State of California
Department of Fish and Wildlife

Memorandum

Date: January 30, 2018

To: Mr. Steve Goldbeck
San Francisco Bay Conservation
and Development Commission
50 California Street, Suite 2600
San Francisco, CA 94111
Attention: Jamie Michaels – jaime,michaels@bcdc.ca.gov

Mr. Bruce Wolfe
Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612
Attention: Keith Lichten – keith.lichten@waterboards.ca.gov

Gregg Erickson

From: Gregg Erickson, Acting Regional Manager
California Department of Fish and Wildlife – Bay Delta Region, 7329 Silverado Trail, Napa, California 94558

Subject: Submittal of 2017 Biennial Report for the Napa River Salt Marsh Restoration Project and Napa River Plant Site Restoration Project, Napa-Sonoma Marshes Wildlife Area (Data for 2016-2017)

This memorandum and attached information comprise the 2017 Biennial Report required by the San Francisco Bay Regional Water Quality Control Board (RWQCB) (Water Board Order No. R02-2004-0063) and the San Francisco Bay Conservation and Development Commission (BCDC) (Permit # 8-04) permits for the Department of Fish and Wildlife (CDFW) Napa-Sonoma Marshes Wildlife Area (NSMWA) Restoration efforts.

The Napa-Sonoma Marshes Wildlife Area Restoration efforts take place in two separate areas: the Napa River Salt Marsh and the Napa Plant Site. The Napa River Salt Marsh consists of Ponds 1 through 8 and is sometimes known as the Napa River Unit (see Figure 1-2). For the purposes of this report, the name "Napa River Salt Marsh" will be used to refer to this area. The last phase of the Napa River Salt Marsh Restoration Project (Ponds 6-8) is complete and only the mixing chamber testing is remaining. Whether the system discharged or not, CDFW is required to report annually to the California Integrated Water Quality System Project (CIQWS), which is an online reporting system for the NPDES permit portion of this project. This reporting is not included in this biennial report but can be found at: https://ciwqs.waterboards.ca.gov/ciwqs/readOnly/PublicReportEsmrAtGlanceServlet?inCommand=reset NPDES Order # R2-2011-0035 and #R2-2017-0007). Pertinent NPDES monitoring efforts and other monitoring parameters required in the Water Board Order No. R02-2004-0063 for Ponds 6-8 are included in this Biennial Report.

The Napa Plant Site is comprised of three distinct units: the North Unit, the Central Unit, and the South Unit (Figure 4-1). The Central Unit and the South Unit make up what is called the Green Island Unit. For the purposes of this report, the name "Napa Plant Site" will be used to refer to all of these units (North, Central, and South).

The permit requirements call for a Biennial Report for the Napa River Salt Marsh as well as a Biennial Report for all three units of the Napa Plant Site. Considering the various phasing and additional de-salting monitoring efforts that occurred for the Napa Plant Site, several different time line requirements for the reporting became complicated and difficult to manage. Per an agreement with RWQCB and BCDC, it was decided that the reports required for both restoration projects will be consolidated into one Biennial Report. Therefore, the 2017 Biennial Report satisfies reporting requirements for both the Napa River Salt Marsh Restoration and the Napa Plant Site Restoration and will include:

- the 2017 Biennial Report for Napa River Salt Marsh
- the 2017 Biennial Report for the Napa Plant Site

In this 2017 Biennial Report, all reports for all phases and both restoration projects are synchronized into one report to simplify CDFW's efforts and the review process. Biennial Reports will be due on odd years and data memos; therefore, the 2017 Biennial Report covers years 2016 and 2017.

The monitoring plan was designed to provide a streamlined program to comply with the legal requirements imposed by the permits and the California Environmental Quality Act (CEQA) requirements, as well as to allow overall tracking of project evolution and performance relative to project planning objectives. Data collection and analysis presented is a collaborative effort between CDFW, University of California Davis (UCD), San Francisco Estuary Institute (SFEI), and the United States Geological Survey (USGS). The overall objectives of the monitoring program include:

1. Track water quality in Ponds 1 – 5 and their receiving waters (Napa Slough, South Slough, and Napa River);

2. Monitor the presence of mercury in Ponds 1 – 5 and the Napa Plant Site;

3. Evaluate the changes in wildlife presence and wildlife use in Ponds 1 – 5 and the Napa Plant Site;

4. Evaluate physical changes in Ponds 1 – 5 and the Napa Plant Site; and

5. Track evolution of vegetation in Ponds 1 – 5 and the Napa Plant Site.

Summary of Data

<u>Napa River Salt Marsh</u>
Extensive data have been collected since the project was initiated. These data are presented and discussed, when applicable, in a series of attachments shown below.

- *Attachment 1*
  Maps, aerials, and photographs for the project area

- *Attachment 2*
  Physical and biological monitoring with discussion of results. Data are provided on:
  - Invasive plant control
  - Bird counts
  - California Ridgway's Rail presence/absence call surveys (until presence is confirmed)
  - California Least Tern surveys

  - Salt marsh harvest mouse presence/absence surveys (until presence is confirmed)
  - Vegetation Colonization
  - Aerial photographs of restored ponds
  - Sedimentation Plates, Erosion Pins, and Outboard Slough Bathymetry (if applicable)

- *Attachment 3*
  Water quality data. A large portion of this report focuses on water and sediment quality data collected from January of 2016 through December of 2017, including monthly pond water quality data and methyl-mercury levels. Water quality data parameters monitored include luminescent dissolved oxygen (LDO), temperature, pH, salinity, and specific conductivity. Parameters and locations sampled include:
  - Monthly water quality from Ponds 1, 1A, 2, 3, 4, 5, and Napa River
  - Water quality from Ponds 6, 6A, 7, 7A
  - Mercury data

Napa Plant Site
Extensive data has been collected in the North, Central, and South Units since the project was initiated. These data are presented and discussed, when applicable, in a series of attachments, as shown below.

- *Attachment 4*
  Maps, aerials, and photographs for the project area

- *Attachment 5*
  Physical and biological monitoring with discussion of results. Data are provided on:
  - Invasive plant control
  - Bird counts
  - California Ridgway's Rail presence/absence call surveys (until presence is confirmed)
  - California Least Tern surveys
  - Salt marsh harvest mouse presence/absence surveys (until presence is confirmed)
  - Fish data
  - Vegetation colonization
  - Aerial photographs of restored ponds
  - Sedimentation plates and outboard slough bathymetry (if applicable)

- *Attachment 6*
  Water quality data parameters and locations sampled include:
  - Mercury data

If you have questions or comments about the project, please contact Ms. Karen Taylor, Environmental Scientist, at (707) 944-5567 or Karen.Taylor@wildlife.ca.gov; or Mr. Larry Wyckoff, Senior Environmental Scientist (Supervisory), at (707) 944-5542 or Larry.Wyckoff@wildlife.ca.gov.

Attachments
ec:
Ms. Katherine Reyes, U.S. Army Corps of Engineers – katherine.m.reyes@usace.army.mil
Mr. Steve Lederer, Napa County Department of Public Works – Steve.Lederer@countyofnapa.org
Mr. Sean Nozzari, California Department of Transportation – sean.nozzari@dot.ca.gov
Mr. Ryan Olah, U.S. Fish and Wildlife Service – ryan_olah@fws.gov

Attachment 1

Napa River Salt Marsh: Maps, Aerials, and Photographs

Figure 1-1 State Location Map

Figure 1-2 Napa River Salt Marsh and Napa Plant Site Location Map

Figure 1-3. Bryzoan species growing on sensors, impacting data collection. (April 2016)

Figure 1-4. Tubeworm species growing on water control infrastructure, impacting management of the area. (April 2016)

Figure 1-5. Mixing chamber testing during highest tide in the middle of the night. (June 2017)

Figure 1-6. Pond 7/7A internal levee at the beginning of Ca Least Tern nesting season. (May 2016)

Figure 1-7. Scientific Aid surveying sedimentation plate in Pond 5. (July 2016)

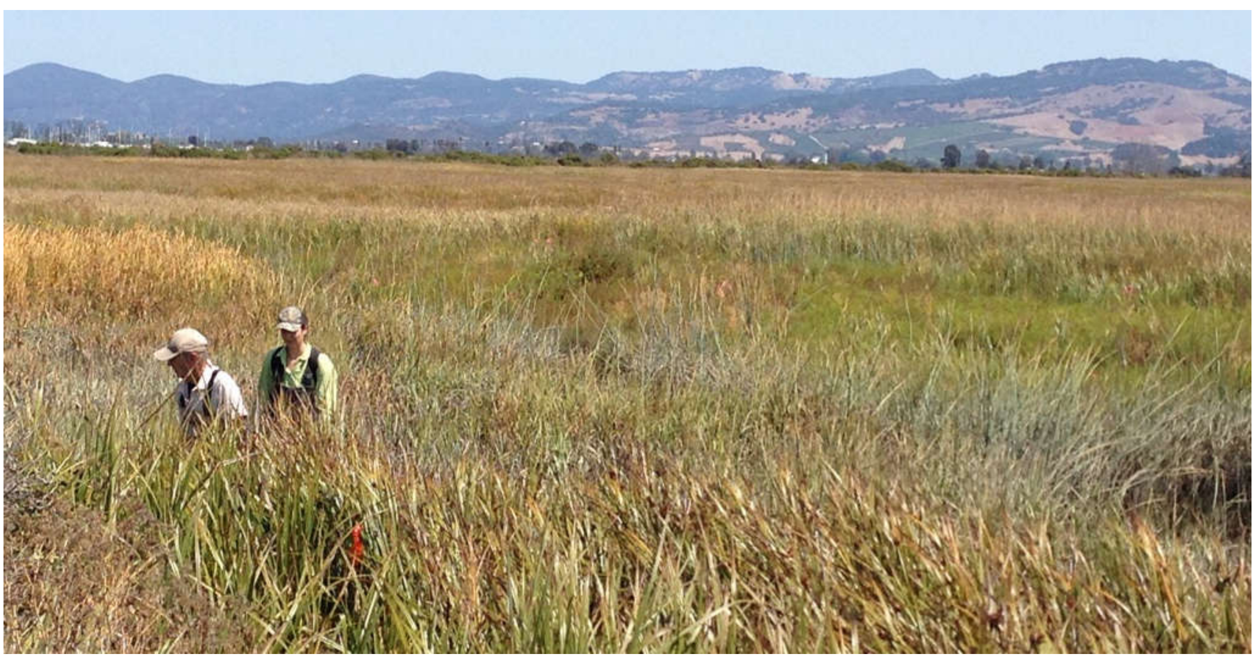


Figure 1-8. NSMWA staff/volunteers setting up a non-permit required salt marsh harvest mouse survey grid in accreted marsh south of Pond 7 at Napa Slough to identify health of probable source population for the restoration. (September 2016)

Figure 1-9. Two sets of otters prints found over surveyor prints while surveyor was at the far end of an out and back route at Pond 7/7A during a California Least Tern nesting survey. (June 2017)

Figure 1-10. California Least Tern resting on Pond 7/7A levee. (June 2017)

Figure 1-11. Vegetation development near sedimentation plate survey. (June 2017)

Figure 1-12. Weir installation at Pond 7 8” pipe intake to mixing chamber. Weir placed to decrease sediment clogging issues in pipe. (August 2017)

Figure 1-13. Live, active *Artemia franscisciana* in Pond 7 near the mixing chamber inlet. (December 2017)


Figure 1-14a. Comparison photo. Pond 3 May 2008


Figure 1-14b. Comparison photo. Pond 3 September 2017

Figure 1-15a. Comparison photo. Pond 4 from South Slough Side. September 2008

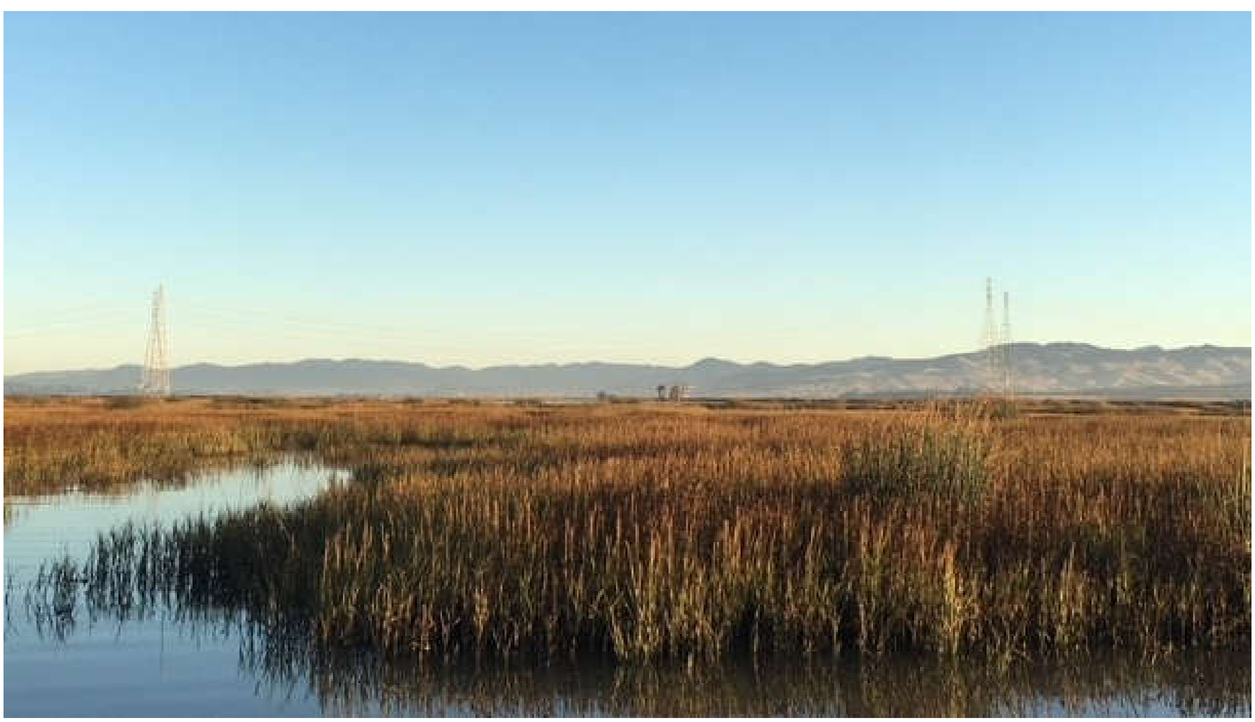


Figure 1-15b. Comparison photo. Pond 4 from South Slough Side. October 2017

Attachment 2

Napa River Salt Marsh:
Physical and Biological Monitoring
Discussion and Results

ATTACHMENT 2

Napa River Salt Marsh:
Physical and Biological Monitoring Discussion and Results

Not all parameters were required for all restored ponds (Ponds 1-5). Please note the ponds in parentheses before each discussion identify the ponds where the parameter was evaluated.

Invasive Plant Control (Ponds 1-5 and 6-8)
Minimizing and controlling invasive plants to the greatest extent possible is an ongoing process. The Invasive *Spartina* Project regularly surveys the Napa-Sonoma Marshes Wildlife Area (NSMWA) for invasive *Spartina*, as well as other non-native, invasive plants. In addition, NSMWA staff frequent the restoration site via boat for varying monitoring purposes. Any visits by NSMWA staff include a visual check for new invasive plants attempting to colonize the newly-restored marsh. Small patches of common reed (*Phragmites australis*) and giant reed grass (*Arundo donax*) have been identified post-construction. They include:

- 2008-along China Slough and South Slough.
- 2013-the outboard side near the northern Pond 3 breach on Napa River
- 2016-the inboard side in Pond 5 and at the entrance of a Pond 3 breach near Dutchman Slough
- 2017-the inboard side of Pond 5 near 2016's patch (more than likely present but not discovered during previous visits).

All locations are carefully monitored since their discovery to ensure rhizomes do not successfully sprout and reappear. The common reed and/or the giant reed grass locations are all isolated and appears to have not attempted to spread, so no herbicides have been needed/used to eradicate these invasive species.

Bird Counts (Ponds 1-5 and 6-8)
(Compliments of USGS)
Special note: The USGS bird count data incorporated all ponds within the NSMWA. Therefore, data discussed below includes not only Ponds 1-5, but also Ponds 6-8 and the Napa Plant Site.

The USGS conducted bird surveys monthly on all ponds in the Napa-Sonoma Marshes Wildlife Area to document changes in distribution of the bird community in response to restoration efforts. We divided ponds into 250 m x 250 m grids (6.25 ha) mapped in Arcview coverages (ESRI, Inc.). All birds were counted within 3 hours of high tide on each pond. The tide was defined as high when predicted depth was >4 ft at the Napa River tide gauge. Birds were identified to species, enumerated, and recorded in a grid square. We later attributed each species to a guild based on taxonomy and foraging strategy: wading birds, terns, eared grebes, fish eating birds, phalaropes, geese, gulls, small shorebirds, medium shorebirds, dabbling ducks, and diving ducks. We also recorded foraging and roosting (non-foraging) behavior for each observation.

USGS performed bird counts and analysis for the Napa River Salt Marsh and Napa Plant Site Restoration Projects from December 2005 through November 2017. All data are presented in terms of season-years (Dec – Nov). Waterbird abundance at high tide differed between 2016 and 2017. USGS observed more waterbirds in 2016 (408,695 waterbirds from 59 species; Table 2-1), than in 2017 (299,939 waterbirds from 58 species; Table 2-1)—a 36% decrease in total abundance. Dabbling ducks, diving ducks, small, and medium shorebirds were the dominant guilds and together comprised 95% of the total abundance in each year. Dabbling duck abundance was similar between years, with a 4% increase in 2017 (Figure 2-10). Diving ducks, however, were 40% less abundant in 2017 than in 2016 (Figure 2-10). Medium shorebirds were similar in trend to diving ducks, with a 41% decrease in abundance from 2016 to 2017 (Figure 2-10). Small shorebirds, however, were 305% less abundant in 2017, than they were in 2016.

Seasonal trends at high tide were similar between years, with greatest waterbird abundances in winter and fall (Figure 2-10). The majority of waterbirds were observed in winter (43% of total abundance of each year), but the total abundance was greater in 2016 (173,867 waterbirds), than in 2017 (130,223 waterbirds; Figure 2-10). Similarly, fall abundances were greater in 2016 (152,049 waterbirds), than in 2017 (119,161 waterbirds), comprising 37% and 40% of total abundance in 2016 and 2017, respectively (Figure 2-10). In 2016, spring and summer combined to comprise 20% of the total abundance (82,779 waterbirds), and in 2017 they accounted for 16% of the total abundance (50,555 waterbirds), (Figure 2-10).

Waterbird abundance trends at high tide for the winter season were similar among the four dominant guilds in 2016 and 2017; however, long term data indicate that this is often not the case (Figure 2-11A). For example, dabbling ducks increased mean winter monthly abundance by 54% from 2011 to 2012, and small shorebirds increased by 84% (Figure 2-11A). During that same time period, diving duck mean winter monthly abundance decreased by 20% (Figure 2-11A). Mean monthly winter abundance of trends of small shorebirds decreased (Figure 2-11A). Winter monthly diving duck abundance, however, appears to have an increasing trend (Figure 2-11A). Closer examination of the high tide data indicates that winter mean abundance trends were similar among pond restoration groups (ponds 3, 4, and 5; ponds 6-8; Napa Plant Site), for 2016 and 2017, but somewhat differ over the longer term (Figure 2-11B-D).

On the most recently restored pond group (ponds 6-8), waterbird total abundances at high tide were similar between 2016 and 2017, but the guild composition differed (Figure 2-12). Dabbling ducks were the most abundant guild in both years, and had a 5% increase in total abundance (Figure 2-12). Diving ducks, the second most abundant guild, decreased in total abundance by 1% from 2016 to 2017 (Figure 2-11). Medium shorebirds increased in total abundance by 12%, while small shorebirds decreased by 24% from 2016 to 2017 (Figure 2-12). While eared grebes comprised <1% of the total abundance, they exhibited the greatest change, with a 147% decrease in total abundance from 2016 to 2017 (Figure 2-12).

On ponds 6-8, where the most recent restoration efforts have taken place, seasonal trends at high tide were similar between 2016 and 2017, with greatest waterbird abundances in winter and fall (Figure 2-12). In 2016, winter comprised 49% of the total abundance, and was comprised predominantly of dabbling ducks (23%), and diving ducks (11%). In 2017, winter accounted for 44% of the total abundance, with diving ducks as the dominant group (21%), followed by dabbling ducks (17%; Figure 2-12). Overall, there was an 11% reduction in winter total abundance between years (Figure 2-12). Fall accounted for 32% of total abundance in 2106, with dabbling and diving ducks in equal abundance (11% each), and 42% in 2017, with a 23% increase in total abundance from 2016 to 2017 (Figure 2-12). The greatest difference between years was observed in the spring (106% decrease in total abundance; Figure 2-12).

Note: These data have not received the USGS Director's approval and as such are provisional and subject to revision. The data are being released on the condition that neither the USGS nor the United States Government may be held liable for any damages resulting from its authorized or unauthorized use.

California Ridgway's Rail Presence/Absence Call Surveys (Ponds 4 and 5)
Annual California Ridgway's rail (*Rallus obsoletus obsoletus*, formerly California clapper rail) presence/absence call surveys have not been officially performed in Ponds 3, 4, or 5 due to a lack of adequate vegetation within the ponds to support the species. Even though no post-construction surveys for permit compliance have been conducted, source population surveys have been conducted on the outboard side of the levees surrounding the ponds to gauge the possible migration of the species to the restored ponds. Surveys consist of passive call surveys followed by call playback surveys (if passive survey results at a given location are negative) along permanent transects on the outboard side of the levees surrounding the ponds. Surveys will be discontinued once Ridgway's rail presence has been established within the ponds. Source population surveys have been conducted on the outboard side of the ponds in several areas, but they are not permit required. Therefore, they are not included in this report.

California Least Tern (Pond 7/7A)
California Least Tern (LETE) have been sited periodically in the NSMWA since 2006 (via USGS bird data). Confirmation of LETE nesting in NSMWA was first identified in 2008 at the Napa Plant Site in the South Unit. Passive, detailed nesting surveys began in 2009 for the NSMWA LETE colony. The colony is considered a loose colony where two sub-colonies occur on the Pond 7/7A internal levee in the Huichica Creek Unit of the NSMWA two miles away from the Napa Plant Site (Figures 5-1 through 5-6). Over the past nine years, the LETE have moved their nesting efforts back and forth between the two locations for unknown reasons. LETE data have been collected by CDFW for Ponds 7/7A but will be discussed in detail in the Napa Plant Site Physical Processes in Attachment 5.

