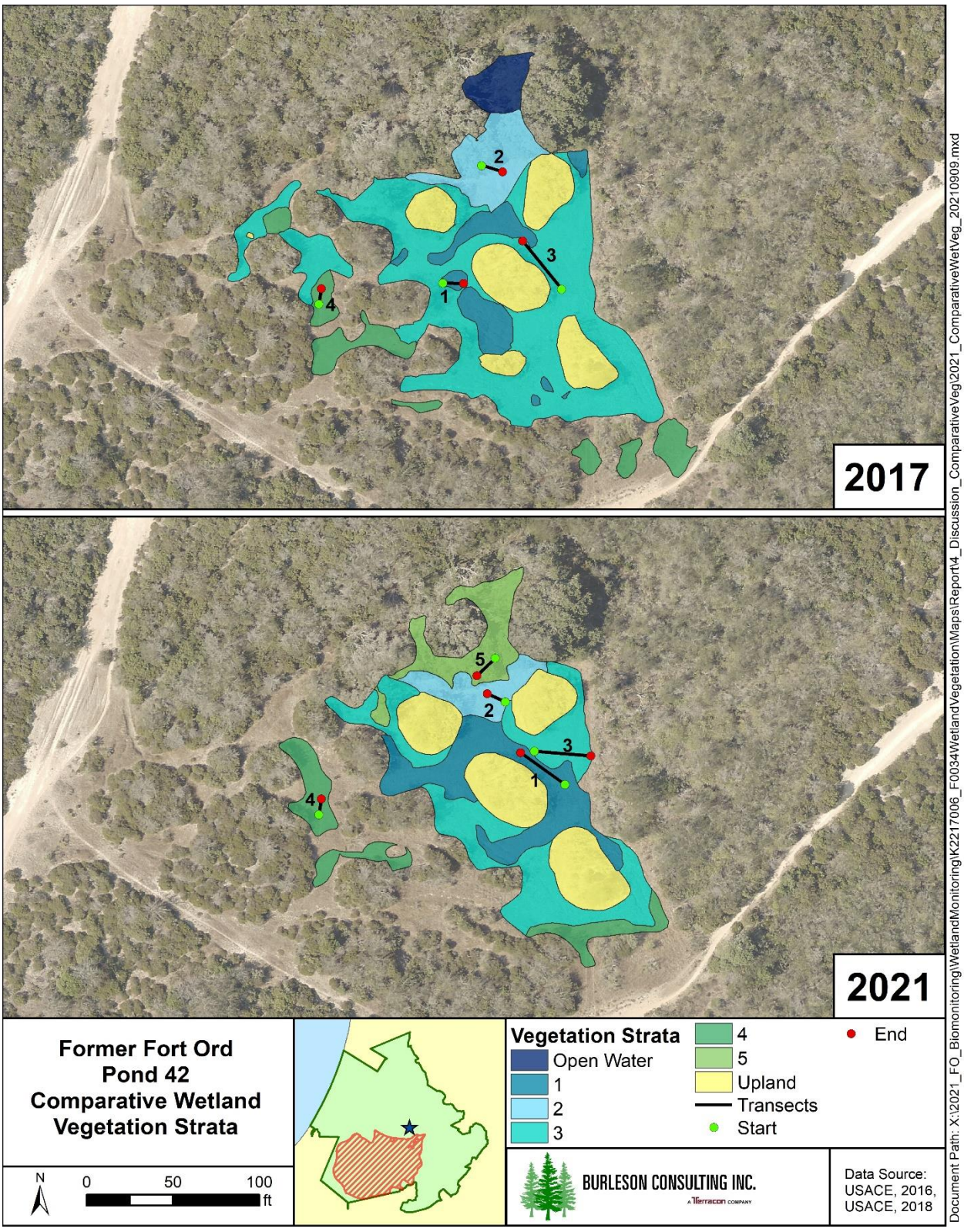

Figure 4-44. Pond 42 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects for 2017 and 2021

Absolute percent vegetative cover in 2021 was lower and thatch/bare ground cover was higher than the 1998 and 2017 baseline years of monitoring (see Table 4-128). Vegetative cover ranged in baseline years from 61.9% in 2017 to 69.6% in 1998, whereas thatch/bare ground ranged from 33.1% in 1998 to 38.7% in 2017. The absolute percent vegetative cover of Pond 42 in 2021 was within the range of values observed at the reference vernal pools and most similar to Pond 997 (see Table 4-129).

Table 4-128. Pond 42 (Year 3 Post-Subsurface Munitions Remediation) 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	84.6%	16.1%
2017*	61.9%	38.7%
2018	55.8%	44.3%
2019	70.2%	29.8%
2020	65.1%	34.4%
2021	43.7%	56.6%

*baseline year

Table 4-129. Pond 42 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Absolute Percent Cover in 2021

Vernal Pool	Vegetative Cover	Thatch/Bare Ground
5	39.3%	60.7%
101 East (East)	38.5%	61.6%
997	45.1%	55.0%
42	**43.7%**	**56.6%**

Species richness in 2021 was greater than the range of values observed in the baseline years of monitoring. Species richness on transects was 20, 31, 28, 24, 32, 14, 40, 27, 28, and 37 in 1998, 2000, 2001, 2002, 2003, 2017, 2018, 2019, 2020, and 2021, respectively. Overall basin species richness values were only recorded in 2017-2021 and were 78, 126, 77, 93, and 82 species, respectively (see Table 4-130 and Appendix A Table A-11). Pond 42 species richness was greater than the range of values observed at the reference vernal pools for transects and the species richness for the entire basin (see Table 4-131 and Appendix E Tables E-22 and E-44).

Species composition and dominant species at Pond 42 were variable across monitoring years. Pale spikerush (*Eleocharis macrostachya*) and brown-headed rush (*Juncus phaeocephalus*) were the two dominant species in 2017, whereas needle spikerush (*Eleocharis acicularis* var. *acicularis*) and coyote thistle (*Eryngium armatum*) were the dominant species in 2018 and 2019. Rabbitfoot grass (*Polypogon monspeliensis*) was another important species in 2019. In 2020, the dominant species were brown-headed rush, needle spike rush, and brass buttons (*Cotula coronopifolia*). Needle spike rush was the dominant species in 2021, with moderate cover from brown-headed rush, rabbitfoot grass, pale spikerush, and coyote thistle. A complete comparison of species composition observed during the

surveys at Pond 42 in 1998, 2000, 2001, 2002, 2003, 2017, 2018, 2019, 2020, and 2021, can be found in Appendix F. Figure 4-45 shows a subset of this comparison for species observed with a 2% cover or greater.

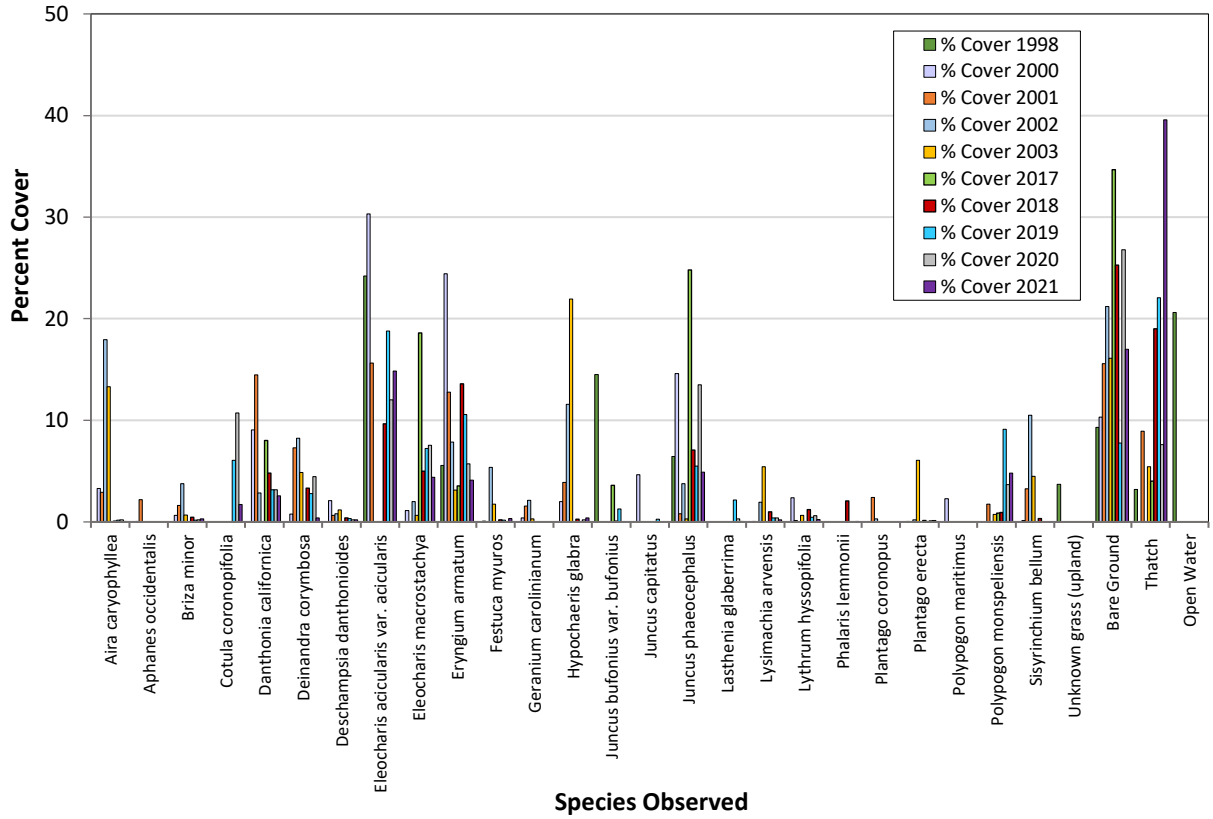

Figure 4-45. Percent Cover of Dominant Species at Pond 42 (Year 3 Post-Subsurface Munitions Remediation)

Native and non-native species richness on Pond 42 transects were greater in 2021 than baseline and values observed at the reference vernal pools (see Table 4-130 and Table 4-131). The relative percent cover of native species was less than baseline years and the non-native cover was greater than baseline (see Table 4-132). Pond 42 native and non-native vegetation percent cover were within the range of values observed at reference vernal pools (see Table 4-133).

Table 4-130. Pond 42 (Year 3 Post-Subsurface Munitions Remediation) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
1998*	12	5	3
2000	20	11	1
2001	14	13	1
2002	16	8	0
2003	19	12	1
2017*	10	4	0
2018	24	15	1
2019	16	11	0
2020	18	10	0
2021	**17**	**20**	**0**

*baseline year

Table 4-131. Pond 42 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Native and Non-Native Species Richness in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	16	15	0
101 East (East)	10	11	0
997	15	12	0
42	**17**	**20**	**0**

Table 4-132. Pond 42 (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
1998*	87.7%	4.4%	7.9%
2000	84.4%	15.6%	0.0%
2001	77.4%	22.4%	0.3%
2002	49.0%	51.0%	0.0%
2003	40.4%	58.7%	1.0%
2017*	97.8%	2.2%	0.0%
2018	90.0%	9.7%	0.4%
2019	75.5%	24.5%	0.0%
2020	74.8%	25.2%	0.0%
2021	74.9%	25.1%	0.0%

*baseline year

Table 4-133. Pond 42 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Native and Non-Native Plants in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	75.0%	25.0%	0.0%
101 East (East)	64.1%	35.9%	0.0%
997	59.1%	40.9%	0.0%
42	**74.9%**	**25.1%**	**0.0%**

Wetland and non-wetland species richness on Pond 42 transects were greater in 2021 than the baseline years of monitoring (see Table 4-134). Wetland species richness was greater than reference vernal pools, while non-wetland species richness was within the range of values observed at the reference vernal pools (see Table 4-135). The relative percent cover of wetland species was within the range of values observed in previous baseline years, whereas non-wetland cover was slightly greater than baseline (see Table 4-136). Relative percent cover of wetland species was greater than the range of values in reference vernal pools, while non-wetland species cover was less than the values observed at reference vernal pools (see Table 4-137).

Table 4-134. Pond 42 (Year 3 Post-Subsurface Munitions Remediation) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
1998*	6	4	4	1	0	5
2000	5	5	4	6	0	11
2001	3	5	4	6	0	10
2002	3	4	4	2	1	10
2003	5	6	3	4	0	14
2017*	5	4	1	2	0	2
2018	9	10	3	7	1	10
2019	6	7	3	5	0	6
2020	7	7	4	2	1	7
2021	6	7	3	7	1	13

*baseline year

Table 4-135. Pond 42 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Wetland and Non-Wetland Species Richness in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	4	6	3	7	1	10
101 East (East)	2	4	1	4	4	6
997	3	5	4	4	1	10
42	**6**	**7**	**3**	**7**	**1**	**13**

Table 4-136. Pond 42 (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Wetland and Non-Wetland Species

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
1998*	42.2%	38.6%	8.7%	0.5%	0.0%	10.0%
2000	35.7%	40.9%	10.3%	8.4%	0.0%	4.7%
2001	20.7%	24.8%	24.0%	7.2%	0.0%	23.3%
2002	3.1%	27.4%	10.6%	27.9%	0.2%	30.7%
2003	5.8%	12.2%	7.5%	19.5%	0.0%	55.0%
2017*	30.9%	53.0%	12.9%	0.4%	0.0%	2.7%
2018	33.0%	44.8%	11.2%	2.3%	0.4%	8.4%
2019	50.3%	38.5%	5.3%	1.3%	0.0%	4.6%
2020	49.0%	36.0%	5.8%	0.9%	0.1%	8.2%
2021	**49.5%**	**35.1%**	**7.0%**	**2.4%**	**0.2%**	**5.8%**

*baseline year

Table 4-137. Pond 42 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Wetland and Non-Wetland Species in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	35.3%	36.5%	3.1%	4.2%	1.7%	19.1%
101 East (East)	17.7%	24.7%	3.6%	29.3%	1.9%	22.8%
997	2.0%	38.4%	19.0%	8.9%	0.2%	31.4%
42	**49.5%**	**35.1%**	**7.0%**	**2.4%**	**0.2%**	**5.8%**

4.11.1.1 *Data Quality Objective 3*

Observable changes in hydrophytic vegetation between surveys were largely associated with precipitation fluctuations. This is expected given the dynamic nature of vernal pools and the close relationship between the hydroperiod and wetland vegetation composition. This year was a historic dry water-year. Below-normal water-years can result in upland and non-native herbs and grasses exploiting a greater portion of a vernal pool and distributing more evenly (Bauder, 2000).

Vegetative cover in Pond 42 was dominated by native and wetland plant species during year 3 post-subsurface munitions remediation monitoring. However, more non-native species than native were observed on transects. Both native and non-native species richness on Pond 42 transects were greater in 2021 than baseline and values observed at the reference vernal pools. In addition, wetland species richness was greater than baseline and reference and non-wetland percent cover was greater than baseline but less than reference. An increase in richness of native and wetland species is not concerning since native and wetland species generally support a healthy vernal pool ecosystem. The relatively high numbers of non-native richness was a trend observed across many vernal pools this year. This is likely related to a below-normal water-year rather than remediation, but it should be observed closely in future monitoring years.

4.11.1.2 *Performance Standard: Plant Cover and Species Diversity*

Pond 42, a post-subsurface munitions remediation vernal pool, was not on track to meet the performance standard for year 3 in 2021. The species composition, and native and wetland species relative abundances were similar to baseline and/or reference vernal pool conditions. However, non-native species richness species richness was greater than the range of values observed in baseline years and the reference vernal pools. This vernal pool should continue to be monitored as recommended in the PBO (see USFWS, 2017).

4.11.2 Wildlife Monitoring

Wildlife data were collected at Pond 42 in 1998, 2000, 2001, 2002, 2003, 2018, 2019, and 2020 (HLA, 1998, 2001, 2002; MACTEC, 2003, 2004, Burleson, 2019, 2020, 2021). California tiger salamander larvae were observed in 2000. Fairy shrimp were present in all years. The vernal pool did not hold sufficient depth for surveys to be completed in 2021. Therefore, DQO 5 and the applicable wildlife usage performance standard cannot be assessed. Table 4-138 shows historical wildlife monitoring results.

Table 4-138. Pond 42 (Year 3 Post-Subsurface Munitions Remediation) Historical Wildlife Monitoring Results

Sampling Year	CTS Larvae Abundance (# Individuals)	Fairy Shrimp Abundance (# Individuals)
1998*	Not detected	Low-Moderate
2000	Common (13)	High – Very High (318, 123)
2001	Not detected	Low (2)
2002	Not detected	High-Very High (250, 1000s)
2003	Not detected	High (low 100s)
2018	Not detected	Low
2019	Not detected	High (217)
2020	Not detected	High (125)

*baseline year

4.11.3 Conclusion

Pond 42, a post-subsurface munitions remediation vernal pool, was in year 3 of monitoring in 2021. The vernal pool was not on track to meet the plant cover and species diversity performance standard due to high non-native richness (see Table 4-139). Pond 42 will continue to be monitored in the future.

Table 4-139. Success at Pond 42 (Year 3 Post-Subsurface Munitions Remediation) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Plant Cover & Species Diversity	DQO 3	Not on track
Wildlife Usage	N/A*	N/A*

*Not applicable; wildlife surveys were not conducted due to insufficient depth

4.12 Pond 43 – Year 3

Pond 43 was monitored in 2021 as a year 3 post-subsurface munitions remediation vernal pool. Pond 43 was monitored for baseline conditions in 1998, 2000, 2015, and 2016. Vegetation in Pond 43 and within its watershed was burned in October 2017 as part of the prescribed burn of BLM Area B Subunit B. Pond

43 had intrusive anomaly investigations in 2018. Table 4-140 summarizes the years that monitoring occurred and surveys were conducted. The cumulative precipitation graph shows precipitation for years in which hydrology monitoring was conducted at Pond 43 (see Figure 4-46). The 1997-1998, 2015-2016, and 2018-2019 water-years were above normal, whereas 2014-2015, 2017-2018, and 2020-2021 water-years were below normal. Water-years 1999-2000 and 2019-2020 were similar to the cumulative normal.

Table 4-140. Pond 43 (Year 3 Post-Subsurface Munitions Remediation) Summary of Historical Surveys for Hydrology, Vegetation, and Wildlife

Survey	Water-Year							
	1997-1998	1999-2000	2014-2015	2015-2016	2017-2018	2018-2019	2019-2020	2020-2021
Hydrology	●	●	●	●	●	●	●	●
Vegetation	●			●	●	●	●	●
Wildlife	●	●		●		●	●	

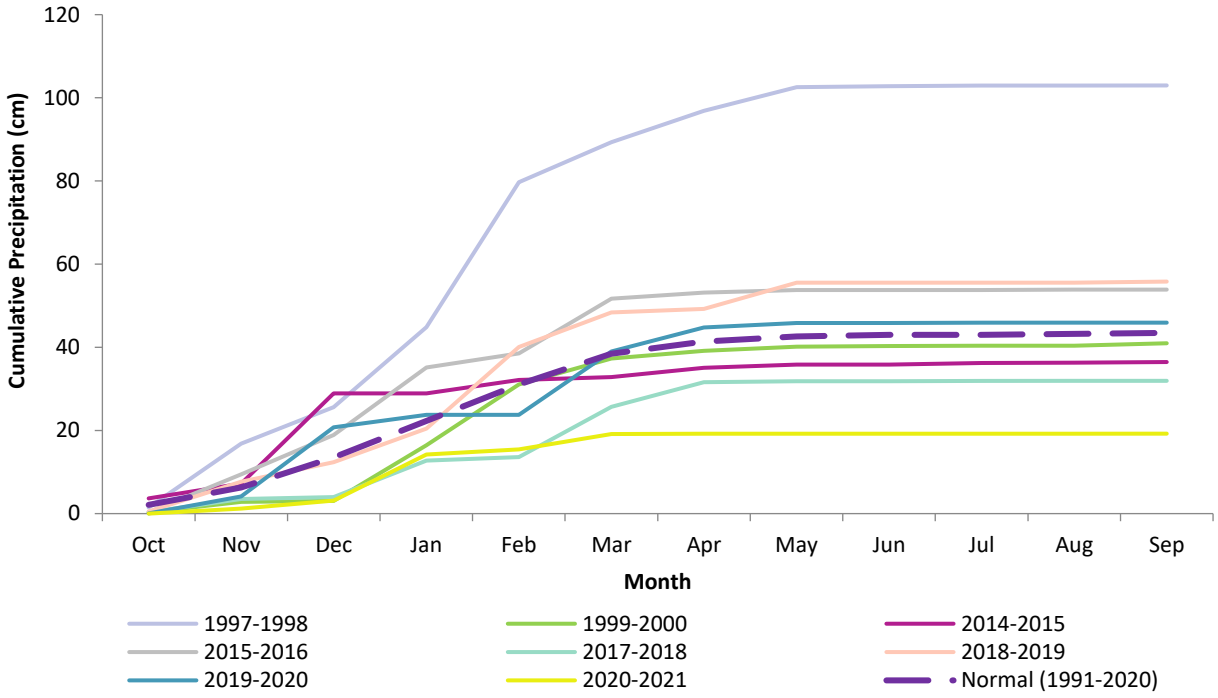

Figure 4-46. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 43 (Year 3 Post-Subsurface Munitions Remediation) Compared to the 30-Year Normal (mean 1991-2020) (NPS, 2021; NCEI NOAA, 2021)

4.12.1 Vegetation Monitoring

Vegetation data were collected at Pond 43 in 1998, 2016, 2018, 2019, 2020, and 2021 (HLA, 1998; Burleson, 2017, 2019, 2020, 2021). In 1998, data were collected along one transect with a length of 75 feet. Quadrats were placed at 10-foot intervals, alternating from right to left along the transect. Because 1998 data were collected differently than in other years, strata were combined across the vernal pool to allow for comparison. In 2016, 2018, 2019, 2020, and 2021, data were collected using the methodology

described in the Methods section of this report. Data from 2016 and 2021 were compared stratum-to-stratum in Table 4-141 as well as visually in Figure 4-47.

Table 4-141. Pond 43 (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage	
	2016	2021
1	19%	71%
2	50%	9%
3	27%	12%
Upland	3%	8%

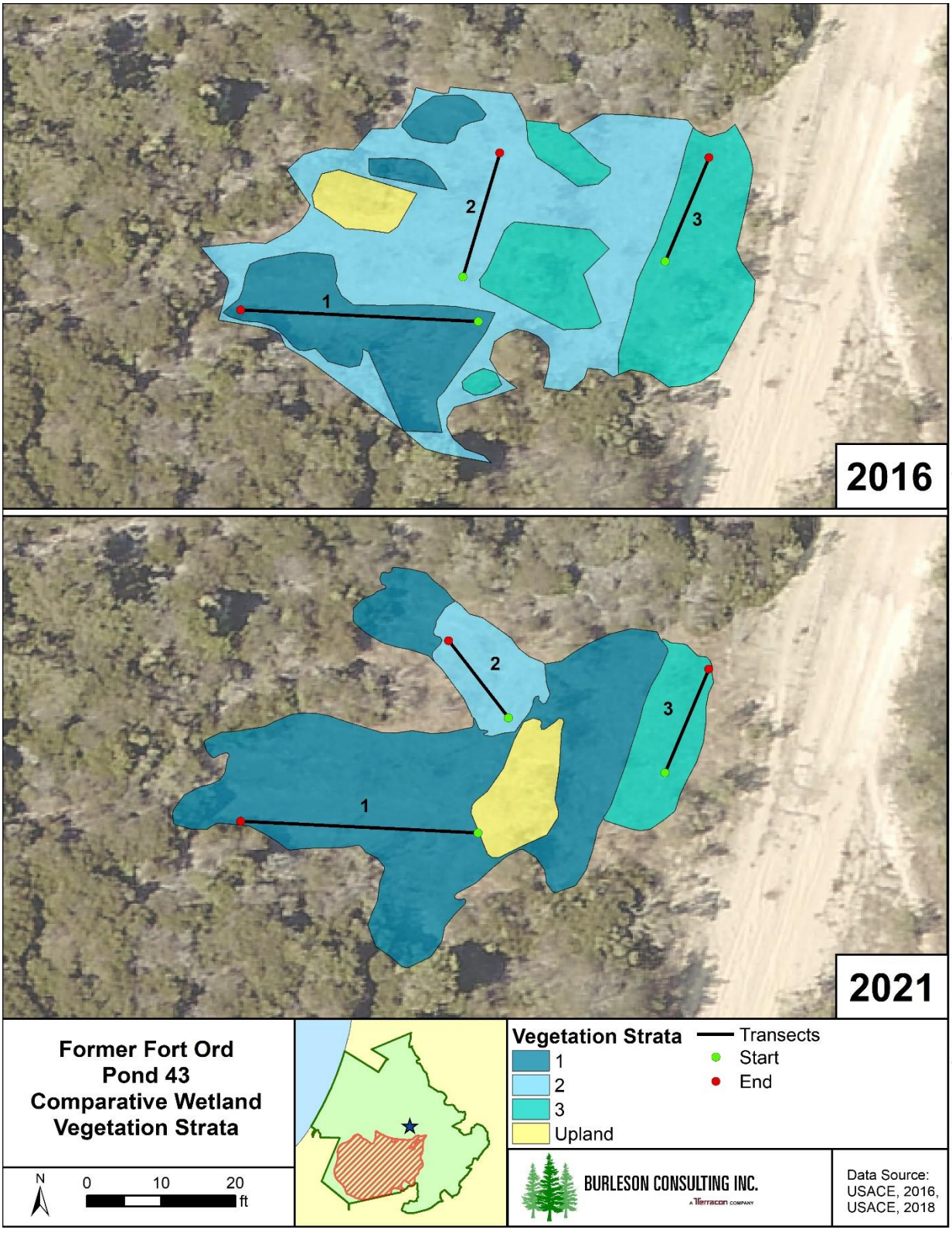

Figure 4-47. Pond 43 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects for 2016 and 2021

Absolute percent vegetative cover in 2021 was lower than baseline values, while thatch/bare ground was most similar to 1998 baseline values (see Table 4-142). Vegetative cover ranged in baseline years from 55.9% in 1998 to 66.5% in 2016, whereas thatch/bare ground ranged from 33.3% in 2016 to 54.4% in 1998. The absolute percent vegetative cover of Pond 43 in 2021 was within the range of values observed at the reference vernal pools and most similar to Pond 997 (see Table 4-143).

Table 4-142. Pond 43 (Year 3 Post-Subsurface Munitions Remediation) Absolute Percent Cover

Year	Vegetative Cover	Thatch/Bare Ground
1998*	55.9%	54.4%
2016*	66.5%	33.3%
2018	56.1%	44.1%
2019	63.9%	37.3%
2020	66.3%	33.8%
2021	44.8%	55.2%

*baseline year

Table 4-143. Pond 43 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Absolute Percent Cover in 2021

Vernal Pool	Vegetative Cover	Thatch/Bare Ground
5	39.3%	60.7%
101 East (East)	38.5%	61.6%
997	45.1%	55.0%
43	**44.8%**	**55.2%**

Species richness in 2021 was greater than in baseline years. Species richness on transects was 22, 24, 37, 45, 41, and 39 species in 1998, 2016, 2018, 2019, 2020, and 2021, respectively, whereas overall basin species richness was 35, 51, 103, 86, and 61 species in 2016, 2018, 2019, 2020, and 2021, respectively (see Table 4-144 and Appendix A Table A-12). The 1998 survey was limited to species on the transect and overall basin species richness was not recorded. Pond 43 species richness was greater than the range observed on transects at the reference vernal pools but within the range of values observed for the entire basin (see Table 4-145 and Appendix E Tables E-22 and E-44).

Species composition and dominant species at Pond 43 were variable across monitoring years. Flowering quillwort (*Triglochin scilloides*) was the dominant species in 1998, Hickman's popcornflower (*Plagiobothrys chorisianus* var. *hickmanii*) was the dominant species in 2016, and brown-headed rush (*Juncus phaeocephalus*) and rabbitfoot grass (*Polypogon monspeliensis*) were the dominant species in 2018 and 2019. In 2020, brown-headed rush and California oatgrass (*Danthonia californica*) were the dominant species. Coyote thistle (*Eryngium armatum*) and brown-headed rush were co-dominant in 2021. A complete comparison of species composition observed at Pond 43 in 1998, 2016, 2018, 2019, 2020, and 2021 can be found in Appendix F. Figure 4-48 shows a subset of this comparison for species observed with a 2% cover or greater.

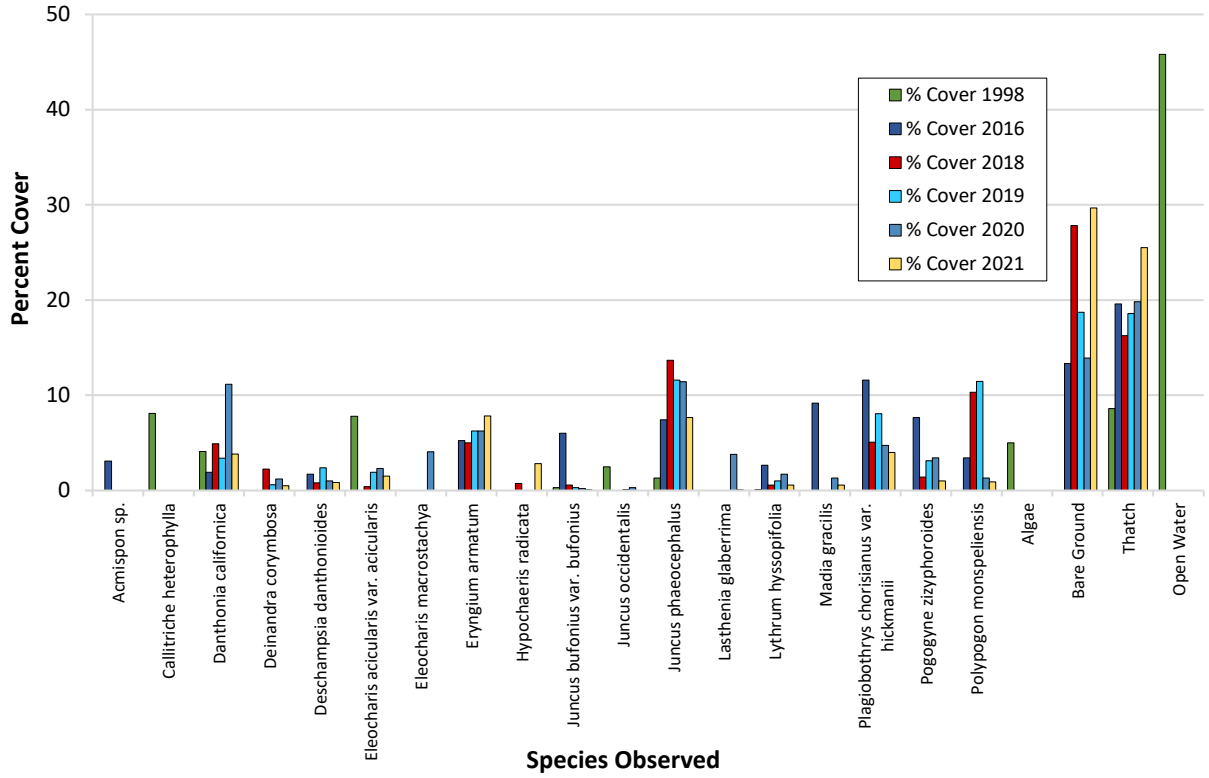

Figure 4-48. Percent Cover of Dominant Species at Pond 43 (Year 3 Post-Subsurface Munitions Remediation)

Native and non-native species richness on Pond 43 transects increased between baseline and 2021 (see Table 4-144). Native and non-native species richness were both greater than the values observed at the reference vernal pools (see Table 4-145). The relative percent cover of native species was less than the baseline values, whereas the relative percent cover of non-native species was greater than baseline (see Table 4-146). Pond 43 was within the range of native and non-native relative percent cover values observed at the reference vernal pools in 2021 and was most similar to reference Pond 101 East (East) (see Table 4-147).

Table 4-144. Pond 43 (Year 3 Post-Subsurface Munitions Remediation) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
1998*	13	7	2
2016*	13	8	2
2018	22	14	1
2019	30	14	1
2020	26	15	0
2021	21	17	1

*baseline year

Table 4-145. Pond 43 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Native and Non-Native Species Richness in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	16	15	0
101 East (East)	10	11	0
997	15	12	0
43	**21**	**17**	**1**

Table 4-146. Pond 43 (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
1998*	83.7%	4.5%	11.8%
2016*	80.3%	14.9%	4.8%
2018	71.2%	28.7%	0.1%
2019	73.2%	26.7%	0.1%
2020	87.0%	13.0%	0.0%
2021	69.1%	30.7%	0.2%

*baseline year

Table 4-147. Pond 43 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Native and Non-Native Plants in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	75.0%	25.0%	0.0%
101 East (East)	64.1%	35.9%	0.0%
997	59.1%	40.9%	0.0%
43	**69.1%**	**30.7%**	**0.2%**

Wetland and non-wetland species richness on Pond 43 transects were greater in 2021 than in baseline years (see Table 4-148). Wetland species richness was also greater than reference pools, while non-wetland species richness was within the range of values observed at reference pools (see Table 4-149). Relative percent cover of wetland species in 2021 was within the range of values observed in baseline years, while non-wetland relative percent cover was greater than baseline (see Table 4-150). Wetland and non-wetland relative percent cover values were within the ranges observed at the reference vernal pools in 2021 (see Table 4-151).

Table 4-148. Pond 43 (Year 3 Post-Subsurface Munitions Remediation) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
1998*	6	5	4	1	0	6
2016*	4	6	3	3	0	7
2018	7	8	6	6	0	10
2019	8	10	7	5	0	15
2020	9	11	4	4	1	12
2021	6	8	4	6	1	14

*baseline year

Table 4-149. Pond 43 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Wetland and Non-Wetland Species Richness in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	4	6	3	7	1	10
101 East (East)	2	4	1	4	4	6
997	3	5	4	4	1	10
43	**6**	**8**	**4**	**6**	**1**	**14**

Table 4-150. Pond 43 (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Wetland and Non-Wetland Species

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
1998*	64.6%	8.6%	8.6%	0.2%	0.0%	18.1%
2016*	34.2%	36.0%	4.1%	3.8%	0.0%	21.9%
2018	16.5%	57.2%	13.1%	5.1%	0.0%	8.2%
2019	24.2%	56.3%	6.6%	4.8%	0.0%	8.1%
2020	31.6%	35.8%	19.7%	3.1%	0.4%	9.3%
2021	16.5%	42.2%	16.2%	10.0%	0.7%	14.3%

*baseline year

Table 4-151. Pond 43 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Wetland and Non-Wetland Species in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	35.3%	36.5%	3.1%	4.2%	1.7%	19.1%
101 East (East)	17.7%	24.7%	3.6%	29.3%	1.9%	22.8%
997	2.0%	38.4%	19.0%	8.9%	0.2%	31.4%
43	**16.5%**	**42.2%**	**16.2%**	**10.0%**	**0.7%**	**14.3%**

4.12.1.1 *Data Quality Objective 3*

Observable changes in hydrophytic vegetation between surveys were largely associated with precipitation fluctuations. This is expected given the dynamic nature of vernal pools and the close relationship between the hydroperiod and wetland vegetation composition. This year was a historic dry water-year. Below-normal water-years can result in upland and non-native herbs and grasses exploiting a greater portion of a vernal pool and distributing more evenly (Bauder, 2000).

Vegetative cover in Pond 43 was dominated by native and wetland plant species during year 3 post-subsurface munitions remediation monitoring in 2021. Pond 43 wetland vegetation results were generally within range of either baseline and/or reference vernal pools with a few exceptions. The native, non-native, and wetland richness were all greater than the baseline years and greater than the range of values observed at reference vernal pools. The increase in native and wetland richness is not concerning. Both support a healthy vernal pool ecosystem. The relatively high numbers of non-native richness was a trend observed across many vernal pools this year. This is likely related to a low water-year rather than remediation, but it should be observed closely in future monitoring years.

4.12.1.2 *Performance Standard: Plant Cover and Species Diversity*

Pond 43, a post-subsurface munitions remediation vernal pool, was not on track to meet the performance standard for year 3 in 2021. The species composition, and native and wetland species relative abundances were similar to baseline and/or reference vernal pool conditions. However, non-native species richness was greater than the range of values observed in baseline years and the reference vernal pools. This vernal pool should continue to be monitored as recommended in the PBO (see USFWS, 2017).

4.12.2 Wildlife Monitoring

Wildlife data were collected at Pond 43 in 1998, 2000, 2016, 2019, and 2020 (HLA, 1998, 2000; Burleson, 2017, 2020). California tiger salamander larvae were not detected in any survey year. Fairy shrimp were present in 1998, 2019, and 2020. The vernal pool did not hold sufficient depth for surveys to be completed in 2021. Therefore, DQO 5 and the applicable wildlife usage performance standard cannot be assessed. Table 4-152 shows historical wildlife monitoring results.

Table 4-152. Pond 43 (Year 3 Post-Subsurface Munitions Remediation) Historical Wildlife Monitoring Results

Sampling Year	CTS Larvae Abundance (# Individuals)	Fairy Shrimp Abundance (# Individuals)
1998*	Not detected	Moderate
2000*	Not detected	Not detected
2016*	Not detected	Not detected
2019	Not detected	High (135, 210)
2020	Not detected	Moderate (40)

*baseline year

4.12.3 Conclusion

Pond 43, a post-subsurface munitions remediation vernal pool, was in year 3 of monitoring in 2021. The vernal pool was not on track to meet the plant cover and species diversity performance standard due to high non-native richness (see Table 4-153). Pond 43 will continue to be monitored in the future.

Table 4-153. Success at Pond 43 (Year 3 Post-Subsurface Munitions Remediation) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Plant Cover & Species Diversity	DQO 3	Not on track
Wildlife Usage	N/A*	N/A*

*Not applicable; wildlife surveys were not conducted due to insufficient depth

4.13 Pond 44 – Year 3

Pond 44 was monitored in 2021 as a year 3 post-subsurface munitions remediation vernal pool. Pond 44 was monitored for baseline conditions in 1998, 2015, and 2016. Vegetation in Pond 44 and within its watershed was masticated in the summer of 2017 in preparation for a prescribed burn of BLM Area B Subunit B. Pond 44 had intrusive anomaly investigations in 2018. Table 4-154 summarizes the years that monitoring occurred and surveys were conducted. The cumulative precipitation graph indicates precipitation for the years that monitoring was conducted at Pond 44 (see Figure 4-49). The 1997-1998, 2015-2016, and 2018-2019, water-years were above normal, whereas 2019-2020, was similar to the cumulative normal water-year. This year, 2020-2021, as well as the 2014-2015 and 2017-2018 water-years were below normal.

Table 4-154. Pond 44 (Year 3 Post-Subsurface Munitions Remediation) Summary of Historical Surveys for Hydrology, Vegetation, and Wildlife

Survey	Water-Year						
	1997-1998	2014-2015	2015-2016	2017-2018	2018-2019	2019-2020	2020-2021
Hydrology	●	●	●	●	●	●	●
Vegetation	●		●	●	●	●	●
Wildlife	●				●	●	

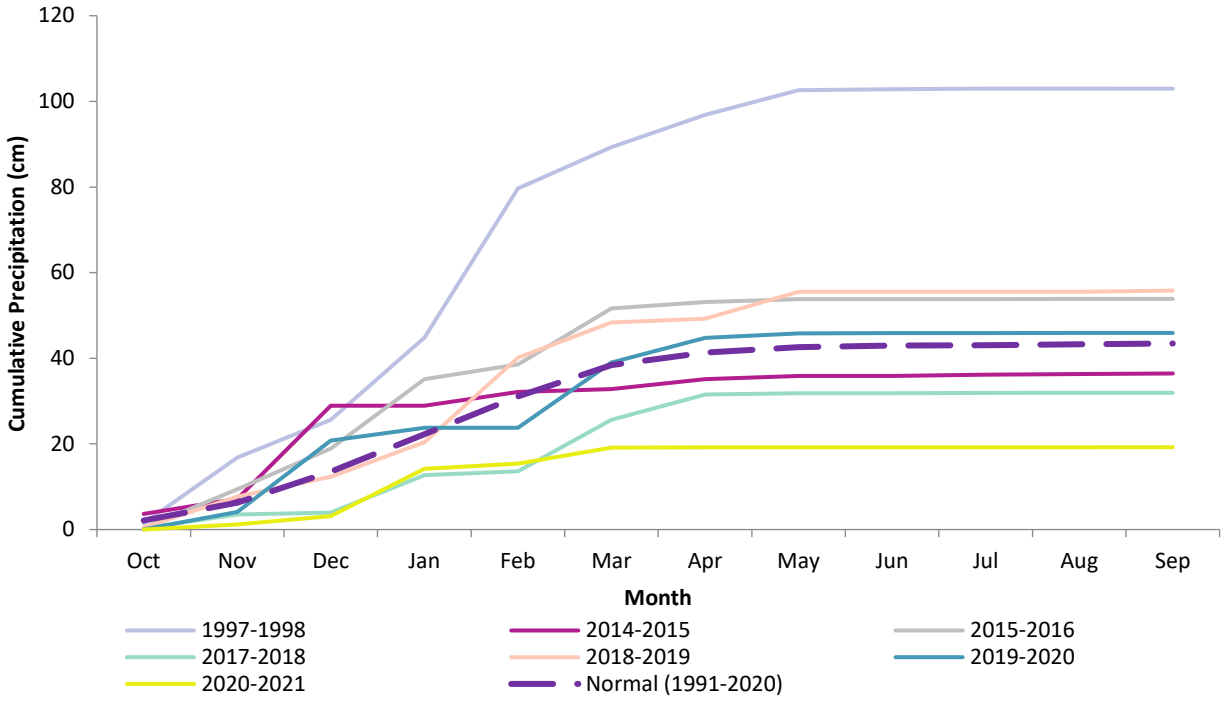

Figure 4-49. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 44 (Year 3 Post-Subsurface Munitions Remediation) Compared to the 30-Year Normal (mean 1991-2020) (NPS, 2021; NCEI NOAA, 2021)

4.13.1 Vegetation Monitoring

Vegetation data were collected at Pond 44 in 1998, 2016, 2018, 2019, 2020, and 2021 (HLA, 1998; Burleson, 2017, 2019, 2020, 2021). In 1998, data were collected along two transects close to 50 feet in length. Quadrats were placed at 10-foot intervals, alternating from right to left along the transect. Because 1998 data were collected differently than in other years, strata were combined across the vernal pool to allow for comparison. In 2016, 2018, 2019, 2020, and 2021 data were collected using the methodology described in the Methods section of this report. Data from 2016 and 2021 were compared stratum-to-stratum in Table 4-155 as well as visually in Figure 4-50.

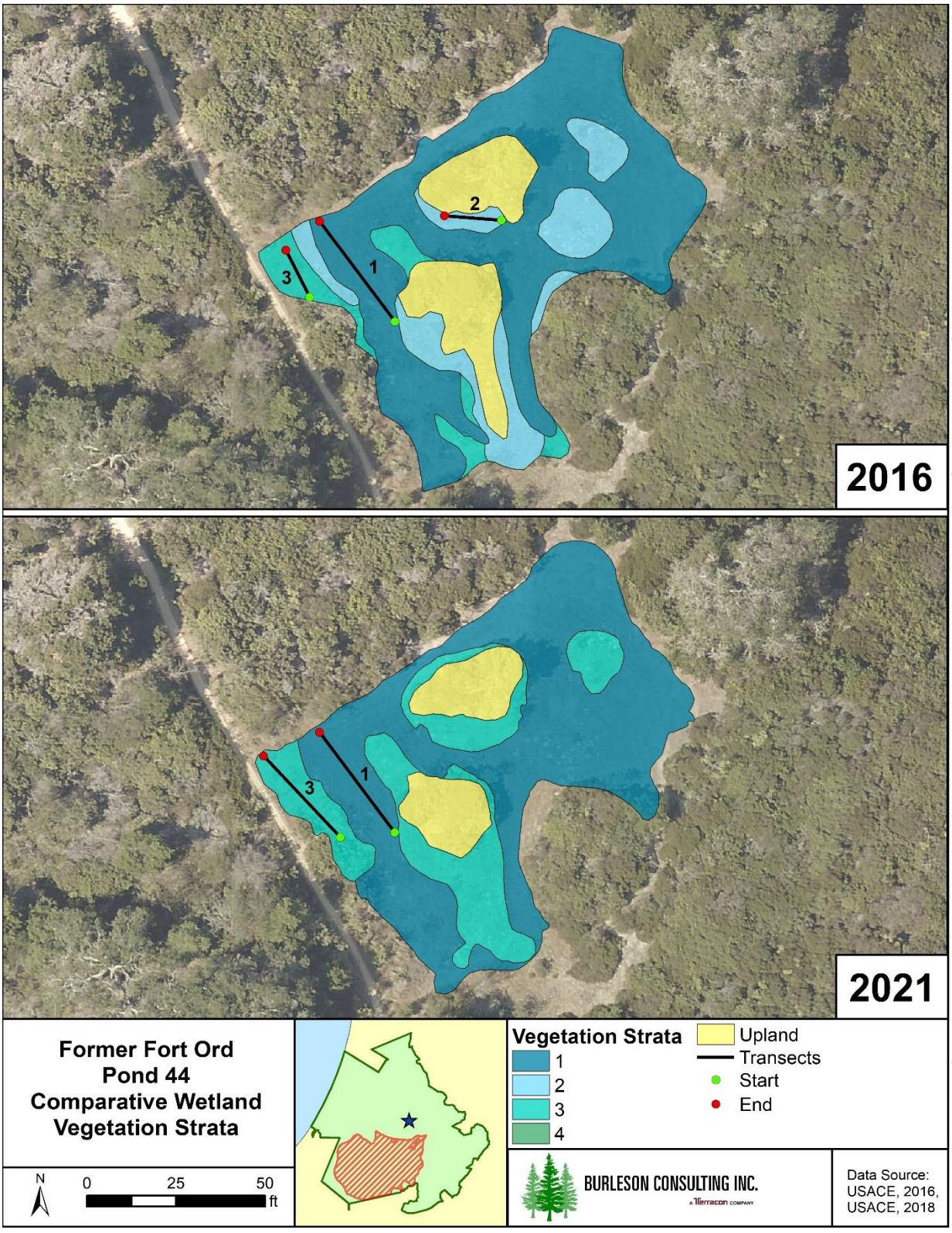

Figure 4-50. Pond 44 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects for 2016 and 2021

Table 4-155. Pond 44 (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage	
	2016	2021
1	60%	63%
2	17%	N/A
3	7%	25%
Upland	16%	12%

The absolute percent vegetative cover of Pond 44 was less than baseline cover, and thatch/bare ground cover was greater than baseline (see Table 4-156). Vegetative cover ranged in baseline years from 72.8% in 1998 to 78.6% in 2016, whereas thatch/bare ground ranged from 22.9% in 2016 to 26.0% in 1998. The absolute percent vegetative cover of Pond 44 in 2021 was greater than the values observed at the reference vernal pools (see Table 4-157).

Table 4-156. Pond 44 (Year 3 Post-Subsurface Munitions Remediation) Absolute Percent Cover

Year	Vegetative Cover	Thatch/Bare Ground
1998*	72.8%	26.0%
2016*	78.6%	22.9%
2018	70.9%	30.0%
2019	67.7%	32.2%
2020	74.4%	25.8%
2021	46.3%	53.8%

*baseline year

Table 4-157. Pond 44 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Absolute Percent Cover in 2021

Vernal Pool	Vegetative Cover	Thatch/Bare Ground
5	39.3%	60.7%
101 East (East)	38.5%	61.6%
997	45.1%	55.0%
44	**46.3%**	**53.8%**

Species richness in 2021 was greater than in baseline years. Species richness on transects was 26, 36, 44, 44, 39, and 48 species in 1998, 2016, 2018, 2019, 2020, and 2021, respectively, whereas overall basin species richness was 47, 71, 74, 67, and 70 species in 2016, 2018, 2019, 2020, and 2021, respectively (see Table 4-158 and Appendix A Table A-13). Pond 44 species richness on transects was greater than the reference vernal pools but was within the range of values observed for the entire basin (see Table 4-159 and Appendix E Tables E-22 and E-44).

Species composition at Pond 44 differed among the monitoring years, however, the dominant species were fairly similar. The dominant species in 1998 was needle spikerush. In 2016, 2018, and 2019, the dominant species was coyote thistle (*Eryngium armatum*). In 2020, California oatgrass (*Danthonia*

californica) and brown-headed rush (*Juncus phaeocephalus*) were the dominant species. Cut-leaved plantain (*Plantago coronopus*) was the dominant species in 2021 with moderate cover from coyote thistle and brown-headed rush. A complete comparison of species composition observed at Pond 44 in 1998, 2016, 2018, 2019, 2020, and 2021 can be found in Appendix F. Figure 4-51 shows a subset of this comparison for species observed with a 2% cover or greater.

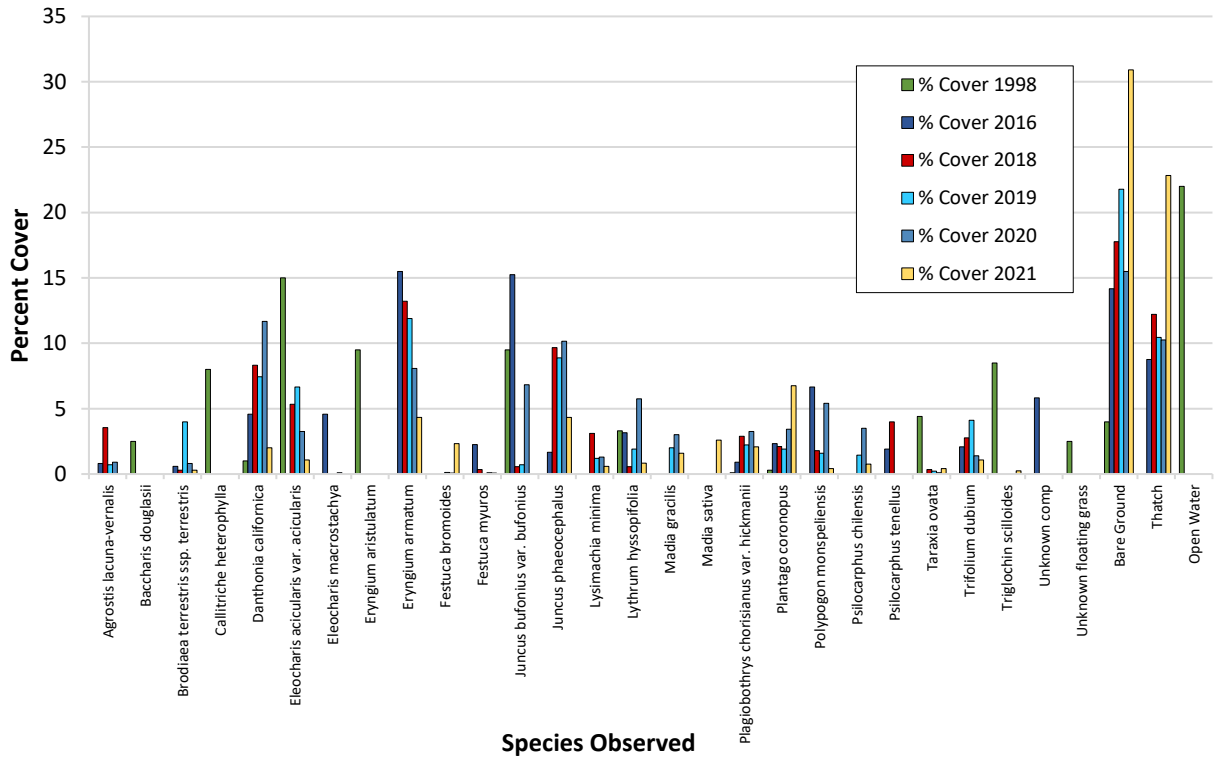

Figure 4-51. Percent Cover of Dominant Species at Pond 44 (Year 3 Post-Subsurface Munitions Remediation)

Native and non-native species richness on Pond 44 transects were greater in 2021 than in baseline years and the values observed at the reference vernal pools (see Table 4-158 and Table 4-159). The relative percent cover of native species was lower, and non-native species cover was greater than, the range of values observed in the baseline years and the values observed at reference vernal pools (see Table 4-160 and Table 4-161).

Table 4-158. Pond 44 (Year 3 Post-Subsurface Munitions Remediation) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
1998*	17	8	2
2016*	21	14	1
2018	28	15	1
2019	28	15	1
2020	22	17	0
2021	27	21	0

*baseline year

Table 4-159. Pond 44 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Native and Non-Native Species Richness in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	16	15	0
101 East (East)	10	11	0
997	15	12	0
44	**27**	**21**	**0**

Table 4-160. Pond 44 (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
1998*	87.6%	8.8%	3.4%
2016*	66.5%	26.1%	7.4%
2018	82.1%	17.7%	0.2%
2019	78.2%	21.7%	0.2%
2020	74.0%	26.0%	0.0%
2021	52.8%	47.2%	0.0%

*baseline year

Table 4-161. Pond 44 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Native and Non-Native Plants in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	75.0%	25.0%	0.0%
101 East (East)	64.1%	35.9%	0.0%
997	59.1%	40.9%	0.0%
44	**52.8%**	**47.2%**	**0.0%**

Wetland and non-wetland species richness on Pond 44 transects were greater in 2021 than in baseline years (see Table 4-162). Wetland species richness at Pond 44 was also greater than the range of values observed at reference vernal pools, however non-wetland species were within the range of reference (see Table 4-163). The relative percent cover of wetland species was less than, and non-wetland species was greater than, the range of values observed in baseline years (see Table 4-164). The relative percent cover of wetland and non-wetland species were within the range of values observed at the reference vernal pools in 2021 (see Table 4-165).

Table 4-162. Pond 44 (Year 3 Post-Subsurface Munitions Remediation) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
1998*	7	4	5	1	0	9
2016*	5	9	5	6	0	10
2018	8	9	4	7	1	15
2019	7	10	6	4	1	16
2020	7	8	5	6	0	13
2021	7	9	5	6	1	20

*baseline year

Table 4-163. Pond 44 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Wetland and Non-Wetland Species Richness in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	4	6	3	7	1	10
101 East (East)	2	4	1	4	4	6
997	3	5	4	4	1	10
44	**7**	**9**	**5**	**6**	**1**	**20**

Table 4-164. Pond 44 (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Wetland and Non-Wetland Species

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
1998*	63.5%	15.2%	3.3%	0.4%	0.0%	14.1%
2016*	15.8%	53.8%	9.7%	8.7%	0.0%	4.7%
2018	20.7%	46.9%	16.8%	8.0%	0.3%	7.4%
2019	19.9%	39.9%	17.4%	8.2%	0.2%	14.4%
2020	17.6%	49.3%	22.1%	2.9%	0.0%	8.2%
2021	10.5%	25.8%	24.7%	10.3%	1.1%	27.7%

*baseline year

Table 4-165. Pond 44 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Wetland and Non-Wetland Species in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	35.3%	36.5%	3.1%	4.2%	1.7%	19.1%
101 East (East)	17.7%	24.7%	3.6%	29.3%	1.9%	22.8%
997	2.0%	38.4%	19.0%	8.9%	0.2%	31.4%
44	**10.5%**	**25.8%**	**24.7%**	**10.3%**	**1.1%**	**27.7%**

4.13.1.1 *Data Quality Objective 3*

Observable changes in hydrophytic vegetation between surveys were largely associated with precipitation fluctuations. This is expected given the dynamic nature of vernal pools and the close relationship between the hydroperiod and wetland vegetation composition. This year was a historic dry water-year. Below-normal water-years can result in upland and non-native herbs and grasses exploiting a greater portion of a vernal pool and distributing more evenly (Bauder, 2000).

Vegetative cover in Pond 44 was dominated by native and wetland plant species during year 3 post-subsurface munitions remediation monitoring in 2021. Pond 44 wetland vegetation results differed from baseline and/or reference vernal pools. The native, non-native, and wetland richness were all greater than the baseline years and the range of values observed at reference vernal pools. The increase in native and wetland richness is not concerning. Both support a healthy vernal pool ecosystem. The relatively high numbers of non-native richness was a trend observed across many vernal pools this year. This is likely related to a low water-year rather than remediation. Similar to Ponds 35 and 40 South, the relative percent cover of native species was lower, and non-native species cover was greater than the range of values observed in the baseline years and the values observed at reference vernal pools. This, along with non-native richness should be observed closely in future monitoring years.

4.13.1.2 *Performance Standard: Plant Cover and Species Diversity*

Pond 44, a post-mastication munitions remediation vernal pool, was not on track to meet the performance standard for year 3 in 2021. Although species composition and wetland species relative abundances were similar to baseline and/or reference vernal pool conditions, non-native richness and cover is concerning. This vernal pool should continue to be monitored as recommended in the PBO (see USFWS, 2017).

4.13.2 Wildlife Monitoring

Wildlife data were collected at Pond 44 in 1998, 2019, and 2020 (HLA, 1998; Burleson, 2020, 2021). California tiger salamanders were not detected in any year, whereas fairy shrimp were present in all years. The vernal pool did not hold sufficient depth for surveys to be completed in 2021. Therefore, DQO 5 and the applicable wildlife usage performance standard cannot be assessed. Table 4-166 shows historical wildlife monitoring results.

Table 4-166. Pond 44 (Year 3 Post-Subsurface Munitions Remediation) Historical Wildlife Monitoring Results

Sampling Year	CTS Larvae Abundance (# Individuals)	Fairy Shrimp Abundance (# Individuals)
1998*	Not detected	Moderate
2019	Not detected	Very High (650, 370)
2020	Not detected	High (258)

*baseline year

4.13.3 Conclusion

Pond 44, a post-subsurface munitions remediation vernal pool, was in year 3 of monitoring in 2021. The vernal pool was not on track to meet the plant cover and species diversity performance standard due to high non-native richness and cover (see Table 4-167). Pond 44 will continue to be monitored in the future.

Table 4-167. Success at Pond 44 (Year 3 Post-Subsurface Munitions Remediation) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Plant Cover & Species Diversity	DQO 3	Not on track
Wildlife Usage	N/A*	N/A*

*Not applicable; wildlife surveys were not conducted due to insufficient depth

4.14 Pond 54 – Year 3

Pond 54 was monitored in 2021 as a year 3 post-subsurface munitions remediation vernal pool. Vegetation within the Pond 54 watershed was masticated in the summer of 2015 in support of MEC remediation in Unit 23. Risk reduction activities in Unit 23 resulted in subsurface munitions remediation in Pond 54 in 2018. All surveys before 2015 are pre-remediation and are considered baseline. Table 4-168 summarizes the years that monitoring was conducted. The cumulative precipitation graph shows the precipitation for monitoring years at Pond 54 (see Figure 4-52). The 2016-2017 and 2018-2019 water-years were above-normal, whereas water-years 2003-2004, 2008-2009, 2017-2018, and 2020-2021 were below-normal.

Table 4-168. Pond 54 (Year 3 Post-Subsurface Munitions Remediation) Summary of Historic Surveys for Hydrology, Vegetation, and Wildlife

Survey	Water-Year					
	2003-2004	2008-2009	2016-2017	2017-2018	2018-2019	2020-2021
Hydrology	●		●	●	●	●
Vegetation	●				●	●
Wildlife	●	●	●		●	

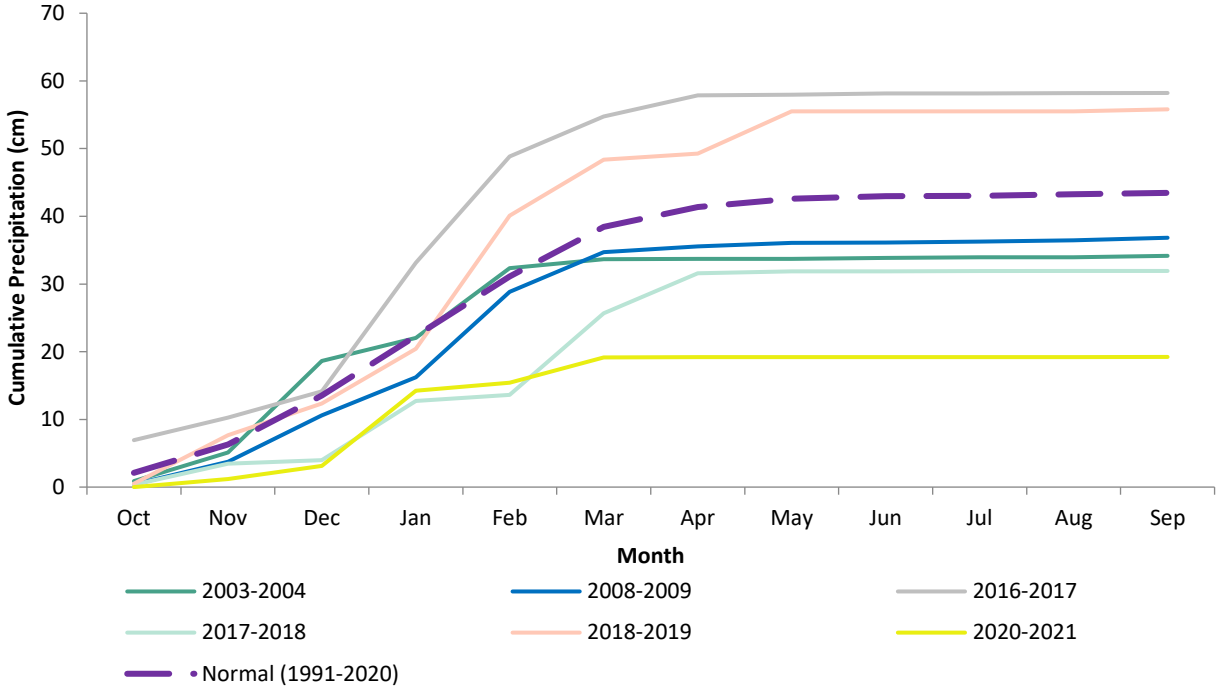

Figure 4-52. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 54 (Year 3 Post-Subsurface Munitions Remediation) Compared to the 30-Year Normal (mean 1991-2020) (NPS, 2021; NCEI NOAA, 2021)

4.14.1 Vegetation Monitoring

Vegetation data were collected at Pond 54 in 2004, 2019, and 2021 (MACTEC, 2005; Burleson 2020). In 2004, data were collected along two transects close to 50 feet in length. Quadrats were placed at 10-foot intervals, alternating from right to left along the transect. Because 2004 data were collected differently than in other years, strata were combined across the vernal pool to allow for comparison. In 2019 and 2021, data were collected using the methodology described in the Methods section of this report. Data from 2019 (Year 1) and 2021 (Year 3) were compared stratum-to-stratum in Table 4-169 as well as visually in Figure 4-54, however data from 2019 is not the baseline year of monitoring.

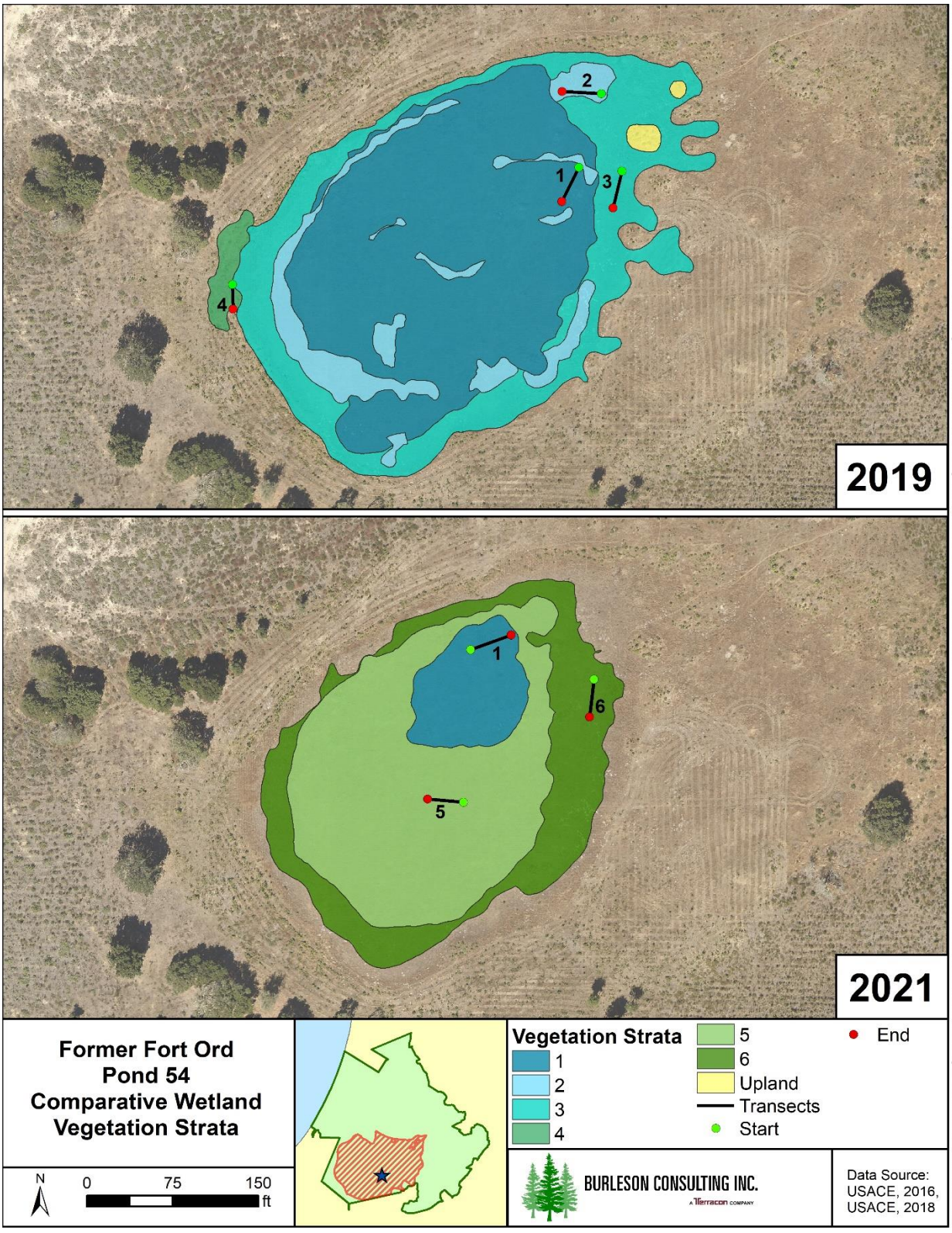

Figure 4-53. Pond 54 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects for 2019 and 2021. This map is not a comparison with baseline; 2019 is Year 2 of monitoring. Baseline data was collected in 2004 using a different methodology.

Table 4-169. Pond 54 (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage	
	2019*	2021
1	55%	12%
2	11%	N/A
3	31%	N/A
4	2%	N/A
5	N/A	57%
6	N/A	31%
Upland	1%	N/A

*2019 is Year 2 of monitoring, baseline data was collected in 2004 using a different methodology.

Absolute percent vegetative cover dramatically decreased between 2004 and 2021 and thatch/bare ground cover increased (see Table 4-170). The absolute percent vegetative cover of Pond 54 in 2021 was lower than the values observed at the reference vernal pools and thatch/bare ground cover was higher (see Table 4-171).

Table 4-170. Pond 54 (Year 3 Post-Subsurface Munitions Remediation) Absolute Percent Cover

Year	Vegetative Cover	Thatch/Bare Ground
2004*	97.4%	2.5%
2019	85.5%	14.5%
2021	33.8%	66.7%

*baseline year

Table 4-171. Pond 54 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Absolute Percent Cover in 2021

Vernal Pool	Vegetative Cover	Thatch/Bare Ground
5	39.3%	60.7%
101 East (East)	38.5%	61.6%
997	45.1%	55.0%
54	**33.8%**	**66.7%**

Species richness increased between 2004 and 2021 at Pond 54. Species richness on transects was 12, 40, and 20 species in 2004, 2019, and 2021, respectively, whereas overall basin species richness was 79 and 53 species in 2019 and 2021, respectively (see Table 4-172 and Appendix A Table A-14). The 2004 survey was limited to species on the transects and total vernal pool species richness was not recorded. Pond 54 species richness in 2021 was less than the range observed at the reference vernal pools for transects and for the entire basin (see Table 4-173 and Appendix F Tables F-27 and F-54).

Species composition at Pond 54 differed among the monitoring years, as did the dominant species. The dominant species in 2004 was rattail sixweeks grass (*Festuca myuros*). In 2019, the dominant species were brown-headed rush (*Juncus phaeocephalus*), pale spikerush (*Eleocharis macrostachya*), and needle spikerush (*Eleocharis acicularis* var. *acicularis*). Cut-leaved geranium (*Geranium dissectum*) was the

dominant species in 2021, along with moderate cover from pale spikerush and brown-headed rush. A complete comparison of species composition observed at Pond 54 in 2004, 2019, and 2021 can be found in Appendix F. Figure 4-51 shows a subset of this comparison for species observed with a 2% cover or greater.

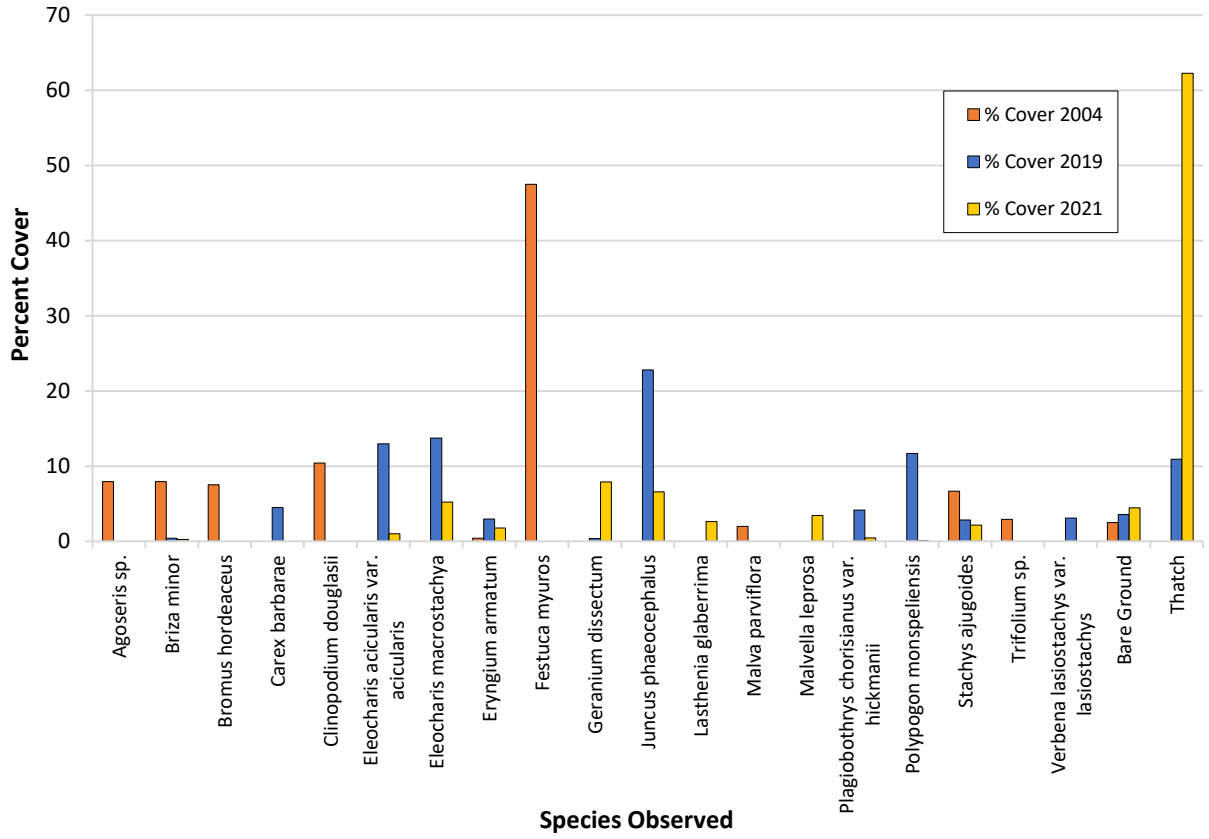

Figure 4-54. Percent Cover of Dominant Species at Pond 54 (Year 3 Post-Subsurface Munitions Remediation)

Native and non-native species richness on Pond 54 was greater in 2021 than baseline (see Table 4-172). Pond 54 native species richness was within the range of values observed at the reference vernal pools, while non-native species richness was less (see Table 4-173). The relative percent cover of native species was considerably greater than the baseline year, whereas non-native cover was considerably less than baseline (see Table 4-174). Pond 54 native and non-native cover were within the range of values observed at the reference vernal pools in 2021 (see Table 4-175).

Table 4-172. Pond 54 (Year 3 Post-Subsurface Munitions Remediation) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
2004*	4	6	2
2019	26	14	0
2021	12	8	0

*baseline year

Table 4-173. Pond 54 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Native and Non-Native Species Richness in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	16	15	0
101 East (East)	10	11	0
997	15	12	0
54	**12**	**8**	**0**

Table 4-174. Pond 54 (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
2004*	19.7%	69.2%	11.1%
2019	82.7%	17.3%	0.0%
2021	74.2%	25.8%	0.0%

*baseline year

Table 4-175. Pond 54 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Native and Non-Native Plants in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	75.0%	25.0%	0.0%
101 East (East)	64.1%	35.9%	0.0%
997	59.1%	40.9%	0.0%
54	**74.2%**	**25.8%**	**0.0%**

Wetland and non-wetland species richness on Pond 54 transects in 2021 were greater than baseline values (see Table 4-176). Wetland species richness was within the range of values at the reference vernal pools, whereas non-wetland species were slightly less than reference pool values (Table 4-177). The relative percent cover of wetland species in 2021 was considerably greater than the baseline year, whereas non-wetland cover was considerably less (see Table 4-178). Wetland and non-wetland cover were within the range of values of reference vernal pools (Table 4-179).

Table 4-176. Pond 54 (Year 3 Post-Subsurface Munitions Remediation) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2004*	2	1	1	3	0	5
2019	8	9	6	6	1	10
2021	5	5	2	4	0	4

*baseline year

Table 4-177. Pond 54 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Wetland and Non-Wetland Species Richness in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	4	6	3	7	1	10
101 East (East)	2	4	1	4	4	6
997	3	5	4	4	1	10
54	**5**	**5**	**2**	**4**	**0**	**4**

Table 4-178. Pond 54 (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Wetland and Non-Wetland Species

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2004*	7.7%	0.4%	8.1%	67.1%	0.0%	16.6%
2019	40.2%	45.6%	10.6%	1.2%	0.3%	2.0%
2021	33.8%	29.9%	1.0%	11.3%	0.0%	24.0%

*baseline year

Table 4-179. Pond 54 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Wetland and Non-Wetland Species in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	35.3%	36.5%	3.1%	4.2%	1.7%	19.1%
101 East (East)	17.7%	24.7%	3.6%	29.3%	1.9%	22.8%
997	2.0%	38.4%	19.0%	8.9%	0.2%	31.4%
54	**33.8%**	**29.9%**	**1.0%**	**11.3%**	**0.0%**	**24.0%**

4.14.1.1 *Data Quality Objective 3*

Observable changes in hydrophytic vegetation between surveys were largely associated with precipitation fluctuations as well as differing methodologies. Changes are expected in relation to precipitation given the dynamic nature of vernal pools and the close relationship between the hydroperiod and wetland vegetation composition. This year was a historic dry water-year. Below-normal

water-years can result in upland and non-native herbs and grasses exploiting a greater portion of a vernal pool and distributing more evenly (Bauder, 2000).

Data collection methodologies also creates some variability when comparing from year to year. In 2004, the transects were placed in "transitional and emergent habitats" and "sampling characterized wetland-influenced vegetation and associated transitional herbaceous species" which differs from the methods in 2019 and 2021 which focuses on placing transects within the wetland in representative locations in each stratum (MACTEC, 2004).

Vegetative cover in Pond 54 was dominated by native and wetland plant species during year 3 post-subsurface munitions remediation monitoring in 2021. Pond 54 wetland vegetation results were generally within range of baseline and/or reference vernal pools, however non-native and non-wetland cover were greater than baseline but less than reference vernal pools. The increase in non-native and non-wetland cover from baseline is likely related to a below-normal water-year, but also related to the methodology used this year differed from baseline methodology. In comparison to reference data however, non-native and non-wetland cover are less than reference, which is favorable.

4.14.1.2 *Performance Standard: Plant Cover and Species Diversity*

Pond 54, a post-mastication and post-subsurface munitions remediation vernal pool, was on track to meet the performance standard for year 3 in 2021. The species composition, richness, and native and wetland species relative abundances were similar to baseline and/or reference vernal pool conditions, however non-native and non-wetland cover were greater than baseline but less than reference vernal pools. This vernal pool should continue to be monitored as recommended in the PBO (see USFWS, 2017).

4.14.2 Wildlife Monitoring

Wildlife data were collected at Pond 54 in 2004, 2009, 2017, and 2019 (MACTEC, 2005; Shaw, 2010, Burleson, 2018, 2020). California tiger salamander larvae were not detected in 2004 but were present in 2017 and 2019; CTS eggs were observed in 2009. Fairy shrimp were not detected in any year. The vernal pool did not hold sufficient depth for surveys to be completed in 2021. Therefore, DQO 5 and the applicable wildlife usage performance standard cannot be assessed. Table 4-180 shows historic wildlife monitoring results.

Table 4-180. Pond 54 (Year 3 Post-Subsurface Munitions Remediation) Historic Wildlife Monitoring Results

Sampling Year	CTS Larvae Abundance (# Individuals)	Fairy Shrimp Abundance (# Individuals)
2004	Not detected	Not detected
2009	CTS eggs present; no larvae	Not detected
2017	Few (1, 4, 2)	Not detected
2019	Common (14, 14)	Not detected

4.14.3 Conclusion

Pond 54, a post-subsurface munitions remediation vernal pool, was in year 3 of monitoring in 2021. The vernal pool was on track to meet the plant cover and species diversity performance standard (see Table 4-181). Pond 54 will continue to be monitored in the future.

Table 4-181. Success at Pond 54 (Year 3 Post-Subsurface Munitions Remediation) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Plant Cover & Species Diversity	DQO 3	On track
Wildlife Usage	N/A*	N/A*

*Not applicable; wildlife surveys were not conducted due to insufficient depth

4.15 Pond 60 – Year 3

Pond 60 was monitored in 2021 as a year 3 post-subsurface munitions remediation vernal pool. Pond 60 was monitored for baseline conditions in 2015 and 2016. Grasses and shrubs in and around Pond 60 were masticated in the summer of 2017 to support MEC remediation activities. Pond 60 had intrusive anomaly investigations in 2018. Table 4-182 summarizes the years that monitoring occurred and surveys were conducted. The cumulative precipitation graph shows precipitation for years in which hydrology monitoring was conducted at Pond 60 (see Figure 4-55). The 2015-2016 and 2018-2019 water-years were above normal, whereas the 2014-2015, 2017-2018, and 2020-2021 water-years were below normal. Water-year 2019-2020 was similar to the cumulative normal water-year.