Salt Marsh Harvest Mouse Presence/Absence Surveys (Ponds 3, 4, and 5)
Annual salt marsh harvest mouse (*Reithrodontomys raviventris*) presence/absence surveys have not been officially performed in Ponds 3, 4, or 5 yet because there is not adequate vegetation within the ponds to support the species. Even though no post-restoration surveys for permit compliance have been conducted, source population surveys have been conducted on the outboard side of the levees surrounding the ponds to gauge the possible migration of the species to the restored ponds. Trapping consist of live trapping per standard USFWS permit conditions. All trapping are performed by CDFW. Traps will be set up in a grid configuration within suitable habitat in restored ponds. Surveys will be discontinued once salt marsh harvest mouse presence has been established within the ponds.

Fish Data (All Units)
(Compliments of USGS)
USGS conducted sampling for larval delta smelt monthly from Feb-April of 2016 and 2017 in Napa Slough and Mud Slough (Figure 2-9). Larval tows were conducted in triplicate at each location (net dimensions: length = 3.35 m, mouth area = 0.37 m^2, mesh size = 505 μm). The net was towed for 5 minutes starting at the bottom of the water column, decreasing depth by $^1/_5$ each minute. The contents of the sample were preserved in formalin for later identification.

Trawls for larval delta smelt were conducted monthly from Feb-Apr, 2016-2017. No delta smelt were found in any of the trawls.

Vegetation Colonization (Ponds 3, 4, and 5)
Vegetation monitoring includes determining the amount of vegetation establishment at the restoration site by using aerial photographs and "ground truthing" of the plant species established until it is determined that the site has achieved 20% cover of tidal marsh vegetation. Once marsh vegetation has become established on 20% of the pond, vegetative transects shall be conducted to provide more detailed information on vegetation cover. At least one of the

ponds is close to this threshold, but have not yet been surveyed. However, plant species that are pioneering within the ponds include Pacific cordgrass (*Spartina foliosa*), gumplant (*Grindelia stricta*), pickleweed (*Salicornia* spp.), and bulrushes (*Scirpus* spp.).

<u>Aerial photographs of restored ponds</u> (Ponds 1-5)
Annual aerial photography has been conducted by the CDFW's warden plane. All photographs are taken with a large format, gyrostabilized, image motion compensated precision lens mapping camera that is mounted in a fixed-wing aircraft. Images were collected in digital format using high definition true color. As feasible, depending on funding and availability of resources, flights have occurred one or more times each year since 2003. Since technology has progressed, Google Earth images are updated regularly to provide CDFW with comparable imagery without the use of the warden plane, if not available. If low tide Google imagery is available, comparable aerials of several areas of the restoration will be presented in reports.

<u>Sedimentation Plates, Erosion Pins, and Outboard Slough Bathymetry</u>
(Ponds 3, 4, and 5)
<u>Sedimentation Plates</u>
Figures 2-1 through 2-3 shows where twelve 1' x 1' stainless steel sedimentation plates were installed by DU and CDFW in Ponds 3, 4, and 5 in December 2007/January 2008. All plate locations were recorded using GPS and marked by two permanently-mounted PVC stakes 1-meter on opposite sides of the plate to decrease the potential of the stakes interfering with sediment accumulation (Figure 1-7 and 1-11 illustrates the plate locations with pvc pipe stakes). Sedimentation plates are required to be measured biennially (every 2 years) at a minimum; annually if feasible. CDFW has made the effort to survey annually when possible. Data collection procedures require that little to no water be present at the sedimentation plate locations for an accurate measurement. An airboat is the only means to safely access the locations without disturbing or affecting sediment on the plates.
The majority (75%) of the sedimentation plates show accretion from year 2007 to year 2017, with the most consistent accretion trend occurring at plates 3S-3, 4S-1, 4S-4, and 5S-4 (Figure 2-4). Eight of the 12 plates show a consistent trend of accretion or erosion through the past ten years. Three of the 12 plates are consistently eroding, with 4S-3 plate being pulled in 2013. Lastly, one plate of the 12 plates bounces back and forth between accretion and eroding at the location. At this time, 4S-3 plate is the only plate removed in the three ponds.

<u>Erosion Pins</u>
In addition, Figures 2-1 through 2-3 show the locations of erosion pins. Each location contains three erosion pins placed one meter apart. All erosion pins were installed by DU and CDFW in/near Ponds 3, 4, and 5 in December 2007/January 2008 with nine locations (27 pins) in Pond 3, six locations (18 pins) in Pond 4, and seven locations (21 pins) in Pond 5. The individual pin consists of a 5-centimeter PVC pipe buried to a depth of one meter. Any erosion is measured in feet of pipe revealed. Erosion pins are required to be measured biennially (every two years).

Figures 2-5 through 2-7 reveal that some erosion is taking place at locations in Ponds 3 and 5, with Pond 3 erosion being more aggressive. These figures also reveal that annual trends of accretion and erosion varies greatly in Pond 4, indicating that there may be several flows affecting the rate of sediment deposition and erosion, depending on the specific location. The more northern erosion pins in Pond 4 (e.g., 4E-1 and 4E-2) appear to be accreting while the more southern erosion pins (e.g., 4E-5 and 4E-6) appear to be eroding (Figure 2-6). Since one or more of the pins at many locations were missing at the time of the survey, and one set of the pins do not have baseline data for comparison, it was difficult to 1) determine which pin remained at the location and 2) make exact determinations on the amount of erosion. At this time, one pole is missing from 2 locations (3E-7 and 3E-8) in Pond 3, one location (4E-1) and one pole missing from 3 locations (4E-2, 4E-5, and 4E-6) in Pond 4, and one pole is missing from 1 location (5E-7) in Pond 5, Included at the bottom of Figures 2-5 through 2-7 are notes on any missing data and any missing erosion pins and sedimentation plates for the ponds.

Outboard Slough Bathymetry

There is no new USGS data for outboard slough bathymetry for Ponds 3, 4, and 5. While USGS has surveyed these ponds in the past, currently, there are no plans to conduct repeat surveys for Ponds 3, 4, and 5.

Figure 2-1. Napa River Salt Marsh Pond 3 Sedimentation Plate and Erosion Pin Location Map

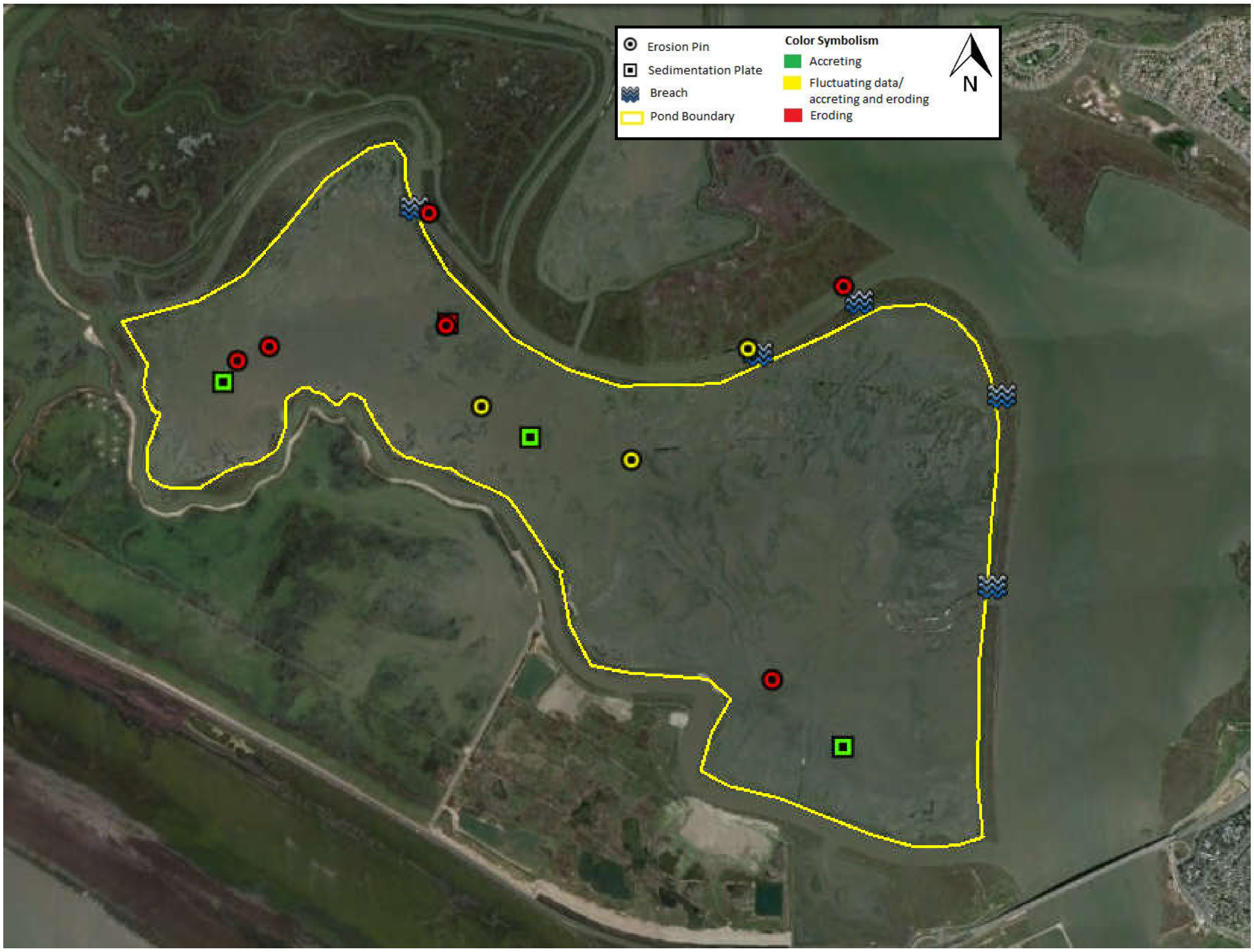


Figure 2-2. Napa River Salt Marsh Pond 4 Sedimentation Plate and Erosion Pin Location Map

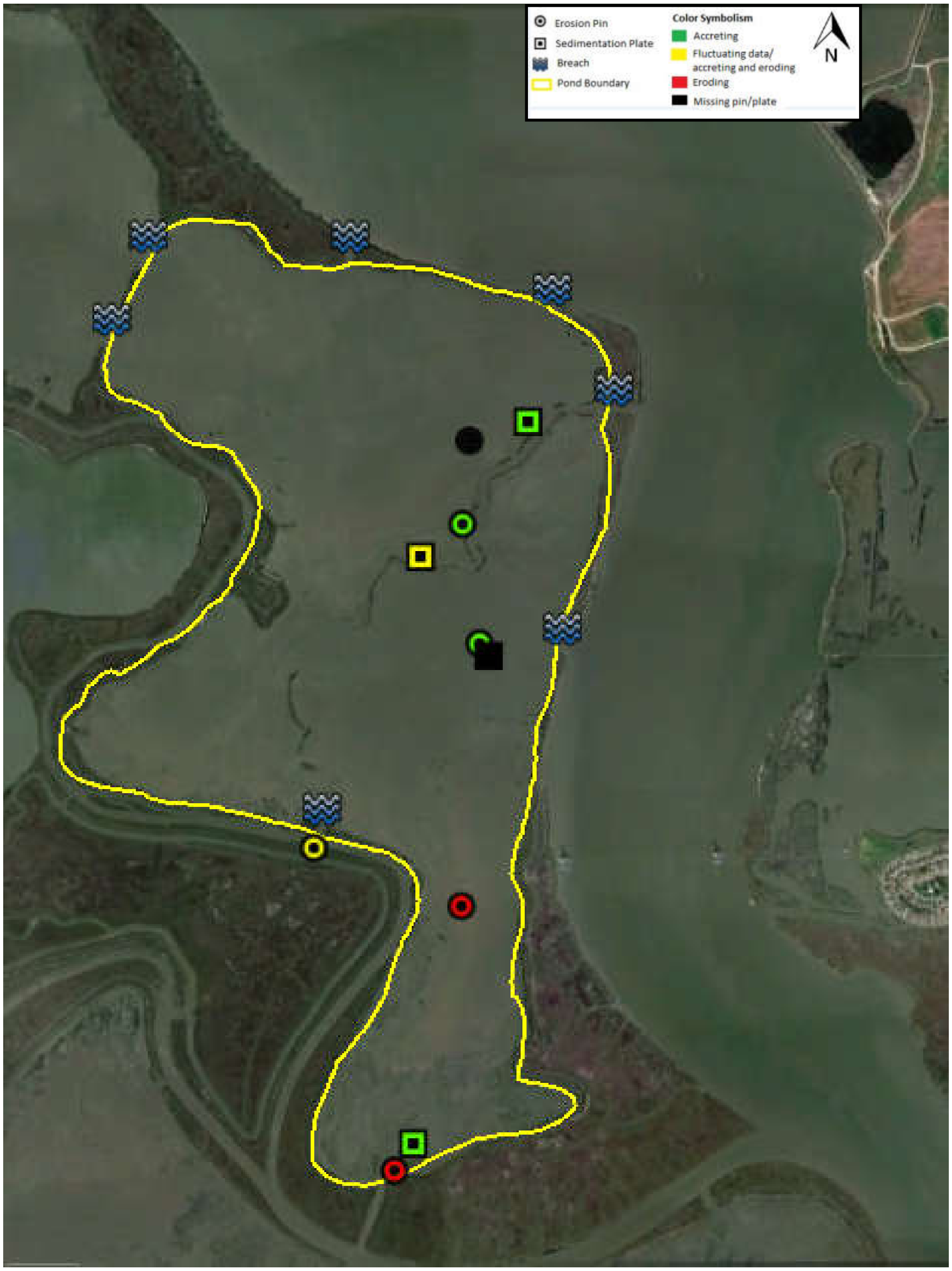


Figure 2-3. Napa River Salt Marsh Pond 5 Sedimentation Plate and Erosion Pin Location Map

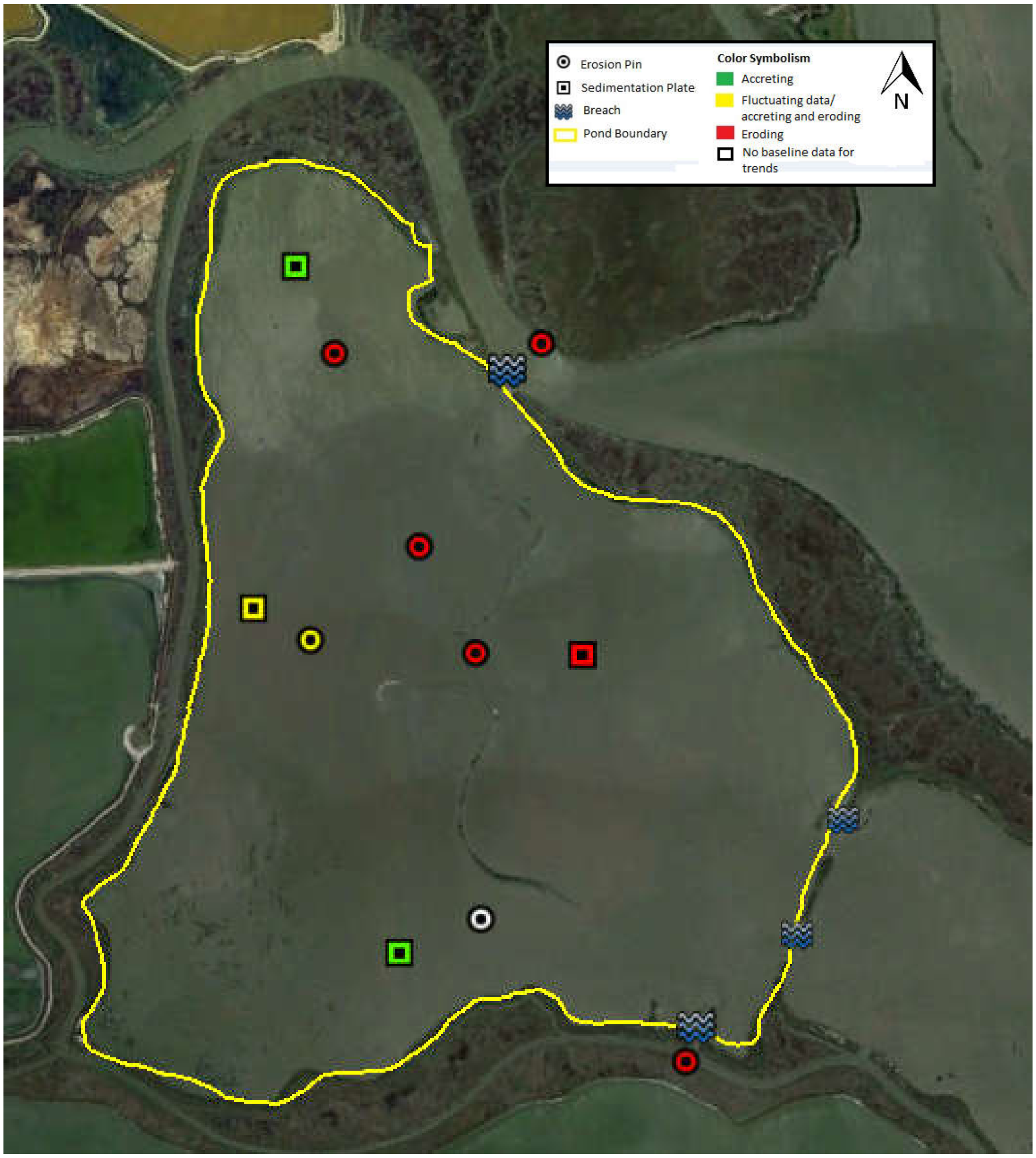
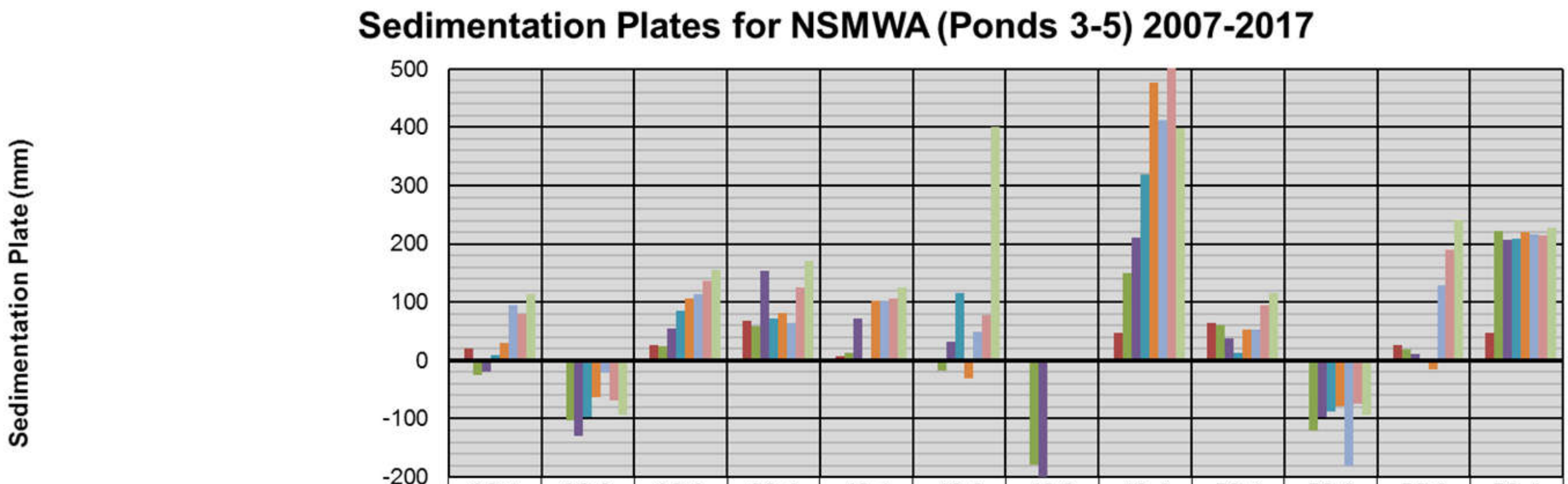


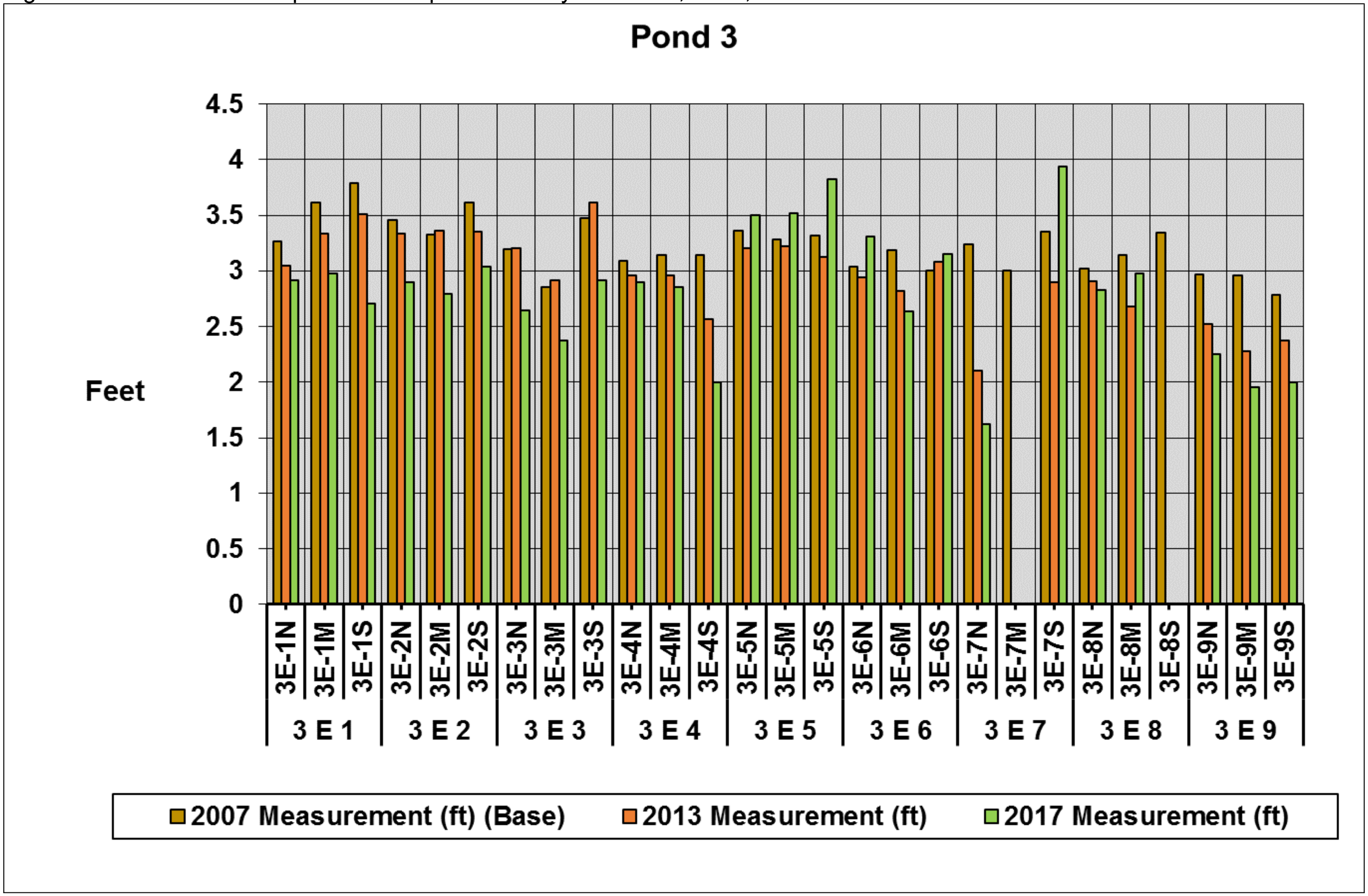
Figure 2-4. Napa River Salt Marsh Restoration Sedimentation Plate for 2007 through 2017.



	3S-1	3S-2	3S-3	3S-4	4S-1	4S-2	4S-3	4S-4	5S-1	5S-2	5S-3	5S-4
2007 Measurement (mm) (Base)	0	0	0	0	0	0	0	0	0	0	0	0
2008-2009 Measurement (mm)	21.17	0	26.6	69	7.8	0	0	47.25	65.2	0	26.6	47.25
2011 Measurement (mm)	-25.75	-102.25	24.333	57.833	12.5	-17.25	-178.75	150.167	59.7	-120	18.3	221.8
2012 Measurement (mm)	-19.75	-129.25	55.67	153.33	72.17	32.17	-224.00	210.83	37.33	-96.25	11.67	206.83
2013 Measurement (mm)	8.50	-96.5	85	72.33	4.17	116.33	0	318.67	13.83	-87.25	3.50	208.16
2014 Measurement (mm)	31.00	-62.25	107.00	80.67	102.50	-29.75	0	476.67	53.33	-77.75	-16.00	220.83
2015 Measurement (mm)	94.17	-21.00	112.83	64.00	102.5	49.5	0	411.75	53.00	-181.25	128.67	216.17
2016 Measurement (mm)	80.33	-68.00	137.17	124.67	105.5	78.17	0	508.5	95.17	-73.75	190.17	215.17
2017 Measurement (mm)	113.66	-92.75	156.5	170.83	125	400	0	399.33	115.00	-93.75	241.33	227.66

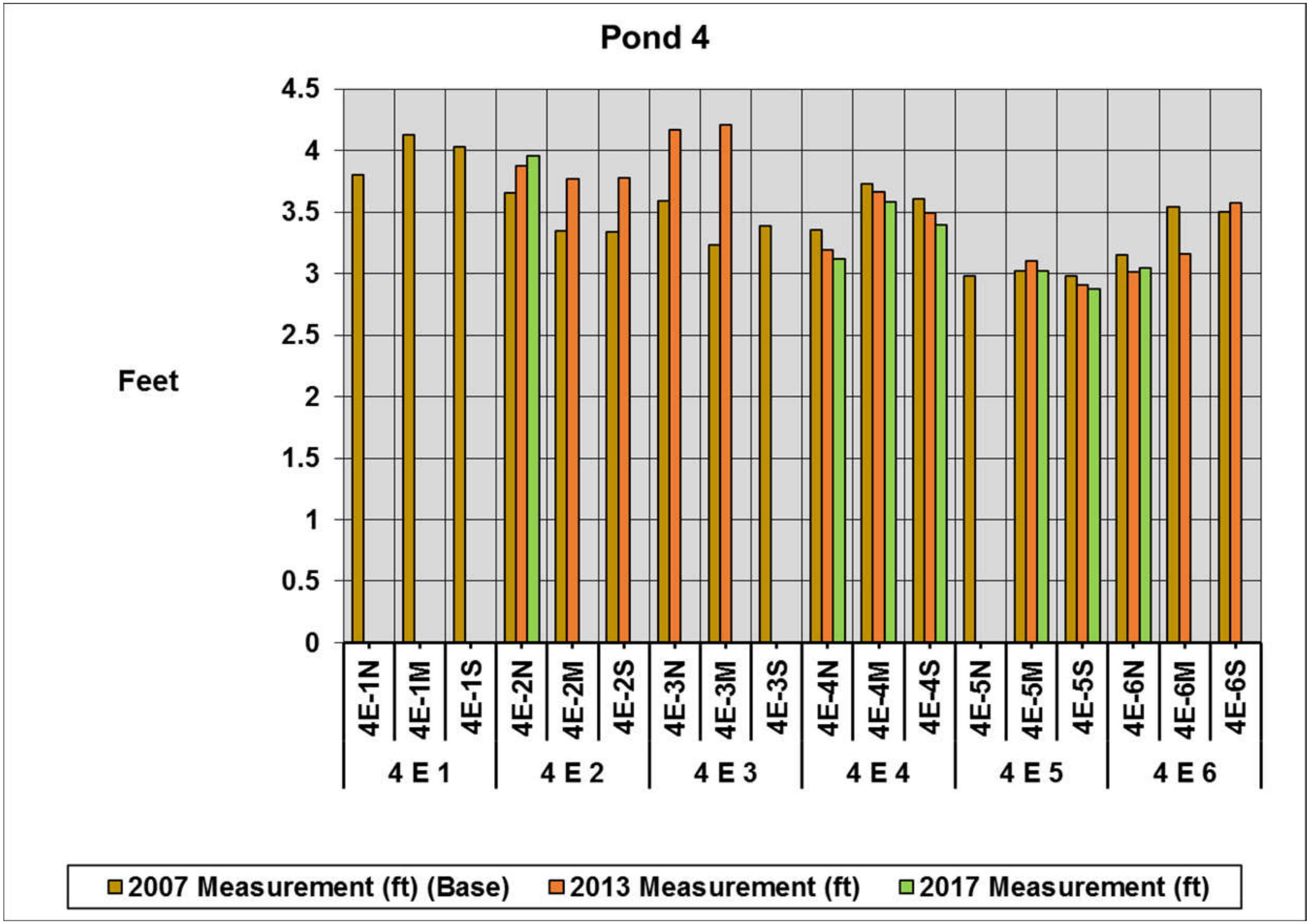
Note: 4S-3 was pulled in 2013 because it had fallen over due to excessive erosion. 4S-2 2017 measurement higher than table. Could not locate.

Figure 2-5. Pond 3 erosion pin data comparisons for years 2007, 2013, and 2017.

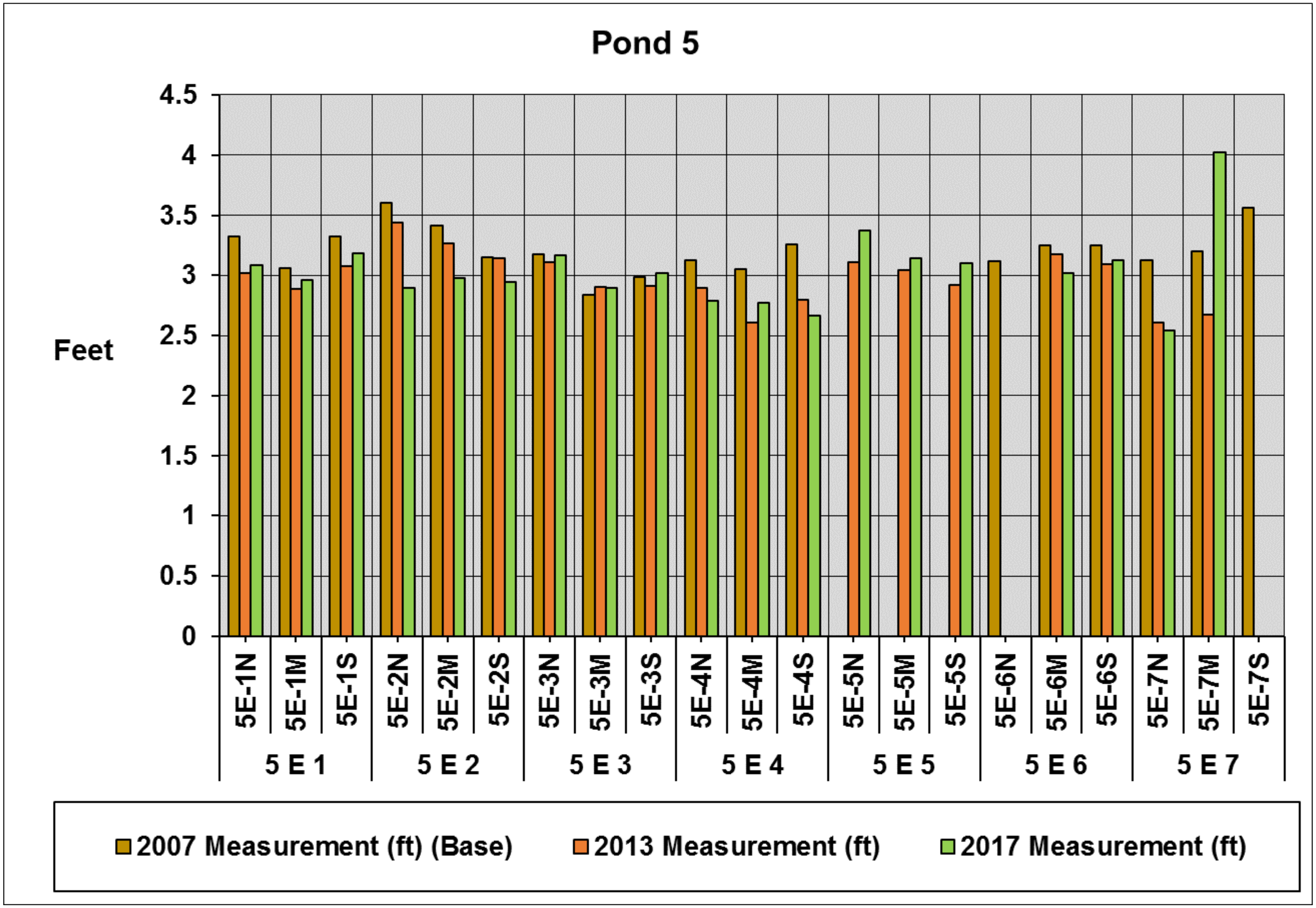


Note: Erosion pins 3E-7M and 3E-8S missing.

Figure 2-6. Pond 4 erosion pin data comparisons for years 2007, 2013, and 2017.



Note: Erosion pins 4E-1N, 4E-1M, 4E-1S, 4E-2S, 4E-3S, 4E-5N and 4E-6S are missing.
Figure 2-7. Pond 5 erosion pin data comparisons for years 2007, 2013, and 2017.



Note: No base data for erosion pins 5E-5N, 5E-5M, and 5E-5S; and erosion pins 5E-6N and 5E-7S are missing.

Figure 2-8. High tide water quality sampling locations (blue dots) in the North, Central, and South units at the Napa Plant Site. (Compliments of USGS)

Figure 2-9. Water quality (blue triangles) and larval delta smelt (yellow circles) sampling locations for the ponds 6 through 8 restoration project. (Compliments of USGS)

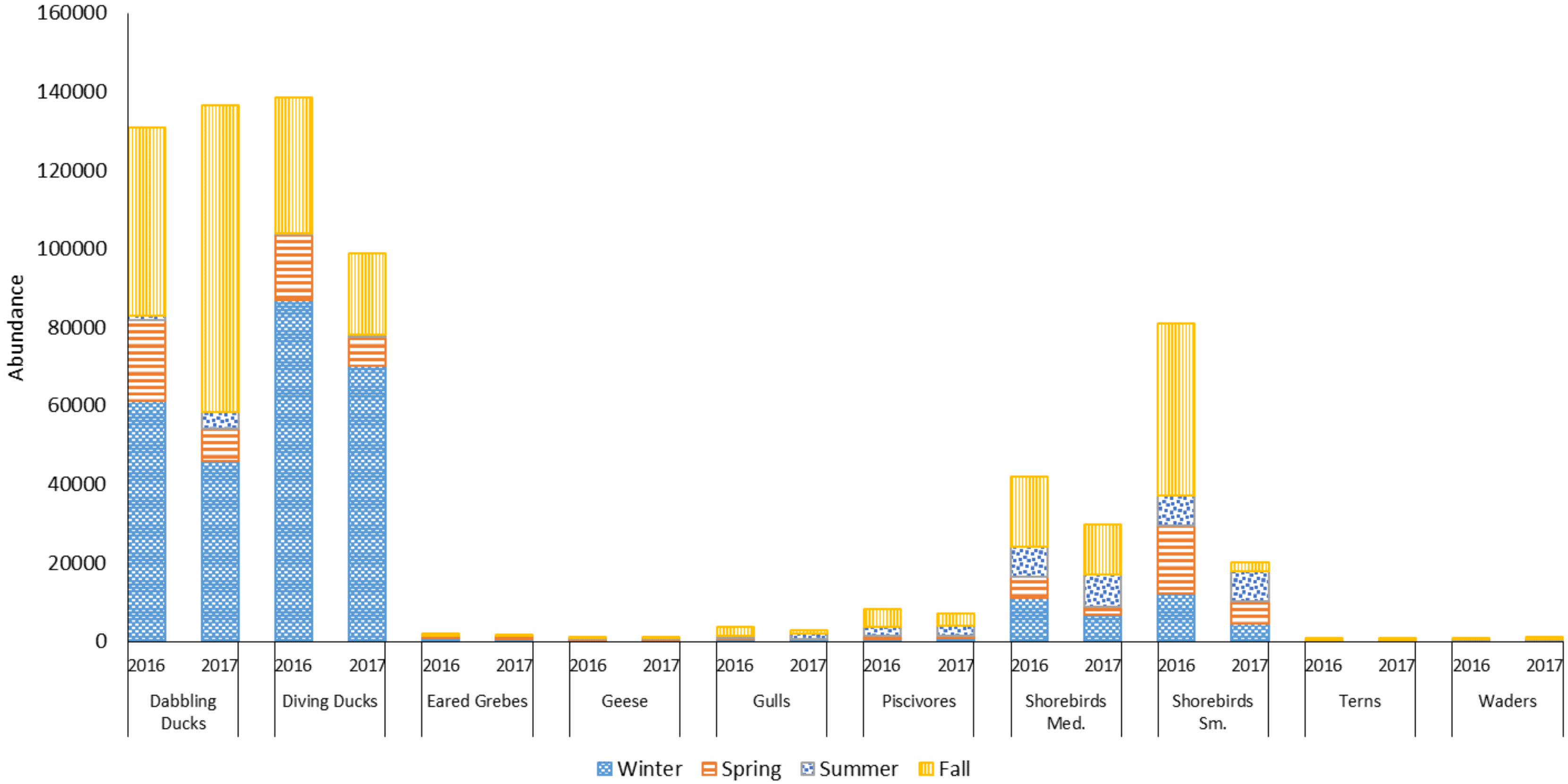


Figure 2-10. Total annual high tide abundance of waterbird guilds by season, from 2016 and 2017, on all ponds (except 2A) in the NSMWA. Winter, Dec-Feb (blue checks); Spring, Mar-May (orange horizontal stripes); Summer, Jun-Aug (white with blue dots); Fall, Sep-Nov (yellow vertical stripes). (Compliments of USGS)

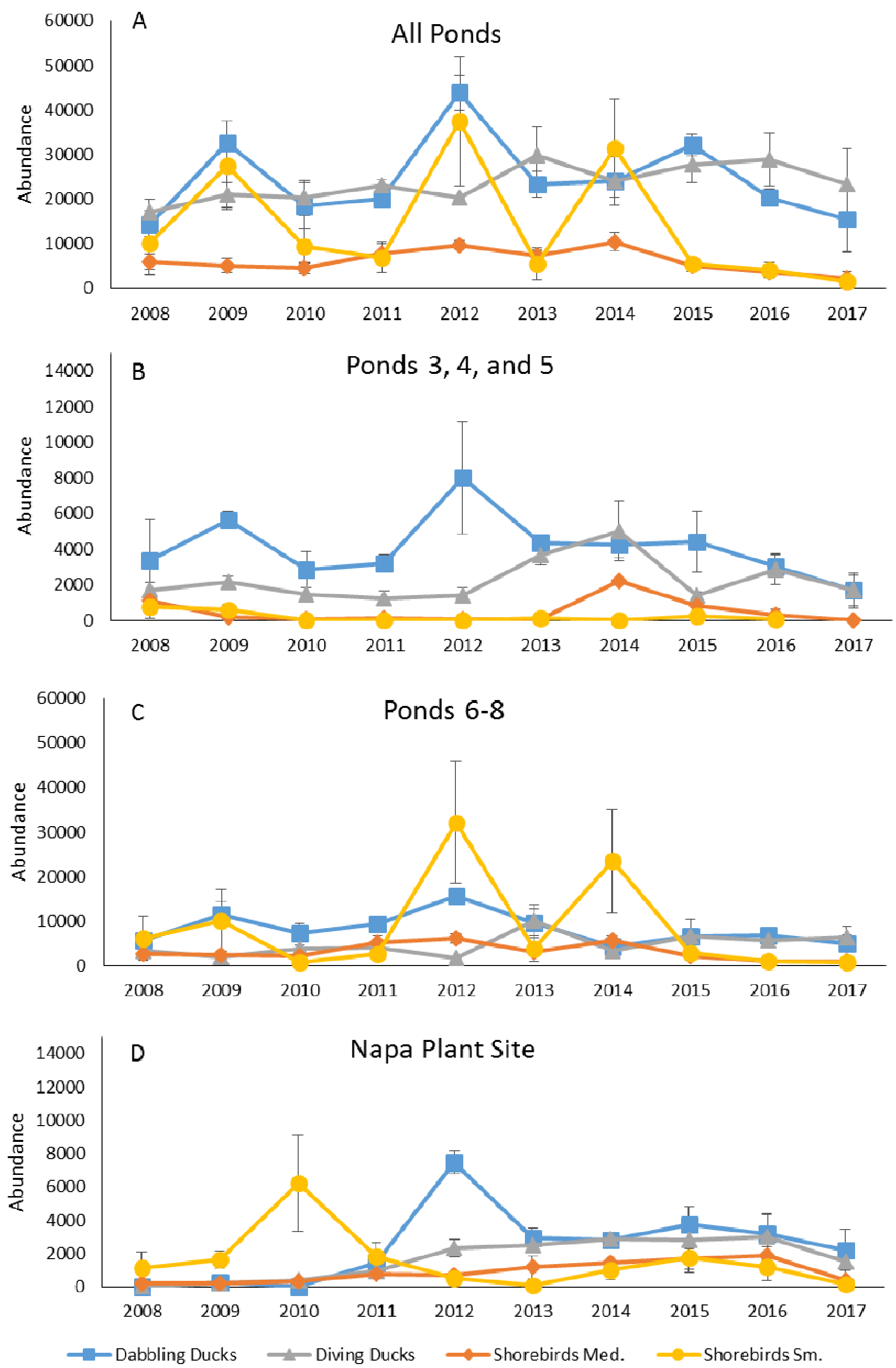


Figure 2-11. Mean (±SE) monthly high tide abundance of dabbling ducks (blue squares), diving ducks (grey triangles), medium shorebirds (orange diamonds), and small shorebirds (yellow circles) during winter (Dec-Feb) from the four most abundant guilds on (A) all ponds, (B) ponds 3, 4, and 5, (C) ponds 6-8, and (D) the Napa Plant Site. Note: y-axes differ among figures. (Compliments of USGS)

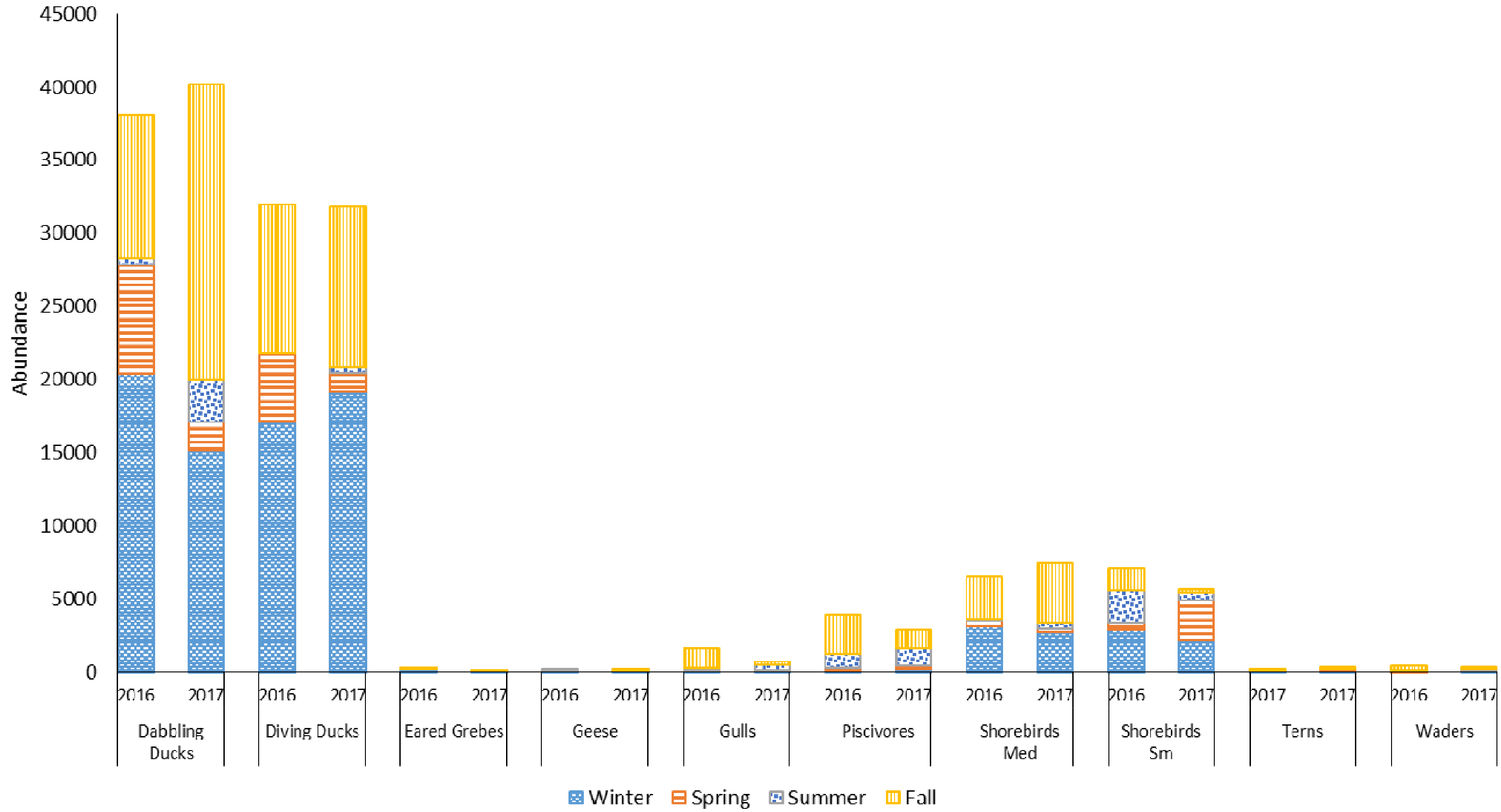


Figure 2-12. Total annual high tide abundance of waterbird guilds by season, from 2016 and 2017, on ponds 6 through 8. Winter, Dec-Feb (blue checks); Spring, Mar-May (orange horizontal stripes); Summer, Jun-Aug (blue dots); Fall, Sep-Nov (yellow vertical stripes). (Compliments of USGS)