Table 4-182. Pond 60 (Year 3 Post-Subsurface Munitions Remediation) Summary of Historical Surveys for Hydrology, Vegetation, and Wildlife

Survey	Water-Year					
	2014-2015	2015-2016	2017-2018	2018-2019	2019-2020	2020-2021
Hydrology	●	●	●	●	●	●
Vegetation	●		●	●	●	●
Wildlife	●	●	●	●	●	●

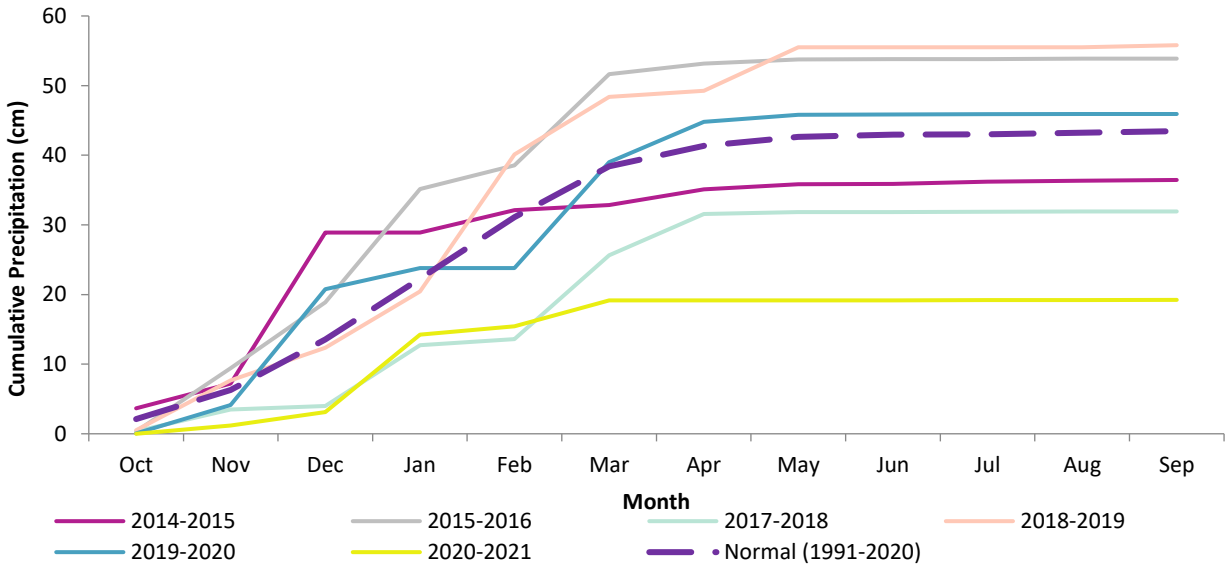

Figure 4-55. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 60 (Year 3 Post-Subsurface Munitions Remediation) Compared to the 30-Year Normal (mean 1991-2020) (NPS, 2021; NCEI NOAA, 2021)

4.15.1 Vegetation Monitoring

Vegetation data were collected at Pond 60 in 2015, 2018, 2019, 2020, 2021 (Burleson, 2016, 2019, 2020, 2021). In 2015, 2018, 2019, 2020, and 2021 data were collected using the methodology described in the Methods section of this report. Data from 2015 and 2021 were compared stratum-to-stratum in Table 4-183 as well as visually in Figure 4-56.

Table 4-183. Pond 60 (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage	
	2015	2021
1	7%	8%
2	35%	44%
3	3%	9%
4	27%	39%
5	2%	N/A
6	26%	N/A

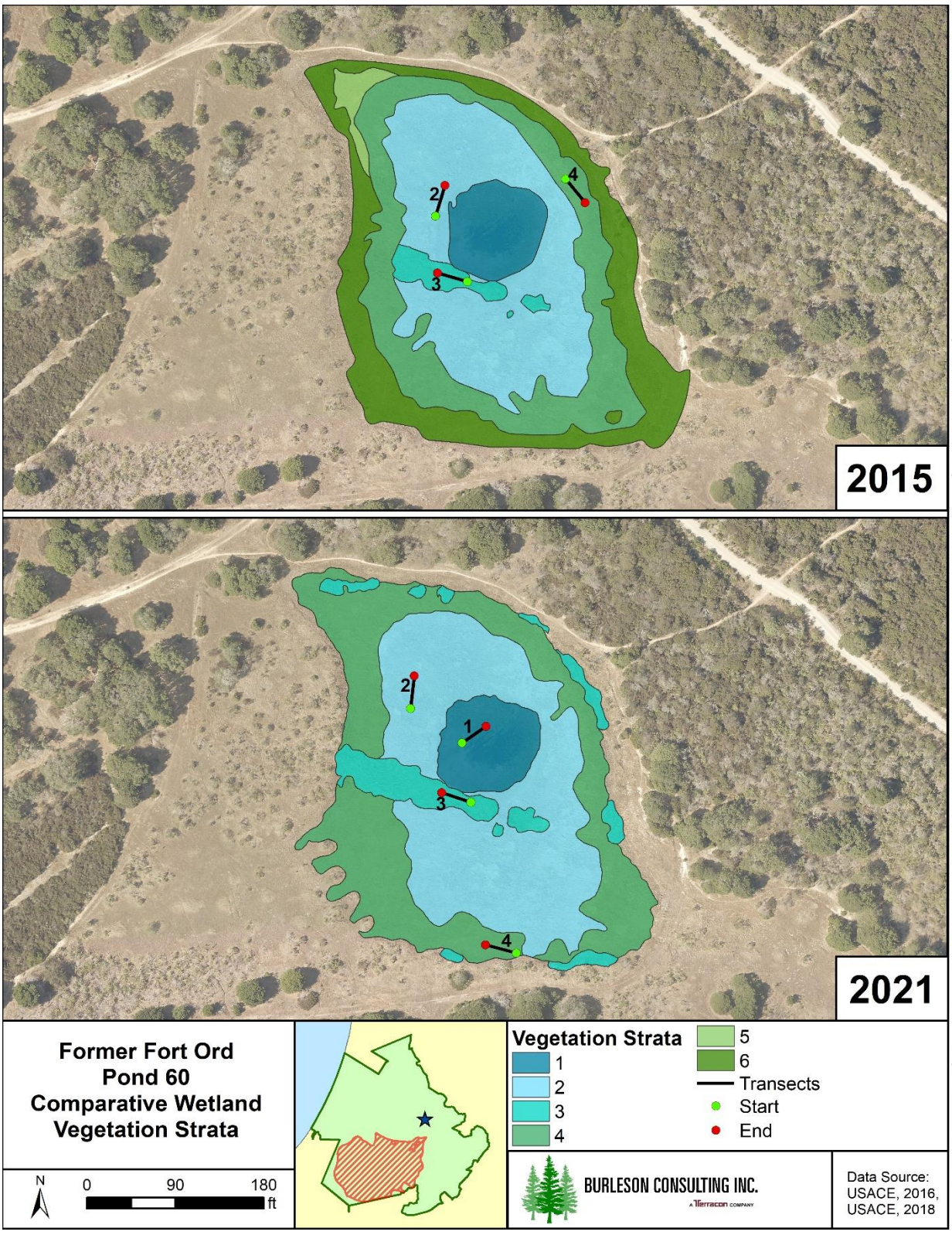

Figure 4-56. Pond 60 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects for 2015 and 2021

Absolute percent vegetative cover at Pond 60 decreased between baseline and 2021 (see Table 4-184). The absolute percent vegetative cover of Pond 60 in 2021 was also slightly less than the values observed at the reference vernal pools (see Table 4-185).

Table 4-184. Pond 60 (Year 3 Post-Subsurface Munitions Remediation) Absolute Percent Cover

Year	Vegetative Cover	Thatch/Bare Ground
2015*	61.8%	38.4%
2018	40.8%	59.7%
2019	77.5%	22.5%
2020	53.8%	45.5%
2021	34.3%	65.6%

*baseline year

Table 4-185. Pond 60 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Absolute Percent Cover in 2021

Vernal Pool	Vegetative Cover	Thatch/Bare Ground
5	39.3%	60.7%
101 East (East)	38.5%	61.6%
997	45.1%	55.0%
60	**34.3%**	**65.6%**

Species richness in 2021 was greater than the baseline year of monitoring. Species richness on transects was 13, 19, 14, 16, and 22 species in 2015, 2018, 2019, 2020, and 2021, respectively, whereas overall basin species richness was 30, 59, 46, 57, and 60 species, respectively (see Table 4-186 and Appendix A Table A-15). Pond 60 species richness was within the range of values observed at the reference vernal pools on transects and for the entire basin (see Table 4-187 and Appendix E Tables E-22 and E-44).

Species composition at Pond 60 was similar in 2015, 2018, 2019, 2020, and 2021. The dominant species in all years were salt grass (*Distichlis spicata*), brown-headed rush (*Juncus phaeocephalus*), and pale spikerush (*Eleocharis macrostachya*), with rabbitfoot grass (*Polypogon monspeliensis*) as a codominant species in 2019. A complete comparison of species composition observed at Pond 60 in 2015, 2018, 2019, 2020, and 2021 can be found in Appendix F. Figure 4-57 shows a subset of this comparison for species observed with a 2% cover or greater.

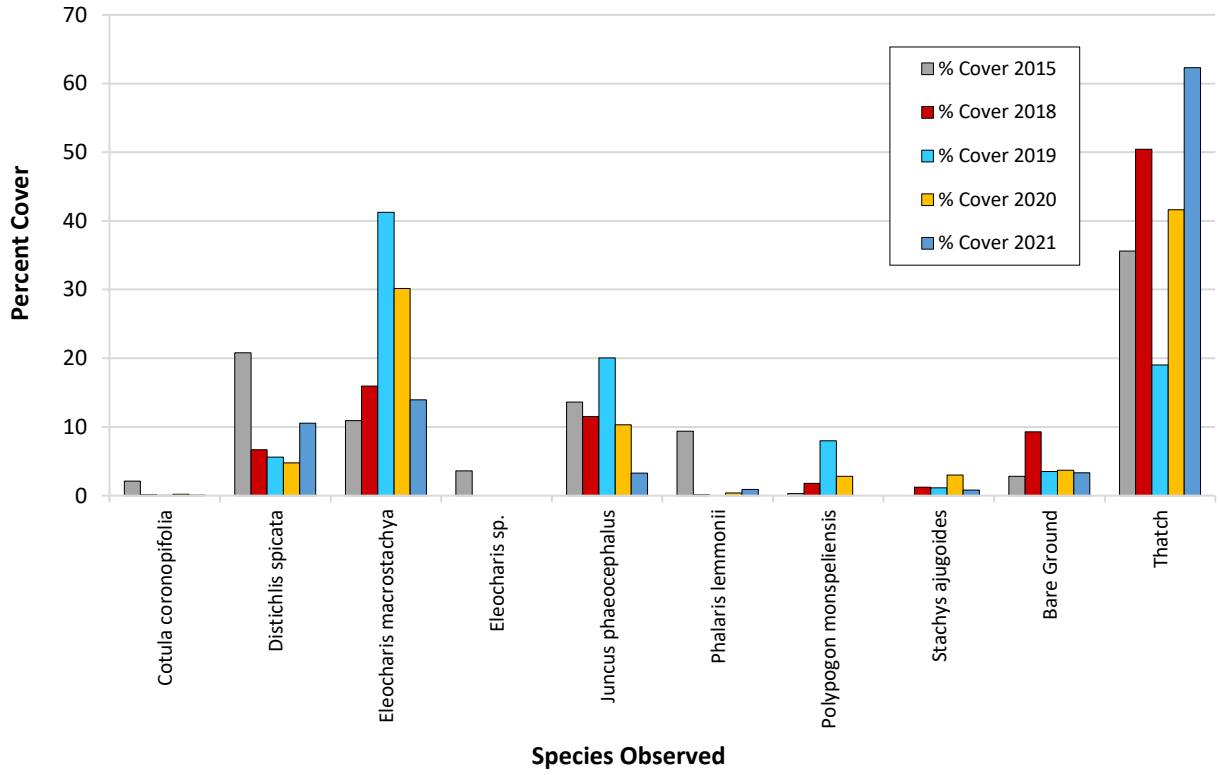

Figure 4-57. Percent Cover of Dominant Species at Pond 60 (Year 3 Post-Subsurface Munitions Remediation)

Native and non-native species richness on Pond 60 transects were greater than in the baseline year (see Table 4-186). Pond 60 native species richness in 2021 was within the range of values observed at reference vernal pools, while non-native species richness was less than reference (see Table 4-187). Pond 60 relative percent cover of native species was greater than in baseline years and at the reference vernal pools, whereas the non-native species cover was greater than baseline but less than reference (see Table 4-188 and Table 4-189).

Table 4-186. Pond 60 (Year 3 Post-Subsurface Munitions Remediation) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
2015*	4	7	2
2018	10	9	0
2019	7	7	0
2020	9	7	0
2021	13	9	0

*baseline year

Table 4-187. Pond 60 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Native and Non-Native Species Richness in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	16	15	0
101 East (East)	10	11	0
997	15	12	0
60	**13**	**9**	**0**

Table 4-188. Pond 60 (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
2015*	88.5%	5.5%	6.0%
2018	92.8%	7.2%	0.0%
2019	88.3%	11.7%	0.0%
2020	93.3%	6.7%	0.0%
2021	92.8%	7.2%	0.0%

*baseline year

Table 4-189. Pond 60 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Native and Non-Native Plants in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	75.0%	25.0%	0.0%
101 East (East)	64.1%	35.9%	0.0%
997	59.1%	40.9%	0.0%
60	**92.8%**	**7.2%**	**0.0%**

Wetland and non-wetland species richness on Pond 60 transects were greater than in the baseline year (see Table 4-190). The wetland species richness was within the range observed at reference vernal pools, whereas the non-wetland richness was less than the reference vernal pool values (see Table 4-191). Relative percent cover of wetland species in 2021 was slightly less than the baseline year of monitoring, but non-wetland species cover was slightly greater (see Table 4-192). Conversely, the relative percent cover of wetland species was greater than the values observed at the reference vernal pools while non-wetland species cover was less than reference (see Table 4-193).

Table 4-190. Pond 60 (Year 3 Post-Subsurface Munitions Remediation) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2015*	3	4	3	1	0	2
2018	5	6	3	2	1	2
2019	6	4	2	2	0	0
2020	6	5	3	1	1	0
2021	5	4	4	2	1	6

*baseline year

Table 4-191. Pond 60 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Wetland and Non-Wetland Species Richness in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	4	6	3	7	1	10
101 East (East)	2	4	1	4	4	6
997	3	5	4	4	1	10
60	**5**	**4**	**4**	**2**	**1**	**6**

Table 4-192. Pond 60 (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Wetland and Non-Wetland Species

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2015*	21.4%	71.4%	0.8%	0.4%	0.0%	6.0%
2018	45.8%	52.1%	0.5%	0.7%	0.1%	0.8%
2019	56.2%	43.5%	0.2%	0.1%	0.0%	0.0%
2020	64.5%	34.2%	0.9%	0.4%	0.1%	0.0%
2021	46.0%	43.9%	1.8%	2.9%	0.6%	4.7%

*baseline year

Table 4-193. Pond 60 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Wetland and Non-Wetland Species in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	35.3%	36.5%	3.1%	4.2%	1.7%	19.1%
101 East (East)	17.7%	24.7%	3.6%	29.3%	1.9%	22.8%
997	2.0%	38.4%	19.0%	8.9%	0.2%	31.4%
60	**46.0%**	**43.9%**	**1.8%**	**2.9%**	**0.6%**	**4.7%**

4.15.1.1 *Data Quality Objective 3*

Observable changes in hydrophytic vegetation between surveys were largely associated with precipitation fluctuations. This is expected given the dynamic nature of vernal pools and the close relationship between the hydroperiod and wetland vegetation composition. This year was a historic dry water-year. Below-normal water-years can result in upland and non-native herbs and grasses exploiting a greater portion of a vernal pool and distributing more evenly (Bauder, 2000).

Vegetative cover in Pond 60 was dominated by native and wetland plant species during year 3 post-subsurface munitions remediation monitoring in 2021. Pond 60 wetland vegetation results were generally within range of either baseline and/or reference vernal pools with a few exceptions. Pond 60 native vegetation cover was greater than baseline and reference. The increase in native cover is not concerning as it supports a healthy vernal pool ecosystem. Additionally, non-native richness and cover as well as non-wetland richness and cover were greater than baseline but less than reference. The relatively high numbers of non-native and non-wetland richness compared to past years is a trend observed across many vernal pools this year. Although non-native and non-wetland cover are greater than baseline, they are still less than reference values, suggesting that these variabilities are likely related to a low water-year rather than remediation. However, they should be observed closely in future monitoring years.

4.15.1.2 *Performance Standard: Plant Cover and Species Diversity*

Pond 60, a post-subsurface munitions remediation vernal pool, was on track to meet the performance standard for year 3. The species composition and native and wetland species relative abundances were similar to baseline and/or reference vernal pool conditions with some variability with species richness. This vernal pool should continue to be monitored as recommended in the PBO (see USFWS, 2017).

4.15.2 Wildlife Monitoring

Wildlife data were collected at Pond 60 in 2015, 2016, 2018, 2019, 2020, and 2021 (Burleson, 2016, 2017, 2019, 2020, 2021). California tiger salamander larvae were observed in 2015, 2016, 2019, and 2020. Fairy shrimp were present in 2019. Table 4-194 shows historical wildlife monitoring results.

Table 4-194. Pond 60 (Year 3 Post-Subsurface Munitions Remediation) Historical Wildlife Monitoring Results

Sampling Year	CTS Larvae Abundance (# Individuals)	Fairy Shrimp Abundance (# Individuals)
2015*	Common (23, 19, 28)	Not detected
2016*	Few – Common (3, 11, 7)	Not detected
2018	Not detected	Not detected
2019	Few – Common (5, 53, 18)	Low (6)
2020	Few (1, 5, 7)	Not detected
2021	Not detected	Not detected

*baseline year

4.15.2.1 *Data Quality Objective 5*

California tiger salamanders were not detected in 2021 but were present in baseline monitoring in 2015 and 2016. This is likely related to the historic low water-year rather than remediation. Only two vernal

pools out of 21 monitored this year held water into March and were surveyed for CTS. Neither had CTS present.

Fairy shrimp were also not detected in 2021, which was consistent with baseline monitoring. Fairy shrimp were not detected in baseline monitoring in 2015 or 2016.

No comparison was made for either species to reference vernal pools as all three reference pools remained dry and were not surveyed for wildlife.

4.15.2.2 *Performance Standard: Wildlife Usage*

Pond 60, a post-mastication and post-subsurface munitions remediation vernal pool, was partially on track to meet DQO 5. Baseline results were similar for fairy shrimp but not for CTS. Data quality objectives 1 and 4 were analyzed in the Hydrology Monitoring Annual Report (Chenega, 2022).

4.15.3 Conclusion

Pond 60, a post-mastication and post-subsurface munitions remediation vernal pool, was in year 3 of monitoring in 2021. The vernal pool was on track to meet the plant cover and species diversity performance standard and partially on track to meet the DQO 5 for wildlife usage standards (see Table 4-195). Pond 60 will continue to be monitored in the future.

Table 4-195. Success at Pond 60 (Year 3 Post-Subsurface Munitions Remediation) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Plant Cover & Species Diversity	DQO 3	On track
Wildlife Usage	DQO 5	Partially on track

4.16 Pond 61 – Year 3

Pond 61 was monitored in 2021 as a year 3 post-subsurface munitions remediation vernal pool. Although limited subsurface remediation occurred at this vernal pool in 1999, the Army did not conduct monitoring prior to 2017 and it is assumed that 2017 represents baseline conditions. Less than 50 percent of the watershed of Pond 61 was masticated in the summer of 2017 to support MEC remediation in BLM Area B Subunits B-3 East and B2-A. Pond 61 had intrusive anomaly investigations in 2018. Table 4-196 summarizes the years that monitoring occurred and surveys were conducted. The cumulative precipitation graph shows precipitation for years in which hydrology monitoring was conducted at Pond 61 (see Figure 4-58). The 2016-2017 and 2018-2019 water-years were above normal, whereas the 2017-2018 and 2020-2021 water-years were below normal. Water-year 2019-2020 was similar to the cumulative normal water-year.

Table 4-196. Summary of Pond 61 (Year 3 Post-Subsurface Munitions Remediation) Historical Surveys for Hydrology, Vegetation, and Wildlife

Survey	Water-Year				
	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
Hydrology	●	●	●	●	●
Vegetation	●	●	●	●	●
Wildlife	●		●	●	●

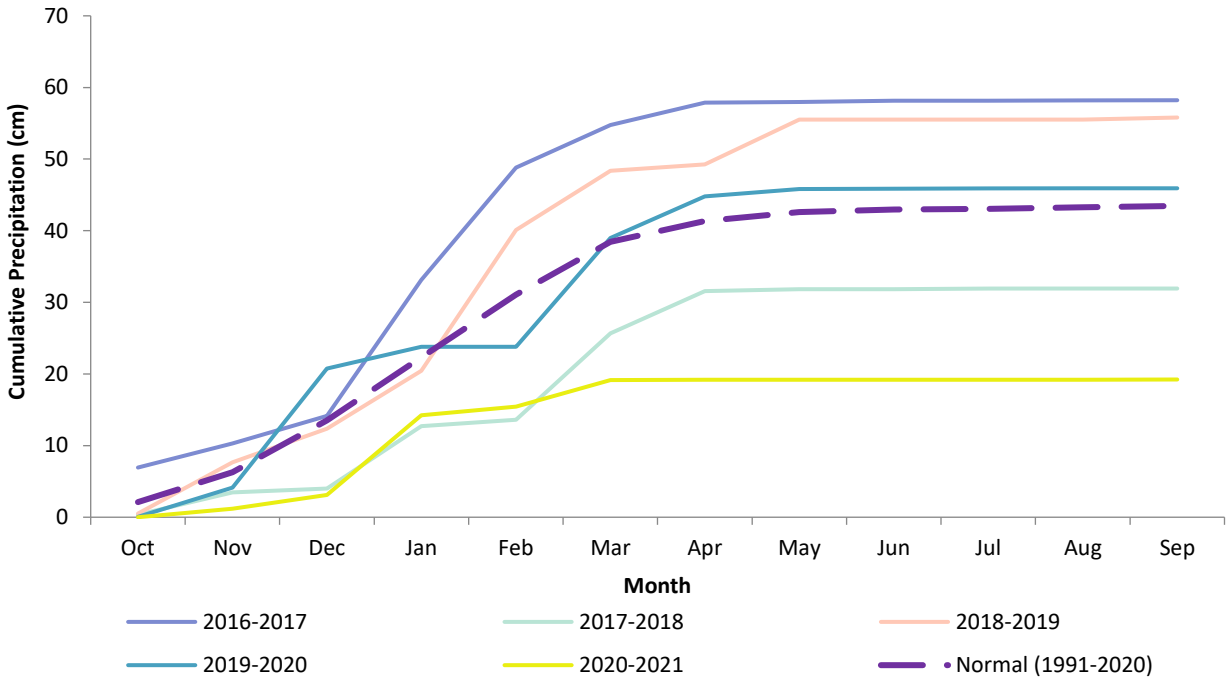

Figure 4-58. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 61 (Year 3 Post-Subsurface Munitions Remediation) Compared to the 30-Year Normal (mean 1991-2020) (NPS, 2021; NCEI NOAA, 2021)

4.16.1 Vegetation Monitoring

Vegetation data were collected at Pond 61 in 2017, 2018, 2019, 2020 and 2021 (Burleson, 2018, 2019, 2020, 2021). Baseline vegetation data were collected at Pond 61 in 2017. Data were collected using the methodology described in the Methods section of this report. Data from 2017 and 2021 were compared stratum-to-stratum in Table 4-197 as well as visually in Figure 4-59.

Pond 61 also supports a CCG population, which is represented by stratum 2. The population was mapped and a visual estimate of percent cover was recorded in 2021 to compare to 2017-2020 (see Figure 3-20 in Section 3.16.1.1).

Table 4-197. Pond 61 (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage	
	2017	2021
1	1%	0.2%
2 (CCG)	5%	5%
3	7%	4%
4	54%	58%
Upland	33%	33%

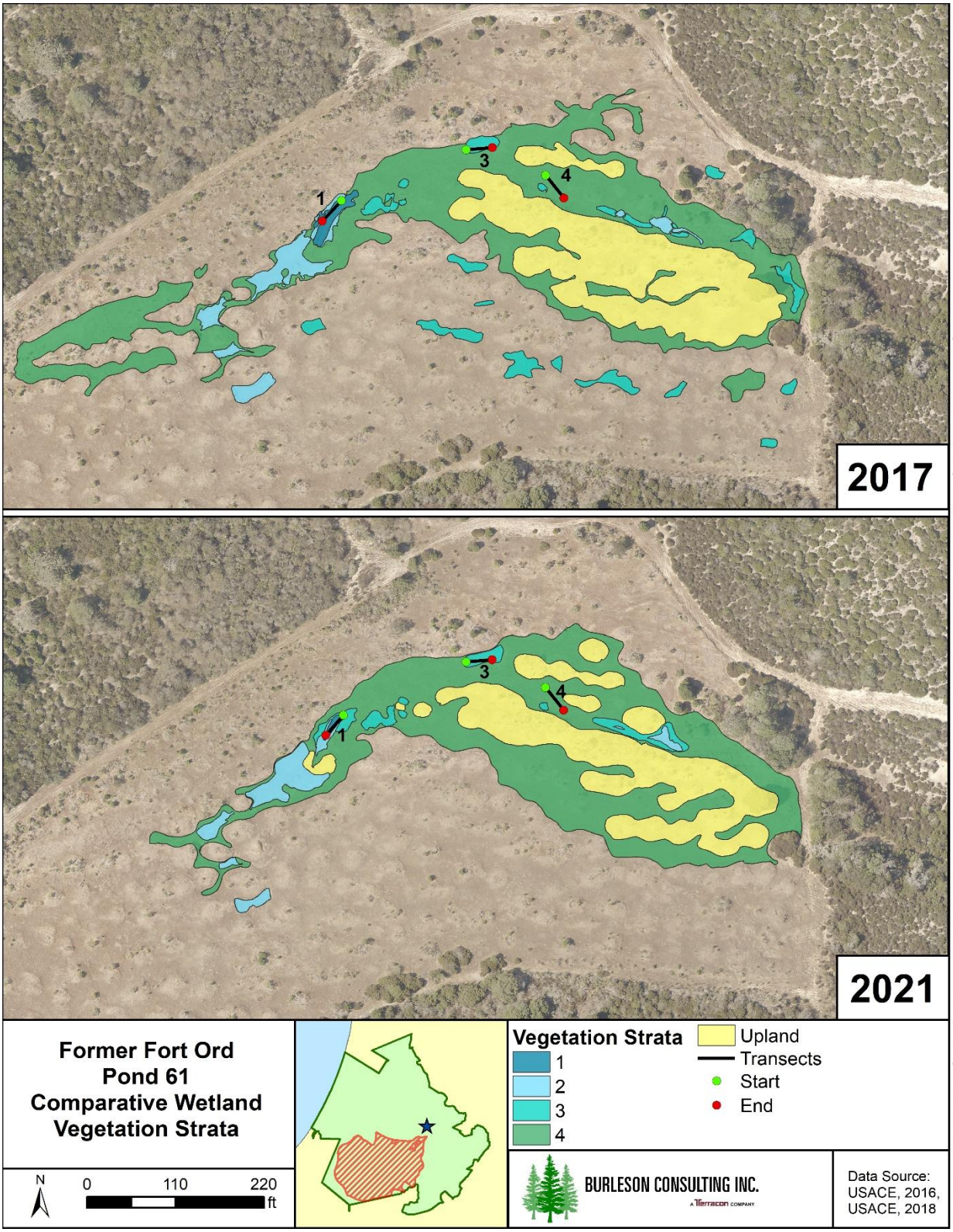

Figure 4-59. Pond 61 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects for 2017 and 2021

The absolute percent vegetative cover observed in 2021 was less than baseline (see Table 4-198). Pond 61 vegetative cover was within the range of values observed at the reference vernal pools and was most similar to Pond 997 (see Table 4-199).

Table 4-198. Pond 61 (Year 3 Post-Subsurface Munitions Remediation) Absolute Percent Cover

Year	Vegetative Cover	Thatch/Bare Ground
2017*	69.4%	32.1%
2018	60.6%	40.8%
2019	66.6%	35.7%
2020	66.1%	34.0%
2021	42.7%	57.6%

*baseline year

Table 4-199. Pond 61 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Absolute Percent Cover in 2021

Vernal Pool	Vegetative Cover	Thatch/Bare Ground
5	39.3%	60.7%
101 East (East)	38.5%	61.6%
997	45.1%	55.0%
61	**42.7%**	**57.6%**

Species richness on transects in 2021 was greater than the baseline year; however, the overall basin species richness was three species less than baseline. Species richness on transects was 23, 41, 47, 36, and 34 species in 2017, 2018, 2019, 2020, and 2021, respectively, whereas overall basin species richness was 100, 100, 119, 98, and 97 species, respectively (see Table 4-200 and Appendix A Table A-16). Pond 61 species richness was greater than the values observed at the reference vernal pools (see Table 4-201 and Appendix E Tables E-22 and E-44).

Species composition at Pond 61 varied in 2017, 2018, 2019, 2020, and 2021; however, the dominant species were fairly similar. The dominant species in 2017 and 2018 were brown-headed rush (*Juncus phaeocephalus*) and pale spikerush (*Eleocharis macrostachya*), and Hickman's popcornflower (*Plagiobothrys chorisianus* var. *hickmanii*), respectively. In 2019, the dominant species was brown-headed rush. The dominant species in 2020 was California oatgrass (*Danthonia californica*) with moderate cover from pale spikerush, coyote thistle (*Eryngium armatum*), and brown-headed rush. Rattlesnake grass (*Briza maxima*) was the dominant species in 2021, a shift from previous years. A complete list of species composition observed during the surveys at Pond 61 in 2017, 2018, 2019, 2020, and 2021 can be found in Appendix F. Figure 4-60 shows a subset of this comparison for species observed with a 2% cover or greater.

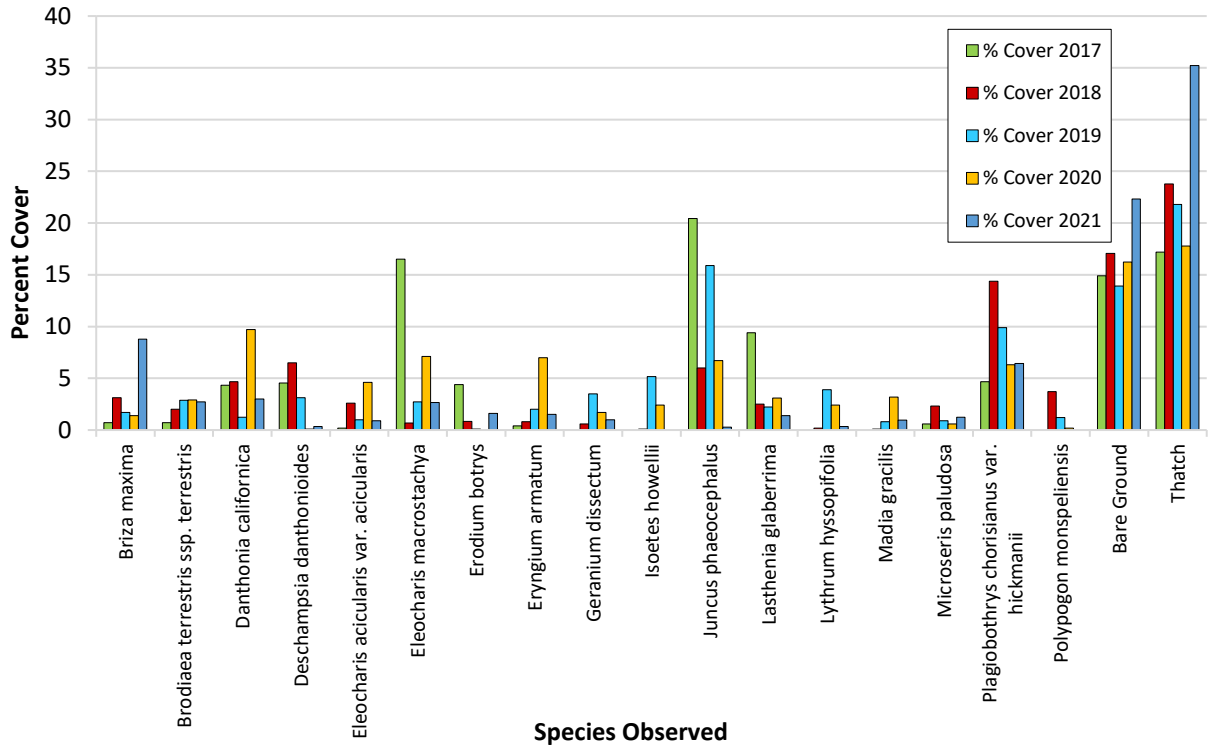

Figure 4-60. Percent Cover of Dominant Species at Pond 61 (Year 3 Post-Subsurface Munitions Remediation)

Native and non-native species richness on Pond 61 transects were greater in 2021 than baseline (see Table 4-200). Native species richness was greater than values observed at reference vernal pools, whereas non-native species richness was within the range observed at reference (see Table 4-201). The relative percent cover of native species was less, and non-native species cover was greater than the baseline values (see Table 4-202). Pond 61 native and non-native relative percent cover were within the range of values observed at the reference vernal pools (Table 4-203).

Table 4-200. Pond 61 (Year 3 Post-Subsurface Munitions Remediation) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
2017*	15	6	2
2018	24	16	1
2019	32	13	2
2020	24	12	0
2021	21	13	0

*baseline year

Table 4-201. Pond 61 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Native and Non-Native Species Richness in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	16	15	0
101 East (East)	10	11	0
997	15	12	0
61	**21**	**13**	**0**

Table 4-202. Pond 61 (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
2017*	90.3%	9.4%	0.3%
2018	80.1%	19.8%	0.1%
2019	79.0%	18.3%	2.8%
2020	88.7%	11.3%	0.0%
2021	59.5%	40.5%	0.0%

*baseline year

Table 4-203. Pond 61 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Native and Non-Native Plants in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	75.0%	25.0%	0.0%
101 East (East)	64.1%	35.9%	0.0%
997	59.1%	40.9%	0.0%
61	**59.5%**	**40.5%**	**0.0%**

Wetland species richness on Pond 61 transects was greater in 2021 than the baseline year and reference vernal pools and non-wetland species richness was slightly less than both (see Table 4-204 and Table 4-205). The relative percent cover of wetland species, however, was dramatically lower than in the baseline year while non-wetland cover was slightly greater (see Table 4-206). Wetland and non-wetland relative percent cover were within the range of values observed at reference vernal pools (see Table 4-207).

Table 4-204. Pond 61 (Year 3 Post-Subsurface Munitions Remediation) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2017*	4	6	2	5	0	6
2018	10	10	3	7	1	10
2019	11	11	6	4	1	14
2020	9	9	4	5	1	8
2021	6	9	3	3	1	12

*baseline year

Table 4-205. Pond 61 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Wetland and Non-Wetland Species Richness in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	4	6	3	7	1	10
101 East (East)	2	4	1	4	4	6
997	3	5	4	4	1	10
61	**6**	**9**	**3**	**3**	**1**	**12**

Table 4-206. Pond 61 (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Wetland and Non-Wetland Species

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2017*	44.3%	37.6%	6.5%	8.2%	0.0%	3.3%
2018	40.6%	31.7%	9.3%	3.2%	0.5%	14.9%
2019	39.0%	36.8%	3.6%	0.3%	0.3%	19.9%
2020	42.2%	24.4%	15.3%	1.2%	0.3%	16.6%
2021	30.2%	7.0%	9.5%	8.3%	0.8%	44.1%

*baseline year

Table 4-207. Pond 61 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Wetland and Non-Wetland Species in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	35.3%	36.5%	3.1%	4.2%	1.7%	19.1%
101 East (East)	17.7%	24.7%	3.6%	29.3%	1.9%	22.8%
997	2.0%	38.4%	19.0%	8.9%	0.2%	31.4%
61	**30.2%**	**7.0%**	**9.5%**	**8.3%**	**0.8%**	**44.1%**

4.16.1.1 *Contra Costa Goldfields*

The area of CCG at Pond 61 has fluctuated from year to year. The area decreased slightly from 0.14 acre in 2017 to 0.12 acre in 2018 and 0.11 acre in 2019, increased in 2020 to 0.15 acre, then decreased slightly in 2021 to 0.13 acre (Burleson, 2018, 2019, 2020, 2021) (see Figure 4-61). The density ranged from 10-65% in 2017, 5-65% in 2018, 5-85% in 2019, 15-65% in 2020, and 5-70% in 2021. In 1999, 2000, 2002, 2017, 2018, 2019, and 2020 the CCG population was in similar locations as 2021 and within the range of 0.09-0.14 acre (HLA, 2000, 2001; MACTEC, 2003; Burleson, 2018, 2019, 2020, 2021). Results suggest that mastication activities in 2017 and post-subsurface munitions remediation in 2019 did not affect the population. Minor changes in population size can be attributed to natural fluctuation.

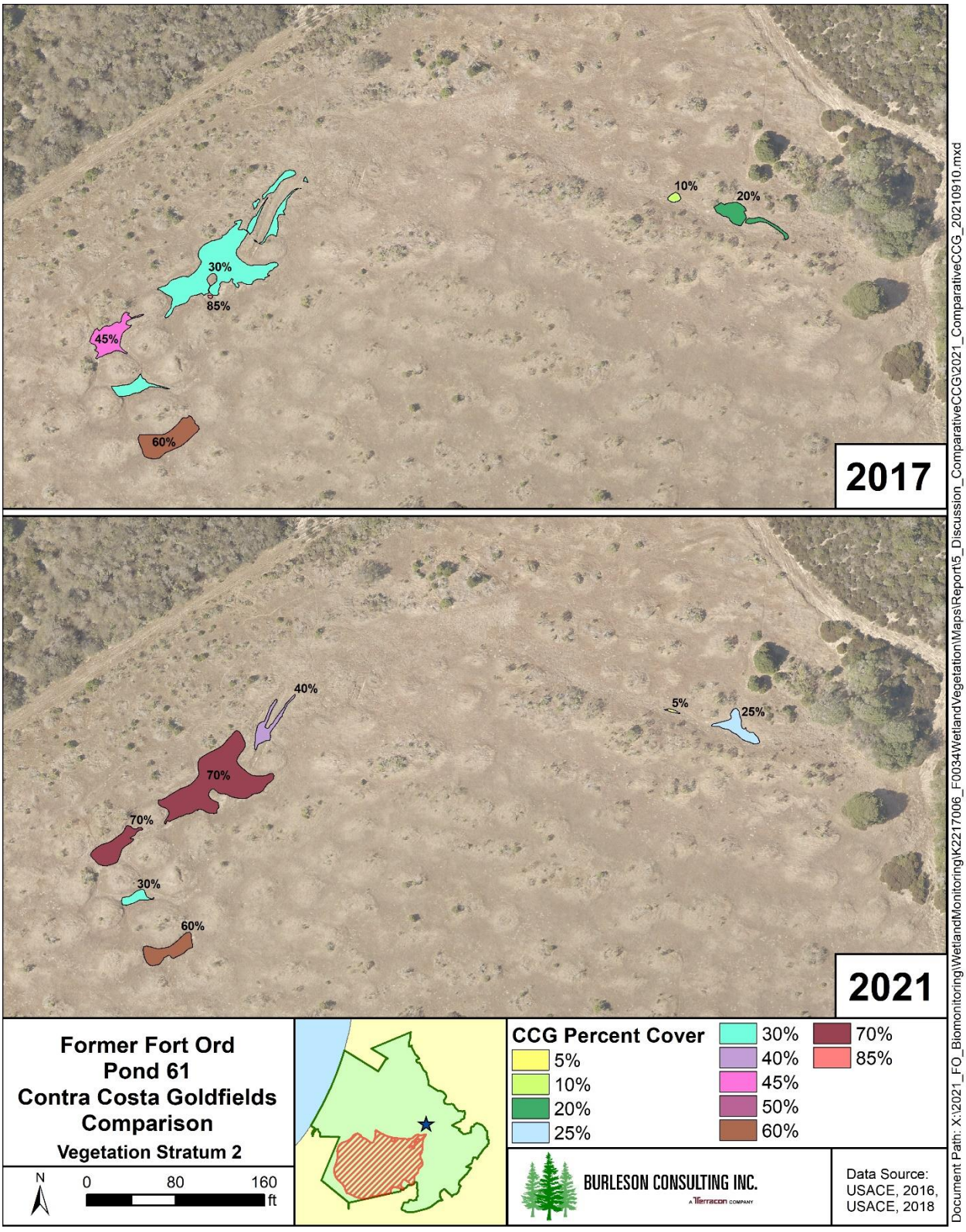

Figure 4-61. Contra Costa Goldfields Populations at Pond 61 (Year 3 Post-Subsurface Munitions Remediation) in 2017 and 2021

4.16.1.2 *Data Quality Objective 3*

Observable changes in hydrophytic vegetation between surveys were largely associated with precipitation fluctuations. This is expected given the dynamic nature of vernal pools and the close relationship between the hydroperiod and wetland vegetation composition. This year was a historic dry water-year. Below-normal water-years can result in upland and non-native herbs and grasses exploiting a greater portion of a vernal pool and distributing more evenly (Bauder, 2000).

Vegetative cover in Pond 61 was dominated by native and wetland plant species during year 3 post-subsurface munitions remediation monitoring in 2021. Pond 61 wetland vegetation results were generally within the range of baseline and/or reference vernal pools with a few favorable exceptions. Native and wetland richness were greater than baseline and reference and non-wetland richness was less than baseline and reference values. The increase in native and wetland richness and decrease in non-wetland is not concerning. These changes support a healthy vernal pool ecosystem.

4.16.1.3 *Performance Standard: Plant Cover and Species Diversity*

Pond 61, a post-subsurface munitions remediation vernal pool, was on track to meet the performance standard for year 3. The species composition, and native and wetland species relative abundances were similar to baseline and/or reference vernal pool conditions. The variation from baseline and reference were all favorable to a healthy ecosystem. This vernal pool should continue to be monitored as recommended in the PBO (see USFWS, 2017).

4.16.2 Wildlife Monitoring

Wildlife data were collected at Pond 61 in 2017, 2019, 2020, and 2021 (Burleson, 2018, 2020, 2021). California tiger salamander larvae were not observed in any year. Fairy shrimp were present in 2019 and 2020. Table 4-208 shows historical wildlife monitoring results.

Table 4-208. Pond 61 (Year 3 Post-Subsurface Munitions Remediation) Historical Wildlife Monitoring Results

Sampling Year	CTS Larvae Abundance (# Individuals)	Fairy Shrimp Abundance (# Individuals)
2017*	Not detected	Not detected
2019	Not detected	High (162)
2020	Not detected	High (172)
2021	Not detected	Not detected

*baseline year

4.16.2.1 *Data Quality Objective 5*

California tiger salamanders and fairy shrimp were not detected in 2021, which was consistent with the baseline survey in 2017. No comparison was made for either species to reference vernal pools as all three reference pools remained dry and were not surveyed for wildlife.

4.16.2.2 *Performance Standard: Wildlife Usage*

Pond 61, a post-mastication and post-subsurface munitions remediation vernal pool, was on track to meet DQO 5. DQOs 1 and 4 were analyzed in the Hydrology Monitoring Annual Report (Chenega, 2022).

4.16.3 Conclusion

Pond 61, a post-subsurface munitions remediation vernal pool, was in year 3 of monitoring in 2021. The vernal pool was on track to meet the plant cover and species diversity performance standard and DQO 5 for wildlife usage (see Table 4-209). Pond 61 will continue to be monitored in the future.

Table 4-209. Success at Pond 61 (Year 3 Post-Subsurface Munitions Remediation) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Plant Cover & Species Diversity	DQO 3	On track
Wildlife Usage	DQO 5	On track

4.17 Pond 73 – Year 3

Pond 73 was monitored in 2021 as a year 3 post-subsurface munitions remediation vernal pool. Vegetation within the Pond 73 watershed was masticated in the summer of 2017 to support MEC remediation in BLM Area B Subunit B-3 East. Pond 73 had intrusive anomaly investigations in 2018. Baseline inundation and vegetation surveys were recorded in 2017 but no baseline depth, water quality, or wildlife monitoring had been conducted. Table 4-210 summarizes the years that monitoring occurred and surveys were conducted. The cumulative precipitation graph shows precipitation for years in which hydrology monitoring was conducted at Pond 73 (see Figure 4-62). The 2016-2017 and 2018-2019 water-years were above-normal, whereas the 2017-2018 and 2020-2021 water-years were below normal. Water-year 2019-2020 was similar to the cumulative normal water-year.

Table 4-210. Pond 73 (Year 3 Post-Subsurface Munitions Remediation) Summary of Historical Surveys for Hydrology, Vegetation, and Wildlife

Survey	Water-Year				
	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
Hydrology	●	●	●	●	●
Vegetation	●	●	●	●	●
Wildlife		●	●	●	

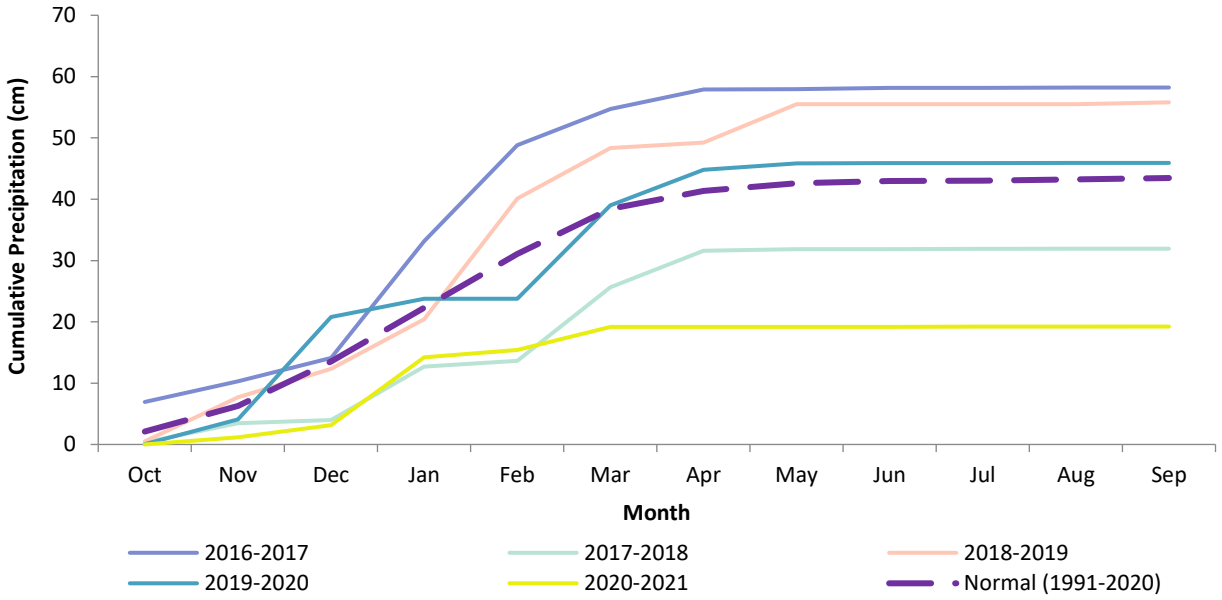

Figure 4-62. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 73 (Year 3 Post-Subsurface Munitions Remediation) Compared to the 30-Year Normal (mean 1991-2020) (NPS, 2021; NCEI NOAA, 2021)

4.17.1 Vegetation Monitoring

Vegetation data were collected at Pond 73 in 2017, 2018, 2019, 2020, and 2021 (Burleson, 2019, 2020, 2021). Baseline vegetation data were collected at Pond 73 in 2017 by DD&A and provided by the Army in 2018. Data were collected using the methodology described in the Methods section of this report. Data from 2017 and 2021 were compared stratum-to-stratum in Table 4-211 as well as visually in Figure 4-63.

Table 4-211. Pond 73 (Year 3 Post-Subsurface Munitions Remediation) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage	
	2017	2021
1	9%	2%
2	71%	28%
3	17%	N/A
4	N/A	68%
Upland	3%	3%

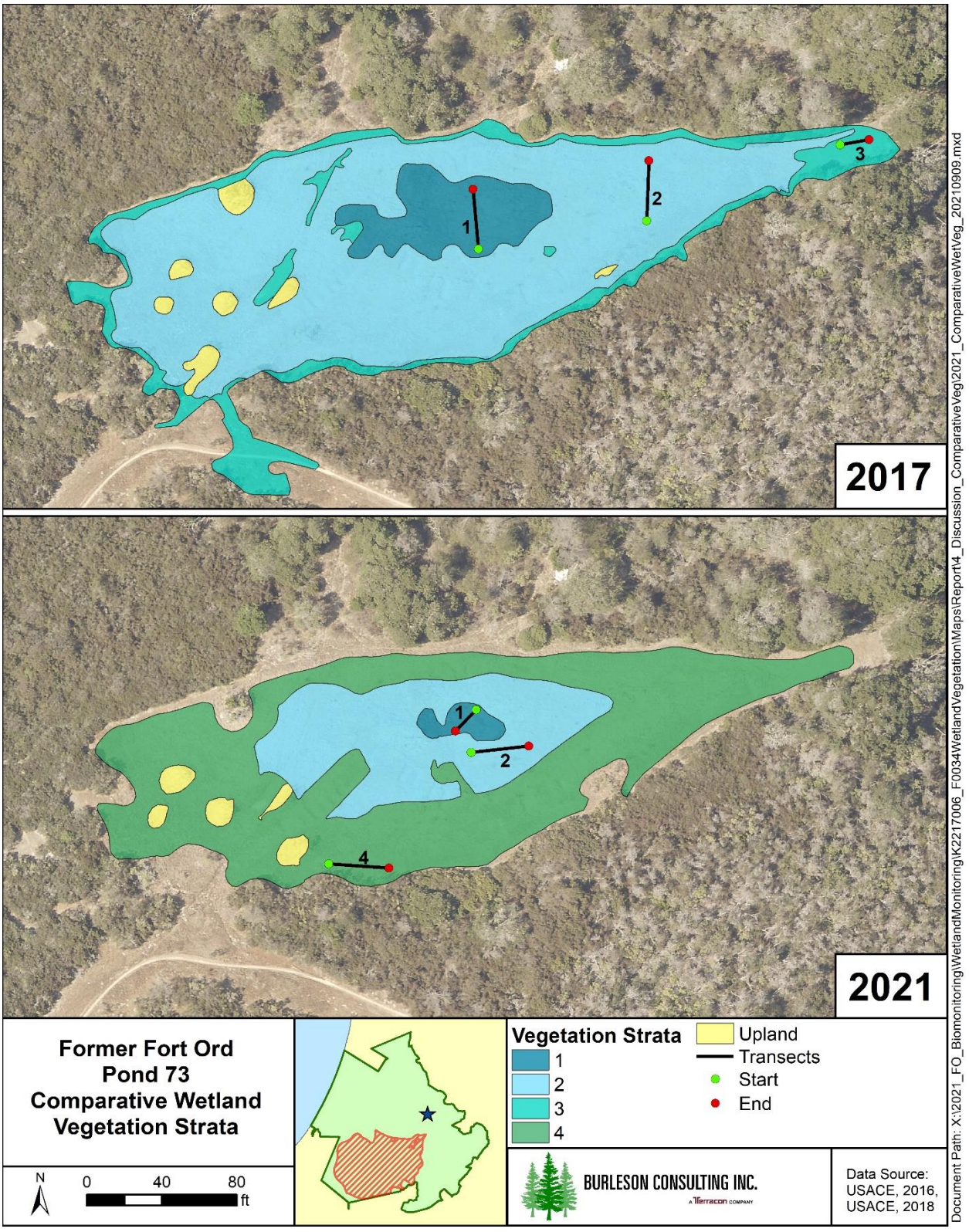

Figure 4-63. Pond 73 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Strata and Transects for 2017 and 2021

The absolute percent vegetative cover decreased dramatically between baseline and 2021 (see Table 4-212). Pond 73 vegetative cover was less than the values observed in reference vernal pools with more thatch/bare ground cover (see Table 4-213).

Table 4-212. Pond 73 (Year 3 Post-Subsurface Munitions Remediation) Absolute Percent Cover

Year	Vegetative Cover	Thatch/Bare Ground
2017*	82.6%	16.9%
2018	61.8%	39.7%
2019	65.9%	34.1%
2020	78.9%	21.2%
2021	36.3%	63.7%

*baseline year

Table 4-213. Pond 73 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Absolute Percent Cover in 2021

Vernal Pool	Vegetative Cover	Thatch/Bare Ground
5	39.3%	60.7%
101 East (East)	38.5%	61.6%
997	45.1%	55.0%
73	**36.3%**	**63.7%**

Species richness in 2021 was greater than baseline. Species richness on transects was 6, 21, 17, 23, and 30 species in 2017, 2018, 2019, 2020, and 2021 respectively, whereas overall basin species richness was 49, 68, 62, 68, and 66 species, respectively (see Table 4-214 and Appendix A Table A-17). Pond 73 species richness was within the ranges observed at reference vernal pools (see Table 4-215 and Appendix E Tables E-22 and E-44).

Species composition at Pond 73 was similar between 2017, 2018, 2019, 2020, and 2021. The dominant species in all survey years were brown-headed rush (*Juncus phaeocephalus*) and pale spikerush (*Eleocharis macrostachya*). In 2018, 2019, 2020, and 2021 coyote thistle (*Eryngium armatum*) was a third dominant species. A complete comparison of species composition observed at Pond 73 in 2017, 2018, 2019, 2020, and 2021 can be found in Appendix F. Figure 4-64 shows a subset of this comparison for species observed with a 2% cover or greater.

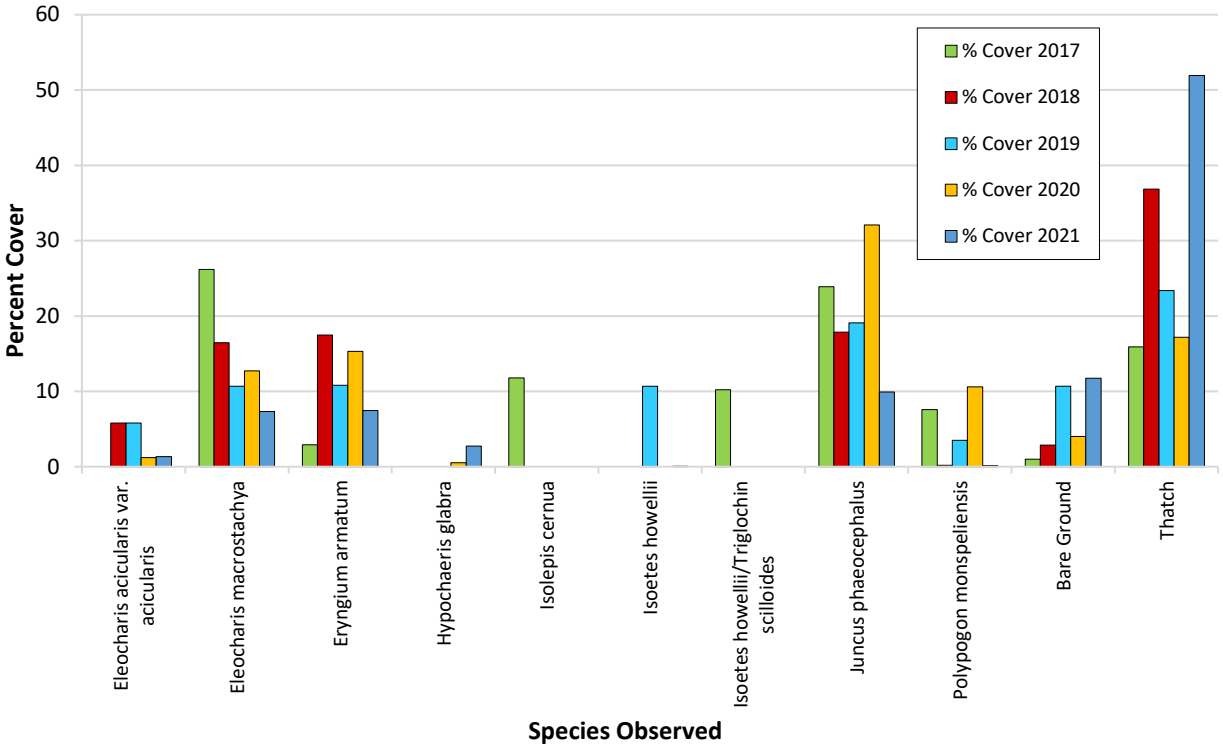

Figure 4-64. Percent Cover of Dominant Species at Pond 73 (Year 3 Post-Subsurface Munitions Remediation)

Native and non-native species richness on Pond 73 transects was greater in 2021 than baseline (see Table 4-214). The native species richness was greater than the values observed at reference vernal pools, whereas non-native species richness was within the range of values observed at reference (see Table 4-215). The relative percent cover of native species was less than baseline and the non-native species cover was greater than baseline (see Table 4-216). Conversely, Pond 73 relative percent cover of native species was greater than reference vernal pools values and non-native cover was less (see Table 4-217).

Table 4-214. Pond 73 (Year 3 Post-Subsurface Munitions Remediation) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
2017*	5	1	0
2018	15	5	1
2019	14	3	0
2020	14	9	0
2021	19	11	0

*baseline year

Table 4-215. Pond 73 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Native and Non-Native Species Richness in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	16	15	0
101 East (East)	10	11	0
997	15	12	0
73	**19**	**11**	**0**

Table 4-216. Pond 73 (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
2017*	90.8%	9.2%	0.0%
2018	98.9%	1.0%	0.1%
2019	91.9%	8.1%	0.0%
2020	83.4%	16.6%	0.0%
2021	82.4%	17.6%	0.0%

*baseline year

Table 4-217. Pond 73 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Native and Non-Native Plants in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	75.0%	25.0%	0.0%
101 East (East)	64.1%	35.9%	0.0%
997	59.1%	40.9%	0.0%
73	**82.4%**	**17.6%**	**0.0%**

Wetland and non-wetland species richness on Pond 73 transects were greater in 2021 than baseline (see Table 4-218). Pond 73 wetland species richness was also greater than the reference vernal pools, while non-wetland species richness was within the range of values observed at reference (see Table 4-219). The relative percent cover of wetland species in 2021 was less than the baseline year of monitoring and the non-wetland species cover was greater than baseline (see Table 4-220). Conversely, Pond 73 wetland species relative percent cover was greater than reference vernal pools in 2021, whereas non-wetland species cover was less than reference vernal pools (see Table 4-221).

Table 4-218. Pond 73 (Year 3 Post-Subsurface Munitions Remediation) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2017*	3	3	0	0	0	0
2018	7	7	2	2	0	3
2019	7	7	1	0	0	2
2020	5	9	1	2	1	5
2021	5	8	1	5	1	10

*baseline year

Table 4-219. Pond 73 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Wetland and Non-Wetland Species Richness in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	4	6	3	7	1	10
101 East (East)	2	4	1	4	4	6
997	3	5	4	4	1	10
73	**5**	**8**	**1**	**5**	**1**	**10**

Table 4-220. Pond 73 (Year 3 Post-Subsurface Munitions Remediation) Relative Percent Cover of Wetland and Non-Wetland Species

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2017*	46.0%	41.6%	0.0%	0.0%	0.0%	12.3%
2018	40.3%	58.3%	0.4%	0.2%	0.0%	0.8%
2019	46.8%	52.6%	0.1%	0.0%	0.0%	0.5%
2020	19.4%	77.0%	0.5%	0.3%	0.3%	2.4%
2021	26.6%	49.9%	1.5%	5.0%	0.2%	16.9%

*baseline year

Table 4-221. Pond 73 (Year 3 Post-Subsurface Munitions Remediation) and Reference Vernal Pool Relative Percent Cover of Wetland and Non-Wetland Species in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	35.3%	36.5%	3.1%	4.2%	1.7%	19.1%
101 East (East)	17.7%	24.7%	3.6%	29.3%	1.9%	22.8%
997	2.0%	38.4%	19.0%	8.9%	0.2%	31.4%
73	**26.6%**	**49.9%**	**1.5%**	**5.0%**	**0.2%**	**16.9%**

4.17.1.1 *Data Quality Objective 3*

Observable changes in hydrophytic vegetation between surveys were largely associated with precipitation fluctuations. This is expected given the dynamic nature of vernal pools and the close relationship between the hydroperiod and wetland vegetation composition. This year was a historic dry water-year. Below-normal water-years can result in upland and non-native herbs and grasses exploiting a greater portion of a vernal pool and distributing more evenly (Bauder, 2000).

Vegetative cover in Pond 73 was dominated by native and wetland plant species during year 3 post-subsurface munitions remediation monitoring in 2021. Pond 73 wetland vegetation results were generally within range of baseline and/or reference vernal pools; however, native and wetland richness were greater in 2021 than baseline and reference vernal pools. The increase in native and wetland richness is not concerning. Both support a healthy vernal pool ecosystem. Conversely, the relative percent cover of native and wetland species was less than baseline, and the non-native and non-wetland species cover were greater than baseline. The decrease of native and wetland cover and increase of non-native and non-wetland cover were likely related to the low water-year rather than remediation. Supporting this, is the fact that native and wetland cover were greater than reference vernal pools values, whereas non-native and non-wetland cover were less than reference.

4.17.1.2 *Performance Standard: Plant Cover and Species Diversity*

Pond 73, a post-mastication and post-subsurface munitions remediation vernal pool, was on track to meet the performance standard for year 3. The species composition, richness, and native and wetland species relative abundances were similar to baseline and/or reference vernal pool conditions, with some variability. Pond 73 provided suitable wetland habitat in 2021. This vernal pool should continue to be monitored as recommended in the PBO (see USFWS, 2017).

4.17.2 Wildlife Monitoring

Wildlife data were collected at Pond 73 in 2018, 2019, and 2020. California tiger salamander larvae were not observed in any year. Fairy shrimp were present in 2019 and 2020. No baseline historical wildlife data were available for comparison. The vernal pool did not hold sufficient depth for surveys to be completed in 2021. Therefore, DQO 5 and the applicable wildlife usage performance standard cannot be assessed. Table 4-222 shows historical wildlife monitoring results.

Table 4-222. Pond 73 (Year 3 Post-Subsurface Munitions Remediation) Historical Wildlife Monitoring Results

Sampling Year	CTS Larvae Abundance (# Individuals)	Fairy Shrimp Abundance (# Individuals)
2018	Not detected	Not detected
2019	Not detected	Present*
2020	Not detected	Low (1)

*Fairy shrimp present during CTS survey, not during the fairy shrimp survey.

4.17.3 Conclusion

Pond 73, a post-subsurface munitions remediation vernal pool, was in year 3 of monitoring in 2021. The vernal pool was on track to meet the plant cover and species diversity performance standard and will continue to be monitored in the future (see Table 4-223).

Table 4-223. Success at Pond 73 (Year 3 Post-Subsurface Munitions Remediation) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Plant Cover & Species Diversity	DQO 3	On track
Wildlife Usage	N/A*	N/A*

** Not applicable; wildlife surveys were not conducted due to insufficient depth

4.18 Pond 74 – Year 3

Pond 74 was monitored in 2021 as a year 3 post-mastication vernal pool. Baseline surveys did not take place prior to mastication because the vernal pool was small and was not detected (Chenega, 2021). Vegetation within the Pond 74 watershed was masticated in the summer of 2017 to support MEC remediation in BLM Area B Unit B-2A. Inundation and vegetation surveys were recorded in 2019 but no baseline depth, water quality, or wildlife monitoring had been conducted. Depth was estimated in 2020. Table 4-224 summarizes the years that monitoring occurred and surveys were conducted. The cumulative precipitation graph shows precipitation for years in which hydrology monitoring was conducted at Pond 74 (see Figure 4-62). The 2019-2020 water-year was similar to the cumulative normal water-year, whereas 2020-2021 was below-normal.

Table 4-224. Pond 74 (Year 3 Post-Mastication) Summary of Historical Surveys for Hydrology, Vegetation, and Wildlife

Survey	Water-Year	
	2018-2019	2020-2021
Hydrology		●
Vegetation	●	●
Wildlife		

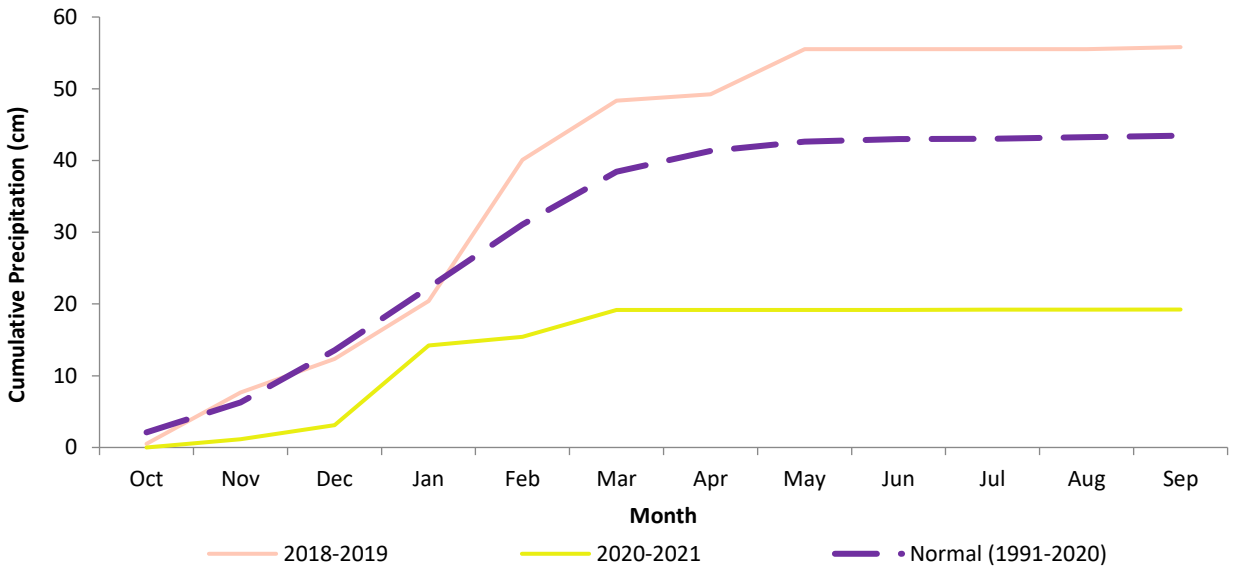

Figure 4-65. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 74 (Year 3 Post-Mastication) Compared to the 30-Year Normal (mean 1991-2020) (NPS, 2021; NCEI NOAA, 2021)

4.18.1 Vegetation Monitoring

Vegetation data were collected at Pond 74 for Year 1 monitoring in 2019 by DD&A and provided by the Army. Data were collected using the methodology described in the Methods section of this report. Considering that baseline data was not collected for Pond 74, the comparison and assessment for Pond 74 can only be made between Year 1 and Year 3 of monitoring. Data from 2019 and 2021 were compared stratum-to-stratum in Table 4-225 as well as visually in Figure 4-63.

Table 4-225. Pond 74 (Year 3 Post-Mastication) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage	
	2019	2021
1	21%	6%
2	14%	N/A
3	59%	21%
4	N/A	68%
Upland	6%	5%

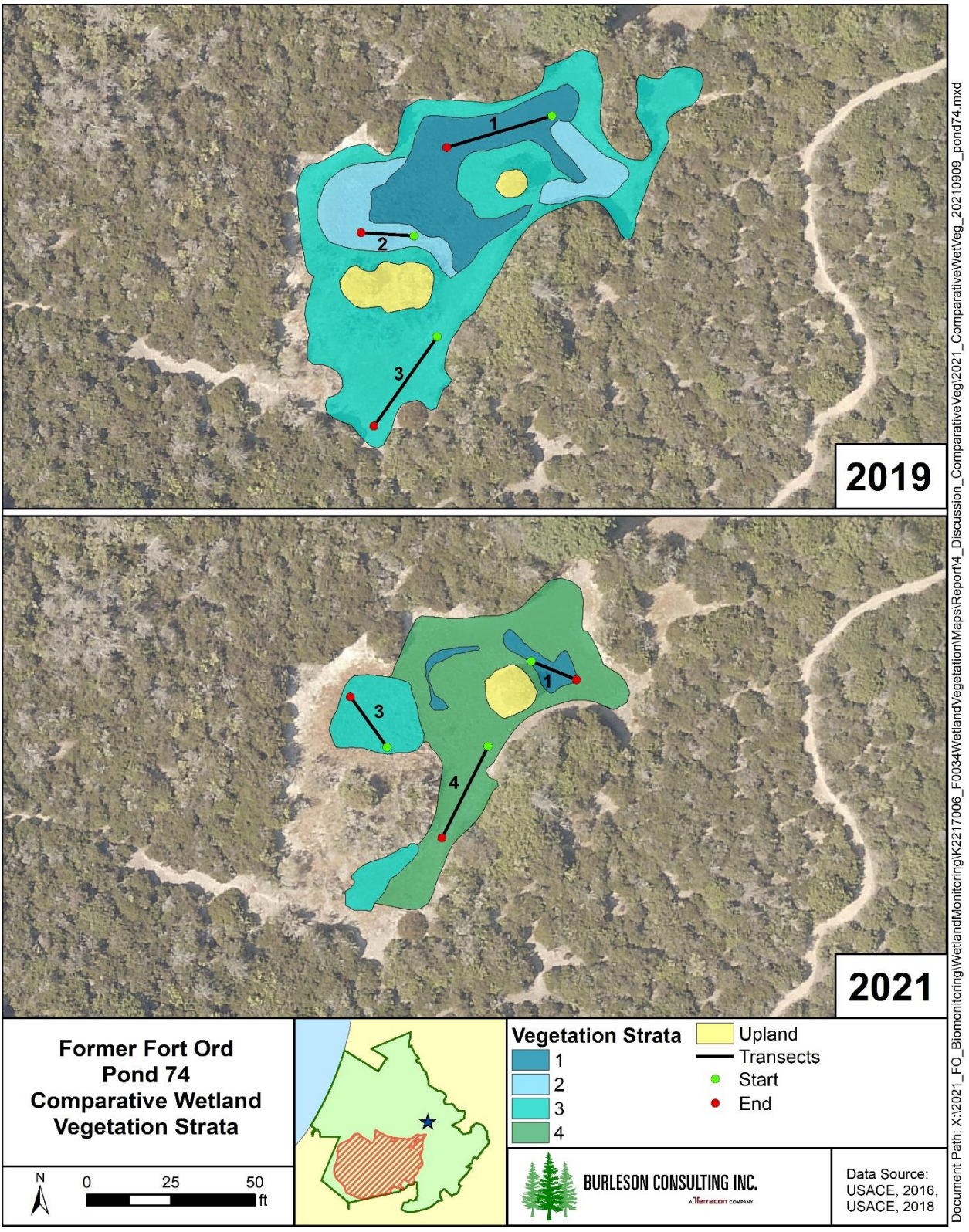

Figure 4-66. Pond 74 (Year 3 Post-Mastication) Vegetation Strata and Transects for 2019 and 2021

The absolute percent vegetative cover decreased between 2019 (Yr 1) and 2021 (see Table 4-226). Pond 74 vegetative cover in 2021 was greater than the values observed in reference vernal pools with less thatch/bare ground cover (see Table 4-227).

Table 4-226. Pond 74 (Year 3 Post-Mastication) Absolute Percent Cover

Year	Vegetative Cover	Thatch/Bare Ground
2019	78.1%	22.5%
2021	49.8%	50.3%

Table 4-227. Pond 74 (Year 3 Post-Mastication) and Reference Vernal Pool Absolute Percent Cover in 2021

Vernal Pool	Vegetative Cover	Thatch/Bare Ground
5	39.3%	60.7%
101 East (East)	38.5%	61.6%
997	45.1%	55.0%
74	**49.8%**	**50.3%**

Species richness in 2021 was greater than 2019 (Yr 1). Species richness on transects was 24 and 34 species in 2019 and 2021, respectively, whereas overall basin species richness was 47 and 52 in 2019 and 2021, respectively (see Table 4-228 and Appendix A Table A-18). Pond 74 species richness on transects was greater than the range of values observed at reference vernal pools, however, species richness for the overall basin was less than the reference values (see Table 4-229 and Appendix E Tables E-22 and E-44). The species richness is represented on the RACs as the length of the curve and number of species along the curve (see Figure 4-67).

Species composition and dominant species at Pond 74 varied between monitoring years. This variability of species composition is illustrated on the RACs as the species codes shift along the curve and losses and gains occur between the two years (see Figure 4-67). The dominant species shift is shown through the changes in the species at the top of the curve. Rabbitfoot grass (*Polypogon monspelliensis*), Hickman's popcornflower (*Plagiobothrys chorisianus* var. *hickmanii*), and brown-headed rush (*Juncus phaeocephalus*) were the dominant species in 2019 (Yr 1). Coyote thistle (*Eryngium armatum*) and coastal tarweed (*Deinandra corymbosa*) were the dominant species in 2021 (Yr 3). A complete comparison of species composition observed at Pond 74 for 2019 and 2021 can be found in Appendix F. Figure 4-69 shows a subset of this comparison for species observed with a 2% cover or greater.

The evenness from each year is represented by the slope of the RACs. The evenness is fairly similar between the two years, however 2021 (Yr 3) was marginally less even than 2019 (Yr 1). Coyote thistle was much more abundant than other species observed in 2021 (see **Figure** 4-68).

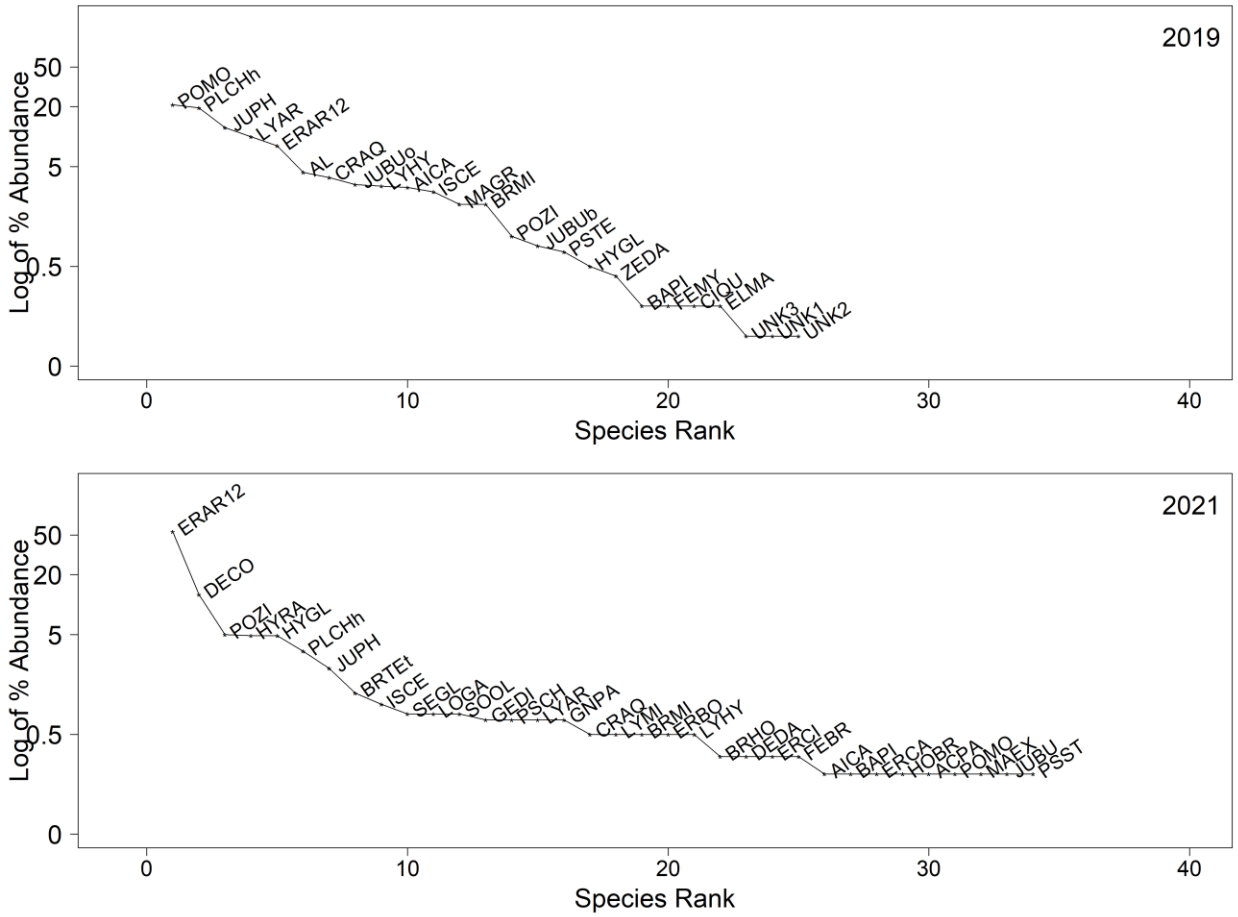

Figure 4-67. Rank Abundance Curves at Pond 74 (Year 3 Post-Mastication) in 2019 (Yr 1) and 2021 (Yr 3). Note that the y-axis is in log-10 scale.