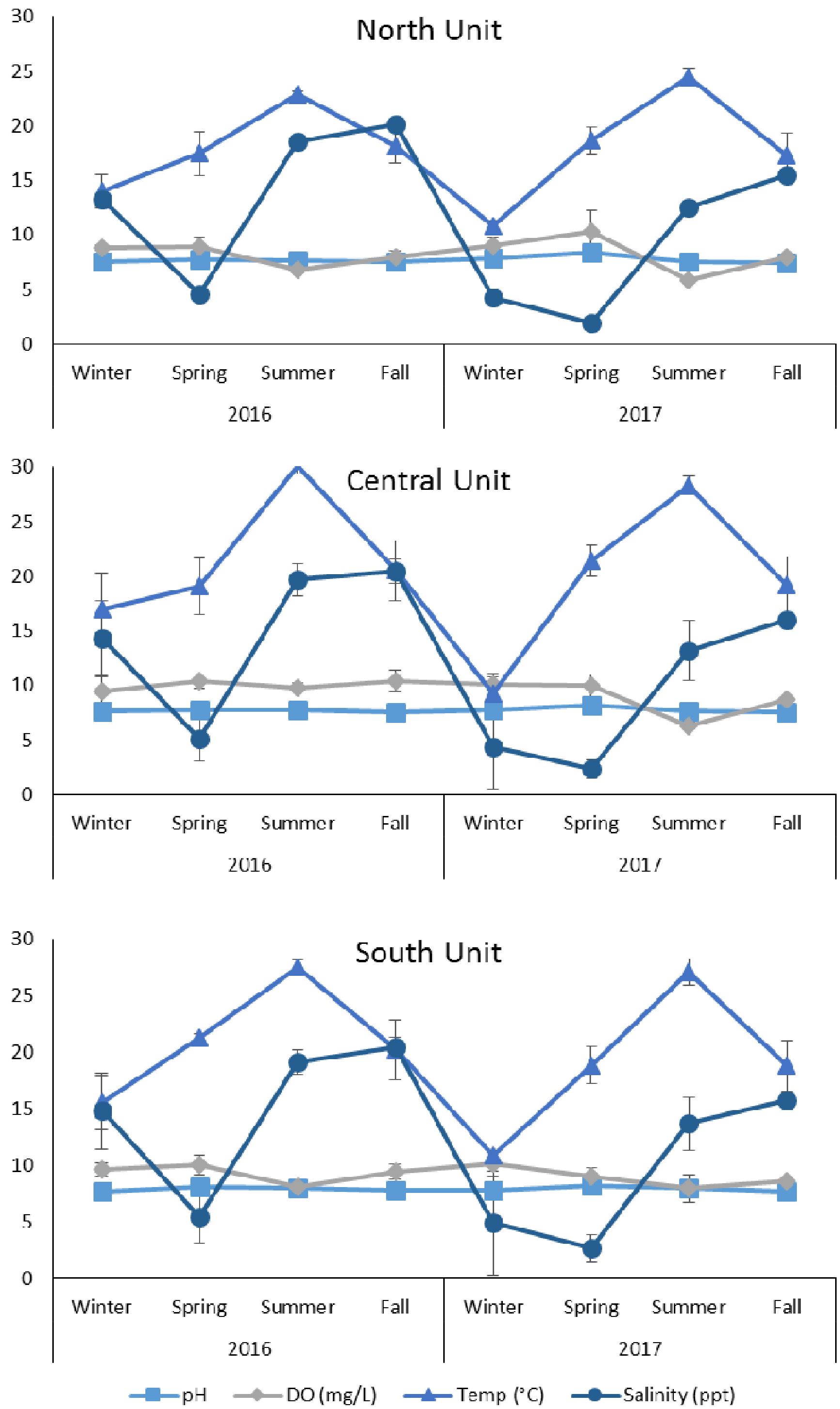


Figure 2-13. Mean (±SE) seasonal pH (squares), dissolved oxygen (DO; mg/L; squares), water temperature (Temp; °C; diamonds), and salinity (ppt; circles) values for the North, Central, and South units of the Napa Plant Site. (Compliments of USGS)

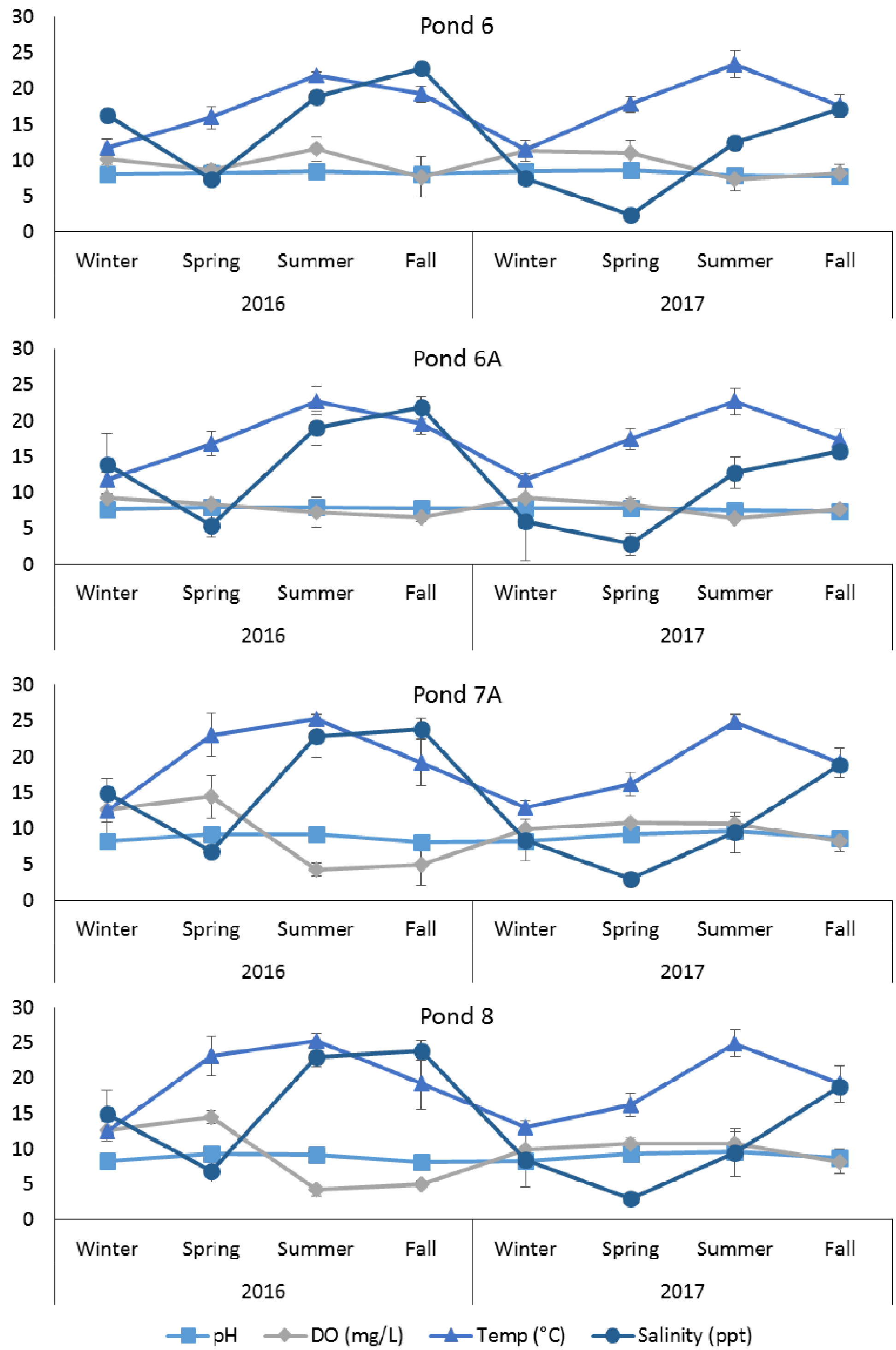


Figure 2-14. Mean (±SE) seasonal pH (squares), dissolved oxygen (DO; mg/L; squares), water temperature (Temp; °C; diamonds), and salinity (ppt; circles) values of ponds 6, 6A, 7A, and 8 in 2016 and 2017. (Compliments of USGS)

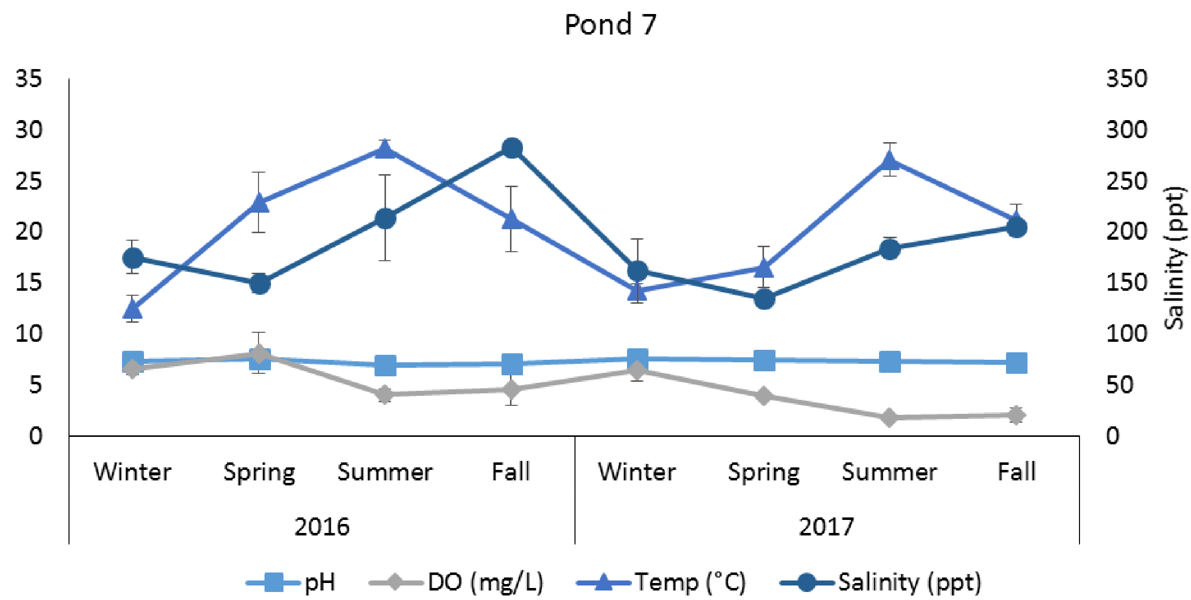


Figure 2-15. Mean (±SE) seasonal pH (squares), dissolved oxygen (DO; mg/L; squares), water temperature (Temp; °C; diamonds), and salinity (ppt; circles) values for pond 7 in 2016 and 2017. Note: Due to difference in scale, salinity is presented on the secondary y-axis. (Compliments of USGS)

Table 2-1. Waterbird species observed at high and low tide on salt ponds in Napa-Sonoma Marshes Wildlife Area in 2016 and 2017. Species observed only in 2016 (†); species observed only in 2017 (‡).

Guild	Common Name	Scientific Name
Dabbling Ducks	American Coot	*Fulica americana*
	American Green-winged Teal	*Anas crecca*
	American Wigeon	*Anas americana*
	Cinnamon Teal‡	*Anas cyanoptera*
	Domestic Mallard‡	*Anas* spp.
	Eurasian Wigeon	*Anas penelope*
	Gadwall	*Anas strepera*
	Mallard	*Anas platyrhynchos*
	Northern Pintail	*Anas acuta*
	Northern Shoveler	*Anas clypeata*
Diving Ducks	Bufflehead	*Bucephala albeola*
	Canvasback	*Aythya valisineria*
	Common Goldeneye	*Bucephala clangula*
	Greater or Lesser Scaup	*Aythya* spp.
	Redhead	*Aythya americana*
	Ruddy Duck	*Oxyura jamaicensis*
	Tufted Duck†	*Aythya fuligula*
Eared Grebes	Eared Grebe	*Podiceps nigricollis*
	Horned Grebe	*Podiceps auritus*
Geese	Cackling Goose†	*Branta hutchinsii*
	Canada Goose†	*Branta canadensis*
	Mute Swan	*Cygnus olor*
	Snow Goose	*Chen caerulescens*
Gulls	Bonaparte's Gull	*Chroicocephalus philadelphia*
	California Gull	*Larus californicus*
	Glaucous-winged Gull	*Larus glaucescens*
	Herring Gull	*Larus argentatus*
	Mew Gull	*Larus canus*
	Ring-billed Gull	*Larus delawarensis*
	Thayer's Gull†	*Larus thayeri*
	Western Gull	*Larus occidentalis*
Piscivores	American White Pelican	*Pelecanus erythrorhynchos*
	Belted Kingfisher†	*Megaceryle alcyon*
	Clark's Grebe	*Aechmophorus clarkii*
	Double-crested Cormorant	*Phalacrocorax auritus*
	Pacific Loon‡	*Gavia pacifica*
	Pied-billed Grebe	*Podilymbus podiceps*
	Red-breasted Merganser	*Mergus serrator*
	Red-throated Loon†	*Gavia stellata*
	Western Grebe	*Aechmophorus occidentalis*

Guild	Common Name	Scientific Name
Shorebirds, Medium	American Avocet	*Recurvirostra americana*
	Black-bellied Plover	*Pluvialis squatarola*
	Black-necked Stilt	*Himantopus mexicanus*
	Greater Yellowlegs	*Tringa melanoleuca*
	Killdeer	*Charadrius vociferus*
	Long-billed Curlew	*Numenius americanus*
	Marbled Godwit	*Limosa fedoa*
	Whimbrel	*Numenius phaeopus*
	Willet	*Tringa semipalmata*
Shorebirds, Small	Dunlin	*Calidris alpina*
	Least Sandpiper	*Calidris minutilla*
	Semipalmated Plover	*Charadrius semipalmatus*
	Short or Long-billed Dowitcher	*Limnodromus* spp.
	Snowy Plover	*Charadrius alexandrinus*
	Western Sandpiper	*Calidris mauri*
Terns	Caspian Tern	*Hydroprogne caspia*
	Elegant Tern	*Thalasseus elegans*
	Forster's Tern	*Sterna forsteri*
	Least Tern	*Sternula antillarum*
Waders	Black-crowned Night-Heron‡	*Nycticorax nycticorax*
	Great Blue Heron	*Ardea herodias*
	Great Egret	*Ardea alba*
	Snowy Egret	*Egretta thula*

Attachment 3

Napa River Salt Marsh: Summary of Water Quality Data

ATTACHMENT 3

Outline of Pertinent Effluent Limitations

Salinity
Must have:
Daily maximum < 100 g/L (parts per thousand)
Monthly average < 50 g/L (ppt)

Temperature
Must be:
< 5°F above ambient

pH
Must be:
< 8.5 and
> 6.5

Dissolved Oxygen
Must not be:
< 5.0 mg/L

Turbidity
Must be no greater than:
(If receiving water is < 50 NTU) 5 NTU above background or
(If receiving water is > 50 NTU) 10% above background

ATTACHMENT 3

Napa River Salt Marsh:
Summary of Water Quality Data for 2016-2017

Monthly Water Quality Data

Salinity reduction and other requirements pertaining to the 2006 breaching of Pond 4 were deemed met by May 6, 2007. Data collected for years 2016 and 2017 are reported below. Note: Equipment problems periodically occur as part of the monitoring process. Due to the age of some of the equipment, in 2016, pH and then later in 2017, dissolved oxygen data were becoming unreliable. Also, in October 2017, our last dependable sonde experienced irreparable water damage. CDFW was able to borrow equipment from USGS to continue the monthly surveys for the rest of 2017. In addition, since USGS collects the required Pond 6-8 water quality data, it is separate from Ponds 1-5 data.

Ponds 1-5

Salinity

The data indicate that the proposed design is successful in maintaining ambient salinity within the restoration project. Figures and Tables 3-2 and 3-3 outline the salinity for 2016 and 2017, respectively. Overall, depending on the season and the amount of rain in any given year, salinities are within 5 ppt (parts per thousand) of ambient. Consistent with previous years' data collected, Ponds 1, 1A and 2, which are closer to the bay, are generally the data that go over 5 ppt of the Napa River. This is what you would expect in this brackish environment, however after several years of drought preceding 2016/2017 may have played a role in salt concentrating in these shallow ponds so close to the bay. In particular May 2016 through September 2016 demonstrate an abnormally high salinity reading in Pond 1 when the shallow pond is at its' highest salinity and incurring bay water at the same time. It is important to note, it is believed the salinity probe in the sonde used January 2016 through April 2016 was not functioning properly. The sonde was replaced in May 2016. Tidal action within a brackish environment can vary greatly even day to day, especially in a rain event. Depending where samples were collected, as expected the salinity was never exact with ambient, especially since only one ambient location along the Napa River is taken.

Turbidity

Turbidity in the NSMWA is a very dynamic system and there are an infinite number of variables and combination of variables that can affect turbidity numbers on any given day (or even moment). Turbidity has proven informative for us during the first few months of breaching, but we have not learned very much from the data much past that. It appears that most of the detectible turbidity changes occur near the breach event. In 2008, permitting agencies and CDFW agreed to terminate turbidity data collection after background sites independent of the restoration project exceeded permit requirements as much or more that the restoration project itself (2009 Biennial Report).

Water Temperature

As with most other parameters, water temperature readings tracked closely with Napa River values, in black (Figures and Tables 3-4 and 3-5). Pond values tended to be only slightly higher (but within 5°C) than the corresponding Napa River temperature readings. In short, pond and Napa River temperatures generally track well together. During 2016 and 2017, the restoration data did not exceed 5°C of the Napa River except for three occasions, all which occurred in Pond 1. Pond 1 data collection location is at the north end of the pond away from the inflow from the Bay and overall a rather shallow pond, which possibly can account for the slightly elevated temperature compared to the Napa River. The data indicate that the restoration project did not affect water temperatures in the lower Napa River.

pH

Per water quality permits, pH values are to remain between 6.5 and 8.5, and not vary from receiving water levels by more than 0.5 pH units. The data presented here (Figure and Tables 3-6 and 3-7) show that for all measurements taken, tidal pond pH values and the pH values in the immediate vicinity of the breach were within 0.5 pH units of the Napa River. In 2014 all pH requirements were met January through August with the exception of the Napa River slightly below 6.5 units in April. In September 2016 pH would not calibrate property so the data was thrown out and should not be considered reliable data. Since then, when collecting data, the pH reading took longer to settle out. The rest of 2016 was within range, however several locations were not within 0.5 units of the Napa River data. In 2017, there were ten readings throughout the year that were slightly either too high or too low. All data was within 0.5 units of the Napa River. Slightly alkaline water currently appears to be standard within this estuarine system.

Dissolved Oxygen

As concentrations of luminescent dissolved oxygen (LDO) rose and fell seasonally in Napa River water between 2016 and 2017, so too did pond LDO levels (Figures and Tables 3-8 through 3-11). This is consistent with previous years' data collected. Pond levels were sometimes slightly below or higher than Napa River concentrations, however data were at all times within the permits limits set forth for the salinity reduction breach.
All of the measurements were at or above the 5.0 mg/L effluent criterion with the exception of Pond 1A on three separate occasions. June and July 2016 and September 2017. It is unclear why readings were low. Typically, low dissolved oxygen readings taken can be due to warm fall months and can possibly reflect the more sluggish nature of flows through the system combined with the shallow nature of the ponds. The aging equipment may have caused issues as well.

Ponds 6-8

(Compliments of USGS)

USGS conducted monthly water quality sampling of ponds 6 – 8, and at each of the ponds at the Napa Plant Site, concurrent with the high tide waterbird surveys (Figure 2-8). USGS measured dissolved oxygen (DO; mg/L), salinity (ppt), water temperature (°C), and pH with a calibrated multi-parameter water quality meter (YSI ProPlus by YSI Inc., Yellow Springs, OH). Ponds sampled from multiple locations were averaged for the whole pond. Seasons were defined as: winter, previous Dec-Feb; spring, Mar-May; summer, Jun-Aug; fall, Sep-Nov. Mean values are presented ± SE.

Water quality data from ponds 6-8 were variable, but showed seasonal trends (Figure 2-14). Dissolved oxygen (DO), was generally >5.0 mg/L on all ponds (Figure 2-14), except in pond 7 where the lowest observed DO occurred in summer of 2017 (1.77±0.18 mg/L; Figure 2-15). Summer of 2017 was also when the highest pond temperatures were observed (pond 8, 14.55±2.62 °C; Figure 2-13). Level of pH ranged from 6.97±0.05 in pond 7 in summer 2016 (Figure 2-15), to 9.62±0.01 in pond 7A in summer of 2017 (Figure 2-14). Highest salinity was observed in pond 7 in fall of 2016 (282.7±6.8 ppt; Figure 2-15). Outside of pond 7, the next highest salinity was also observed in fall of 2016, on pond 7A (23.9±1.4 ppt; Figure 2-14). Lowest salinity was observed on pond 8 in spring of 2017 (1.9±0.1 ppt; Figure 2-14).

Note: These data have not received the USGS Director's approval and as such are provisional and subject to revision. The data are being released on the condition that neither the USGS nor the United States Government may be held liable for any damages resulting from its authorized or unauthorized use.

Mercury Data
(Compliments of SFEI)
In 2016 and 2017, SFEI (San Francisco Estuary Institute) and UC Davis conducted mercury biosentinel sampling at 11 North Bay wetland sites, which included the Napa River Salt Marsh and Napa Plant Site Restoration Projects (Figure 3-12). A total of 296 fish samples were analyzed. These samples represented 11 species collected at 9 sites. In addition, blood samples were analyzed from 70 tidal marsh songbirds at five sites. Of these 70 samples, 62 were from Song Sparrows, and the remaining samples were from Common Yellowthroats, Marsh Wrens, and one Orange-crowned Warbler. This monitoring followed the multi-species biosentinel monitoring approach developed for the 2012-2014 North Bay Hg biosentinel monitoring. Results described here are preliminary.

Fish mercury concentrations varied considerably by species and site, with values ranging from 0.01 µg/g (wet weight) to 0.41 µg/g (wet weight) (Figure 3-15). The highest fish Hg concentrations were seen in Mississippi silverside at Steamboat Slough in 2017 (Figure 3-13). Mississippi silversides showed a significant correlation between fish length and Hg concentration, and therefore length-standardized Hg concentrations will be used for statistical analyses (Figure 3-17). Song Sparrow blood-mercury concentrations ranged from 0.11 to 1.19 ug/g (wet weight).

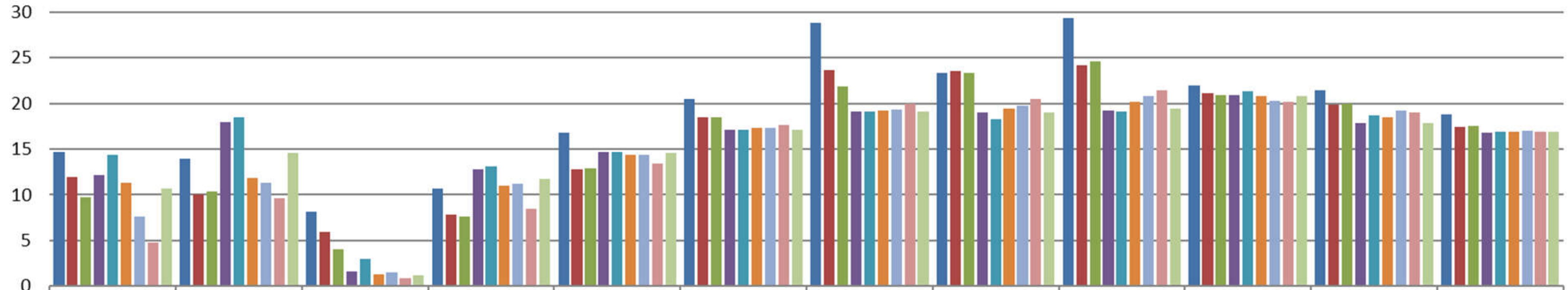
Average fish Hg concentrations exceeded the water quality objective for prey fish of 0.03ug/g at all sites except Pond 7A. All fish samples were above 0.03 ug/g at Steamboat Slough and Petaluma Marsh. Bird mercury concentrations were highest in Steamboat Slough in 2016 and highest at Petaluma marsh in 2017 (Figure 3-16).

The project report describing these monitoring results in more detail were not yet finalized as of January 2018. The study will be available on the SFEI website (www.sfei.org) in March 2018.

Figure 3-1 Napa River Salt Marsh Water Quality Sample Locations

Monthly Sample Locations

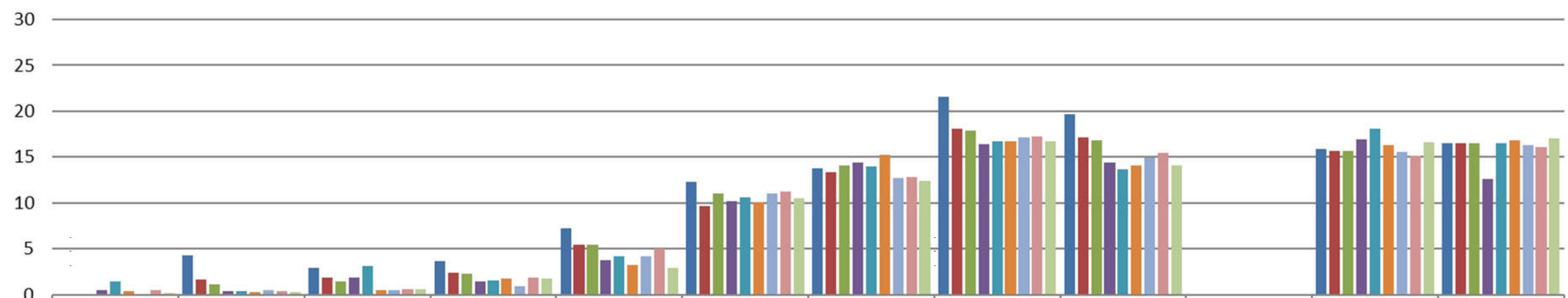
Figure 3-2. 2016 Salinity (ppt) Ponds 1-5 with Napa River



	1/20/2016	2/17/2016	3/16/2016	4/20/2016	5/18/2016	6/27/2016	7/28/2016	8/15/2016	9/26/2016	10/31/2016	11/8/2016	12/7/2016
1	14.63	13.99	8.12	10.62	16.80	20.47	28.78	23.28	29.33	21.90	21.45	18.82
1A	11.91	10.07	5.88	7.85	12.75	18.47	23.64	23.52	24.13	21.07	19.89	17.47
2	9.76	10.33	4.03	7.65	12.87	18.43	21.80	23.27	24.54	20.90	19.92	17.56
3A	12.17	17.98	1.62	12.76	14.72	17.11	19.06	19.05	19.21	20.89	17.79	16.82
3B	14.34	18.49	3.01	13.14	14.69	17.06	19.14	18.22	19.15	21.27	18.73	16.87
4A	11.35	11.82	1.26	10.95	14.31	17.28	19.26	19.37	20.14	20.74	18.46	16.88
4B	7.64	11.27	1.51	11.20	14.36	17.35	19.32	19.70	20.74	20.30	19.16	16.99
5A	4.82	9.6	0.87	8.45	13.41	17.65	20.00	20.43	21.39	20.11	18.99	16.89
NR CL	10.70	14.6	1.14	11.76	14.52	17.11	19.06	18.98	19.46	20.80	17.79	16.93

1 1A 2 3A 3B 4A 4B 5A NR CL

Figure 3-3. 2017 Salinity (ppt) Ponds 1-5 with Napa River

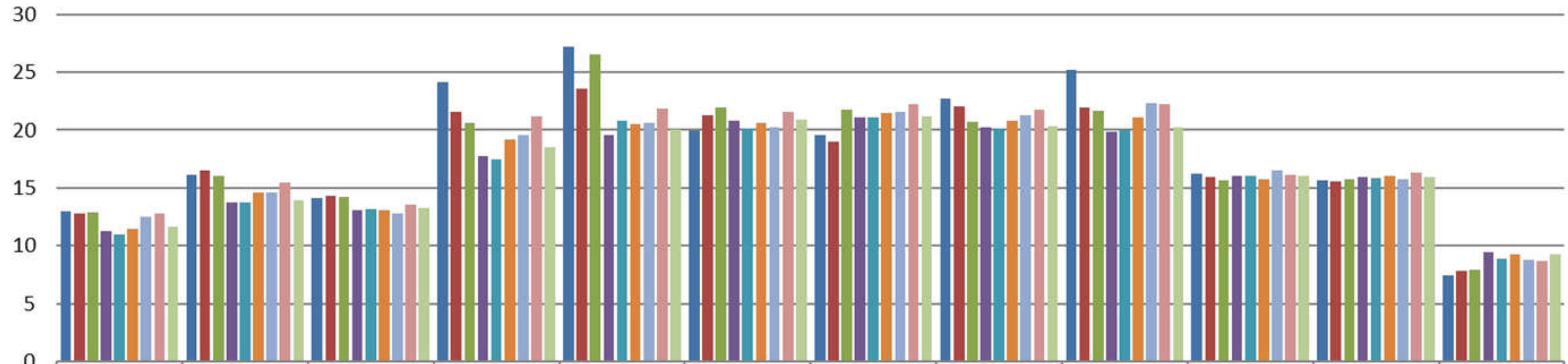


	1/25/2017	2/21/2017	3/9/2017	4/27/2017	5/30/2017	6/28/2017	7/18/2017	8/24/2017	9/26/2017	10/25/2017	11/29/2017	12/12/2017
1		4.24	2.86	3.64	7.26	12.30	13.76	21.51	19.66		15.91	16.50
1A		1.66	1.82	2.37	5.46	9.62	13.34	18.13	17.09		15.63	16.50
2		1.13	1.47	2.27	5.46	11.06	14.09	17.85	16.79		15.66	16.55
3A	0.45	0.33	1.89	1.40	3.71	10.22	14.35	16.44	14.36		16.89	12.55
3B	1.46	0.35	3.14	1.50	4.12	10.55	13.95	16.73	13.62		18.08	16.47
4A	0.40	0.24	0.46	1.70	3.24	10.02	15.25	16.69	14.08		16.29	16.79
4B		0.44	0.49	0.95	4.19	11.01	12.72	17.10	14.96		15.58	16.26
5A	0.43	0.33	0.58	1.89	5.04	11.22	12.83	17.20	15.50		15.10	16.12
NR CL	0.19	0.3	0.56	1.79	2.87	10.52	12.41	16.73	14.08		16.62	16.98

1 1A 2 3A 3B 4A 4B 5A NR CL

NOTE: Blank data entry (*) indicates no reliable data could be collected.

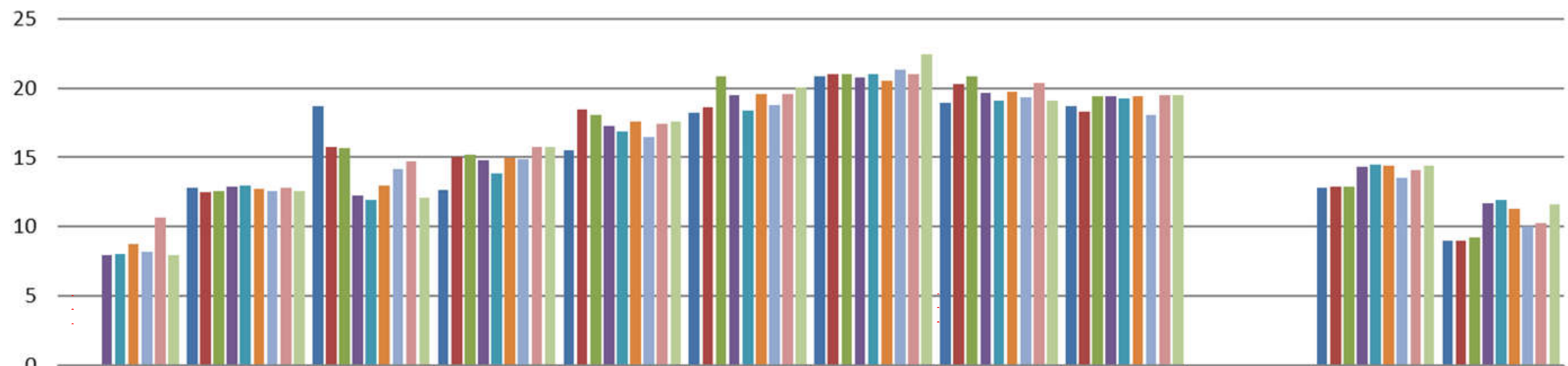
Figure 3-4. 2016 Temperature (°C) Ponds 1-5 with Napa River



	1/20/2016	2/17/2016	3/16/2016	4/20/2016	5/18/2016	6/27/2016	7/28/2016	8/15/2016	9/26/2016	10/31/2016	11/8/2016	12/7/2016
1	12.99	16.11	14.09	24.15	27.17	19.98	19.56	22.72	25.21	16.19	15.65	7.43
1A	12.81	16.49	14.29	21.54	23.62	21.24	18.95	22.04	21.99	15.97	15.57	7.87
2	12.89	16.02	14.19	20.59	26.56	21.94	21.77	20.70	21.67	15.68	15.75	7.92
3A	11.29	13.76	13.12	17.71	19.55	20.79	21.13	20.27	19.9	16.01	15.91	9.45
3B	11.02	13.75	13.16	17.46	20.77	20.10	21.12	20.13	20.01	16.08	15.87	8.92
4A	11.45	14.63	13.10	19.20	20.51	20.64	21.51	20.78	21.05	15.79	16.00	9.26
4B	12.46	14.65	12.78	19.53	20.64	20.2	21.59	21.24	22.32	16.48	15.73	8.8
5A	12.75	15.46	13.55	21.20	21.83	21.54	22.27	21.75	22.2	16.15	16.32	8.67
NR CL	11.61	13.96	13.27	18.56	20.05	20.87	21.21	20.32	20.24	16.01	15.91	9.23

1 1A 2 3A 3B 4A 4B 5A NR CL

Figure 3-5. 2017 Temperature (°C) Ponds 1-5 with Napa River

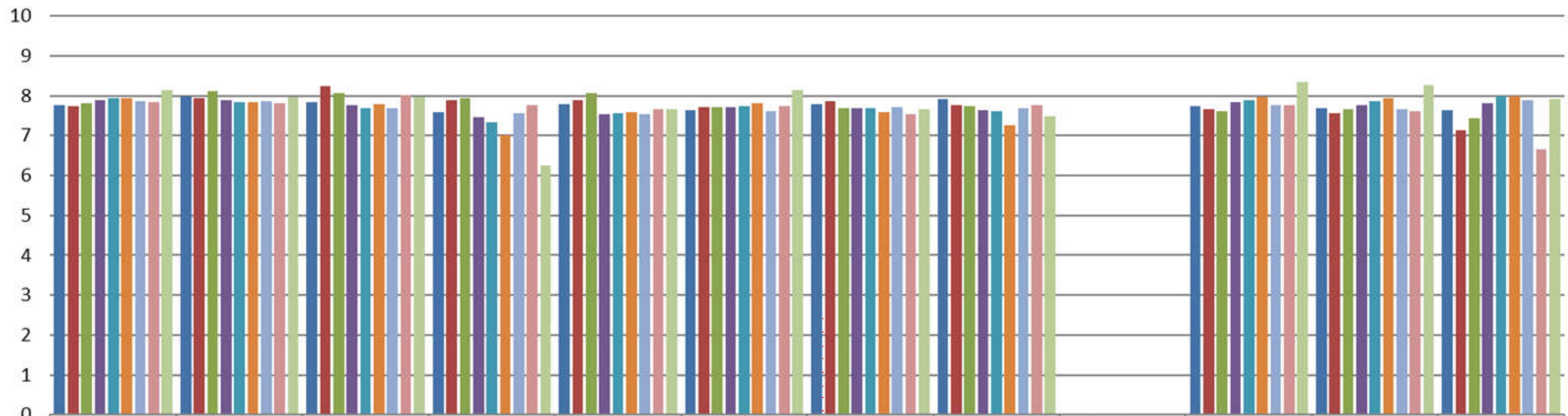


	1/25/2017	2/21/2017	3/9/2017	4/27/2017	5/30/2017	6/28/2017	7/18/2017	8/24/2017	9/26/2017	10/25/2017	11/29/2017	12/29/2017
1		12.77	18.70	12.63	15.55	18.23	20.86	18.92	18.68		12.80	9.00
1A		12.45	15.77	15.00	18.47	18.59	21.00	20.26	18.30		12.90	9.00
2		12.57	15.66	15.18	18.09	20.80	20.98	20.81	19.43		12.90	9.20
3A	7.95	12.89	12.22	14.78	17.28	19.47	20.78	19.67	19.41		14.30	11.70
3B	8.00	12.95	11.94	13.87	16.90	18.38	20.98	19.05	19.27		14.50	11.90
4A	8.71	12.69	12.98	14.99	17.56	19.57	20.52	19.75	19.42		14.40	11.30
4B	8.22	12.54	14.19	14.85	16.46	18.78	21.32	19.36	18.02		13.50	10.00
5A	10.68	12.78	14.70	15.78	17.38	19.55	21.03	20.38	19.47		14.10	10.30
NR CL	7.98	12.56	12.12	15.75	17.60	20.02	22.45	19.05	19.46		14.40	11.60

1 1A 2 3A 3B 4A 4B 5A NR CL

NOTE: Blank data entry (*) indicates no reliable data could be collected.

Figure 3-6. 2016 pH (units) Ponds 1-5 with Napa River

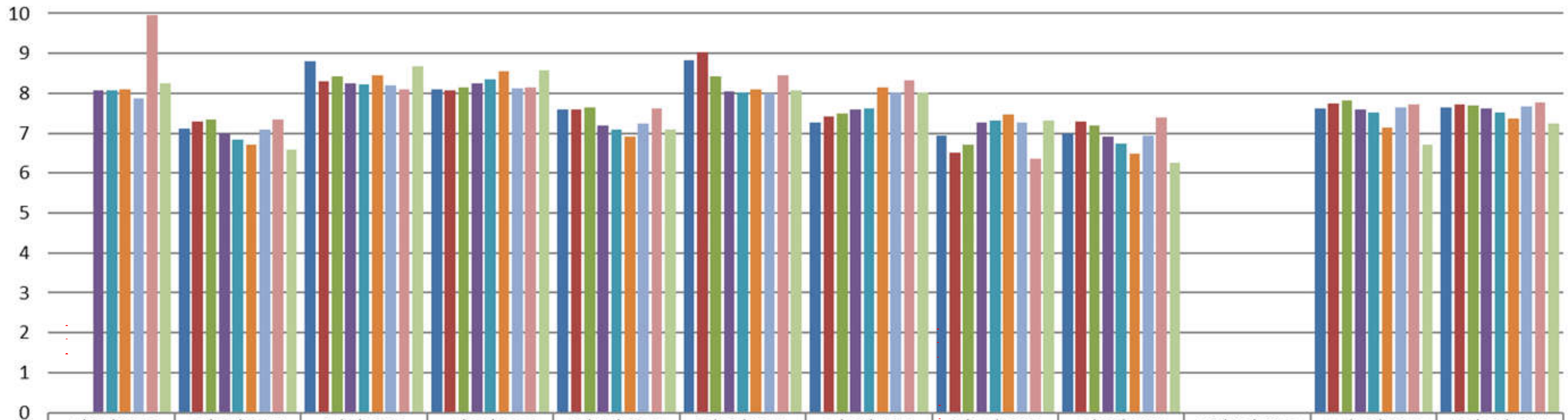


	1/20/2016	2/17/2016	3/16/2016	4/20/2016	5/18/2016	6/27/2016	7/28/2016	8/15/2016	9/26/2016	10/31/2016	11/8/2016	12/7/2016
1	7.76	7.99	7.85	7.59	7.78	7.63	7.79	7.91		7.74	7.69	7.63
1A	7.74	7.95	8.24	7.88	7.89	7.70	7.86	7.75		7.66	7.57	7.13
2	7.82	8.12	8.07	7.95	8.06	7.70	7.69	7.73		7.61	7.65	7.44
3A	7.89	7.89	7.76	7.46	7.53	7.70	7.68	7.63		7.84	7.77	7.80
3B	7.93	7.84	7.68	7.34	7.55	7.74	7.69	7.60		7.88	7.87	8.00
4A	7.95	7.84	7.78	7.01	7.59	7.82	7.59	7.27		7.96	7.93	8.00
4B	7.86	7.87	7.69	7.57	7.54	7.62	7.72	7.68		7.75	7.65	7.89
5A	7.83	7.8	8.02	7.75	7.66	7.73	7.53	7.76		7.76	7.62	6.66
NR CL	8.13	7.97	7.97	6.24	7.66	8.15	7.66	7.48		8.33	8.27	7.92

1 1A 2 3A 3B 4A 4B 5A NR CL

NOTE: Blank data entry (*) indicates no reliable data could be collected.

Figure 3-7. 2017 pH (units) Ponds 1-5 with Napa River

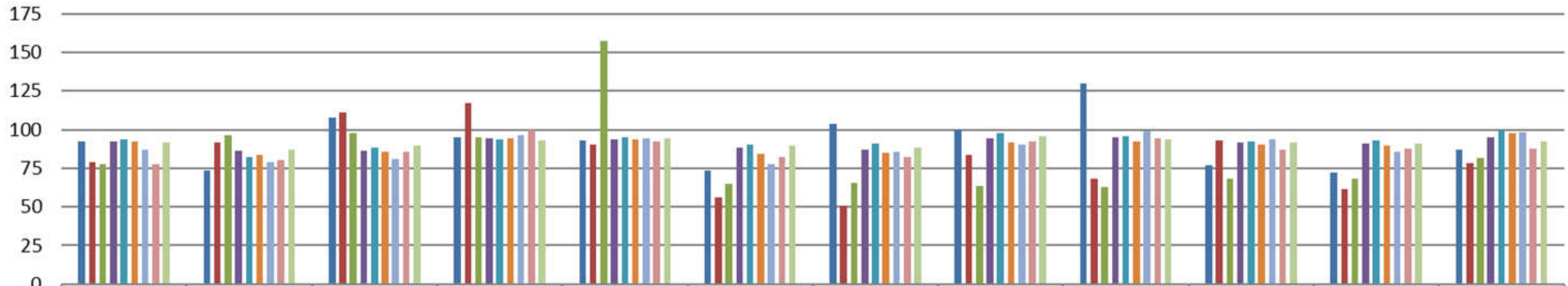


	1/25/2017	2/21/2017	3/9/2017	4/27/2017	5/30/2017	6/28/2017	7/18/2017	8/24/2017	9/26/2017	10/25/2017	11/29/2017	12/12/2017
1		7.11	8.80	8.09	7.59	8.84	7.26	6.94	7.00		7.62	7.64
1A		7.29	8.31	8.08	7.60	9.03	7.43	6.50	7.28		7.74	7.72
2		7.35	8.43	8.14	7.64	8.42	7.49	6.70	7.18		7.82	7.69
3A	8.06	7	8.24	8.25	7.19	8.05	7.59	7.27	6.92		7.60	7.61
3B	8.06	6.85	8.22	8.35	7.08	8.01	7.61	7.31	6.75		7.52	7.52
4A	8.09	6.7	8.44	8.55	6.92	8.09	8.16	7.47	6.49		7.15	7.37
4B	7.88	7.1	8.20	8.11	7.23	8.00	8.02	7.27	6.95		7.64	7.67
5A	9.96	7.34	8.09	8.15	7.63	8.44	8.33	6.35	7.38		7.72	7.77
NR CL	8.26	6.59	8.67	8.57	7.08	8.07	8.03	7.31	6.25		6.71	7.25

1 1A 2 3A 3B 4A 4B 5A NR CL

NOTE: Blank data entry (*) indicates no reliable data could be collected.