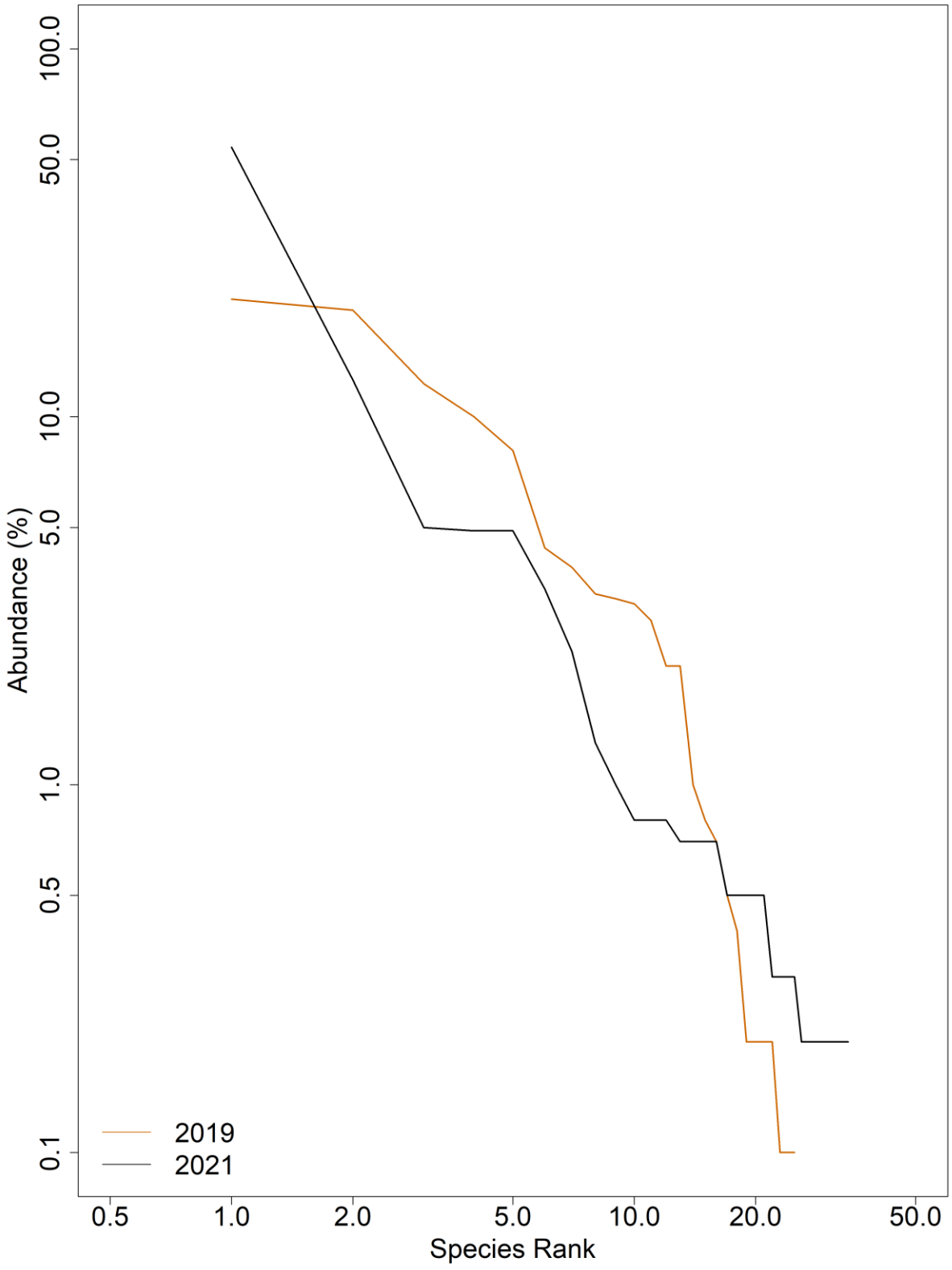

Figure 4-68. Rank Abundance Curves at Pond 74 (Year 3 Post-Mastication) in 2019 (Yr 1) and 2021 (Yr 3). Note that the x-axis and y-axis are in log-10 scale.

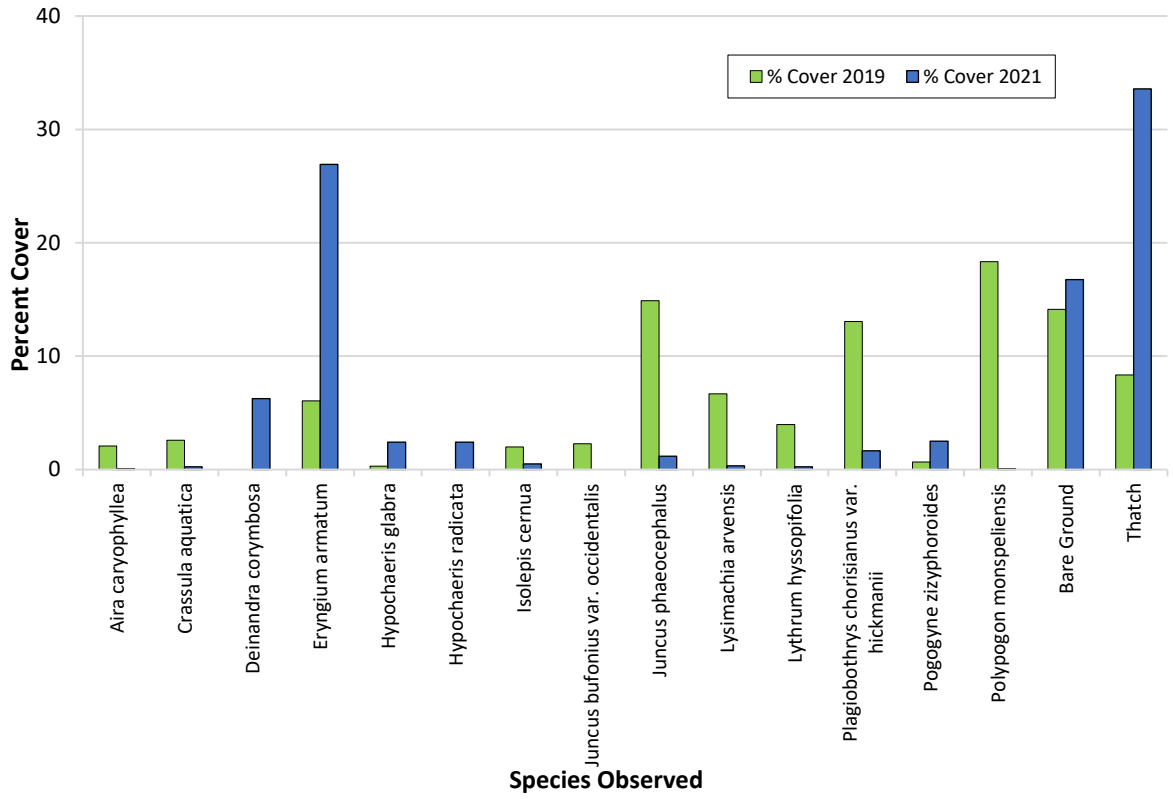

Figure 4-69. Percent Cover of Dominant Species at Pond 74 (Year 3 Post-Mastication)

Native and non-native species richness on Pond 74 transects was greater in 2021 than 2019 (Yr 1) (see Table 4-228). The native species richness in 2021 was greater than reference, whereas non-native species richness was within the range of values observed at the reference vernal pools (see Table 4-229). In 2019 (Yr 1), native species richness was within the range of values observed at the reference vernal pools, whereas non-native richness was less than reference. The relative percent cover of native species in 2021 (Yr 3) was greater than 2019 (Yr 1) and reference vernal pool values. In 2021 (Yr 3) non-native species cover was less than 2019 (Yr 1) and the range of values observed at the reference vernal pools (see Table 4-230 and Table 4-231). In 2019 (Yr 1), native species cover was less than the values observed at the reference vernal pools, whereas non-native cover was greater than reference.

Table 4-228. Pond 74 (Year 3 Post-Mastication) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
2019	14	7	3
2021	19	15	0

Table 4-229. Pond 74 (Year 3 Post-Mastication) and Reference Vernal Pool Native and Non-Native Species Richness in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	16	15	0
101 East (East)	10	11	0
997	15	12	0
74	**19**	**15**	**0**

Table 4-230. Pond 74 (Year 3 Post-Mastication) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
2019	57.5%	42.2%	0.3%
2021	83.6%	16.4%	0.0%

Table 4-231. Pond 74 (Year 3 Post-Mastication) and Reference Vernal Pool Relative Percent Cover of Native and Non-Native Plants in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	75.0%	25.0%	0.0%
101 East (East)	64.1%	35.9%	0.0%
997	59.1%	40.9%	0.0%
74	**83.6%**	**16.4%**	**0.0%**

Wetland and non-wetland species richness on Pond 74 transects were greater in 2021 than year 1 (see Table 4-232). Pond 74 wetland species richness was greater than the values observed at the reference vernal pools, while non-wetland species richness was within the range of values observed at reference vernal pools (see Table 4-233). In 2019 (Yr 1), wetland species richness was within the range of values observed at the reference vernal pools that year, however non-wetland species richness was less than reference. The relative percent cover of wetland species in 2021 was 0.2% greater than 2019; similarly, non-wetland species cover was slightly greater in 2021 than year 1 of monitoring (see Table 4-234). Pond 74 wetland and non-wetland species relative percent cover values were within the range of values observed at the reference vernal pools in 2021 (Yr 3) and 2019 (Yr 1) (see Table 4-235).

Table 4-232. Pond 74 (Year 3 Post-Mastication) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2019	7	5	2	2	0	8
2021	5	8	3	5	1	12

Table 4-233. Pond 74 (Year 3 Post-Mastication) and Reference Vernal Pool Wetland and Non-Wetland Species Richness in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	4	6	3	7	1	10
101 East (East)	2	4	1	4	4	6
997	3	5	4	4	1	10
74	**5**	**8**	**3**	**5**	**1**	**12**

Table 4-234. Pond 74 (Year 3 Post-Mastication) Relative Percent Cover of Wetland and Non-Wetland Species

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2019	29.4%	30.7%	10.5%	2.8%	0.0%	26.7%
2021	10.4%	59.0%	1.3%	6.0%	0.8%	22.4%

Table 4-235. Pond 74 (Year 3 Post-Mastication) and Reference Vernal Pool Relative Percent Cover of Wetland and Non-Wetland Species in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	35.3%	36.5%	3.1%	4.2%	1.7%	19.1%
101 East (East)	17.7%	24.7%	3.6%	29.3%	1.9%	22.8%
997	2.0%	38.4%	19.0%	8.9%	0.2%	31.4%
74	**10.4%**	**59.0%**	**1.3%**	**6.0%**	**0.8%**	**22.4%**

4.18.1.1 *Data Quality Objective 3*

Observable changes in hydrophytic vegetation between surveys were largely associated with precipitation fluctuations. This is expected given the dynamic nature of vernal pools and the close relationship between the hydroperiod and wetland vegetation composition. This year was a historic dry water-year. Below-normal water-years can result in upland and non-native herbs and grasses exploiting a greater portion of a vernal pool and distributing more evenly (Bauder, 2000).

Vegetative cover in Pond 74 was dominated by native and wetland plant species during year 3 post-subsurface munitions remediation monitoring in 2021. Pond 73 wetland vegetation results in 2021 (Yr 3) were generally within range of reference vernal pools; however, native richness and cover were greater than reference and non-native cover was less than reference. Greater native richness and cover and lower non-native cover are not concerning. Native species dominance supports a healthy vernal pool ecosystem. Conditions were slightly less favorable in 2019 (Yr 1) compared to reference. In 2019 (Yr 1), non-native richness and non-wetland richness and cover were less than reference. Whereas native species cover was less than the values observed at the reference vernal pools, and non-native cover was greater than reference.

4.18.1.2 *Performance Standard: Plant Cover and Species Diversity*

Pond 74, a post-mastication munitions remediation vernal pool, met the performance standard for year 3. The species composition, richness, and native and wetland species relative abundances were similar to reference vernal pool conditions, with favorable differences in greater native richness and cover and less non-native cover.

4.18.2 Wildlife Monitoring

No baseline historical wildlife data were available for comparison. In addition, the vernal pool did not hold sufficient depth for surveys to be completed in 2021. Therefore, DQO 5 and the applicable wildlife usage performance standard cannot be accessed. Data quality objectives 1 and 4 were analyzed in the Hydrology Monitoring Annual Report (Chenega, 2022). It is unlikely that even in a normal or above normal water-year that Pond 74 would support CTS or fairy shrimp due to its short hydroperiod. Other Fort Ord vernal pools with similar characteristics (Ponds 997 and 3 South, see Figure 5-1 in Chenega 2022) do not have historical records of CTS presence. It is unknown whether fairy shrimp were present in Pond 74 prior to mastication, but at Pond 3 South they were only detected in 1998 and have never been detected in Pond 997.

4.18.3 Conclusion

Pond 74, a post-subsurface munitions remediation vernal pool, was in the final year (Yr 3) of monitoring in 2021. The vernal pool cannot be evaluated for DQO 5 because no wildlife data exists for baseline or any follow-up year of monitoring. Pond 74 met the plant cover and species diversity performance standard (see Table 4-236). In order to evaluate wildlife usage at Pond 74 further monitoring is recommended. However, additional monitoring would be of limited utility since there is no baseline for comparison. Additional monitoring could help assess whether the vernal pool can provide sufficient inundation and water quality suitable for wildlife, but it could only provide confirmation that performance standards were not affected by mastication if CTS and/or fairy shrimp were detected. If wildlife were not detected, no assessment could be made whether mastication activities had a negative effect on presence and abundance of these species because it is unknown if they were present prior to mastication.

Table 4-236. Success at Pond 74 (Year 3 Post-Mastication) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Plant Cover & Species Diversity	DQO 3	Met
Wildlife Usage	N/A*	N/A*

*Not applicable; wildlife surveys were not conducted due to insufficient depth

4.19 Pond 75 – Baseline

Pond 75 was surveyed for the first time in 2021. No additional baseline surveys exist. Table 4-237 summarizes the years that monitoring occurred and surveys conducted. The cumulative precipitation graph shows below-normal precipitation for the 2020-2021 water-year compared to the 30-year normal (see Figure 4-70).

Table 4-237. Pond 75 (Baseline) Summary of Historic Surveys for Hydrology, Vegetation, and Wildlife

Survey	Water-Year
	2020-2021
Hydrology	●
Vegetation	●
Wildlife	

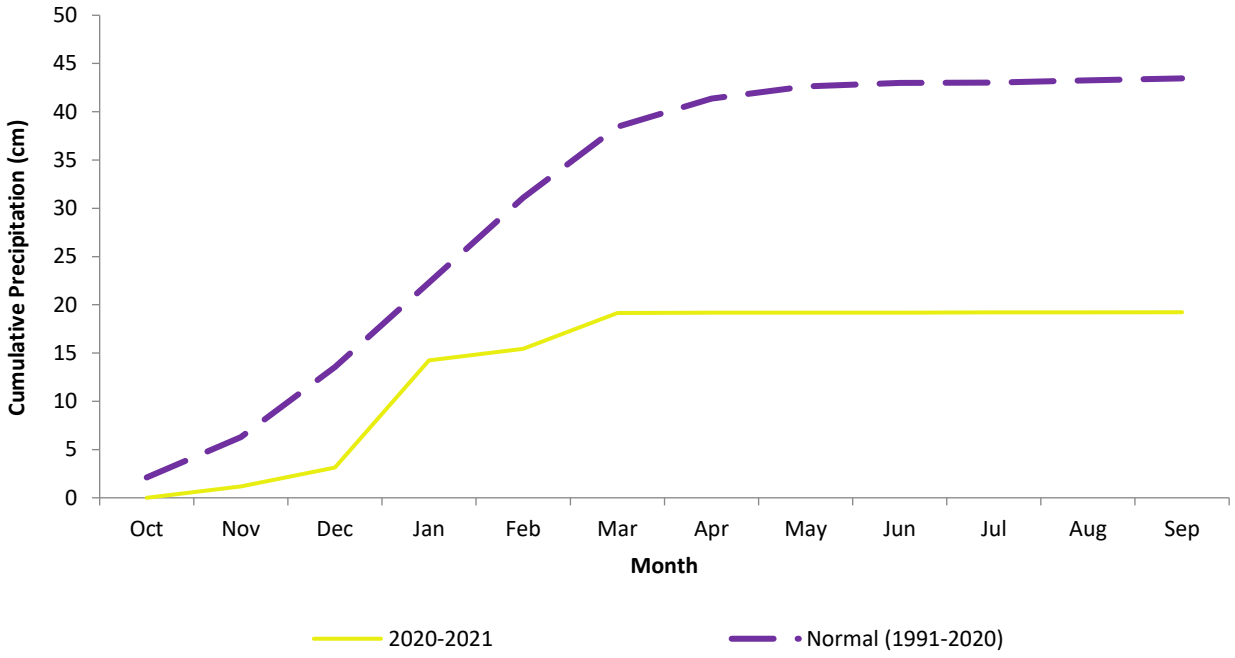

Figure 4-70. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 75 (Baseline) Compared to the 30-Year Normal (mean 1991-2020) (NPS, 2021; NCEI NOAA, 2021)

4.19.1 Vegetation Monitoring

Baseline vegetation data were collected at Pond 75 in 2021 and will be compared to data from future surveys. The absolute percent vegetative cover was 48.7% vegetation and 51.4% thatch. Pond 75 vegetative cover was slightly greater than the values observed at the reference vernal pools but was closest to reference vernal pool 997, which had 48.7% vegetative cover (see Table 4-238).

Table 4-238. Pond 75 (Baseline) and Reference Vernal Pool Absolute Percent Cover in 2021

Vernal Pool	Vegetative Cover	Thatch/Bare Ground
5	39.3%	60.7%
101 East (East)	38.5%	61.6%
997	45.1%	55.0%
75	**48.7%**	**51.4%**

Species richness on transects was 16 species, whereas overall basin species richness was 35 species. (see Table 4-239 and Appendix A Table A-19). Pond 75 species richness was less than the values observed at the reference vernal pools (see Table 4-239 and Appendix E Tables E-22 - E-44).

A complete comparison of species composition observed at Pond 75 can be found in Appendix F. Figure 4-71 shows a subset of this comparison for species observed with a 2% cover or greater. The most dominant species were pale spikerush (*Eleocharis macrostachya*), followed by beardless wild rye (*Elymus triticoides*), western goldenrod (*Euthamia occidentalis*), and brown-headed rush (*Juncus phaeocephalus*).

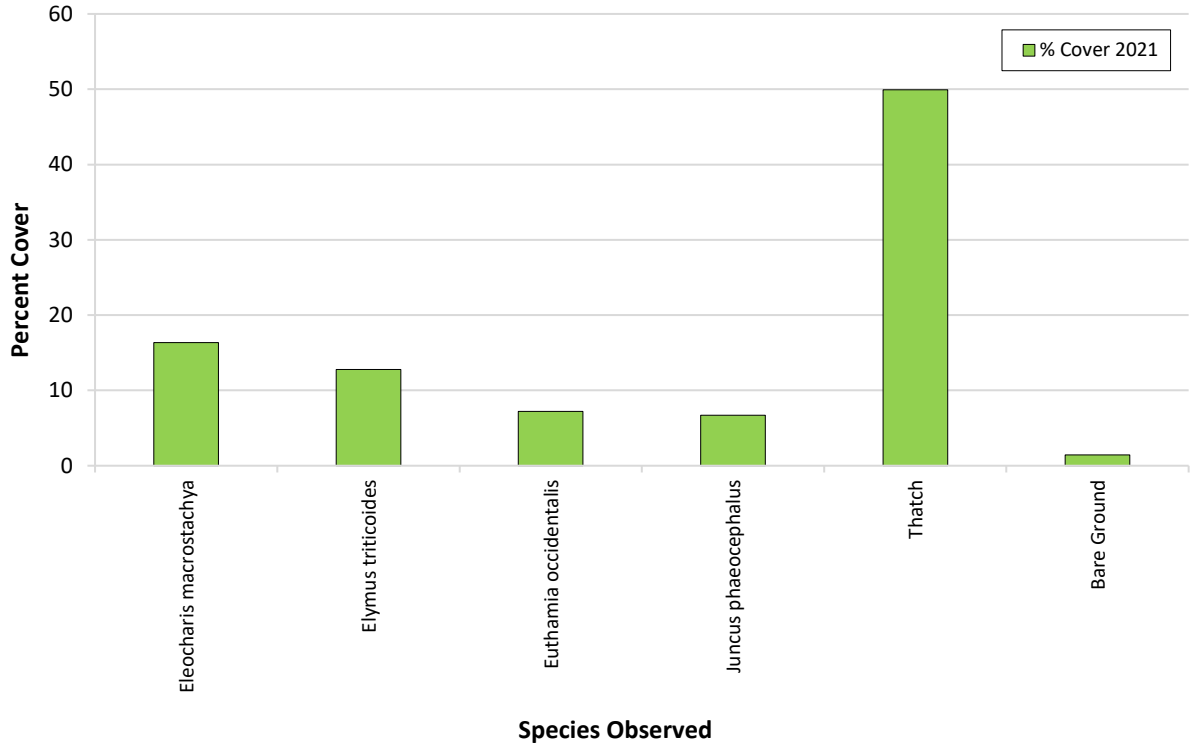

Figure 4-71. Percent Cover of Dominant Species at Pond 75 (Baseline)

Pond 75 had a greater number of native species than non-native species in 2021. The native richness was within the range of values observed at reference vernal pools and non-native richness was less than reference (see Table 4-239). The relative percent cover of native species was greater than the relative percent cover of non-native species. Pond 75 had higher native species cover than the reference vernal pools and lower non-native cover (see Table 4-240).

Table 4-239. Pond 75 (Baseline) and Reference Vernal Pool Native and Non-Native Species Richness in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	16	15	0
101 East (East)	10	11	0
997	15	12	0
75	**10**	**6**	**0**

Table 4-240. Pond 75 (Baseline) and Reference Vernal Pool Relative Percent Cover of Native and Non-Native Plants in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	75.0%	25.0%	0.0%
101 East (East)	64.1%	35.9%	0.0%
997	59.1%	40.9%	0.0%
75	**93.9%**	**6.1%**	**0.0%**

The wetland species in Pond 75 were predominantly facultative and facultative wetland. There were 10 wetland plants and three non-wetland plants observed on transects. Pond 75 followed the same trend as the reference vernal pools with more wetland than non-wetland species, although Pond 75 had fewer non-wetland species than the range of values observed at the reference vernal pools (see Table 4-241). The relative percent cover of wetland species at Pond 75 was greater than the range of values observed at the reference vernal pools and the non-native cover was less than reference. (see Table 4-242).

Table 4-241. Pond 75 (Baseline) and Reference Vernal Pool Wetland and Non-Wetland Species Richness in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	4	6	3	7	1	10
101 East (East)	2	4	1	4	4	6
997	3	5	4	4	1	10
75	**1**	**5**	**4**	**2**	**1**	**3**

Table 4-242. Pond 75 (Baseline) and Reference Vernal Pool Relative Percent Cover of Wetland and Non-Wetland Species in 2020

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	35.3%	36.5%	3.1%	4.2%	1.7%	19.1%
101 East (East)	17.7%	24.7%	3.6%	29.3%	1.9%	22.8%
997	2.0%	38.4%	19.0%	8.9%	0.2%	31.4%
75	**33.6%**	**32.3%**	**28.3%**	**1.6%**	**0.2%**	**4.0%**

4.19.1.1 *Data Quality Objective 3*

Pond 75 was dominated by native and wetland plant species during baseline monitoring in 2021. Pond 75 baseline data will be compared to future surveys.

4.19.1.2 *Performance Standard: Plant Cover and Species Diversity*

Pond 75 was a baseline vernal pool in 2021 and was not required to meet the performance standard. Pond 75 will be monitored after remediation and will be compared to these baseline data in future years as recommended in the PBO (see USFWS, 2017).

4.19.2 Wildlife Monitoring

Baseline wildlife data were not collected at Pond 75 because the vernal pool did not hold sufficient depth for surveys to be completed in 2021.

4.19.3 Conclusion

Pond 75 was not compared to DQOs in 2021 because the vernal pool was in baseline condition. The plant cover and species diversity data were suitable for comparison to future monitoring events (see Table 4-243).

Table 4-243. Success at Pond 75 (Baseline) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Plant Cover & Species Diversity	DQO 3	Suitable for Baseline
Wildlife Usage	N/A*	N/A*

*Not applicable; wildlife surveys were not conducted due to insufficient depth

4.20 Pond 101 East (West) – Year 3

Pond 101 East (West) was monitored in 2021 as a year 3 post-mastication vernal pool. Pond 101 East (West) was monitored in previous years as a reference vernal pool. Vegetation in Pond 101 East (West) was masticated in 2018. Table 4-244 summarizes the years that monitoring occurred and surveys were conducted. The cumulative precipitation graph shows precipitation for years in which hydrology monitoring was conducted at Pond 101 East (West) (see Figure 4-72). The 2015-2016, 2016-2017, and 2018-2019 water-years were above normal. All other monitoring was conducted either in a normal or below-normal water-year, drought year, or consecutive drought year.

Table 4-244. Pond 101 East (West) (Year 3 Post-Mastication) Summary of Historical Surveys for Hydrology, Vegetation, and Wildlife

Survey	Water-Year									
	1991-1992	2000-2001	2009-2010	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
Hydrology		●		●	●	●	●	●	●	●
Vegetation		●			●	●	●	●	●	●
Wildlife	●	●	●		●	●		●	●	

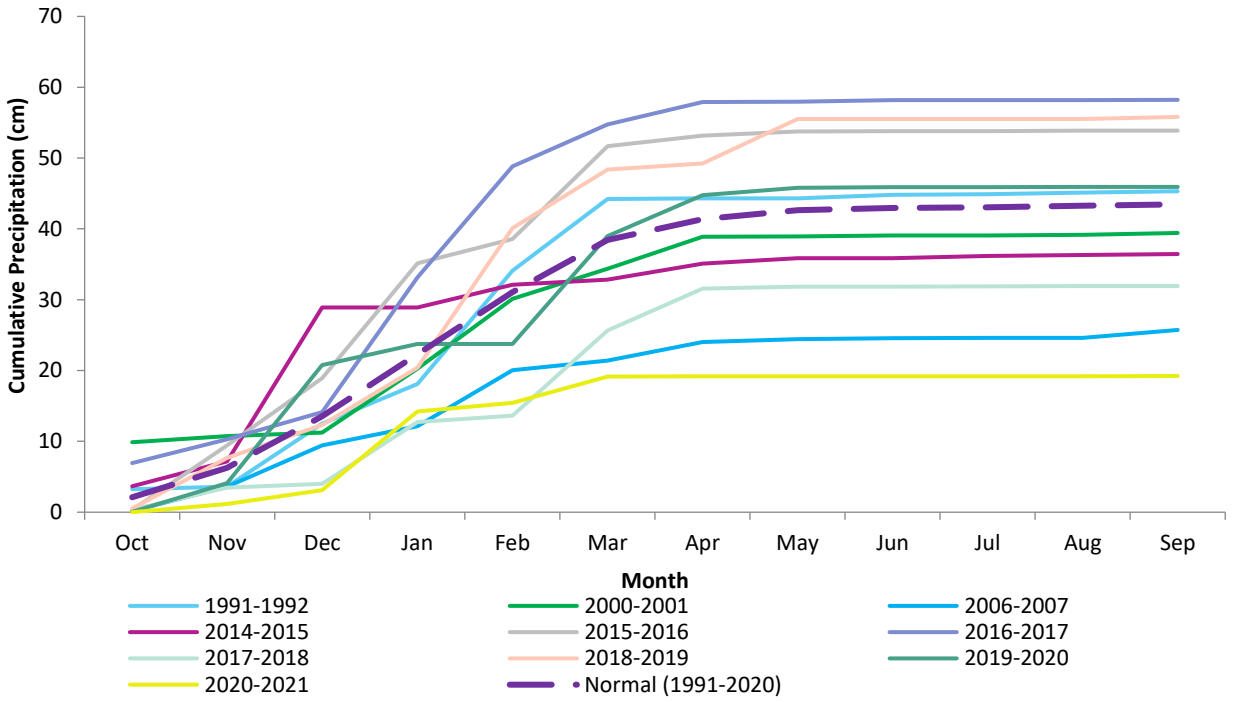

Figure 4-72. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 101 East (West) (Year 3 Post-Mastication) Compared to the 30-Year Normal (mean 1991-2020) (NPS, 2021; NCEI NOAA, 2021)

4.20.1 Vegetation Monitoring

Vegetation data were collected at Pond 101 East (West) in 2001, 2016, 2017, 2018, 2019, 2020, and 2021 (Harding ESE, 2002; Burleson, 2017, 2018, 2019, 2020, 2021). 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. Because 2001 data were collected differently than in other years, strata were combined across the vernal pool to allow for comparison. In years 2016-2021, data were collected using the methodology described in the Methods section of this report. Data from 2016 and 2021 were compared stratum-to-stratum in Table 4-245 as well as visually in Figure 4-73.

Table 4-245. Pond 101 East (West) (Year 3 Post-Mastication) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage	
	2016	2021
1	13%	1%
2	37%	22%
3	12%	6%
4	22%	2%
5	15%	46%
6	N/A	4%
8	N/A	6%
9	N/A	13%

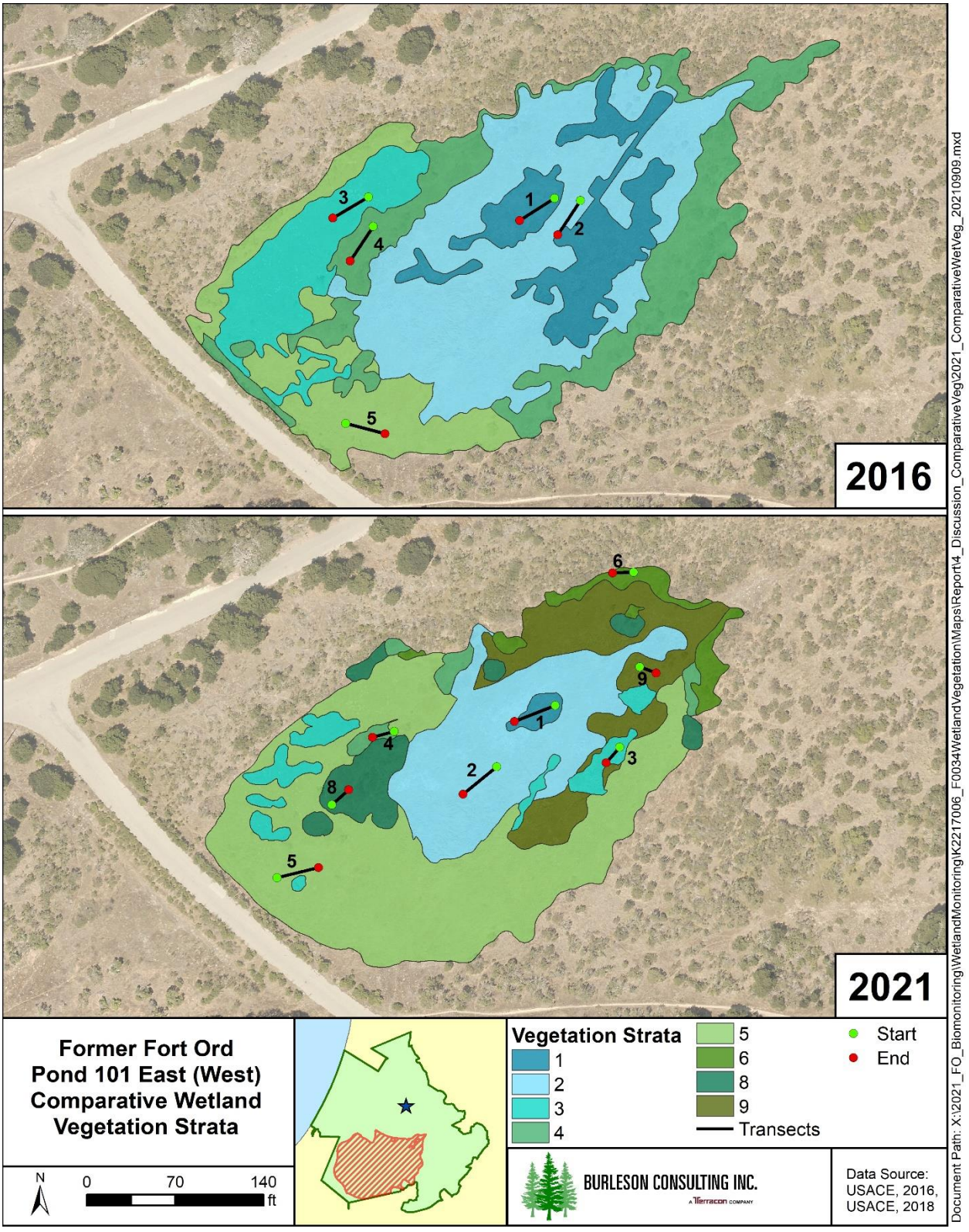

Figure 4-73. Pond 101 East (West) (Year 3 Post-Mastication) Vegetation Strata and Transects for 2016 and 2021

The absolute percent vegetative cover observed in 2021 was less than baseline years (see Table 4-246). Vegetative cover ranged in baseline years from 58.1% in 2018 to 75.9% in 2016, whereas thatch/bare ground ranged from 25.5% in 2016 to 34.3% in 2001. The 2021 Pond 101 East (West) absolute percent vegetative cover was also slightly less than the values observed at the reference vernal pools and thatch/bare ground was slightly greater (see Table 4-247).

Table 4-246. Pond 101 East (West) (Year 3 Post-Mastication) Absolute Percent Cover

Year	Vegetative Cover	Thatch/Bare Ground
2001*	66.5%	34.3%
2016*	75.9%	25.5%
2017*	69.0%	30.5%
2018*	58.1%	42.3%
2019	76.0%	24.0%
2020	55.4%	44.6%
2021	36.8%	63.2%

*baseline year

Table 4-247. Pond 101 East (West) (Year 3 Post-Mastication) and Reference Vernal Pool Absolute Percent Cover in 2021

Vernal Pool	Vegetative Cover	Thatch/Bare Ground
5	39.3%	60.7%
101 East (East)	38.5%	61.6%
997	45.1%	55.0%
101 East (West)	**36.8%**	**63.2%**

Species richness in 2021 was within the range of values observed in baseline years. Species richness on transects was 31, 30, 36, 50, 49, 41, and 38 species in 2001, 2016, 2017, 2018, 2019, 2020, and 2021, respectively, whereas overall basin species richness was 58, 68, 88, 85, 75, and 71 species in 2016, 2017, 2018, 2019, 2020, and 2021, respectively (see Table 4-248 and Appendix A Table A-20). The 2001 survey only included species observed on the transects and total vernal pool species richness was not recorded. Pond 101 East (West) species richness was slightly greater than the reference vernal pools (see Table 4-249 and Appendix E Tables E-22 and E-44). The species richness is represented on the RACs as the length of the curve and number of species along the curve (see Figure 4-74 and Figure 4-75).

Species composition at Pond 101 East (West) was variable through time, and the dominant species differed slightly between years. This variability of species composition is illustrated on the RACs as the species codes shift along the curve and losses and gains occur from year to year (see Figure 4-74 and Figure 4-75). Pale spikerush (*Eleocharis macrostachya*) was consistently a dominant species in all years except 2001. Sand spikerush (*Eleocharis montevidensis)* was the dominant species in 2001 (baseline), Italian rye grass (*Festuca perennis*) and pale spikerush (*Eleocharis macrostachya*) were dominant species in 2016 (baseline), 2019 (Yr 1), and 2020 (Yr 2), while pale spikerush and grass poly (*Lythrum hyssopifolia*) were the dominant species in 2017 (baseline). Pale spikerush (*Eleocharis macrostachya*), salt grass (*Distichlis spicata),* and Italian rye grass (*Festuca perennis*) were the dominant species in 2018 (baseline). Pale spikerush (*Eleocharis macrostachya*) was the dominant species in 2021 (Yr 3). A complete comparison of species composition observed at Pond 101 East (West) in 2001, 2016-2021 can

be found in Appendix F. Figure 4-77 shows a subset of this comparison for species observed with a 2% cover or greater.

The evenness from each year is represented by the slope of the RACs. The evenness is very similar from baseline to 2019 (Yr 1), 2020 (Yr 2), and 2021 (Yr 3) with richness distributed along the entire curve (see Figure 4-81). There was a slightly higher concentration or plateau of species toward the tail end in 2018 (baseline) and 2020 (Yr 2), which was similar to reference Ponds 5 and 101 East (East). "Structurally complex systems, such as a fen [or vernal pool] system," as explained in Verberk, 2011, "are species rich and have a more even community abundance pattern, possibly owing to a fine partitioning of available niches."

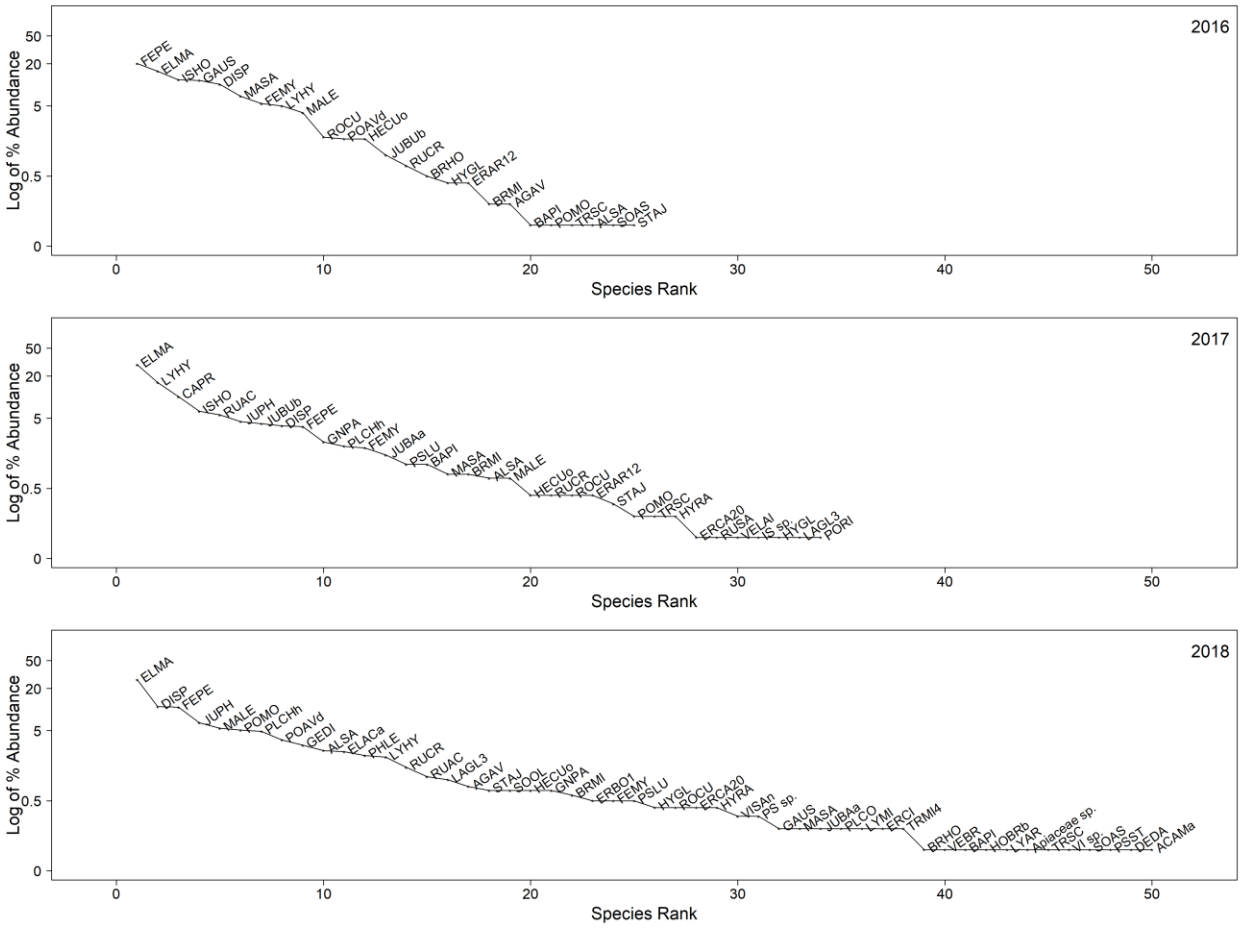

Figure 4-74. Rank Abundance Curves at Pond 101 East (West) (Year 3 Post-Mastication) in 2016-2018 (Baseline). Note that the y-axis is in log-10 scale.

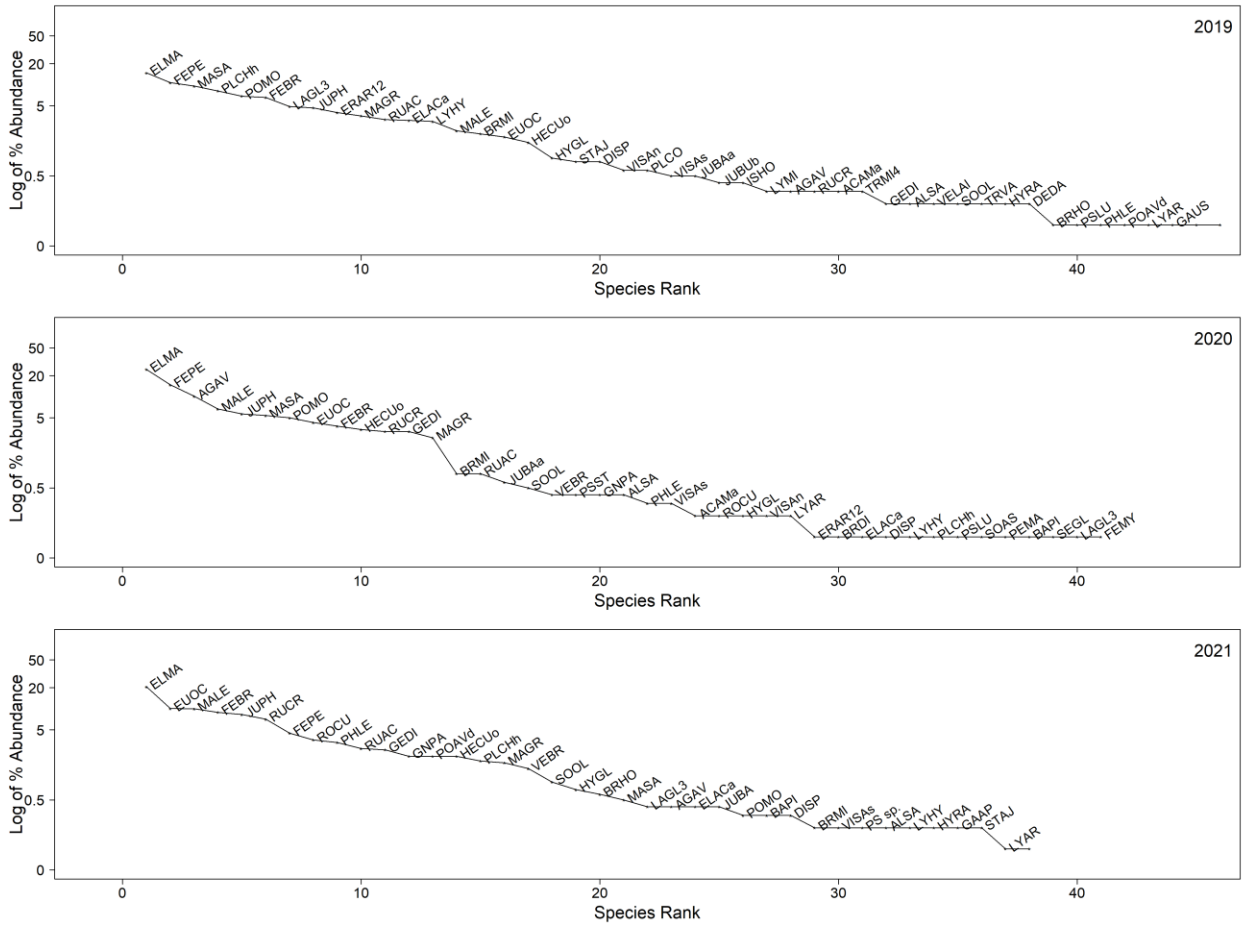

Figure 4-75. Rank Abundance Curves at Pond 101 East (West) (Year 3 Post-Mastication) in 2019 (Yr 1), 2020 (Yr 2) and 2021 (Yr 3). Note that the y-axis is in log-10 scale.

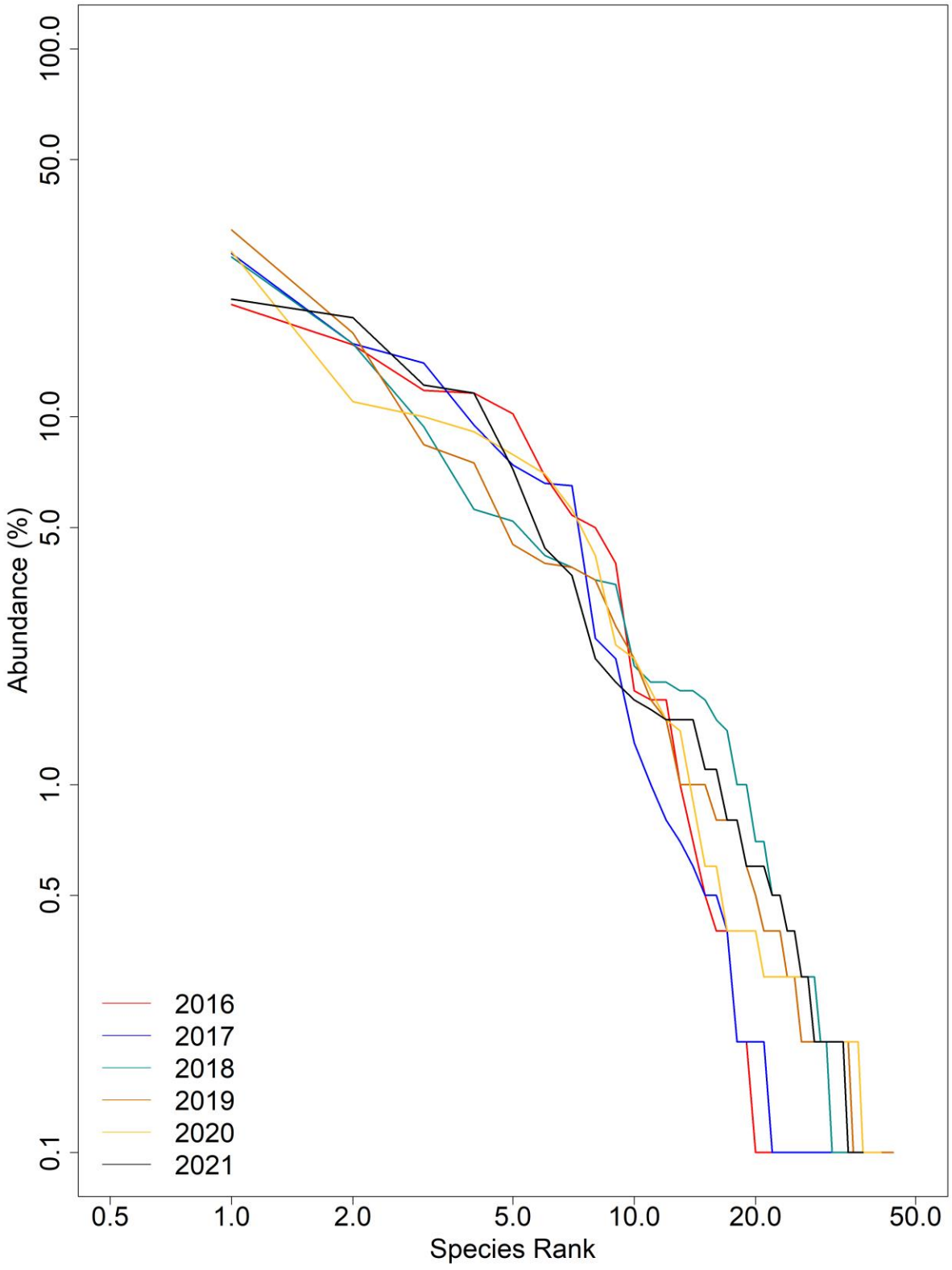

Figure 4-76. Rank Abundance Curves at Pond 101 East (West) (Year 3 Post-Mastication) in 2016-2018 (Baseline), 2019 (Yr 1), 2020 (Yr 2), and 2021 (Yr 3). Note that the x-axis and y-axis are in log-10 scale.

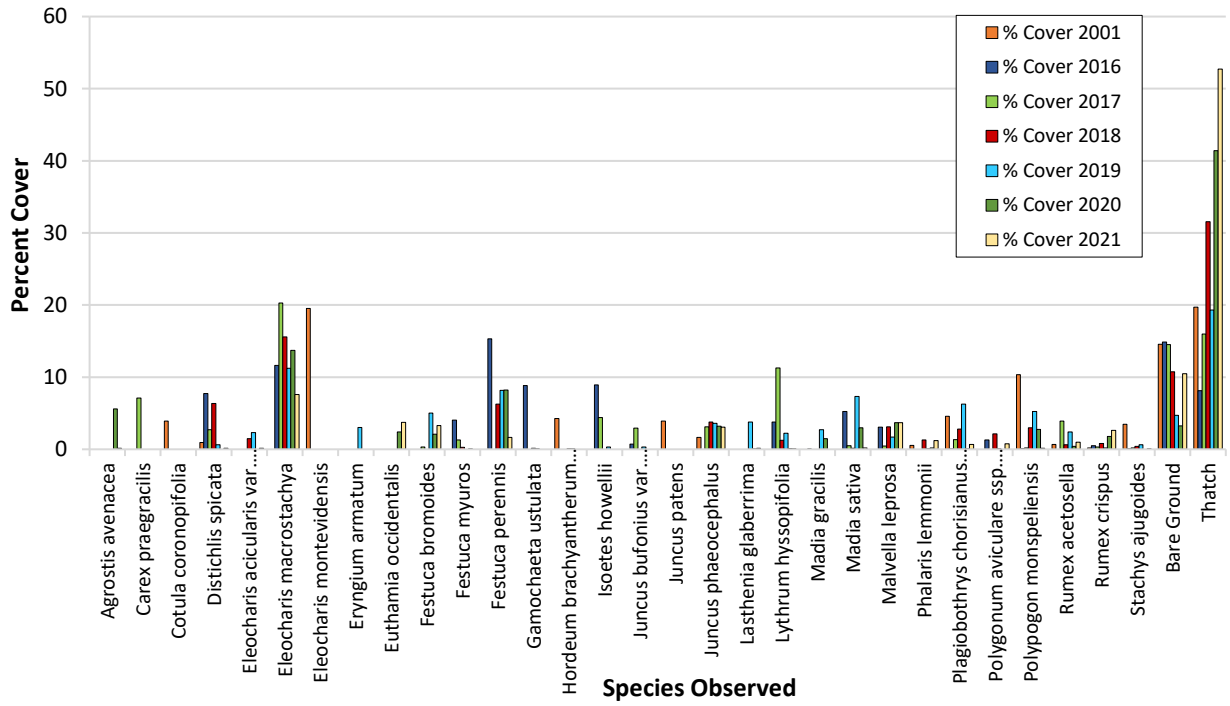

Figure 4-77. Percent Cover of Dominant Species at Pond 101 East (West) (Year 3 Post-Mastication)

Native and non-native species richness on Pond 101 East (West) transects were within the range of values observed in baseline years in 2021 (Yr 3) and 2020 (Yr 2). In 2019 (Yr 1), native species richness was greater than baseline and non-native richness was within the range of values observed in baseline years (see Table 4-248). Native and non-native species richness in 2021 (Yr 3) were greater than the values observed at reference vernal pools (see Table 4-249). In 2020 (Yr 2), native species richness was within the range of reference values while non-native was slightly greater (Burleson, 2021). However, in 2019 (Yr 1), native species richness was greater than reference values and non-native was within the range of reference vernal pools (Burleson, 2020).

Table 4-248. Pond 101 East (West) (Year 3 Post-Mastication) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
2001*	15	16	0
2016*	17	12	1
2017*	23	12	1
2018*	26	21	3
2019	29	19	1
2020	21	20	0
2021	20	17	1

*baseline year

Table 4-249. Pond 101 East (West) (Year 3 Post-Mastication) and Reference Vernal Pool Native and Non-Native Species Richness in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	16	15	0
101 East (East)	10	11	0
997	15	12	0
101 East (West)	**20**	**17**	**1**

The relative percent cover of native and non-native species were within the range of baseline values in 2021 (Yr 3) and 2019 (Yr 1). Less native species cover, and slightly higher non-native species cover was observed in 2020 (Yr 2) (see Table 4-250). In comparison to reference, 2021 (Yr 3) native and non-native cover values were within range (see Table 4-251). However, in 2020 (Yr 2) and 2019 (Yr 1), native cover was less than the values observed at reference and non-native cover was greater (Burleson, 2020, 2021).

Table 4-250. Pond 101 East (West) (Year 3 Post-Mastication) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
2001*	62.5%	37.5%	0.0%
2016*	65.6%	34.4%	0.0%
2017*	70.3%	29.6%	0.1%
2018*	67.1%	32.5%	0.3%
2019	63.4%	36.5%	0.1%
2020	56.4%	43.6%	0.0%
2021	68.1%	31.7%	0.2%

*baseline year

Table 4-251. Pond 101 East (West) (Year 3 Post-Mastication) and Reference Vernal Pool Relative Percent Cover of Native and Non-Native Plants in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	75.0%	25.0%	0.0%
101 East (East)	64.1%	35.9%	0.0%
997	59.1%	40.9%	0.0%
101 East (West)	**68.1%**	**31.7%**	**0.2%**

Wetland and non-wetland species richness on Pond 101 East (West) transects in 2021 (Yr 3) and 2020 (Yr 2), were within the range of values observed in baseline. In 2019 (Yr 1), wetland species richness was greater than baseline and non-wetland species richness was within the range of baseline values (see Table 4-252 and Table 4-253). In all post-remediation monitoring years, wetland richness was either within in range of baseline and reference or greater and non-wetland richness was within the range of both.

Table 4-252. Pond 101 East (West) (Year 3 Post-Mastication) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2001*	4	8	7	5	2	5
2016*	7	5	5	4	0	9
2017*	8	12	4	6	0	6
2018*	8	11	9	8	2	12
2019	7	15	10	4	3	10
2020	6	11	6	4	3	11
2021	7	8	6	5	2	10

*baseline year

Table 4-253. Pond 101 East (West) (Year 3 Post-Mastication) and Reference Vernal Pool Wetland and Non-Wetland Species Richness in 2021

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

In 2019 (Yr 1), wetland and non-wetland species cover were within the range of baseline values. In 2020 (Yr 2), wetland species cover was less than the baseline years; however, non-wetland cover was within the range of values observed in baseline. By 2021 (Yr 3), wetland cover was slightly less than the range of baseline values and non-wetland cover was greater (see Table 4-254). Compared to reference vernal pools, wetland and non-wetland cover values were within the range of values for all three post-mastication years (see Table 4-255).

Table 4-254. Pond 101 East (West) (Year 3 Post-Mastication) Relative Percent Cover of Wetland and Non-Wetland Species

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2001*	20.9%	62.0%	5.1%	4.6%	2.2%	5.2%
2016*	34.5%	11.7%	22.8%	10.0%	0.0%	21.0%
2017*	55.1%	29.6%	4.2%	8.6%	0.0%	2.5%
2018*	38.6%	29.0%	17.0%	8.4%	1.0%	6.1%
2019	35.2%	20.2%	14.4%	5.7%	1.3%	23.2%
2020	25.3%	17.0%	19.9%	7.6%	1.0%	29.3%
2021	27.3%	25.1%	15.4%	13.7%	1.1%	17.5%

*baseline year

Table 4-255. Pond 101 East (West) (Year 3 Post-Mastication) and Reference Vernal Pool Relative Percent Cover of Wetland and Non-Wetland Species in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	35.3%	36.5%	3.1%	4.2%	1.7%	19.1%
101 East (East)	17.7%	24.7%	3.6%	29.3%	1.9%	22.8%
997	2.0%	38.4%	19.0%	8.9%	0.2%	31.4%
101 East (West)	**27.3%**	**25.1%**	**15.4%**	**13.7%**	**1.1%**	**17.5%**

4.20.1.1 *Data Quality Objective 3*

Observable changes in hydrophytic vegetation between surveys were largely associated with precipitation fluctuations. This is expected given the dynamic nature of vernal pools and the close relationship between the hydroperiod and wetland vegetation composition. This year was a historic dry water-year. Below-normal water-years can result in upland and non-native herbs and grasses exploiting a greater portion of a vernal pool and distributing more evenly (Bauder, 2000).

Vegetative cover in Pond 101 East (West) was dominated by native and wetland plant species during year 3 post-mastication monitoring in 2021. By 2021 (Yr 3) the native and non-native species richness and cover values were within the range of baseline and/or reference vernal pools. In all post-remediation monitoring years, wetland richness was either within in range of baseline and reference or greater and non-wetland richness was within the range of both. There has been a slight decrease in wetland species cover and an increase in non-wetland cover compared to baseline. This is likely related to the water-years, which is supported by the fact that compared to reference vernal pools, wetland and non-wetland cover were within the range of reference values for all three post-mastication years.

4.20.1.2 *Performance Standard: Plant Cover and Species Diversity*

Pond 101 East (West), a post-mastication vernal pool, met the performance standard by year 3 in 2021. The species composition, richness, and native and wetland species relative abundances were similar to baseline and/or reference vernal pool conditions. 101 East (West) provided suitable wetland habitat in 2021.

4.20.2 Wildlife Monitoring

Wildlife data were collected at Pond 101 East (West) in 1992, 2001, 2010, 2016, 2017, 2019, and 2020 (Jones and Stokes, 1992; Harding ESE, 2002; Shaw, 2011; Burleson, 2017, 2018, 2020, 2021). California tiger salamander larvae were present in 1992, 2010, 2016, 2017, and 2019. Fairy shrimp were present in 2001 and 2019. The vernal pool did not hold sufficient depth for surveys to be completed in 2021. Therefore, DQO 5 and the applicable wildlife usage performance standard will only be assessed for 2019 (Yr 1) and 2020 (Yr 2). Table 4-256 shows historical wildlife monitoring results.

Table 4-256. Pond 101 East (West) (Year 3 Post-Mastication) Historical Wildlife Monitoring Results

Sampling Year	CTS Larvae Abundance (# Individuals)	Fairy Shrimp Abundance (# Individuals)
1992	Present*	Not detected*
2001	Not detected*	Moderate (12, 100)*
2010	Common*	Not detected*
2016	Common - Abundant (>101, 103, 100)	Not detected
2017	Common (21, 39, 47)	Not detected
2019	Common – Abundant (56, 132, 144)	High (181)
2020	Not detected	Not detected

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

4.20.2.1 *Data Quality Objective 5*

California tiger salamanders were not detected in 2020 (Yr 2) but were present in 2019 (Yr 1), which was consistent with baseline monitoring. California tiger salamanders were present in 1992, 2010, 2016, and 2017, but were not detected in 2001. Results in 2020 (Yr 2) and 2019 (Yr 1) were consistent with reference vernal pools; CTS were not detected at Pond 5 or 101 East (East) in 2020 but were present in 2019.

Fairy shrimp were not detected in 2020 (Yr 2) but were present in 2019 (Yr 1). Fairy shrimp results were consistent with baseline. Fairy shrimp presence in Pond 101 East (West) has been variable with more years of no detection than detection. In baseline years, fairy shrimp were not detected in 1992, 2010, 2016, and 2017, but were present in 2001. Results in 2020 (Yr 2) and 2019 (Yr 1) were consistent with reference vernal pools; fairy shrimp were not detected at Pond 5 in 2020 but were present at Pond 5 and Pond 101 East (East) in 2019.

4.20.2.2 Performance Standard: Wildlife Usage

Pond 101 East (West), a post-mastication vernal pool, was in the final year of monitoring and met DQO 5. California tiger salamanders were present in 2019 (Yr 1) but were not detected in 2020 (Yr 2). This trend was also observed at reference vernal pools Pond 5 and 101 East (East). California tiger salamanders were present during baseline surveys in 1992, 2010, 2016, and 2017, but were not detected in 2001. Fairy shrimp were present in 2019 (Yr 1) but were not detected in 2020 (Yr 2). In baseline surveys, fairy shrimp detection was variable; moderate numbers were observed in 2001 but fairy shrimp were not detected in 1992, 2010, 2016, and 2017. Therefore, the 2019 (Yr 1) and 2020 (Yr 2) results were similar to baseline data. Data quality objectives 1 and 4 were analyzed in the Hydrology Monitoring Annual Report (Chenega, 2022)

4.20.3 Conclusion

Pond 101 East (West), a post-mastication vernal pool, was in the final year (Yr 3) of monitoring in 2021. The vernal pool met the plant cover and species diversity performance standard and met DQO 5 for wildlife usage (see Table 4-257). No further monitoring is recommended for Pond 101 East (West).

Table 4-257. Success at Pond 101 East (West) (Year 3 Post-Mastication) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Plant Cover & Species Diversity	DQO 3	Met
Wildlife Usage	DQO 5	Met

4.21 Pond 101 West – Year 3

Pond 101 West was monitored in 2021 as a year 3 post-mastication vernal pool. Pond 101 West was monitored for baseline conditions in 1992, 2001, 2015, and 2016. Vegetation in Pond 101 West was masticated in 2018. Table 4-258 summarizes the years that monitoring occurred and surveys conducted. The cumulative precipitation graph shows precipitation for years in which hydrology monitoring was conducted at Pond 101 West (see Figure 4-78). The only water-years above-normal were 2015-2016 and 2018-2019. All other monitoring was conducted either in a normal, below-normal water-year, drought year, or consecutive drought year.

Table 4-258. Pond 101 West (Year 3 Post-Mastication) Summary of Historic Surveys for Hydrology, Vegetation, and Wildlife

Survey	Water-Year					
	1991-1992	2000-2001	2014-2015	2015-2016	2018-2019	2020-2021
Hydrology		●	●	●	●	●
Vegetation				●	●	●
Wildlife	●			●	●	

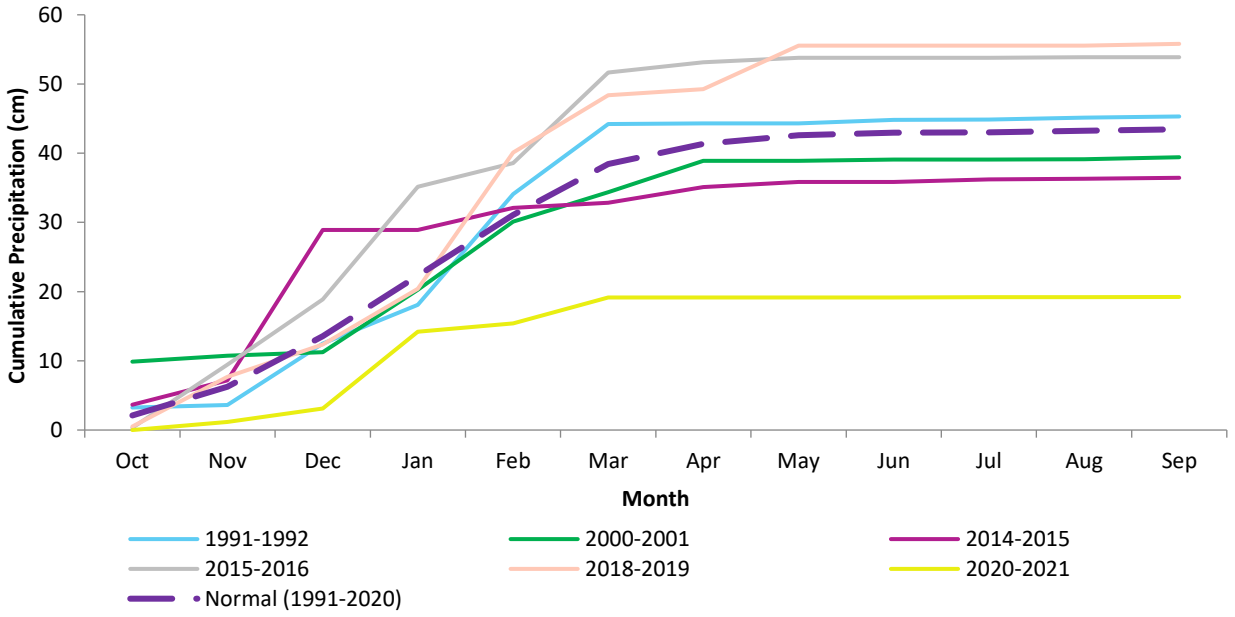

Figure 4-78. Cumulative Monthly Precipitation for Years that Hydrology Monitoring Occurred at Pond 101 West (Year 3 Post-Mastication) Compared to the 30-Year Normal (mean 1991-2020) (NPS, 2021; NCEI NOAA, 2021)

4.21.1 Vegetation Monitoring

Vegetation data were collected at Pond 101 West in 2016, 2019, and 2021 (Burleson, 2017, 2020, 2021). In years 2016, 2019, and 2021, data were collected using the methodology described in the Methods section of this report. Data from 2016 and 2021 were compared stratum-to-stratum in Table 4-259 as well as visually in Figure 4-79.

Table 4-259. Pond 101 West (Year 3 Post-Mastication) Vegetative Strata Percentage within the Vernal Pool Basin Boundary

Stratum	Percentage	
	2016	2021
1	56%	40%
2	44%	33%
4	N/A	27%

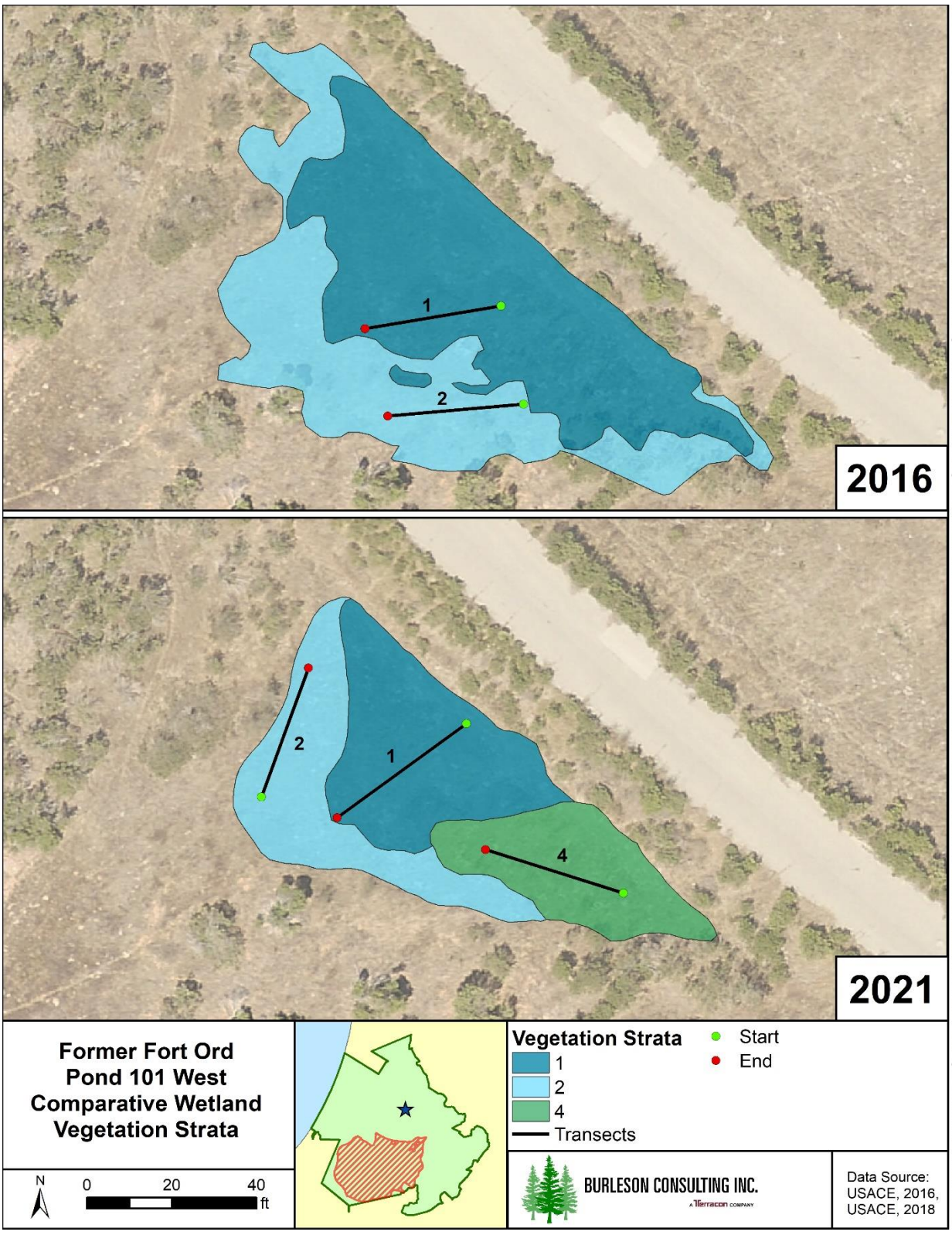

Figure 4-79. Pond 101 West (Year 3 Post-Mastication) Vegetation Strata and Transects for 2016 and 2021

The absolute percent vegetative cover value of Pond 101 West decreased between baseline and 2021, whereas thatch/bare ground increased (see Table 4-260). Conversely, the absolute vegetation cover was slightly greater at Pond 101 West than the reference vernal pools and thatch/bare ground was less than reference (see Table 4-261).

Table 4-260. Pond 101 West (Year 1 Post-Mastication) Absolute Percent Cover

Year	Vegetative Cover	Thatch/Bare Ground
2016*	73.2%	26.7%
2019	86.7%	13.5%
2021	46.7%	53.4%

*baseline year

Table 4-261. Pond 101 West (Year 1 Post-Mastication) and Reference Vernal Pool Absolute Percent Cover in 2019

Vernal Pool	Vegetative Cover	Thatch/Bare Ground
5	39.3%	60.7%
101 East (East)	38.5%	61.6%
997	45.1%	55.0%
101 West	**46.7%**	**53.4%**

Species richness in 2021 was greater than baseline. Species richness on transects was 23, 40, and 33 species in 2016, 2019, and 2021 respectively, whereas overall basin species richness was 43, 75, and 51 species in 2016, 2019, and 2021, respectively (see Table 4-262 and Appendix A Table A-21). Pond 101 West species richness on transects was greater than the range of values observed at the reference vernal pools, however, species richness for the overall basin was less than the reference vernal pools (see Table 4-263 and Appendix E Tables E-22 and E-44). The species richness is represented on the RACs as the length of the curve and number of species along the curve (see Figure 4-80).

Species composition and dominant species at Pond 101 West varied between monitoring years and baseline. This variability of species composition is illustrated on the RACs as the species codes shift along the curve and losses and gains occur from year to year (see Figure 4-80). A consistent dominant species in baseline and follow up years, 2019 (Yr 1) and 2021 (Yr 3), was Hickman's popcornflower (*Plagiobothrys chorisianus* var. *hickmanii*). Smooth goldfields (*Lasthenia glaberrima*) was an important species in all three years as well. In 2016 (baseline) and 2021 (Yr 3) Italian ryegrass (*Festuca perennis*) was a dominant species. However, in 2019 (Yr 1) pale spikerush (*Eleocharis macrostachya*) and gumweed (*Madia gracilis*) were dominant species. Western goldenrod (Euthamia occidentalis) was dominant in 2021 (Yr 3). Gumweed and western goldenrod were not prevalent in baseline. A complete comparison of species composition observed at Pond 101 West in 2016 (baseline) 2019 (Yr 1) and 2021 (Yr 2) can be found in Appendix F. Figure 4-82 shows a subset of this comparison for species observed with a 2% cover or greater.

The evenness from each year is represented by the slope of the RACs. The evenness is very similar from baseline to 2019 (Yr 1) and 2021 (Yr 3) with richness distributed along the entire curve (see Figure 4-81). There was a slightly higher concentration or plateau of species toward the tail end in 2019 (Yr 1) and 2021 (Yr 3), which was similar to reference Ponds 5 and 101 East (East). "Structurally complex systems,

such as a fen [or vernal pool] system," as explained in Verberk, 2011, "are species rich and have a more even community abundance pattern, possibly owing to a fine partitioning of available niches."

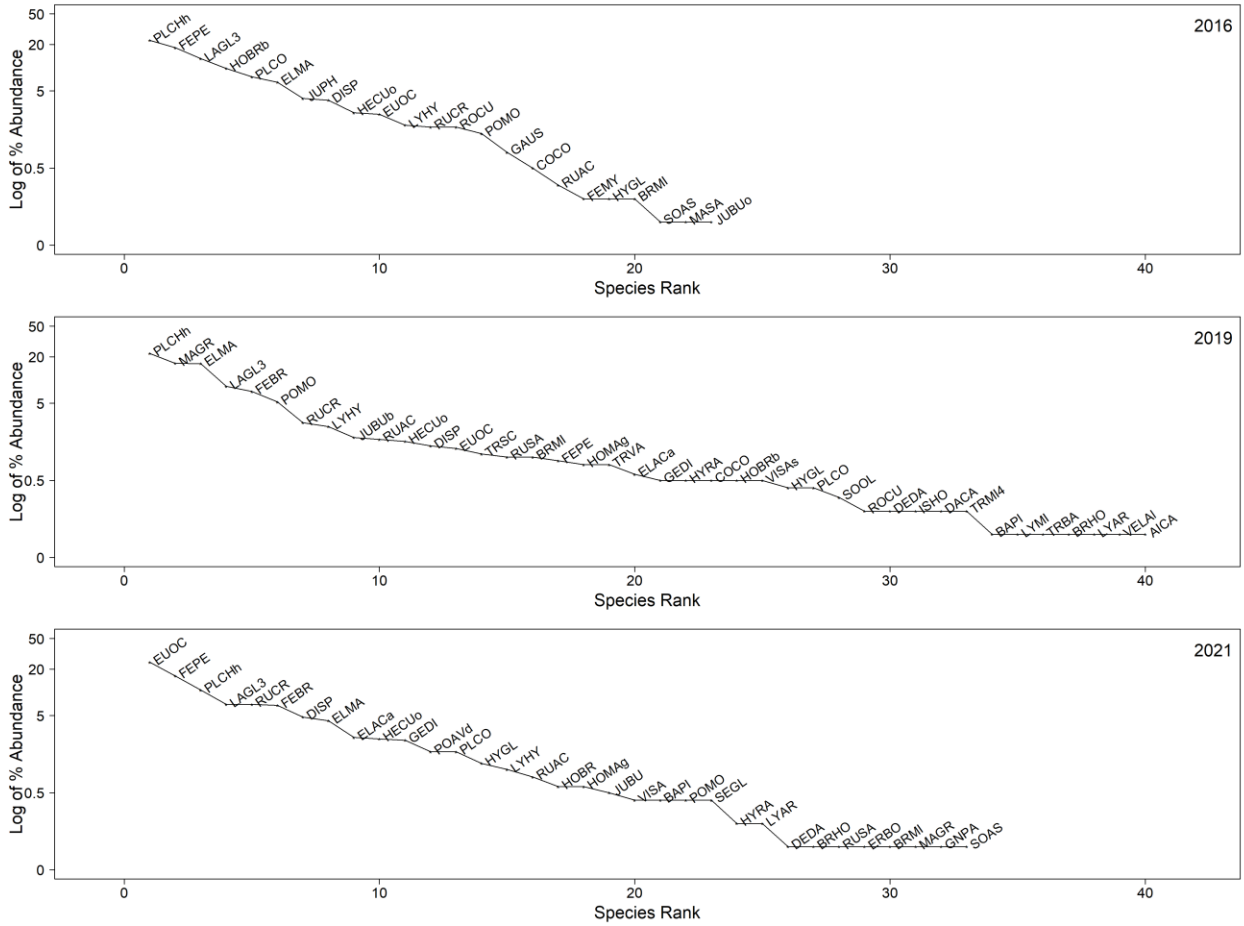

Figure 4-80. Rank Abundance Curves at Pond 101 West (Year 3 Post-Mastication) in 2016 (Baseline), 2019 (Yr 1), and 2021 (Yr 3). Note that the y-axis is in log-10 scale.

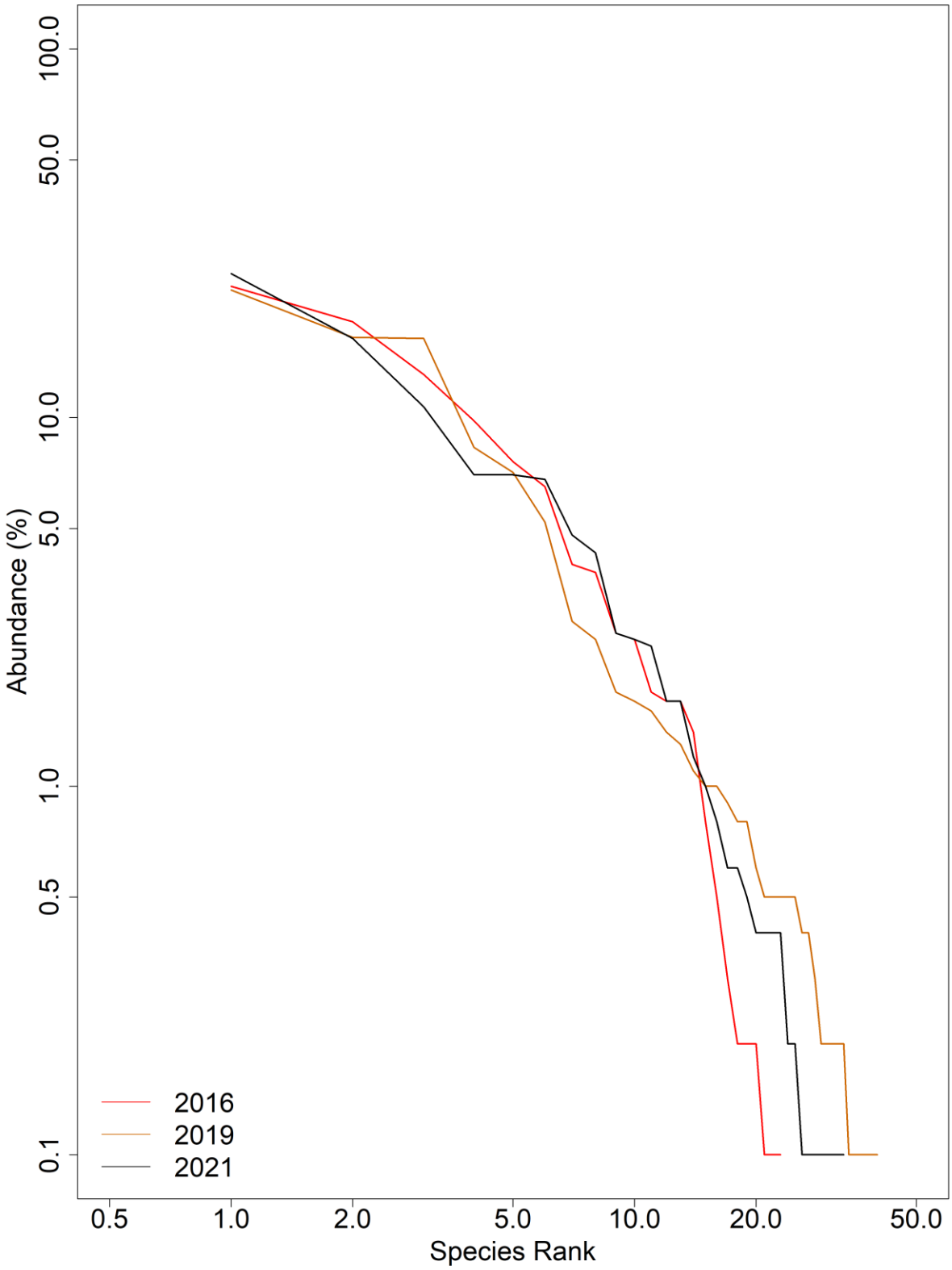

Figure 4-81. Rank Abundance Curves at Pond 101 West (Year 3 Post-Mastication) in 2016 (Baseline), 2019 (Yr 1), and 2021 (Yr 3). Note that the x-axis and y-axis are in log-10 scale.