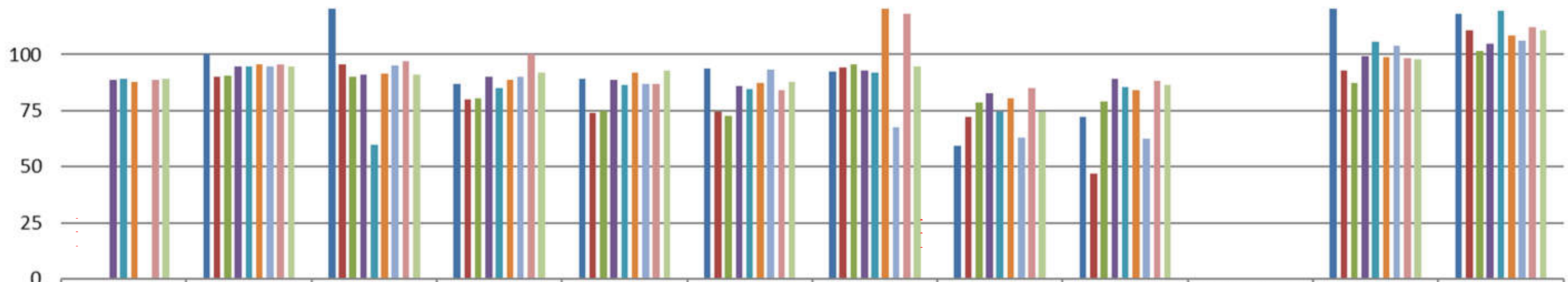
Figure 3-8. 2016 LDO (% Saturation) Ponds 1-5 with Napa River



	1/20/2016	2/17/2016	3/16/2016	4/20/2016	5/18/2016	6/27/2016	7/28/2016	8/15/2016	9/26/2016	10/31/2016	11/8/2016	12/7/2016
1	92.0	73.6	107.9	95.3	93.0	73.4	103.5	99.40	129.6	77.1	71.9	87.2
1A	78.7	91.4	111.0	117.0	90.6	56.4	50.6	83.30	67.9	93.2	61.5	78.3
2	77.7	96.4	97.9	94.7	157.3	65.1	65.3	63.30	62.6	68.2	68.1	81.6
3A	92.6	86.6	86.6	94.0	93.4	88.2	87.1	94.00	94.7	91.8	91.2	94.8
3B	93.9	82.2	88.5	93.9	94.8	90.5	90.7	97.40	95.9	92.5	92.7	99.5
4A	92.1	83.8	85.7	94.0	93.5	84.2	85.2	91.60	92.1	90.6	89.5	97.5
4B	86.9	79.1	81.1	96.0	94.6	77.8	85.3	90.40	99.2	93.5	85.8	98.2
5A	77.7	80.3	85.5	99.8	92.5	82.4	82.3	92.20	94.3	86.9	87.7	87.5
NR CL	91.9	87.0	89.5	92.9	94.1	89.3	88.2	95.5	93.5	91.7	91.0	92.1

1 1A 2 3A 3B 4A 4B 5A NR CL

Figure 3-9. 2017 LDO (% Saturation) Ponds 1-5 with Napa River

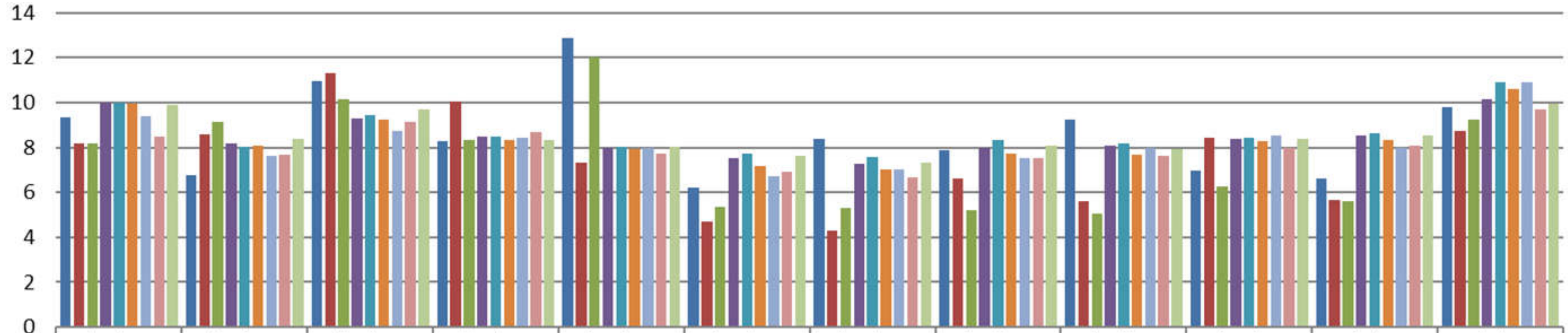


	1/25/2017	2/21/2017	3/9/2017	4/27/2017	5/30/2017	6/28/2017	7/18/2017	8/24/2017	9/26/2017	10/25/2017	11/29/2017	12/12/2017
1		100.2	132.1	86.70	89.2	93.6	92.6	59.10	72.2		127.3	117.90
1A		90.3	95.7	80.10	74.1	74.5	94.1	72.10	47.0		92.7	110.6
2		90.4	90.2	80.40	74.8	72.6	95.8	78.40	79.1		87.1	101.7
3A	88.9	94.9	91.0	90.30	88.9	85.8	92.7	82.50	89.0		99.1	105.0
3B	89.0	94.5	59.9	84.90	86.3	84.6	91.9	74.60	85.5		105.9	119.4
4A	88	95.7	91.4	88.80	91.8	87.2	129.9	80.30	84.2		98.6	108.3
4B		94.8	95.1	90.00	86.7	93.1	67.5	63.20	62.5		103.9	106.1
5A	88.7	95.4	97.0	100.30	86.7	84.1	118.0	84.90	88.2		98.2	112.3
NR CL	89.1	94.9	90.8	91.80	92.7	87.8	94.9	74.6	86.4		97.9	110.7

1 1A 2 3A 3B 4A 4B 5A NR CL

NOTE: Blank data entry (*) indicates no reliable data could be collected.

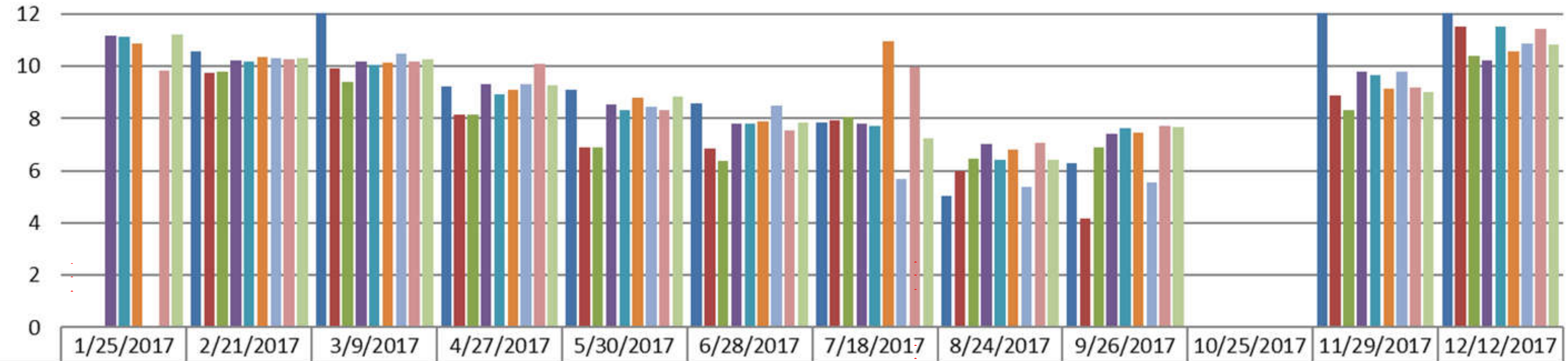
Figure 3-10. 2016 LDO mg/L) Ponds 1-5 with Napa River



	1/20/2016	2/17/2016	3/16/2016	4/20/2016	5/18/2016	6/27/2016	7/28/2016	8/15/2016	9/26/2016	10/31/2016	11/8/2016	12/7/2016
1	9.34	6.78	10.95	8.29	12.87	6.22	8.37	7.85	9.25	6.98	6.60	9.80
1A	8.16	8.57	11.32	10.02	7.33	4.68	4.29	6.63	5.61	8.43	5.66	8.73
2	8.19	9.11	10.12	8.33	12.03	5.35	5.30	5.19	5.04	6.28	5.62	9.23
3A	9.99	8.18	9.29	8.50	8.00	7.52	7.25	7.95	8.09	8.37	8.51	10.16
3B	10.01	8.01	9.42	8.50	8.04	7.71	7.55	8.32	8.18	8.42	8.64	10.90
4A	9.94	8.08	9.23	8.34	7.92	7.19	7.04	7.70	7.68	8.30	8.32	10.62
4B	9.39	7.64	8.74	8.44	7.98	6.69	7.04	7.51	7.96	8.53	7.95	10.90
5A	8.48	7.66	9.15	8.67	7.72	6.90	6.66	7.51	7.61	7.96	8.08	9.67
NR CL	9.91	8.36	9.70	8.31	8.02	7.60	7.33	8.10	7.92	8.38	8.54	9.94

1 1A 2 3A 3B 4A 4B 5A NR CL

Figure 3-11. 2017 LDO (mg/L) Ponds 1-5 with Napa River



	1/25/2017	2/21/2017	3/9/2017	4/27/2017	5/30/2017	6/28/2017	7/18/2017	8/24/2017	9/26/2017	10/25/2017	11/29/2017	12/12/2017
1		10.57	12.81	9.24	9.08	8.57	7.83	5.02	6.28		12.17	12.20
1A		9.75	9.92	8.14	6.88	6.87	7.91	6.00	4.15		8.88	11.51
2		9.77	9.39	8.16	6.88	6.37	8.04	6.47	6.89		8.31	10.39
3A	11.18	10.24	10.18	9.30	8.52	7.79	7.81	7.02	7.40		9.78	10.23
3B	11.12	10.17	10.03	8.91	8.32	7.79	7.73	6.41	7.63		9.68	11.53
4A	10.85	10.36	10.15	9.09	8.78	7.88	10.95	6.81	7.44		9.12	10.58
4B		10.29	10.48	9.32	8.45	8.49	5.69	5.40	5.56		9.81	10.88
5A	9.82	10.28	10.16	10.10	8.30	7.55	9.97	7.05	7.73		9.20	11.42
NR CL	11.22	10.31	10.26	9.25	8.85	7.84	7.23	6.41	7.65		9.00	10.84

1 1A 2 3A 3B 4A 4B 5A NR CL

NOTE: Blank data entry (*) indicates no reliable data could be collected.

Figure 3-12. North Bay Mercury Biosentinel Site Map for 2016-2017 (Compliments from SFEI)

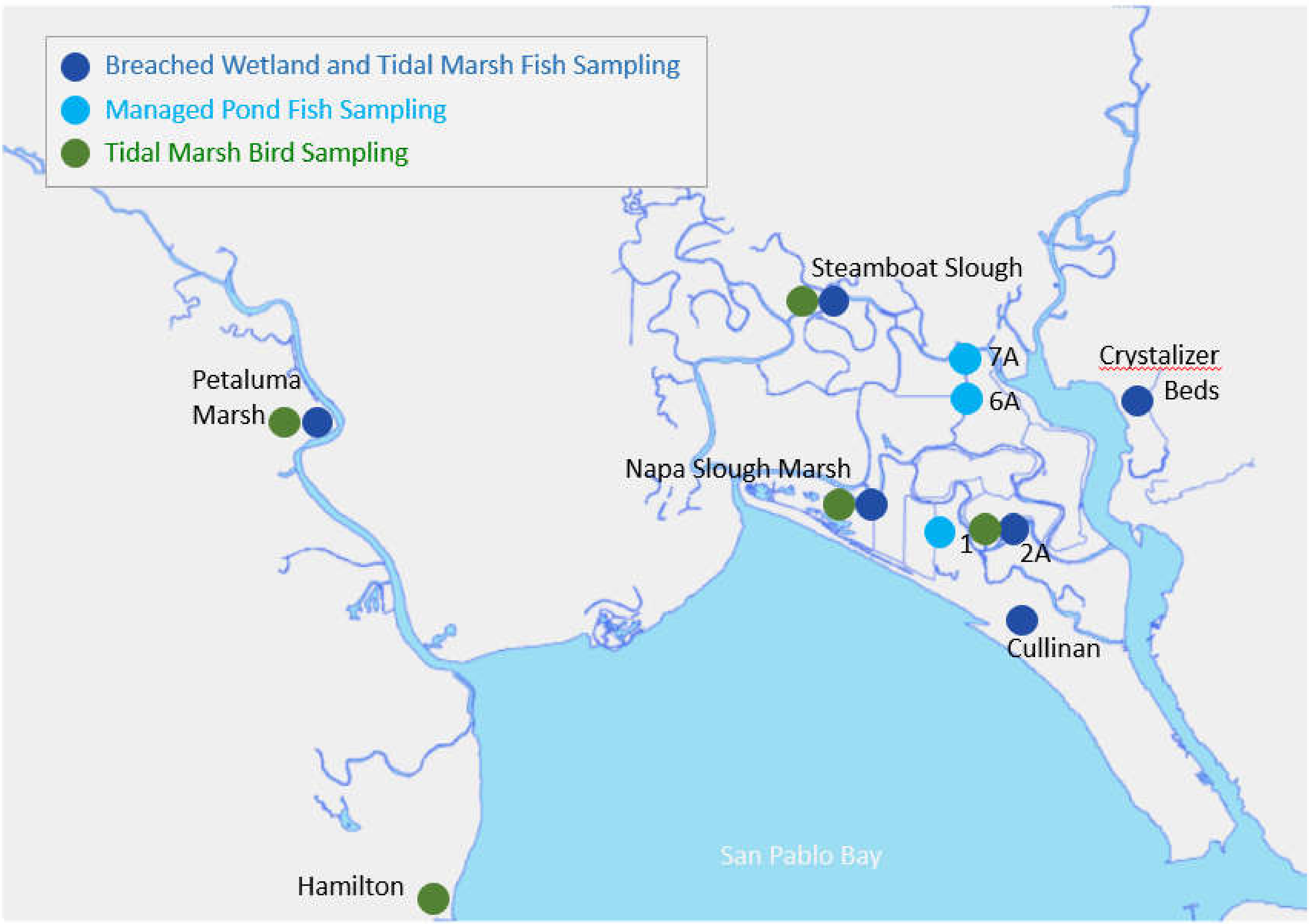


Figure 3-13. Fish mercury concentrations by species for sites sampled in 2016. Dashed line equals 0.03 ug/g. GAMB = mosquitofish, LOMU = long-jaw mudsucker, MISI = Mississippi silverside, NOAN = northern anchovy, PAHE = Pacific herring, PRSC = prickly sculpin, RAKI = rainwater killifish, SHGO = shimofuri goby, THST = three-spine stickleback, TOSM = topsmelt, YEGO = yellowfin goby. (Compliments of SFEI).

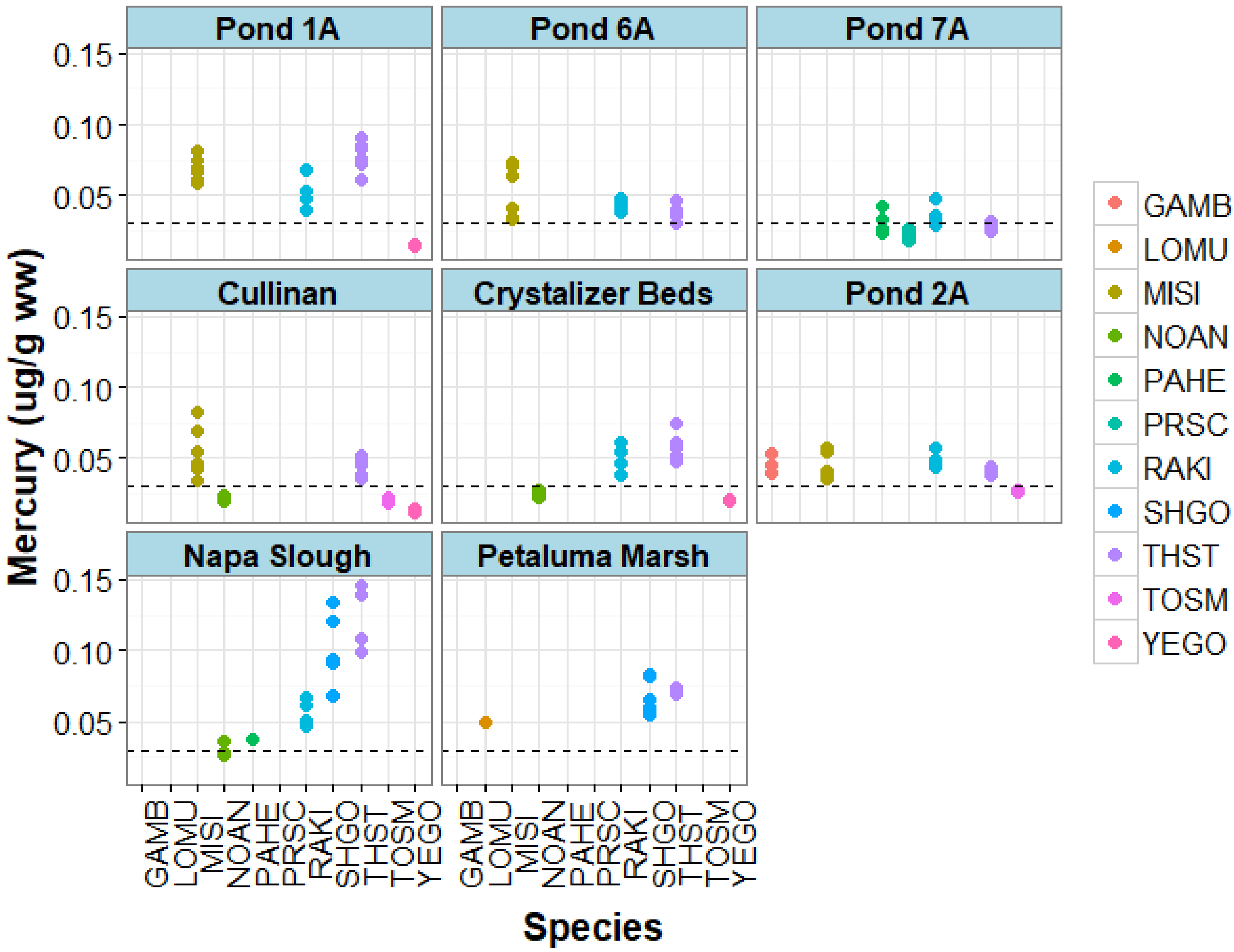


Figure 3-14. Fish mercury concentrations by species for sites sampled in 2017. Dashed line equals 0.03 ug/g. (Compliments from SFEI)

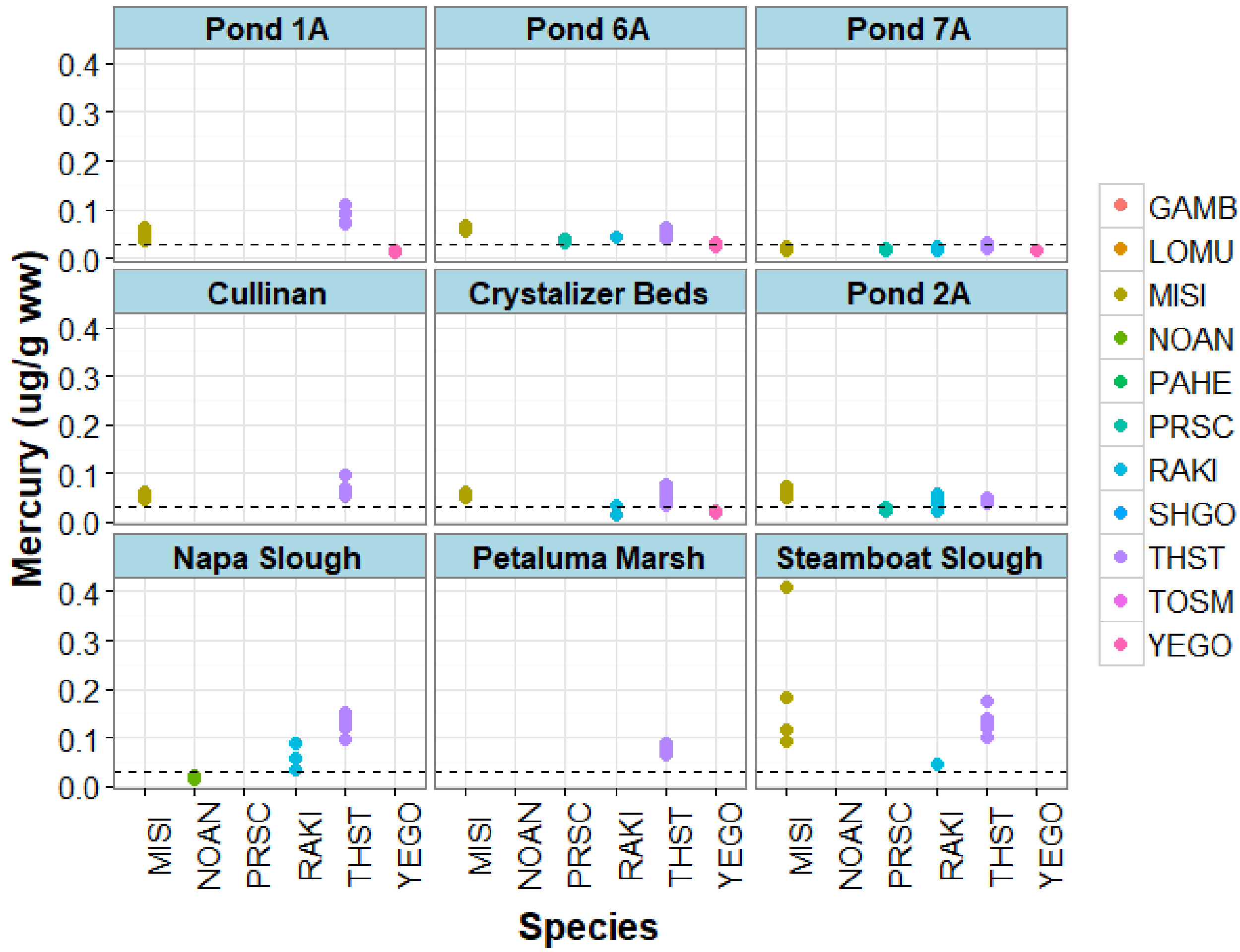


Figure 3-15. Fish mercury concentrations by site type for 2016-2017. Dashed line equals 0.03 ug/g. (Compliments from SFEI)

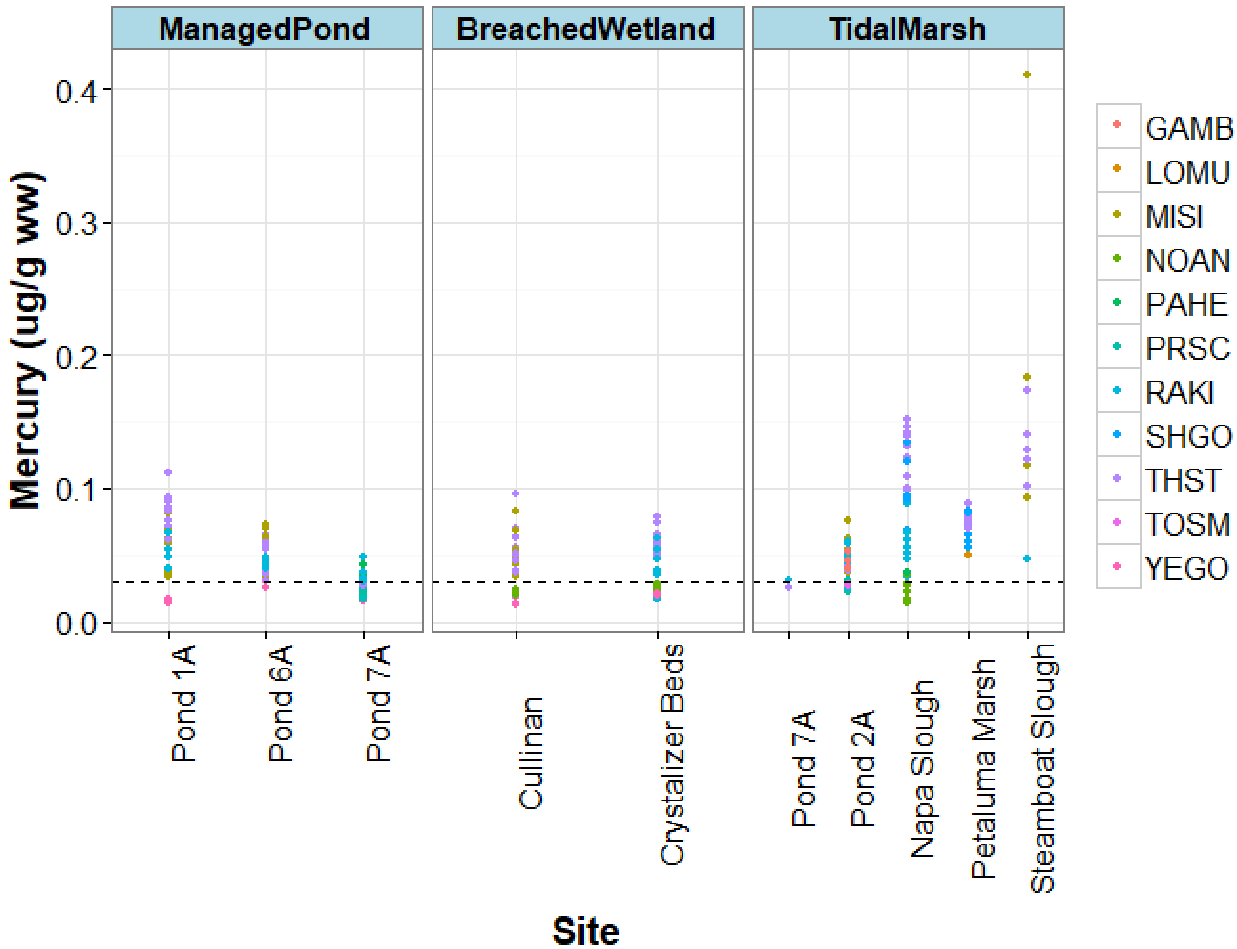


Figure 3-16. Bird mercury concentrations by site in 2016-2017. Error bars represent the 95% confidence interval. (Compliments from SFEI)

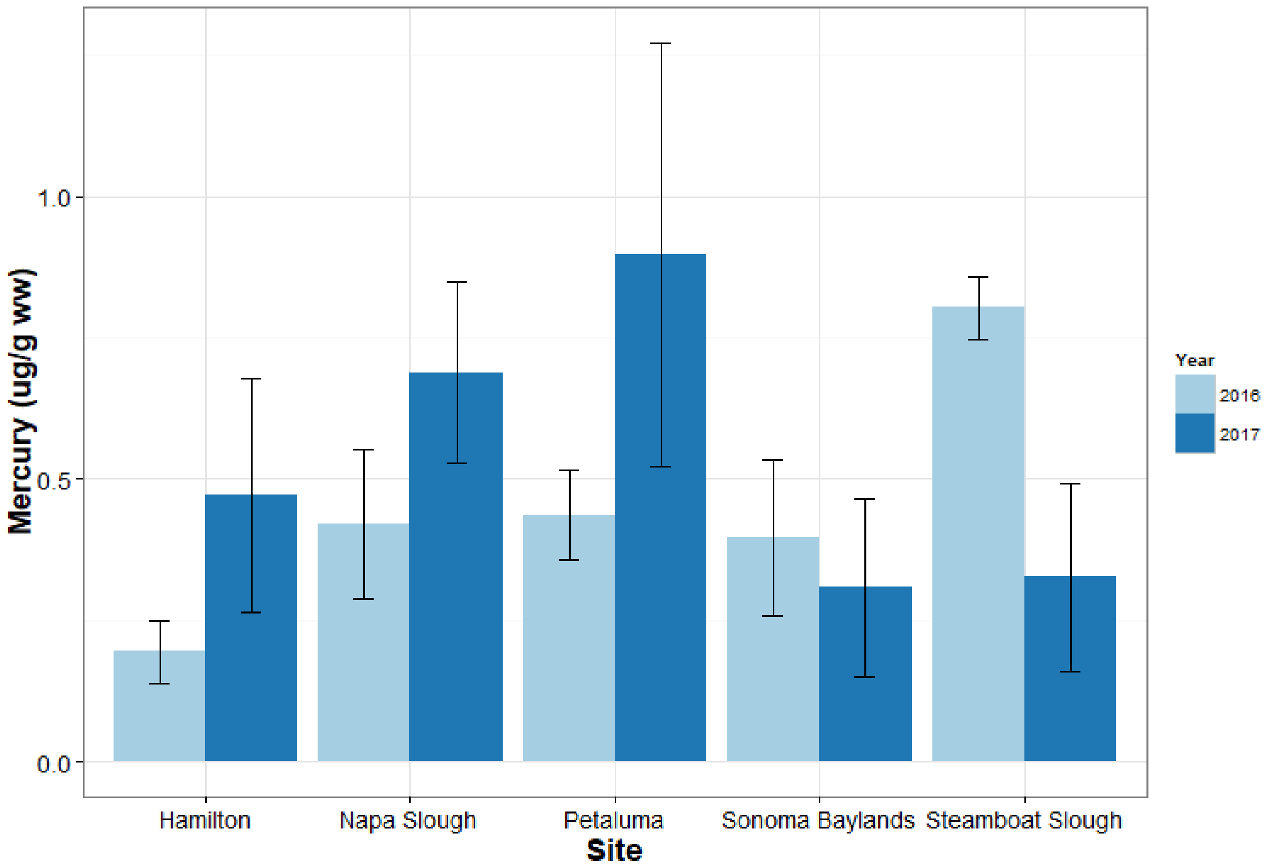
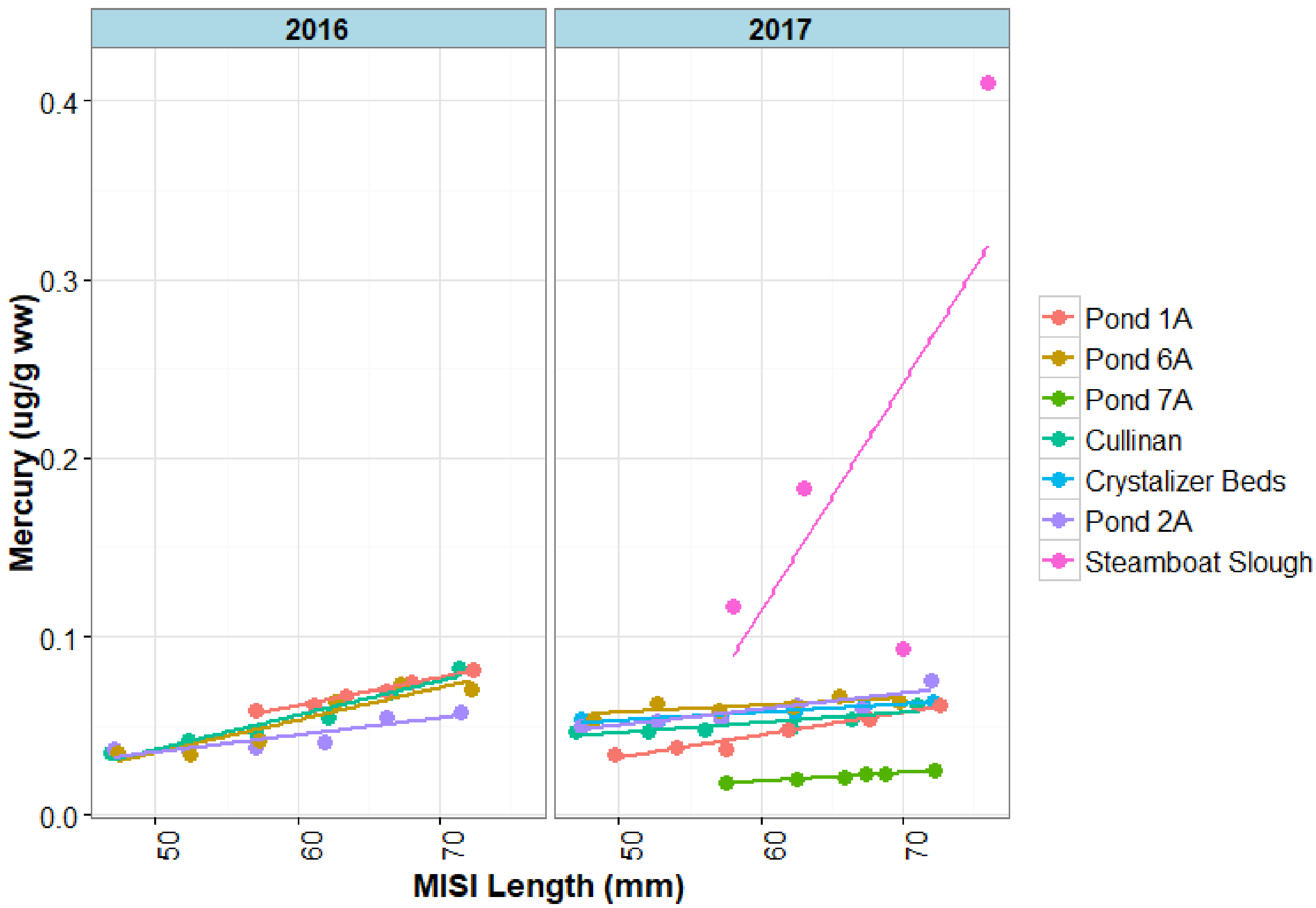


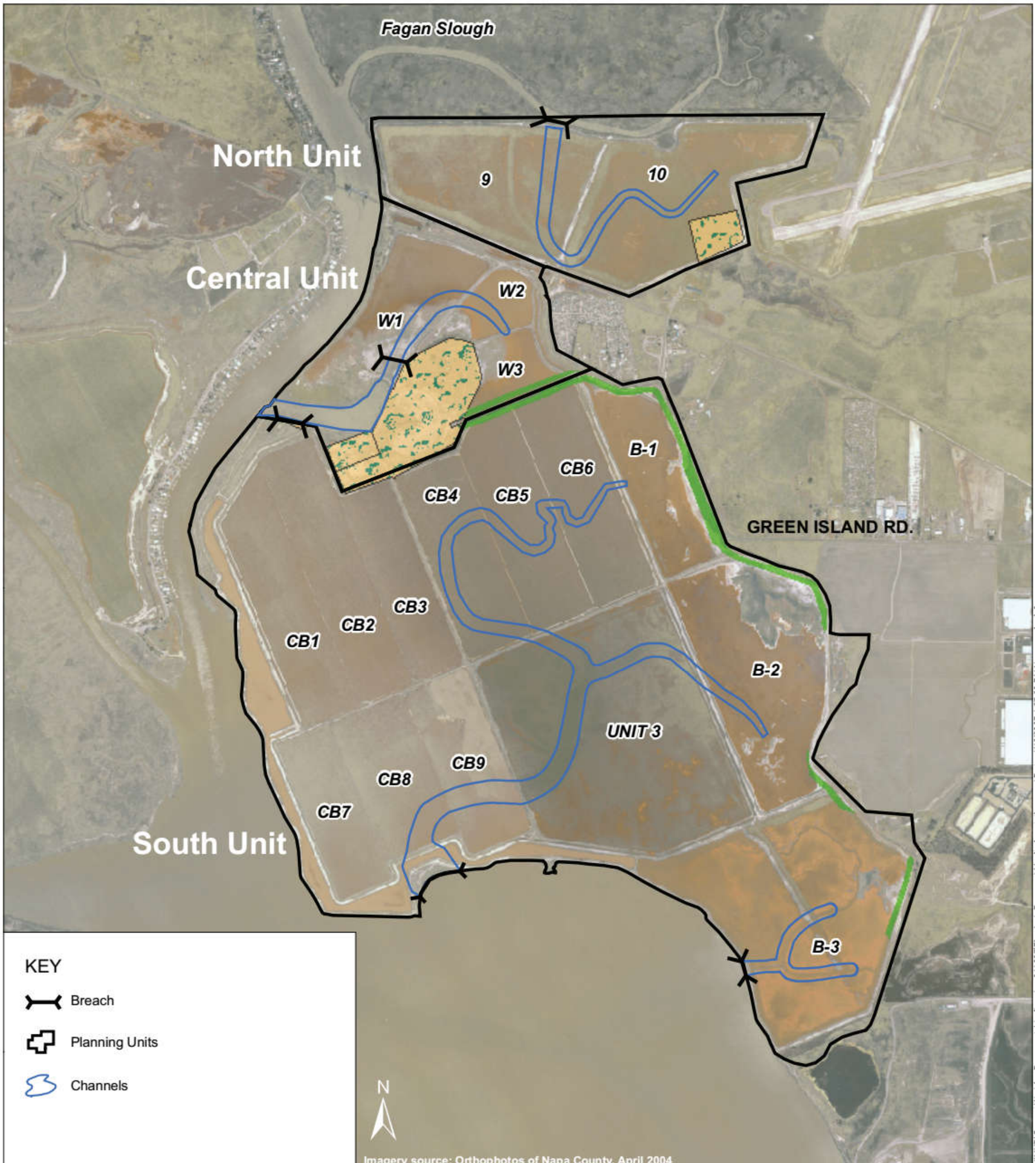
Figure 3-17. Length-Hg correlation for Mississippi silversides. (Compliments from SFEI)



Attachment 4

Napa Plant Site:
Maps, Aerials, and Photographs

Figure 4-1 Napa Plant Site Location Map



PURPOSE: WETLAND RESTORATION DATUM: NAVD88 ADJACENT PROPERTY OWNERS: SEE TABLE 6	PLAN VIEW 0 500 1,000 2,000 3,000 FEET 1 inch equals 1,750 feet CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE	IN: CITY OF AMERICAN CANYON AT: 2983 GREEN ISLAND RD. COUNTY OF: NAPA STATE: CA APPLICATION BY: CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

Figure 4-2. LETE Main Island at sunrise. (June 2017)

Figure 4-3. Nest/eggs from surveyors view. (June 2017)

Figure 4-4. Three egg, LETE nest in progress of hatching. (June 2017)

Figure 4-5. Unknown mammal prints found on Main Island LETE nesting site after the colonies disappearance. (July 2017)

Figure 4-6. Field cameras used to document viable nests and other activities on the island. (June 2017)

Figure 4-7. Field camera capturing LETE incubating two eggs on the Main Island at Napa Plant Site. (June 2017)

Figure 4-8a. Comparison photo. Central Unit Breach of the Napa Plant Site (Green Island Unit). March 2010

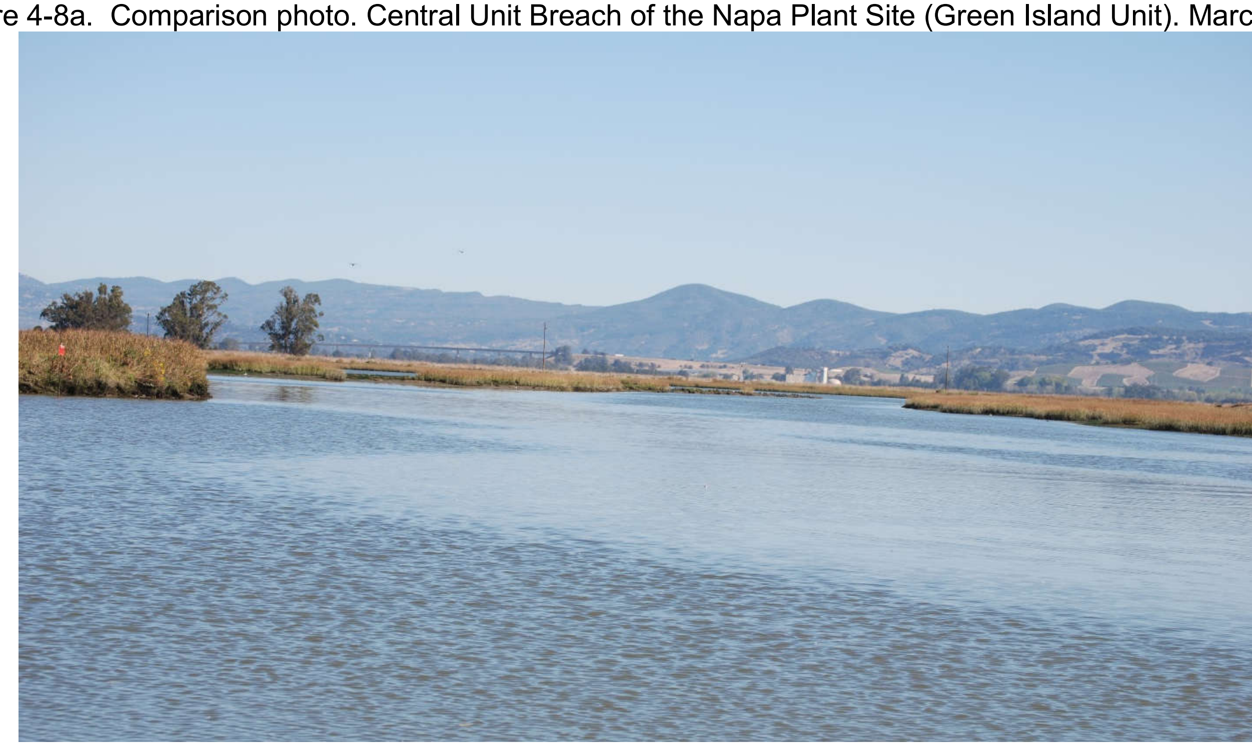


Figure 4-8b. Comparison photo. Central Unit Breach of the Napa Plant Site (Green Island Unit). September 2017

Figure 4-9a. Comparison photo. South Unit of Napa Plant Site (Green Island Unit) at “Barge Breach”. September 2011

Figure 4-9b. Comparison photo. South Unit of Napa Plant Site (Green Island Unit) at “Barge Breach”. October 25, 2017

Attachment 5

Napa Plant Site:
Physical and Biological Monitoring Discussion and Results

ATTACHMENT 5

Napa Plant Site Restoration:
Physical and Biological Monitoring Discussion and Results

Not all parameters were required for all restored units (North, Central, and South Units). Please note the units in parentheses before each discussion identify the ponds where the parameter was evaluated.

Invasive Plant Control (All Units)
Minimizing and controlling invasive plants to the greatest extent possible is an ongoing process. The Invasive *Spartina* Project regularly surveys the NSMWA including Napa Plant Site for invasive *Spartina*, as well as other non-native, invasive plants. In addition, NSMWA staff frequent the restoration site via boat for varying monitoring purposes. Any visits by NSMWA staff include a visual check for new invasive plants attempting to colonize the newly-restored marsh. A few sprouts of common reed (*Phragmites australis*) were identified in the summer of 2012 along the new access road in the Central Unit. In 2016 and 2017, the size remained the same or smaller than when they were found. This location has been carefully monitored since they have been found to ensure rhizomes do not successfully sprout and reappear. The common reed has not attempted to spread, so no herbicides have been needed to eradicate this invasive species.
In past years, opposite-leaf Russian thistle （*Salisola soda*) had spread in the South Unit in upland areas along the access levees and throughout the perimeter of the transition area intermixed with pickleweed and native *Spartina*, In 2016 and 2017, *Salisola soda* have nearly disappeared. Herbicide spraying efforts in the upland areas were able to manage the invasive species. It is unknown why the transitional areas decreased in *Salisola soda*, but it is possible the exposure to brackish water in naturally managed the species.

Bird Counts (All Units)
(Compliments of USGS)
Special note: The USGS bird count data incorporated all ponds within the NSMWA. Therefore, other data discussed in Attachment 2 also incorporates more general Napa Plant Site bird count data.

High and low tide surveys at the Napa Plant site in 2016 and 2017, indicate a shift in winter monthly foraging and roosting behavior (Figure 5-7). At high tide in 2016, more birds were roosting (56%) than foraging (44%), while the reverse was true in 2017 (61% foraging, 39% roosting; Figure 5-7). At low tide, foraging was the predominant activity in both years (74% in 2016, and 85% in 2017; Figure 5-7). All four dominant guilds were predominantly roosting at high tide in both years (>85%; Figure 5-7), while at low tide this was the case only for diving ducks. Dabbling ducks, small, and medium shorebirds predominantly foraged at low tide in both years (Figure 5-7).

Note: These data have not received the USGS Director's approval and as such are provisional and subject to revision. The data are being released on the condition that neither the USGS nor the United States Government may be held liable for any damages resulting from its authorized or unauthorized use.

California Ridgway’s Rail Presence/Absence Call Surveys (All Units)
Annual clapper rail presence/absence call surveys have not been performed the Napa Plant Site yet because there is not adequate vegetation within the units to support the species. Surveys will consist of passive call surveys followed by call playback surveys (if passive survey results at a given location are negative) along permanent transects on the outboard side of the levees surrounding unit. Surveys will be discontinued once Ridgway’s rail presence has been established within the ponds. Source population surveys have been conducted on the outboard side of the ponds in several areas, but are not permit required, therefore are not included in this report.

California Least Tern (South Unit)

California Least Tern (LETE) have been sited periodically in the NSMWA since 2006 (via USGS bird data). Confirmation of LETE nesting in NSMWA was first identified in 2008 at the Napa Plant Site in the South Unit. Passive, detailed nesting surveys began in 2009 for the NSMWA LETE colony. The colony is considered a loose colony where two sub-colonies occur on the Pond 7/7A internal levee in the Huichica Creek Unit of the NSMWA two miles away from the Napa Plant Site (Figures 5-1 through 5-6). Over the past nine years, the LETE have moved their nesting efforts back and forth between the two locations for unknown reasons. To date, nine detailed nesting surveys have been conducted:

- 2009- South Unit and Pond 7/7A pre-construction
- 2010- South Unit during construction (where habitat islands were formed, but construction outside the buffer area was active and the area not tidal) and Pond 7/7A pre-construction
- 2011-South Unit post-construction and Pond 7/7A pre-construction
- 2012-South Unit post-construction and Pond 7/7A pre-construction
- 2013-South Unit post-construction (no nests were found at the Napa Plant Site) and Pond 7/7A pre-construction
- 2014-South Unit post-construction (no nests were found at the Napa Plant Site) and Pond 7/7A during construction)
- 2015-Sount Unit post-construction and Pond 7/7A during construction (improved habitat areas constructed but construction outside the buffer area)
- 2016- South Unit and Pond 7/7A post-construction
- 2017- South Unit and Pond 7/7A post-construction

Nesting surveys involve transect walking, traversing in a zigzag formation across each habitat island, habitat area, and levee at the Napa Plant Site and the internal levee at Ponds 7/7A. The Pond 7 pond bottom was last available for nesting in 2014 prior to habitat creation and enhancement along the internal levee. Details collected during surveys include, but not be limited to, arrival and departure dates, number of nests, number of eggs, number of successful hatched eggs, number of adults and/or chicks seen during survey, and predation pressures. The USFWS permit for the Napa Plant Site (included in Corps File No. 400258N) and USFWS permit for Ponds 6-8 (Biological Opinion 81420-2011-F-0278) requires a minimum of 5 years post-construction monitoring of the colony. Details to report “include, but not limited to, yearly population estimates, arrival and departure dates, predation pressures, and fledgling success”. 2015 marks the end of the 5-year post-construction monitoring requirement for Napa Plant Site, however Napa Plant Site and Pond 7/7A together are a compilation of the same colony. Therefore, detailed nesting surveys are planned to continue at NPS until 2020, due to the loose nesting colony nature of the species, changing nesting habitat within NSMWA, and permit requirements for Pond 7/7A (five years post-construction).