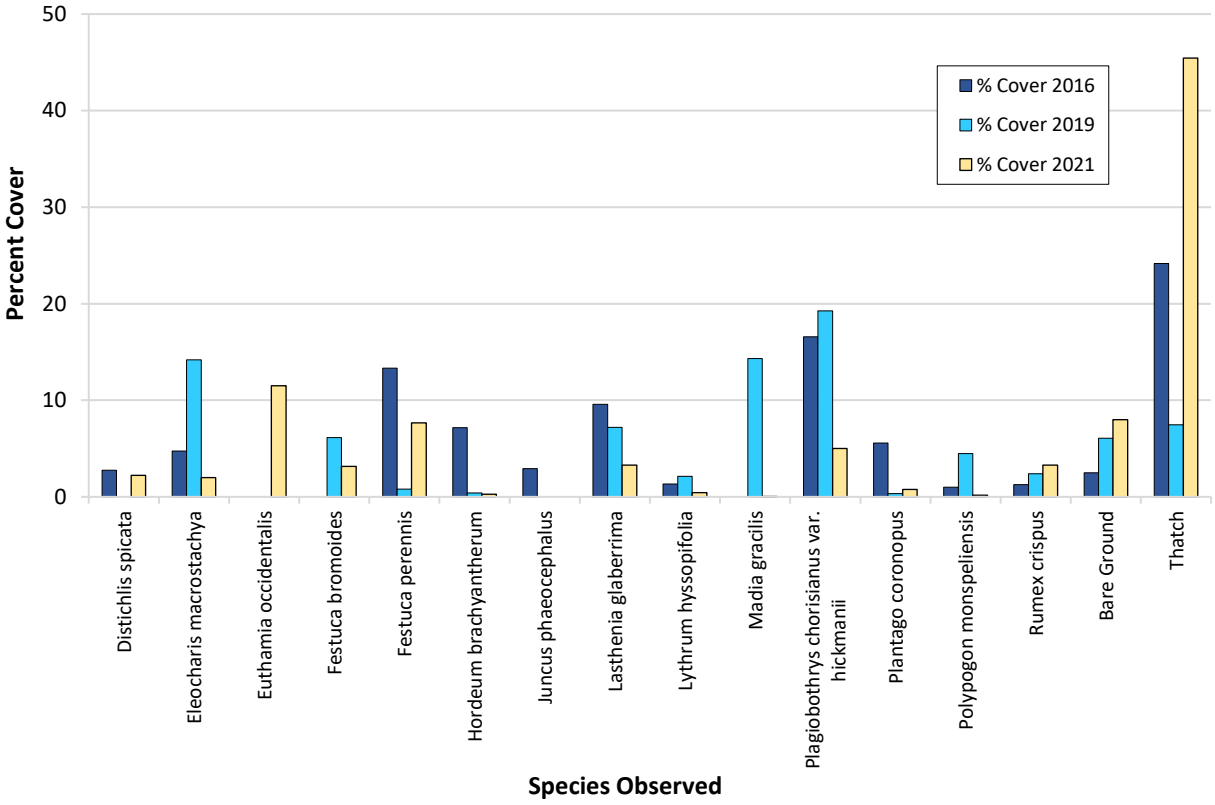

Figure 4-82. Percent Cover of Dominant Species at Pond 101 West (Year 3 Post-Mastication)

Native and non-native species richness on Pond 101 West transects were greater than baseline in 2021 (Yr 3) and 2019 (Yr 1) (Table 4-262). Native species richness was within the range of values observed in reference vernal pools, however non-native species richness in 2021 (Yr 3) was greater than reference (see Table 4-263). In 2019 (Yr 1) both native and non-native species richness were within the range of values observed at reference vernal pools.

Table 4-262. Pond 101 West (Year 3 Post-Mastication) Native and Non-Native Species Richness

Year	Native	Non-Native	Unidentified
2016*	12	11	0
2019	22	18	0
2021	14	19	0

*baseline year

Table 4-263. Pond 101 West (Year 3 Post-Mastication) and Reference Vernal Pool Native and Non-Native Species Richness in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	16	15	0
101 East (East)	10	11	0
997	15	12	0
101 West	**14**	**19**	**0**

The relative percent cover of native and non-native species varied through time, with less native species cover and slightly higher non-native species cover in 2021 (Yr 3) than the values observed in the baseline year of monitoring and reference vernal pools (see Table 4-264 and Table 4-265). However, relative percent cover of native species was greater in 2019 (Yr 1) than baseline and reference and non-native species was less.

Table 4-264. Pond 101 West (Year 3 Post-Mastication) Relative Percent Cover of Native and Non-Native Plants

Year	Native	Non-Native	Unidentified
2016*	67.7%	32.3%	0.0%
2019	74.8%	25.2%	0.0%
2021	58.5%	41.5%	0.0%

*baseline year

Table 4-265. Pond 101 West (Year 3 Post-Mastication) and Reference Vernal Pool Relative Percent Cover of Native and Non-Native Plants in 2021

Vernal Pool	Native	Non-Native	Unidentified
5	75.0%	25.0%	0.0%
101 East (East)	64.1%	35.9%	0.0%
997	59.1%	40.9%	0.0%
101 West	**58.5%**	**41.5%**	**0.0%**

Wetland and non-wetland species richness on Pond 101 West transects increased between baseline and follow-up monitoring years 2019 (Yr 1) and 2021 (Yr 3) (see Table 4-266). Wetland species richness was greater than what was observed at the reference vernal pools, and non-wetland species richness was within the range of reference in both 2019 (Yr 1) and 2021 (Yr 3) (see Table 4-267).

Table 4-266. Pond 101 West (Year 3 Post-Mastication) Wetland and Non-Wetland Species Richness

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2016*	6	6	4	3	0	4
2019	9	9	10	4	2	6
2021	5	8	7	5	1	7

*baseline year

Table 4-267. Pond 101 West (Year 3 Post-Mastication) and Reference Vernal Pool Wetland and Non-Wetland Species Richness in 2021

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

The relative percent cover of wetland species was less, and non-wetland species cover was greater than the values observed in baseline for 2021 (Yr 3) and 2019 (Yr 1) (see Table 4-268). The wetland species relative percent cover values were within the ranges observed at the reference vernal pools in 2019 (Yr 1), however non-wetland species cover was less than reference. In 2021 (Yr 3), wetland species cover was greater and non-wetland cover was less than the values observed in reference vernal pools (see Table 4-269).

Table 4-268. Pond 101 West (Year 3 Post-Mastication) Relative Percent Cover of Wetland and Non-Wetland Species

Year	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
2016*	46.2%	21.5%	27.8%	0.7%	0.0%	3.8%
2019	52.0%	11.5%	7.1%	2.4%	0.8%	26.2%
2021	25.6%	31.2%	27.7%	1.4%	0.4%	13.7%

*baseline year

Table 4-269. Pond 101 West (Year 3 Post-Mastication) and Reference Vernal Pool Relative Percent Cover of Wetland and Non-Wetland Species in 2021

Vernal Pool	Wetland			Non-Wetland		Not Listed
	OBL	FACW	FAC	FACU	UPL	
5	35.3%	36.5%	3.1%	4.2%	1.7%	19.1%
101 East (East)	17.7%	24.7%	3.6%	29.3%	1.9%	22.8%
997	2.0%	38.4%	19.0%	8.9%	0.2%	31.4%
101 West	**25.6%**	**31.2%**	**27.7%**	**1.4%**	**0.4%**	**13.7%**

4.21.1.1 *Data Quality Objective 3*

Observable changes in hydrophytic vegetation between surveys were largely associated with precipitation fluctuations. This is expected given the dynamic nature of vernal pools and the close relationship between the hydroperiod and wetland vegetation composition. This year was a historic dry water-year. Below-normal water-years can result in upland and non-native herbs and grasses exploiting a greater portion of a vernal pool and distributing more evenly (Bauder, 2000).

Vegetative cover in Pond 101 West was dominated by native and wetland plant species during year 3 post-mastication monitoring in 2021. Pond 101 West was generally within range of baseline and/or reference vernal pools with a few exceptions. In 2021 (Yr 3), non-native richness and cover were greater than baseline and reference. The relatively high numbers of non-native and non-wetland richness is a trend observed across many vernal pools this year including reference Pond 5. This is likely related to a low water-year rather than remediation. Another exception was that wetland species richness was greater than baseline and reference in 2019 (Yr 1) and 2021 (Yr 3). The increase in wetland richness is not concerning as wetland plants generally support a healthy vernal pool ecosystem. The wetland and non-wetland cover was variable compared to baseline and reference in 2019 (Yr 1) and 2021 (Yr 3). Compared to baseline, wetland cover decreased, and non-wetland cover increased. However, compared to reference, wetland cover was within range or greater than baseline and non-wetland cover was less for both 2019 (Yr 1) and 2021 (Yr 3).

4.21.1.2 *Performance Standard: Plant Cover and Species Diversity*

Pond 101 West, a post-mastication vernal pool met the performance standard by year 3 in 2021. The species composition, and native and wetland species relative abundances were similar to baseline and/or reference vernal pool conditions, with a few exceptions that are either likely related to a historic below-normal water-year or are generally favorable changes for wetland function. The high non-native richness in 2021 (Yr 3) was not observed in 2019 (Yr 1). The evaluation of meeting the vegetation performance standard according to the Wetland Plan, is to "aid in determining whether vegetation is disturbed wetlands is similar enough to that in wetlands before MEC to determine whether wetland function is retained". The decision for whether a vernal pool has met the performance standard is based on reviewing both years of monitoring data. The results differ between the two years, but the intent of the performance standard has been met based on the consideration of water-years and that the wetland function of Pond 101 West is retained.

4.21.2 Wildlife Monitoring

Wildlife data were collected at Pond 101 West in 1992, 2001, 2010, 2016, and 2019 (Jones and Stokes, 1992; Harding ESE, 2002; Shaw, 2011; Burleson, 2017). California tiger salamander larvae were observed in 1992, 2010, 2016, and 2019. Fairy shrimp were detected in 2001. The vernal pool did not hold sufficient depth for surveys to be completed in 2021. Data were not collected at Pond 101 West in 2020 (Yr 2). Therefore, DQO 5 and the applicable wildlife usage performance standard will only be assessed for 2019 (Yr 1). Table 4-270 shows historic wildlife monitoring results.

Table 4-270. Pond 101 West (Year 3 Post-Mastication) Historical Wildlife Monitoring Results

Sampling Year	CTS Larvae Abundance (# Individuals)	Fairy Shrimp Abundance (# Individuals)
1992	Present*	Not detected*
2001	Not detected*	Moderate (12, 100)*
2010	Common*	Not detected*
2016	Few – Common (11, 12, 10)	Not detected
2019	Common – Abundant (32, 106)	Not detected

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

4.21.2.1 *Data Quality Objective 5*

California tiger salamanders were present in 2019 (Yr 1), which was generally consistent with baseline monitoring. California tiger salamanders were present in 1992, 2010, and 2016, but were not detected

in 2001. Results in 2019 (Yr 1) were consistent with reference vernal pools; CTS were present in Pond 5 and Pond 101 East (East).

Fairy shrimp were not detected in 2019 (Yr 1), which was generally consistent with baseline monitoring. Fairy shrimp were not detected in 1992, 2010, or 2016, but were present in 2001. It is possible that survey event timing prevented detection in 1992 and 2016. Fairy shrimp detections typically occur between January and March and all surveys at Pond 101 West occurred in March or later. It is also possible that the detection in 2001 was not in Pond 101 West. The data from 2001 does not specify which of the three vernal pools the detection was in but rather refers to them collectively as Pond 101. Results in 2019 (Yr 1) were consistent with reference Pond 997.

4.21.2.2 *Performance Standard: Wildlife Usage*

Pond 101 West was a post-mastication remediation vernal pool in the final year of monitoring and met DQO 5. California tiger salamanders were present in 2019 (Yr 1). California tiger salamanders were present during baseline surveys in 1992, 2010, and 2016, but were not detected in 2001. Fairy shrimp were not detected in 2019 (Yr 1). In baseline years, fairy shrimp were not detected in 1992, 2010, or 2016 but were present in moderate numbers in 2001. Therefore the 2019 (Yr 1) results are similar to baseline. There were no wildlife surveys conducted in 2020 (Yr 2) and the vernal pool remained dry throughout the 2021 (Yr 3) monitoring. Data quality objectives 1 and 4 were analyzed in the Hydrology Monitoring Annual Report (Chenega, 2022).

4.21.3 Conclusion

Pond 101 West, a post-mastication vernal pool, was in the final year (Yr 3) of monitoring in 2021. The vernal pool met the plant cover and species diversity performance standard and met DQO 5 for wildlife usage (see Table 4-271). No further monitoring is recommended for Pond 101 West.

Table 4-271. Success at Pond 101 West (Year 3 Post-Mastication) Based on Performance Standards and Applicable Data Quality Objectives

Performance Standard	Applicable DQO	Success
Plant Cover & Species Diversity	DQO 3	Met
Wildlife Usage	DQO 5	Met

5 CONCLUSION

Rainfall was drastically lower than any previous monitoring year with a total cumulative precipitation approximately 45% of normal rainfall. This had measurable impacts to the vernal pools' wetland vegetation and wildlife usage. Only seven of the 21 vernal pools held water for any period. The other 14 were dry for the entirety of the 2020-2021 water-year (Chenega, 2022).

As mentioned in previous reports, variability is expected in vernal pools that have dynamic conditions in response to the amount of precipitation and the resulting hydroperiod (Bauder, 2000, 2005; Mulhouse *et al*., 2005; Witham *et al*., 1998). Drought conditions impacted the wetland vegetation in a variety of ways. The most consistent trend across all but two vernal pools monitored this year was greater thatch/bare ground cover than vegetative cover. The mean vegetative cover for reference vernal pools was 40.9% and for remediated pools was 44.2%, conversely thatch/bare ground cover was 59% at reference and 56% for remediated vernal pools. Many of the vernal pools also had greater non-native species richness compared to their baseline year of monitoring and reference vernal pools. This was true for vernal pools 3 North, 3 South, 35, 39, 40 South, 42, 43, and 44. All of these vernal pools are not on track to meet the performance standard for wetland vegetation either due to high non-native richness, high non-native cover, and/or high non-wetland richness (see Table 5-1). Despite dry conditions all vernal pools supported a majority of wetland species and relative percent cover was dominated by wetland species. Eleven of the vernal pools monitored had the highest non-wetland richness, non-wetland cover or both in 2021 compared to any previous monitoring year, including a reference vernal pool Pond 101 East (East). This observation is consistent with the literature, most [vernal pool] species will germinate and persist without inundation, but it is likely that inundation plays a large role in keeping upland competitors out of the pools (Bliss and Zedler, 1998). Non-wetland richness or cover, although greater than previous years at a majority of the vernal pools, was still within range of baseline or reference vernal pools at all except Ponds 3 North and 3 South.

A new analysis introduced in this report is the use of RACs to understand distribution of the species, relative abundance, species evenness, and species richness. Rank abundance curves were created for the reference vernal pools (Ponds 5, 101 East (East), and 997), as well as vernal pools in their final year of monitoring (Ponds 74, 101 East (West), and 101 West). Comparison plots were produced for each vernal pool with all monitoring years from 2015-2021 (see Appendix G). Notable differences from year to year are species richness, the change in species composition through gains and losses of differing species, and the distribution and relative abundance of species as they shift in position along the curves. For many vernal pools the dominant species were similar from year to year but for others they change every year.

Remarkably, the evenness is relatively low and fairly similar across years. This may be in part because of high species richness at the vernal pools and our sampling methodology. This is supported by a study of subalpine meadow communities with the same sampling scale as data collected at Ford Ord vernal pools. The researchers found a consistent negative correlation between S (species richness) and J (evenness) in these communities along the successional gradient at the sampling scale of 0.5 m x 0.5 m quadrats along transect lines (Hui Zhang, 2012). In addition to low evenness, richness was uniformly distributed along the entire curve with a slightly higher concentration or plateau of species toward the tail end. This plateau represents the species that are likely contributing around 1% and only found once along the transect.

The 2020-2021 water-year did not provide favorable conditions for CTS or fairy shrimp. Ponds 60 and 61 were the only vernal pools that held sufficient depth in March to trigger the wildlife surveys, and neither CTS nor fairy shrimp were detected. Pond 60 is partially on track for wildlife presence as it has supported CTS in baseline years. Pond 61 is on track for wildlife presence as it did not support CTS or fairy shrimp in the baseline year of monitoring.

Ponds 3 North, 3 South, 16, 35, 39, 40 South, 41, 42, 43, 44, 54, 60, 61, 73, and 75 will continue to be monitored. Ponds 101 East (West) and 101 (West) have met performance standards and do not require additional monitoring for wetland vegetation or wildlife usage. Pond 74 has not been monitored for wildlife usage in any year. If it is important to evaluate this performance standard, then further monitoring would be recommended. Pond 74 met the performance standard for wetland vegetation.

Table 5-1. 2021 Remediated Vernal Pools and Performance Standards Status

Vernal Pool	Monitoring Status	Wetland Vegetation	Wildlife
		DQO 3 (richness and cover)	DQO 5 (wildlife presence)
3 North	Year 3 Post-Subsurface Munitions Remediation	Not on track	N/A
3 South	Year 3 Post-Subsurface Munitions Remediation	Not on track	N/A
16	Year 3 Post-Subsurface Munitions Remediation	On track	N/A
35	Year 3 Post-Subsurface Munitions Remediation	Not on track	N/A
39	Year 3 Post-Subsurface Munitions Remediation	Not on track	N/A
40 South	Year 3 Post-Subsurface Munitions Remediation	Not on track	N/A
41	Year 3 Post-Subsurface Munitions Remediation	On track	N/A
42	Year 3 Post-Subsurface Munitions Remediation	Not on track	N/A
43	Year 3 Post-Subsurface Munitions Remediation	Not on track	N/A
44	Year 3 Post-Subsurface Munitions Remediation	Not on track	N/A
54	Year 3 Post-Subsurface Munitions Remediation	On track	N/A
60	Year 3 Post-Subsurface Munitions Remediation	On track	Partial
61	Year 3 Post-Subsurface Munitions Remediation	On track	On track
73	Year 3 Post-Subsurface Munitions Remediation	On track	N/A
74	Year 3 Post-Mastication	Met	N/A*
75	Baseline	Suitable for Baseline	N/A
101 East (West)	Year 3 Post-Mastication	Met	Met
101 (West)	Year 3 Post-Mastication	Met	Met

*No baseline or follow-up monitoring data for wildlife surveys

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APPENDIX A

Vegetation Transect Data

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Table A-1. Pond 5 (Reference) Wetland Vegetation Transect Data by Stratum

POND 5			
Date	5/19/2021		
Surveying Personnel	Kayti Christianson, Emily Poor, and Brett Bell		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water			
Notes			
Pond 5 remained dry throughout the 2020-2021 water-year (Chenega, 2022). Stratum 1 was repeated from 2016, 2018, 2019, and 2020. Strata 2, and 3 were repeated from 2016-2020. Stratum 7 was repeated from 2019 and 2020. Stratum 8, and the associated transect 8, were established in 2021. Transect 1 was repeated from 2016, 2018, 2019, and 2020. Transect 2 was repeated from 2016 and 2020. Transect 3 was repeated from 2020 and Transect 7 was repeated from 2019 and 2020.			

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	29%	ELMA	35	ELMA	33	ELMA	24	ELMA	32	ELMA	32	CRTR	1
			SOOL	1	TH	50	BAPI	1	MALE	6	ERCA	1	ELMA	28
			TH	52	BG	17	MALE	3	SEGL	1	MALE	4	MALE	4
			BG	12			SEGL	1	TH	57	SEGL	2	SOOL	1
							SOOL	2	BG	4	TH	53	TH	65
							TH	64			BG	8	BG	1
							BG	5						
			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	34%	DISP	45	DISP	15	DISP	12	DISP	24	CRTR	1	CRTR	1
			ELMA	3	ELMA	8	ELMA	2	ELMA	3	DISP	31	DISP	10
			MALE	1	MALE	1	MALE	1	MALE	1	ELMA	2	ELMA	4
			TH	51	TH	76	TH	83	TH	64	TH	63	TH	82
							BG	2	BG	8	BG	3	BG	3
			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
3	10 m	9%	DISP	12	AICA	1	BRMI	1	BRMI	1	BRMI	1	BRMI	1
			ELMA	1	BRMI	1	CRTR	1	CRTR	1	DISP	8	DISP	6
			GEDI	2	CRTR	1	DISP	2	DISP	2	ELMA	1	ELMA	1
			HYGL	3	DISP	5	GAAP	1	GEDI	2	GEDI	3	GEDI	2
			PHLE	1	GEDI	2	GEDI	5	HYGL	1	HYGL	1	HYGL	6
			RUCR	2	HYGL	7	HYGL	3	STAJ	36	PHLE	1	MAGR	1
			STAJ	40	PHLE	1	PHLE	1	TH	55	STAJ	30	PHLE	1
			TH	37	PLCHh	1	STAJ	36	BG	2	TH	53	STAJ	28
			BG	2	STAJ	28	TH	48			BG	2	TH	52
					TH	52	BG	2					BG	2
					BG	1								
			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
7	10 m	6%	AGAV	2	GEDI	1	BAPI	1	AGAV	2	JUBA	56	GEDI	4
			GEDI	4	JUBA	24	HYGL	1	JUBA	30	TH	44	JUBA	58
			JUBA	28	PSST	1	JUBA	20	PSST	4			POMO	1
			PSRA	4	SEGL	3	PSST	1	SOOL	1			TH	37
			PSST	2	SOOL	7	SEGL	2	TH	51				
			SEGL	1	TH	53	SOOL	1	BG	12				
			SOAS	1	BG	11	TH	63						
			SOOL	5			BG	11						
			TH	52										
			BG	1										
			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
8	10 m	22%	BRMI	3	BRHO	1	AICA	1	BRDI	1	BRDI	1	DISP	4
			DISP	2	BRMI	1	BRHO	2	BRMI	1	BRMI	1	GEDI	20
			GEDI	25	GEDI	40	BRMI	2	DISP	2	DISP	1	HYGL	6
			JUBA	2	JUBA	2	DISP	1	ERCA	1	GEDI	20	JUBA	2
			PHLE	3	PHLE	1	ERBO	4	GEDI	6	HECUo	3	PSLU	3
			SEGL	3	PSLU	3	GEDI	12	HYGL	2	JUBA	1	SEGL	2
			TH	60	SEGL	1	HYGL	8	MAGR	1	LYHY	1	STAJ	5
			BG	2	STAJ	2	JUBA	1	MASA	2	RUCR	12	TH	50
					TH	48	MAGR	1	PHLE	1	SEGL	2	BG	8
					BG	1	PHLE	1	RUCR	2	TH	16		
							POMO	1	SEGL	1	BG	42		
							SOOL	1	SOAS	16				
							STAJ	1	SOOL	1				
							TH	61	TH	58				
							BG	3	BG	5				
			TOTAL	100	TOTAL	100	TOTAL	100	TOTAL	100	TOTAL	100	TOTAL	100

Pond 5 2021 Species List					
Species Name	**Common Name**	**Species Code**	**Species Name**	**Common Name**	**Species Code**
Achillea millefolium	common yarrow	ACMI	*Hypochaeris glabra*	smooth cat's-ear	HYGL
Acmispon wrangelianus	Chilean trefoil	ACWR	*Hypochaeris radicata*	rough cat's-ear	HYRA
Agoseris grandiflora	large-flowered agoseris	AGGR	*Juncus balticus*	Baltic rush	JUBA
Agrostis avenacea	Pacific bent grass	AGAV	*Juncus phaeocephalus*	brown-headed rush	JUPH
Aira caryophyllea	silvery hair-grass	AICA	*Lactuca serriola*	prickly lettuce	LASE
Avena barbata	slender wild oat	AVBA	*Lasthenia glaberrima*	smooth goldfields	LAGL3
Baccharis glutinosa	marsh baccharis	BAGL	*Lysimachia arvensis*	scarlet pimpernel	LYAR
Baccharis pilularis	coyote brush	BAPI	*Lythrum hyssopifolia*	grass poly	LYHY
Briza maxima	rattlesnake grass	BRMA	*Madia gracilis*	gumweed	MAGR
Briza minor	annual quaking grass	BRMI	*Madia sativa*	coast tarweed	MASA
Bromus carinatus	California brome	BRCA	*Malvella leprosa*	alkali mallow	MALE
Bromus diandrus	ripgut grass	BRDI	*Microseris paludosa*	marsh microseris	MIPA
Bromus hordeaceus	soft chess	BRHO	*Nuttallanthus texanus*	blue toadflax	NUTE
Calandrinia menziesii	redmaids	CAME	*Phalaris lemmonii*	Lemmon's canary grass	PHLE
Carduus pycnocephalus	Italian thistle	CAPY	*Plagiobothrys chorisianus* var. *hickmanii*	Hickman's popcornflower	PLCHH
Cirsium brevistylum	Indian thistle	CIBR	*Plantago coronopus*	cut-leaved plantain	PLCO
Cirsium vulgare	bull thistle	CIVU	*Polypogon monspeliensis*	rabbitfoot grass	POMO
Clinopodium douglasii	yerba buena	CLDO	*Pseudognaphalium luteoalbum*	weedy cudweed	PSLU
Cressa truxillensis	spreading alkaliweed	CRTR	*Pseudognaphalium ramosissimum*	pink everlasting	PSRA
Cynosurus echinatus	bristly dogtail grass	CYEC	*Pseudognaphalium stramineum*	cottonbatting plant	PSST
Daucus pusillus	rattlesnake weed	DAPU	*Rumex acetosella*	sheep sorrel	RUAC
Distichlis spicata	salt grass	DISP	*Rumex crispus*	curly dock	RUCR
Eleocharis acicularis var. *acicularis*	needle spikerush	ELACa	*Senecio glomeratus*	cutleaf burnweed	SEGL
Eleocharis macrostachya	pale spikerush	ELMA	*Senecio vulgaris*	common groundsel	SEVU
Erigeron canadensis	horseweed	ERCA	*Silene gallica*	small-flower catchfly	SIGA
Erodium botrys	long-beaked filaree	ERBO	*Sonchus asper*	prickly sow thistle	SOAS
Erodium cicutarium	redstem filaree	ERCI	*Sonchus oleraceus*	common sow thistle	SOOL
Eryngium armatum	coyote thistle	ERAR12	*Stachys ajugoides*	bugle hedge nettle	STAJ
Euthamia occidentalis	western goldenrod	EUOC	*Stachys bullata*	California hedge nettle	STBU
Festuca bromoides	brome fescue	FEBR	*Toxicodendron diversilobum*	poison oak	TODI
Frankenia salina	alkali heath	FRSA	*Trifolium depauperatum* var. *amplectens*	pale sack clover	TRDEA
Galium aparine	goose grass	GAAP	*Trifolium microcephalum*	small head clover	TRMI
Gamochaeta ustulata	purple cudweed	GAUS	*Verbena lasiostachys* var. *lasiostachys*	western vervain	VELAL
Geranium dissectum	cut-leaved geranium	GEDI	**Groundcover Codes**		
Gnaphalium palustre	lowland cudweed	GNPA	BG	Bare Ground	
Heliotropium curassavicum var. *oculatum*	Chinese pusley	HECUO	TH	Thatch/Duff/Algae	
Helminthotheca echioides	bristly oxtongue	HEEC	AL	Algae	

Table A-2. Pond 101 East (East) (Reference) Wetland Vegetation Transect Data by Stratum

POND 101 East (East)			
Date	5/25/2021		
Surveying Personnel	Kayti Christianson, Emily Poor, Brett Bell, and Lizzy Eichorn		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water			
Notes			
Pond 101 East (East) remained dry throughout the 2020-2021 water-year (Chenega, 2022). Strata 3 was repeated from 2016. Strata 4 was repeated from 2016 and 2020, whereas strata 5 was repeated from 2017-2020. Transects 3, 4, and 5 were all relocated because the previous locations were no longer within the correct strata.			

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	57%	ELMA	6	AGAV	9	AGAV	12	AGAV	3	AGAV	4	AGAV	1
			MALE	17	ELMA	2	ELMA	3	ELMA	9	ELMA	20	ELMA	16
			TH	75	ERCA	1	MALE	22	MALE	21	MALE	25	MALE	49
			BG	2	MALE	13	POMO	1	POMO	1	RUCR	22	TH	29
					POMO	10	TH	58	TH	64	TH	26	BG	6
					TH	63	BG	4	BG	2	BG	4		
					BG	2								
			TOTAL	**100**	**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	3%	GEDI	1	GEDI	3	JUBA	31	EUOC	4	EUOC	17	EUOC	2
			JUBA	30	JUBA	28	BG	2	JUBA	30	JUBA	3	JUBA	10
			RUAC	4	RUAC	1	TH	67	TH	65	TH	76	RUAC	7
			TH	64	TH	57			BG	1	BG	4	TH	79
			BG	1	BG	11							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	40%	EPCI	2	ELMA	1	ERBO	1	ERBO	2	ERBO	9	EPCI	2
			GEDI	19	ERBO	8	GEDI	20	GEDI	26	ERCA	1	ERBO	4
			HYGL	3	GEDI	9	MAGR	1	STAJ	9	GEDI	19	GEDI	15
			MAGR	1	HYGL	2	MALE	1	VISAn	2	HYGL	2	HECUo	1
			STAJ	8	MAGR	1	RUCR	3	VISAs	4	MAGR	1	HYGL	1
			VISAs	2	MALE	3	SOOL	1	TH	47	MASA	2	MAGR	1
			TH	47	RUAC	14	STAJ	18	BG	10	STAJ	11	MASA	1
			BG	18	STAJ	6	VISAn	1			VISA	1	STAJ	14
					VISAs	1	TH	49			TH	45	VISAs	1
					TH	47	BG	5			BG	9	TH	58
					BG	8							BG	2
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 101 East (East) 2021 Species List					
Species Name	**Common Name**	**Species Code**	**Species Name**	**Common Name**	**Species Code**
Achillea millefolium	common yarrow	ACMI	*Lactuca serriola*	prickly lettuce	LASE
Agrostis avenacea	Pacific bent grass	AGAV	*Lasthenia glaberrima*	smooth goldfields	LAGL3
Aira caryophyllea	silvery hair-grass	AICA	*Lythrum hyssopifolia*	grass poly	LYHY
Alopecurus saccatus	Pacific foxtail	ALSA	*Madia gracilis*	gumweed	MAGR
Atriplex prostrata	fat-hen	ATPR	*Madia sativa*	coast tarweed	MASA
Avena barbata	slender wild oat	AVBA	*Malvella leprosa*	alkali mallow	MALE
Baccharis glutinosa	marsh baccharis	BAGL	*Phalaris lemmonii*	Lemmon's canary grass	PHLE
Baccharis pilularis	coyote brush	BAPI	*Plantago coronopus*	cut-leaved plantain	PLCO
Briza maxima	rattlesnake grass	BRMA	*Plantago lanceolata*	English plantain	PLLA
Briza minor	annual quaking grass	BRMI	*Polygonum aviculare* ssp. *depressum*	prostrate knotweed	POAVD
Bromus diandrus	ripgut grass	BRDI	*Polypogon monspeliensis*	rabbitfoot grass	POMO
Bromus hordeaceus	soft chess	BRHO	*Pseudognaphalium luteoalbum*	weedy cudweed	PSLU
Carduus pycnocephalus	Italian thistle	CAPY	*Pseudognaphalium stramineum*	cottonbatting plant	PSST
Cirsium vulgare	bull thistle	CIVU	*Rumex acetosella*	sheep sorrel	RUAC
Clarkia purpurea ssp. *quadrivulnera*	winecup clarkia	CLPUQ	*Rumex conglomeratus*	clustered dock	RUCO
Conium maculatum	poison hemlock	COMA	*Rumex crispus*	curly dock	RUCR
Cynosurus echinatus	bristly dogtail grass	CYEC	*Rumex salicifolius*	willow dock	RUSA
Eleocharis macrostachya	pale spikerush	ELMA	*Senecio glomeratus*	cutleaf burnweed	SEGL
Epilobium ciliatum	fringed willowherb	EPCI	*Silene gallica*	small-flower catchfly	SIGA
Erigeron canadensis	horseweed	ERCA	*Sonchus asper*	prickly sow thistle	SOAS
Erodium botrys	long-beaked filaree	ERBO	*Sonchus oleraceus*	common sow thistle	SOOL
Erodium cicutarium	redstem filaree	ERCI	*Stachys ajugoides*	bugle hedge nettle	STAJ
Euthamia occidentalis	western goldenrod	EUOC	*Torilis arvensis*	tall sock destroyer	TOAR
Festuca bromoides	brome fescue	FEBR	*Toxicodendron diversilobum*	poison oak	TODI
Festuca perennis	Italian rye grass	FEPE	*Trifolium depauperatum* var. *amplectens*	pale sack clover	TRDEA
Galium aparine	goose grass	GAAP	*Trifolium gracilentum*	pin point clover	TRGR
Geranium dissectum	cut-leaved geranium	GEDI	*Trifolium microcephalum*	small head clover	TRMI
Gnaphalium palustre	lowland cudweed	GNPA	*Verbena bracteata*	bracted verbena	VEBR
Heliotropium curassavicum var. *oculatum*	Chinese pusley	HECUO	*Verbena lasiostachys* var. *lasiostachys*	western vervain	VELAL
Heterotheca grandiflora	telegraph weed	HEGR	*Veronica peregrina* ssp. *xalapensis*	speedwell	VEPEX
Hordeum brachyantherum	meadow barley	HOBR	*Vicia sativa* ssp. *nigra*	common vetch	VISAN
Hypochaeris glabra	smooth cat's-ear	HYGL	*Vicia sativa* ssp. *sativa*	spring vetch	VISAS
Hypochaeris radicata	rough cat's-ear	HYRA	**Groundcover Codes**		
Juncus balticus	Baltic rush	JUBA	BG	Bare Ground	
Juncus falcatus	falcate rush	JUFA	TH	Thatch/Duff	
Juncus phaeocephalus	brown-headed rush	JUPH	AL	Algae	

Table A-3. Pond 997 (Reference) Wetland Vegetation Transect Data by Stratum

POND 997			
Date	5/5/2021		
Surveying Personnel	Kayti Christianson, Emily Poor, and Brett Bell		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water			
Notes			
Pond 997 remained dry throughout the 2020-2021 water-year (Chenega, 2022). Strata and transects 1 and 3 were repeated from 2017-2020. Stratum 2 was repeated from the same range of years but consisted of CCG and no transects were placed in this stratum.			

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	9%	BRHO	2	BRMA	1	ERAR12	40	BRMA	1	ERAR12	45	BAPI	1
			BRMA	1	ERAR12	28	PLCO	2	ERAR12	25	PLCHh	1	BRMA	2
			ERAR12	12	JUBUb	1	PSCH	1	ERBO	1	PLCO	3	ELMA	1
			LYHY	1	LYHY	1	TH	40	JUBUb	1	PSCH	1	ERAR12	13
			PLCO	2	PLCO	2	BG	18	LYHY	1	TH	43	ERBO	4
			PSCH	2	PSCH	1			PLCHh	1	BG	7	LYHY	2
			TH	55	TH	30			PLCO	1			PLCHh	2
			BG	25	BG	36			PSCH	2			PLCO	2
									TH	33			PSCA	1
									BG	34			TH	44
													BG	28
			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		Quadrat #4		Quadrat #5		Quadrat #6	
			Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover	Species	% Cover
3	10 m	89%	AICA	1	BRHO	1	BRMA	25	BRHO	1	AICA	1	AICA	1
			BRHO	1	BRMA	15	BRMI	1	BRMA	15	BRMA	18	BRMA	15
			BRMA	10	BRMI	1	DACA	7	DACA	25	BRMI	1	BRMI	1
			BRMI	1	DACA	28	ERAR12	2	ERAR12	12	DACA	9	DACA	6
			DACA	5	ERAR12	8	ERBO	4	ERBO	4	DECO	3	DECO	2
			DECO	2	ERBO	4	FEBR	2	FEBR	2	ERAR12	4	ERBO	6
			ERAR12	7	FEBR	1	HYGL	3	GEDI	1	ERBO	7	FEBR	5
			ERBO	4	GEDI	1	MAGR	2	HYGL	2	FEBR	4	GAUS	1
			FEBR	2	HYGL	4	PLCO	3	JUPH	1	HYGL	3	GEDI	1
			GEDI	1	MAGR	3	RUAC	1	MAGR	2	MAGR	2	HYGL	3
			HYGL	6	SOOL	1	TH	30	PLCO	1	TH	40	LYHY	1
			JUPH	1	TH	25	BG	20	RUAC	2	BG	8	LYMI	1
			MAGR	2	BG	8			TH	30			MAGR	3
			MIPA	1					BG	2			MIPA	1
			PLCO	1									RUAC	3
			TH	35									TRIX	1
			BG	20									TH	34
													BG	15
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 997 2021 Species List

Species Name	Common Name	Species Code
Acmispon americanus var. *americanus*	Spanish lotus	ACAMA
Agrostis lacuna-vernalis	vernal pool bent grass	AGLAV
Aira caryophyllea	silvery hair-grass	AICA
Avena barbata	slender wild oat	AVBA
Avena fatua	wild oat	AVFA
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
Castilleja ambigua ssp. *ambigua*	Johnny-Nip	CAAMA3
Cotula coronopifolia	brass buttons	COCO
Danthonia californica	California oat grass	DACA
Deinandra corymbosa	coastal tarweed	DECO
Drymocallis glandulosa var. *wrangelliana*	sticky cinquefoil	DRGLW
Eleocharis acicularis var. *acicularis*	needle spikerush	ELACa
Eleocharis macrostachya	pale spikerush	ELMA
Erodium botrys	long-beaked filaree	ERBO
Eryngium armatum	coyote thistle	ERAR12
Festuca bromoides	brome fescue	FEBR
Festuca perennis	Italian rye grass	FEPE
Galium porrigens	climbing bedstraw	GAPO
Gamochaeta ustulata	purple cudweed	GAUS
Geranium dissectum	cut-leaved geranium	GEDI
Horkelia cuneata var. *cuneata*	wedge-leaved horkelia	HOCUC
Hypochaeris glabra	smooth cat's-ear	HYGL
Hypochaeris radicata	rough cat's-ear	HYRA
Juncus bufonius var. *bufonius*	common toad rush	JUBUB
Juncus phaeocephalus	brown-headed rush	JUPH
Juncus uncialis	inch-high rush	JUUN
Lasthenia conjugens	Contra Costa goldfields	LACO
Luzula comosa	Pacific woodrush	LUCO6
Lysimachia arvensis	scarlet pimpernel	LYAR
Lysimachia minima	chaffweed	LYMI
Lythrum hyssopifolia	grass poly	LYHY
Madia gracilis	gumweed	MAGR
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 lanceolata	English plantain	PLLA
Pogogyne zizyphoroides	Sacramento mesa mint	POZI
Pseudognaphalium californicum	California everlasting	PSCA
Pseudognaphalium luteoalbum	weedy cudweed	PSLU
Pseudognaphalium stramineum	cottonbatting plant	PSST
Psilocarphus chilensis	round woolly-marbles	PSCH
Quercus agrifolia	coast live oak	QUAG
Rumex acetosella	sheep sorrel	RUAC
Senecio glomeratus	cutleaf burnweed	SEGL
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
Taraxia ovata	sun cups	TAOV
Toxicodendron diversilobum	poison oak	TODI
Triteleia ixioides	coast pretty face	TRIX
Zeltnera davyi	Davy's centuary	ZEDA
Groundcover Codes		
BG	Bare Ground	
TH	Thatch/Duff	
AL	Algae	

Table A-4. Pond 3 North (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Transect Data by Stratum

POND 3 North			
Date	5/14/2021		
Surveying Personnel	Kayti Christianson, Emily Poor, and Brett Bell		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water			
Notes			
Pond 3 North was dry by the February 24 hydrology monitoring event (Chenega, 2022). Strata 2, 3, and 4 were repeated from 2015, 2018, 2019, and 2020. Transect 2 was relocated because the previous location was no longer within the stratum. Transect 3 was repeated from 2018 and 2020. Stratum 4 consisted of CCG and no transects were placed in this stratum. An upland stratum was mapped and occupied 1% relative cover of the 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
2	10 m	12%	FEPE	1	COCO	1	BRHO	1	ELACa	1	ELMA	30	ELMA	50
			ELMA	45	ELACa	2	ELMA	40	ELMA	58	LAGL3	2	LAGL3	1
			FEBR	1	ELMA	52	ERCA	1	LAGL3	2	RUCR	1	SOOL	2
			LAGL3	1	ERCA	1	GNPA	1	POMO	2	TH	65	TH	40
			PLCHh	2	LAGL3	1	LAGL3	2	SEGL	2	BG	2	BG	7
			POMO	2	TH	37	POMO	1	TH	32				
			SEGL	1	BG	6	RUCR	2	BG	3				
			TRDU	1			SEGL	1						
			VISA	2			TH	50						
			TH	44			BG	1						
			BG	1										
			TOTAL	**101**	**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
3	10 m	52%	ACPA	1	ACPA	1	ACPA	1	ACPA	1	AICA	1	BRMI	1
			AGLAv	1	AGLAv	1	AICA	1	BRDI	1	BRDI	1	BRTEt	1
			AICA	1	AICA	1	BRHO	3	BRHO	2	BRHO	1	CAAM	2
			BRMI	1	BRHO	1	BRMI	1	DACA	18	DACA	1	DACA	1
			CAAM	10	BRMI	1	CAAM	1	DECO	1	DECO	1	DECO	1
			DECO	1	BRTEt	1	DACA	1	ERAR12	1	ERCA	1	ERAR12	15
			ERAR12	22	CAAM	4	DECO	2	FEBR	1	FEBR	2	FEBR	2
			FEBR	1	DACA	2	DEDA	2	FEPE	10	FEPE	7	FEPE	20
			FEPE	1	DECO	1	ERAR12	4	HYGL	1	HYGL	4	HYGL	1
			HYGL	1	DEDA	1	ERBO	4	LYAR	1	LOGA	1	MIPA	1
			JUPH	1	ERAR12	26	ERCI	1	LYMI	1	LYAR	1	POMO	1
			LYAR	1	ERBO	3	FEBR	1	MIPA	4	MIPA	1	TRAN	1
			MIPA	3	FEBR	1	FEPE	1	PLCO	2	PLCO	1	VISAn	1
			POMO	1	HYGL	1	HYGL	1	PLER	1	SOOL	1	TH	29
			SOOL	1	JUPH	2	JUBU	1	TRDU	2	TRAN	2	BG	23
			TH	33	LEPA	1	LYAR	1	TH	41	TH	9		
			BG	20	LYAR	1	LYMI	1	BG	12	BG	65		
					LYHY	1	MIDOd	1						
					MAEX	1	MIPA	4						
					MAGR	1	PLCO	1						
					MIPA	5	TRAN	1						
					SEGL	1	TH	11						
					TH	20	BG	55						
					BG	22								
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 3 North 2021 Species List					
Species Name	**Common Name**	**Species Code**	**Species Name**	**Common Name**	**Species Code**
Achillea millefolium	common yarrow	ACMI	*Leptosiphon parviflorus*	variable linanthus	LEPA
Acmispon americanus var. *americanus*	Spanish lotus	ACAMA	*Logfia gallica*	narrowleaf cottonrose	LOGA
Acmispon parviflorus	hill lotus	ACPA	*Lysimachia arvensis*	scarlet pimpernel	LYAR
Agrostis lacuna-vernalis	vernal pool bent grass	AGLAV	*Lysimachia minima*	chaffweed	LYMI
Aira caryophyllea	silvery hair-grass	AICA	*Lythrum hyssopifolia*	grass poly	LYHY
Avena barbata	slender wild oat	AVBA	*Madia exigua*	small tarweed	MAEX
Baccharis pilularis	coyote brush	BAPI	*Madia gracilis*	gumweed	MAGR
Briza minor	annual quaking grass	BRMI	*Madia sativa*	coast tarweed	MASA
Brodiaea terrestris ssp. *terrestris*	dwarf brodiaea	BRTET	*Microseris douglasii* ssp. *douglasii*	Douglas' silverpuffs	MIDOD
Bromus diandrus	ripgut grass	BRDI	*Microseris paludosa*	marsh microseris	MIPA
Bromus hordeaceus	soft chess	BRHO	*Plagiobothrys chorisianus* var. *hickmanii*	Hickman's popcornflower	PLCHH
Carpobrotus chilensis	sea fig	CACH	*Plantago coronopus*	cut-leaved plantain	PLCO
Castilleja ambigua	Johnny-Nip	CAAM	*Plantago erecta*	California plantain	PLER
Centaurea melitensis	Maltese star-thistle	CEME	*Polypogon monspeliensis*	rabbitfoot grass	POMO
Cotula coronopifolia	brass buttons	COCO	*Pseudognaphalium luteoalbum*	weedy cudweed	PSLU
Danthonia californica	California oat grass	DACA	*Pseudognaphalium stramineum*	cottonbatting plant	PSST
Deinandra corymbosa	coastal tarweed	DECO	*Psilocarphus chilensis*	round woolly-marbles	PSCH
Deschampsia danthonioides	annual hair grass	DEDA	*Rumex crispus*	curly dock	RUCR
Eleocharis acicularis var. *acicularis*	needle spikerush	ELACa	*Schoenoplectus californicus*	California bulrush	SCCA
Eleocharis macrostachya	pale spikerush	ELMA	*Senecio glomeratus*	cutleaf burnweed	SEGL
Erigeron canadensis	horseweed	ERCA	*Senecio vulgaris*	common groundsel	SEVU
Erodium botrys	long-beaked filaree	ERBO	*Sidalcea malviflora* ssp. *malviflora*	checkerbloom	SIMAM
Erodium cicutarium	redstem filaree	ERCI	*Sisyrinchium bellum*	western blue-eyed grass	SIBE
Eryngium armatum	coyote thistle	ERAR12	*Sonchus asper*	prickly sow thistle	SOAS
Festuca bromoides	brome fescue	FEBR	*Sonchus oleraceus*	common sow thistle	SOOL
Festuca perennis	Italian rye grass	FEPE	*Stipa pulchra*	purple needle grass	STPU
Gamochaeta ustulata	purple cudweed	GAUS	*Taraxia ovata*	sun cups	TAOV
Geranium dissectum	cut-leaved geranium	GEDI	*Toxicodendron diversilobum*	poison oak	TODI
Gnaphalium palustre	lowland cudweed	GNPA	*Trifolium angustifolium*	narrow-leaved clover	TRAN
Heliotropium curassavicum var. *oculatum*	Chinese pusley	HECUO	*Trifolium dubium*	little hop clover	TRDU
Hordeum brachyantherum	meadow barley	HOBR	*Triphysaria pusilla*	little owl's clover	TRPU
Hordeum marinum ssp. *gussoneanum*	Mediterranean barley	HOMAG	*Vicia hirsuta*	hairy vetch	VIHI
Hypochaeris glabra	smooth cat's-ear	HYGL	*Vicia sativa* ssp. *nigra*	common vetch	VISAN
Hypochaeris radicata	rough cat's-ear	HYRA	*Vicia sativa* ssp. *sativa*	spring vetch	VISAS
Juncus bufonius	toad rush	JUBU	*Zeltnera davyi*	Davy's centuary	ZEDA
Juncus occidentalis	western rush	JUOC	**Groundcover Codes**		
Juncus phaeocephalus	brown-headed rush	JUPH	BG	Bare Ground	
Lasthenia conjugens	Contra Costa goldfields	LACO	TH	Thatch/Duff	
Lasthenia glaberrima	smooth goldfields	LAGL3	AL	Algae	

Table A-5. Pond 3 South (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Transect Data by Stratum

POND 3 South			
Date	5/13/2021		
Surveying Personnel	Kayti Christianson, Emily Poor, and Brett Bell		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water			

Notes

Pond 3 South remained dry throughout the 2020-2021 water-year (Chenega, 2022). Strata 1 through 4 were repeated from 2016, 2018, 2019, and 2020. Stratum 5 was repeated from 2020. Stratum 6 and the corresponding transect were established in 2021. Transect 1 was repeated from 2016, 2018, 2019, and 2020, whereas Transect 4 was repeated from 2016 and 2018. Transects 2 and 3 were relocated because the previous locations were no longer within the strata. Stratum 5 consisted of CCG and no transects were placed in this stratum. An upland stratum was mapped and occupied 2% relative cover of the 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	28%	ELACa	1	ELACa	1	ELACa	3	AICA	1	BAPI	1	COCO	3
			ELMA	4	ELMA	6	ELMA	6	COCO	1	COCO	1	ELACa	1
			ERAR12	14	ERAR12	9	ERAR12	7	ELACa	1	ELACa	2	ELMA	10
			JUPH	1	FEPE	1	HYGL	1	ELMA	6	ELMA	6	ERAR12	1
			LOGA	1	JUPH	3	JUPH	2	ERAR12	1	ERAR12	1	ERCA	1
			PLCHh	2	LAGL3	12	MALE	2	ERCA	1	GEDI	1	GAUS	1
			POMO	1	PLCHh	4	PLCHh	5	FEPE	1	JUPH	3	GEDI	1
			TH	74	POMO	3	POMO	3	GEDI	1	LAGL3	6	HYGL	1
			BG	2	TH	51	SEGL	1	JUPH	3	MALE	7	LAGL3	5
					BG	10	TH	58	LAGL3	5	PLCHh	3	MALE	4
							BG	12	LYHY	1	POMO	8	PLCHh	7
									MALE	5	PSST	1	POMO	3
									PLCHh	2	SEGL	1	SEGL	1
									POMO	4	TRDU	1	TH	25
									PSST	1	TH	33	BG	36
									SEGL	1	BG	25		
									TH	45				
									BG	20				
			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
2	5 m	2%	ELMA	2	ELACa	2	ERAR12	1
			ERAR12	4	ELTR3	2	FEPE	1
			FEPE	1	ERAR12	12	GEDI	1
			HYRA	1	JUPH	12	JUPH	37
			JUPH	20	MALE	4	MALE	5
			MALE	2	TH	66	TH	54
			MIPA	1	BG	2	BG	1
			TH	64				
			BG	5				
			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	10 m	37%	AICA	1	AICA	1	ACMI	3	ACMI	2	ACMI	1	ACMI	2
			BRMI	1	BRMI	1	AICA	1	BRTEt	1	AVBA	1	AICA	1
			DACA	2	CAAMa3	1	BRTEt	1	DACA	26	BRTEt	1	BRTEt	1
			DECO	8	DACA	3	CAAMa3	1	DECO	2	DACA	23	DACA	24
			ERAR12	6	DECO	6	DACA	14	ERBO	1	DECO	1	DECO	2
			ERBO	1	ERAR12	10	DECO	4	FEBR	1	ERBO	1	ERBO	4
			FEBR	3	FEBR	1	ERAR12	2	GEDI	1	FEBR	1	FEBR	1
			GEDI	1	GEDI	1	FEBR	1	HYGL	1	HYGL	1	FEPE	4
			HYGL	1	HYGL	1	GEDI	1	LOGA	1	JUPH	1	GEDI	1
			HYRA	1	HYRA	1	HYGL	1	PLCO	3	LOGA	1	HYGL	1
			JUPH	1	LOGA	1	LOGA	1	SIBE	4	LYAR	1	LOGA	1
			LOGA	1	LYAR	1	LYAR	1	SIMAm	1	MAGR	1	LYAR	1
			LYAR	1	MAGR	1	PSST	1	TH	26	SIBE	1	TH	5
			LYMI	1	PLER	1	SIBE	2	BG	30	SIMAm	6	BG	53
			MAGR	1	SIMAm	1	SOOL	1			SOOL	1		
			PLER	1	TH	19	TH	30			TH	23		
			PSST	1	BG	50	BG	35			BG	35		
			SIMAm	6										
			TH	16										
			BG	46										
			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	24%	BRDI	1	BRHO	1	BRTEt	1	BRDI	2	BRDI	1	BRDI	1
			BRHO	4	DECO	1	DECO	1	BRHO	1	BRTEt	1	DECO	1
			DACA	2	FEBR	1	ELMA	1	ELMA	1	ELMA	1	ELMA	1
			ELMA	1	FEPE	12	FEBR	1	FEBR	1	FEBR	1	FEBR	1
			ERBO	1	MALE	2	FEPE	7	FEPE	12	FEPE	15	FEPE	12
			FEBR	1	TH	24	GEDI	1	GEDI	1	MALE	1	GEDI	1
			FEPE	9	BG	60	JUPH	1	MALE	3	TH	76	HYGL	1
			MALE	6			MALE	5	PLCO	1	BG	4	MALE	2
			MIPA	2			MIPA	2	TH	72			MIPA	1
			TH	55			PSST	1	BG	6			TH	66
			BG	18			TH	71					BG	13
							BG	8						
			TOTAL	**100**	**TOTAL**	**101**	**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
6	10 m	7%	BRDI	1	DECO	1	DACA	2	ERAR12	2	ERAR12	1	ERAR12	2
			CAAM	1	ERAR12	2	ERAR12	1	FEBR	1	JUFA	8	JUFA	5
			DACA	1	JUFA	4	FEBR	1	JUFA	9	PLCO	24	PLCO	30
			DECO	1	JUPH	1	JUFA	9	JUPH	1	BG	40	BG	23
			ELMA	1	PLCO	13	JUPH	1	PLCO	11	TH	27	TH	40
			ERAR12	1	BG	45	LYAR	1	BG	40				
			FEBR	1	TH	34	PLCO	12	TH	36				
			JUFA	6			BG	26						
			LYAR	1			TH	47						
			MALE	1										
			PLCO	12										
			BG	39										
			TH	34										
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 3 South 2021 Species List

Species Name	Common Name	Species Code	Species Name	Common Name	Species Code
Achillea millefolium	common yarrow	ACMI	*Logfia gallica*	narrowleaf cottonrose	LOGA
Acmispon americanus var. *americanus*	Spanish lotus	ACAMA	*Lupinus bicolor*	miniature lupine	LUBI
Acmispon parviflorus	hill lotus	ACPA	*Lysimachia arvensis*	scarlet pimpernel	LYAR
Adenostoma fasciculatum	chamise	ADFA	*Lysimachia minima*	chaffweed	LYMI
Agoseris grandiflora	large-flowered agoseris	AGGR	*Lythrum hyssopifolia*	grass poly	LYHY
Aira caryophyllea	silvery hair-grass	AICA	*Madia exigua*	small tarweed	MAEX
Allium hickmanii	Hickman's onion	ALHI	*Madia gracilis*	gumweed	MAGR
Arctostaphylos hookeri	Hooker's manzanita	ARHO	*Madia sativa*	coast tarweed	MASA
Avena barbata	slender wild oat	AVBA	*Malvella leprosa*	alkali mallow	MALE
Baccharis pilularis	coyote brush	BAPI	*Microseris paludosa*	marsh microseris	MIPA
Briza maxima	rattlesnake grass	BRMA	*Phalaris lemmonii*	Lemmon's canary grass	PHLE
Briza minor	annual quaking grass	BRMI	*Plagiobothrys chorisianus* var. *hickmanii*	Hickman's popcornflower	PLCHH
Brodiaea terrestris ssp. *terrestris*	dwarf brodiaea	BRTET	*Plantago coronopus*	cut-leaved plantain	PLCO
Bromus diandrus	ripgut grass	BRDI	*Plantago erecta*	California plantain	PLER
Bromus hordeaceus	soft chess	BRHO	*Plantago lanceolata*	English plantain	PLLA
Bromus madritensis ssp. *rubens*	red brome	BRMAR	*Pogogyne zizyphoroides*	Sacramento mesa mint	POZI
Calochortus uniflorus	pink star-tulip	CAUN	*Polypogon monspeliensis*	rabbitfoot grass	POMO
Castilleja ambigua ssp. *ambigua*	Johnny-Nip	CAAMA3	*Pseudognaphalium luteoalbum*	weedy cudweed	PSLU
Cotula coronopifolia	brass buttons	COCO	*Pseudognaphalium ramosissimum*	pink everlasting	PSRA
Crocanthemum scoparium	peak rush-rose	CRSC	*Pseudognaphalium stramineum*	cottonbatting plant	PSST
Danthonia californica	California oat grass	DACA	*Psilocarphus chilensis*	round woolly-marbles	PSCH
Deinandra corymbosa	coastal tarweed	DECO	*Rubus ursinus*	California blackberry	RUUR
Deschampsia danthonioides	annual hair grass	DEDA	*Rumex crispus*	curly dock	RUCR
Eleocharis acicularis var. *acicularis*	needle spikerush	ELACa	*Sanicula crassicaulis*	Pacific sanicle	SACR
Eleocharis macrostachya	pale spikerush	ELMA	*Senecio glomeratus*	cutleaf burnweed	SEGL
Elymus triticoides	beardless wild rye	ELTR3	*Senecio vulgaris*	common groundsel	SEVU
Epilobium ciliatum	fringed willowherb	EPCI	*Sidalcea malviflora* ssp. *malviflora*	checkerbloom	SIMAM
Erigeron canadensis	horseweed	ERCA	*Silene gallica*	small-flower catchfly	SIGA
Erodium botrys	long-beaked filaree	ERBO	*Sisyrinchium bellum*	western blue-eyed grass	SIBE
Eryngium armatum	coyote thistle	ERAR12	*Sonchus asper*	prickly sow thistle	SOAS
Festuca bromoides	brome fescue	FEBR	*Sonchus oleraceus*	common sow thistle	SOOL
Festuca perennis	Italian rye grass	FEPE	*Spergularia macrotheca* var. *leucantha*	sticky sandspurry	SPMAL
Gamochaeta ustulata	purple cudweed	GAUS	*Stipa pulchra*	purple needle grass	STPU
Geranium dissectum	cut-leaved geranium	GEDI	*Taraxia ovata*	sun cups	TAOV
Gnaphalium palustre	lowland cudweed	GNPA	*Tribolium obliterum*	Capetown grass	TROB
Hordeum brachyantherum ssp. *brachyantherum*	meadow barley	HOBRB	*Trifolium angustifolium*	narrow-leaved clover	TRAN
Hypochaeris glabra	smooth cat's-ear	HYGL	*Trifolium dubium*	little hop clover	TRDU
Hypochaeris radicata	rough cat's-ear	HYRA	*Triphysaria pusilla*	little owl's clover	TRPU
Juncus balticus	Baltic rush	JUBA	*Triteleia ixioides*	coast pretty face	TRIX
Juncus falcatus	falcate rush	JUFA	*Vicia sativa* ssp. *nigra*	common vetch	VISAN
Juncus occidentalis	western rush	JUOC	*Zeltnera davyi*	Davy's centuary	ZEDA
Juncus phaeocephalus	brown-headed rush	JUPH	**Groundcover Codes**		
Lasthenia conjugens	Contra Costa goldfields	LACO	BG	Bare Ground	
Lasthenia glaberrima	smooth goldfields	LAGL3	TH	Thatch/Duff	
Leptosiphon parviflorus	variable linanthus	LEPA	AL	Algae	

Table A-6. Pond 16 (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Transect Data by Stratum

POND 16

Date	5/7/2021, 5/18/2021
Surveying Personnel	Kayti Christianson, Emily Poor and Brett Bell

Vegetation Type	% Cover	Species	Notes
Emergent Vegetation	100	RUSA 1%, ELMA 1%, MALE 1%, HECUo 2%, POMO 1%, SCCA 60%, PSLU 3% GAUS 1%, BAPI 1%, CIVU 3%, TH 6%, BG 20%	Strata 1
Floating Vegetation			
Submerged Vegetation			
Open Water			

Notes

Pond 16 remained dry throughout the 2020-2021 water-year (Chenega, 2022). Strata 3 and 5 were repeated from 2015, 2017, 2019, and 2020. Strata 1, 4, and 6 were repeated from 2017, 2019, and 2020. Stratum 8 and the associated transect were established in 2021. Transects 3 and 5 were repeated from 2015, 2017, 2019, and 2020. Transect 4 was repeated from 2019 and 2020, whereas Transect 6 was repeated from 2017, 2019, and 2020. No transect was placed in stratum 1 due to the height and density of the vegetation as well as the presence of a red-winged black bird nest at the transect start point. A visual cover estimate was conducted to assess vegetative cover.

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	38%	AGEX	2	ELMA	78	ELMA	70	ELMA	70	ELMA	68	BRMI	1
			ELMA	75	HYAN	3	GEDI	1	HEEC	1	HYAN	2	ELMA	40
			GEDI	1	POMO	2	HYAN	1	MALE	1	MALE	1	HYAN	1
			HYAN	3	PSLU	3	MALE	1	PSLU	1	POMO	3	PSLU	12
			MALE	1	TH	9	PSLU	1	SOOL	1	PSLU	4	TH	35
			POMO	1	BG	5	TH	22	TH	21	TH	17	BG	11
			PSLU	4			BG	4	BG	5	BG	5		
			TH	7										
			BG	6										
			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	11%	CAPR	60	BRHO	1	CAPR	45	BRHO	1	CAPR	40	CAPR	48
			HEEC	1	CAPR	42	HEEC	1	CAPR	52	JUBA	1	JUBA	2
			JUPH	1	JUBA	1	JUBA	1	JUBA	2	JUPH	1	RUUR	12
			RUUR	2	JUPH	1	JUPH	1	JUPH	1	RUUR	6	TH	37
			TH	32	RUUR	3	TH	49	TH	42	TH	48	BG	1
			BG	5	TH	42	BG	3	BG	3	BG	4		
					BG	10								
			TOTAL	**101**	**TOTAL**	**100**	**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
5	10 m	30%	CABA	40	CABA	33	CABA	33	CABA	20	CABA	44	CABA	36
			RUUR	18	RUUR	9	RUUR	6	RUUR	16	RUUR	4	RUUR	18
			SOEL	5	SOEL	18	SOEL	15	SOEL	6	SOEL	3	SOEL	14
			TH	37	TH	40	TH	46	TH	58	TH	49	TH	32
			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
6	5 m	11%	ELMA	1	JUBA	45	JUBA	38
			JUBA	42	TH	54	TH	60
			TH	53	BG	1	BG	2
			BG	4				
			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
8	10 m	5%	ERCA	1	BAPI	1	POMO	32	HEGR	2	ELMA	2	GNPA	2
			GEDI	8	ERCA	2	PSLU	1	POMO	45	HEGR	2	POMO	56
			GNPA	2	FEBR	3	TH	3	PSLU	1	POMO	38	TH	2
			POMO	35	POMO	30	BG	64	PSST	10	PSLU	4	BG	40
			PSLU	1	PSST	4			TH	2	TH	1		
			PSST	1	TH	58			BG	40	BG	53		
			TH	2	BG	2								
			BG	50										
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 16 2021 Species List					
Species Name	**Common Name**	**Species Code**	**Species Name**	**Common Name**	**Species Code**
Achillea millefolium	common yarrow	ACMI	*Juncus balticus*	Baltic rush	JUBA
Acmispon americanus var. *americanus*	Spanish lotus	ACAMA	*Juncus effusus*	common rush	JUEF
Agrostis exarata	spike bent grass	AGEX	*Juncus falcatus*	falcate rush	JUFA
Aira caryophyllea	silvery hair-grass	AICA	*Juncus phaeocephalus*	brown-headed rush	JUPH
Amsinckia menziesii	common fiddleneck	AMME	*Logfia filaginoides*	California cottonrose	LOFI
Avena barbata	slender wild oat	AVBA	*Lupinus albifrons*	silver bush lupine	LUAL4
Baccharis pilularis	coyote brush	BAPI	*Lupinus arboreus*	yellow bush lupine	LUAR
Bowlesia incana	hoary bowlesia	BOIN3	*Lysimachia arvensis*	scarlet pimpernel	LYAR
Briza maxima	rattlesnake grass	BRMA	*Lysimachia minima*	chaffweed	LYMI
Briza minor	annual quaking grass	BRMI	*Malvella leprosa*	alkali mallow	MALE
Bromus diandrus	ripgut grass	BRDI	*Nuttallanthus texanus*	blue toadflax	NUTE
Bromus hordeaceus	soft chess	BRHO	*Polygonum aviculare* ssp. *depressum*	prostrate knotweed	POAVD
Camissoniopsis micrantha	miniature suncup	CAMI	*Polypogon monspeliensis*	rabbitfoot grass	POMO
Cardamine hirsuta	hairy bittercress	CAHI3	*Pseudognaphalium luteoalbum*	weedy cudweed	PSLU
Carduus pycnocephalus	Italian thistle	CAPY	*Pseudognaphalium stramineum*	cottonbatting plant	PSST
Carex barbarae	whiteroot	CABA	*Quercus agrifolia*	coast live oak	QUAG
Carex pachystachya	chamisso sedge	CAPA	*Ranunculus californicus*	California buttercup	RACA
Carex praegracilis	clustered field sedge	CAPR	*Rosa californica*	California wild rose	ROCA
Carpobrotus edulis	ice plant	CAED	*Rubus ursinus*	California blackberry	RUUR
Cirsium brevistylum	Indian thistle	CIBR	*Rumex acetosella*	sheep sorrel	RUAC
Cirsium vulgare	bull thistle	CIVU	*Rumex crispus*	curly dock	RUCR
Clarkia purpurea ssp. *quadrivulnera*	winecup clarkia	CLPUQ	*Rumex fueginus*	golden dock	RUFU
Conium maculatum	poison hemlock	COMA	*Rumex salicifolius*	willow dock	RUSA
Crypsis schoenoides	swamp pricklegrass	CRSC2	*Salix lasiandra* var. *lasiandra*	shining willow	SALAL
Cryptantha clevelandii	Cleveland's cryptantha	CRCL	*Schoenoplectus californicus*	California bulrush	SCCA
Cyperus eragrostis	tall cyperus	CYER	*Senecio glomeratus*	cutleaf burnweed	SEGL
Deschampsia cespitosa ssp. *cespitosa*	tufted hair grass	DECEC2	*Senecio vulgaris*	common groundsel	SEVU
Drymocallis glandulosa var. *wrangelliana*	sticky cinquefoil	DRGLW	*Silene gallica*	small-flower catchfly	SIGA
Eleocharis macrostachya	pale spikerush	ELMA	*Solanum americanum*	small-flowered nightshade	SOAM
Erigeron canadensis	horseweed	ERCA	*Solidago elongata*	West Coast Canada goldenrod	SOEL
Erodium cicutarium	redstem filaree	ERCI	*Solidago velutina* ssp. *californica*	California goldenrod	SOVEC
Festuca bromoides	brome fescue	FEBR	*Sonchus asper*	prickly sow thistle	SOAS
Festuca myuros	rattail sixweeks grass	FEMY	*Sonchus oleraceus*	common sow thistle	SOOL
Galium aparine	goose grass	GAAP	*Stachys ajugoides*	bugle hedge nettle	STAJ
Geranium dissectum	cut-leaved geranium	GEDI	*Symphoricarpos albus*	common snowberry	SYAL
Gnaphalium palustre	lowland cudweed	GNPA	*Toxicodendron diversilobum*	poison oak	TODI
Heliotropium curassavicum var. *oculatum*	Chinese pusley	HECUO	*Trifolium hirtum*	rose clover	TRHI
Helminthotheca echioides	bristly oxtongue	HEEC	*Verbena bracteata*	bracted verbena	VEBR
Heterotheca grandiflora	telegraph weed	HEGR	*Vicia americana* ssp. *americana*	American vetch	VIAMA
Hypericum anagalloides	creeping St. John's wort	HYAN	**Groundcover Codes**		
Hypochaeris glabra	smooth cat's-ear	HYGL	BG	Bare Ground	
Hypochaeris radicata	rough cat's-ear	HYRA	TH	Thatch/Duff	
Iris douglasiana	Douglas iris	IRDO	AL	Algae	

Table A-7. Pond 35 (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Transect Data by Stratum

POND 35			
Date	5/4/2021		
Surveying Personnel	Kayti Christianson, Emily Poor, and Brett Bell		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water			
Notes			
Pond 35 remained dry throughout the 2020-2021 water-year (Chenega, 2022). Strata 1 and 2 were repeated from 2016, 2018, 2019, and 2020. Stratum 3 was repeated from 2016, 2018, 2019. Stratum 4 was repeated from 2018, 2019, and 2020. Transects 1 and 2 were repeated from 2016, 2018, 2019, and 2020. Transects 3 and 4 were relocated because the previous locations were no longer within the stratum.			

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	18%	COCO	2	COCO	3	COCO	2	COCO	1	COCO	2	COCO	1
			ELMA	1	LAGL3	1	ELMA	2	ELMA	1	ELMA	2	ELMA	1
			LAGL3	1	PLCHh	14	GEDI	1	PLCHh	5	PLCHh	2	FEBR	1
			PLCHh	16	PLCO	25	PLCHh	10	PLCO	22	PLCO	40	FEMY	1
			PLCO	23	PSCH	2	PLCO	35	BG	22	BG	10	PLCHh	7
			PSCH	1	BG	17	PSCH	1	TH	49	TH	44	PLCO	32
			TH	38	TH	37	BG	13					BG	25
			BG	18			TH	36					TH	32
			TOTAL	**100**	**TOTAL**	**99**	**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	42%	HYGL	1	ELMA	1	PLCO	40	ELMA	1	PLCO	37	PLCO	50
			PLCO	15	GEDI	1	PSCH	1	PLCO	35	TH	35	TRAN	2
			PSCH	3	PLCO	28	TH	28	PSCH	1	BG	28	TH	33
			TRAN	2	PSCH	2	BG	31	TH	38			BG	15
			TH	15	TRAN	2			BG	25				
			BG	64	TH	26								
					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
3	10 m	12%	FEPE	15	FEPE	15	FEPE	35	BRHO	3	BAPI	3	BRHO	2
			GEDI	6	GEDI	6	GEDI	3	FEPE	5	BRDI	1	FEPE	15
			HOBR	8	HOBR	10	HOBR	3	GEDI	3	BRHO	3	HOBR	20
			PLCO	5	PLCO	3	PLCO	5	HOBR	25	FEPE	5	PLCO	4
			TRAN	2	TRAN	2	TRAN	2	PLCO	8	GEDI	1	TRAN	1
			TRDU	1	VIHI	2	VIHI	1	TRAN	2	HOBR	25	TH	28
			TH	28	VISA	1	BG	28	VIHI	1	PLCO	4	BG	30
			BG	35	TH	55	TH	23	TH	15	TRAN	1		
					BG	6			BG	38	VIHI	1		
											VISA	1		
											TH	30		
											BG	25		
			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	28%	ACWR	1	ERBO	5	DACA	8	BRDI	1	AICA	1	BRDI	1
			BRHO	2	FEBR	3	ERBO	7	ERBO	2	BRHO	3	BRHO	8
			ERBO	10	FEPE	2	FEBR	3	FEBR	2	ERBO	3	ERBO	2
			FEBR	3	HOBR	2	FEPE	1	FEPE	1	FEBR	2	FEBR	3
			FEPE	5	PLCO	6	HOBR	5	HOBR	5	FEPE	1	FEPE	1
			GEDI	1	TRAN	4	PLCO	5	HYGL	1	HYRA	1	GEDI	1
			HYGL	1	TH	50	TRAN	3	LUBI	1	JUOC	1	HYGL	1
			PLCO	3	BG	28	TH	56	PLCO	4	LUBI	4	LUBI	2
			TRAN	3			BG	12	TAOV	1	MAGR	1	PLCO	13
			TH	43					TRAN	15	PLCO	8	RUAC	2
			BG	28					TH	36	TRAN	10	TRAN	4
									BG	30	BG	29	BG	11
											TH	36	TH	51
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**99**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 35 2021 Species List

Species Name	Common Name	Species Code
Acmispon wrangelianus	Chilean trefoil	ACWR
Aira caryophyllea	silvery hair-grass	AICA
Astragalus didymocarpus var. *didymocarpus*	dwarf white milkvetch	ASDID2
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Briza minor	annual quaking grass	BRMI
Brodiaea terrestris ssp. *terrestris*	dwarf brodiaea	BRTET
Bromus diandrus	ripgut grass	BRDI
Bromus hordeaceus	soft chess	BRHO
Bromus madritensis ssp. *rubens*	red brome	BRMAR
Cardionema ramosissimum	sand mat	CARA
Castilleja densiflora ssp. *densiflora*	dense flower owl's clover	CADED
Cotula coronopifolia	brass buttons	COCO
Cyperus eragrostis	tall cyperus	CYER
Danthonia californica	California oat grass	DACA
Deschampsia danthonioides	annual hair grass	DEDA
Eleocharis macrostachya	pale spikerush	ELMA
Elymus glaucus	blue wild-rye	ELGL
Elymus triticoides	beardless wild rye	ELTR3
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	redstem filaree	ERCI
Eschscholzia californica	California poppy	ESCA
Festuca bromoides	brome fescue	FEBR
Festuca myuros	rattail sixweeks grass	FEMY
Festuca perennis	Italian rye grass	FEPE
Geranium dissectum	cut-leaved geranium	GEDI
Heliotropium curassavicum var. *oculatum*	Chinese pusley	HECUO
Heterotheca grandiflora	telegraph weed	HEGR
Hordeum brachyantherum	meadow barley	HOBR
Hordeum marinum ssp. *gussoneanum*	Mediterranean barley	HOMAG
Hypochaeris glabra	smooth cat's-ear	HYGL
Hypochaeris radicata	rough cat's-ear	HYRA
Juncus occidentalis	western rush	JUOC
Lasthenia glaberrima	smooth goldfields	LAGL3
Lupinus bicolor	miniature lupine	LUBI
Lysimachia arvensis	scarlet pimpernel	LYAR
Lythrum hyssopifolia	grass poly	LYHY
Madia gracilis	gumweed	MAGR
Navarretia squarrosa	skunkweed	NASQ
Plagiobothrys chorisianus var. *hickmanii*	Hickman's popcornflower	PLCHH
Plantago coronopus	cut-leaved plantain	PLCO
Plantago lanceolata	English plantain	PLLA
Pseudognaphalium stramineum	cottonbatting plant	PSST
Psilocarphus chilensis	round woolly-marbles	PSCH
Quercus agrifolia	coast live oak	QUAG
Rumex acetosella	sheep sorrel	RUAC
Rumex crispus	curly dock	RUCR
Rumex salicifolius	willow dock	RUSA
Senecio glomeratus	cutleaf burnweed	SEGL
Silene gallica	small-flower catchfly	SIGA
Sonchus asper	prickly sow thistle	SOAS
Sonchus oleraceus	common sow thistle	SOOL
Spergularia sp.		
Stachys ajugoides	bugle hedge nettle	STAJ
Taraxia ovata	sun cups	TAOV
Tribolium obliterum	Capetown grass	TROB
Trifolium angustifolium	narrow-leaved clover	TRAN
Trifolium dubium	little hop clover	TRDU
Trifolium hirtum	rose clover	TRHI
Triglochin scilloides	flowering quillwort	TRSC
Vicia hirsuta	hairy vetch	VIHI
Vicia sativa ssp. *nigra*	common vetch	VISAN
Vicia sativa ssp. *sativa*	spring vetch	VISAS
Groundcover Codes		
BG	Bare Ground	
TH	Thatch/Duff	
AL	Algae	

Table A-8. Pond 39 (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Transect Data by Stratum

POND 39			
Date	5/10/2021		
Surveying Personnel	Kayti Christianson, Emily Poor, Brett Bell, and Lizzy Eichorn		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water			
Notes			
Pond 39 was dry by the March 2 hydrology monitoring event (Chenega, 2022). Strata 1 and 3 were repeated from 2016, 2018, 2019, and 2020. Stratum 4 was repeated from 2018-2020. Transect 1 was repeated from 2016, 2018, and 2020. Transects 3 and 4 were relocated to areas with more representative vegetative composition. An upland stratum was mapped and occupied 16% relative cover of the 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	3%	BRHO	1	COCO	1	BRMI	1
			BRMI	1	ELACa	2	ELACa	1
			ELACa	20	ELMA	70	ELMA	65
			ELMA	10	ERCA	1	ERCA	2
			FEPE	1	HOBR	1	RUCR	1
			GEDI	1	PLCHh	1	TH	24
			HOBR	1	VISAs	1	BG	6
			JUPH	22	TH	15		
			PLCHh	9	BG	8		
			TH	10				
			BG	24				
			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
3	5 m	3%	AVBA	1	BRHO	1	AVBA	1
			BRHO	1	FEBR	1	BRDI	1
			ERBO	5	FEMY	1	BRHO	5
			FEBR	1	FEPE	30	DACA	2
			FEMY	1	GEDI	2	FEMY	1
			FEPE	19	HOBR	1	FEPE	23
			GEDI	1	JUOC	1	GEDI	1
			TRAN	2	TRAN	3	JUOC	2
			VIHI	1	VIHI	1	MASA	1
			VISAn	1	TH	59	TRAN	1
			TH	65			VIHI	1
			BG	2			VISA	1
							TH	56
							BG	4
			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	78%	BRDI	1	BRDI	2	DACA	75	BRDI	2	BRDI	1	BRHO	1
			BRHO	1	DACA	60	FEBR	1	DACA	45	BRHO	1	DACA	60
			BRTEt	1	GEDI	5	GEDI	3	FEBR	1	DACA	63	FEBR	1
			DACA	52	HOMAg	1	MIPA	1	FEPE	1	FEBR	1	GEDI	8
			ERBO	2	JUPH	1	PLCO	4	GEDI	7	GEDI	6	VISAs	2
			FEBR	2	MIPA	2	VISAs	2	MIPA	1	VIHI	1	TH	24
			FEPE	1	VISAs	2	TH	10	PLCO	1	VISAs	2	BG	4
			GEDI	2	TH	22	BG	4	VISAs	2	TH	20		
			PLCO	12	BG	5			TH	35	BG	5		
			TRAN	2					BG	5				
			VISAs	2										
			TH	14										
			BG	8										
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 39 2021 Species List

Species Name	Common Name	Species Code
Achillea millefolium	common yarrow	ACMI
Aira caryophyllea	silvery hair-grass	AICA
Arctostaphylos hookeri	Hooker's manzanita	ARHO
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Briza minor	annual quaking grass	BRMI
Brodiaea terrestris ssp. *terrestris*	dwarf brodiaea	BRTET
Bromus diandrus	ripgut grass	BRDI
Bromus hordeaceus	soft chess	BRHO
Calochortus uniflorus	pink star-tulip	CAUN
Castilleja densiflora ssp. *densiflora*	dense flower owl's clover	CADED
Centaurea melitensis	Maltese star-thistle	CEME
Cotula coronopifolia	brass buttons	COCO
Danthonia californica	California oat grass	DACA
Deschampsia danthonioides	annual hair grass	DEDA
Drymocallis glandulosa var. *wrangelliana*	sticky cinquefoil	DRGLW
Eleocharis acicularis var. *acicularis*	needle spikerush	ELACa
Eleocharis macrostachya	pale spikerush	ELMA
Elymus glaucus	blue wild-rye	ELGL
Erigeron canadensis	horseweed	ERCA
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	redstem filaree	ERCI
Eryngium armatum	coyote thistle	ERAR12
Festuca bromoides	brome fescue	FEBR
Festuca myuros	rattail sixweeks grass	FEMY
Festuca perennis	Italian rye grass	FEPE
Gamochaeta ustulata	purple cudweed	GAUS
Geranium dissectum	cut-leaved geranium	GEDI
Heliotropium curassavicum var. *oculatum*	Chinese pusley	HECUO
Heteromeles arbutifolia	toyon	HEAR
Heterotheca grandiflora	telegraph weed	HEGR
Hordeum brachyantherum	meadow barley	HOBR
Hordeum marinum ssp. *gussoneanum*	Mediterranean barley	HOMAG
Horkelia cuneata var. *sericea*	wedge-leaved horkelia	HOCUS
Hypochaeris glabra	smooth cat's-ear	HYGL
Hypochaeris radicata	rough cat's-ear	HYRA
Juncus balticus	Baltic rush	JUBA
Juncus bufonius	toad rush	JUBU
Juncus occidentalis	western rush	JUOC
Juncus patens	spreading rush	JUPA
Juncus phaeocephalus	brown-headed rush	JUPH
Lasthenia glaberrima	smooth goldfields	LAGL3
Luzula comosa	Pacific woodrush	LUCO6
Lysimachia arvensis	scarlet pimpernel	LYAR
Lythrum hyssopifolia	grass poly	LYHY
Madia gracilis	gumweed	MAGR
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 lanceolata	English plantain	PLLA
Polygonum aviculare ssp. *depressum*	prostrate knotweed	POAVD
Polypogon monspeliensis	rabbitfoot grass	POMO
Pseudognaphalium stramineum	cottonbatting plant	PSST
Psilocarphus chilensis	round woolly-marbles	PSCH
Quercus agrifolia	coast live oak	QUAG
Rumex acetosella	sheep sorrel	RUAC
Rumex crispus	curly dock	RUCR
Rumex salicifolius	willow dock	RUSA
Sidalcea malviflora ssp. *malviflora*	checkerbloom	SIMAM
Silene gallica	small-flower catchfly	SIGA
Sisyrinchium bellum	western blue-eyed grass	SIBE
Sonchus asper	prickly sow thistle	SOAS
Stipa pulchra	purple needle grass	STPU
Taraxia ovata	sun cups	TAOV
Toxicodendron diversilobum	poison oak	TODI
Trifolium angustifolium	narrow-leaved clover	TRAN
Trifolium campestre	hop clover	TRCA5
Trifolium dubium	little hop clover	TRDU
Triteleia ixioides	coast pretty face	TRIX
Vicia hirsuta	hairy vetch	VIHI
Vicia sativa ssp. *nigra*	common vetch	VISAN
Vicia sativa ssp. *sativa*	spring vetch	VISAS
Groundcover Codes		
BG	Bare Ground	
TH	Thatch/Duff	
AL	Algae	

Table A-9. Pond 40 South (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Transect Data by Stratum

POND 40 South			
Date	5/10/2021		
Surveying Personnel	Kayti Christianson, Emily Poor, Brett Bell, and Lizzy Eichorn		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water			
Notes			
Pond 40 South remained dry throughout the 2020-2021 water-year (Chenega, 2022). Strata 1 through 3 were repeated from 2016, 2018, 2019, and 2020. Transects 1 and 2 were repeated from 2016, 2018, 2019 and 2020. Transect 3 was relocated because the previous location was no longer within the stratum.			

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3	
			Species	% Cover	Species	% Cover	Species	% Cover
1	5 m	10%	ELACa	1	BRMI	1	ELACa	1
			ELMA	10	ELACa	1	ELMA	10
			ERBO	1	ELMA	3	ERBO	1
			FEPE	1	ERBO	1	GEDI	1
			PLCHh	15	FEPE	1	PLCHh	20
			PLCO	5	PLCHh	15	PLCO	22
			RUCR	2	PLCO	16	TH	43
			TRAN	1	TH	52	BG	2
			TH	49	BG	10		
			BG	15				
			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	55%	AICA	1	AICA	1	BRHO	1
			ERBO	9	BRHO	1	ERBO	8
			FEBR	1	ERBO	11	FEBR	2
			FEMY	1	FEBR	1	HYGL	3
			HYGL	9	FEMY	1	JUPH	6
			JUPH	2	HYGL	6	PLCO	4
			PLCO	12	JUPH	1	PLLA	1
			SIGA	1	PLCO	9	RUAC	7
			TRAN	1	RUAC	1	SIGA	1
			TH	32	TRAN	1	TRAN	1
			BG	31	TH	30	TH	31
					BG	37	BG	35
			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	10 m	35%	FEBR	4	BRHO	1	ELACa	1	ELACa	7	ELACa	3	ELACa	6
			FEPE	28	DACA	5	FEBR	1	FEPE	75	ERCA	1	FEBR	1
			GEDI	1	FEBR	2	FEPE	70	PLCHh	1	FEBR	1	FEPE	60
			HOBR	1	FEPE	20	JUPH	1	TH	15	FEPE	30	TH	31
			JUPH	1	GEDI	1	PLCHh	1	BG	2	PLCHh	25	BG	2
			VISA	1	JUPH	2	TH	15			POMO	1		
			TH	60	MAGR	1	BG	11			TH	28		
			BG	4	VISA	1					BG	11		
					TH	59								
					BG	8								
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 40 South 2021 Species List

Species Name	Common Name	Species Code
Acmispon americanus var. *americanus*	Spanish lotus	ACAMA
Aira caryophyllea	silvery hair-grass	AICA
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Briza minor	annual quaking grass	BRMI
Brodiaea terrestris ssp. *terrestris*	dwarf brodiaea	BRTET
Bromus diandrus	ripgut grass	BRDI
Bromus hordeaceus	soft chess	BRHO
Bromus madritensis ssp. *madritensis*	foxtail chess	BRMAM3
Centaurea melitensis	Maltese star-thistle	CEME
Danthonia californica	California oat grass	DACA
Deinandra corymbosa	coastal tarweed	DECO
Deschampsia danthonioides	annual hair grass	DEDA
Drymocallis glandulosa var. *wrangelliana*	sticky cinquefoil	DRGLW
Eleocharis acicularis var. *acicularis*	needle spikerush	ELACa
Eleocharis macrostachya	pale spikerush	ELMA
Erodium botrys	long-beaked filaree	ERBO
Erigeron canadensis	horseweed	ERCA
Erodium cicutarium	redstem filaree	ERCI
Eryngium armatum	coyote thistle	ERAR12
Festuca bromoides	brome fescue	FEBR
Festuca myuros	rattail sixweeks grass	FEMY
Festuca perennis	Italian rye grass	FEPE
Gamochaeta ustulata	purple cudweed	GAUS
Geranium dissectum	cut-leaved geranium	GEDI
Heterotheca grandiflora	telegraph weed	HEGR
Hordeum brachyantherum	meadow barley	HOBR
Hypochaeris glabra	smooth cat's-ear	HYGL
Hypochaeris radicata	rough cat's-ear	HYRA
Juncus occidentalis	western rush	JUOC
Juncus phaeocephalus	brown-headed rush	JUPH
Lysimachia arvensis	scarlet pimpernel	LYAR
Madia gracilis	gumweed	MAGR
Madia sativa	coast tarweed	MASA
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 luteoalbum	weedy cudweed	PSLU
Pseudognaphalium stramineum	cottonbatting plant	PSST
Rumex acetosella	sheep sorrel	RUAC
Rumex crispus	curly dock	RUCR
Rumex salicifolius	willow dock	RUSA
Sidalcea malviflora ssp. *malviflora*	checkerbloom	SIMAM
Silene gallica	small-flower catchfly	SIGA
Sisyrinchium bellum	western blue-eyed grass	SIBE
Sonchus asper	prickly sow thistle	SOAS
Sonchus oleraceus	common sow thistle	SOOL
Taraxia ovata	sun cups	TAOV
Trifolium angustifolium	narrow-leaved clover	TRAN
Trifolium dubium	little hop clover	TRDU
Vicia sativa	spring vetch	VISA
Vicia sativa ssp. *nigra*	common vetch	VISAN
Groundcover Codes		
BG	Bare Ground	
TH	Thatch/Duff	
AL	Algae	

Table A-10. Pond 41 (Year 3 Post-Subsurface Munitions Remediation) Wetland Vegetation Transect Data by Stratum

POND 41			
Date	5/6/2021		
Surveying Personnel	Kayti Christianson, Emily Poor, and Brett Bell		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water			
Notes			
Pond 41 remained dry throughout the 2020-2021 water-year (Chenega, 2022). Strata 1, 2, and 3 were repeated from 2016, 2019, and 2020. Stratum 4 was repeated from 2019 and 2020. Transects 1 was relocated because the previous location was no longer within the stratum. Transect 2 was repeated from 2016, 2019, and 2020. Transect 3 was repeated from 2020, whereas Transect 4 was repeated from 2019 and 2020.			

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3	
			Species	% Cover	Species	% Cover	Species	% Cover
1	5 m	3%	DEDA	1	ELACa	4	ELACa	2
			ELACa	3	ELMA	2	ELMA	3
			ELMA	1	GEDI	12	GEDI	9
			ERAR12	2	LAGL3	8	LAGL3	28
			GEDI	10	MALE	11	MALE	15
			LAGL3	22	PHLE	1	PHLE	1
			MALE	9	PLCHh	3	PLCHh	5
			PHLE	3	TH	45	RUCR	7
			RUCR	5	BG	14	TH	26
			STAJ	1			BG	4
			TH	40				
			BG	3				
			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	87%	BRHO	1	AICA	1	BRHO	6	BRHO	30	BRHO	20	BRHO	1
			ELACa	2	BRHO	3	ELACa	1	ELACa	1	ELACa	1	BRMI	3
			ERAR12	28	DEDA	1	ELMA	1	GEDI	5	GEDI	15	ELMA	1
			GEDI	7	ELACa	3	GEDI	15	MALE	2	LAGL3	2	ERCI	1
			HYGL	1	FEBR	1	PHLE	1	STAJ	2	MALE	6	GEDI	13
			LAGL3	2	GEDI	12	PLCHh	2	TH	58	PHLE	1	JUPH	2
			PHLE	1	LAGL3	2	STAJ	14	BG	2	PLCHh	8	LAGL3	1
			PLCHh	3	MALE	2	TH	58			STAJ	5	MALE	1
			POMO	2	PHLE	2	BG	2			TH	41	PHLE	1
			TH	52	PLCHh	15					BG	1	PLCHh	30
			BG	1	POMO	1							STAJ	10
					RUCR	1							TH	28
					STAJ	1							BG	8
					TH	52								
					BG	3								
			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
3	10 m	6%	ELACa	5	ELACa	4	BRMI	1	ACMI	1	ELACa	2	BRMI	1
			GEDI	16	GEDI	3	DEDA	1	BRMI	3	GEDI	1	ELACa	5
			JUPH	20	JUPH	41	ELACa	3	ELACa	5	JUPH	45	JUPH	18
			MALE	1	RUCR	7	GEDI	1	ERCA	1	TH	52	MALE	3
			TH	55	TH	45	HYGL	1	GEDI	2			RUCR	2
			BG	3			HYRA	1	JUPH	18			SOOL	1
							JUPH	25	MALE	4			UNK1	1
							MALE	1	PLCHh	1			TH	68
							PLCHh	3	RUCR	1			BG	1
							RUCR	5	SOOL	4				
							STAJ	2	BG	3				
							TH	56	TH	57				
			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	4%	AICA	1	AICA	2	AICA	1	ACAMa	1	AICA	1	ACMI	9
			BRHO	2	BRHO	1	BRMI	1	AICA	1	BRMI	1	BAPI	1
			BRMI	1	BRMI	1	BRTEt	1	BRMI	1	CAAM	1	BRMI	1
			DACA	1	BRTEt	1	DACA	3	BRTEt	2	DACA	10	DACA	12
			ELACa	1	DACA	6	DECO	1	DACA	4	ERAR12	2	FEBR	1
			ERAR12	1	ELACa	3	ELACa	1	ERAR12	5	ERBO	2	GEDI	3
			ERBO	1	ERBO	1	ERBO	2	ERBO	2	FEBR	1	HYGL	4
			FEBR	2	FEBR	1	FEBR	1	FEBR	1	GEDI	3	HYRA	3
			GEDI	5	GEDI	6	GEDI	2	GEDI	2	HYGL	6	JUPH	1
			HYGL	2	HYGL	5	HYGL	10	HYGL	6	HYRA	3	LUCO6	2
			HYRA	2	JUPH	1	JUPH	1	HYRA	2	JUPH	1	MAGR	4
			JUPH	1	MAGR	4	MAGR	15	JUPH	1	LUCO6	1	STAJ	1
			MAGR	5	BG	9	BG	7	MAGR	3	MAGR	4	BG	5
			BG	3	TH	59	TH	54	BG	10	BG	19	TH	53
			TH	72					TH	59	TH	45		
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 41 2021 Species List					
Species Name	**Common Name**	**Species Code**	**Species Name**	**Common Name**	**Species Code**
Achillea millefolium	common yarrow	ACMI	*Juncus phaeocephalus*	brown-headed rush	JUPH
Acmispon americanus var. *americanus*	Spanish lotus	ACAMA	*Lasthenia glaberrima*	smooth goldfields	LAGL3
Aira caryophyllea	silvery hair-grass	AICA	*Luzula comosa*	Pacific woodrush	LUCO6
Baccharis pilularis	coyote brush	BAPI	*Lysimachia arvensis*	scarlet pimpernel	LYAR
Briza maxima	rattlesnake grass	BRMA	*Lythrum hyssopifolia*	grass poly	LYHY
Briza minor	annual quaking grass	BRMI	*Madia exigua*	small tarweed	MAEX
Brodiaea terrestris ssp. *terrestris*	dwarf brodiaea	BRTET	*Madia gracilis*	gumweed	MAGR
Bromus diandrus	ripgut grass	BRDI	*Madia sativa*	coast tarweed	MASA
Bromus hordeaceus	soft chess	BRHO	*Malvella leprosa*	alkali mallow	MALE
Calandrinia menziesii	redmaids	CAME	*Microseris paludosa*	marsh microseris	MIPA
Castilleja ambigua	Johnny-Nip	CAAM	*Phalaris lemmonii*	Lemmon's canary grass	PHLE
Centaurea melitensis	Maltese star-thistle	CEME	*Plagiobothrys chorisianus* var. *hickmanii*	Hickman's popcornflower	PLCHH
Danthonia californica	California oat grass	DACA	*Plantago coronopus*	cut-leaved plantain	PLCO
Deinandra corymbosa	coastal tarweed	DECO	*Polypogon monspeliensis*	rabbitfoot grass	POMO
Deschampsia danthonioides	annual hair grass	DEDA	*Pseudognaphalium luteoalbum*	weedy cudweed	PSLU
Drymocallis glandulosa var. *wrangelliana*	sticky cinquefoil	DRGLW	*Pseudognaphalium ramosissimum*	pink everlasting	PSRA
Eleocharis acicularis var. *acicularis*	needle spikerush	ELACa	*Pseudognaphalium stramineum*	cottonbatting plant	PSST
Eleocharis macrostachya	pale spikerush	ELMA	*Psilocarphus chilensis*	round woolly-marbles	PSCH
Elymus glaucus	blue wild-rye	ELGL	*Rumex acetosella*	sheep sorrel	RUAC
Erigeron canadensis	horseweed	ERCA	*Rumex crispus*	curly dock	RUCR
Erodium botrys	long-beaked filaree	ERBO	*Rumex salicifolius*	willow dock	RUSA
Erodium cicutarium	redstem filaree	ERCI	*Senecio glomeratus*	cutleaf burnweed	SEGL
Eryngium armatum	coyote thistle	ERAR12	*Sonchus asper*	prickly sow thistle	SOAS
Festuca bromoides	brome fescue	FEBR	*Sonchus oleraceus*	common sow thistle	SOOL
Festuca myuros	rattail sixweeks grass	FEMY	*Stachys ajugoides*	bugle hedge nettle	STAJ
Galium aparine	goose grass	GAAP	Unknown 1		
Gamochaeta ustulata	purple cudweed	GAUS	*Verbena bracteata*	bracted verbena	VEBR
Geranium dissectum	cut-leaved geranium	GEDI	*Verbena lasiostachys* var. *lasiostachys*	western vervain	VELAL
Gnaphalium palustre	lowland cudweed	GNPA	*Vicia sativa* ssp. *sativa*	spring vetch	VISAS
Heliotropium curassavicum var. *oculatum*	Chinese pusley	HECUO	**Groundcover Codes**		
Hordeum brachyantherum	meadow barley	HOBR	BG	Bare Ground	
Hypochaeris glabra	smooth cat's-ear	HYGL	TH	Thatch/Duff	
Hypochaeris radicata	rough cat's-ear	HYRA	AL	Algae	
Juncus balticus	Baltic rush	JUBA			

Table A-11. Pond 42 (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Transect Data by Stratum

POND 42			
Date	5/19/2021		
Surveying Personnel	Kayti Christianson, Emily Poor, Brett Bell, and Lizzy Eichorn		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water			
Notes			
Pond 42 was dry by the March 25 hydrology monitoring event (Chenega, 2022). Strata 1 through 4 were repeated from 2017-2020. Stratum 5 was repeated from 2019 and 2020. Transects 1 and 3 were relocated because the previous locations were no longer within the correct strata. Transect 2 was repeated from 2018, 2019, and 2020. Transect 4 was repeated from 2017-2020, whereas Transect 5 was repeated from 2020. An upland stratum was mapped and occupied 26% relative cover of the 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	17%	BRTEt	1	COCO	2	BRMI	1	BRHO	1	ELACa	46	BRMI	1
			ELACa	25	DEDA	1	COCO	1	COCO	1	ERAR12	9	DEDA	1
			ERAR12	6	ELACa	32	ELACa	42	DEDA	1	FEBR	1	ELACa	45
			JUPH	7	ERAR12	5	ERAR12	4	ELACa	62	GNPA	1	ERAR12	10
			LYHY	1	FEBR	1	FEBR	1	ERAR12	2	JUPH	4	GEDI	1
			POMO	1	JUPH	4	HYGL	1	GNPA	1	PLCHh	1	HYGL	1
			SEGL	1	POMO	1	JUPH	2	LYHY	1	POMO	3	JUPH	2
			TH	53	SEGL	1	PLCHh	1	PLCHh	1	SEGL	1	PLCHh	1
			BG	5	TH	44	POMO	1	POMO	5	TH	19	POMO	3
					BG	9	SEGL	1	TH	16	BG	15	SEGL	1
							TH	27	BG	9			TH	17
							BG	18					BG	17
			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
2	5 m	7%	ELMA	20	ELMA	42	ELMA	30
			ERAR12	3	SEGL	1	PHLE	1
			PSLU	1	SOOL	1	TH	65
			SEGL	1	TH	50	BG	4
			TH	65	BG	6		
			BG	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
3	10 m	28%	COCO	1	COCO	2	COCO	1	ELACa	13	DECO	1	BRMI	1
			ELACa	11	ELACa	11	ELACa	5	ERAR12	6	DEDA	1	DECO	1
			GEDI	1	ERCA	1	ERAR12	1	JUPH	20	ELACa	10	ELACa	10
			JUPH	25	GEDI	1	FEMY	1	TH	40	ERAR12	13	ERAR12	19
			SEGL	1	GNPA	1	GNPA	1	BG	21	HYGL	1	FEMY	1
			TH	41	JUPH	20	HYRA	1			JUPH	4	JUPH	9
			BG	20	LAGL3	1	JUPH	6			LYAR	1	LOGA	1
					PLCHh	1	LYHY	1			POMO	1	PLCHh	1
					POMO	1	PLCHh	2			TH	46	SEGL	1
					SEGL	1	POMO	9			BG	22	TH	40
					SOOL	1	PSLU	1					BG	21
					TH	37	SEGL	1						
					BG	22	TH	53						
							BG	17						
			TOTAL	100	TOTAL	100	TOTAL	100	TOTAL	100	TOTAL	100	TOTAL	105

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3	
			Species	% Cover	Species	% Cover	Species	% Cover
4	5 m	11%	BRMA	1	AICA	1	AVBA	1
			BRMI	1	BRMI	1	BRMI	1
			CAAT	1	CAAT	1	BRTEt	1
			DACA	24	DACA	23	CAAT	1
			DECO	2	DECO	2	DACA	7
			ERBO	2	ERAR12	4	DECO	2
			FEMY	2	ERBO	3	ERAR12	4
			GAUS	1	FEMY	2	ERBO	4
			HYGL	1	GAUS	1	FEMY	1
			LOGA	1	HYGL	2	HYGL	2
			LYAR	1	LOGA	1	LOGA	1
			MIPA	1	LYAR	1	LYAR	1
			PLER	1	MIPA	1	PLER	1
			TH	27	PLER	1	POMO	1
			BG	34	TH	16	TRDU	1
					BG	40	TH	21
							BG	50
			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
5	5 m	11%	COCO	22	COCO	5	COCO	1
			ERCA	1	POMO	40	LYHY	1
			LYHY	1	PSLU	19	POMO	20
			POMO	15	SEGL	1	PSLU	1
			PSLU	1	TH	27	TH	72
			SEGL	1	BG	8	BG	5
			TH	55				
			BG	4				
			TOTAL	100	TOTAL	100	TOTAL	100

Pond 42 2021 Species List					
Species Name	**Common Name**	**Species Code**	**Species Name**	**Common Name**	**Species Code**
Achillea millefolium	common yarrow	ACMI	*Lasthenia glaberrima*	smooth goldfields	LAGL3
Agrostis avenacea	Pacific bent grass	AGAV	*Logfia gallica*	narrowleaf cottonrose	LOGA
Agrostis lacuna-vernalis	vernal pool bent grass	AGLAV	*Luzula comosa*	Pacific woodrush	LUCO6
Aira caryophyllea	silvery hair-grass	AICA	*Lysimachia arvensis*	scarlet pimpernel	LYAR
Avena barbata	slender wild oat	AVBA	*Lysimachia minima*	chaffweed	LYMI
Baccharis pilularis	coyote brush	BAPI	*Lythrum hyssopifolia*	grass poly	LYHY
Briza maxima	rattlesnake grass	BRMA	*Madia exigua*	small tarweed	MAEX
Briza minor	annual quaking grass	BRMI	*Madia gracilis*	gumweed	MAGR
Brodiaea terrestris ssp. *terrestris*	dwarf brodiaea	BRTET	*Madia sativa*	coast tarweed	MASA
Bromus hordeaceus	soft chess	BRHO	*Microseris paludosa*	marsh microseris	MIPA
Carduus pycnocephalus	Italian thistle	CAPY	*Phalaris lemmonii*	Lemmon's canary grass	PHLE
Castilleja ambigua ssp. *ambigua*	Johnny-Nip	CAAMA3	*Plagiobothrys chorisianus* var. *hickmanii*	Hickman's popcornflower	PLCHH
Castilleja attenuata	valley tassels	CAAT	*Plantago coronopus*	cut-leaved plantain	PLCO
Centaurea melitensis	Maltese star-thistle	CEME	*Plantago elongata*	annual coast plantain	PLEL
Cirsium brevistylum	Indian thistle	CIBR	*Plantago erecta*	California plantain	PLER
Cotula coronopifolia	brass buttons	COCO	*Pogogyne zizyphoroides*	Sacramento mesa mint	POZI
Danthonia californica	California oat grass	DACA	*Polypogon monspeliensis*	rabbitfoot grass	POMO
Deinandra corymbosa	coastal tarweed	DECO	*Pseudognaphalium luteoalbum*	weedy cudweed	PSLU
Deschampsia danthonioides	annual hair grass	DEDA	*Pseudognaphalium ramosissimum*	pink everlasting	PSRA
Diplacus aurantiacus	sticky monkey flower	DIAU	*Pseudognaphalium stramineum*	cottonbatting plant	PSST
Distichlis spicata	salt grass	DISP	*Psilocarphus chilensis*	round woolly-marbles	PSCH
Eleocharis acicularis var. *acicularis*	needle spikerush	ELACa	*Quercus agrifolia*	coast live oak	QUAG
Eleocharis macrostachya	pale spikerush	ELMA	*Rubus ursinus*	California blackberry	RUUR
Elymus glaucus	blue wild-rye	ELGL	*Rumex salicifolius*	willow dock	RUSA
Erigeron canadensis	horseweed	ERCA	*Salix* sp.		
Eriodictyon californicum	yerba santa	ERCA6	*Senecio glomeratus*	cutleaf burnweed	SEGL
Erodium botrys	long-beaked filaree	ERBO	*Silene gallica*	small-flower catchfly	SIGA
Erodium cicutarium	redstem filaree	ERCI	*Sisyrinchium bellum*	western blue-eyed grass	SIBE
Eryngium armatum	coyote thistle	ERAR12	*Sonchus oleraceus*	common sow thistle	SOOL
Festuca bromoides	brome fescue	FEBR	*Stachys ajugoides*	bugle hedge nettle	STAJ
Festuca myuros	rattail sixweeks grass	FEMY	*Stachys bullata*	California hedge nettle	STBU
Galium aparine	goose grass	GAAP	*Taraxia ovata*	sun cups	TAOV
Gamochaeta ustulata	purple cudweed	GAUS	*Toxicodendron diversilobum*	poison oak	TODI
Geranium dissectum	cut-leaved geranium	GEDI	*Tribolium obliterum*	Capetown grass	TROB
Gnaphalium palustre	lowland cudweed	GNPA	*Trifolium campestre*	hop clover	TRCA5
Horkelia cuneata var. *cuneata*	wedge-leaved horkelia	HOCUC	*Trifolium dubium*	little hop clover	TRDU
Hypochaeris glabra	smooth cat's-ear	HYGL	*Typha* sp.		
Hypochaeris radicata	rough cat's-ear	HYRA	*Vicia americana* ssp. *americana*	American vetch	VIAMA
Iris douglasiana	Douglas iris	IRDO	*Zeltnera davyi*	Davy's centuary	ZEDA
Juncus bufonius var. *bufonius*	common toad rush	JUBUB	**Groundcover Codes**		
Juncus capitatus	dwarf rush	JUCA	BG	Bare Ground	
Juncus phaeocephalus	brown-headed rush	JUPH	TH	Thatch/Duff	
Lactuca serriola	prickly lettuce	LASE	AL	Algae	

Table A-12. Pond 43 (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Transect Data by Stratum

POND 43			
Date	5/4/2021		
Surveying Personnel	Kayti Christianson, Emily Poor, and Brett Bell		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water			
Notes			
Pond 43 remained dry throughout the 2020-2021 water-year (Chenega, 2022). All three strata were repeated from 2016, 2018, 2019, and 2020. Transects 1 and 3 were repeated from 2016, 2018, 2019, and 2020. Transect 2 was repeated from 2020. An upland stratum was mapped and occupied 8% relative cover of the 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	71%	BRTEt	1	CRAQ	1	DECO	2	CRAQ	1	CRAQ	1	DEDA	1
			DEDA	1	DEDA	1	DEDA	2	DECO	2	DEDA	1	ELACa	1
			ELACa	3	ELACa	2	ELACa	1	DEDA	1	ELACa	5	ERAR12	25
			ERAR12	5	ERAR12	12	ERAR12	8	ELACa	1	ERAR12	20	FEBR	1
			HYGL	2	GAUS	1	FEMY	1	ERAR12	12	GAUS	1	HYRA	4
			HYRA	6	HYGL	1	HYGL	2	FEBR	1	HYRA	2	JUPH	3
			JUPH	3	JUPH	8	HYRA	10	HYGL	2	JUPH	1	LOGA	1
			LAGL3	1	LOGA	1	JUBUb	1	HYRA	6	LYHY	1	LYAR	5
			LYHY	1	LYHY	1	LYHY	1	JUPH	6	LYMI	1	PLCHh	2
			PLCHh	12	PLCHh	10	PLCHh	3	LYAR	1	PLCHh	1	POMO	1
			POMO	2	POMO	2	POMO	2	LYHY	1	POMO	1	POZI	1
			POZI	3	POZI	3	POZI	2	PLCHh	2	POZI	1	PSCH	2
			PSCH	1	PSCH	1	PSCH	1	POMO	1	PSCH	1	TH	43
			TH	12	TH	20	SOAS	1	POZI	1	SOAS	1	BG	10
			BG	47	BG	36	TH	28	PSCH	2	TH	42		
							BG	35	TH	25	BG	20		
									BG	35				
			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
2	5 m	9%	BRMI	1	BRMI	1	BRHO	1
			DEDA	1	DEDA	1	BRMI	1
			FEBR	1	GAUS	1	DEDA	1
			GAUS	1	GEDI	2	ERAR12	6
			GEDI	2	HYGL	1	HYGL	5
			HYGL	5	JUPH	25	HYRA	5
			JUPH	16	LYAR	2	JUPH	28
			LOGA	1	LYMI	1	LYAR	1
			LYAR	2	PLCHh	10	LYHY	1
			LYMI	2	PLCO	1	LYMI	1
			MAGR	1	POMO	1	PLCHh	3
			PLCHh	4	SOOL	1	POZI	1
			POMO	1	VELAI	1	PSCH	1
			PSCH	3	TH	44	TH	19
			SOOL	1	BG	8	BG	26
			VELAI	1				
			TH	30				
			BG	27				
			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
3	5 m	12%	ACAMA	1	ACAMa	1	ACAMa	1
			AICA	2	AICA	2	BRHO	2
			BRHO	2	BRHO	2	BRMI	1
			BRMI	1	BRMI	1	DACA	3
			DACA	13	DACA	30	ERAR12	1
			DECO	2	ELACa	3	FEBR	2
			ELACa	2	ERAR12	3	GEDI	2
			ERAR12	2	FEBR	1	HO sp.	1
			FEBR	2	GAUS	2	HYGL	2
			GEDI	2	GEDI	1	HYRA	1
			HYGL	2	JUPH	1	LOGA	1
			JUPH	1	LYAR	1	LYHY	1
			LYAR	1	MAGR	3	PLCHh	1
			MAGR	3	PLCO	10	PLCO	3
			PLCO	8	SIBE	1	PLER	1
			SOOL	1	SOOL	1	PSCH	1
			TAOV	2	TRDU	2	TRDU	1
			TRDU	3	TROB	4	TROB	1
			TH	19	TH	20	TH	4
			BG	31	BG	11	BG	70
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 43 2021 Species List					
Species Name	**Common Name**	**Species Code**	**Species Name**	**Common Name**	**Species Code**
Acmispon americanus var. *americanus*	Spanish lotus	ACAMA	*Lasthenia glaberrima*	smooth goldfields	LAGL3
Adenostoma fasciculatum	chamise	ADFA	*Logfia gallica*	narrowleaf cottonrose	LOGA
Agrostis lacuna-vernalis	vernal pool bent grass	AGLAV	*Lysimachia arvensis*	scarlet pimpernel	LYAR
Aira caryophyllea	silvery hair-grass	AICA	*Lysimachia minima*	chaffweed	LYMI
Arctostaphylos hookeri	Hooker's manzanita	ARHO	*Lythrum hyssopifolia*	grass poly	LYHY
Baccharis pilularis	coyote brush	BAPI	*Madia gracilis*	gumweed	MAGR
Briza minor	annual quaking grass	BRMI	*Madia sativa*	coast tarweed	MASA
Brodiaea terrestris ssp. *terrestris*	dwarf brodiaea	BRTET	*Microseris paludosa*	marsh microseris	MIPA
Bromus diandrus	ripgut grass	BRDI	*Plagiobothrys chorisianus* var. *hickmanii*	Hickman's popcornflower	PLCHH
Bromus hordeaceus	soft chess	BRHO	*Plantago coronopus*	cut-leaved plantain	PLCO
Chlorogalum pomeridianum	wavyleaf soap plant	CHPO	*Plantago erecta*	California plantain	PLER
Crassula aquatica	aquatic pygmy-weed	CRAQ	*Pogogyne zizyphoroides*	Sacramento mesa mint	POZI
Danthonia californica	California oat grass	DACA	*Polypogon monspeliensis*	rabbitfoot grass	POMO
Deinandra corymbosa	coastal tarweed	DECO	*Pseudognaphalium luteoalbum*	weedy cudweed	PSLU
Deschampsia danthonioides	annual hair grass	DEDA	*Psilocarphus chilensis*	round woolly-marbles	PSCH
Eleocharis acicularis var. *acicularis*	needle spikerush	ELACa	*Senecio glomeratus*	cutleaf burnweed	SEGL
Elymus glaucus	blue wild-rye	ELGL	*Silene gallica*	small-flower catchfly	SIGA
Epilobium ciliatum	fringed willowherb	EPCI	*Sisyrinchium bellum*	western blue-eyed grass	SIBE
Erigeron canadensis	horseweed	ERCA	*Sonchus asper*	prickly sow thistle	SOAS
Eriophyllum confertiflorum	golden yarrow	ERCO	*Sonchus oleraceus*	common sow thistle	SOOL
Eryngium armatum	coyote thistle	ERAR12	*Taraxia ovata*	sun cups	TAOV
Festuca myuros	rattail sixweeks grass	FEMY	*Tribolium obliterum*	Capetown grass	TROB
Festuca bromoides	brome fescue	FEBR	*Trifolium campestre*	hop clover	TRCA5
Gamochaeta ustulata	purple cudweed	GAUS	*Trifolium depauperatum*	sack clover	TRDE
Geranium dissectum	cut-leaved geranium	GEDI	*Trifolium dubium*	little hop clover	TRDU
Hordeum sp.	sterile barley	HO sp.	*Trifolium gracilentum*	pin point clover	TRGR
Horkelia cuneata	wedge-leaved horkelia	HOCU	*Trifolium microcephalum*	small head clover	TRMI
Hypochaeris glabra	smooth cat's-ear	HYGL	*Verbena lasiostachys* var. *lasiostachys*	western vervain	VELAL
Hypochaeris radicata	rough cat's-ear	HYRA	**Groundcover Codes**		
Juncus bufonius var. *bufonius*	common toad rush	JUBUB	BG	Bare Ground	
Juncus bufonius var. *occidentalis*	round-fruited toad rush	JUBUO	TH	Thatch/Duff	
Juncus occidentalis	western rush	JUOC	AL	Algae	
Juncus phaeocephalus	brown-headed rush	JUPH			

Table A-13. Pond 44 (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Transect Data by Stratum

POND 44			
Date	5/5/2021, 5/6/2021		
Surveying Personnel	Kayti Christianson, Emily Poor, Brett Bell, and Lizzy Eichorn		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water			
Notes			
Pond 44 remained dry throughout the 2020-2021 water-year (Chenega, 2022). All vegetative strata within the basin were mapped and tabulated. Strata 1 and 3 were repeated from 2016, 2018, 2019, and 2020. Transect 1 was repeated from 2016, whereas Transect 3 was relocated to an area with more representative vegetative composition. An upland stratum was mapped and occupied 12% relative cover of the 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	63%	ACPA	1	AGLAv	1	AGLAv	1	ACPA	1	AGLAv	1	AGLAv	1
			AGLAv	1	BRMI	1	BRMI	1	BRDI	2	BAPI	1	BRMI	1
			BRMI	1	DECO	1	DECO	1	BRMI	2	BRMI	2	ELACa	3
			CRAQ	1	DEDA	1	DEDA	1	BRTEt	1	BRTEt	1	ERAR12	5
			DECO	1	ERAR12	6	ELACa	3	ELACa	3	ELACa	3	FEMY	1
			DEDA	1	FEBR	1	ERAR12	22	ERAR12	5	ERAR12	1	GEDI	1
			ERAR12	12	GEDI	1	GEDI	1	GEDI	2	GEDI	1	JUPH	3
			FEBR	1	HYRA	2	JUBU	1	HYRA	4	HYGL	2	LAGL3	1
			GEDI	1	JUBU	1	JUPH	2	JUPH	20	JUBU	1	LYHY	1
			HYGL	1	LYAR	1	LYHY	1	LAGL3	1	JUPH	23	LYMI	1
			HYRA	2	LYHY	1	LYMI	1	LYAR	1	LAGL3	1	PLCHh	15
			JUBU	1	LYMI	1	PLCHh	2	LYHY	1	LYHY	1	POMO	1
			JUPH	2	PLCHh	2	PLCO	7	PLCHh	1	LYMI	1	POZI	1
			LYHY	1	PLCO	5	PLER	1	PLCO	7	PLCHh	4	PSCH	2
			LYMI	1	POMO	1	POMO	1	TRDU	1	PLCO	7	TRDU	1
			PLCHh	1	PSCH	1	PSCH	3	VISAn	1	POZI	1	TRVA	1
			PLCO	6	SOOL	1	SOOL	1	TH	34	PSCH	2	TH	36
			POMO	1	TRDU	1	TRDU	1	BG	13	SOOL	1	BG	25
			POZI	1	TRSC	1	TRSC	1			VISA	1		
			SOOL	1	VISAn	1	TH	22			TH	15		
			TAOV	1	TH	10	BG	26			BG	30		
			TRSC	1	BG	59								
			TH	42										
			BG	18										
			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
3	10 m	25%	ACPA	1	AICA	1	AICA	1	ACPA	1	ACPA	1	ACPA	1
			AICA	2	BRHO	6	BRHO	1	AICA	2	BRMA	1	AICA	1
			BRHO	2	BRMI	1	BRMI	1	BRMI	2	BRMI	2	BRMI	1
			BRMA	1	CAAT	1	BRTEt	1	DACA	6	CAAT	1	BRTEt	1
			BRMI	1	DECO	1	DACA	2	ERAR12	1	DACA	8	DACA	5
			CAAT	1	FEBR	6	FEBR	12	FEBR	1	DECO	1	DECO	1
			DACA	3	GEDI	3	GEDI	2	GEDI	2	ERBO	7	ERBO	4
			DECO	3	HYGL	1	HYGL	1	HYRA	2	FEBR	2	FEBR	1
			ELACa	1	HYRA	1	HYRA	2	JUBU	1	GEDI	1	GEDI	1
			FEBR	4	JUOC	1	JUOC	1	JUPH	2	HYGL	2	HYGL	1
			GEDI	2	LYAR	2	LYAR	1	LYAR	2	HYRA	1	JUBU	1
			HYGL	2	LYHY	1	LYHY	1	LYMI	1	JUBU	1	LYAR	1
			HYRA	2	MAGR	2	MASA	7	MAGR	4	LYAR	1	LYHY	1
			JUBU	1	MASA	7	PLCO	9	MASA	9	LYHY	1	MAGR	8
			LYAR	5	PLCO	5	TAOV	1	PLCO	7	MAGR	2	MASA	5
			LYMI	1	SOOL	1	TRCA5	1	PSCH	1	PLCO	4	PLCO	4
			MAEX	1	TAOV	1	VISA	1	TAOV	2	SIGA	1	TRDU	1
			MAGR	3	TRCA5	1	TH	18	TRCA5	1	TRDU	2	VISA	1
			MASA	3	TRDU	3	BG	37	TRDU	3	VISA	1	TH	33
			PLCO	20	VISAn	2			TRGR	1	TH	15	BG	28
			POMO	1	TH	23			TH	9	BG	45		
			SOOL	1	BG	30			BG	40				
			TRCA5	1										
			TRVA	1										
			TH	17										
			BG	20										
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 44 2021 Species List					
Species Name	**Common Name**	**Species Code**	**Species Name**	**Common Name**	**Species Code**
Acmispon parviflorus	hill lotus	ACPA	*Lasthenia glaberrima*	smooth goldfields	LAGL3
Agrostis lacuna-vernalis	vernal pool bent grass	AGLAV	*Lupinus bicolor*	miniature lupine	LUBI
Aira caryophyllea	silvery hair-grass	AICA	*Luzula comosa*	Pacific woodrush	LUCO6
Arctostaphylos hookeri	Hooker's manzanita	ARHO	*Lysimachia arvensis*	scarlet pimpernel	LYAR
Avena barbata	slender wild oat	AVBA	*Lysimachia minima*	chaffweed	LYMI
Baccharis pilularis	coyote brush	BAPI	*Lythrum hyssopifolia*	grass poly	LYHY
Briza maxima	rattlesnake grass	BRMA	*Madia exigua*	small tarweed	MAEX
Briza minor	annual quaking grass	BRMI	*Madia gracilis*	gumweed	MAGR
Brodiaea terrestris ssp. *terrestris*	dwarf brodiaea	BRTET	*Madia sativa*	coast tarweed	MASA
Bromus diandrus	ripgut grass	BRDI	*Microseris paludosa*	marsh microseris	MIPA
Bromus hordeaceus	soft chess	BRHO	*Plagiobothrys chorisianus* var. *hickmanii*	Hickman's popcornflower	PLCHH
Castilleja attenuata	valley tassels	CAAT	*Plantago coronopus*	cut-leaved plantain	PLCO
Chlorogalum pomeridianum	wavyleaf soap plant	CHPO	*Plantago erecta*	California plantain	PLER
Cotula coronopifolia	brass buttons	COCO	*Pogogyne zizyphoroides*	Sacramento mesa mint	POZI
Crassula aquatica	aquatic pygmy-weed	CRAQ	*Polypogon monspeliensis*	rabbitfoot grass	POMO
Crocanthemum scoparium	peak rush-rose	CRSC	*Psilocarphus chilensis*	round woolly-marbles	PSCH
Danthonia californica	California oat grass	DACA	*Quercus agrifolia*	coast live oak	QUAG
Daucus pusillus	rattlesnake weed	DAPU	*Rumex acetosella*	sheep sorrel	RUAC
Deinandra corymbosa	coastal tarweed	DECO	*Silene gallica*	small-flower catchfly	SIGA
Deschampsia danthonioides	annual hair grass	DEDA	*Sisyrinchium bellum*	western blue-eyed grass	SIBE
Eleocharis acicularis var. *acicularis*	needle spikerush	ELACa	*Sonchus asper*	prickly sow thistle	SOAS
Elymus glaucus	blue wild-rye	ELGL	*Sonchus oleraceus*	common sow thistle	SOOL
Erodium botrys	long-beaked filaree	ERBO	*Taraxia ovata*	sun cups	TAOV
Eryngium armatum	coyote thistle	ERAR12	*Toxicodendron diversilobum*	poison oak	TODI
Festuca bromoides	brome fescue	FEBR	*Trifolium angustifolium*	narrow-leaved clover	TRAN
Festuca myuros	rattail sixweeks grass	FEMY	*Trifolium campestre*	hop clover	TRCA5
Galium porrigens	climbing bedstraw	GAPO	*Trifolium dubium*	little hop clover	TRDU
Geranium dissectum	cut-leaved geranium	GEDI	*Trifolium gracilentum*	pin point clover	TRGR
Heliotropium curassavicum var. *oculatum*	Chinese pusley	HECUO	*Trifolium variegatum*	variegated clover	TRVA
Horkelia cuneata	wedge-leaved horkelia	HOCU	*Trifolium willdenovii*	tomcat clover	TRWI
Hypochaeris glabra	smooth cat's-ear	HYGL	*Triglochin scilloides*	flowering quillwort	TRSC
Hypochaeris radicata	rough cat's-ear	HYRA	*Vicia sativa* ssp. *nigra*	common vetch	VISAN
Juncus bufonius	toad rush	JUBU	*Vicia sativa* ssp. *sativa*	spring vetch	VISAS
Juncus bufonius var. *bufonius*	common toad rush	JUBUB	**Groundcover Codes**		
Juncus capitatus	dwarf rush	JUCA	BG	Bare Ground	
Juncus occidentalis	western rush	JUOC	TH	Thatch/Duff	
Juncus phaeocephalus	brown-headed rush	JUPH	AL	Algae	

Table A-14. Pond 54 (Year 3 Post-Subsurface Munitions Remediation) Wetland Vegetation Transect Data by Stratum

POND 54			
Date	5/17/2021		
Surveying Personnel	Kayti Christianson, Emily Poor, and Brett Bell		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water			
Notes			
Pond 54 remained dry throughout the 2020-2021 water-year (Chenega, 2022). Stratum 1 was repeated from 2019. Strata and transects 5 and 6 were established in 2021. Transect 1 was relocated because the previous location was no longer within the correct stratum.			

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	12%	ELMA	15	ELMA	22	ELMA	3	BRMI	1	ELMA	18	ELMA	5
			JUPH	3	JUPH	1	JUPH	25	ELMA	12	MALE	1	HYGL	1
			MALE	2	MALE	2	MALE	2	JUPH	8	STAJ	1	JUPH	30
			TH	80	PHLE	3	TH	68	MALE	1	TH	80	PHLE	4
					TH	71	BG	2	PHLE	1			PLCHh	4
					BG	1			STAJ	2			RUCR	2
									TH	75			TH	52
													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	57%	DEDA	1	DEDA	3	DEDA	1	ELACa	1	DEDA	1	DEDA	1
			ELACa	5	ELACa	1	ELMA	1	ELMA	1	ELACa	1	ELACa	2
			ERAR12	5	ELMA	8	JUPH	1	JUPH	8	ELMA	1	ELMA	1
			JUPH	20	FEBR	2	LAGL3	18	LAGL3	4	JUPH	1	JUPH	3
			LAGL3	3	JUPH	2	MALE	28	MALE	7	LAGL3	1	LAGL3	9
			MALE	2	LAGL3	12	STAJ	6	PHLE	6	MALE	2	MALE	6
			PHLE	1	MALE	6	TH	54	PLCHh	1	PHLE	5	PHLE	1
			STAJ	1	POMO	1	BG	1	TH	71	PLCHh	3	STAJ	4
			TH	59	STAJ	9			BG	1	TH	85	BG	3
			BG	3	TH	54							TH	70
					BG	2								
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**110**	**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
6	10m	31%	BRMI	1	BRMI	1	ELACa	2	BAPI	1	ELACa	2	BRMI	1
			ELMA	1	ELACa	2	ELMA	1	ELACa	1	ELMA	2	ELACa	1
			ERCA	1	ELMA	1	GEDI	18	ELMA	1	ERAR12	11	ELMA	1
			GEDI	25	ERAR12	2	JUPH	6	GEDI	25	GEDI	12	ERAR12	14
			HYRA	1	ERBO	4	PHLE	1	JUPH	3	JUPH	3	GEDI	30
			JUPH	1	ERCA	1	STAJ	4	STAJ	4	STAJ	2	JUPH	2
			PHLE	2	GEDI	32	TH	68	TH	59	TH	65	TH	45
			STAJ	2	JUPH	1			BG	6	BG	3	BG	6
			TH	20	MALE	3								
			BG	46	STAJ	4								
					TH	45								
					BG	4								
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 54 2021 Species List					
Species Name	**Common Name**	**Species Code**	**Species Name**	**Common Name**	**Species Code**
Achillea millefolium	common yarrow	ACMI	*Juncus phaeocephalus*	brown-headed rush	JUPH
Avena barbata	slender wild oat	AVBA	*Lasthenia glaberrima*	smooth goldfields	LAGL3
Baccharis pilularis	coyote brush	BAPI	*Lysimachia arvensis*	scarlet pimpernel	LYAR
Briza minor	annual quaking grass	BRMI	*Lythrum hyssopifolia*	grass poly	LYHY
Brodiaea terrestris ssp. *terrestris*	dwarf brodiaea	BRTET	*Madia gracilis*	gumweed	MAGR
Bromus diandrus	ripgut grass	BRDI	*Malvella leprosa*	alkali mallow	MALE
Bromus hordeaceus	soft chess	BRHO	*Microseris paludosa*	marsh microseris	MIPA
Castilleja ambigua ssp. *ambigua*	Johnny-Nip	CAAMA3	*Phalaris lemmonii*	Lemmon's canary grass	PHLE
Castilleja densiflora ssp. *densiflora*	dense flower owl's clover	CADED	*Plagiobothrys chorisianus* var. *hickmanii*	Hickman's popcornflower	PLCHH
Cirsium vulgare	bull thistle	CIVU	*Polypogon monspeliensis*	rabbitfoot grass	POMO
Danthonia californica	California oat grass	DACA	*Pseudognaphalium luteoalbum*	weedy cudweed	PSLU
Deinandra corymbosa	coastal tarweed	DECO	*Pseudognaphalium stramineum*	cottonbatting plant	PSST
Deschampsia danthonioides	annual hair grass	DEDA	*Ranunculus californicus*	California buttercup	RACA
Eleocharis acicularis var. *acicularis*	needle spikerush	ELACa	*Rumex crispus*	curly dock	RUCR
Eleocharis macrostachya	pale spikerush	ELMA	*Rumex salicifolius*	willow dock	RUSA
Erigeron canadensis	horseweed	ERCA	*Senecio glomeratus*	cutleaf burnweed	SEGL
Erodium botrys	long-beaked filaree	ERBO	*Sisyrinchium bellum*	western blue-eyed grass	SIBE
Erodium cicutarium	redstem filaree	ERCI	*Sonchus asper*	prickly sow thistle	SOAS
Eryngium armatum	coyote thistle	ERAR12	*Sonchus oleraceus*	common sow thistle	SOOL
Festuca bromoides	brome fescue	FEBR	*Stachys ajugoides*	bugle hedge nettle	STAJ
Gamochaeta ustulata	purple cudweed	GAUS	*Trifolium depauperatum*	sack clover	TRDE
Geranium dissectum	cut-leaved geranium	GEDI	*Trifolium dichotomum*	branched indian clover	TRDI6
Gnaphalium palustre	lowland cudweed	GNPA	*Trifolium microcephalum*	small head clover	TRMI
Heliotropium curassavicum var. *oculatum*	Chinese pusley	HECUO	*Trifolium willdenovii*	tomcat clover	TRWI
Heterotheca grandiflora	telegraph weed	HEGR	**Groundcover Codes**		
Hordeum brachyantherum	meadow barley	HOBR	BG	Bare Ground	
Hypochaeris glabra	smooth cat's-ear	HYGL	TH	Thatch/Duff	
Hypochaeris radicata	rough cat's-ear	HYRA	AL	Algae	
Juncus balticus ssp. *ater*	Baltic rush	JUBAa			

Table A-15. Pond 60 (Year 3 Post-Subsurface Munitions Remediation) Wetland Vegetation Transect Data by Stratum

POND 60			
Date	5/24/2021		
Surveying Personnel	Kayti Christianson, Emily Poor, and Brett Bell		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water			
Notes			
Pond 60 was dry by the April 16 hydrology monitoring event (Chenega, 2022). Strata 1 through 4 were repeated from 2015, 2018, 2019, and 2020. Transect 1 was repeated from 2020. Transect 2 was repeated from 2018, 2019 and 2020, while Transect 3 was repeated from 2018 and 2020. Transect 4 was relocated to an area with more representative vegetative composition.			

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	8%	ELMA	45	ELMA	35	ELMA	38	ELMA	65	ELMA	55	ELMA	63
			MALE	1	MALE	12	MALE	9	TH	33	TH	41	TH	34
			TH	48	TH	41	TH	33	BG	2	BG	4	BG	3
			BG	6	BG	12	BG	20						
			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	44%	DISP	14	DISP	18	DISP	10	DISP	6	DISP	37	DISP	7
			ELMA	3	ELMA	3	ELMA	3	ELMA	5	ELMA	4	ELMA	6
			SEGL	1	TH	77	FEPE	1	SEGL	1	GAUS	1	GAUS	1
			TH	81	BG	2	GAUS	1	TH	87	PS sp.	1	SEGL	1
			BG	1			SEGL	1	BG	1	TH	55	SOOL	1
							TH	81			BG	2	TH	82
							BG	3					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
3	10 m	9%	DISP	3	DISP	20	DISP	40	DISP	15	DISP	5	DISP	15
			ELMA	2	ELMA	1	ELMA	2	ELMA	2	ELMA	1	ELMA	1
			JUPH	10	JUPH	8	JUPH	6	JUPH	10	JUPH	12	JUPH	25
			TH	84	TH	69	TH	50	TH	72	TH	80	TH	57
			BG	1	BG	2	BG	2	BG	1	BG	2	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
4	10 m	39%	BRMI	2	BRMI	3	DISP	7	DISP	10	ACPA	1	COCO	1
			DISP	10	DISP	14	ERAR12	8	EPCI	1	COCO	1	DISP	7
			GEDI	5	GEDI	4	GEDI	3	GEDI	7	DISP	15	ELMA	1
			HYGL	1	JUPH	2	PHLE	9	JUPH	1	ERCA	2	GEDI	3
			JUPH	2	PLCHh	2	PLCHh	4	LYHY	2	JUPH	1	HYGL	2
			PHLE	2	RUCR	2	PSST	1	PHLE	2	LYHY	1	JUPH	2
			PLCHh	1	TH	72	STAJ	4	PLCHh	5	PHLE	7	LYHY	2
			PSST	1	BG	1	TH	61	SEGL	1	PLCHh	2	PHLE	2
			RUCR	5			BG	3	STAJ	5	SEGL	1	PLCHh	4
			SEGL	1					TH	64	SOOL	1	SEGL	2
			SOOL	2					BG	2	BG	1	SOOL	1
			STAJ	2							TH	67	STAJ	8
			TH	64									BG	3
			BG	2									TH	62
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 60 2021 Species List					
Species Name	**Common Name**	**Species Code**	**Species Name**	**Common Name**	**Species Code**
Acmispon parviflorus	hill lotus	ACPA	*Juncus phaeocephalus*	brown-headed rush	JUPH
Agrostis avenacea	Pacific bent grass	AGAV	*Lasthenia glaberrima*	smooth goldfields	LAGL3
Aira caryophyllea	silvery hair-grass	AICA	*Logfia gallica*	narrowleaf cottonrose	LOGA
Avena barbata	slender wild oat	AVBA	*Lysimachia arvensis*	scarlet pimpernel	LYAR
Baccharis pilularis	coyote brush	BAPI	*Lythrum hyssopifolia*	grass poly	LYHY
Briza maxima	rattlesnake grass	BRMA	*Madia exigua*	small tarweed	MAEX
Briza minor	annual quaking grass	BRMI	*Madia gracilis*	gumweed	MAGR
Brodiaea terrestris ssp. *terrestris*	dwarf brodiaea	BRTET	*Madia sativa*	coast tarweed	MASA
Bromus diandrus	ripgut grass	BRDI	*Malvella leprosa*	alkali mallow	MALE
Bromus hordeaceus	soft chess	BRHO	*Phalaris lemmonii*	Lemmon's canary grass	PHLE
Castilleja ambigua ssp. *ambigua*	Johnny-Nip	CAAMA3	*Plagiobothrys chorisianus* var. *hickmanii*	Hickman's popcornflower	PLCHH
Clarkia purpurea ssp. *quadrivulnera*	winecup clarkia	CLPUQ	*Plantago coronopus*	cut-leaved plantain	PLCO
Cotula coronopifolia	brass buttons	COCO	*Polypogon monspeliensis*	rabbitfoot grass	POMO
Daucus pusillus	rattlesnake weed	DAPU	*Pseudognaphalium luteoalbum*	weedy cudweed	PSLU
Deinandra corymbosa	coastal tarweed	DECO	*Pseudognaphalium ramosissimum*	pink everlasting	PSRA
Distichlis spicata	salt grass	DISP	*Pseudognaphalium stramineum*	cottonbatting plant	PSST
Eleocharis acicularis var. *acicularis*	needle spikerush	ELACa	*Rumex acetosella*	sheep sorrel	RUAC
Eleocharis macrostachya	pale spikerush	ELMA	*Rumex crispus*	curly dock	RUCR
Elymus triticoides	beardless wild rye	ELTR3	*Rumex salicifolius*	willow dock	RUSA
Epilobium ciliatum	fringed willowherb	EPCI	*Senecio glomeratus*	cutleaf burnweed	SEGL
Erigeron canadensis	horseweed	ERCA	*Senecio vulgaris*	common groundsel	SEVU
Erodium botrys	long-beaked filaree	ERBO	*Silene gallica*	small-flower catchfly	SIGA
Eryngium armatum	coyote thistle	ERAR12	*Silybum marianum*	milk thistle	SIMA
Euthamia occidentalis	western goldenrod	EUOC	*Sonchus asper*	prickly sow thistle	SOAS
Festuca bromoides	brome fescue	FEBR	*Sonchus oleraceus*	common sow thistle	SOOL
Festuca perennis	Italian rye grass	FEPE	*Stachys ajugoides*	bugle hedge nettle	STAJ
Galium aparine	goose grass	GAAP	Unknown Fabaceae (*Medicago* or *Melolotus*)		
Gamochaeta ustulata	purple cudweed	GAUS	*Vicia sativa*	spring vetch	VISA
Geranium dissectum	cut-leaved geranium	GEDI	**Groundcover Codes**		
Helminthotheca echioides	bristly oxtongue	HEEC	BG	Bare Ground	
Hypochaeris glabra	smooth cat's-ear	HYGL	TH	Thatch/Duff	
Hypochaeris radicata	rough cat's-ear	HYRA	AL	Algae	

Table A-16. Pond 61 (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Transect Data by Stratum

POND 61			
Date	5/3/2021		
Surveying Personnel	Kayti Christianson, Emily Poor, and Brett Bell		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water			
Notes			
Pond 61 was dry by the April 5 hydrology monitoring event (Chenega, 2022). Strata 1 through 4 were repeated from 2017-2020. Transect 1 was repeated from 2018 and 2019, whereas Transect 3 was repeated from 2017-2020. Transect 4 was repeated from 2017 and 2018. Stratum 2 consisted of CCG and no transect was placed in this stratum. An upland stratum was mapped and occupied 33% relative cover of the 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	0.2%	ELACa	1	BRTEt	1	ELACa	1	ELMA	8	BRTEt	1	BRTEt	1
			ELMA	7	ELACa	2	ELMA	10	LACO	2	ELMA	5	CIQU	1
			LAGL3	1	ELMA	16	LAGL3	6	LAGL3	1	LACO	2	ELMA	2
			LYHY	1	LAGL3	7	LYHY	1	PLCHh	2	LAGL3	4	JUBUo	1
			PLCHh	2	LYHY	1	PLCHh	5	POZI	1	PLCHh	1	LACO	1
			TH	22	PLCHh	1	TH	55	PSCH	1	TH	22	LAGL3	2
			BG	65	POZI	1	BG	22	TH	5	BG	65	LYHY	1
					PSCH	1			BG	80			PLCHh	6
					TH	45							POZI	1
					BG	25							PSCH	1
													SOOL	1
													TH	22
													BG	65
			TOTAL	**99**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**105**

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	4%	AGLAv	1	BRMA	1	BRMI	1	BRTEt	12	BRMI	1	BRMA	1
			BRMA	3	BRMI	2	BRTEt	10	DECO	1	BRTEt	4	BRTEt	9
			BRMI	2	BRTEt	3	DEDA	1	DEDA	1	DECO	2	DEDA	1
			BRTEt	1	DECO	2	ELACa	2	ELACa	1	DEDA	1	ELACa	2
			CAPY	1	DEDA	1	ERAR12	9	ERAR12	9	ELACa	1	ERAR12	1
			DECO	5	ELACa	3	ERBO	2	ERBO	2	ERAR12	7	ERBO	1
			DEDA	1	ERBO	1	GEDI	1	FEBR	1	ERBO	1	GEDI	1
			ELACa	3	GEDI	2	HYGL	1	GEDI	1	GEDI	1	HYGL	1
			FEBR	2	HYGL	1	HYRA	1	HYGL	1	HYRA	3	HYRA	1
			GEDI	2	HYRA	1	LYAR	1	HYRA	1	JUPH	1	JUPH	1
			HYGL	4	JUPH	1	PLCHh	3	JUPH	1	LAGL3	1	LAGL3	1
			HYRA	3	LAGL3	1	POZI	12	LAGL3	1	LYAR	1	PLCHh	35
			JUPH	1	LYHY	1	TRDU	1	LYAR	1	PLCHh	12	POZI	6
			LYHY	1	MAGR	1	TH	48	PLCHh	4	TH	61	TH	35
			MIPA	1	MASA	2	BG	7	SOOL	1	BG	4	BG	4
			PLCHh	20	PLCHh	25			TH	54				
			PSCH	1	SOOL	1			BG	8				
			SOOL	1	URLI5	1								
			URLI5	1	TH	35								
			TH	38	BG	15								
			BG	8										
			TOTAL	**100**	**TOTAL**	**100**	**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
4	10 m	58%	BRHO	1	BRMA	39	BRMA	25	BRHO	2	BRMA	25	BRMA	12
			BRMA	27	BRMI	1	BRMI	1	BRMA	25	BRTEt	1	BRMI	1
			BRMI	2	BRTEt	1	BRTEt	2	BRTEt	1	DACA	12	BRTEt	1
			BRTEt	1	CAUN	1	CAUN	1	CAUN	1	DECO	1	DACA	30
			CAUN	1	DACA	1	DACA	1	DACA	10	ERBO	1	DECO	3
			DECO	2	DECO	5	DECO	3	DECO	2	GEDI	1	ERBO	3
			ERAR12	1	ERBO	4	ERBO	5	ERBO	7	HYGL	3	FEBR	1
			ERBO	2	FEBR	1	FEBR	1	FEBR	1	HYRA	1	GEDI	1
			GEDI	2	GEDI	3	GEDI	2	GEDI	1	LYAR	1	HYGL	2
			HYGL	4	HYGL	2	HYGL	4	HYGL	8	MAGR	2	LYAR	1
			HYRA	4	HYRA	8	HYRA	8	HYRA	1	MIPA	7	MAGR	3
			MAGR	3	LYAR	1	MAGR	4	LYAR	2	TH	39	MIPA	2
			MASA	2	MAGR	2	MASA	1	MAGR	2	BG	6	TH	36
			MIPA	3	MASA	2	MIPA	3	MIPA	3			BG	4
			TH	35	MIPA	3	SOOL	1	TH	30				
			BG	10	SOOL	1	TH	32	BG	3				
					TH	20	BG	6						
					BG	5								
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**99**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 61 2021 Species List

Species Name	Common Name	Species Code
Acaena pinnatifida var. *californica*	California acaena	ACPIC
Achillea millefolium	common yarrow	ACMI
Adenostoma fasciculatum	chamise	ADFA
Agrostis lacuna-vernalis	vernal pool bent grass	AGLAV
Aira caryophyllea	silvery hair-grass	AICA
Allium hickmanii	Hickman's onion	ALHI
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 carinatus	California brome	BRCA
Bromus diandrus	ripgut grass	BRDI
Bromus hordeaceus	soft chess	BRHO
Calochortus uniflorus	pink star-tulip	CAUN
Calystegia subacaulis ssp. *subacaulis*	hill morning glory	CASUS
Carduus pycnocephalus	Italian thistle	CAPY
Castilleja ambigua ssp. *ambigua*	Johnny-Nip	CAAMA3
Castilleja densiflora	dense flower owl's clover	CADE
Chlorogalum pomeridianum	wavyleaf soap plant	CHPO
Cicendia quadrangularis	timwort	CIQU
Cirsium quercetorum	brownie thistle	CIQU2
Clarkia purpurea ssp. *quadrivulnera*	winecup clarkia	CLPUQ
Corethrogyne filaginifolia	common sandaster	COFI
Cotula coronopifolia	brass buttons	COCO
Danthonia californica	California oat grass	DACA
Deinandra corymbosa	coastal tarweed	DECO
Deschampsia danthonioides	annual hair grass	DEDA
Eleocharis acicularis var. *acicularis*	needle spikerush	ELACa
Eleocharis macrostachya	pale spikerush	ELMA
Elymus glaucus	blue wild-rye	ELGL
Elymus triticoides	beardless wild rye	ELTR3
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	redstem filaree	ERCI
Eryngium armatum	coyote thistle	ERAR12
Eschscholzia californica	California poppy	ESCA
Festuca bromoides	brome fescue	FEBR
Festuca myuros	rattail sixweeks grass	FEMY
Festuca perennis	Italian rye grass	FEPE
Galium aparine	goose grass	GAAP
Galium porrigens	climbing bedstraw	GAPO
Gamochaeta ustulata	purple cudweed	GAUS
Geranium dissectum	cut-leaved geranium	GEDI
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
Hypochaeris radicata	rough cat's-ear	HYRA
Isoetes howellii	Howell's quillwort	ISHO
Isolepis carinata	keeled bulrush	ISCA
Juncus bufonius var. *occidentalis*	round-fruited toad rush	JUBUO
Juncus occidentalis	western rush	JUOC
Juncus phaeocephalus	brown-headed rush	JUPH
Koeleria macrantha	June grass	KOMA
Lasthenia conjugens	Contra Costa goldfields	LACO
Lasthenia glaberrima	smooth goldfields	LAGL3
Leptosiphon parviflorus	variable linanthus	LEPA
Logfia gallica	narrowleaf cottonrose	LOGA
Lupinus nanus	sky lupine	LUNA
Luzula comosa	Pacific woodrush	LUCO6
Lysimachia arvensis	scarlet pimpernel	LYAR
Lythrum hyssopifolia	grass poly	LYHY
Madia exigua	small tarweed	MAEX
Madia gracilis	gumweed	MAGR
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
Plantago lanceolata	English plantain	PLLA
Pogogyne zizyphoroides	Sacramento mesa mint	POZI
Polypogon monspeliensis	rabbitfoot grass	POMO
Pseudognaphalium californicum	California everlasting	PSCA
Pseudognaphalium luteoalbum	weedy cudweed	PSLU
Pseudognaphalium stramineum	cottonbatting plant	PSST
Psilocarphus chilensis	round woolly-marbles	PSCH
Quercus agrifolia	coast live oak	QUAG
Ranunculus californicus	California buttercup	RACA
Rumex acetosella	sheep sorrel	RUAC
Rumex crispus	curly dock	RUCR
Senecio glomeratus	cutleaf burnweed	SEGL
Sidalcea malviflora ssp. *malviflora*	checkerbloom	SIMAM
Silene gallica	small-flower catchfly	SIGA
Sisyrinchium bellum	western blue-eyed grass	SIBE
Sonchus asper	prickly sow thistle	SOAS
Sonchus oleraceus	common sow thistle	SOOL
Stachys ajugoides	bugle hedge nettle	STAJ
Stipa cernua	nodding needle grass	STCE
Taraxia ovata	sun cups	TAOV
Trifolium depauperatum	sack clover	TRDE
Trifolium dubium	little hop clover	TRDU
Trifolium polyodon	Pacific Grove clover	TRPO3
Triglochin scilloides	flowering quillwort	TRSC
Uropappus lindleyi	silver puffs	URLI5
Vicia sativa ssp. *sativa*	spring vetch	VISAS
Groundcover Codes		
BG	Bare Ground	
TH	Thatch/Duff	
AL	Algae	

Table A-17. Pond 73 (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Transect Data by Stratum

POND 73			
Date	5/12/2021		
Surveying Personnel	Kayti Christianson, Emily Poor, and Brett Bell		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water			
Notes			
Pond 73 remained dry throughout the 2020-2021 water-year (Chenega, 2022). Strata 1 and 2 were repeated from 2017-2020, whereas stratum 4 was repeated from 2018-2020. Transect 1 was repeated from 2018, 2019, and 2020. Transect 2 was repeated from 2018. Transect 4 was repeated from 2018 and 2020. An upland stratum was mapped and occupied 3% relative cover of the 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	2%	ELMA	30	ELMA	40	ELMA	33
			LAGL3	1	LAGL3	1	ERCA	1
			TH	69	TH	59	JUPH	1
							LAGL3	2
							PLCHh	1
							SEGL	2
							TH	60
			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	27%	ELACa	1	ELACa	3	ELACa	2	ELACa	2	BRTEt	5	BRTEt	2
			ELMA	2	ELMA	1	ELMA	1	ELMA	1	ELACa	2	ELACa	1
			JUPH	35	JUPH	25	ERAR12	7	HYRA	1	ELMA	1	ELMA	1
			TH	62	LAGL3	1	JUPH	20	JUPH	25	ERAR12	1	ERAR12	1
					TH	60	LAGL3	1	BG	12	JUPH	22	JUPH	16
					BG	10	TH	60	TH	59	LAGL3	1	LAGL3	1
							BG	9			TH	65	TH	72
											BG	3	BG	6
			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	68%	ACMI	1	AICA	1	BRMI	1	AICA	1	AGLAv	1	AICA	1
			BRMI	1	BRMI	1	DECO	3	BRMI	3	AICA	1	BRMI	1
			BRTEt	1	DEDA	1	DEDA	1	BRTEt	1	BRMI	1	BRTEt	1
			DECO	8	ELACa	4	ERAR12	25	CAAM	1	BRTEt	1	DECO	1
			DEDA	1	ERAR12	13	ERBO	1	DECO	2	DECO	1	ELACa	1
			ELACa	1	GEDI	1	GAUS	1	ELACa	1	ELACa	2	ERAR12	26
			ERAR12	12	HYGL	5	HYGL	5	ERAR12	10	ERAR12	17	GAUS	1
			GEDI	9	HYRA	5	HYRA	4	GEDI	1	GAUS	1	GEDI	1
			HYGL	12	JUBU	1	JUPH	1	HYGL	10	GEDI	1	HYGL	2
			ISHO	1	PLCHh	1	POMO	1	HYRA	6	HYGL	7	HYRA	1
			JUPH	1	PSCH	1	SEGL	1	LOGA	1	HYRA	3	JUPH	3
			MASA	1	SOOL	1	TH	20	PLCHh	1	MIPA	1	LOGA	1
			PLCHh	1	TH	45	BG	36	POMO	1	PLCHh	1	MIPA	1
			TH	28	BG	20			PSCH	1	PSCH	1	PLCHh	1
			BG	22					SIGA	1	TH	50	TH	50
									TH	20	BG	11	BG	8
									BG	39				
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 73 2021 Species List					
Species Name	**Common Name**	**Species Code**	**Species Name**	**Common Name**	**Species Code**
Achillea millefolium	common yarrow	ACMI	*Logfia gallica*	narrowleaf cottonrose	LOGA
Acmispon americanus var. *americanus*	Spanish lotus	ACAMA	*Lysimachia arvensis*	scarlet pimpernel	LYAR
Agrostis avenacea	Pacific bent grass	AGAV	*Lysimachia minima*	chaffweed	LYMI
Agrostis lacuna-vernalis	vernal pool bent grass	AGLAV	*Lythrum hyssopifolia*	grass poly	LYHY
Aira caryophyllea	silvery hair-grass	AICA	*Madia exigua*	small tarweed	MAEX
Avena barbata	slender wild oat	AVBA	*Madia gracilis*	gumweed	MAGR
Baccharis pilularis	coyote brush	BAPI	*Madia sativa*	coast tarweed	MASA
Briza maxima	rattlesnake grass	BRMA	*Microseris paludosa*	marsh microseris	MIPA
Briza minor	annual quaking grass	BRMI	*Phalaris lemmonii*	Lemmon's canary grass	PHLE
Brodiaea terrestris ssp. *terrestris*	dwarf brodiaea	BRTET	*Plagiobothrys chorisianus* var. *hickmanii*	Hickman's popcornflower	PLCHH
Bromus hordeaceus	soft chess	BRHO	*Plantago coronopus*	cut-leaved plantain	PLCO
Carduus pycnocephalus	Italian thistle	CAPY	*Polypogon monspeliensis*	rabbitfoot grass	POMO
Castilleja ambigua	Johnny-Nip	CAAM	*Pogogyne zizyphoroides*	Sacramento mesa mint	POZI
Cicendia quadrangularis	timwort	CIQU	*Pseudognaphalium luteoalbum*	weedy cudweed	PSLU
Clarkia purpurea ssp. *quadrivulnera*	winecup clarkia	CLPUQ	*Pseudognaphalium stramineum*	cottonbatting plant	PSST
Cotula coronopifolia	brass buttons	COCO	*Psilocarphus chilensis*	round woolly-marbles	PSCH
Danthonia californica	California oat grass	DACA	*Rumex acetosella*	sheep sorrel	RUAC
Deinandra corymbosa	coastal tarweed	DECO	*Rumex crispus*	curly dock	RUCR
Deschampsia danthonioides	annual hair grass	DEDA	*Senecio glomeratus*	cutleaf burnweed	SEGL
Eleocharis acicularis var. *acicularis*	needle spikerush	ELACa	*Senecio vulgaris*	common groundsel	SEVU
Eleocharis macrostachya	pale spikerush	ELMA	*Sidalcea malviflora* ssp. *malviflora*	checkerbloom	SIMAM
Elymus triticoides	beardless wild rye	ELTR3	*Silene gallica*	small-flower catchfly	SIGA
Erigeron canadensis	horseweed	ERCA	*Sisyrinchium bellum*	western blue-eyed grass	SIBE
Erodium botrys	long-beaked filaree	ERBO	*Sonchus asper*	prickly sow thistle	SOAS
Eryngium armatum	coyote thistle	ERAR12	*Sonchus oleraceus*	common sow thistle	SOOL
Galium aparine	goose grass	GAAP	*Spiranthes romanzoffiana*	hooded lady's tresses	SPRO
Gamochaeta ustulata	purple cudweed	GAUS	*Taraxia ovata*	sun cups	TAOV
Geranium dissectum	cut-leaved geranium	GEDI	*Toxicodendron diversilobum*	poison oak	TODI
Heterocodon rariflorum	western pearlflower	HERA	*Trifolium gracilentum*	pin point clover	TRGR
Hypochaeris glabra	smooth cat's-ear	HYGL	*Trifolium microcephalum*	small head clover	TRMI
Hypochaeris radicata	rough cat's-ear	HYRA	*Triodanis biflora*	Venus' looking glass	TRBI2
Isoetes howellii	Howell's quillwort	ISHO	**Groundcover Codes**		
Juncus bufonius	toad rush	JUBU	BG	Bare Ground	
Juncus phaeocephalus	brown-headed rush	JUPH	TH	Thatch/Duff	
Lasthenia glaberrima	smooth goldfields	LAGL3	AL	Algae	

Table A-18. Pond 74 (Year 3 Post-Mastication) Wetland Vegetation Transect Data by Stratum

POND 74			
Date	5/12/2021		
Surveying Personnel	Kayti Christianson, Emily Poor, and Brett Bell		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water			
Notes			
Pond 74 remained dry throughout the 2020-2021 water-year (Chenega, 2022). Strata 1 and 3 were repeated from 2020; however, the associated transects were relocated because the previous locations were no longer within the correct strata. Stratum 4 was identified and the corresponding transect was established in 2021. An upland stratum was mapped and occupied 5% relative cover of the 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	6%	BRMI	1	BAPI	1	BRTEt	2
			BRTEt	1	BRTEt	1	DECO	1
			ERAR12	30	ERAR12	28	ERAR12	22
			ERCI	1	GNPA	1	ERCI	1
			GNPA	1	HYGL	1	GNPA	1
			HYGL	1	HYRA	1	HYGL	1
			HYRA	2	ISCE	1	HYRA	4
			ISCE	1	JUPH	2	ISCE	1
			JUPH	4	LOGA	1	JUPH	1
			LOGA	1	LYHY	1	LOGA	1
			LYAR	1	LYMI	1	LYAR	1
			PLCHh	4	PLCHh	7	LYMI	1
			POZI	3	POZI	10	PLCHh	6
			SEGL	1	SEGL	1	POMO	1
			TH	37	SOOL	1	POZI	16
			BG	11	TH	39	SOOL	1
					BG	4	TH	33
							BG	6
			TOTAL	**100**	**TOTAL**	**101**	**TOTAL**	**100**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3	
			Species	% Cover	Species	% Cover	Species	% Cover
3	5 m	21%	BRMI	2	AICA	1	BRTEt	2
			BRTEt	1	BRTEt	1	DECO	38
			DECO	22	DECO	9	DEDA	1
			DEDA	1	ERAR12	6	ERAR12	3
			ERAR12	1	ERBO	1	ERBO	2
			GNPA	1	ERCA	1	FEBR	1
			HYGL	2	GEDI	2	GEDI	1
			HYRA	3	HYGL	5	HYGL	2
			JUPH	1	HYRA	15	HYRA	3
			LOGA	1	LOGA	1	JUPH	1
			LYAR	1	LYHY	1	LYAR	1
			LYHY	1	PLCHh	1	SEGL	2
			LYMI	1	BG	44	SOOL	2
			PLCHh	1	TH	12	TH	36
			PSST	1			BG	5
			SEGL	1				
			BG	55				
			TH	4				
			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	68%	CRAQ	1	DECO	1	DECO	1	ACPA	1	BRHO	1	CRAQ	1
			ERAR12	35	ERAR12	38	ERAR12	42	BRHO	1	CRAQ	1	DECO	1
			HYGL	2	HYGL	1	HYGL	3	DECO	1	DECO	1	ERAR12	50
			ISCE	1	PSCH	1	ISCE	1	ERAR12	33	ERAR12	35	FEBR	1
			POZI	1	TH	41	JUPH	1	GEDI	1	HYGL	3	HOBR	1
			PSCH	1	BG	18	MAEX	1	HYGL	5	JUPH	1	HYGL	3
			TH	39			PLCHh	1	HYRA	1	TH	50	JUPH	2
			BG	20			TH	40	ISCE	1	BG	8	PSCH	1
							BG	10	JUBU	1			TH	25
									JUPH	1			BG	15
									PSCH	1				
									SOOL	1				
									TH	47				
									BG	5				
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 74 2021 Species List					
Species Name	**Common Name**	**Species Code**	**Species Name**	**Common Name**	**Species Code**
Acmispon parviflorus	hill lotus	ACPA	*Hypochaeris radicata*	rough cat's-ear	HYRA
Aira caryophyllea	silvery hair-grass	AICA	*Isolepis cernua*	low bulrush	ISCE
Baccharis pilularis	coyote brush	BAPI	*Juncus bufonius*	toad rush	JUBU
Briza minor	annual quaking grass	BRMI	*Juncus phaeocephalus*	brown-headed rush	JUPH
Brodiaea terrestris ssp. *terrestris*	dwarf brodiaea	BRTET	*Logfia gallica*	narrowleaf cottonrose	LOGA
Bromus hordeaceus	soft chess	BRHO	*Lysimachia arvensis*	scarlet pimpernel	LYAR
Carduus pycnocephalus	Italian thistle	CAPY	*Lysimachia minima*	chaffweed	LYMI
Centaurea melitensis	Maltese star-thistle	CEME	*Lythrum hyssopifolia*	grass poly	LYHY
Cicendia quadrangularis	timwort	CIQU	*Madia exigua*	small tarweed	MAEX
Cirsium brevistylum	Indian thistle	CIBR	*Melilotus indicus*	Indian sweetclover	MEIN
Cirsium vulgare	bull thistle	CIVU	*Microseris paludosa*	marsh microseris	MIPA
Crassula aquatica	aquatic pygmy-weed	CRAQ	*Plagiobothrys chorisianus* var. *hickmanii*	Hickman's popcornflower	PLCHH
Danthonia californica	California oat grass	DACA	*Pogogyne serpylloides*	thymeleaf beardstyle	POSE2
Deinandra corymbosa	coastal tarweed	DECO	*Pogogyne zizyphoroides*	Sacramento mesa mint	POZI
Deschampsia danthonioides	annual hair grass	DEDA	*Polypogon monspeliensis*	rabbitfoot grass	POMO
Eleocharis acicularis var. *acicularis*	needle spikerush	ELACa	*Pseudognaphalium stramineum*	cottonbatting plant	PSST
Eleocharis macrostachya	pale spikerush	ELMA	*Psilocarphus chilensis*	round woolly-marbles	PSCH
Erigeron canadensis	horseweed	ERCA	*Senecio glomeratus*	cutleaf burnweed	SEGL
Erodium botrys	long-beaked filaree	ERBO	*Sonchus asper*	prickly sow thistle	SOAS
Erodium cicutarium	redstem filaree	ERCI	*Sonchus oleraceus*	common sow thistle	SOOL
Eryngium armatum	coyote thistle	ERAR12	*Spiranthes romanzoffiana*	hooded lady's tresses	SPRO
Festuca bromoides	brome fescue	FEBR	*Stipa pulchra*	purple needle grass	STPU
Gamochaeta ustulata	purple cudweed	GAUS	*Veronica peregrina* ssp. *xalapensis*	speedwell	VEPEX
Geranium dissectum	cut-leaved geranium	GEDI	*Zeltnera davyi*	Davy's centuary	ZEDA
Gnaphalium palustre	lowland cudweed	GNPA	**Groundcover Codes**		
Heterocodon rariflorum	western pearlflower	HERA	BG	Bare Ground	
Hordeum brachyantherum	meadow barley	HOBR	TH	Thatch/Duff	
Hypochaeris glabra	smooth cat's-ear	HYGL	AL	Algae	

Table A-19. Pond 75 (Baseline) Wetland Vegetation Transect Data by Stratum

POND 75			
Date	5/7/2021		
Surveying Personnel	Kayti Christianson, Emily Poor, and Brett Bell		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water			
Notes			
Pond 75 remained dry throughout the 2020-2021 water-year (Chenega, 2022). Strata 1 through 4 were identified and the corresponding transects were established in 2021.			

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	25%	BRMI	6	ELMA	65	BRMI	2	BRMI	5	ELMA	46	ELMA	55
			ELMA	30	GEDI	2	ELMA	28	ELMA	55	MALE	3	GEDI	3
			GEDI	6	SIBE	12	GEDI	4	GEDI	2	RUCR	1	MALE	6
			RUCR	1	TH	20	PHLE	8	MALE	3	TH	49	TH	35
			SIMA	16	BG	1	RUCR	1	PHLE	6	BG	1	BG	1
			TH	31			SOAS	2	SOOL	2				
			BG	10			VEPEx	2	VEPEx	4				
							TH	47	TH	21				
							BG	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
2	10 m	65%	ELMA	1	ELMA	2	ELMA	1	ELMA	2	ELMA	1	ELMA	1
			ELTR3	25	ELTR3	35	ELTR3	35	ELTR3	45	ELTR3	40	ELTR3	38
			TH	74	TH	63	TH	64	TH	53	TH	59	TH	61
			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
3	10 m	6%	ELMA	3	ELMA	2	ELMA	2
			ELTR3	3	ELTR3	1	ELTR3	1
			EUOC	20	EUOC	35	EUOC	75
			TH	74	TH	62	TH	22
			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	4%	ELTR3	1	ELTR3	2	BAPI	2
			JUPH	43	JUPH	48	ELTR3	4
			TH	55	RACA	1	JUPH	30
			BG	1	TH	48	RACA	1
					BG	2	TH	61
							BG	2
			TOTAL	**100**	**TOTAL**	**101**	**TOTAL**	**100**

Pond 75 2021 Species List					
Species Name	**Common Name**	**Species Code**	**Species Name**	**Common Name**	**Species Code**
Acmispon americanus var. *americanus*	Spanish lotus	ACAMA	*Hordeum brachyantherum*	meadow barley	HOBR
Aira caryophyllea	silvery hair-grass	AICA	*Juncus falcatus*	falcate rush	JUFA
Avena fatua	wild oat	AVFA	*Juncus phaeocephalus*	brown-headed rush	JUPH
Baccharis pilularis	coyote brush	BAPI	*Malvella leprosa*	alkali mallow	MALE
Briza minor	annual quaking grass	BRMI	*Microseris paludosa*	marsh microseris	MIPA
Bromus diandrus	ripgut grass	BRDI	*Perideridia gairdneri*	Gairdner's yampah	PEGA
Bromus hordeaceus	soft chess	BRHO	*Phalaris lemmonii*	Lemmon's canary grass	PHLE
Carex praegracilis	clustered field sedge	CAPR	*Pseudognaphalium stramineum*	cottonbatting plant	PSST
Cirsium brevistylum	Indian thistle	CIBR	*Ranunculus californicus*	California buttercup	RACA
Cryptantha microstachys	popcorn flower	CRMI3	*Rumex crispus*	curly dock	RUCR
Eleocharis macrostachya	pale spikerush	ELMA	*Silybum marianum*	milk thistle	SIMA
Elymus triticoides	beardless wild rye	ELTR3	*Sisyrinchium bellum*	western blue-eyed grass	SIBE
Erigeron canadensis	horseweed	ERCA	*Sonchus asper*	prickly sow thistle	SOAS
Euthamia occidentalis	western goldenrod	EUOC	*Sonchus oleraceus*	common sow thistle	SOOL
Festuca bromoides	brome fescue	FEBR	*Veronica peregrina* ssp. *xalapensis*	speedwell	VEPEX
Festuca perennis	Italian rye grass	FEPE	**Groundcover Codes**		
Galium aparine	goose grass	GAAP	BG	Bare Ground	
Galium porrigens	climbing bedstraw	GAPO	TH	Thatch/Duff	
Geranium dissectum	cut-leaved geranium	GEDI	AL	Algae	
Heliotropium curassavicum var. *oculatum*	Chinese pusley	HECUO			

Table A-20. Pond 101 East (West) (Year 3 Post-Mastication) Wetland Vegetation Transect Data by Stratum

POND 101 East (West)			
Date	5/20/2021		
Surveying Personnel	Kayti Christianson, Emily Poor, Brett Bell, and Lizzy Eichorn		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water			
Notes			
Pond 101 East (West) remained dry throughout the 2020-2021 water-year (Chenega, 2022). Strata 1, 2, 4, and 5 were repeated from 2016-2020. Stratum 3 was repeated from 2016-2019. Stratum 6 was repeated from 2017-2020. Stratum 8 was repeated from 2019 and 2020. Stratum 9 was repeated from 2020. Transects 1, 2, 4 and 5 were repeated from 2020. Transects 3 and 6 were relocated because the previous locations were no longer within the correct strata. Transect 8 was repeated from 2019 and 2020. Transect 9 was relocated to a more representative vegetative composition.			

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%	ELACa	1	ELACa	2	AGAV	1	AGAV	1	AGAV	1	AGAV	2
			ELMA	8	ELMA	7	ALSA	1	BRMI	1	BAPI	1	ALSA	1
			HECUo	4	FEBR	1	BAPI	1	ELMA	2	ELACa	1	ELMA	4
			JUBA	1	GNPA	2	ELMA	4	GAAP	2	ELMA	5	GNPA	2
			MALE	11	MALE	10	FEBR	1	GNPA	12	GNPA	3	LYHY	1
			PHLE	20	PHLE	12	GEDI	2	MALE	9	HYRA	2	MALE	16
			RUCR	1	POAVd	9	GNPA	7	POAVd	7	LYHY	1	POAVd	2
			TH	46	TH	42	LYAR	1	POMO	1	MALE	17	VEBR	4
			BG	8	BG	15	MALE	9	ROCU	15	PHLE	1	TH	61
							PHLE	5	VEBR	7	POAVd	3	BG	7
							POAVd	4	TH	5	POMO	1		
							POMO	2	BG	38	ROCU	16		
							ROCU	13			VEBR	3		
							RUCR	2			TH	22		
							SOOL	8			BG	23		
							VEBR	3						
							TH	18						
							BG	18						
			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	22%	BRDI	1	ELMA	20	ELMA	23	ELMA	27	ELMA	25	ELMA	35
			ELMA	6	MALE	2	MALE	1	MALE	13	MALE	13	MALE	4
			TH	89	TH	73	TH	75	TH	56	GEDI	1	PHLE	1
			BG	4	BG	5	BG	3	BG	4	TH	56	TH	57
											BG	5	BG	3
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**102**	**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
3	5 m	6%	BAPI	1	ELMA	8	BRHO	4
			ELMA	4	HECUo	2	ELMA	2
			HECUo	12	LAGL3	2	HECUo	2
			LAGL3	2	PLCHh	4	LAGL3	1
			PLCHh	15	TH	83	PLCHh	3
			PS sp.	1	BG	1	RUCR	12
			RUCR	4			TH	74
			TH	55			BG	2
			BG	6				
			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%	DISP	2	BRMI	1	BRHO	1
			ELMA	2	DISP	1	DISP	1
			GEDI	5	ELMA	3	ELMA	3
			HYGL	1	GEDI	7	FEBR	1
			JUPH	2	HYGL	1	GEDI	7
			MAGR	7	JUPH	13	HYGL	2
			MASA	2	MAGR	12	JUBA	1
			RUAC	19	MALE	1	JUPH	3
			VISAs	1	MASA	2	MAGR	2
			TH	52	RUCR	1	MASA	2
			BG	7	SOOL	3	TH	64
					TH	36	BG	13
					BG	19		
			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	46%	BRHO	1	ELMA	1	ELMA	1	BRMI	1	ELMA	1	BRHO	1
			ELMA	1	FEBR	14	FEBR	20	ELMA	1	FEBR	19	ELMA	2
			FEBR	25	FEPE	13	FEPE	2	FEBR	8	FEPE	7	FEBR	19
			FEPE	9	HECUo	1	MALE	4	FEPE	19	GEDI	2	FEPE	5
			GEDI	3	TH	61	TH	69	GEDI	1	RUCR	2	HYGL	1
			HECUo	2	BG	10	BG	4	HYGL	1	TH	21	MALE	4
			STAJ	1					MALE	1	BG	46	TH	65
			VISAs	1					TH	22			BG	3
			TH	53					BG	46				
			BG	4										
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**98**	**TOTAL**	**100**

Transect #	Transect Length	Relative % Cover of Wetland	Quadrat #1		Quadrat #2		Quadrat #3	
			Species	% Cover	Species	% Cover	Species	% Cover
6	5 m	4%	ELACa	1	BAPI	1	ELMA	1
			ELMA	3	ELMA	2	JUBA	1
			JUBA	1	JUBA	1	JUPH	25
			JUPH	30	JUPH	28	RUAC	8
			RUAC	1	RUAC	5	RUCR	1
			TH	60	STAJ	1	TH	64
			BG	4	TH	60		
					BG	2		
			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
8	5 m	6%	ELMA	1	ELMA	1	ELMA	1
			EUOC	38	EUOC	45	EUOC	40
			GEDI	2	GEDI	1	GEDI	1
			MALE	2	TH	41	HYGL	2
			TH	47	BG	12	PS sp.	1
			BG	10			TH	46
							BG	9
			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
9	5 m	13%	ELMA	20	ELMA	17	ELMA	10
			MALE	2	HECUo	1	HECUo	1
			RUCR	35	MALE	3	PHLE	1
			TH	36	RUCR	5	RUCR	23
			BG	7	TH	70	TH	61
					BG	4	BG	4
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 101 East (West) 2020 Species List

Species Name	Common Name	Species Code	Species Name	Common Name	Species Code
Agrostis avenacea	Pacific bent grass	AGAV	*Lasthenia glaberrima*	smooth goldfields	LAGL3
Aira caryophyllea	silvery hair-grass	AICA	*Lysimachia arvensis*	scarlet pimpernel	LYAR
Alopecurus saccatus	Pacific foxtail	ALSA	*Lythrum hyssopifolia*	grass poly	LYHY
Avena barbata	slender wild oat	AVBA	*Madia gracilis*	gumweed	MAGR
Baccharis pilularis	coyote brush	BAPI	*Madia sativa*	coast tarweed	MASA
Briza maxima	rattlesnake grass	BRMA	*Malvella leprosa*	alkali mallow	MALE
Briza minor	annual quaking grass	BRMI	*Oxalis corniculata*	creeping woodsorrel	OXCO
Bromus carinatus	California brome	BRCA	*Petrorhagia dubia*	hairypink	PEDU
Bromus diandrus	ripgut grass	BRDI	*Phalaris lemmonii*	Lemmon's canary grass	PHLE
Bromus hordeaceus	soft chess	BRHO	*Plagiobothrys chorisianus* var. *hickmanii*	Hickman's popcornflower	PLCHH
Carex praegracilis	clustered field sedge	CAPR	*Plantago coronopus*	cut-leaved plantain	PLCO
Cotula coronopifolia	brass buttons	COCO	*Plantago lanceolata*	English plantain	PLLA
Cyperus eragrostis	tall cyperus	CYER	*Polygonum aviculare* ssp. *depressum*	prostrate knotweed	POAVD
Deschampsia danthonioides	annual hair grass	DEDA	*Polypogon monspeliensis*	rabbitfoot grass	POMO
Distichlis spicata	salt grass	DISP	*Pseudognaphalium* sp.		
Eleocharis acicularis var. *acicularis*	needle spikerush	ELACa	*Pseudognaphalium luteoalbum*	weedy cudweed	PSLU
Eleocharis macrostachya	pale spikerush	ELMA	*Pseudognaphalium stramineum*	cottonbatting plant	PSST
Erigeron canadensis	horseweed	ERCA	*Quercus agrifolia*	coast live oak	QUAG
Erodium botrys	long-beaked filaree	ERBO	*Rorippa curvisiliqua*	western yellowcress	ROCU
Erodium cicutarium	redstem filaree	ERCI	*Rumex acetosella*	sheep sorrel	RUAC
Eryngium armatum	coyote thistle	ERAR12	*Rumex crispus*	curly dock	RUCR
Euthamia occidentalis	western goldenrod	EUOC	*Rumex salicifolius*	willow dock	RUSA
Festuca bromoides	brome fescue	FEBR	*Senecio glomeratus*	cutleaf burnweed	SEGL
Festuca myuros	rattail sixweeks grass	FEMY	*Sonchus asper*	prickly sow thistle	SOAS
Festuca perennis	Italian rye grass	FEPE	*Sonchus oleraceus*	common sow thistle	SOOL
Galium aparine	goose grass	GAAP	*Stachys ajugoides*	bugle hedge nettle	STAJ
Gamochaeta ustulata	purple cudweed	GAUS	*Torilis arvensis*	tall sock destroyer	TOAR
Geranium dissectum	cut-leaved geranium	GEDI	*Trifolium microcephalum*	small head clover	TRMI
Gnaphalium palustre	lowland cudweed	GNPA	*Verbena lasiostachys* var. *lasiostachys*	western vervain	VELAL
Heliotropium curassavicum var. *oculatum*	Chinese pusley	HECUO	*Verbena bracteata*	bracted verbena	VEBR
Hordeum brachyantherum ssp. *brachyantherum*	meadow barley	HOBRB	*Veronica peregrina* ssp. *xalapensis*	speedwell	VEPEX
Hordeum marinum ssp. *gussoneanum*	Mediterranean barley	HOMAG	*Vicia sativa* ssp. *nigra*	common vetch	VISAN
Hypochaeris glabra	smooth cat's-ear	HYGL	*Vicia sativa* ssp. *sativa*	spring vetch	VISAS
Hypochaeris radicata	rough cat's-ear	HYRA	**Groundcover Codes**		
Juncus balticus	Baltic rush	JUBA	BG	Bare Ground	
Juncus bufonius	toad rush	JUBU	TH	Thatch/Duff	
Juncus patens	spreading rush	JUPA	AL	Algae	
Juncus phaeocephalus	brown-headed rush	JUPH			

Table A-21. Pond 101 West (Year 3 Post-Mastication) Wetland Vegetation Transect Data by Stratum

Pond 101 West			
Date	5/11/2021		
Surveying Personnel	Kayti Christianson, Emily Poor, Brett Bell, and Lizzy Eichorn		
Vegetation Type	**% Cover**	**Species**	**Notes**
Emergent Vegetation			
Floating Vegetation			
Submerged Vegetation			
Open Water			
Notes			
Pond 101 West remained dry throughout the 2020-2021 water-year (Chenega, 2022). Strata 1 and 2 were repeated from 2016 and 2019. Stratum 4 and the associated transect were established in 2021. Transect 1 was relocated to an area with more representative vegetative composition, whereas transect 2 was relocated because the previous location was no longer within the correct stratum.			

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	40%	BAPI	1	BAPI	1	BAPI	1	BRMI	1	ELMA	2	DEDA	1
			ELMA	8	ELMA	10	BRHO	1	ELMA	2	FEBR	1	ELMA	2
			GNPA	1	HECUo	1	ELMA	6	FEPE	1	FEPE	1	GEDI	3
			LAGL3	3	LAGL3	8	HECUo	4	HECUo	2	GEDI	1	HECUo	7
			LYAR	1	LYHY	1	HYGL	1	LAGL3	20	HECUo	3	HYGL	1
			LYHY	7	PLCHh	14	LAGL3	3	PLCHh	25	HYGL	1	LAGL3	6
			PLCHh	4	POMO	1	PLCHh	20	PLCO	1	HYRA	1	PLCHh	15
			POAVd	14	RUCR	12	RUCR	8	POMO	1	LAGL3	15	RUCR	8
			RUCR	16	TH	34	TH	55	RUCR	6	PLCHh	5	TH	54
			SEGL	1	BG	18	BG	1	SEGL	1	POMO	1	BG	3
			SOAS	1					TH	39	RUCR	4		
			TH	31					BG	1	SEGL	1		
			BG	12							TH	58		
											BG	6		
			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	33%	DISP	11	DISP	7	DISP	2	DISP	4	DISP	11	DISP	5
			FEBR	10	FEBR	15	ELACa	6	FEBR	5	ELACa	7	ELACa	6
			FEPE	30	FEPE	9	FEBR	23	FEPE	38	ERBO	1	FEBR	1
			GEDI	2	GEDI	1	FEPE	7	GEDI	2	FEBR	2	FEPE	20
			VISA	2	HOBR	2	GEDI	2	HOBR	1	FEPE	32	GEDI	1
			TH	38	HYGL	1	HOBR	1	HYGL	1	GEDI	1	HECUo	1
			BG	7	RUAC	7	HYGL	2	HYRA	1	HECUo	1	HOBR	1
					TH	48	MAGR	1	JUBU	4	HOMAg	1	HOMAg	3
					BG	10	PLCO	9	PLCO	3	TH	41	PLCO	1
							TH	44	RUCR	1	BG	3	RUSA	1
							BG	3	VISA	1			TH	56
									TH	35			BG	4
									BG	6				
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**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	27%	ELMA	1	ELMA	1	ELACa	2	PLCHh	2	EUOC	40	EUOC	30
			EUOC	36	EUOC	36	ELMA	1	LAGL3	1	PLCHh	1	GEDI	3
			GEDI	2	GEDI	1	EUOC	35	EUOC	30	RUCR	1	PLCHh	1
			HECUo	2	HYGL	1	GEDI	1	ELMA	1	LAGL3	1	ELMA	1
			HYGL	1	LAGL3	1	HOMAg	1	ELACa	1	ELMA	1	TH	62
			LYAR	1	PLCHh	1	HYGL	1	TH	60	TH	47	BG	3
			PLCHh	1	RUCR	1	LAGL3	1	BG	5	BG	9		
			RUCR	2	TH	50	PLCHh	1						
			TH	18	BG	8	TH	48						
			BG	36			BG	9						
			TOTAL	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**	**TOTAL**	**100**

Pond 101 West 2021 Species List					
Species Name	**Common Name**	**Species Code**	**Species Name**	**Common Name**	**Species Code**
Avena barbata	slender wild oat	AVBA	*Kickxia elatine*	sharpleaf cancerwort	KIEL
Baccharis pilularis	coyote brush	BAPI	*Lasthenia glaberrima*	smooth goldfields	LAGL3
Brassica nigra	black mustard	BRNI	*Logfia gallica*	narrowleaf cottonrose	LOGA
Briza maxima	rattlesnake grass	BRMA	*Lysimachia arvensis*	scarlet pimpernel	LYAR
Briza minor	annual quaking grass	BRMI	*Lythrum hyssopifolia*	grass poly	LYHY
Bromus diandrus	ripgut grass	BRDI	*Madia gracilis*	gumweed	MAGR
Bromus hordeaceus	soft chess	BRHO	*Madia sativa*	coast tarweed	MASA
Cotula coronopifolia	brass buttons	COCO	*Melilotus indicus*	Indian sweetclover	MEIN
Cyperus eragrostis	tall cyperus	CYER	*Plagiobothrys chorisianus* var. *hickmanii*	Hickman's popcornflower	PLCHH
Danthonia californica	California oat grass	DACA	*Plantago coronopus*	cut-leaved plantain	PLCO
Daucus carota	Queen Anne's lace	DACA6	*Polygonum aviculare* ssp. *depressum*	prostrate knotweed	POAVD
Deschampsia danthonioides	annual hair grass	DEDA	*Polypogon monspeliensis*	rabbitfoot grass	POMO
Distichlis spicata	salt grass	DISP	*Pseudognaphalium stramineum*	cottonbatting plant	PSST
Eleocharis acicularis var. *acicularis*	needle spikerush	ELACa	*Rorippa curvisiliqua*	western yellowcress	ROCU
Eleocharis macrostachya	pale spikerush	ELMA	*Rumex acetosella*	sheep sorrel	RUAC
Erodium botrys	long-beaked filaree	ERBO	*Rumex crispus*	curly dock	RUCR
Euthamia occidentalis	western goldenrod	EUOC	*Rumex salicifolius*	willow dock	RUSA
Festuca bromoides	brome fescue	FEBR	*Senecio glomeratus*	cutleaf burnweed	SEGL
Festuca perennis	Italian rye grass	FEPE	*Sonchus asper*	prickly sow thistle	SOAS
Galium aparine	goose grass	GAAP	*Sonchus oleraceus*	common sow thistle	SOOL
Geranium dissectum	cut-leaved geranium	GEDI	*Stachys ajugoides*	bugle hedge nettle	STAJ
Gnaphalium palustre	lowland cudweed	GNPA	*Trifolium microcephalum*	small head clover	TRMI
Heliotropium curassavicum var. *oculatum*	Chinese pusley	HECUO	*Vicia sativa*	spring vetch	VISA
Hordeum brachyantherum	meadow barley	HOBR	**Groundcover Codes**		
Hordeum marinum ssp. *gussoneanum*	Mediterranean barley	HOMAG	BG	Bare Ground	
Hypochaeris glabra	smooth cat's-ear	HYGL	TH	Thatch/Duff	
Hypochaeris radicata	rough cat's-ear	HYRA	AL	Algae	
Juncus bufonius	toad rush	JUBU			

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APPENDIX B

Stratum Cover by Vernal Pool

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Table B-1. Pond 5 (Reference) Wetland Vegetation Cover by Stratum

POND 5				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
1	**29%**	BAPI	coyote brush	0.2
		CRTR	spreading alkaliweed	0.2
		ELMA	pale spikerush	30.7
		ERCA	horseweed	0.2
		MALE	alkali mallow	2.8
		SEGL	cutleaf burnweed	0.7
		SOOL	common sow thistle	0.7
		TH	Thatch	56.8
		BG	Bare Ground	7.8
		TOTAL		**100.0**
2	**34%**	CRTR	spreading alkaliweed	0.3
		DISP	salt grass	22.8
		ELMA	pale spikerush	3.7
		MALE	alkali mallow	0.7
		TH	Thatch	69.8
		BG	Bare Ground	2.7
		TOTAL		**100.0**
3	**9%**	DISP	salt grass	5.8
		STAJ	bugle hedge nettle	33.0
		RUCR	curly dock	0.3
		HYGL	smooth cat's-ear	3.5
		ELMA	pale spikerush	0.5
		GEDI	cut-leaved geranium	2.7
		PHLE	Lemmon's canary grass	0.8
		PLCHh	Hickman's popcornflower	0.2
		BRMI	annual quaking grass	0.8
		AICA	silvery hair-grass	0.2
		CRTR	spreading alkaliweed	0.5
		GAAP	goose grass	0.2
		MAGR	gumweed	0.2
		TH	Thatch	49.5
		BG	Bare Ground	1.8
		TOTAL		**100.0**

Table B-1 (continued). Pond 5 (Reference) Wetland Vegetation Cover by Stratum

POND 5				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
7	**6%**	AGAV	Pacific bent grass	0.7
		BAPI	coyote brush	0.2
		GEDI	cut-leaved geranium	1.5
		HYGL	smooth cat's-ear	0.2
		JUBA	Baltic rush	36.0
		POMO	rabbitfoot grass	0.2
		PSRA	pink everlasting	0.7
		PSST	cottonbatting plant	1.3
		SEGL	cutleaf burnweed	1.0
		SOAS	prickly sow thistle	0.2
		SOOL	common sow thistle	2.3
		TH	Thatch	50.0
		BG	Bare Ground	5.8
		TOTAL		**100.0**
8	**22%**	AICA	silvery hair-grass	0.2
		BRDI	ripgut grass	0.3
		BRHO	soft chess	0.5
		BRMI	annual quaking grass	1.3
		DISP	salt grass	1.7
		ERBO	long-beaked filaree	0.7
		ERCA	horseweed	0.2
		GEDI	cut-leaved geranium	20.5
		HECUo	Chinese pusley	0.5
		HYGL	smooth cat's-ear	2.7
		JUBA	Baltic rush	1.3
		LYHY	grass poly	0.2
		MAGR	gumweed	0.3
		MASA	coast tarweed	0.3
		PHLE	Lemmon's canary grass	1.0
		POMO	rabbitfoot grass	0.2
		PSLU	weedy cudweed	1.0
		RUCR	curly dock	2.3
		SEGL	cutleaf burnweed	1.5
		SOAS	prickly sow thistle	2.7
		SOOL	common sow thistle	0.3
		STAJ	bugle hedge nettle	1.3
		TH	Thatch	48.8
		BG	Bare Ground	10.2
		TOTAL		**100.0**

Table B-2. Pond 101 East (East) (Reference) Wetland Vegetation Cover by Stratum

POND 101 East (East)				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
3	**57%**	AGAV	Pacific bent grass	4.8
		ELMA	pale spikerush	9.3
		ERCA	horseweed	0.2
		MALE	alkali mallow	24.5
		POMO	rabbitfoot grass	2.0
		RUCR	curly dock	3.7
		TH	Thatch	52.5
		BG	Bare Ground	3.3
		TOTAL		**100.3**
4	**3%**	EUOC	western goldenrod	3.8
		GEDI	cut-leaved geranium	0.7
		JUBA	Baltic rush	22.0
		RUAC	sheep sorrel	2.0
		TH	Thatch	68.0
		BG	Bare Ground	3.5
		TOTAL		**100.0**
5	**40%**	ELMA	pale spikerush	0.2
		EPCI	fringed willowherb	0.7
		ERBO	long-beaked filaree	4.0
		ERCA	horseweed	0.2
		GEDI	cut-leaved geranium	18.0
		HECUo	Chinese pusley	0.2
		HYGL	smooth cat's-ear	1.3
		MAGR	gumweed	0.8
		MALE	alkali mallow	0.7
		MASA	coast tarweed	0.5
		RUAC	sheep sorrel	2.3
		RUCR	curly dock	0.5
		SOOL	common sow thistle	0.2
		STAJ	bugle hedge nettle	11.0
		VISA	spring vetch	0.2
		VISAn	common vetch	0.5
		VISAs	spring vetch	1.3
		TH	Thatch	48.8
		BG	Bare Ground	8.7
		TOTAL		**100.0**

Table B-3. Pond 997 (Reference) Wetland Vegetation Cover by Stratum

POND 997				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
1	**9%**	BAPI	coyote brush	0.2
		BRHO	soft chess	0.3
		BRMA	rattlesnake grass	0.8
		ELMA	pale spikerush	0.2
		ERAR12	coyote thistle	27.2
		ERBO	long-beaked filaree	0.8
		JUBUb	common toad rush	0.3
		LYHY	grass poly	0.8
		PLCHh	Hickman's popcornflower	0.7
		PLCO	cut-leaved plantain	2.0
		PSCA	California everlasting	0.2
		PSCH	round woolly-marbles	1.2
		TH	Thatch	40.8
		BG	Bare Ground	24.7
		TOTAL		**100.2**
2 (CCG)	**2%**	-	-	-

Table B-3 (continued). Pond 997 (Reference) Wetland Vegetation Cover by Stratum

POND 997				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
3	**89%**	AICA	silvery hair-grass	0.5
		BRHO	soft chess	0.5
		BRMA	rattlesnake grass	16.3
		BRMI	annual quaking grass	0.8
		DACA	California oat grass	13.3
		DECO	coastal tarweed	1.2
		ERAR12	coyote thistle	5.5
		ERBO	long-beaked filaree	4.8
		FEBR	brome fescue	2.7
		GAUS	purple cudweed	0.2
		GEDI	cut-leaved geranium	0.7
		HYGL	smooth cat's-ear	3.5
		JUPH	brown-headed rush	0.3
		LYHY	grass poly	0.2
		LYMI	chaffweed	0.2
		MAGR	gumweed	2.3
		MIPA	marsh microseris	0.3
		PLCO	cut-leaved plantain	0.8
		RUAC	sheep sorrel	1.0
		SOOL	common sow thistle	0.2
		TRIX	coast pretty face	0.2
		TH	Thatch	32.3
		BG	Bare Ground	12.2
		TOTAL		**100.0**

Table B-4. Pond 3 North (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Cover by Stratum

POND 3 NORTH				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
2	**12%**	BRHO	soft chess	0.2
		COCO	brass buttons	0.2
		ELACa	needle spikerush	0.5
		ELMA	pale spikerush	45.8
		ERCA	horseweed	0.3
		FEBR	brome fescue	0.2
		FEPE	Italian rye grass	0.2
		GNPA	lowland cudweed	0.2
		LAGL3	smooth goldfields	1.5
		PLCHh	Hickman's popcornflower	0.3
		POMO	rabbitfoot grass	0.8
		RUCR	curly dock	0.5
		SEGL	cutleaf burnweed	0.7
		SOOL	common sow thistle	0.3
		TRDU	little hop clover	0.2
		VISA	spring vetch	0.3
		TH	Thatch	44.7
		BG	Bare Ground	3.3
		TOTAL		**100.2**

Table B-4 (continued). Pond 3 North (Year 3 Post-Subsurface Munitions Remediation) Wetland Vegetation Cover by Stratum

POND 3 NORTH				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
3	**52%**	ACPA	hill lotus	0.7
		AGLAv	vernal pool bent grass	0.3
		AICA	silvery hair-grass	0.7
		BRDI	ripgut grass	0.3
		BRHO	soft chess	1.2
		BRMI	annual quaking grass	0.7
		BRTEt	dwarf brodiaea	0.3
		CAAM	Johnny-Nip	2.8
		DACA	California oat grass	3.8
		DECO	coastal tarweed	1.2
		DEDA	annual hair grass	0.5
		ERAR12	coyote thistle	11.3
		ERBO	long-beaked filaree	1.2
		ERCA	horseweed	0.2
		ERCI	redstem filaree	0.2
		FEBR	brome fescue	1.3
		FEPE	Italian rye grass	6.5
		HYGL	smooth cat's-ear	1.5
		JUBU	toad rush	0.2
		JUPH	brown-headed rush	0.5
		LEPA	variable linanthus	0.2
		LOGA	narrowleaf cottonrose	0.2
		LYAR	scarlet pimpernel	0.8
		LYHY	grass poly	0.2
		LYMI	chaffweed	0.3
		MAEX	small tarweed	0.2
		MAGR	gumweed	0.2
		MIDOd	Douglas' silverpuffs	0.2
		MIPA	marsh microseris	3.0
		PLCO	cut-leaved plantain	0.7
		PLER	California plantain	0.2
		POMO	rabbitfoot grass	0.3
		SEGL	cutleaf burnweed	0.2
		SOOL	common sow thistle	0.3
		TRAN	narrow-leaved clover	0.7
		TRDU	little hop clover	0.3
		VISAn	common vetch	0.2
		TH	Thatch	23.8
		BG	Bare Ground	32.8
		TOTAL		**100.0**
4 (CCG)	**35%**	-	-	-
UPLAND	**1%**	-	-	-

Table B-5. Pond 3 South (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Cover by Stratum

POND 3 SOUTH				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
1	**28%**	AICA	silvery hair-grass	0.2
		BAPI	coyote brush	0.2
		COCO	brass buttons	0.8
		ELACa	needle spikerush	1.5
		ELMA	pale spikerush	6.3
		ERAR12	coyote thistle	5.5
		ERCA	horseweed	0.3
		FEPE	Italian rye grass	0.3
		GAUS	purple cudweed	0.2
		GEDI	cut-leaved geranium	0.5
		HYGL	smooth cat's-ear	0.3
		JUPH	brown-headed rush	2.0
		LAGL3	smooth goldfields	4.7
		LOGA	narrowleaf cottonrose	0.2
		LYHY	grass poly	0.2
		MALE	alkali mallow	3.0
		PLCHh	Hickman's popcornflower	3.8
		POMO	rabbitfoot grass	3.7
		PSST	cottonbatting plant	0.3
		SEGL	cutleaf burnweed	0.7
		TRDU	little hop clover	0.2
		TH	Thatch	47.7
		BG	Bare Ground	17.5
		TOTAL		**100.0**
2	**2%**	ELACa	needle spikerush	0.7
		ELMA	pale spikerush	0.7
		ELTR3	beardless wild rye	0.7
		ERAR12	coyote thistle	5.7
		FEPE	Italian rye grass	0.7
		GEDI	cut-leaved geranium	0.3
		HYRA	rough cat's-ear	0.3
		JUPH	brown-headed rush	23.0
		MALE	alkali mallow	3.7
		MIPA	marsh microseris	0.3
		TH	Thatch	61.3
		BG	Bare Ground	2.7
		TOTAL		**100.0**

Table B-5 (continued). Pond 3 South (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Cover by Stratum

POND 3 SOUTH				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
3	**37%**	ACMI	common yarrow	1.3
		AICA	silvery hair-grass	0.7
		AVBA	slender wild oat	0.2
		BRMI	annual quaking grass	0.3
		BRTEt	dwarf brodiaea	0.7
		CAAMa3	Johnny-Nip	0.3
		DACA	California oat grass	15.3
		DECO	coastal tarweed	3.8
		ERAR12	coyote thistle	3.0
		ERBO	long-beaked filaree	1.2
		FEBR	brome fescue	1.3
		FEPE	Italian rye grass	0.7
		GEDI	cut-leaved geranium	0.8
		HYGL	smooth cat's-ear	1.0
		HYRA	rough cat's-ear	0.3
		JUPH	brown-headed rush	0.3
		LOGA	narrowleaf cottonrose	1.0
		LYAR	scarlet pimpernel	0.8
		LYMI	chaffweed	0.2
		MAGR	gumweed	0.5
		PLCO	cut-leaved plantain	0.5
		PLER	California plantain	0.3
		PSST	cottonbatting plant	0.3
		SIBE	western blue-eyed grass	1.2
		SIMAm	checkerbloom	2.3
		SOOL	common sow thistle	0.3
		TH	Thatch	19.8
		BG	Bare Ground	41.5
		TOTAL		**100.2**

Table B-5 (continued). Pond 3 South (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Cover by Stratum

POND 3 SOUTH				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
4	**24%**	BRDI	ripgut grass	0.8
		BRHO	soft chess	1.0
		BRTEt	dwarf brodiaea	0.3
		DACA	California oat grass	0.3
		DECO	coastal tarweed	0.5
		ELMA	pale spikerush	0.8
		ERBO	long-beaked filaree	0.2
		FEBR	brome fescue	1.0
		FEPE	Italian rye grass	11.2
		GEDI	cut-leaved geranium	0.5
		HYGL	smooth cat's-ear	0.2
		JUPH	brown-headed rush	0.2
		MALE	alkali mallow	3.2
		MIPA	marsh microseris	0.8
		PLCO	cut-leaved plantain	0.2
		PSST	cottonbatting plant	0.2
		TH	Thatch	60.7
		BG	Bare Ground	18.2
		TOTAL		**100.2**
5 (CCG)	**0.1%**	-	-	-

Table B-5 (continued). Pond 3 South (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Cover by Stratum

POND 3 SOUTH				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
6	**7%**	BRDI	ripgut grass	0.2
		BRHO	soft chess	0.0
		BRTEt	dwarf brodiaea	0.0
		CAAM	Johnny-Nip	0.2
		DACA	California oat grass	0.5
		DECO	coastal tarweed	0.3
		ELMA	pale spikerush	0.2
		ERAR12	coyote thistle	1.5
		FEBR	brome fescue	0.5
		FEPE	Italian rye grass	0.0
		GEDI	cut-leaved geranium	0.0
		HYGL	smooth cat's-ear	0.0
		JUFA	falcate rush	6.8
		JUPH	brown-headed rush	0.5
		LYAR	scarlet pimpernel	0.3
		MALE	alkali mallow	0.2
		MIPA	marsh microseris	0.0
		PLCO	cut-leaved plantain	17.0
		PSST	cottonbatting plant	0.0
		TH	Thatch	36.3
		BG	Bare Ground	35.5
		TOTAL		**100.0**
UPLAND	**2%**	-	-	-

Table B-6. Pond 16 (Year 3 Post-Subsurface Munitions Remediation) Wetland Vegetation Cover by Stratum

POND 16				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
3	**38%**	AGEX	spike bent grass	0.3
		BRMI	annual quaking grass	0.2
		ELMA	pale spikerush	66.8
		GEDI	cut-leaved geranium	0.3
		HEEC	bristly oxtongue	0.2
		HYAN	creeping St. John's wort	1.7
		MALE	alkali mallow	0.7
		POMO	rabbitfoot grass	1.0
		PSLU	weedy cudweed	4.2
		SOOL	common sow thistle	0.2
		TH	Thatch	18.5
		BG	Bare Ground	6.0
		TOTAL		**100.0**
4	**11%**	BRHO	soft chess	0.3
		CAPR	clustered field sedge	47.8
		HEEC	bristly oxtongue	0.3
		JUBA	Baltic rush	1.2
		JUPH	brown-headed rush	0.8
		RUUR	California blackberry	3.8
		TH	Thatch	41.7
		BG	Bare Ground	4.3
		TOTAL		**100.3**
5	**30%**	CABA	whiteroot	34.3
		RUUR	California blackberry	11.8
		SOEL	West Coast Canada goldenrod	10.2
		TH	Thatch	43.7
		TOTAL		**100.0**

Table B-6 (continued). Pond 16 (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Cover by Stratum

POND 16				
Stratum	**Relative % Cover of Wetland**	**Species**	**Species Common Name**	**% Cover**
6	**11%**	ELMA	pale spikerush	0.3
		JUBA	Baltic rush	41.7
		TH	Thatch	55.7
		BG	Bare Ground	2.3
		TOTAL		**100.0**
8	**5%**	BAPI	coyote brush	0.2
		ELMA	pale spikerush	0.3
		ERCA	horseweed	0.5
		FEBR	brome fescue	0.5
		GEDI	cut-leaved geranium	1.3
		GNPA	lowland cudweed	0.7
		HEGR	telegraph weed	0.7
		POMO	rabbitfoot grass	39.3
		PSLU	weedy cudweed	1.2
		PSST	cottonbatting plant	2.5
		TH	Thatch	11.3
		BG	Bare Ground	41.5
		TOTAL		**100.0**

Table B-7. Pond 35 (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Cover by Stratum

POND 35				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
1	**18%**	COCO	brass buttons	1.8
		ELMA	pale spikerush	1.2
		FEBR	brome fescue	0.2
		FEMY	rattail sixweeks grass	0.2
		GEDI	cut-leaved geranium	0.2
		LAGL3	smooth goldfields	0.3
		PLCHh	Hickman's popcornflower	9.0
		PLCO	cut-leaved plantain	29.5
		PSCH	round woolly-marbles	0.7
		TH	Thatch	39.3
		BG	Bare Ground	17.5
		TOTAL		**99.8**
2	**42%**	ELMA	pale spikerush	0.3
		GEDI	cut-leaved geranium	0.2
		HYGL	smooth cat's-ear	0.2
		PLCO	cut-leaved plantain	34.2
		PSCH	round woolly-marbles	1.2
		TRAN	narrow-leaved clover	1.0
		TH	Thatch	29.2
		BG	Bare Ground	33.8
		TOTAL		**100.0**
3	**12%**	BAPI	coyote brush	0.5
		BRDI	ripgut grass	0.2
		BRHO	soft chess	1.3
		FEPE	Italian rye grass	15.0
		GEDI	cut-leaved geranium	3.2
		HOBR	meadow barley	15.2
		PLCO	cut-leaved plantain	4.8
		TRAN	narrow-leaved clover	1.7
		TRDU	little hop clover	0.2
		VIHI	hairy vetch	0.8
		VISA	spring vetch	0.3
		TH	Thatch	29.8
		BG	Bare Ground	27.0
		TOTAL		**100.0**

Table B-7 (continued). Pond 35 (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Cover by Stratum

POND 35				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
4	**28%**	ACWR	Chilean trefoil	0.2
		AICA	silvery hair-grass	0.2
		BRDI	ripgut grass	0.3
		BRHO	soft chess	2.2
		DACA	California oat grass	1.3
		ERBO	long-beaked filaree	4.8
		FEBR	brome fescue	2.7
		FEPE	Italian rye grass	1.8
		GEDI	cut-leaved geranium	0.3
		HOBR	meadow barley	2.0
		HYGL	smooth cat's-ear	0.5
		HYRA	rough cat's-ear	0.2
		JUOC	western rush	0.2
		LUBI	miniature lupine	1.2
		MAGR	gumweed	0.2
		PLCO	cut-leaved plantain	6.5
		RUAC	sheep sorrel	0.3
		TAOV	sun cups	0.2
		TRAN	narrow-leaved clover	6.5
		TH	Thatch	45.3
		BG	Bare Ground	23.0
		TOTAL		**99.8**

Table B-8. Pond 39 (Year 3 Post-Subsurface Munitions Remediation) Wetland Vegetation Cover by Stratum

POND 39				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
1	**3%**	BRHO	soft chess	0.3
		BRMI	annual quaking grass	0.7
		COCO	brass buttons	0.3
		ELACa	needle spikerush	7.7
		ELMA	pale spikerush	48.3
		ERCA	horseweed	1.0
		FEPE	Italian rye grass	0.3
		GEDI	cut-leaved geranium	0.3
		HOBR	meadow barley	0.7
		JUPH	brown-headed rush	7.3
		PLCHh	Hickman's popcornflower	3.3
		RUCR	curly dock	0.3
		VISAs	spring vetch	0.3
		TH	Thatch	16.3
		BG	Bare Ground	12.7
		TOTAL		**100.0**
3	**3%**	AVBA	slender wild oat	0.7
		BRDI	ripgut grass	0.3
		BRHO	soft chess	2.3
		DACA	California oat grass	0.7
		ERBO	long-beaked filaree	1.7
		FEBR	brome fescue	0.7
		FEMY	rattail sixweeks grass	1.0
		FEPE	Italian rye grass	24.0
		GEDI	cut-leaved geranium	1.3
		HOBR	meadow barley	0.3
		JUOC	western rush	1.0
		MASA	coast tarweed	0.3
		TRAN	narrow-leaved clover	2.0
		VIHI	hairy vetch	1.0
		VISA	spring vetch	0.3
		VISAn	common vetch	0.3
		TH	Thatch	60.0
		BG	Bare Ground	2.0
		TOTAL		**100.0**

Table B-8 (continued). Pond 39 (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Cover by Stratum

POND 39				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
4	**78%**	BRDI	ripgut grass	1.0
		BRHO	soft chess	0.5
		BRTEt	dwarf brodiaea	0.2
		DACA	California oat grass	59.2
		ERBO	long-beaked filaree	0.3
		FEBR	brome fescue	1.0
		FEPE	Italian rye grass	0.3
		GEDI	cut-leaved geranium	5.2
		HOMAg	Mediterranean barley	0.2
		JUPH	brown-headed rush	0.2
		MIPA	marsh microseris	0.7
		PLCO	cut-leaved plantain	2.8
		TRAN	narrow-leaved clover	0.3
		VIHI	hairy vetch	0.2
		VISAs	spring vetch	2.0
		TH	Thatch	20.8
		BG	Bare Ground	5.2
		TOTAL		**100.0**
UPLAND	**16%**	-	-	-

Table B-9. Pond 40 South (Year 3 Post-Subsurface Munitions Remediation) Wetland Vegetation Cover by Stratum

POND 40 SOUTH				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
1	**10%**	BRMI	annual quaking grass	0.3
		ELACa	needle spikerush	1.0
		ELMA	pale spikerush	7.7
		ERBO	long-beaked filaree	1.0
		FEPE	Italian rye grass	0.7
		GEDI	cut-leaved geranium	0.3
		PLCHh	Hickman's popcornflower	16.7
		PLCO	cut-leaved plantain	14.3
		RUCR	curly dock	0.7
		TRAN	narrow-leaved clover	0.3
		TH	Thatch	48.0
		BG	Bare Ground	9.0
		TOTAL		**100.0**
2	**55%**	AICA	silvery hair-grass	0.7
		BRHO	soft chess	0.7
		ERBO	long-beaked filaree	9.3
		FEBR	brome fescue	1.3
		FEMY	rattail sixweeks grass	0.7
		HYGL	smooth cat's-ear	6.0
		JUPH	brown-headed rush	3.0
		PLCO	cut-leaved plantain	8.3
		PLLA	English plantain	0.3
		RUAC	sheep sorrel	2.7
		SIGA	small-flower catchfly	0.7
		TRAN	narrow-leaved clover	1.0
		TH	Thatch	31.0
		BG	Bare Ground	34.3
		TOTAL		**100.0**

Table B-9 (continued). Pond 40 South (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Cover by Stratum

POND 40 SOUTH				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
3	**35%**	BRHO	soft chess	0.2
		DACA	California oat grass	0.8
		ELACa	needle spikerush	2.8
		ERCA	horseweed	0.2
		FEBR	brome fescue	1.5
		FEPE	Italian rye grass	47.2
		GEDI	cut-leaved geranium	0.3
		HOBR	meadow barley	0.2
		JUPH	brown-headed rush	0.7
		MAGR	gumweed	0.2
		PLCHh	Hickman's popcornflower	4.5
		POMO	rabbitfoot grass	0.2
		VISA	spring vetch	0.3
		TH	Thatch	34.7
		BG	Bare Ground	6.3
		TOTAL		**100.0**

Table B-10. Pond 41 (Year 3 Post-Subsurface Munitions Remediation) Wetland Vegetation Cover by Stratum

POND 41				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
1	**3%**	DEDA	annual hair grass	0.3
		ELACa	needle spikerush	3.0
		ELMA	pale spikerush	2.0
		ERAR12	coyote thistle	0.7
		GEDI	cut-leaved geranium	10.3
		LAGL3	smooth goldfields	19.3
		MALE	alkali mallow	11.7
		PHLE	Lemmon's canary grass	1.7
		PLCHh	Hickman's popcornflower	2.7
		RUCR	curly dock	4.0
		STAJ	bugle hedge nettle	0.3
		TH	Thatch	37.0
		BG	Bare Ground	7.0
		TOTAL		**100.0**
2	**87%**	AICA	silvery hair-grass	0.2
		BRHO	soft chess	10.2
		BRMI	annual quaking grass	0.5
		DEDA	annual hair grass	0.2
		ELACa	needle spikerush	1.3
		ELMA	pale spikerush	0.3
		ERAR12	coyote thistle	4.7
		ERCI	redstem filaree	0.2
		FEBR	brome fescue	0.2
		GEDI	cut-leaved geranium	11.2
		HYGL	smooth cat's-ear	0.2
		JUPH	brown-headed rush	0.3
		LAGL3	smooth goldfields	1.2
		MALE	alkali mallow	1.8
		PHLE	Lemmon's canary grass	1.0
		PLCHh	Hickman's popcornflower	9.7
		POMO	rabbitfoot grass	0.5
		RUCR	curly dock	0.2
		STAJ	bugle hedge nettle	5.3
		TH	Thatch	48.2
		BG	Bare Ground	2.8
		TOTAL		**100.0**

Table B-10 (continued). Pond 41 (Year 3 Post-Subsurface Munitions Remediation) Wetland Vegetation Cover by Stratum

POND 41				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
3	**6%**	JUPH	brown-headed rush	27.8
		GEDI	cut-leaved geranium	3.8
		MALE	alkali mallow	1.5
		ELACa	needle spikerush	4.0
		RUCR	curly dock	2.5
		PLCHh	Hickman's popcornflower	0.7
		STAJ	bugle hedge nettle	0.3
		HYRA	rough cat's-ear	0.2
		DEDA	annual hair grass	0.2
		BRMI	annual quaking grass	0.8
		HYGL	smooth cat's-ear	0.2
		SOOL	common sow thistle	0.8
		ACMI	common yarrow	0.2
		ERCA	horseweed	0.2
		UNK1	Unknown 1	0.2
		TH	Thatch	55.5
		BG	Bare Ground	1.2
		TOTAL		**100.0**

Table B-10 (continued). Pond 41 (Year 3 Post-Subsurface Munitions Remediation) Wetland Vegetation Cover by Stratum

POND 41				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
4	**4%**	ACAMa	Spanish lotus	0.2
		ACMI	common yarrow	1.5
		AICA	silvery hair-grass	1.0
		BAPI	coyote brush	0.2
		BRHO	soft chess	0.5
		BRMI	annual quaking grass	1.0
		BRTEt	dwarf brodiaea	0.7
		CAAM	Johnny-Nip	0.2
		DACA	California oat grass	6.0
		DECO	coastal tarweed	0.2
		ELACa	needle spikerush	0.8
		ERAR12	coyote thistle	1.3
		ERBO	long-beaked filaree	1.3
		FEBR	brome fescue	1.2
		GEDI	cut-leaved geranium	3.5
		HYGL	smooth cat's-ear	5.5
		HYRA	rough cat's-ear	1.7
		JUPH	brown-headed rush	1.0
		LUCO6	Pacific woodrush	0.5
		MAGR	gumweed	5.8
		STAJ	bugle hedge nettle	0.2
		TH	Thatch	57.0
		BG	Bare Ground	8.8
		TOTAL		**100.0**

Table B-11. Pond 42 (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Cover by Stratum

POND 42				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
1	**17%**	BRHO	soft chess	0.2
		BRMI	annual quaking grass	0.3
		BRTEt	dwarf brodiaea	0.2
		COCO	brass buttons	0.7
		DEDA	annual hair grass	0.5
		ELACa	needle spikerush	42.0
		ERAR12	coyote thistle	6.0
		FEBR	brome fescue	0.5
		GEDI	cut-leaved geranium	0.2
		GNPA	lowland cudweed	0.3
		HYGL	smooth cat's-ear	0.3
		JUPH	brown-headed rush	3.2
		LYHY	grass poly	0.3
		PLCHh	Hickman's popcornflower	0.7
		POMO	rabbitfoot grass	2.3
		SEGL	cutleaf burnweed	0.8
		TH	Thatch	29.3
		BG	Bare Ground	12.2
		TOTAL		**100.0**
2	**7%**	ELMA	pale spikerush	30.7
		ERAR12	coyote thistle	1.0
		PHLE	Lemmon's canary grass	0.3
		PSLU	weedy cudweed	0.3
		SEGL	cutleaf burnweed	0.7
		SOOL	common sow thistle	0.3
		TH	Thatch	60.0
		BG	Bare Ground	6.7
		TOTAL		**100.0**

Table B-11 (continued). Pond 42 (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Cover by Stratum

POND 42				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
3	**28%**	BRMI	annual quaking grass	0.2
		COCO	brass buttons	0.7
		DECO	coastal tarweed	0.3
		DEDA	annual hair grass	0.2
		ELACa	needle spikerush	10.0
		ERAR12	coyote thistle	6.5
		ERCA	horseweed	0.2
		FEMY	rattail sixweeks grass	0.3
		GEDI	cut-leaved geranium	0.3
		GNPA	lowland cudweed	0.3
		HYGL	smooth cat's-ear	0.2
		HYRA	rough cat's-ear	0.2
		JUPH	brown-headed rush	14.0
		LAGL3	smooth goldfields	0.2
		LOGA	narrowleaf cottonrose	0.2
		LYAR	scarlet pimpernel	0.2
		LYHY	grass poly	0.2
		PLCHh	Hickman's popcornflower	0.7
		POMO	rabbitfoot grass	1.8
		PSLU	weedy cudweed	0.2
		SEGL	cutleaf burnweed	0.7
		SOOL	common sow thistle	0.2
		TH	Thatch	42.8
		BG	Bare Ground	20.5
		TOTAL		**100.8**

Table B-11 (continued). Pond 42 (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Cover by Stratum

POND 42				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
4	**11%**	DACA	California oat grass	18.0
		DECO	coastal tarweed	2.0
		ERBO	long-beaked filaree	3.0
		GAUS	purple cudweed	0.7
		MIPA	marsh microseris	0.7
		LYAR	scarlet pimpernel	1.0
		FEMY	rattail sixweeks grass	1.7
		PLER	California plantain	1.0
		BRMA	rattlesnake grass	0.3
		LOGA	narrowleaf cottonrose	1.0
		BRMI	annual quaking grass	1.0
		CAAT	valley tassels	1.0
		HYGL	smooth cat's-ear	1.7
		ERAR12	coyote thistle	2.7
		AICA	silvery hair-grass	0.3
		TRDU	little hop clover	0.3
		POMO	rabbitfoot grass	0.3
		BRTEt	dwarf brodiaea	0.3
		AVBA	slender wild oat	0.3
		TH	Thatch	21.3
		BG	Bare Ground	41.3
		TOTAL		**100.0**
5	**11%**	COCO	brass buttons	9.3
		ERCA	horseweed	0.3
		LYHY	grass poly	0.7
		POMO	rabbitfoot grass	25.0
		PSLU	weedy cudweed	7.0
		SEGL	cutleaf burnweed	0.7
		TH	Thatch	51.3
		BG	Bare Ground	5.7
		TOTAL		**100.0**
UPLAND	**26%**	-	-	-

Table B-12. Pond 43 (Year 3 Post-Subsurface Munitions Remediation) Wetland Vegetation Cover by Stratum

POND 43				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
1	**71%**	BRTEt	dwarf brodiaea	0.2
		CRAQ	aquatic pygmy-weed	0.5
		DECO	coastal tarweed	0.7
		DEDA	annual hair grass	1.2
		ELACa	needle spikerush	2.2
		ERAR12	coyote thistle	13.7
		FEBR	brome fescue	0.3
		FEMY	rattail sixweeks grass	0.2
		GAUS	purple cudweed	0.3
		HYGL	smooth cat's-ear	1.2
		HYRA	rough cat's-ear	4.7
		JUBUb	common toad rush	0.2
		JUPH	brown-headed rush	3.5
		LAGL3	smooth goldfields	0.2
		LOGA	narrowleaf cottonrose	0.3
		LYAR	scarlet pimpernel	1.0
		LYHY	grass poly	0.8
		LYMI	chaffweed	0.2
		PLCHh	Hickman's popcornflower	5.0
		POMO	rabbitfoot grass	1.5
		POZI	Sacramento mesa mint	1.8
		PSCH	round woolly-marbles	1.3
		SOAS	prickly sow thistle	0.3
		TH	Thatch	28.3
		BG	Bare Ground	30.5
		TOTAL		**100.0**

Table B-12 (continued). Pond 43 (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Cover by Stratum

POND 43				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
2	**9%**	BRHO	soft chess	0.3
		BRMI	annual quaking grass	1.0
		DEDA	annual hair grass	1.0
		ERAR12	coyote thistle	2.0
		FEBR	brome fescue	0.3
		GAUS	purple cudweed	0.7
		GEDI	cut-leaved geranium	1.3
		HYGL	smooth cat's-ear	3.7
		HYRA	rough cat's-ear	1.7
		JUPH	brown-headed rush	23.0
		LOGA	narrowleaf cottonrose	0.3
		LYAR	scarlet pimpernel	1.7
		LYHY	grass poly	0.3
		LYMI	chaffweed	1.3
		MAGR	gumweed	0.3
		PLCHh	Hickman's popcornflower	5.7
		PLCO	cut-leaved plantain	0.3
		POMO	rabbitfoot grass	0.7
		POZI	Sacramento mesa mint	0.3
		PSCH	round woolly-marbles	1.3
		SOOL	common sow thistle	0.7
		VELAl	western vervain	0.7
		TH	Thatch	31.0
		BG	Bare Ground	20.3
		TOTAL		**100.0**

Table B-12 (continued). Pond 43 (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Cover by Stratum

POND 43				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
3	**12%**	ACAMa	Spanish lotus	1.0
		AICA	silvery hair-grass	1.3
		BRHO	soft chess	2.0
		BRMI	annual quaking grass	1.0
		DACA	California oat grass	15.3
		DECO	coastal tarweed	0.7
		ELACa	needle spikerush	1.7
		ERAR12	coyote thistle	2.0
		FEBR	brome fescue	1.7
		GAUS	purple cudweed	0.7
		GEDI	cut-leaved geranium	1.7
		HO sp.	sterile barley	0.3
		HYGL	smooth cat's-ear	1.3
		HYRA	rough cat's-ear	0.3
		JUPH	brown-headed rush	0.7
		LOGA	narrowleaf cottonrose	0.3
		LYAR	scarlet pimpernel	0.7
		LYHY	grass poly	0.3
		MAGR	gumweed	2.0
		PLCHh	Hickman's popcornflower	0.3
		PLCO	cut-leaved plantain	7.0
		PLER	California plantain	0.3
		PSCH	round woolly-marbles	0.3
		SIBE	western blue-eyed grass	0.3
		SOOL	common sow thistle	0.7
		TAOV	sun cups	0.7
		TRDU	little hop clover	2.0
		TROB	Capetown grass	1.7
		TH	Thatch	14.3
		BG	Bare Ground	37.3
		TOTAL		**100.0**
UPLAND	**8%**	-	-	-

Table B-13. Pond 44 (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Cover by Stratum

POND 44				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
1	**63%**	ACPA	hill lotus	0.3
		AGLAv	vernal pool bent grass	0.8
		BAPI	coyote brush	0.2
		BRDI	ripgut grass	0.3
		BRMI	annual quaking grass	1.3
		BRTEt	dwarf brodiaea	0.3
		CRAQ	aquatic pygmy-weed	0.2
		DECO	coastal tarweed	0.5
		DEDA	annual hair grass	0.5
		ELACa	needle spikerush	2.0
		ERAR12	coyote thistle	8.5
		FEBR	brome fescue	0.3
		FEMY	rattail sixweeks grass	0.2
		GEDI	cut-leaved geranium	1.2
		HYGL	smooth cat's-ear	0.5
		HYRA	rough cat's-ear	1.3
		JUBU	toad rush	0.7
		JUPH	brown-headed rush	8.3
		LAGL3	smooth goldfields	0.5
		LYAR	scarlet pimpernel	0.3
		LYHY	grass poly	1.0
		LYMI	chaffweed	0.8
		PLCHh	Hickman's popcornflower	4.2
		PLCO	cut-leaved plantain	5.3
		PLER	California plantain	0.2
		POMO	rabbitfoot grass	0.7
		POZI	Sacramento mesa mint	0.5
		PSCH	round woolly-marbles	1.3
		SOOL	common sow thistle	0.7
		TAOV	sun cups	0.2
		TRDU	little hop clover	0.7
		TRSC	flowering quillwort	0.5
		TRVA	variegated clover	0.2
		VISA	spring vetch	0.2
		VISAn	common vetch	0.3
		TH	Thatch	26.5
		BG	Bare Ground	28.5
		TOTAL		**100.0**

Table B-13 (continued). Pond 44 (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Cover by Stratum

POND 44				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
3	**25%**	ACPA	hill lotus	0.7
		AICA	silvery hair-grass	1.2
		BRHO	soft chess	1.5
		BRMA	rattlesnake grass	0.3
		BRMI	annual quaking grass	1.3
		BRTEt	dwarf brodiaea	0.3
		CAAT	valley tassels	0.5
		DACA	California oat grass	4.0
		DECO	coastal tarweed	1.0
		ELACa	needle spikerush	0.2
		ERAR12	coyote thistle	0.2
		ERBO	long-beaked filaree	1.8
		FEBR	brome fescue	4.3
		GEDI	cut-leaved geranium	1.8
		HYGL	smooth cat's-ear	1.2
		HYRA	rough cat's-ear	1.3
		JUBU	toad rush	0.7
		JUOC	western rush	0.3
		JUPH	brown-headed rush	0.3
		LYAR	scarlet pimpernel	2.0
		LYHY	grass poly	0.7
		LYMI	chaffweed	0.3
		MAEX	small tarweed	0.2
		MAGR	gumweed	3.2
		MASA	coast tarweed	5.2
		PLCO	cut-leaved plantain	8.2
		POMO	rabbitfoot grass	0.2
		PSCH	round woolly-marbles	0.2
		SIGA	small-flower catchfly	0.2
		SOOL	common sow thistle	0.3
		TAOV	sun cups	0.7
		TRCA5	hop clover	0.7
		TRDU	little hop clover	1.5
		TRGR	pin point clover	0.2
		TRVA	variegated clover	0.2
		VISA	spring vetch	0.5
		VISAn	common vetch	0.3
		TH	Thatch	19.2
		BG	Bare Ground	33.3
		TOTAL		**100.0**
UPLAND	**12%**	**-**	**-**	**-**

Table B-14. Pond 54 (Year 3 Post-Mastication) Wetland Vegetation Cover by Stratum

POND 54				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
1	**12%**	BRMI	annual quaking grass	0.2
		ELMA	pale spikerush	12.5
		HYGL	smooth cat's-ear	0.2
		JUPH	brown-headed rush	11.2
		MALE	alkali mallow	1.3
		PHLE	Lemmon's canary grass	1.3
		PLCHh	Hickman's popcornflower	0.7
		RUCR	curly dock	0.3
		STAJ	bugle hedge nettle	0.5
		TH	Thatch	71.0
		BG	Bare Ground	0.8
		TOTAL		**100.0**
5	**57%**	DEDA	annual hair grass	1.2
		ELACa	needle spikerush	1.7
		ELMA	pale spikerush	2.0
		ERAR12	coyote thistle	0.8
		FEBR	brome fescue	0.3
		JUPH	brown-headed rush	5.8
		LAGL3	smooth goldfields	7.8
		MALE	alkali mallow	8.5
		PHLE	Lemmon's canary grass	2.2
		PLCHh	Hickman's popcornflower	0.7
		POMO	rabbitfoot grass	0.2
		STAJ	bugle hedge nettle	3.3
		TH	Thatch	65.5
		BG	Bare Ground	1.7
		TOTAL		**101.7**

Table B-14 (continued). Pond 54 (Year 3 Post-Mastication) Wetland Vegetation Cover by Stratum

POND 54				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
6	**31%**	BAPI	coyote brush	0.2
		BRMI	annual quaking grass	0.5
		ELACa	needle spikerush	1.3
		ELMA	pale spikerush	1.2
		ERAR12	coyote thistle	4.5
		ERBO	long-beaked filaree	0.7
		ERCA	horseweed	0.3
		GEDI	cut-leaved geranium	23.7
		HYRA	rough cat's-ear	0.2
		JUPH	brown-headed rush	2.7
		MALE	alkali mallow	0.5
		PHLE	Lemmon's canary grass	0.5
		STAJ	bugle hedge nettle	2.7
		TH	Thatch	50.3
		BG	Bare Ground	10.8
		TOTAL		**100.0**

Table B-15. Pond 60 (Year 3 Post-Subsurface Munitions Remediation) Wetland Vegetation Cover by Stratum

POND 60				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
1	**8%**	ELMA	pale spikerush	50.2
		MALE	alkali mallow	3.7
		TH	Thatch	38.3
		BG	Bare Ground	7.8
		TOTAL		**100.0**
2	**44%**	DISP	salt grass	15.3
		ELMA	pale spikerush	4.0
		FEPE	Italian rye grass	0.2
		GAUS	purple cudweed	0.5
		PS sp.	*Pseudognaphalium* sp.	0.2
		SEGL	cutleaf burnweed	0.7
		SOOL	common sow thistle	0.2
		TH	Thatch	77.2
		BG	Bare Ground	1.8
		TOTAL		**100.0**
3	**9%**	DISP	salt grass	16.3
		ELMA	pale spikerush	1.5
		JUPH	brown-headed rush	11.8
		TH	Thatch	68.7
		BG	Bare Ground	1.7
		TOTAL		**100.0**

Table B-15 (continued). Pond 60 (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Cover by Stratum

POND 60				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
4	**39%**	ACPA	hill lotus	0.2
		BRMI	annual quaking grass	0.8
		COCO	brass buttons	0.3
		DISP	salt grass	10.5
		ELMA	pale spikerush	0.2
		EPCI	fringed willowherb	0.2
		ERAR12	coyote thistle	1.3
		ERCA	horseweed	0.3
		GEDI	cut-leaved geranium	3.7
		HYGL	smooth cat's-ear	0.5
		JUPH	brown-headed rush	1.3
		LYHY	grass poly	0.8
		PHLE	Lemmon's canary grass	3.7
		PLCHh	Hickman's popcornflower	3.0
		PSST	cottonbatting plant	0.3
		RUCR	curly dock	1.2
		SEGL	cutleaf burnweed	0.8
		SOOL	common sow thistle	0.7
		STAJ	bugle hedge nettle	3.2
		TH	Thatch	65.0
		BG	Bare Ground	2.0
		TOTAL		**100.0**

Table B-16. Pond 61 (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Cover by Stratum

POND 61				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
1	**0.2%**	BRTEt	dwarf brodiaea	0.5
		CIQU	timwort	0.2
		ELACa	needle spikerush	0.7
		ELMA	pale spikerush	8.0
		JUBUo	round-fruited toad rush	0.2
		LACO	Contra Costa goldfields	0.8
		LAGL3	smooth goldfields	3.5
		LYHY	grass poly	0.7
		PLCHh	Hickman's popcornflower	2.8
		POZI	Sacramento mesa mint	0.5
		PSCH	round woolly-marbles	0.5
		SOOL	common sow thistle	0.2
		TH	Thatch	28.5
		BG	Bare Ground	53.7
		TOTAL		**100.7**
2 (CCG)	**5%**	-	-	-

Table B-16 (continued). Pond 61 (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Cover by Stratum

POND 61				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
3	**4%**	AGLAv	vernal pool bent grass	0.2
		BRMA	rattlesnake grass	0.8
		BRMI	annual quaking grass	1.0
		BRTEt	dwarf brodiaea	6.5
		CAPY	Italian thistle	0.2
		DECO	coastal tarweed	1.7
		DEDA	annual hair grass	1.0
		ELACa	needle spikerush	2.0
		ERAR12	coyote thistle	4.3
		ERBO	long-beaked filaree	1.2
		FEBR	brome fescue	0.5
		GEDI	cut-leaved geranium	1.3
		HYGL	smooth cat's-ear	1.3
		HYRA	rough cat's-ear	1.7
		JUPH	brown-headed rush	0.8
		LAGL3	smooth goldfields	0.7
		LYAR	scarlet pimpernel	0.5
		LYHY	grass poly	0.3
		MAGR	gumweed	0.2
		MASA	coast tarweed	0.3
		MIPA	marsh microseris	0.2
		PLCHh	Hickman's popcornflower	16.5
		POZI	Sacramento mesa mint	3.0
		PSCH	round woolly-marbles	0.2
		SOOL	common sow thistle	0.5
		TRDU	little hop clover	0.2
		URLI5	silver puffs	0.3
		TH	Thatch	45.2
		BG	Bare Ground	7.7
		TOTAL		**100.2**

Table B-16 (continued). Pond 61 (Year 3 Post-Subsurface Munitions Remediation)
Wetland Vegetation Cover by Stratum

POND 61				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
4	**58%**	BRHO	soft chess	0.5
		BRMA	rattlesnake grass	25.5
		BRMI	annual quaking grass	0.8
		BRTEt	dwarf brodiaea	1.2
		CAUN	pink star-tulip	0.7
		DACA	California oat grass	9.0
		DECO	coastal tarweed	2.7
		ERAR12	coyote thistle	0.2
		ERBO	long-beaked filaree	3.7
		FEBR	brome fescue	0.7
		GEDI	cut-leaved geranium	1.7
		HYGL	smooth cat's-ear	3.8
		HYRA	rough cat's-ear	3.7
		LYAR	scarlet pimpernel	0.8
		MAGR	gumweed	2.7
		MASA	coast tarweed	0.8
		MIPA	marsh microseris	3.5
		SOOL	common sow thistle	0.3
		TH	Thatch	32.0
		BG	Bare Ground	5.7
		TOTAL		**99.8**
UPLAND	**33%**	-	-	-

Table B-17. Pond 73 (Year 3 Post-Subsurface Munitions Remediation) Wetland Vegetation Cover by Stratum

POND 73				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
1	**2%**	ELMA	pale spikerush	34.3
		ERCA	horseweed	0.3
		JUPH	brown-headed rush	0.3
		LAGL3	smooth goldfields	1.3
		PLCHh	Hickman's popcornflower	0.3
		SEGL	cutleaf burnweed	0.7
		TH	Thatch	62.7
		TOTAL		**100.0**
2	**27%**	BRTEt	dwarf brodiaea	1.2
		ELACa	needle spikerush	1.8
		ELMA	pale spikerush	1.2
		ERAR12	coyote thistle	1.5
		HYRA	rough cat's-ear	0.2
		JUPH	brown-headed rush	23.8
		LAGL3	smooth goldfields	0.7
		TH	Thatch	63.0
		BG	Bare Ground	6.7
		TOTAL		**100.0**

Table B-17 (continued). Pond 73 (Year 3 Post-Subsurface Munitions Remediation) Wetland Vegetation Cover by Stratum

POND 73				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
4	**68%**	ACMI	common yarrow	0.2
		AGLAv	vernal pool bent grass	0.2
		AICA	silvery hair-grass	0.7
		BRMI	annual quaking grass	1.3
		BRTEt	dwarf brodiaea	0.7
		CAAM	Johnny-Nip	0.2
		DECO	coastal tarweed	2.5
		DEDA	annual hair grass	0.5
		ELACa	needle spikerush	1.5
		ERAR12	coyote thistle	17.2
		ERBO	long-beaked filaree	0.2
		GAUS	purple cudweed	0.5
		GEDI	cut-leaved geranium	2.2
		HYGL	smooth cat's-ear	6.8
		HYRA	rough cat's-ear	3.2
		ISHO	Howell's quillwort	0.2
		JUBU	toad rush	0.2
		JUPH	brown-headed rush	0.8
		LOGA	narrowleaf cottonrose	0.3
		MASA	coast tarweed	0.2
		MIPA	marsh microseris	0.3
		PLCHh	Hickman's popcornflower	0.8
		POMO	rabbitfoot grass	0.3
		PSCH	round woolly-marbles	0.5
		SEGL	cutleaf burnweed	0.2
		SIGA	small-flower catchfly	0.2
		SOOL	common sow thistle	0.2
		TH	Thatch	35.5
		BG	Bare Ground	22.7
		TOTAL		**100.0**
UPLAND	**3%**	-	-	-

Table B-18. Pond 74 (Year 3 Post-Mastication) Wetland Vegetation Cover by Stratum

POND 74				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
1	**6%**	BAPI	coyote brush	0.3
		BRMI	annual quaking grass	0.3
		BRTEt	dwarf brodiaea	1.3
		DECO	coastal tarweed	0.3
		ERAR12	coyote thistle	26.7
		ERCI	redstem filaree	0.7
		GNPA	lowland cudweed	1.0
		HYGL	smooth cat's-ear	1.0
		HYRA	rough cat's-ear	2.3
		ISCE	low bulrush	1.0
		JUPH	brown-headed rush	2.3
		LOGA	narrowleaf cottonrose	1.0
		LYAR	scarlet pimpernel	0.7
		LYHY	grass poly	0.3
		LYMI	chaffweed	0.7
		PLCHh	Hickman's popcornflower	5.7
		POMO	rabbitfoot grass	0.3
		POZI	Sacramento mesa mint	9.7
		SEGL	cutleaf burnweed	0.7
		SOOL	common sow thistle	0.7
		TH	Thatch	36.3
		BG	Bare Ground	7.0
		TOTAL		**100.3**

Table B-18 (continued). Pond 74 (Year 3 Post-Mastication) Wetland Vegetation Cover by Stratum

POND 74				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
3	**21%**	AICA	silvery hair-grass	0.3
		BRMI	annual quaking grass	0.7
		BRTEt	dwarf brodiaea	1.3
		DECO	coastal tarweed	23.0
		DEDA	annual hair grass	0.7
		ERAR12	coyote thistle	3.3
		ERBO	long-beaked filaree	1.0
		ERCA	horseweed	0.3
		FEBR	brome fescue	0.3
		GEDI	cut-leaved geranium	1.0
		GNPA	lowland cudweed	0.3
		HYGL	smooth cat's-ear	3.0
		HYRA	rough cat's-ear	7.0
		JUPH	brown-headed rush	0.7
		LOGA	narrowleaf cottonrose	0.7
		LYAR	scarlet pimpernel	0.7
		LYHY	grass poly	0.7
		LYMI	chaffweed	0.3
		PLCHh	Hickman's popcornflower	0.7
		PSST	cottonbatting plant	0.3
		SEGL	cutleaf burnweed	1.0
		SOOL	common sow thistle	0.7
		TH	Thatch	17.3
		BG	Bare Ground	34.7
		TOTAL		**100.0**

Table B-18 (continued). Pond 74 (Year 3 Post-Mastication) Wetland Vegetation Cover by Stratum

POND 74				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
4	**68%**	ACPA	hill lotus	0.2
		BRHO	soft chess	0.3
		CRAQ	aquatic pygmy-weed	0.5
		DECO	coastal tarweed	0.8
		ERAR12	coyote thistle	38.8
		FEBR	brome fescue	0.2
		GEDI	cut-leaved geranium	0.2
		HOBR	meadow barley	0.2
		HYGL	smooth cat's-ear	2.8
		HYRA	rough cat's-ear	0.2
		ISCE	low bulrush	0.5
		JUBU	toad rush	0.2
		JUPH	brown-headed rush	0.8
		MAEX	small tarweed	0.2
		PLCHh	Hickman's popcornflower	0.2
		POZI	Sacramento mesa mint	0.2
		PSCH	round woolly-marbles	0.7
		SOOL	common sow thistle	0.2
		TH	Thatch	40.3
		BG	Bare Ground	12.7
		TOTAL		**100.0**
UPLAND	**5%**	-	-	-

Table B-19. Pond 75 (Baseline) Wetland Vegetation Cover by Stratum

POND 75				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
1	**25%**	BRMI	annual quaking grass	2.2
		ELMA	pale spikerush	46.5
		GEDI	cut-leaved geranium	2.8
		MALE	alkali mallow	2.0
		PHLE	Lemmon's canary grass	2.3
		RUCR	curly dock	0.5
		SIBE	western blue-eyed grass	2.0
		SIMA	milk thistle	2.7
		SOAS	prickly sow thistle	0.3
		SOOL	common sow thistle	0.3
		VEPEx	speedwell	1.0
		TH	Thatch	33.8
		BG	Bare Ground	3.5
		TOTAL		**100.0**
2	**65%**	ELMA	pale spikerush	1.3
		ELTR3	beardless wild rye	36.3
		TH	Thatch	62.3
		TOTAL		**100.0**
3	**6%**	ELMA	pale spikerush	2.3
		ELTR3	beardless wild rye	1.7
		EUOC	western goldenrod	43.3
		TH	Thatch	52.7
		TOTAL		**100.0**
4	**4%**	BAPI	coyote brush	0.7
		ELTR3	beardless wild rye	2.3
		JUPH	brown-headed rush	40.3
		RACA	California buttercup	0.7
		TH	Thatch	54.7
		BG	Bare Ground	1.7
		TOTAL		**100.3**

Table B-20. Pond 101 East (West) (Year 3 Post-Mastication) Wetland Vegetation Cover by Stratum

POND 101 East (West)				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
1	**1%**	AGAV	Pacific bent grass	0.8
		ALSA	Pacific foxtail	0.3
		BAPI	coyote brush	0.3
		BRMI	annual quaking grass	0.2
		ELACa	needle spikerush	0.7
		ELMA	pale spikerush	5.0
		FEBR	brome fescue	0.3
		GAAP	goose grass	0.3
		GEDI	cut-leaved geranium	0.3
		GNPA	lowland cudweed	4.3
		HECUo	Chinese pusley	0.7
		HYRA	rough cat's-ear	0.3
		JUBA	Baltic rush	0.2
		LYAR	scarlet pimpernel	0.2
		LYHY	grass poly	0.3
		MALE	alkali mallow	12.0
		PHLE	Lemmon's canary grass	6.3
		POAVd	prostrate knotweed	4.2
		POMO	rabbitfoot grass	0.7
		ROCU	western yellowcress	7.3
		RUCR	curly dock	0.5
		SOOL	common sow thistle	1.3
		VEBR	bracted verbena	2.8
		TH	Thatch	32.3
		BG	Bare Ground	18.2
		TOTAL		**100.0**
2	**22%**	BRDI	ripgut grass	0.2
		ELMA	pale spikerush	22.7
		GEDI	cut-leaved geranium	0.2
		MALE	alkali mallow	5.5
		PHLE	Lemmon's canary grass	0.2
		TH	Thatch	67.7
		BG	Bare Ground	4.0
		TOTAL		**100.3**

Table B-20 (continued). Pond 101 East (West) (Year 3 Post-Mastication) Wetland Vegetation Cover by Stratum

POND 101 East (West)				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
3	**6%**	BAPI	coyote brush	0.3
		BRHO	soft chess	1.3
		ELMA	pale spikerush	4.7
		HECUo	Chinese pusley	5.3
		LAGL3	smooth goldfields	1.7
		PLCHh	Hickman's popcornflower	7.3
		PS sp.	*Pseudognaphalium* sp.	0.3
		RUCR	curly dock	5.3
		TH	Thatch	70.7
		BG	Bare Ground	3.0
		TOTAL		**100.0**
4	**2%**	BRHO	soft chess	0.3
		BRMI	annual quaking grass	0.3
		DISP	salt grass	1.3
		ELMA	pale spikerush	2.7
		FEBR	brome fescue	0.3
		GEDI	cut-leaved geranium	6.3
		HYGL	smooth cat's-ear	1.3
		JUBA	Baltic rush	0.3
		JUPH	brown-headed rush	6.0
		MAGR	gumweed	7.0
		MALE	alkali mallow	0.3
		MASA	coast tarweed	2.0
		RUAC	sheep sorrel	6.3
		RUCR	curly dock	0.3
		SOOL	common sow thistle	1.0
		VISAs	spring vetch	0.3
		TH	Thatch	50.7
		BG	Bare Ground	13.0
		TOTAL		**100.0**

Table B-20 (continued). Pond 101 East (West) (Year 3 Post-Mastication) Wetland Vegetation Cover by Stratum

POND 101 East (West)				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
5	**46%**	BRHO	soft chess	0.3
		BRMI	annual quaking grass	0.2
		ELMA	pale spikerush	1.2
		FEBR	brome fescue	17.5
		FEPE	Italian rye grass	9.2
		GEDI	cut-leaved geranium	1.0
		HECUo	Chinese pusley	0.5
		HYGL	smooth cat's-ear	0.3
		MALE	alkali mallow	1.5
		RUCR	curly dock	0.3
		STAJ	bugle hedge nettle	0.2
		VISAs	spring vetch	0.2
		TH	Thatch	48.5
		BG	Bare Ground	18.8
		TOTAL		**99.7**
6	**4%**	BAPI	coyote brush	0.3
		ELACa	needle spikerush	0.3
		ELMA	pale spikerush	2.0
		JUBA	Baltic rush	1.0
		JUPH	brown-headed rush	27.7
		RUAC	sheep sorrel	4.7
		RUCR	curly dock	0.3
		STAJ	bugle hedge nettle	0.3
		TH	Thatch	61.3
		BG	Bare Ground	2.0
		TOTAL		**100.0**

Table B-20 (continued). Pond 101 East (West) (Year 3 Post-Mastication) Wetland Vegetation Cover by Stratum

POND 101 East (West)				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
8	**6%**	ELMA	pale spikerush	1.0
		EUOC	western goldenrod	41.0
		GEDI	cut-leaved geranium	1.3
		HYGL	smooth cat's-ear	0.7
		MALE	alkali mallow	0.7
		PS sp.	*Pseudognaphalium* sp.	0.3
		TH	Thatch	44.7
		BG	Bare Ground	10.3
		TOTAL		**100.0**
9	**13%**	ELMA	pale spikerush	15.7
		HECUo	Chinese pusley	0.7
		MALE	alkali mallow	1.7
		PHLE	Lemmon's canary grass	0.3
		RUCR	curly dock	21.0
		TH	Thatch	55.7
		BG	Bare Ground	5.0
		TOTAL		**100.0**

Table B-21. Pond 101 West (Year 3 Post-Mastication) Wetland Vegetation Cover by Stratum

POND 101 West				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
1	**40%**	BAPI	coyote brush	0.5
		BRHO	soft chess	0.2
		BRMI	annual quaking grass	0.2
		DEDA	annual hair grass	0.2
		ELMA	pale spikerush	5.0
		FEBR	brome fescue	0.2
		FEPE	Italian rye grass	0.3
		GEDI	cut-leaved geranium	0.7
		GNPA	lowland cudweed	0.2
		HECUo	Chinese pusley	2.8
		HYGL	smooth cat's-ear	0.5
		HYRA	rough cat's-ear	0.2
		LAGL3	smooth goldfields	9.2
		LYAR	scarlet pimpernel	0.2
		LYHY	grass poly	1.3
		PLCHh	Hickman's popcornflower	13.8
		PLCO	cut-leaved plantain	0.2
		POAVd	prostrate knotweed	2.3
		POMO	rabbitfoot grass	0.5
		RUCR	curly dock	9.0
		SEGL	cutleaf burnweed	0.5
		SOAS	prickly sow thistle	0.2
		TH	Thatch	45.2
		BG	Bare Ground	6.8
		TOTAL		**100.0**

Table B-21 (continued). Pond 101 West (Year 3 Post-Mastication) Wetland Vegetation Cover by Stratum

POND 101 West				
Stratum	**Relative % Cover of Wetland**	**Species Code**	**Species Common Name**	**% Cover**
2	**33%**	DISP	salt grass	6.7
		ELACa	needle spikerush	3.2
		ERBO	long-beaked filaree	0.2
		FEBR	brome fescue	9.3
		FEPE	Italian rye grass	22.7
		GEDI	cut-leaved geranium	1.5
		HECUo	Chinese pusley	0.3
		HOBR	meadow barley	0.8
		HOMAg	Mediterranean barley	0.7
		HYGL	smooth cat's-ear	0.7
		HYRA	rough cat's-ear	0.2
		JUBU	toad rush	0.7
		MAGR	gumweed	0.2
		PLCO	cut-leaved plantain	2.2
		RUAC	sheep sorrel	1.2
		RUCR	curly dock	0.2
		RUSA	willow dock	0.2
		VISA	spring vetch	0.5
		TH	Thatch	43.7
		BG	Bare Ground	5.5
		TOTAL		**100.3**
4	**27%**	EUOC	western goldenrod	34.5
		ELACa	needle spikerush	0.5
		ELMA	pale spikerush	1.0
		GEDI	cut-leaved geranium	1.2
		HECUo	Chinese pusley	0.3
		HOMAg	Mediterranean barley	0.2
		HYGL	smooth cat's-ear	0.5
		LAGL3	smooth goldfields	0.7
		LYAR	scarlet pimpernel	0.2
		PLCHh	Hickman's popcornflower	1.2
		RUCR	curly dock	0.7
		TH	Thatch	47.5
		BG	Bare Ground	11.7
		TOTAL		**100.0**

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APPENDIX C

CTS and Aquatic Invertebrate Data from Aquatic Surveys at Vernal Pools Monitored in 2021

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Table C-1. CTS Aquatic Survey Results for Vernal Pools Monitored in 2021 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
				Mean*	Range	Mode	Mean*	Range	Mode	
60	3/24/2021	0	-	-	-	-	-	-	-	58 mins
61	3/24/2021	0	-	-	-	-	-	-	-	6 mins

Table C-2. Aquatic Invertebrates Observed During Aquatic Surveys at Vernal Pools Monitored in 2021

Vernal Pool	Aquatic Invertebrate																	
	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)	Predaceous Diving Beetle (Family Dytiscidae)	Giant Water Bug (Family	Water Scorpion (Family Nepidae)	Mosquito (Family	Water Scavenger Beetle	Dipteran Larvae (Order Diptera)	Snail
60	-	●	●	●	●	-	-	●	●	-	●	●	-	-	●	●	●	●
61	-	-	●	●	●	-	●	-	●	●	-	●	-	-	●	-	●	-

Table C-3. Fairy Shrimp Aquatic Survey Results for Vernal Pools Monitored in 2021 at Former Fort Ord

Vernal Pool	Sampling Date	Abundance (# of Individuals)
60	3/24/2021	Not detected
61	3/24/2021	Not detected

APPENDIX D

Site Photos

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Figure D-1. Pond 5 (Reference): Vegetation Photo Point 1 on 5/19/2021

Figure D- 2. Pond 5 (Reference): Vegetation Photo Point 2 on 5/19/2021

Figure D- 3. Pond 101 East (East) (Reference): Vegetation Photo Point on 5/25/2021

Figure D- 4. Pond 997 (Reference): Vegetation Photo Point on 5/5/2021

Figure D- 5. Pond 3 North (Year 3 Post-Subsurface Munitions Remediation): Vegetation Photo Point on 5/14/2021

Figure D- 6. Contra Costa goldfields (Lasthenia conjugens) at Pond 3 North on 4/23/2021.

Figure D- 7. Close-up of Contra Costa goldfields (Lasthenia conjugens) At Pond 3 North on 4/23/2021.

Figure D- 8. Pond 3 South (Year 3 Post-Subsurface Munitions Remediation): Vegetation Photo Point 1 on 5/13/2021

Figure D- 9. Pond 3 South (Year 3 Post-Subsurface Munitions Remediation): Vegetation Photo Point 2 on 5/13/2021

Figure D- 10. Pond 16 (Year 3 Post-Subsurface Munitions Remediation): Vegetation Photo Point on 5/18/2021

Figure D- 11. Pond 35 (Year 3 Post-Subsurface Munitions Remediation): Vegetation Photo Point 1 on 5/4/2021

Figure D- 12. Pond 35 (Year 3 Post-Subsurface Munitions Remediation): Vegetation Photo Point 2 on 5/4/2021

Figure D- 13. Pond 39 (Year 3 Post-Subsurface Munitions Remediation): Vegetation Photo Point on 5/6/2021

Figure D- 14. Pond 40 South (Year 3 Post-Subsurface Munitions Remediation): Vegetation Photo Point 1 on 5/11/2021

Figure D- 15. Pond 40 South (Year 3 Post-Subsurface Munitions Remediation): Vegetation Photo Point 2 on 5/11/2021

Figure D- 16. Pond 41 (Year 3 Post-Subsurface Munitions Remediation): Vegetation Photo Point on 5/6/2021

Figure D- 17. Pond 41 (Year 3 Post-Subsurface Munitions Remediation): Vegetation Photo Point on 5/6/2021

Figure D- 18. Pond 42 (Year 3 Post-Subsurface Munitions Remediation): Vegetation Photo Point on 5/14/2021

Figure D- 19. Pond 43 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Photo Point 1 on 5/4/2021

Figure D- 20. Pond 43 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Photo Point 2 on 5/4/2021

Figure D- 21. Pond 44 (Year 3 Post-Subsurface Munitions Remediation): Vegetation Photo Point on 5/6/2021

Figure D- 22. Pond 54 (Year 3 Post-Subsurface Munitions Remediation): Vegetation Photo Point on 5/17/2021

Figure D- 23. Pond 60 (Year 3 Post-Subsurface Munitions Remediation): Vegetation Photo Point on 5/24/2021

Figure D- 24. Pond 60 (Year 3 Post-Subsurface Munitions Remediation): Wildlife Survey on 3/24/2021

Figure D- 25. Pond 61 (Year 3 Post-Subsurface Munitions Remediation): Vegetation Photo Point 1 on 5/3/2021

Figure D- 26. Pond 61 (Year 3 Post-Subsurface Munitions Remediation): Vegetation Photo Point 2 on 5/3/2021

Figure D- 27. Pond 61 (Year 3 Post-Subsurface Munitions Remediation): Wildlife Survey on 3/24/2021

Figure D- 28. Photo 1 of Contra Costa goldfields (Lasthenia conjugens) at Pond 61 (Year 3 Post-Subsurface Munitions Remediation) on 4/16/2021

Figure D- 29. Photo 2 of Contra Costa goldfields (Lasthenia conjugens) at Pond 61 (Year 3 Post-Subsurface Munitions Remediation) on 4/16/2021

Figure D- 30. Photo 3 of Contra Costa goldfields (Lasthenia conjugens) at Pond 61 (Year 3 Post-Subsurface Munitions Remediation) on 4/16/2021

Figure D- 31. Photo 4 of Contra Costa goldfields (Lasthenia conjugens) at Pond 61 (Year 3 Post-Subsurface Munitions Remediation) on 4/16/2021

Figure D- 32. Pond 73 (Year 3 Post-Subsurface Munitions Remediation): Vegetation Photo Point 1 on 5/12/2021

Figure D- 33. Pond 73 (Year 3 Post-Subsurface Munitions Remediation): Vegetation Photo Point 2 on 5/12/2021

Figure D- 34. Pond 74 (Year 3 Post-Mastication): Vegetation Photo Point 1 on 5/12/2021

Figure D- 35. Pond 74 (Year 3 Post-Mastication): Vegetation Photo Point 2 on 5/12/2021

Figure D- 36. Pond 75 (Baseline): Vegetation Photo Point 1 on 5/7/2021

Figure D- 37. Pond 75 (Baseline): Vegetation Photo Point 2 on 5/7/2021

Figure D- 38. Pond 101 East (West) (Year 3 Post-Mastication): Vegetation Photo Point on 5/19/2021

Figure D- 39. Pond 101 West (Year 3 Post-Mastication): Vegetation Photo Point on 5/11/2021

APPENDIX E

Vegetation Species Richness of Native and Non-Native Species and Wetland Indicator Category by Vernal Pool

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Table E-1. Pond 5 (Reference) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 5			
Stratum	**Native**	**Non-Native**	**Unidentified**
1	5	2	0
2	4	0	0
3	8	5	0
7	4	7	0
8	8	14	0
Basin Total	**40**	**30**	**0**

Table E-2. 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**
3	3	3	0
4	2	2	0
5	8	8	0
Basin Total	**32**	**36**	**0**

Table E-3. Pond 997 (Reference) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 997			
Stratum	**Native**	**Non-Native**	**Unidentified**
1	7	5	0
3	9	12	0
Basin Total	**36**	**23**	**0**

Table E-4. Pond 3 North (Year 3 Post-Subsurface Munitions Remediation) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 3 North			
Stratum	**Native**	**Non-Native**	**Unidentified**
2	6	10	0
3	18	19	0
Basin Total	**42**	**32**	**0**

Table E-5. Pond 3 South (Year 3 Post-Subsurface Munitions Remediation) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 3 South			
Stratum	**Native**	**Non-Native**	**Unidentified**
1	11	10	0
2	7	3	0
3	13	13	0
4	8	8	0
6	11	8	0
Basin Total	**55**	**31**	**0**

Table E-6. Pond 16 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 16			
Stratum	**Native**	**Non-Native**	**Unidentified**
3	3	7	0
4	4	2	0
5	3	0	0
6	2	0	0
8	6	4	0
Basin Total	**50**	**32**	**0**

Table E-7. Pond 35 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 35			
Stratum	**Native**	**Non-Native**	**Unidentified**
1	4	5	0
2	2	4	0
3	2	9	0
4	7	12	0
Basin Total	**29**	**33**	**1**

Table E-8. Pond 39 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 39			
Stratum	**Native**	**Non-Native**	**Unidentified**
1	6	7	0
3	4	12	0
4	4	11	0
Basin Total	**41**	**32**	**0**

Table E-9. Pond 40 South (Year 3 Post-Subsurface Munitions Remediation) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 40 South			
Stratum	**Native**	**Non-Native**	**Unidentified**
1	3	7	0
2	1	11	0
3	7	6	0
Basin Total	**24**	**29**	**0**

Table E-10. Pond 41 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 41			
Stratum	**Native**	**Non-Native**	**Unidentified**
1	9	2	0
2	10	9	0
3	8	6	1
4	13	8	0
Basin Total	**38**	**24**	**1**

Table E-11. Pond 42 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 42			
Stratum	**Native**	**Non-Native**	**Unidentified**
1	7	9	0
2	3	3	0
3	9	13	0
4	8	11	0
5	1	5	0
Basin Total	**50**	**30**	**2**

Table E-12. Pond 43 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 43			
Stratum	**Native**	**Non-Native**	**Unidentified**
1	14	9	0
2	10	12	0
3	13	14	1
Basin Total	**38**	**23**	**0**

Table E-13. Pond 44 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 44			
Stratum	**Native**	**Non-Native**	**Unidentified**
1	20	15	0
3	18	19	0
Basin Total	**43**	**27**	**0**

Table E-14. Pond 54 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 54			
Stratum	**Native**	**Non-Native**	**Unidentified**
1	6	3	0
5	10	2	0
6	9	4	0
Basin Total	**34**	**19**	**0**

Table E-15. Pond 60 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 60			
Stratum	**Native**	**Non-Native**	**Unidentified**
1	2	0	0
2	3	3	1
3	3	0	0
4	11	8	0
Basin Total	**29**	**30**	**1**

Table E-16. Pond 61 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 61			
Stratum	**Native**	**Non-Native**	**Unidentified**
1	10	2	0
3	15	12	0
4	8	10	0
Basin Total	**65**	**32**	**0**

Table E-17. Pond 73 (Year 3 Post-Subsurface Munitions Remediation) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 73			
Stratum	**Native**	**Non-Native**	**Unidentified**
1	5	1	0
2	6	1	0
4	16	11	0
Basin Total	**41**	**25**	**0**

Table E-18. Pond 74 (Year 3 Post-Mastication) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 74			
Stratum	**Native**	**Non-Native**	**Unidentified**
1	10	10	0
3	10	12	0
4	12	6	0
Basin Total	**32**	**20**	**0**

Table E-19. Pond 75 (Baseline) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 75			
Stratum	**Native**	**Non-Native**	**Unidentified**
1	5	6	0
2	2	0	0
3	3	0	0
4	4	0	0
Basin Total	**23**	**12**	**0**

Table E-20. Pond 101 East (West) (Year 3 Post-Mastication) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 101 East (West)			
Stratum	**Native**	**Non-Native**	**Unidentified**
1	12	11	0
2	3	2	0
3	5	2	1
4	7	9	0
5	4	8	0
6	6	2	0
8	3	2	1
9	4	1	0
Basin Total	**37**	**33**	**1**

Table E-21. Pond 101 West (Year 3 Post-Mastication) Vegetation Species Richness of Native and Non-Native Species by Stratum

Pond 101 West			
Stratum	**Native**	**Non-Native**	**Unidentified**
1	7	15	0
2	7	11	0
4	6	5	0
Basin Total	**22**	**29**	**0**

Table E-22. Vegetation Species Richness of Native and Non-Native Species within Entire Vernal Pool Basin at Vernal Pools Monitored in 2021

Vernal Pool	Native	Non-Native	Unidentified	Total
5	40	30	0	70
101 East (East)	32	36	0	68
997	36	23	0	59
3 North	42	32	0	74
3 South	55	31	0	86
16	50	32	0	82
35	29	33	1	63
39	41	32	0	73
40 South	24	29	0	53
41	38	24	1	63
42	50	30	2	82
43	38	23	0	61
44	43	27	0	70
54	34	19	0	53
60	29	30	1	60
61	65	32	0	97
73	41	25	0	66
74	32	20	0	52
75	23	12	0	35
101 West	22	29	0	51
101 East (West)	37	33	1	71

Table E-23. Pond 5 (Reference) Number of Wetland Plants by Indicator Category by Stratum

Pond 5						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
1	1	1	0	2	1	2
2	1	2	0	1	0	0
3	3	3	2	2	0	3
7	0	2	1	1	1	6
8	2	5	2	5	1	7
Basin Total	**7**	**11**	**10**	**14**	**1**	**27**

Table E-24. 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**
3	1	1	1	2	0	1
4	0	2	0	1	0	1
5	2	1	1	4	3	5
Basin Total	**5**	**14**	**13**	**13**	**3**	**20**

Table E-25. Pond 997 (Reference) Number of Wetland Plants by Indicator Category by Stratum

Pond 997						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
1	3	3	1	2	0	3
3	1	3	4	4	1	8
Basin Total	**7**	**12**	**10**	**6**	**1**	**23**

Table E-26. Pond 3 North (Year 3 Post-Subsurface Munitions Remediation) Number of Wetland Plants by Indicator Category by Stratum

Pond 3 North						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
2	5	2	2	3	2	2
3	1	8	5	5	3	15
Basin Total	**7**	**16**	**10**	**9**	**4**	**28**

Table E-27. Pond 3 South (Year 3 Post-Subsurface Munitions Remediation) Number of Wetland Plants by Indicator Category by Stratum

Pond 3 South						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
1	6	3	2	4	0	6
2	2	2	2	2	0	2
3	0	6	6	4	1	9
4	1	1	4	3	0	7
6	1	4	5	2	0	7
Basin Total	**7**	**19**	**9**	**14**	**2**	**35**

Table E-28. Pond 16 (Year 3 Post-Subsurface Munitions Remediation) Number of Wetland Plants by Indicator Category by Stratum

Pond 16						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
3	2	3	2	1	1	1
4	0	3	1	2	0	0
5	0	0	1	2	0	0
6	1	1	0	0	0	0
8	1	3	1	1	0	4
Basin Total	**5**	**14**	**15**	**18**	**1**	**29**

Table E-29. Pond 35 (Year 3 Post-Subsurface Munitions Remediation) Number of Wetland Plants by Indicator Category by Stratum

Pond 35						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
1	4	1	1	1	0	2
2	1	1	1	0	0	3
3	0	1	2	2	1	5
4	0	2	3	5	0	9
Basin Total	**7**	**6**	**9**	**12**	**3**	**26**

Table E-30. Pond 39 (Year 3 Post-Subsurface Munitions Remediation) Number of Wetland Plants by Indicator Category by Stratum

Pond 39						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
1	4	2	3	2	1	1
3	0	2	2	3	2	7
4	0	1	4	2	1	7
Basin Total	**6**	**14**	**13**	**12**	**2**	**26**

Table E-31. Pond 40 South (Year 3 Post-Subsurface Munitions Remediation) Number of Wetland Plants by Indicator Category by Stratum

Pond 40 South						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
1	3	0	4	1	0	2
2	0	1	1	6	0	4
3	2	3	2	2	1	3
Basin Total	**3**	**10**	**8**	**11**	**3**	**18**

Table E-32. Pond 41 (Year 3 Post-Subsurface Munitions Remediation) Number of Wetland Plants by Indicator Category by Stratum

Pond 41						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
1	5	3	1	1	0	1
2	5	5	2	3	0	4
3	3	2	2	4	1	3
4	2	3	3	5	0	8
Basin Total	**6**	**12**	**10**	**12**	**2**	**21**

Table E-33. Pond 42 (Year 3 Post-Subsurface Munitions Remediation) Number of Wetland Plants by Indicator Category by Stratum

Pond 42						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
1	4	5	1	1	0	5
2	1	3	0	0	1	1
3	5	6	2	3	1	5
4	0	2	3	4	0	10
5	2	2	0	1	0	1
Basin Total	**8**	**16**	**8**	**14**	**1**	**35**

Table E-34. Pond 43 (Year 3 Post-Subsurface Munitions Remediation) Number of Wetland Plants by Indicator Category by Stratum

Pond 43						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
1	6	7	1	3	0	6
2	3	6	4	2	1	6
3	3	4	4	4	1	12
Basin Total	**6**	**13**	**7**	**8**	**1**	**26**

Table E-35. Pond 44 (Year 3 Post-Subsurface Munitions Remediation) Number of Wetland Plants by Indicator Category by Stratum

Pond 44						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
1	7	8	4	3	3	10
3	2	7	5	5	3	15
Basin Total	**8**	**11**	**7**	**11**	**3**	**30**

Table E-36. Pond 54 (Year 3 Post-Subsurface Munitions Remediation) Number of Wetland Plants by Indicator Category by Stratum

Pond 54						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
1	3	2	2	1	0	1
5	5	5	0	1	0	1
6	3	3	1	4	0	2
Basin Total	**6**	**12**	**8**	**9**	**1**	**17**

Table E-37. Pond 60 (Year 3 Post-Subsurface Munitions Remediation) Number of Wetland Plants by Indicator Category by Stratum

Pond 60						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
1	1	0	0	1	0	0
2	1	1	1	0	1	3
3	1	2	0	0	0	0
4	5	5	3	1	1	4
Basin Total	**7**	**10**	**8**	**10**	**2**	**23**

Table E-38. Pond 61 (Year 3 Post-Subsurface Munitions Remediation) Number of Wetland Plants by Indicator Category by Stratum

Pond 61						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
1	6	4	0	0	1	1
3	5	5	2	3	1	11
4	0	2	3	3	1	9
Basin Total	**11**	**17**	**12**	**13**	**2**	**42**

Table E-39. Pond 73 (Year 3 Post-Subsurface Munitions Remediation) Number of Wetland Plants by Indicator Category by Stratum

Pond 73						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
1	3	1	0	1	0	1
2	3	2	0	1	0	1
4	3	8	1	4	1	10
Basin Total	**8**	**15**	**10**	**10**	**1**	**22**

Table E-40. Pond 74 (Year 3 Post-Mastication) Number of Wetland Plants by Indicator Category by Stratum

Pond 74						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
1	4	5	2	1	1	7
3	2	5	3	4	1	7
4	4	5	0	2	1	6
Basin Total	**7**	**13**	**5**	**8**	**1**	**18**

Table E-41. Pond 75 (Baseline) Number of Wetland Plants by Indicator Category by Stratum

Pond 75						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
1	1	3	2	2	1	2
2	1	0	1	0	0	0
3	1	1	1	0	0	0
4	0	1	2	0	0	1
Basin Total	**1**	**8**	**7**	**6**	**1**	**12**

Table E-42. Pond 101 East (West) (Year 3 Post-Mastication) Number of Wetland Plants by Indicator Category by Stratum

Pond 101 East (West)						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
1	4	5	5	3	1	5
2	1	1	0	1	0	2
3	3	0	1	1	0	3
4	1	3	2	3	2	5
5	2	0	3	2	1	4
6	3	2	1	1	0	1
8	1	1	0	1	0	3
9	1	1	1	1	0	1
Basin Total	**8**	**18**	**11**	**12**	**3**	**19**

Table E-43. Pond 101 West (Year 3 Post-Mastication) Number of Wetland Plants by Indicator Category by Stratum

Pond 101 West						
Stratum	**OBL**	**FACW**	**FAC**	**FACU**	**UPL**	**NL**
1	4	3	6	3	0	6
2	1	4	4	3	1	5
4	4	1	3	0	0	3
Basin Total	**8**	**9**	**11**	**8**	**2**	**13**

Table E-44. Wetland Plants by Indicator Category within Entire Vernal Pool Basin at Vernal Pools Monitored in 2021

Vernal Pool	OBL	FACW	FAC	FACU	UPL	NL	Total
5	7	11	10	14	1	27	70
101 East (East)	5	14	13	13	3	20	68
997	7	12	10	6	1	23	59
3 North	7	16	10	9	4	28	74
3 South	7	19	9	14	2	35	86
16	5	14	15	18	1	29	82
35	7	6	9	12	3	26	63
39	6	14	13	12	2	26	73
40 South	3	10	8	11	3	18	53
41	6	12	10	12	2	21	63
42	8	16	8	14	1	35	82
43	6	13	7	8	1	26	61
44	8	11	7	11	3	30	70
54	6	12	8	9	1	17	53
60	7	10	8	10	2	23	60
61	11	17	12	13	2	42	97
73	8	15	10	10	1	22	66
74	7	13	5	8	1	18	52
75	1	8	7	6	1	12	35
101 West	8	9	11	8	2	13	51
101 East (West)	8	18	11	12	3	19	71

APPENDIX F

Species Composition of Follow-Up Wetland Vegetation Monitoring by Vernal Pool

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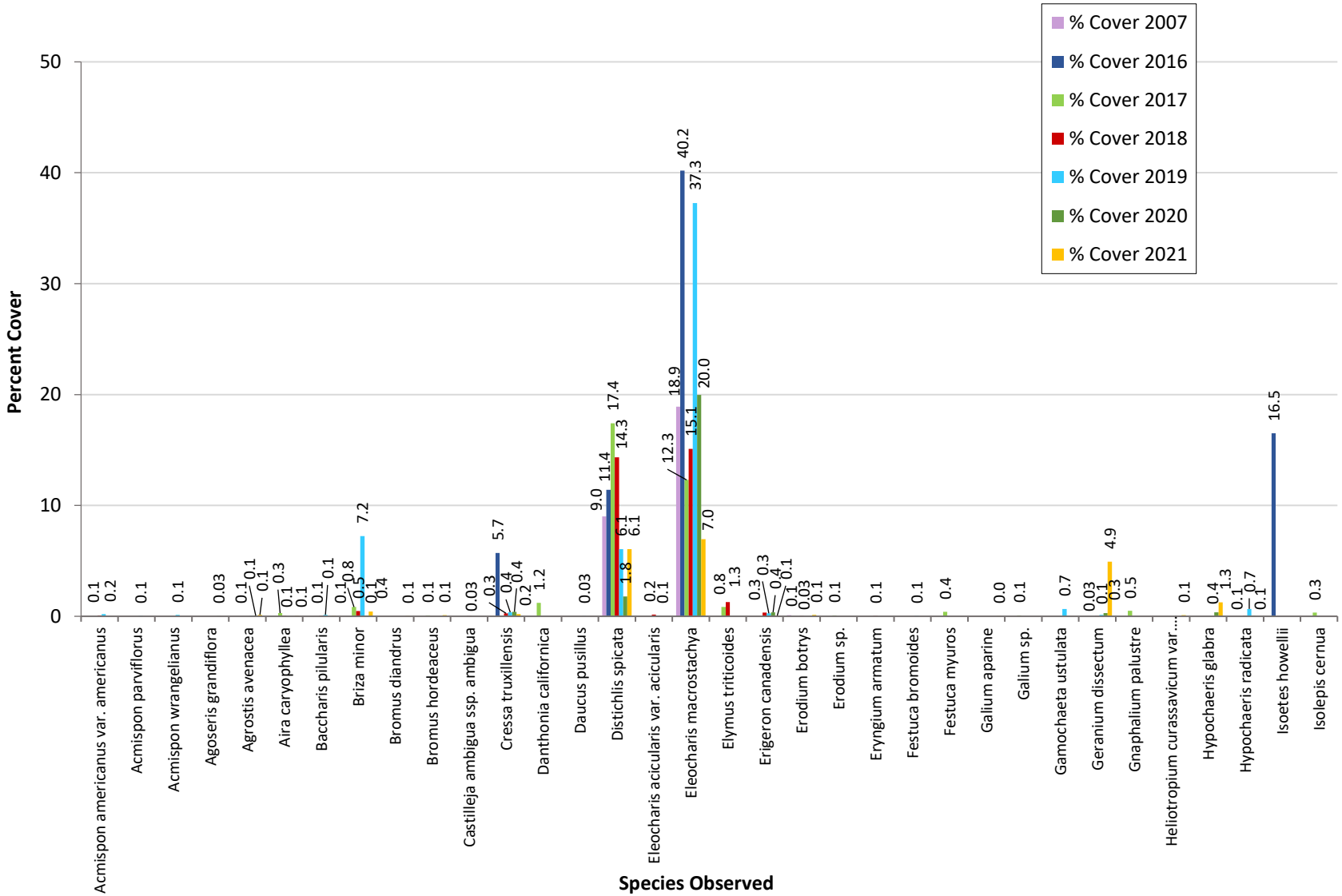

Figure F-1. Comparison Graph of Percent Cover by Wetland Plant Species for 2007, 2016, 2017, 2018, 2019, 2020, and 2021 at Pond 5 (Reference)

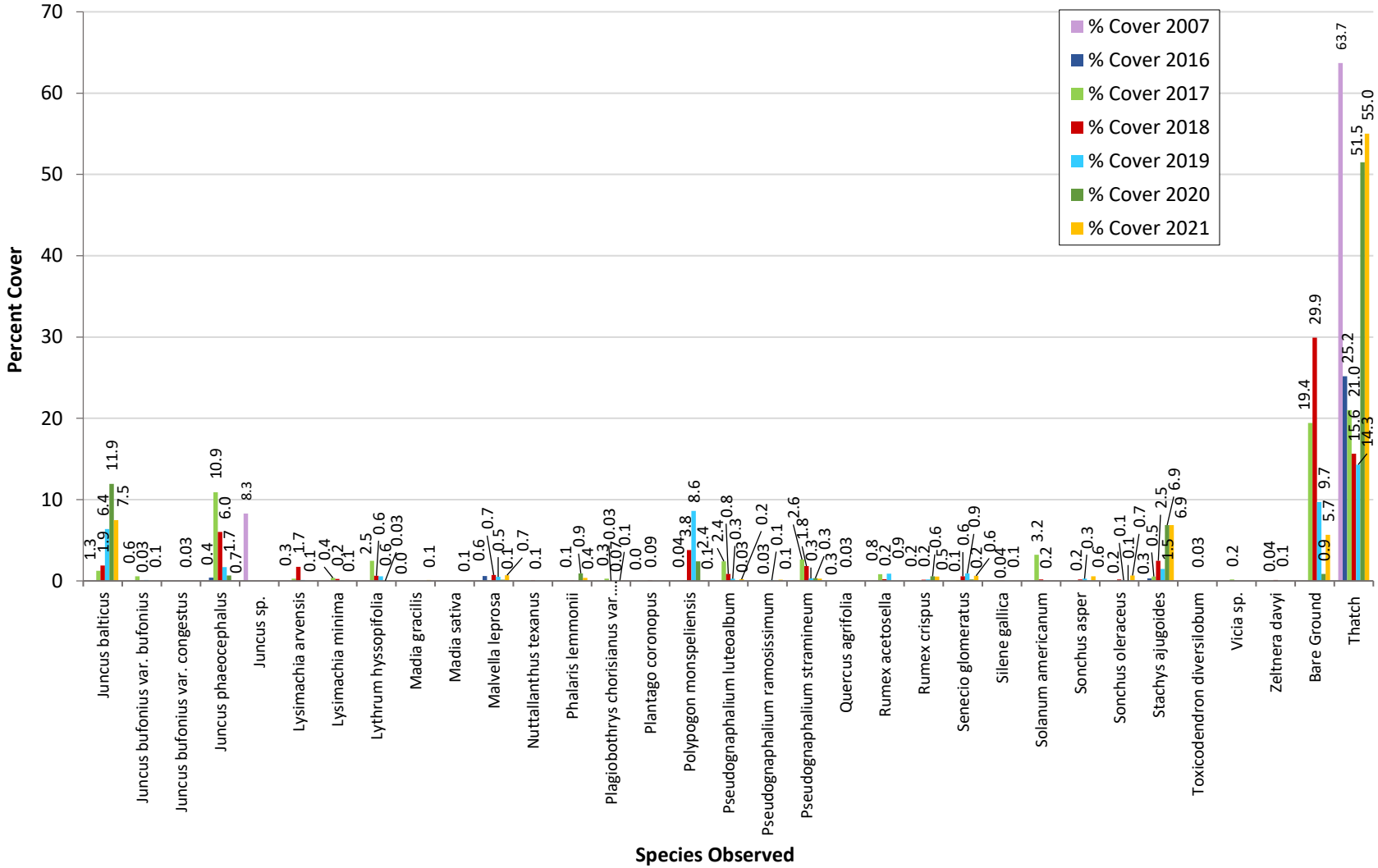

Figure F-1. (continued). Comparison Graph of Percent Cover by Wetland Plant Species for 2007, 2016, 2017, 2018, 2019, 2020, and 2021 at Pond 5 (Reference)

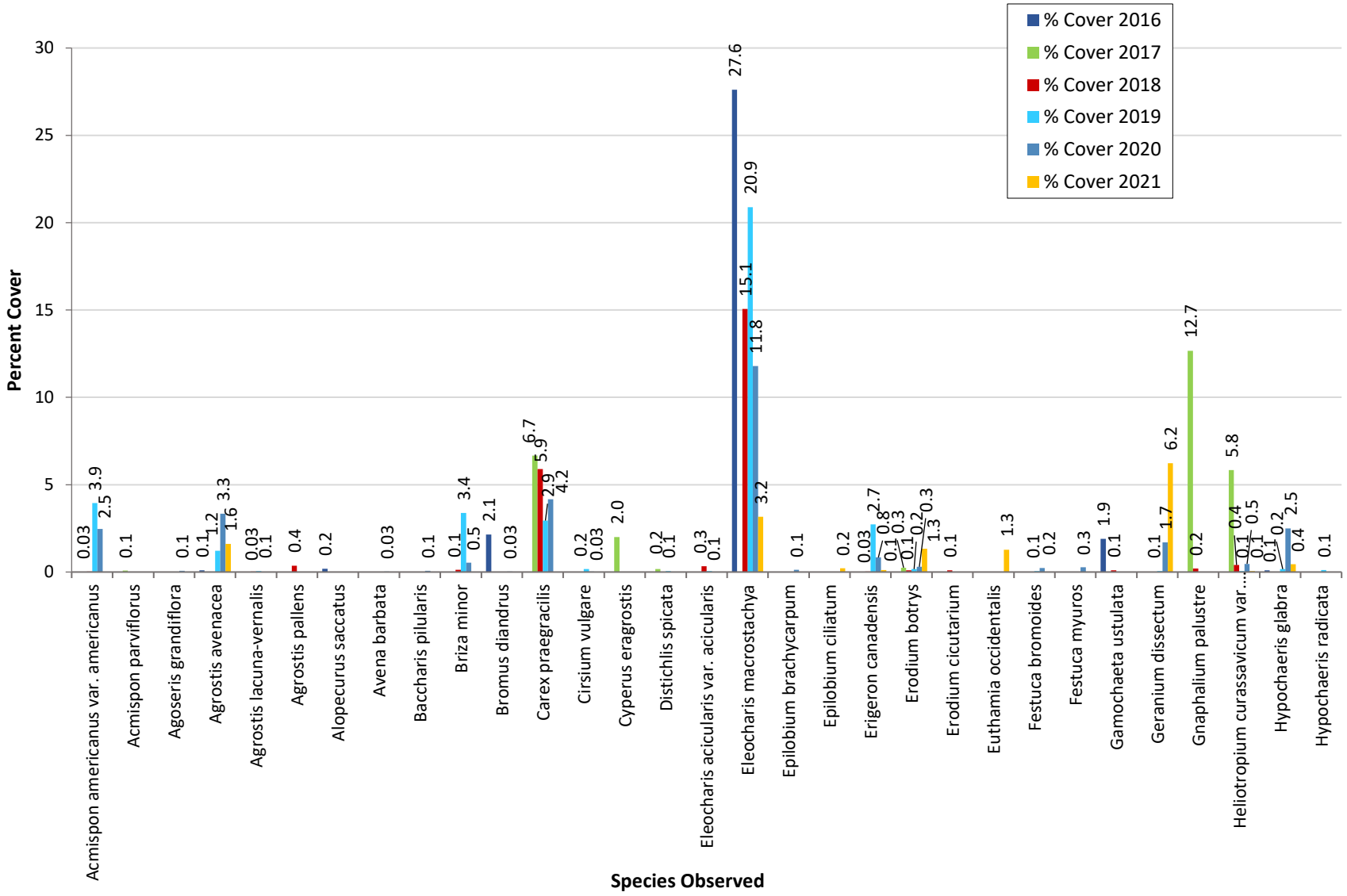

Figure F-2. Comparison Graph of Percent Cover by Wetland Plant Species for 2016, 2017, 2018, 2019, 2020, and 2021 at Pond 101 East (East)(Reference)

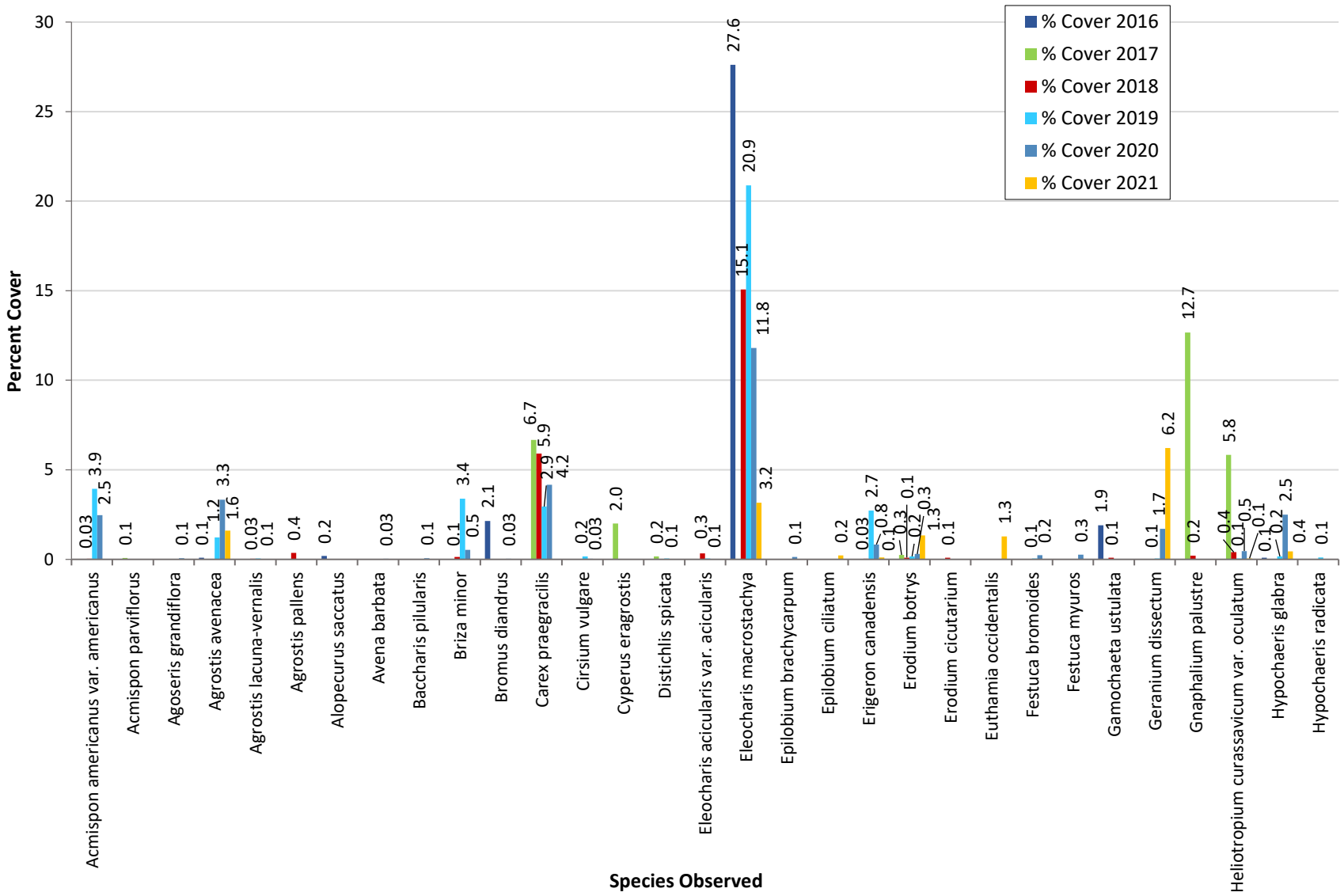

Figure F-2 (continued). Comparison Graph of Percent Cover by Wetland Plant Species for 2016, 2017, 2018, 2019, 2020, and 2021 at Pond 101 East (East)(Reference)

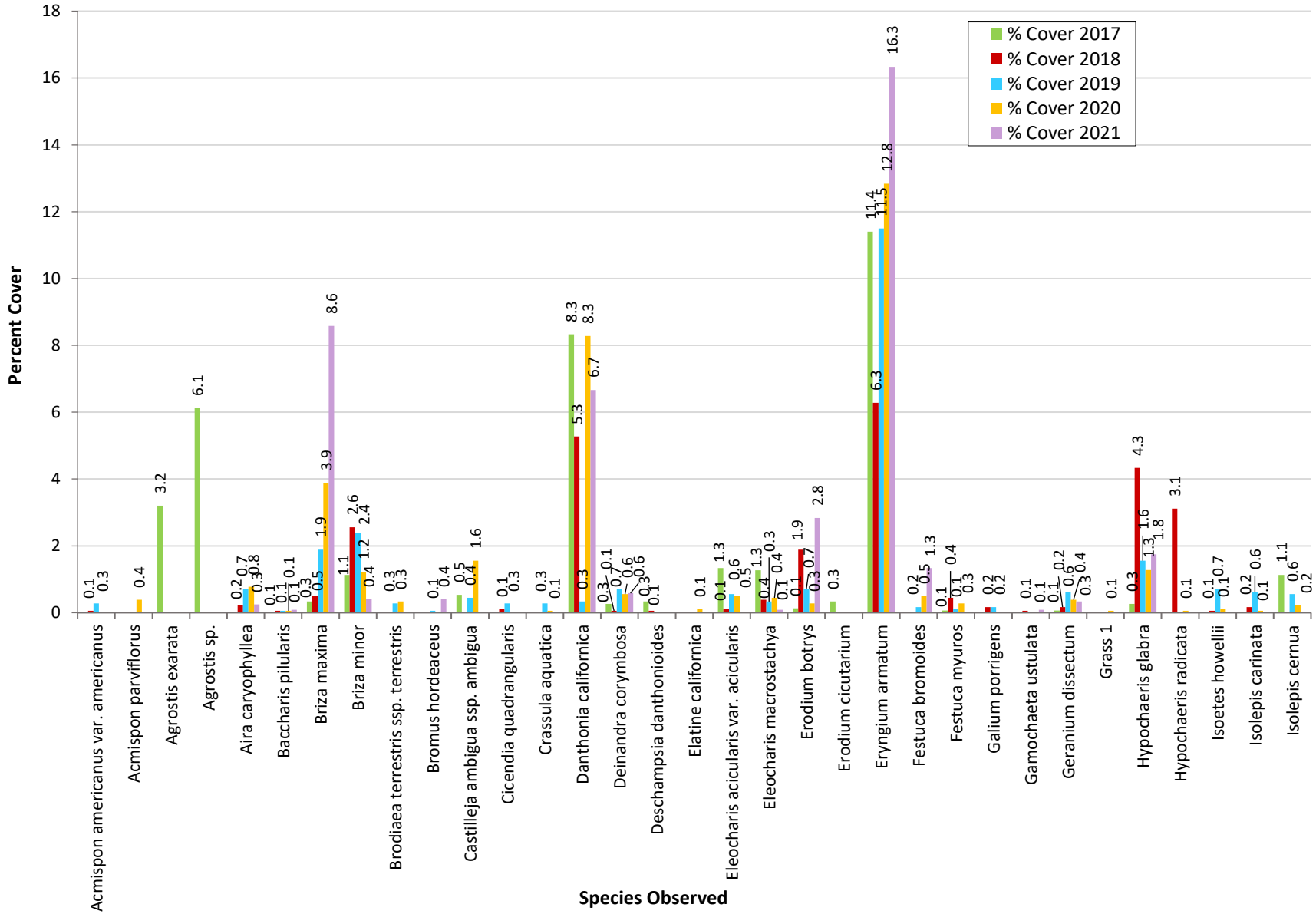

Figure F-3. Comparison Graph of Percent Cover by Wetland Plant Species for 2017, 2018, 2019, 2020, and 2021 at Pond 997 (Reference)

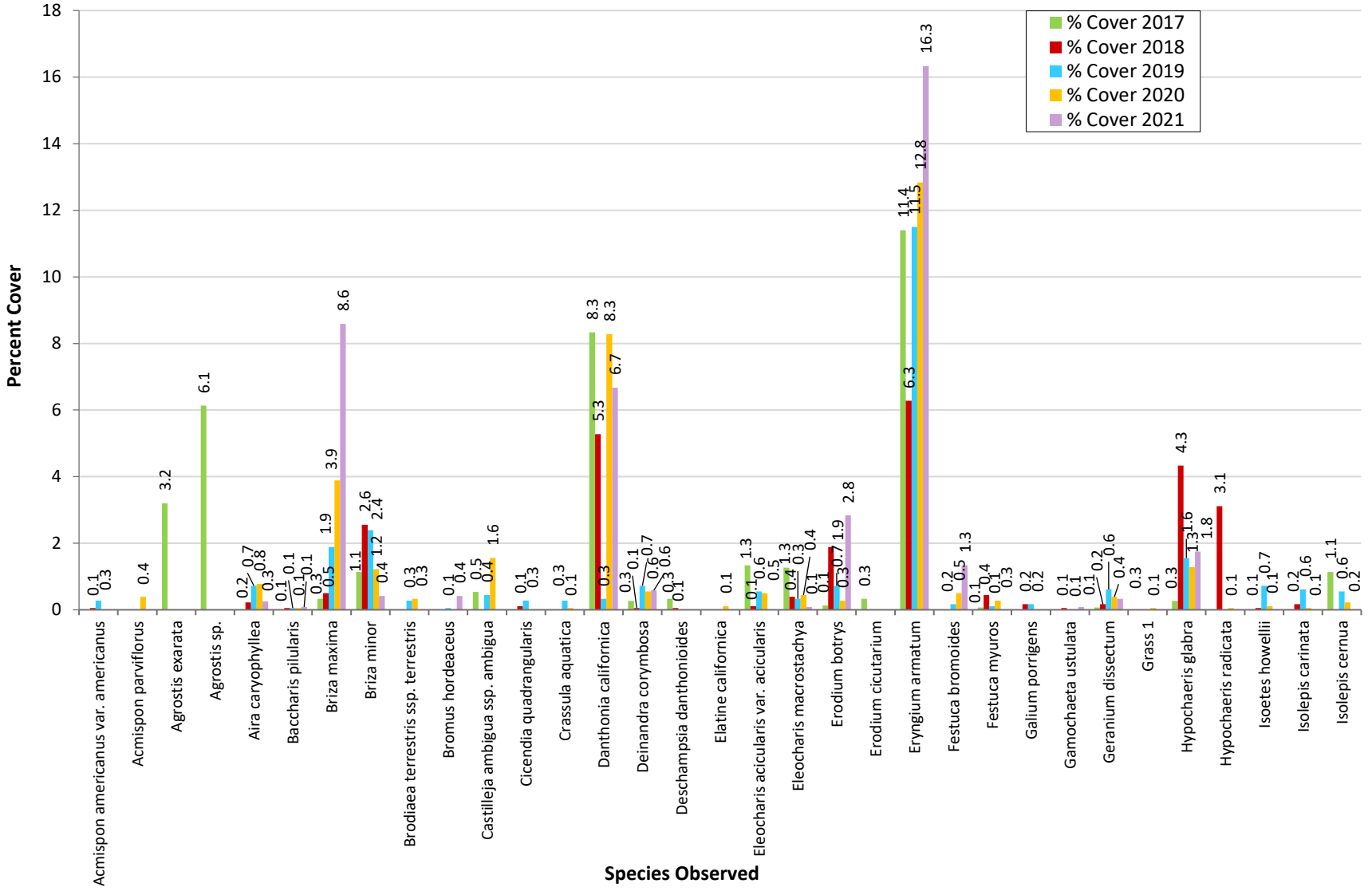

Figure F-3 (continued). Comparison Graph of Percent Cover by Wetland Plant Species for 2017, 2018, 2019, 2020, and 2021 at Pond 997 (Reference)

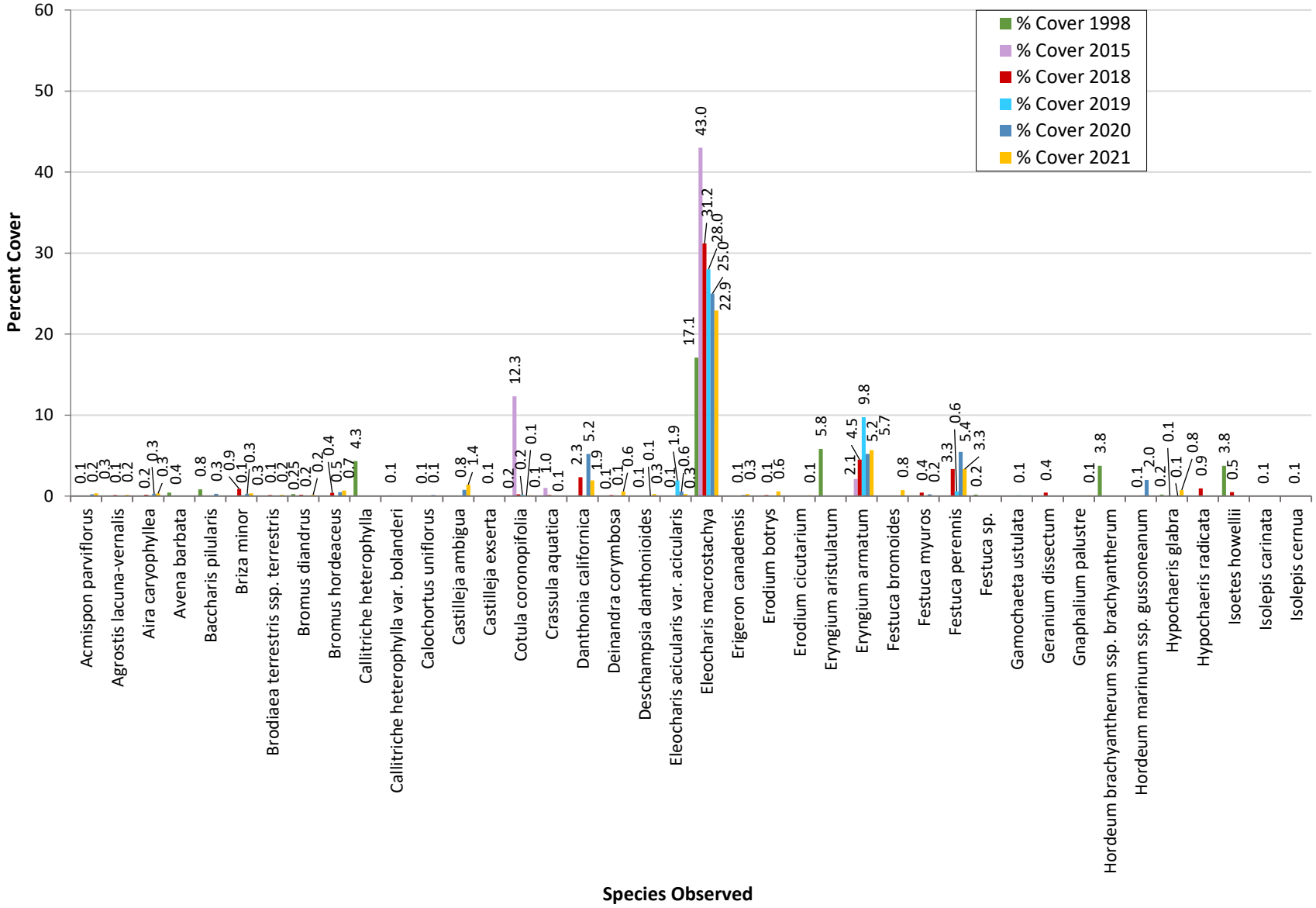

Figure F-4. Comparison Graph of Percent Cover by Wetland Plant Species for 1998, 2015, 2018, 2019, 2020, and 2021 at Pond 3 North (Year 3 Post-Subsurface Munitions Remediation)

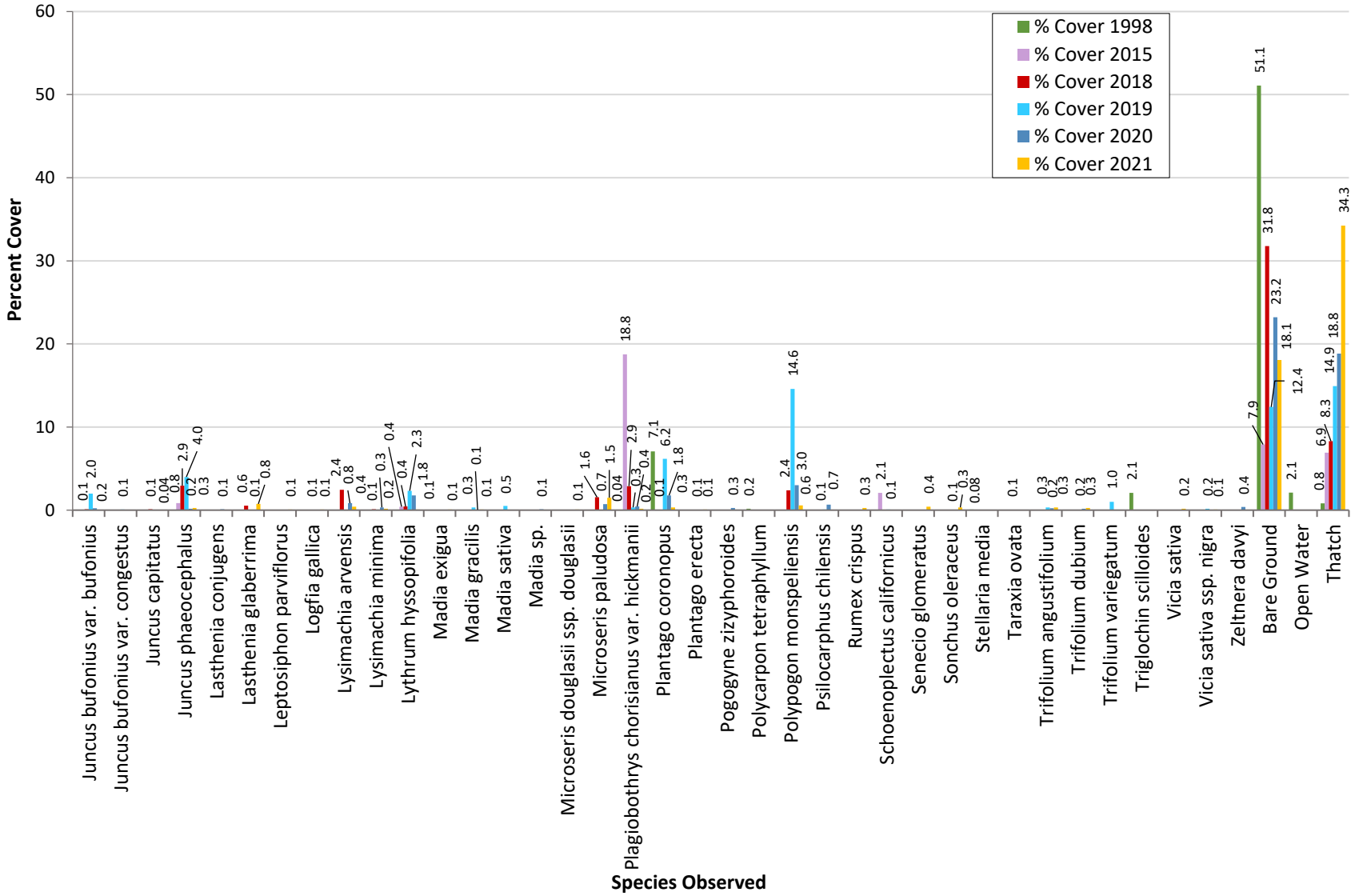

Figure F-4 (continued). Comparison Graph of Percent Cover by Wetland Plant Species for 1998, 2015, 2018, 2019, 2020, and 2021 at Pond 3 North (Year 3 Post-Subsurface Munitions Remediation)

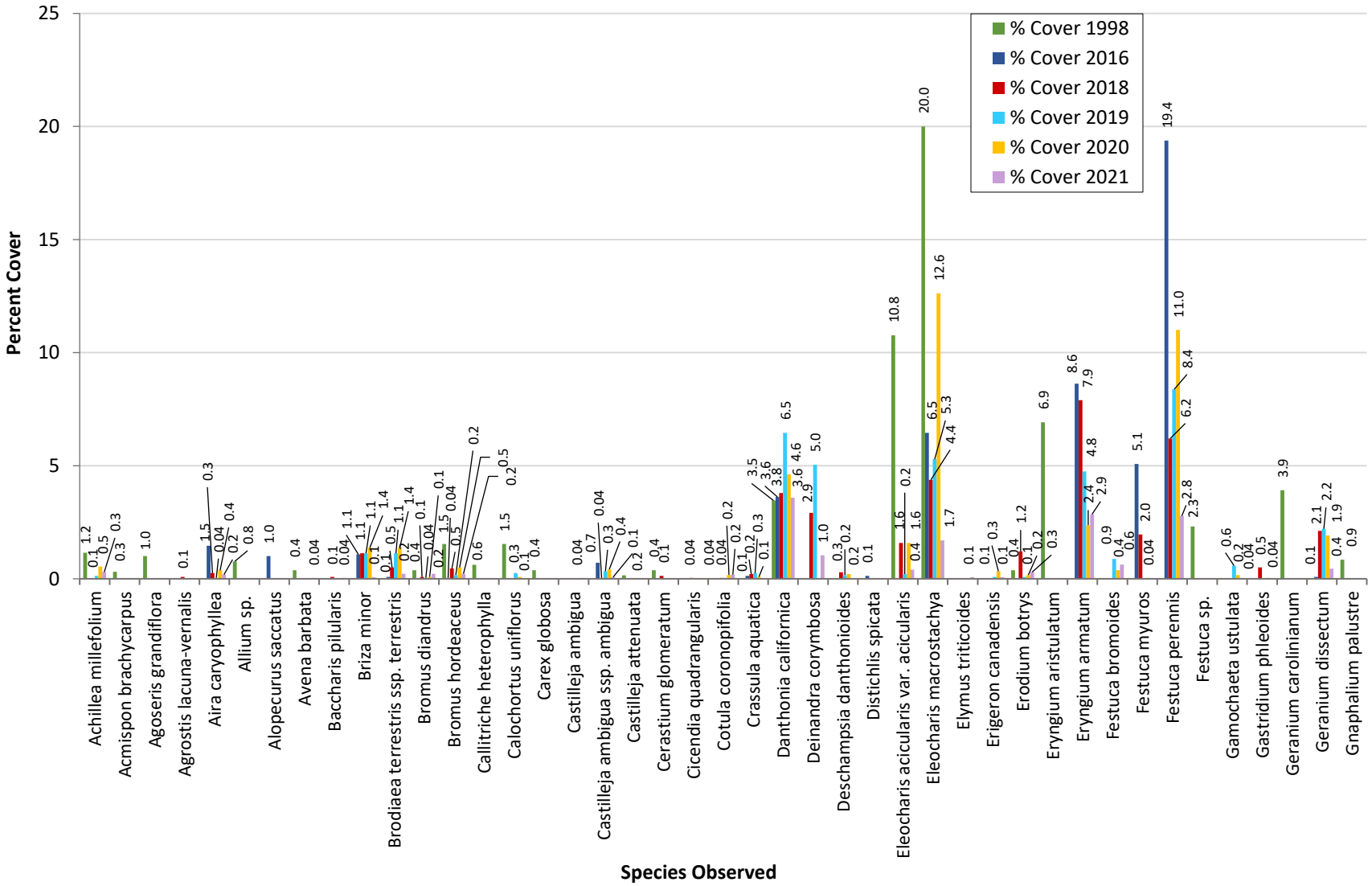

Figure F-5. Comparison Graph of Percent Cover by Wetland Plant Species for 1998, 2016, 2018, 2019, 2020, and 2021 at Pond 3 South (Year 3 Post-Subsurface Munitions Remediation)

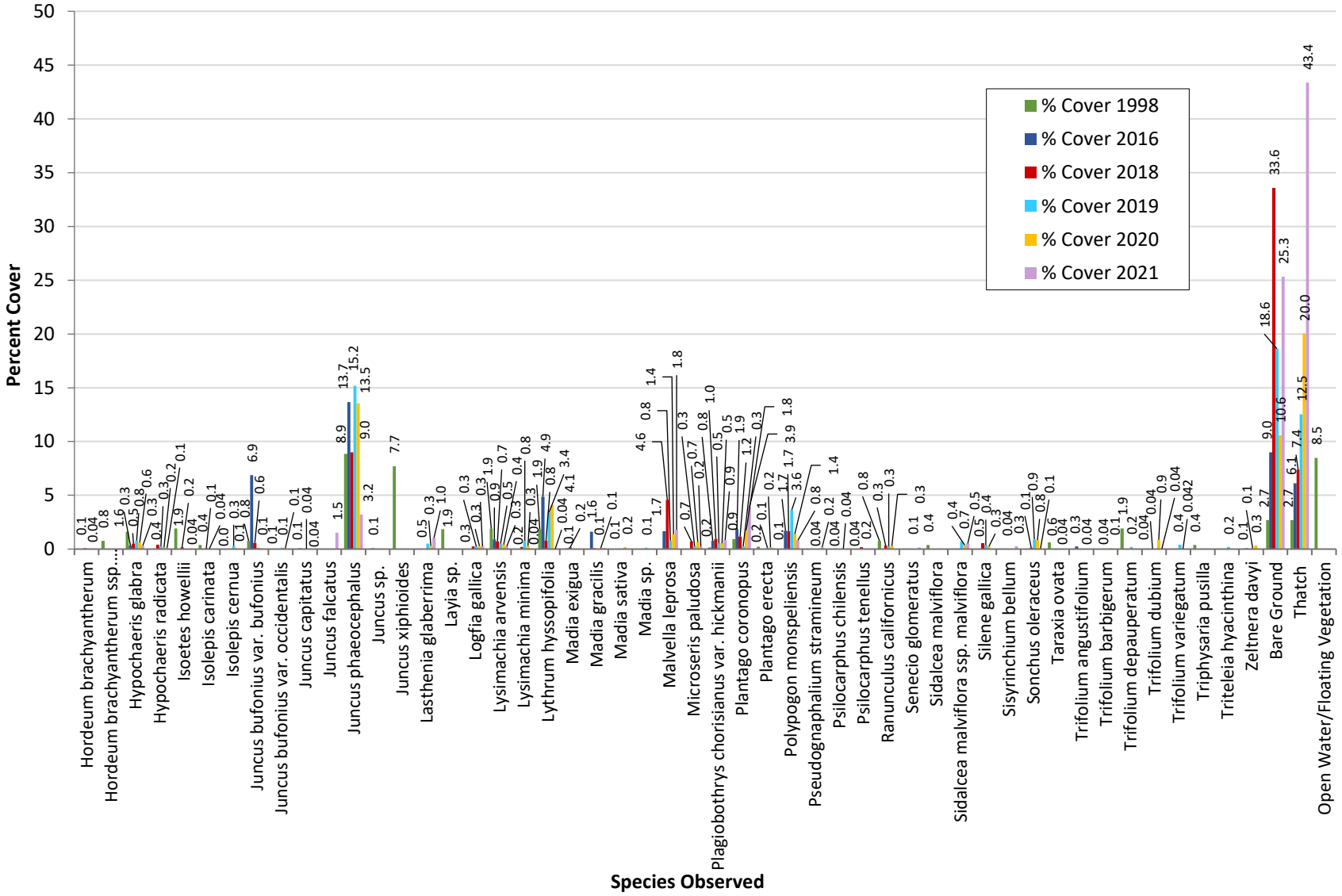

Figure F-5 (continued). Comparison Graph of Percent Cover by Wetland Plant Species for 1998, 2016, 2018, 2019, 2020 and 2021 at Pond 3 South (Year 3 Post-Subsurface Munitions Remediation)

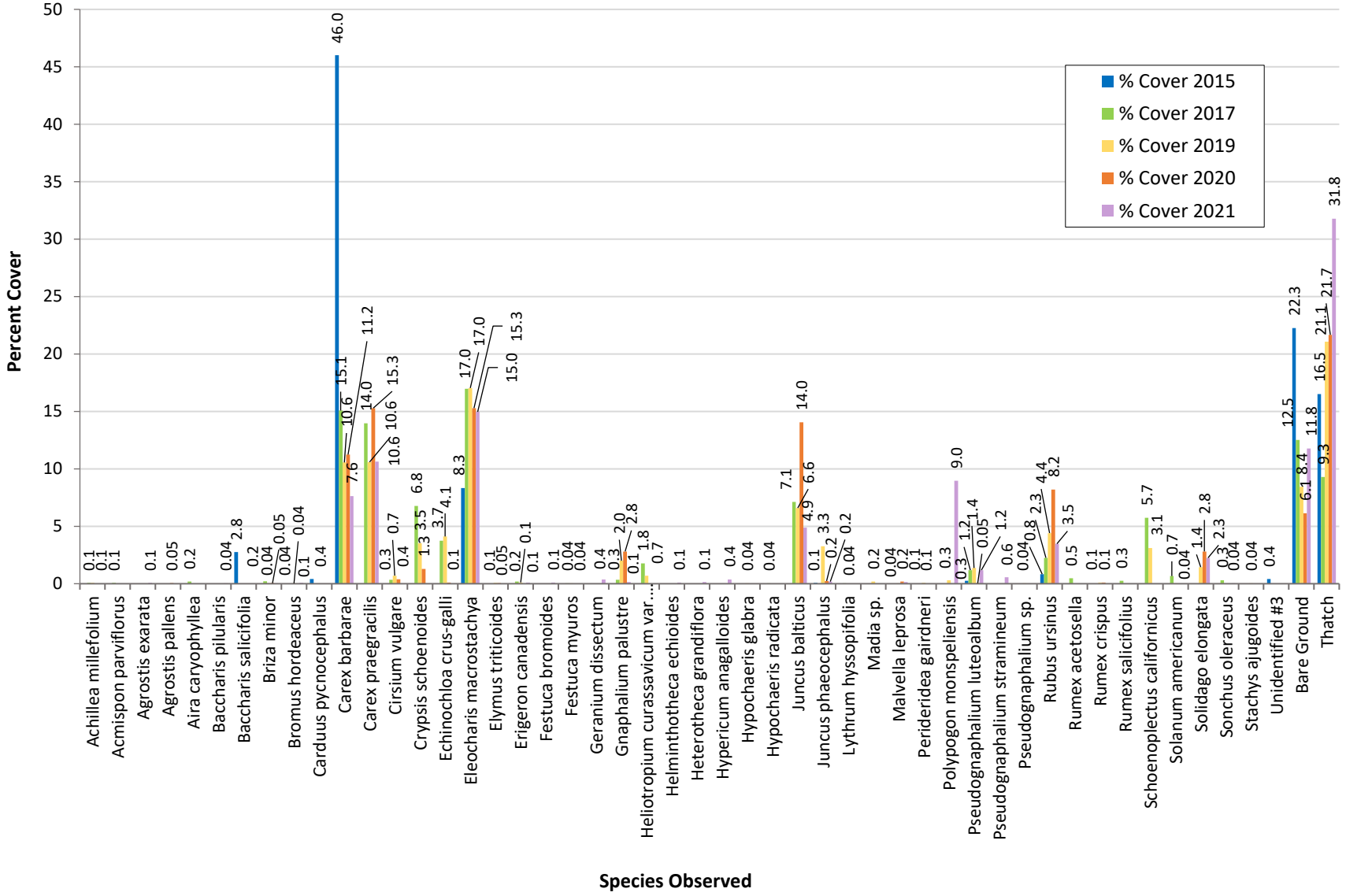

Figure F-6. Comparison Graph of Percent Cover by Wetland Plant Species for 2015, 2017, 2019, 2020, and 2021 at Pond 16 (Year 3 Post-Subsurface Munitions Remediation)

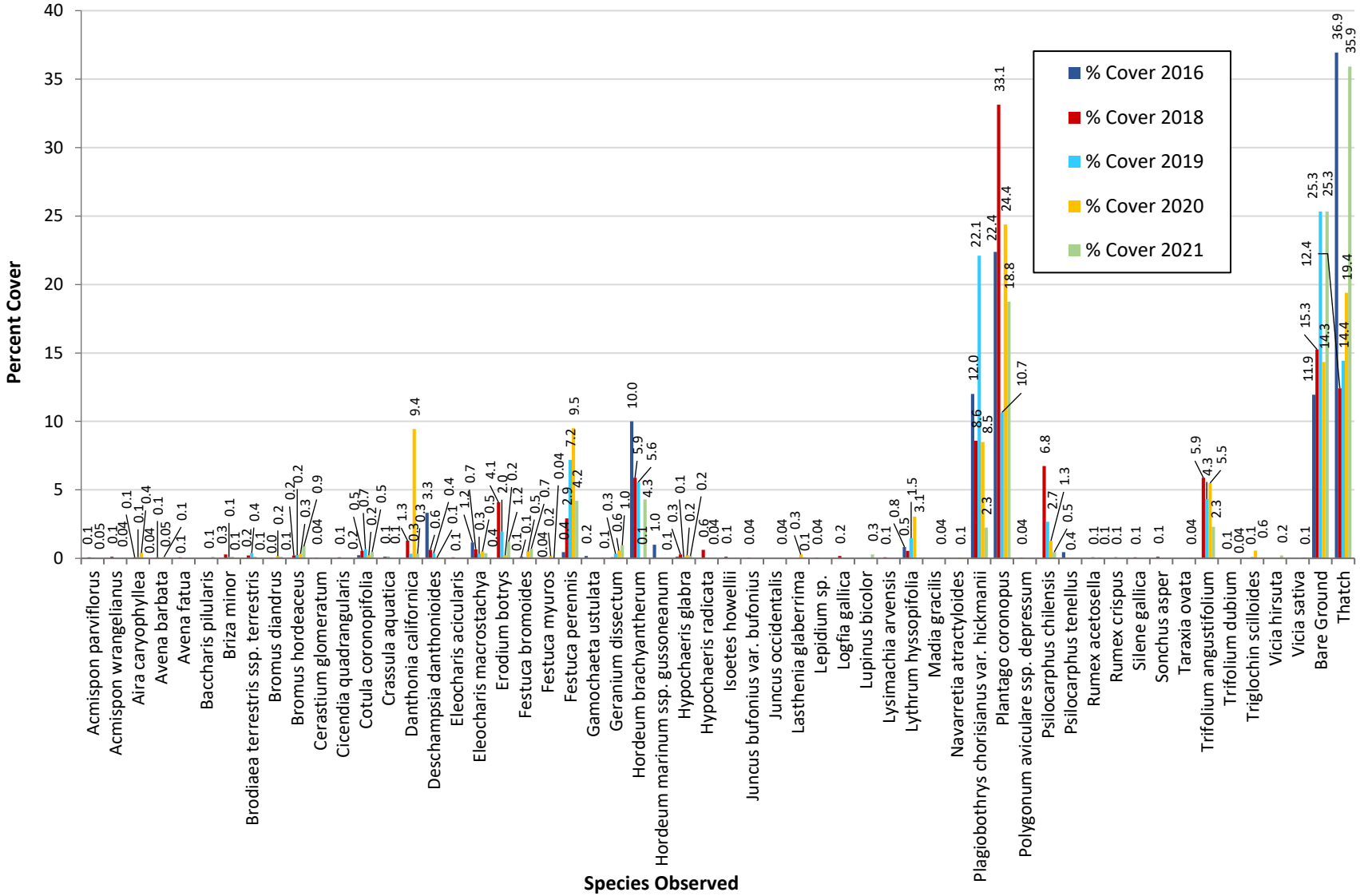

Figure F-7. Comparison Graph of Percent Cover by Wetland Plant Species for 2016, 2018, 2019, 2020, and 2021 at Pond 35 (Year 3 Post-Subsurface Munitions Remediation)

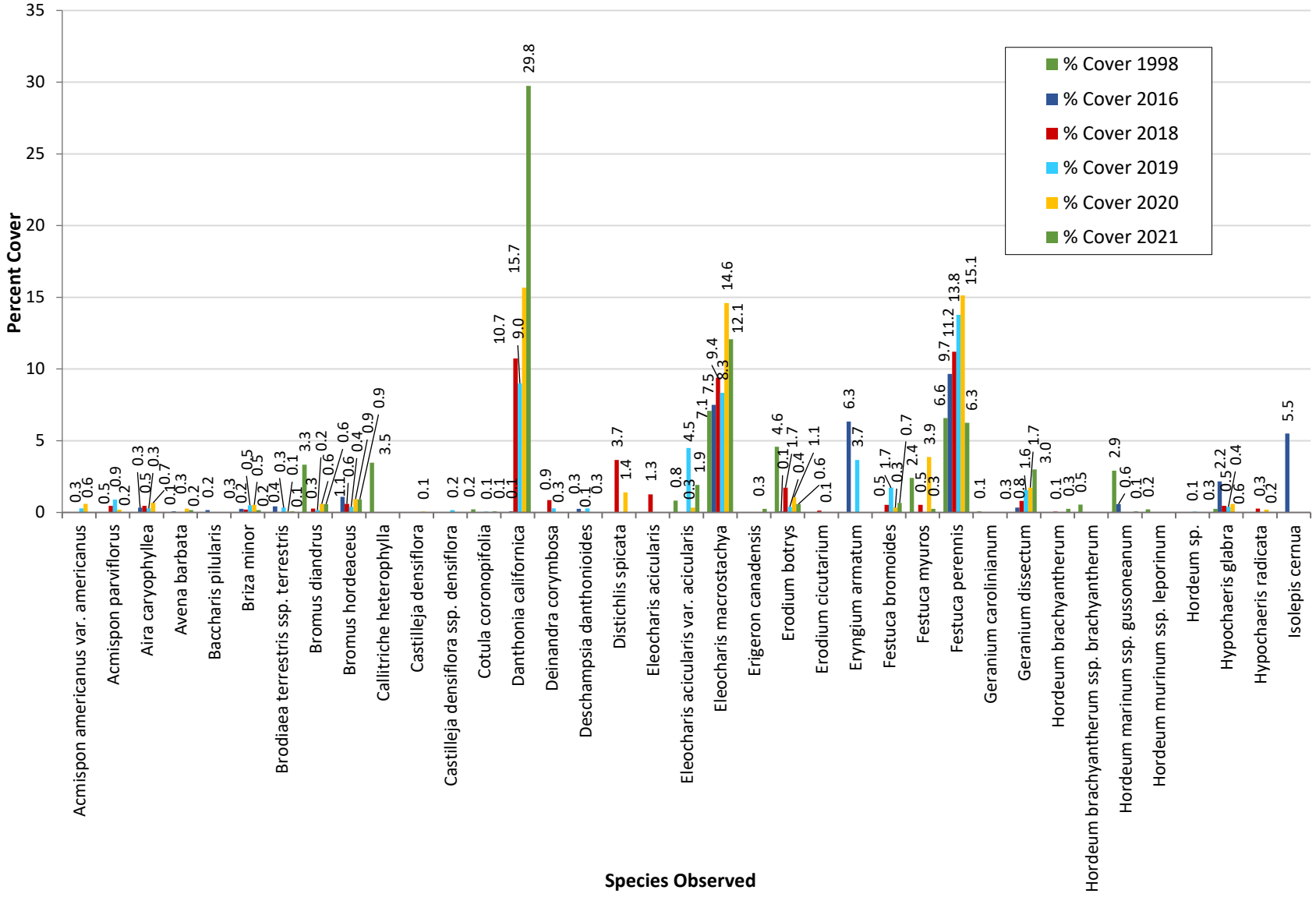

Figure F-8. Comparison Graph of Percent Cover by Wetland Plant Species for 1998, 2016, 2018, 2019, 2020, and 2021 at Pond 39 (Year 3 Post-Subsurface Munitions Remediation)

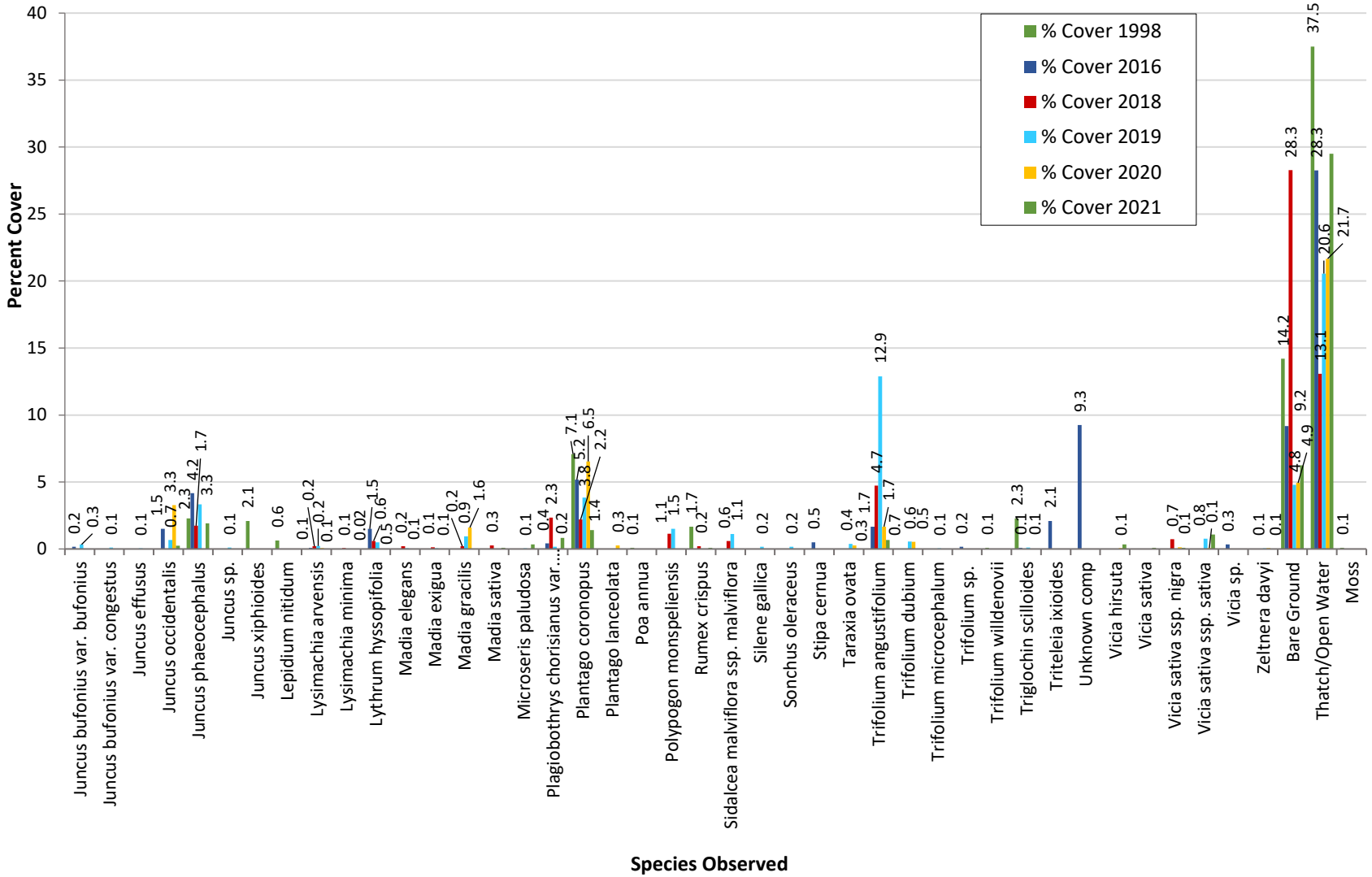

Figure F-8 (Continued). Comparison Graph of Percent Cover by Wetland Plant Species for 1998, 2016, 2018, 2019, 2020, and 2021 at Pond 39 (Year 3 Post-Subsurface Munitions Remediation)

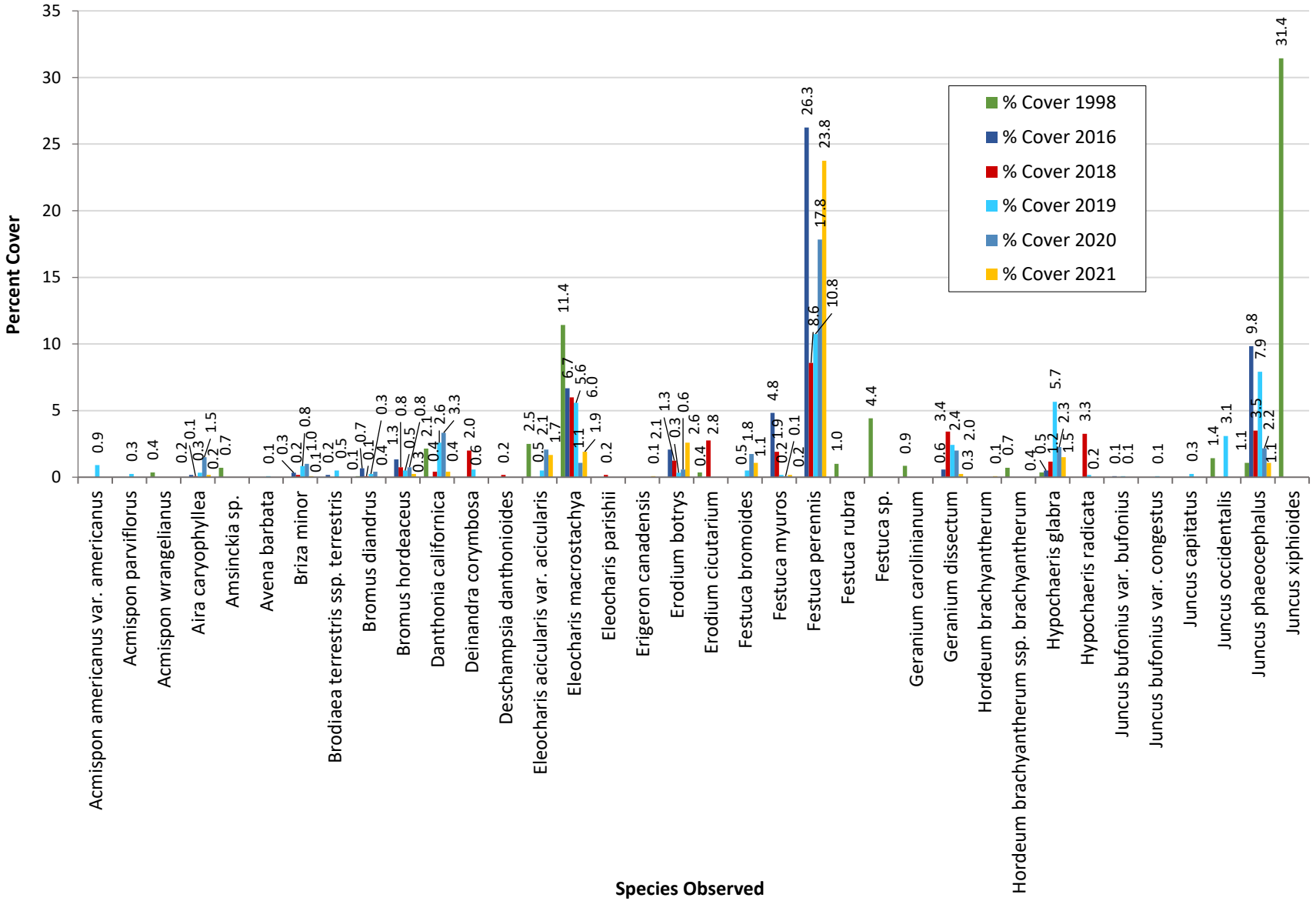

Figure F-9. Comparison Graph of Percent Cover by Wetland Plant Species for 1998, 2016, 2018, 2019, 2020, and 2021 at Pond 40 South (Year 3 Post-Subsurface Munitions Remediation)

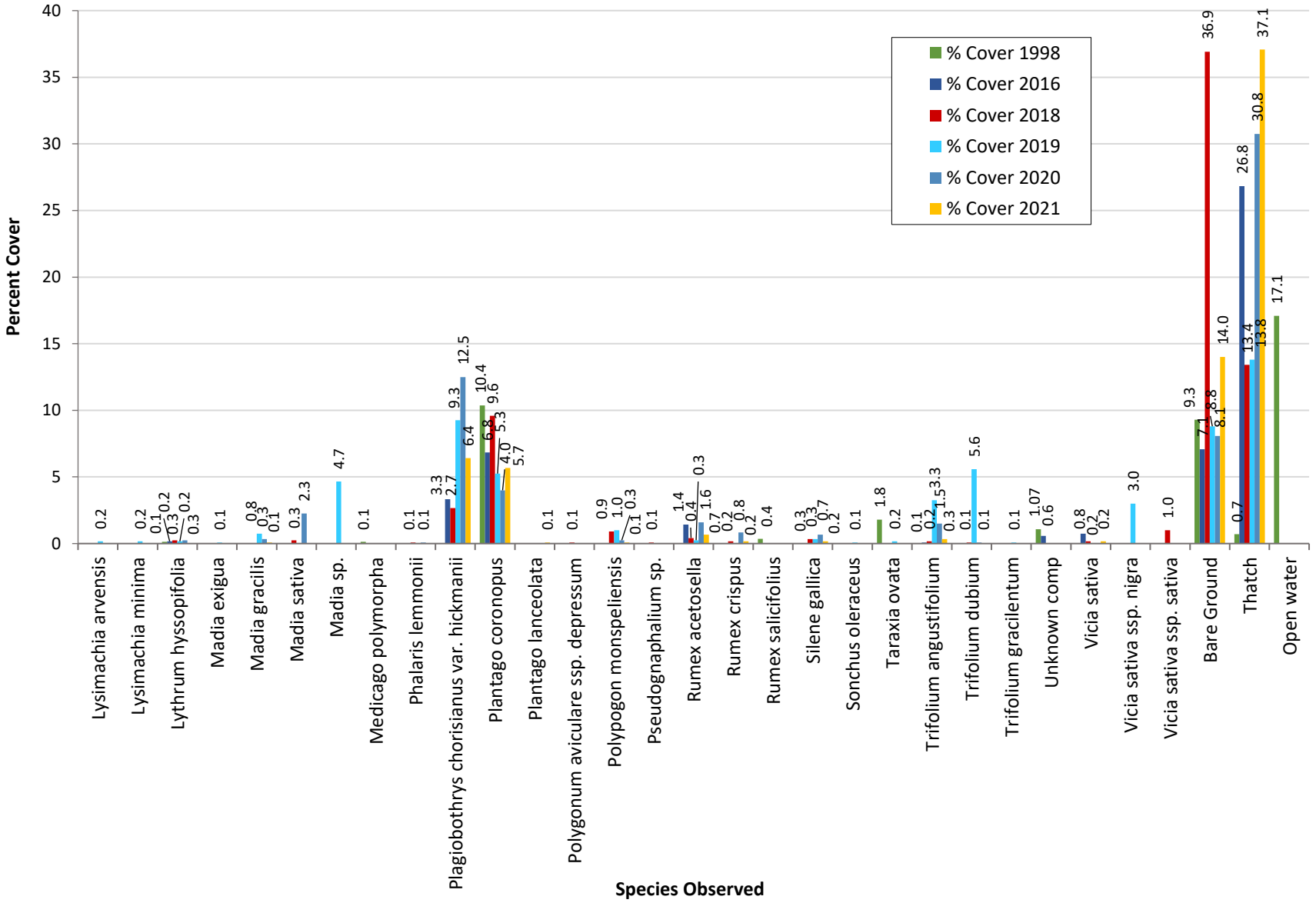

Figure F-9 (continued). Comparison Graph of Percent Cover by Wetland Plant Species for 1998, 2016, 2018, 2019, 2020, and 2021 at Pond 40 South (Year 3 Post-Subsurface Munitions Remediation)

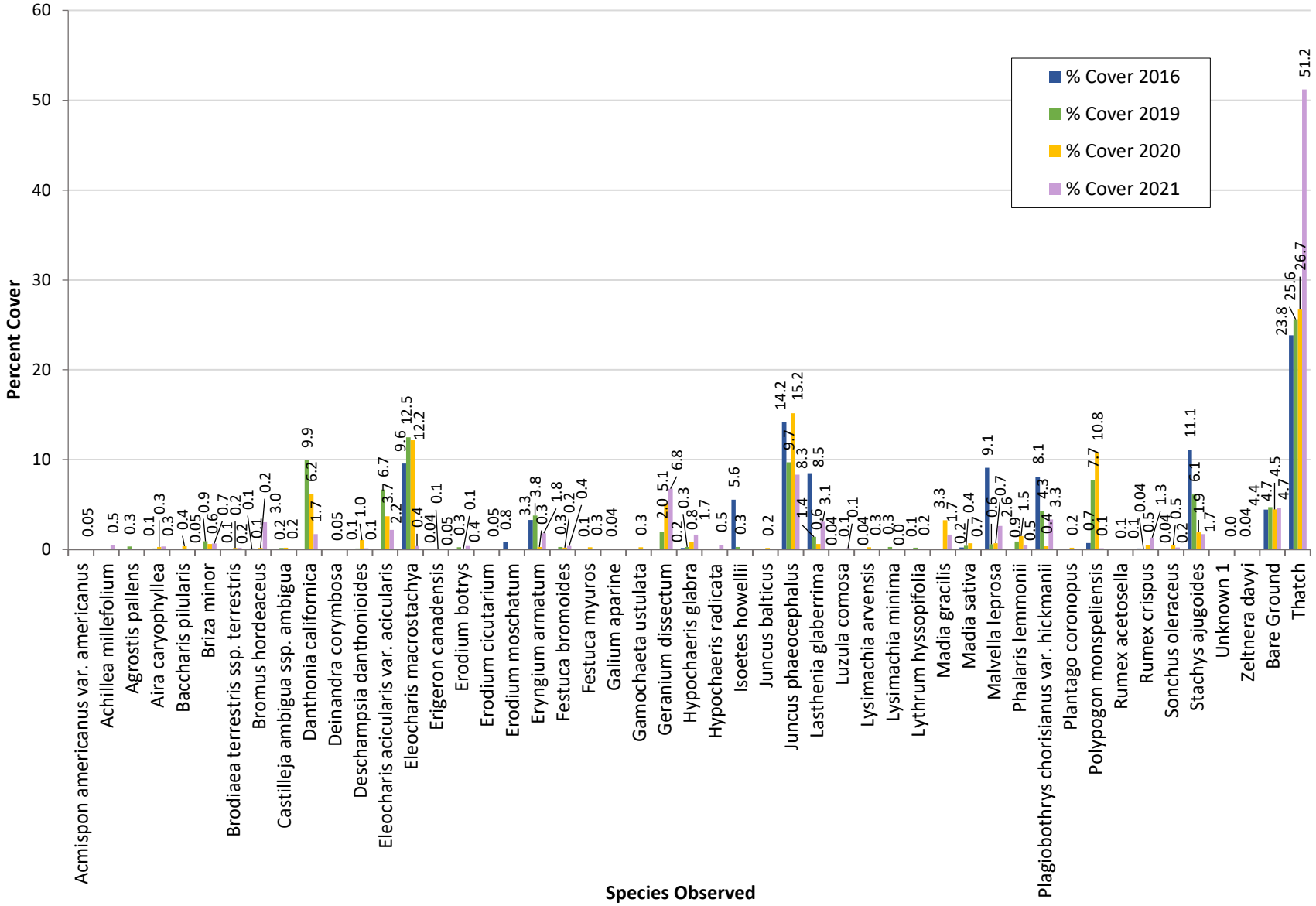

Figure F-10. Comparison Graph of Percent Cover by Wetland Plant Species for 2016, 2019, 2020, and 2021 at Pond 41 (Year 3 Post-Subsurface Munitions Remediation)

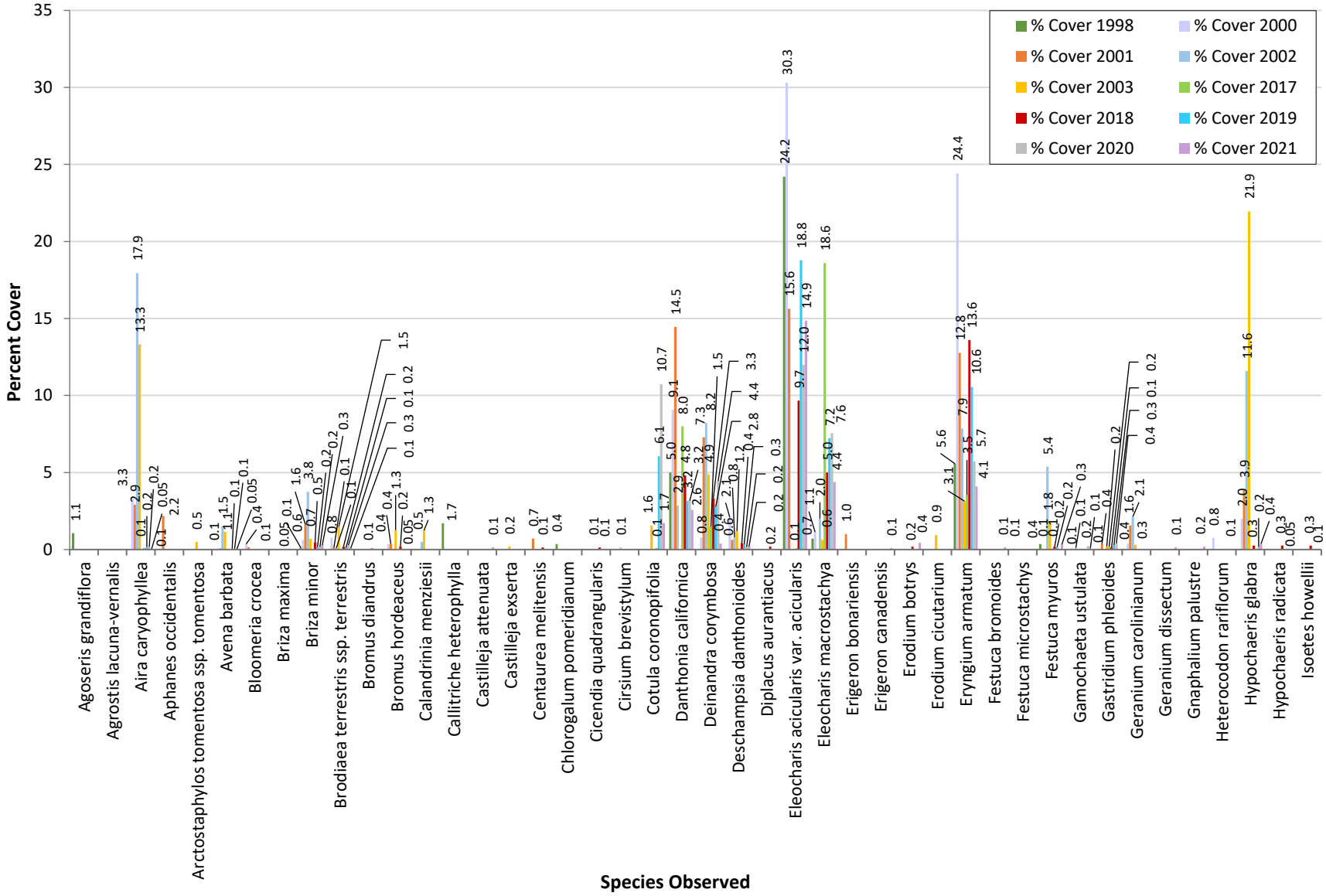

Figure F-11. Comparison Graph of Percent Cover by Wetland Plant Species for 1998, 2000, 2001, 2002, 2003, 2017, 2018, 2019, 2020, and 2021 at Pond 42 (Year 3 Post-Subsurface Munitions Remediation)

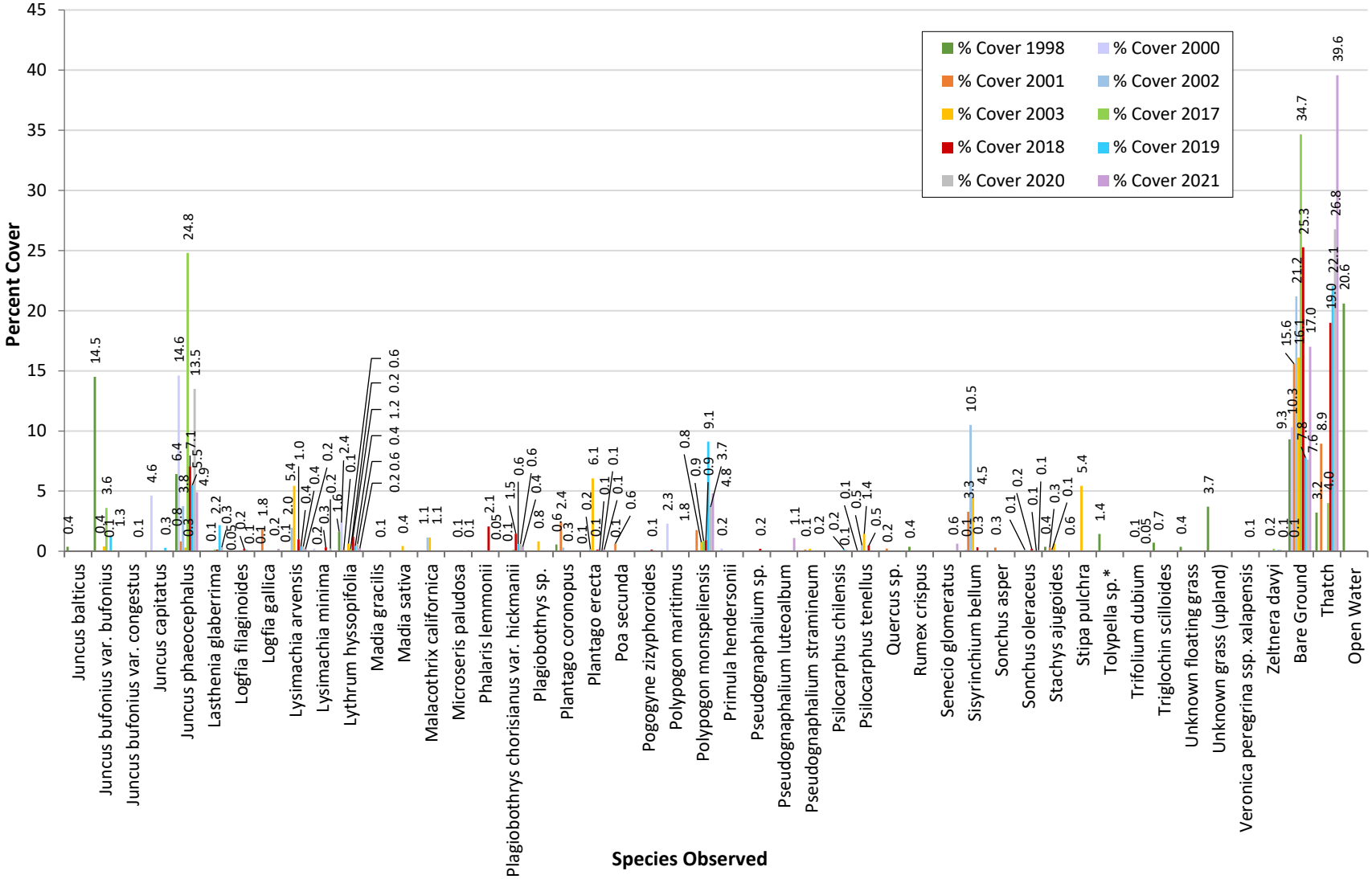

Figure F-11 (continued). Comparison Graph of Percent Cover by Wetland Plant Species for 1998, 2000, 2001, 2002, 2003, 2017, 2018, 2019, 2020, and 2021 at Pond 42 (Year 3 Post-Subsurface Munitions Remediation)

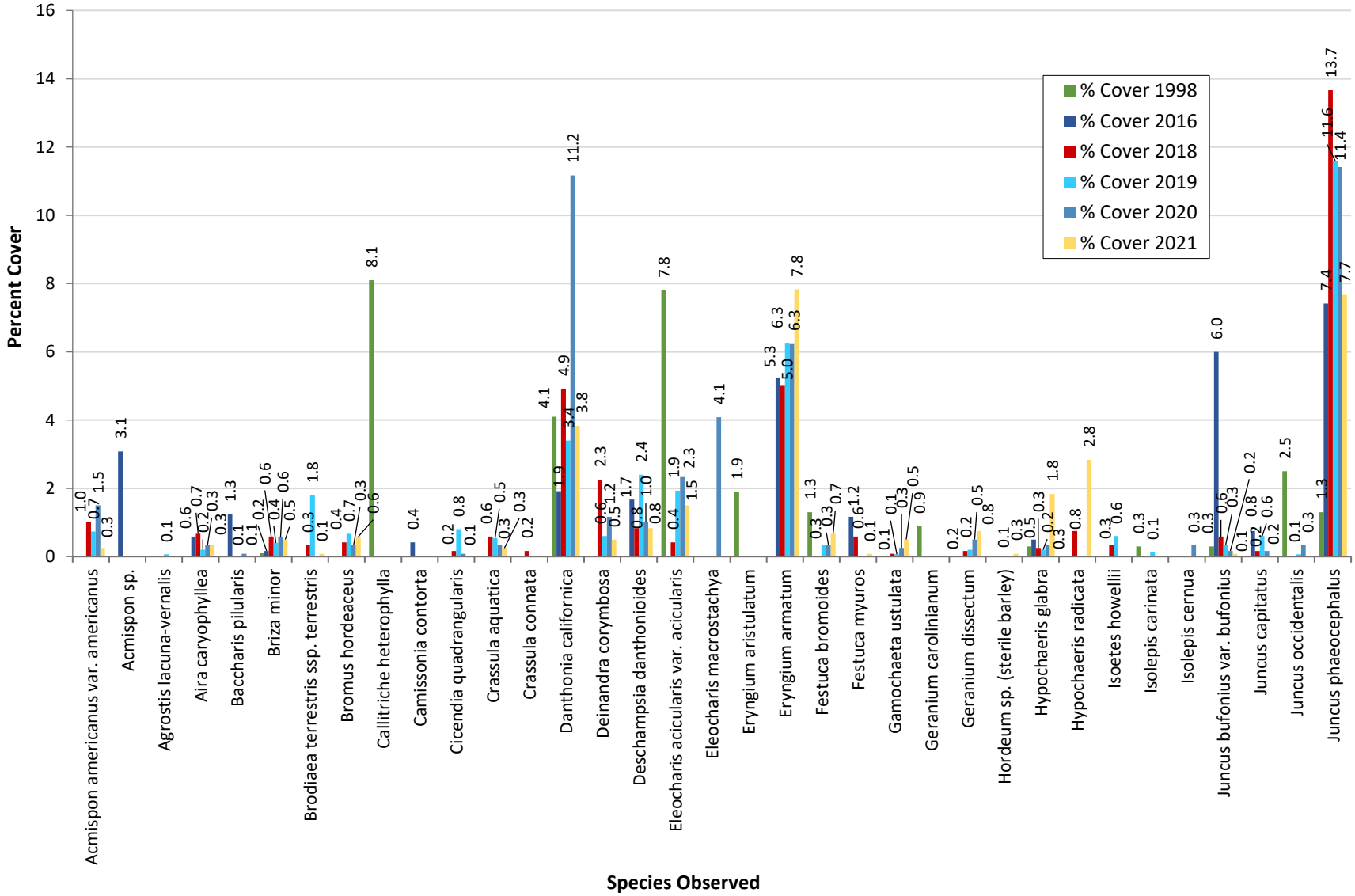

Figure F-12. Comparison Graph of Percent Cover by Wetland Plant Species for 1998, 2016, 2018, 2019, 2020, and 2021 at Pond 43 (Year 3 Post-Subsurface Munitions Remediation)

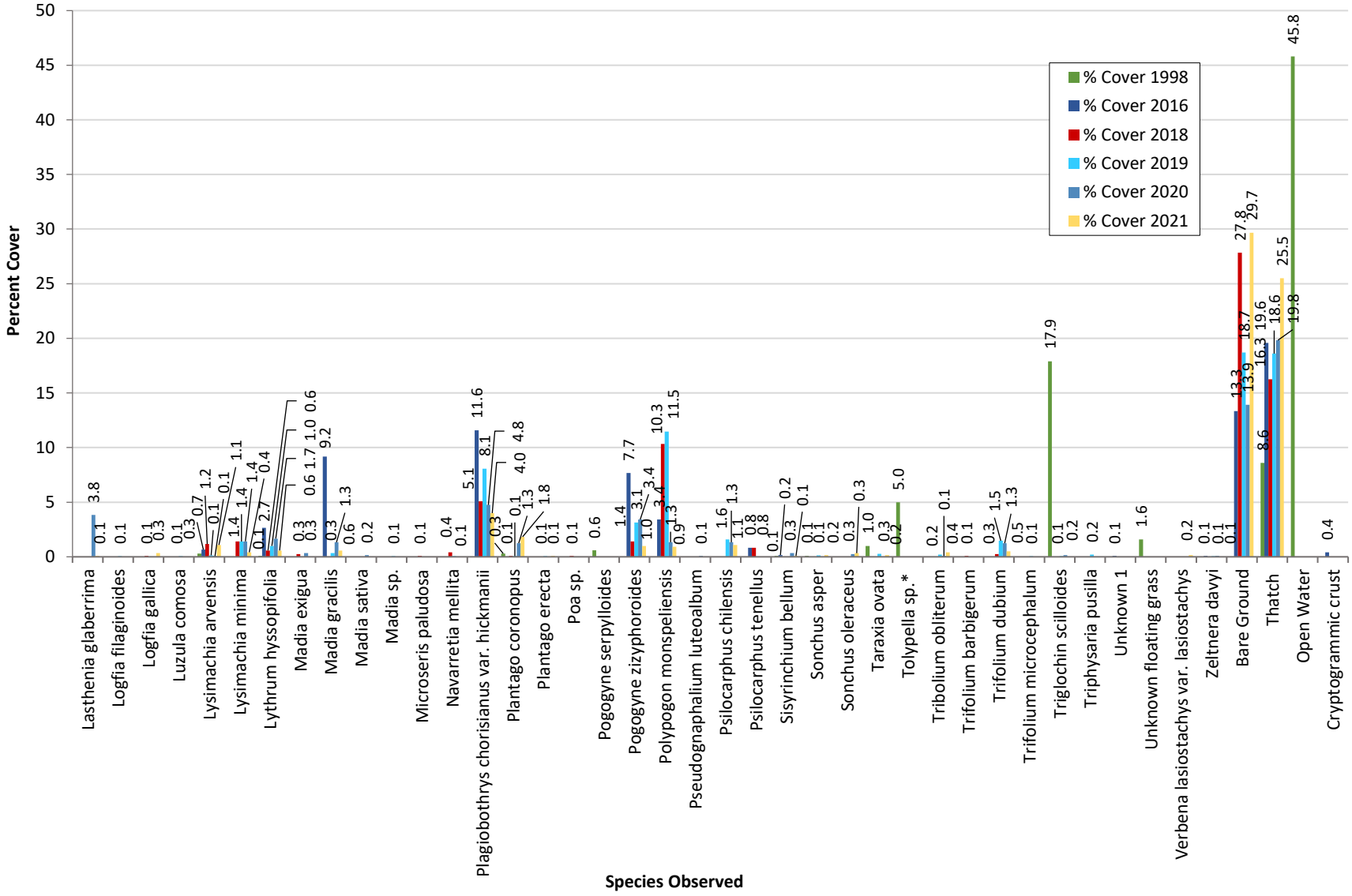

Figure F-12 (continued)**.** Comparison Graph of Percent Cover by Wetland Plant Species for 1998, 2016, 2018, 2019, 2020, and 2021 at Pond 43 (Year 3 Post-Subsurface Munitions Remediation)

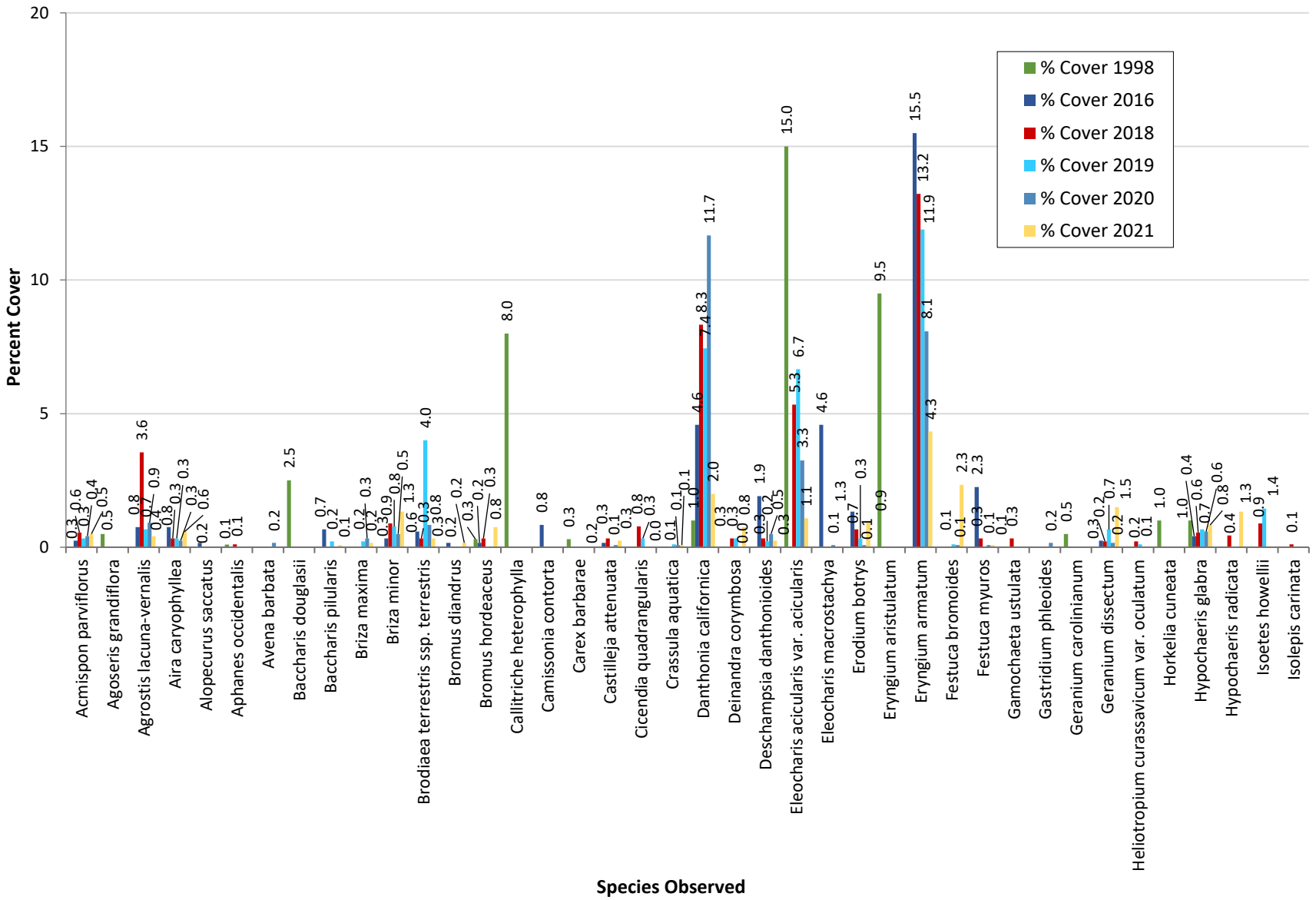

Figure F-13. Comparison Graph of Percent Cover by Wetland Plant Species for 1998, 2016, 2018, 2019, 2020, and 2021 at Pond 44 (Year 3 Post-Subsurface Munitions Remediation)

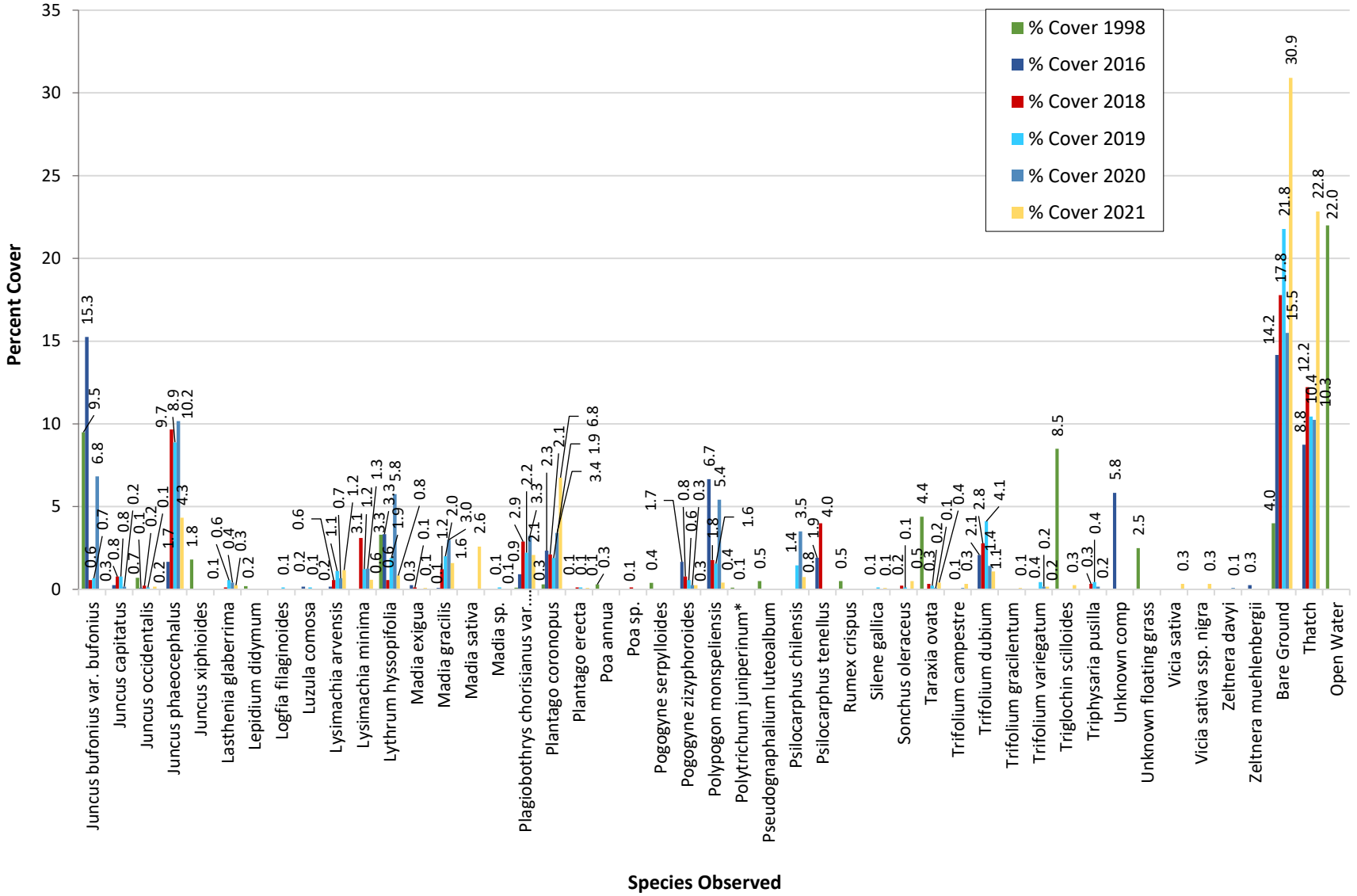

Figure F-13 (continued). Comparison Graph of Percent Cover by Wetland Plant Species for 1998, 2016, 2018, 2019, 2020, and 2021 at Pond 44 (Year 3 Post-Subsurface Munitions Remediation)

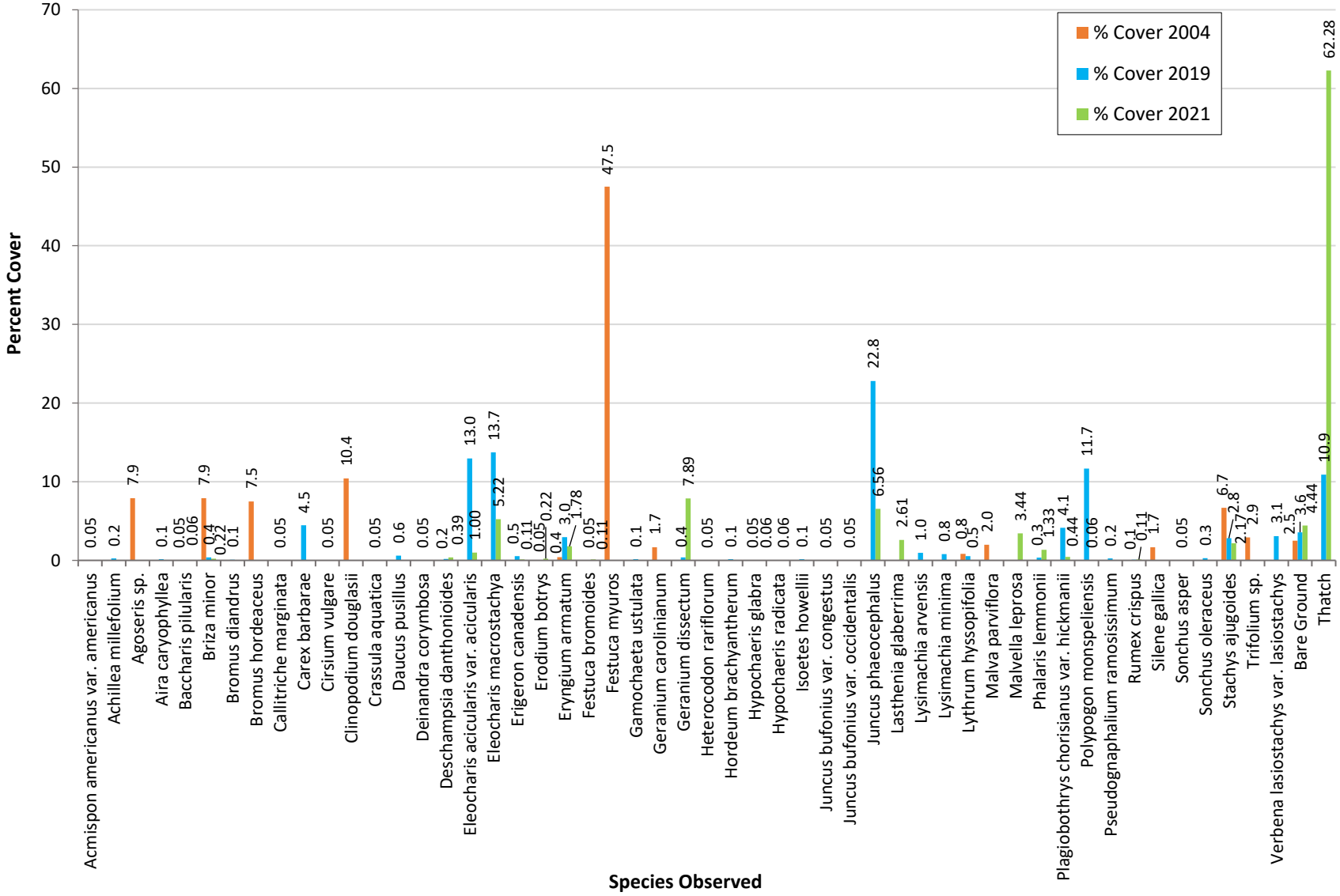

Figure F-14. Comparison Graph of Percent Cover by Wetland Plant Species for 2004, 2019, and 2021 at Pond 54 (Year 3 Post-Mastication)

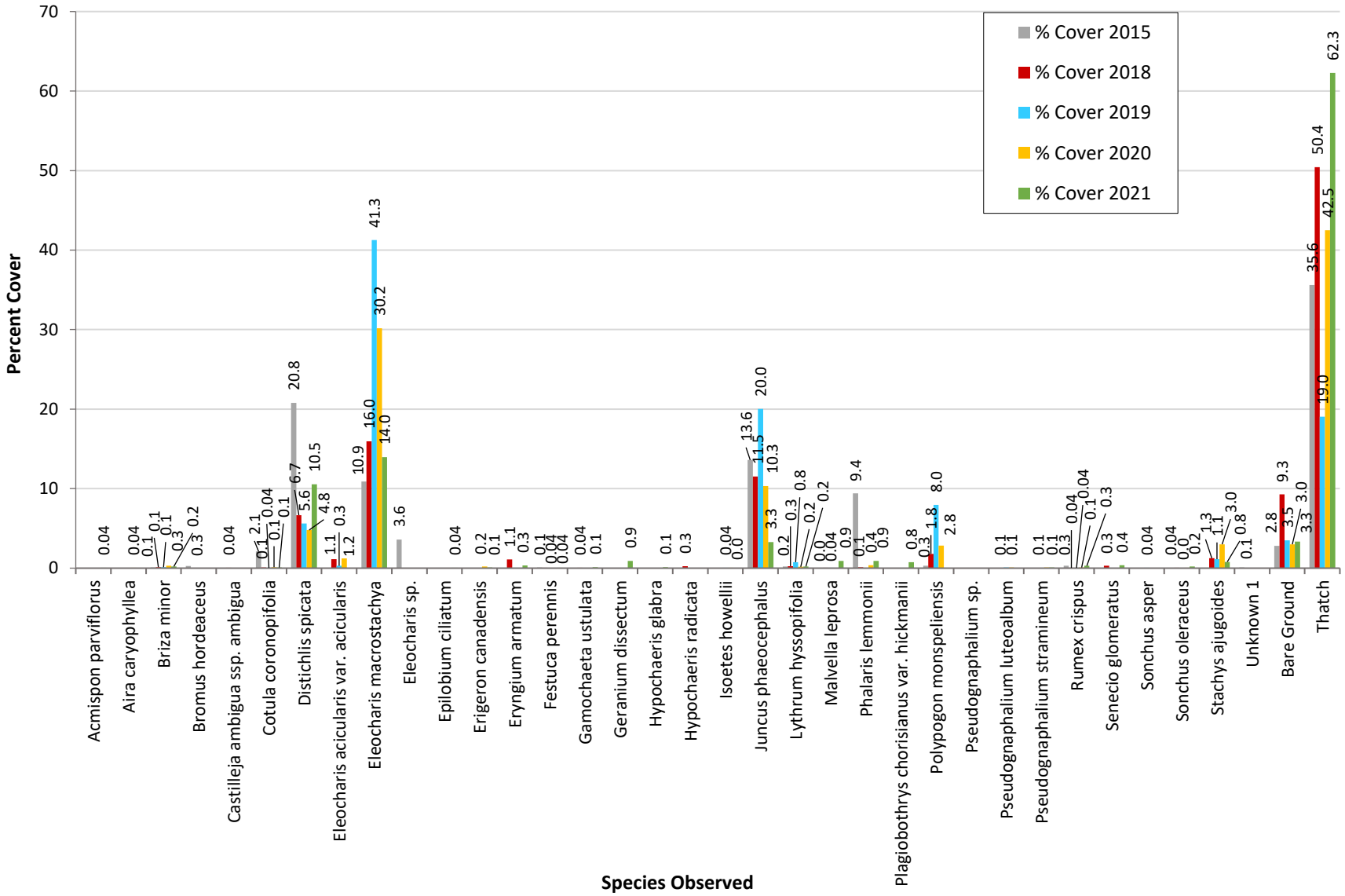

Figure F-15. Comparison Graph of Percent Cover by Wetland Plant Species for 2015, 2018, 2019, 2020, and 2021 at Pond 60 (Year 3 Post-Subsurface Munitions Remediation)

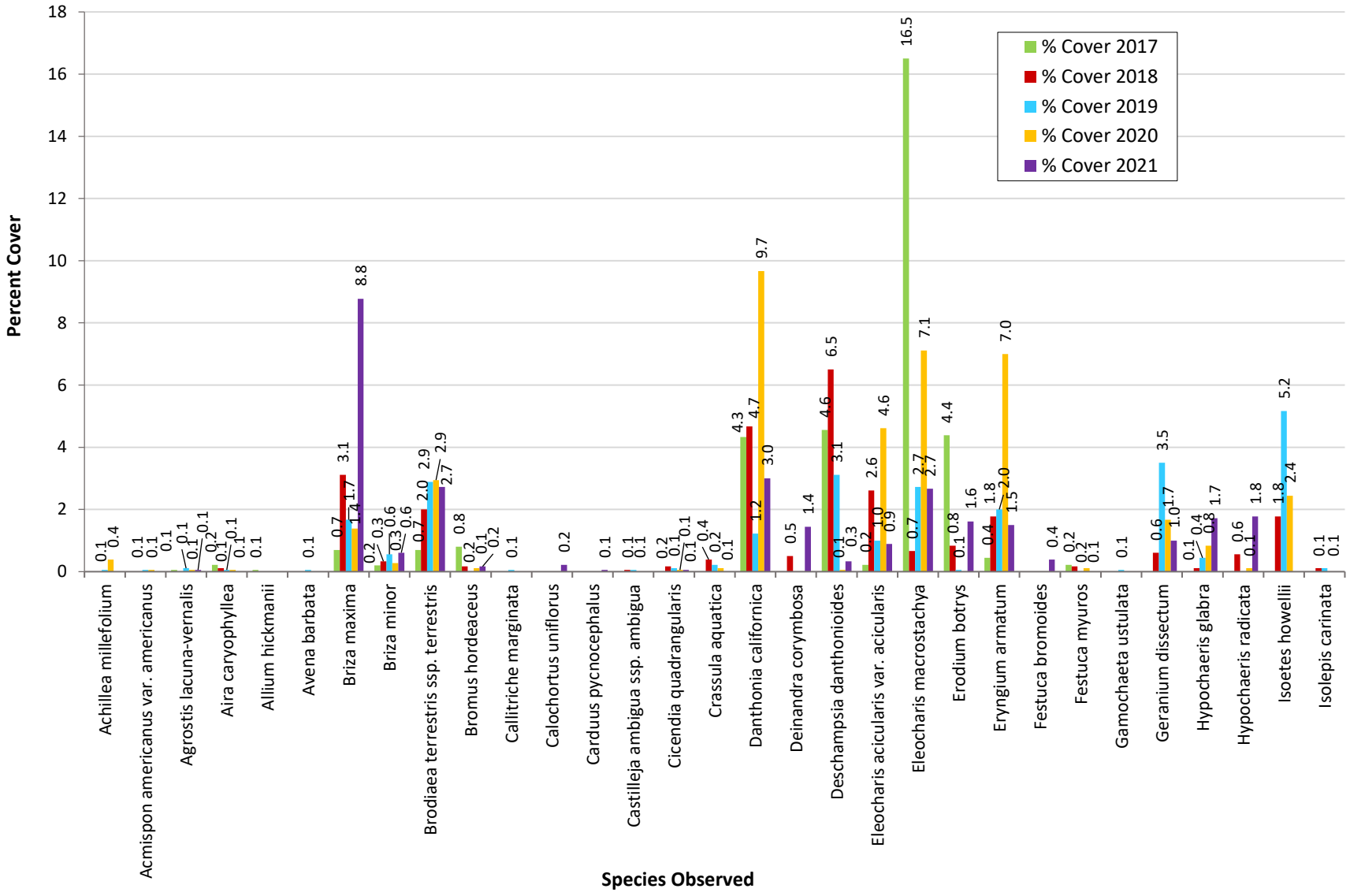

Figure F-16. Comparison Graph of Percent Cover by Wetland Plant Species for 2017, 2018, 2019, 2020, and 2021 at Pond 61 (Year 3 Post-Subsurface Munitions Remediation)

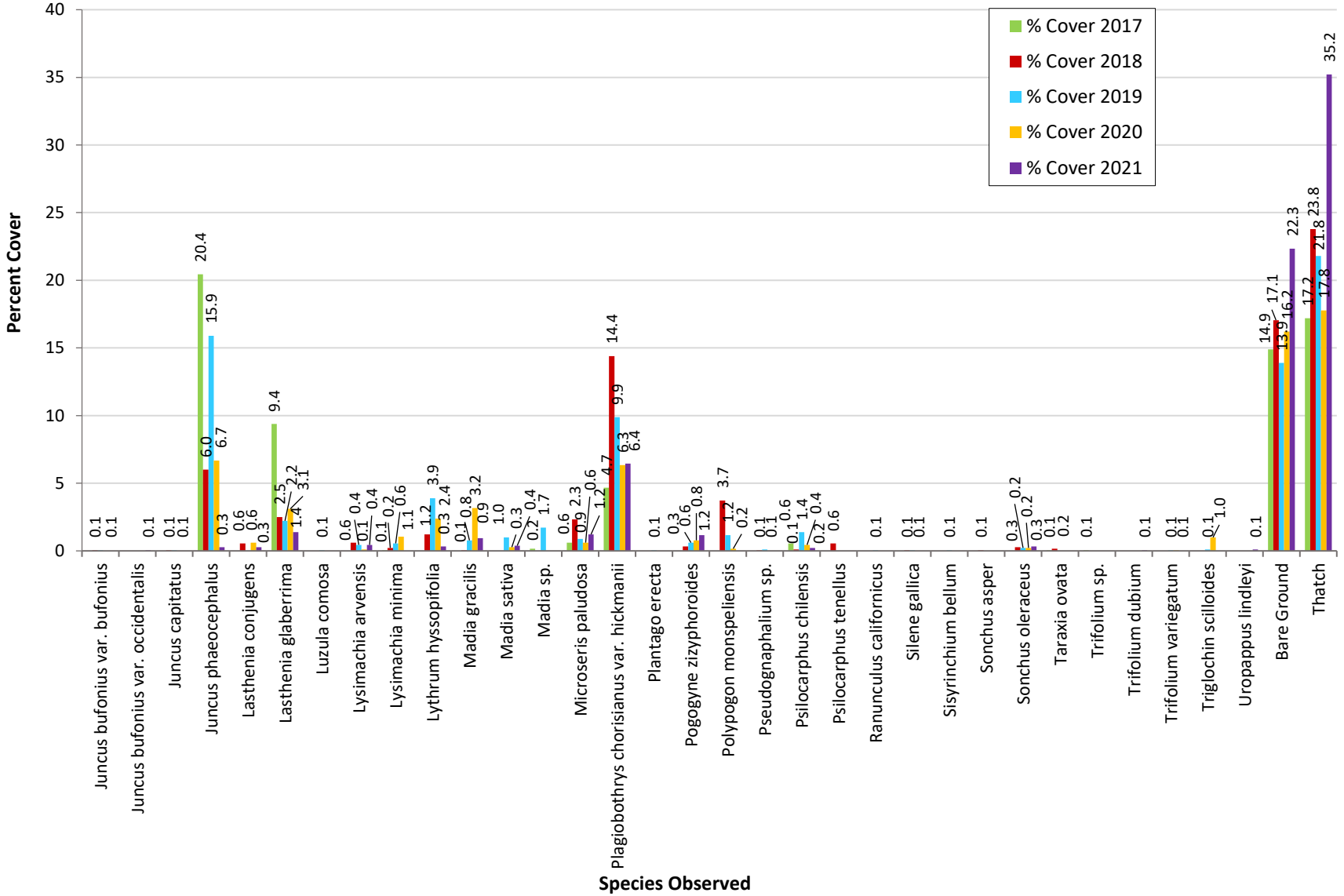

Figure F-16 (continued)**.** Comparison Graph of Percent Cover by Wetland Plant Species for 2017, 2018, 2019, 2020, and 2021 at Pond 61 (Year 3 Post-Subsurface Munitions Remediation)

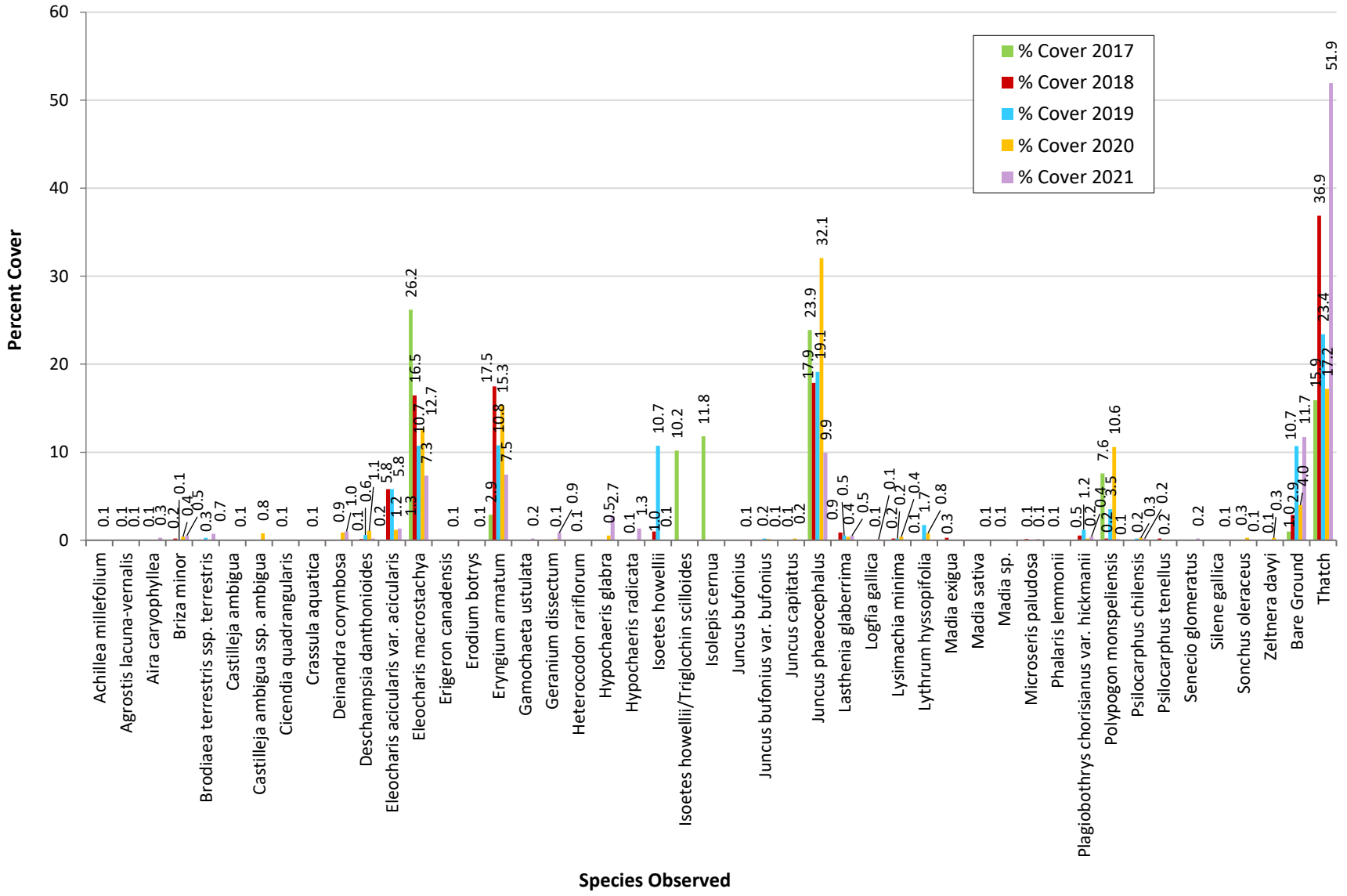

Figure F-17. Comparison Graph of Percent Cover by Wetland Plant Species for 2017, 2018, 2019, 2020, and 2021 at Pond 73 (Year 3 Post-Subsurface Munitions Remediation)

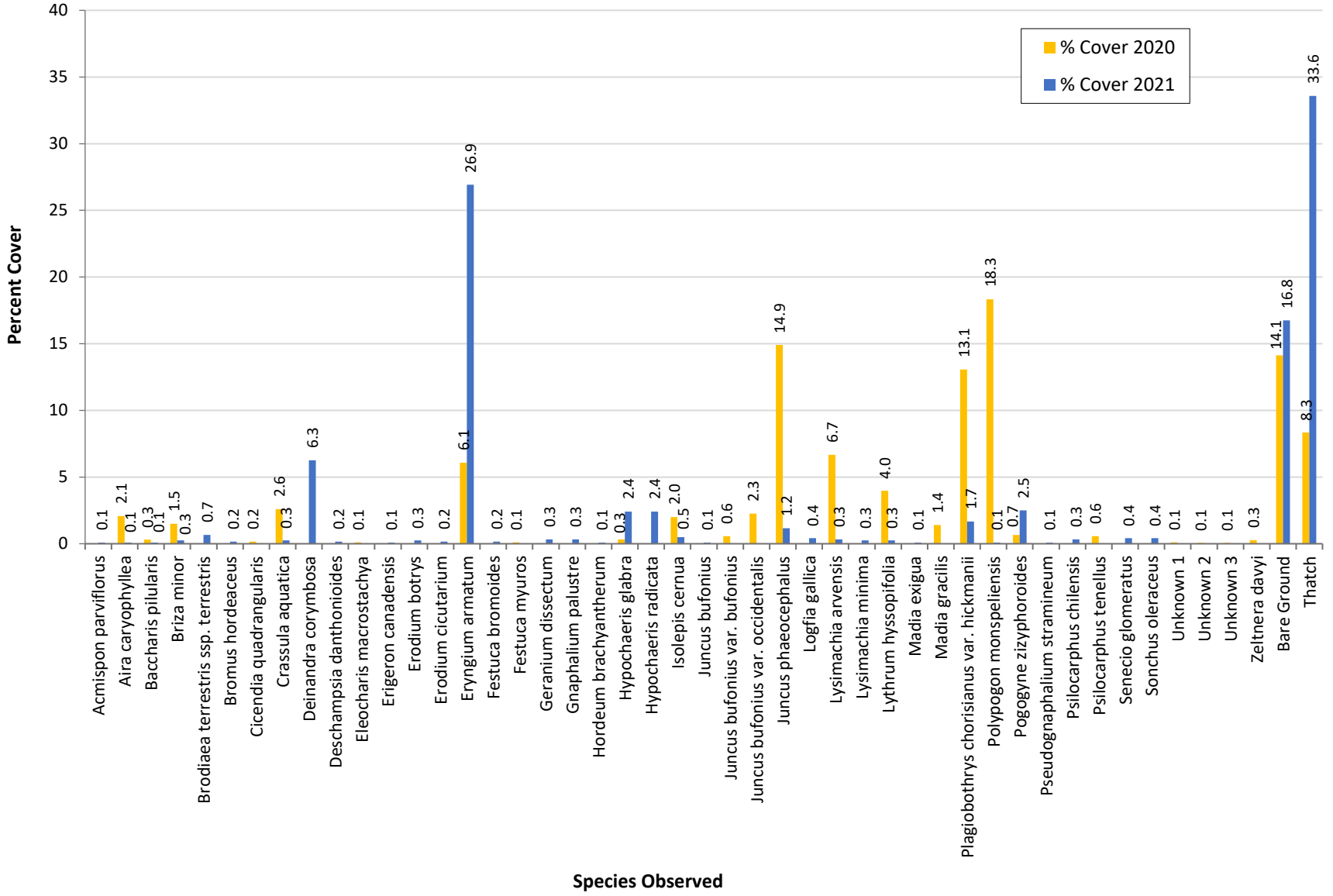

Figure F-18. Comparison Graph of Percent Cover by Wetland Plant Species for 2020 and 2021 at Pond 74 (Year 3 Post-Mastication)

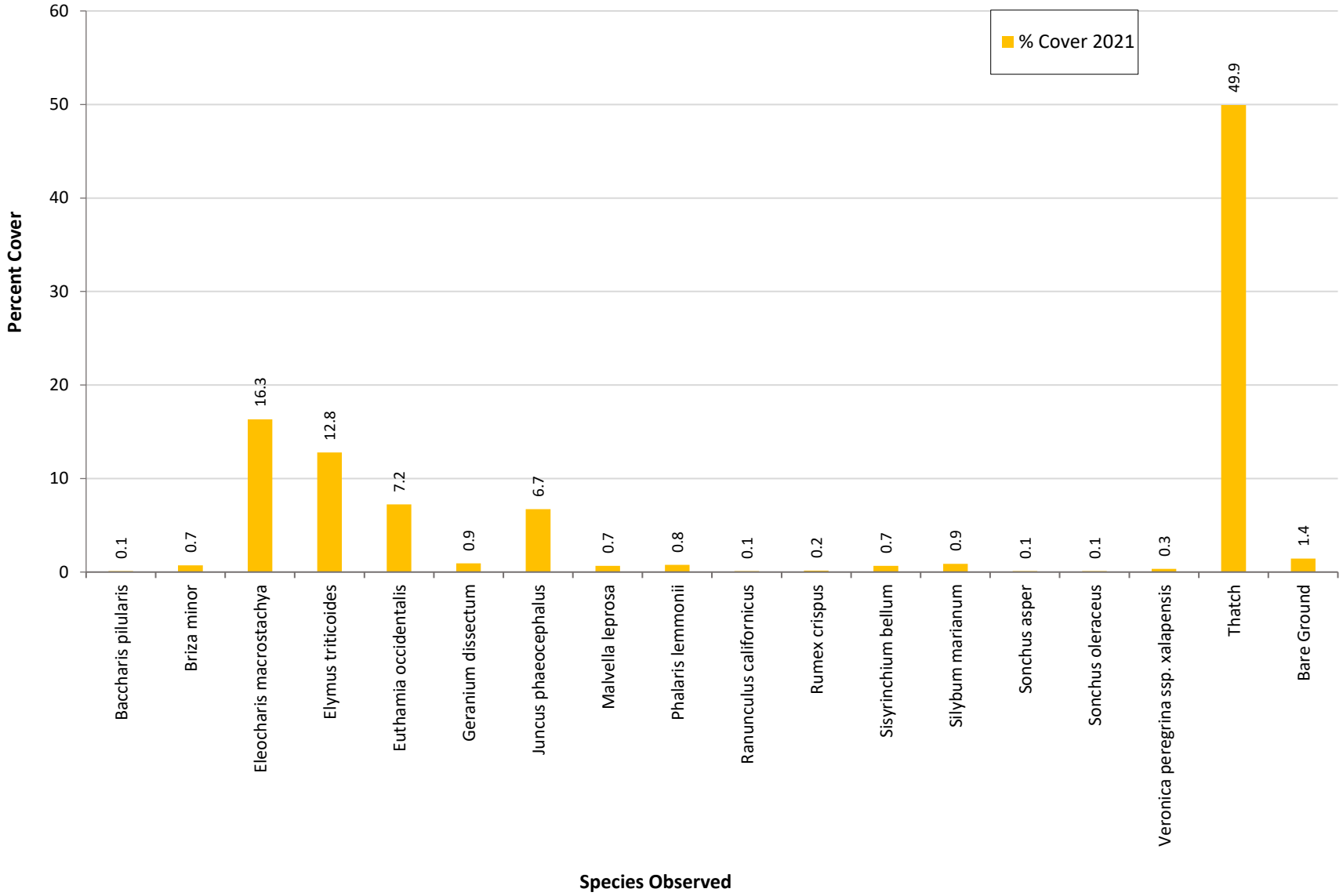

Figure F-19. Graph of Percent Cover by Wetland Plant Species for 2021 at Pond 75 (Baseline)

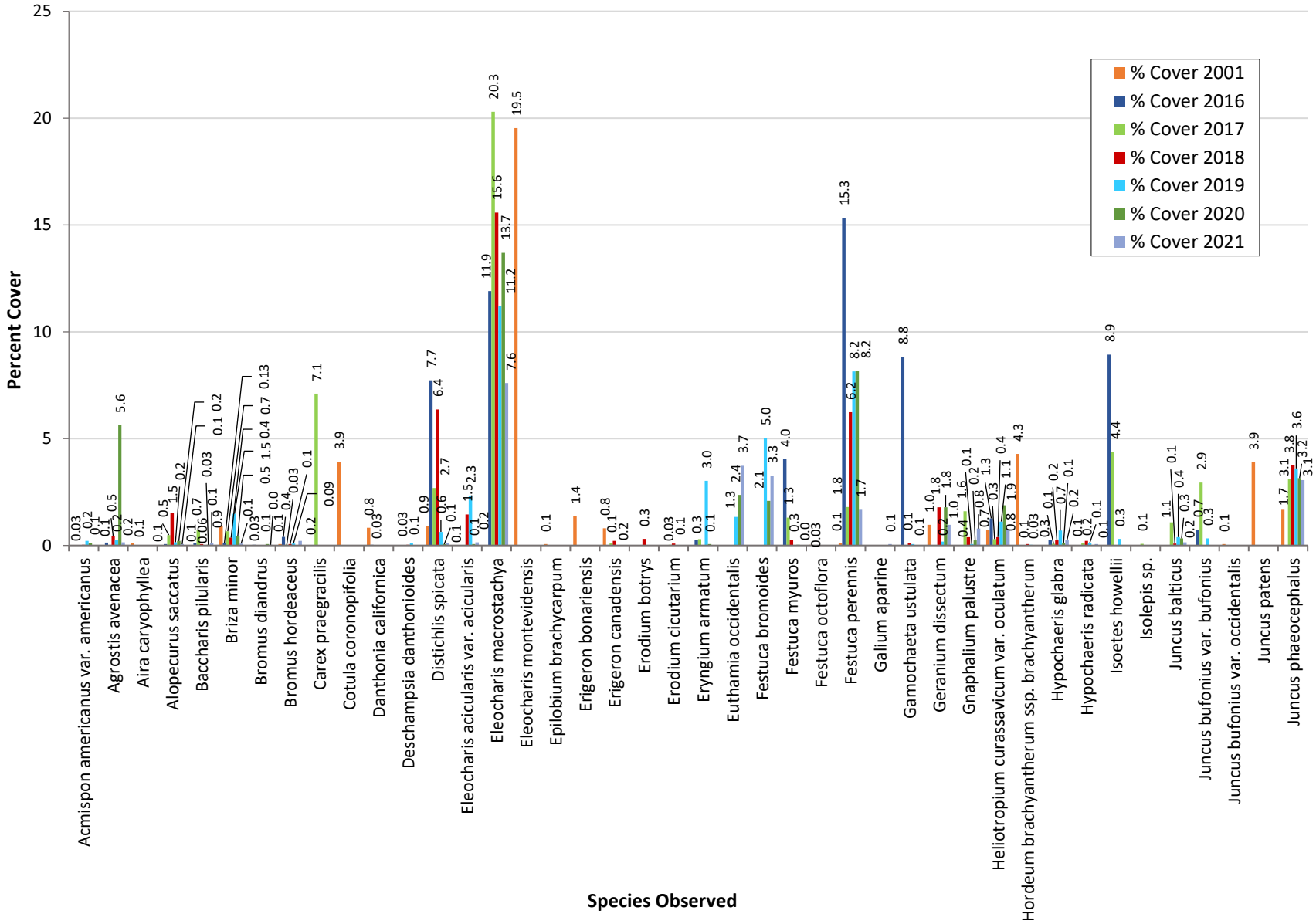

Figure F-20. Comparison Graph of Percent Cover by Wetland Plant Species for 2001, 2016, 2017, 2018, 2019, 2020, and 2021 at Pond 101 East (West) (Year 3 Post-Mastication)

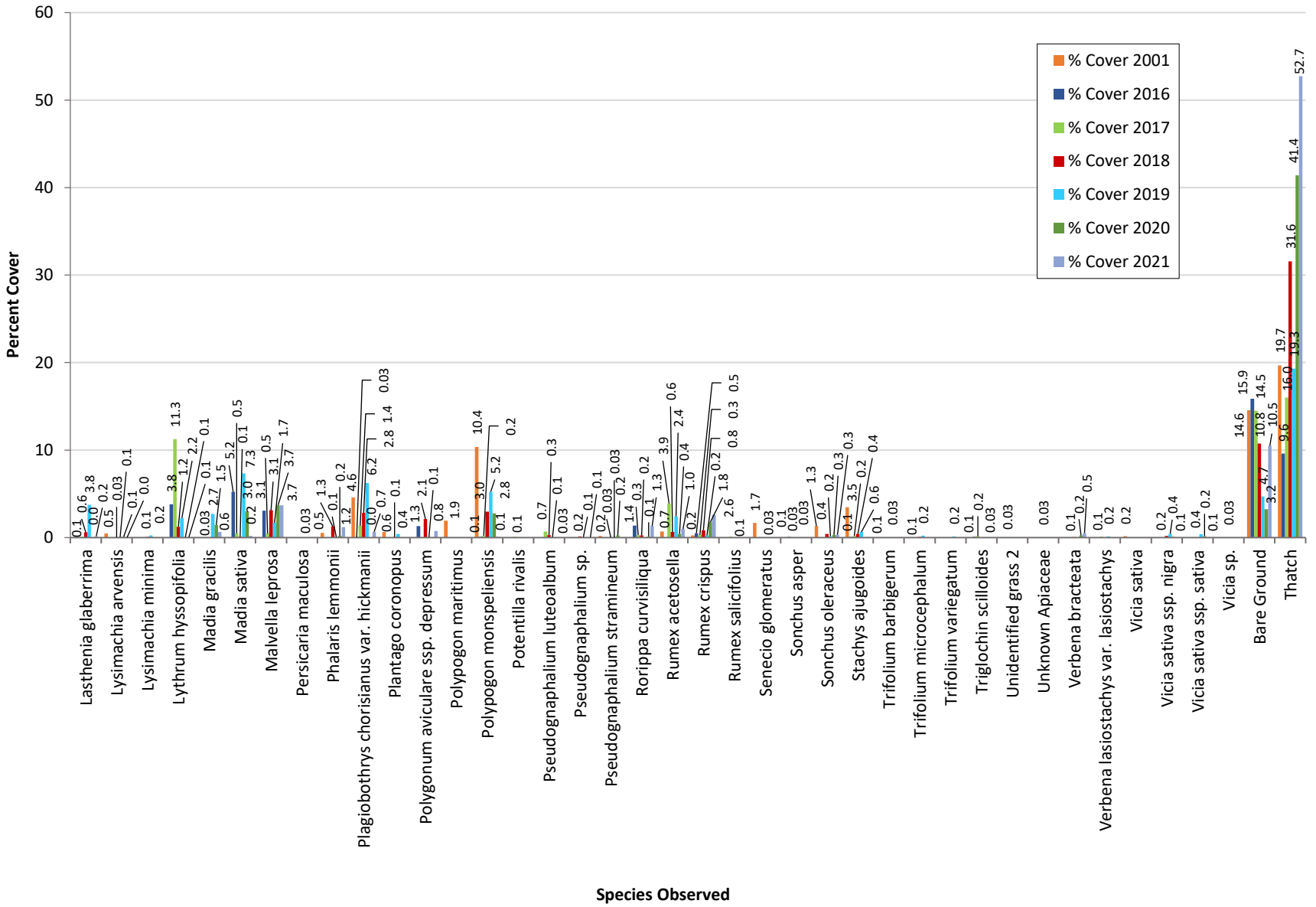

Figure F-20 (continued). Comparison Graph of Percent Cover by Wetland Plant Species for 2001, 2016, 2017, 2018, 2019, 2020, and 2021 at Pond 101 East (West) (Year 3 Post-Mastication)

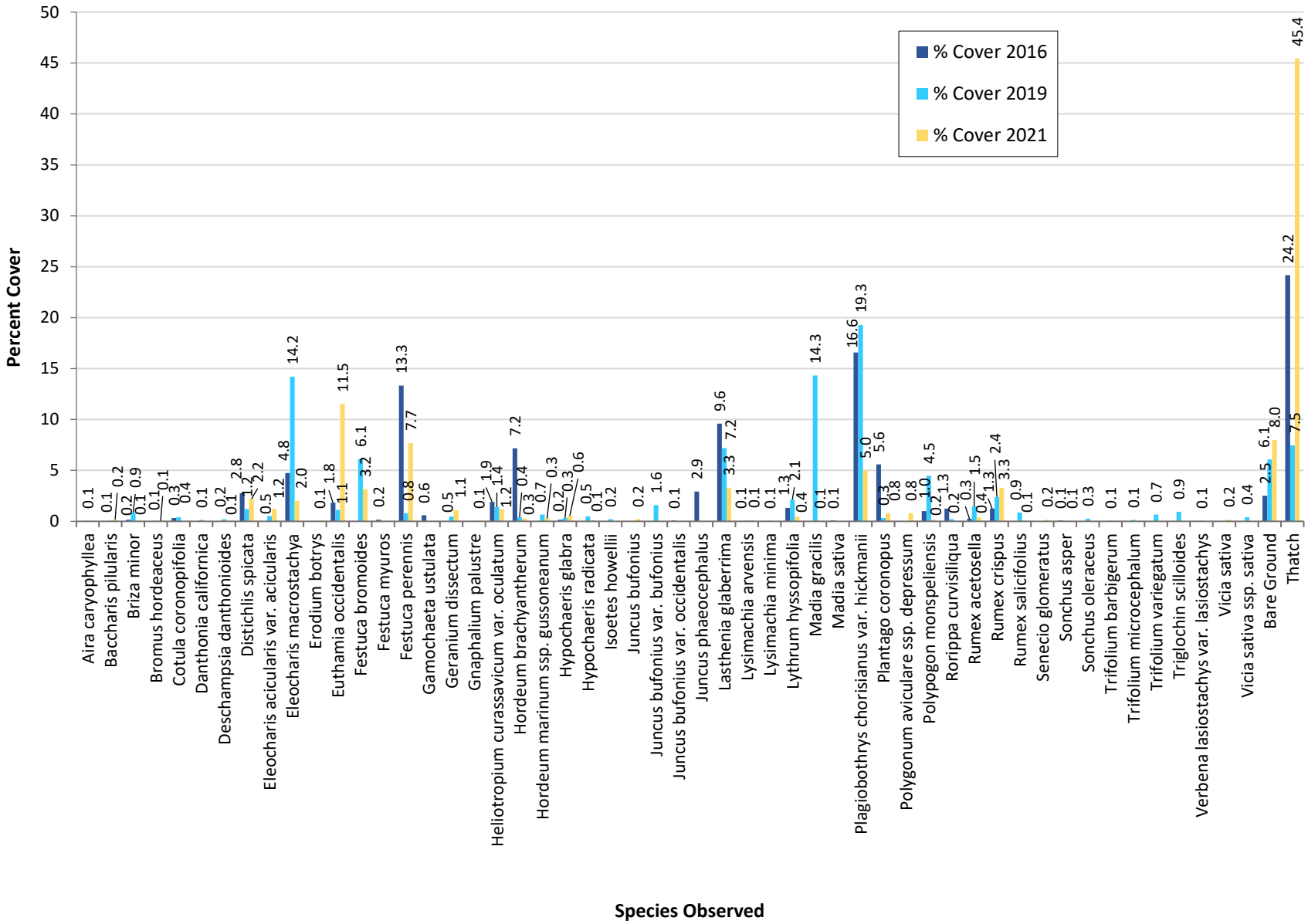

Figure F-21. Comparison Graph of Percent Cover by Wetland Plant Species for 2016, 2019, and 2021 at Pond 101 West (Year 3 Post-Mastication)

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APPENDIX G

Rank Abundance Curves

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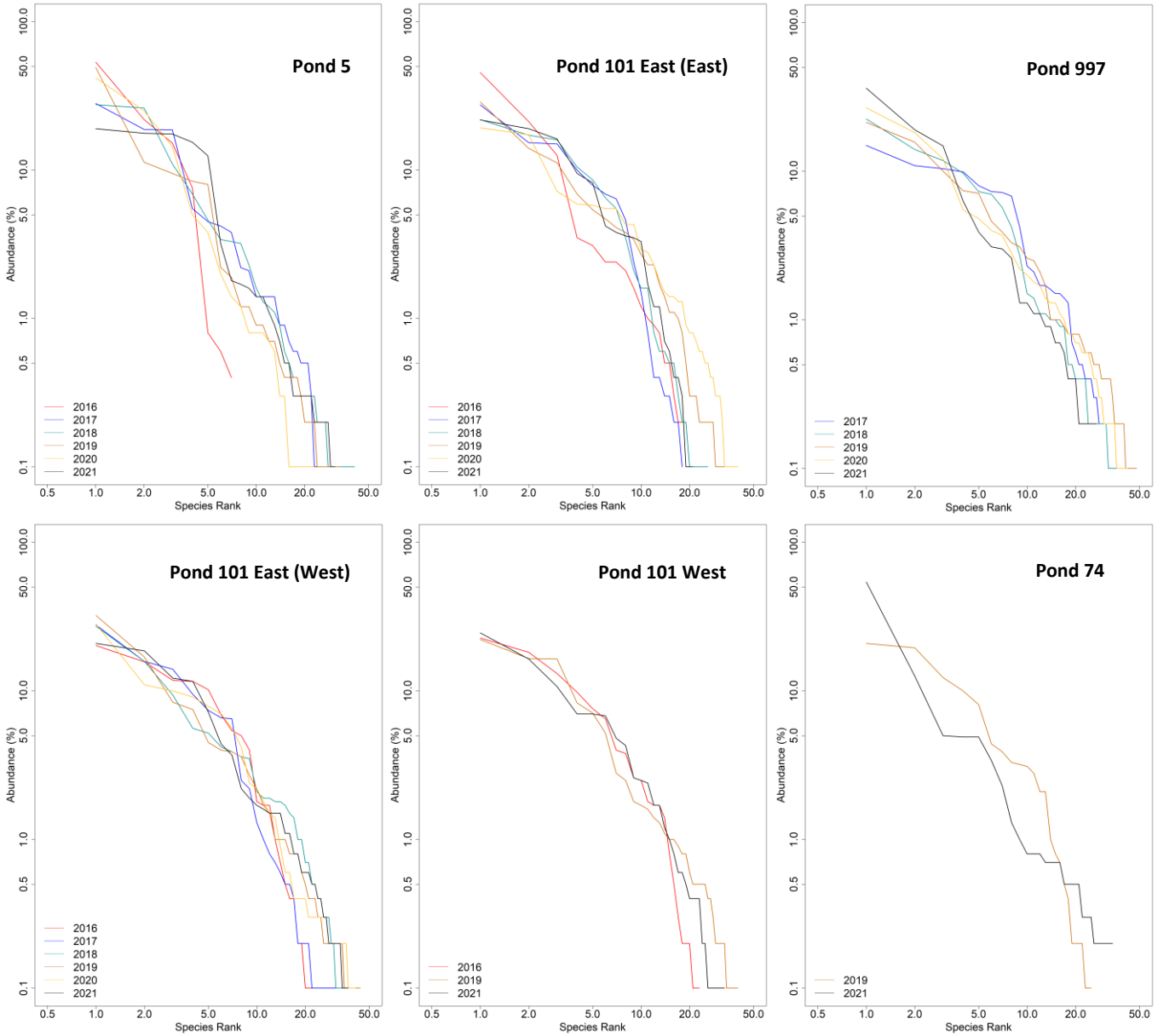

Figure G-1. Comparison Plots for RACs by Pond for all years. Top three plots are reference vernal pools. The bottom three plots are vernal pools in their final year of monitoring. Both the x-axis and y-axis are in log-10 scale.