LETE data focuses the report on the colony as a whole as well as each specific site. Figures 5-1 and 5-3 demonstrate the colonies shift in area use depending on various factors (e.g. predation pressures, construction activity, habitat changes, etc.). American Peregrine Falcon, Common Raven, Northern Harrier, river otter and other predators routinely patrol nesting areas, but are not always the driving force behind colony success. Typically one location or the other prove to be dominantly stronger in success.

Looking at the colony as a whole, Figure 5-3 compares the nine years of LETE nesting surveys. It is clear at first glance that 2017 was the highest producing nests and eggs, with 62 more nests (compared to the previous highest in 2013 at 80) and 98 more eggs laid (compared to the previous highest in 2013 at 169). In addition, 2017 had the highest number of successful hatches, with 45 more successful hatches (compared to the previous highest in 2015 at 114).
Figure 5-4 shows the total number of eggs compared to the successful and unsuccessful hatches produced each season. While it is a positive indicator 2017 egg production was extremely high compared to previous years, if eggs are not successful for any number of reasons, the effort becomes wasted, valuable time and energy to the adult LETE. Therefore, it is considered a gauge to measure the strength and health of the colony in any given year the closer we see success compared to the total.

<u>Salt Marsh Harvest Mouse Presence/Absence Surveys</u> (North Unit)

All three units of the Napa Plant Site Restoration have SMHM present and are establishing populations within the restoration site. In 2013, the North Unit revealed strong numbers of SMHM and again in 2014 the Central and South Units were also trapped along the fringes of the ponds. Considering the numbers trapped and even the spread of demographics trapped during the survey, CDFW's permit requirement for SMHM presence in the restoration project have been satisfied.

Fish Data (All Units)
(Compliments of USGS)
USGS conducted sampling for larval delta smelt monthly from Feb-April of 2016 and 2017 in Napa Slough and Mud Slough (Figure 2-9). Larval tows were conducted in triplicate at each location (net dimensions: length = 3.35 m, mouth area = 0.37 m^2, mesh size = 505 µm). The net was towed for 5 minutes starting at the bottom of the water column, decreasing depth by $^1/_5$ each minute. The contents of the sample were preserved in formalin for later identification.

Trawls for larval delta smelt were conducted monthly from Feb-Apr, 2016-2017. No delta smelt were found in any of the trawls.

Vegetation Colonization (All Units)
Vegetation monitoring includes determining the amount of vegetation establishment at the restoration site by using aerial photographs and "ground truthing" of the plant species established until it is determined that the site has achieved 20% cover of tidal marsh vegetation. While the majority of the Units are establishing vegetation on the pond bottoms, in the North Unit, the Runway Safety Area (RSA) itself is approximately 6.8 acres and is the largest area of vegetated marsh in the newly restored area. Once marsh vegetation has become established on 20% of the pond, vegetative transects shall be conducted to provide more detailed information on vegetation cover. The ponds have not yet achieved 20% cover; however, plant species that are pioneering within the ponds include Pacific cordgrass (*Spartina foliosa*), gumplant (*Grindelia stricta*), pickleweed (*Salicornia* spp.), brass buttons (*Cotula coronopifolia*), salt grass (*Distichlis spicata*), meadow barley (*Hordeum brachyantherum*), alkali-bulrush (*Scirpus maritimus*), and other bulrush species (*Scirpus* spp.).

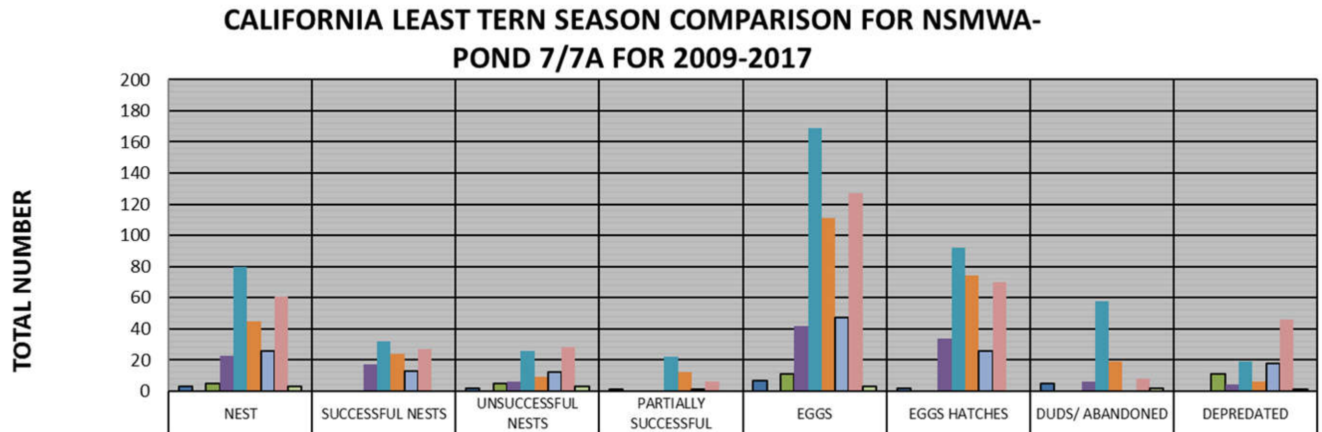
Aerial photographs of restored ponds (All Units)
Annual aerial photography has been conducted by the CDFW's warden plane. All photographs are taken with a large format, gyrostabilized, image motion compensated precision lens mapping camera that is mounted in a fixed-wing aircraft. Images were collected in digital format using high definition true color. As feasible, depending on funding and availability of resources, flights have occurred one or more times each year since 2003. Since technology has progressed, Google Earth images are updated regularly to provide CDFW with comparable imagery without the use of the warden plane, if not available. If low tide Google imagery is available, comparable aerials of several areas of the restoration will be presented in reports.

Sedimentation Plates and Outboard Slough Bathymetry (All Units)
Sedimentation Plates
Six stainless steel sedimentation plates were installed by DU and CDFW in the North, Central, and South Units in 2008, 2009, and 2010, respectively (Figure 5-8). North Unit plates (2 plates) were placed in 2008 just after breach, Central Unit (1 plate) was placed in 2009 just prior to breach, and South Unit plates (3 plates) were placed just after the breach in 2010. All plate locations were recorded using GPS and marked by two permanently-mounted stakes 1-meter on opposite sides of the plate to decrease the potential of the stakes interfering with sediment accumulation. Sedimentation is to be measured in years 2, 5, 10, and 15 of the restoration project. Per the permits, only three of the six plates need to be measured regularly; the remaining three can be kept in reserve for measuring, in case the predicted deposition fails to produce elevations at which vegetation develops. Data collection procedures require that little to no water be present at the sedimentation plate locations for an accurate measurement. An airboat or kayak at low tide is the only means to safely access the locations without disturbing or affecting sediment on the plates.

Figure 5-9 depicts that the plate at CB-8 is experiencing steady accretion while the plate at CB-2 is staying fairly neutral with low amounts of accretion, which is to be expected considering their proximity to nearby breaches. Figure 5-9 also illustrates that the plate at B-3 appeared to be showing a trend of steady erosion in years 2012 and 2013 but recently experienced a high level of accretion, as can be seen in the 2015 survey measurements. B-3 has was not required to be surveyed in 2016 or 2017 to compare data. The Central Unit survey results show a trend of steady accretion.

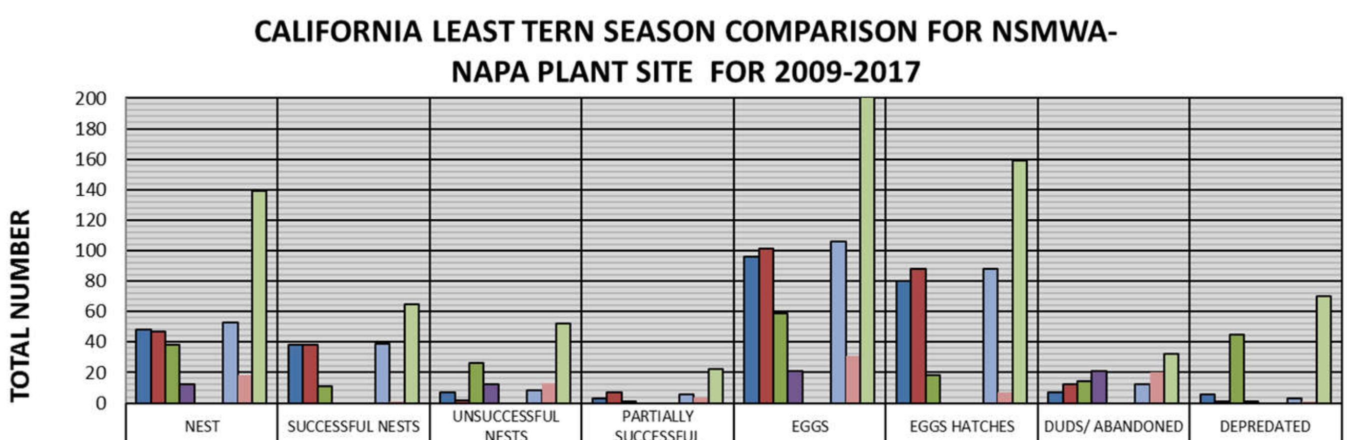
Outboard Slough Bathymetry

In the past, in addition to CDFW's sedimentation surveys, USGS had conducted a bank erosion survey at Fagan Slough and a full-scale bathymetric survey of the Napa Plant Site. Currently, there is no new USGS data for either the bank erosion survey or outboard slough bathymetry for the Napa Plant Site. At this time, there are no plans to conduct repeat surveys for the Napa Plant Site.



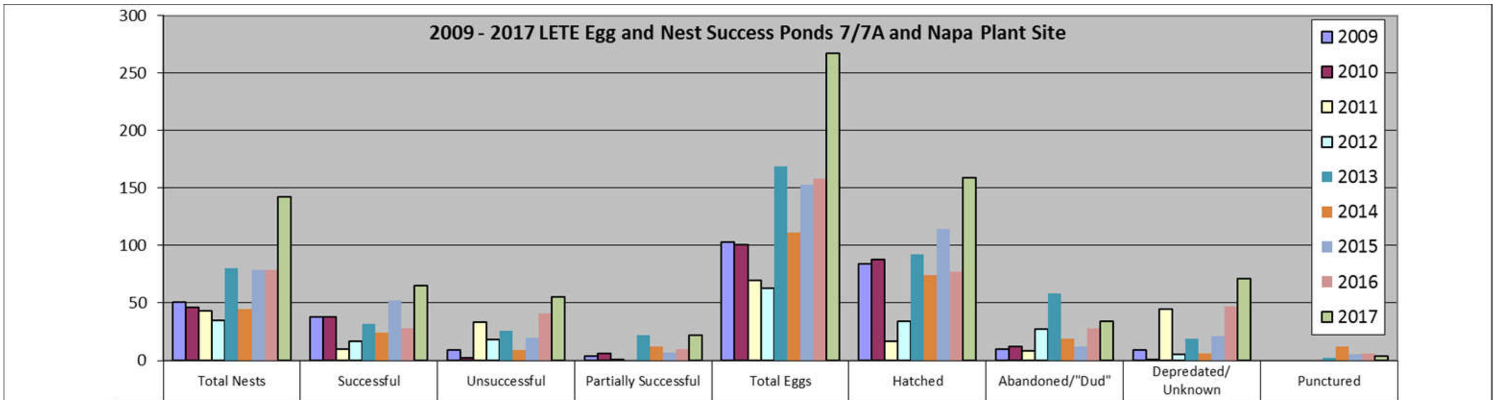
	NEST	SUCCESSFUL NESTS	UNSUCCESSFUL NESTS	PARTIALLY SUCCESSFUL	EGGS	EGGS HATCHES	DUDS/ ABANDONED	DEPREDATED
2009	3	0	2	1	7	2	5	0
2010	0	0	0	0	0	0	0	0
2011	5	0	5	0	11	0	0	11
2012	23	17	6	0	42	34	6	4
2013	80	32	26	22	169	92	58	19
2014	45	24	9	12	111	74	19	6
2015	26	13	12	1	47	26	0	18
2016	61	27	28	6	127	70	8	46
2017	3	0	3	0	3	0	2	1

Figure 5-1. Pond 7-7A California Least Tern colony results for 2009-2019 in Napa-Sonoma Marshes Wildlife Area.



	NEST	SUCCESSFUL NESTS	UNSUCCESSFUL NESTS	PARTIALLY SUCCESSFUL	EGGS	EGGS HATCHES	DUDS/ ABANDONED	DEPREDATED
2009	48	38	7	3	96	80	7	6
2010	47	38	2	7	101	88	12	1
2011	38	11	26	1	59	18	14	45
2012	12	0	12	0	21	0	21	1
2013	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0
2015	53	39	8	6	106	88	12	3
2016	18	1	13	4	31	7	20	1
2017	139	65	52	22	264	159	32	70

Figure 5-2. Napa Plant Site California Least Tern colony results for 2009-2019 in Napa-Sonoma Marshes Wildlife Area.



	Total Nests	Successful	Unsuccessful	Partially Successful	Total Eggs	Hatched	Abandoned/"Dud"	Depredated/ Unknown	Punctured
2009	51	38	9	4	103	84	10	9	0
2010	46	38	2	6	101	88	12	1	0
2011	43	10	33	1	70	17	8	45	0
2012	35	17	18	0	63	34	27	5	0
2013	80	32	26	22	169	92	58	19	2
2014	45	24	9	12	111	74	19	6	12
2015	79	52	20	7	153	114	12	21	5
2016	79	28	41	10	158	77	28	47	6
2017	142	65	55	22	267	159	34	71	4

Figure 5-3. Napa-Sonoma Marshes Wildlife Area California Least Tern colony results for 2009-2019, covering both sub-colonies.

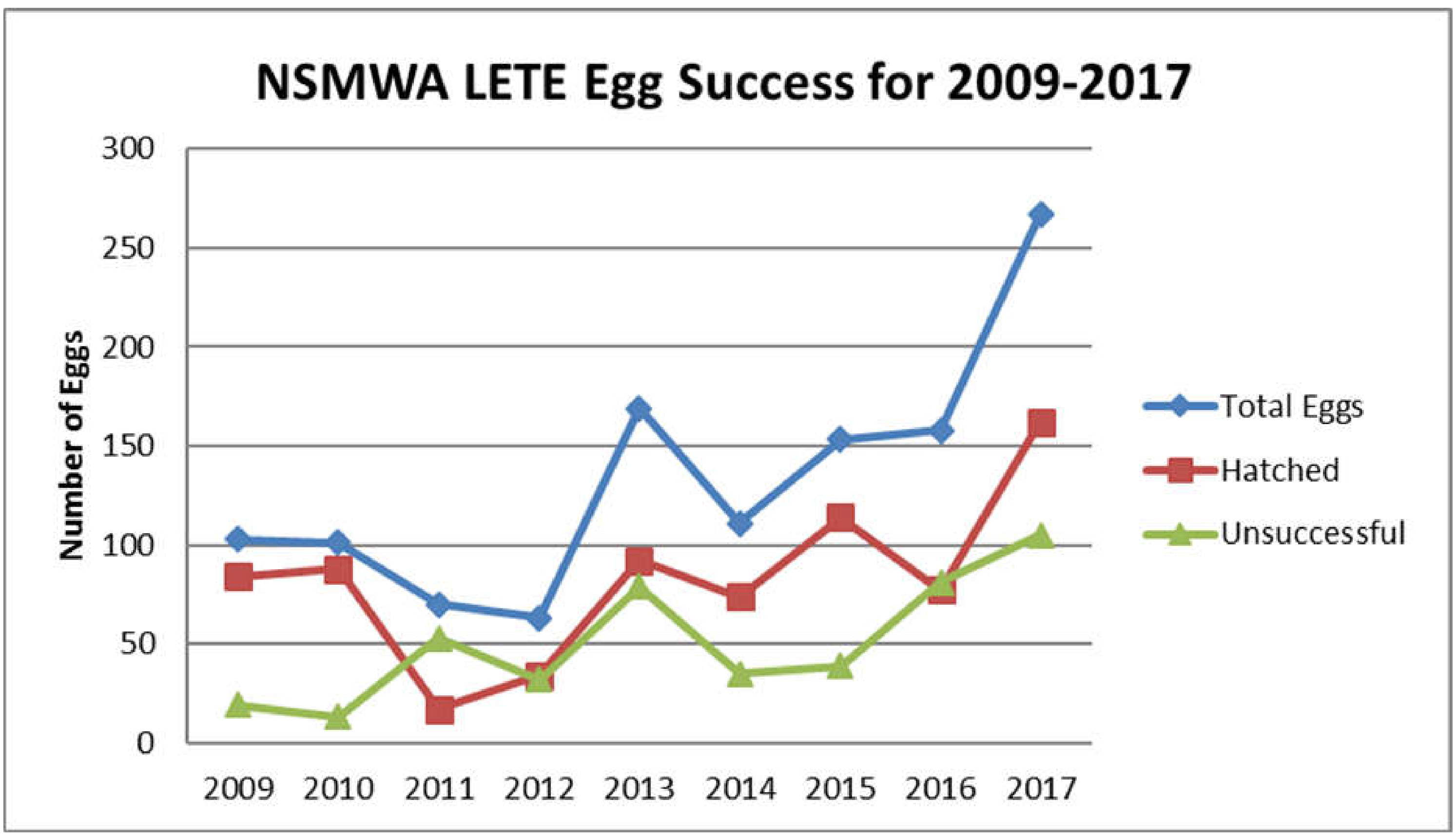


Figure 5-4. Napa-Sonoma Marshes Wildlife Area California Least Tern egg totals and success for 2009-2017.

Figure 5-5. Pond 7-7A California Least Tern nesting locations for 2017.

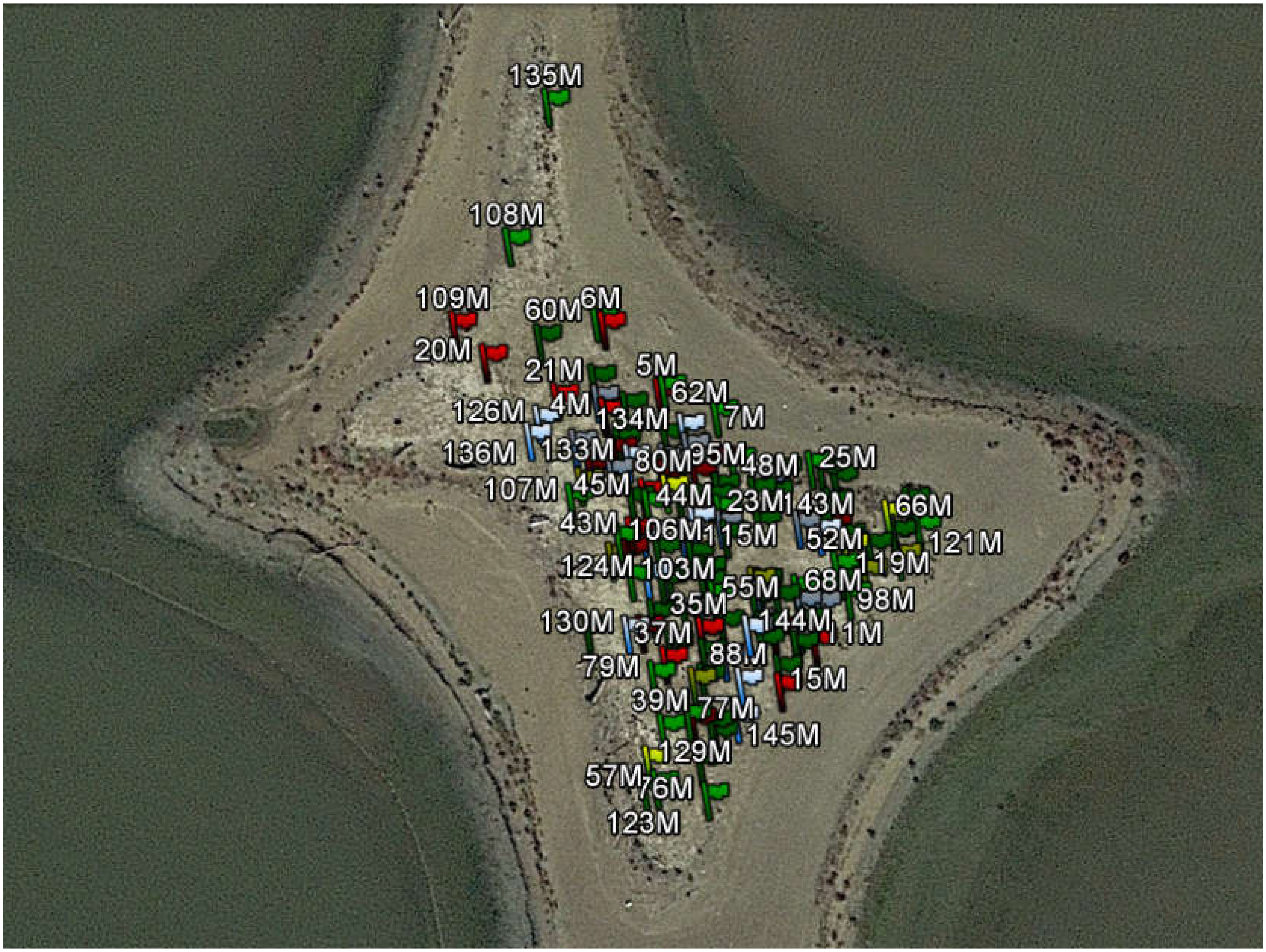


Figure 5-6. Napa Plant Site California Least Tern nesting locations for 2017.

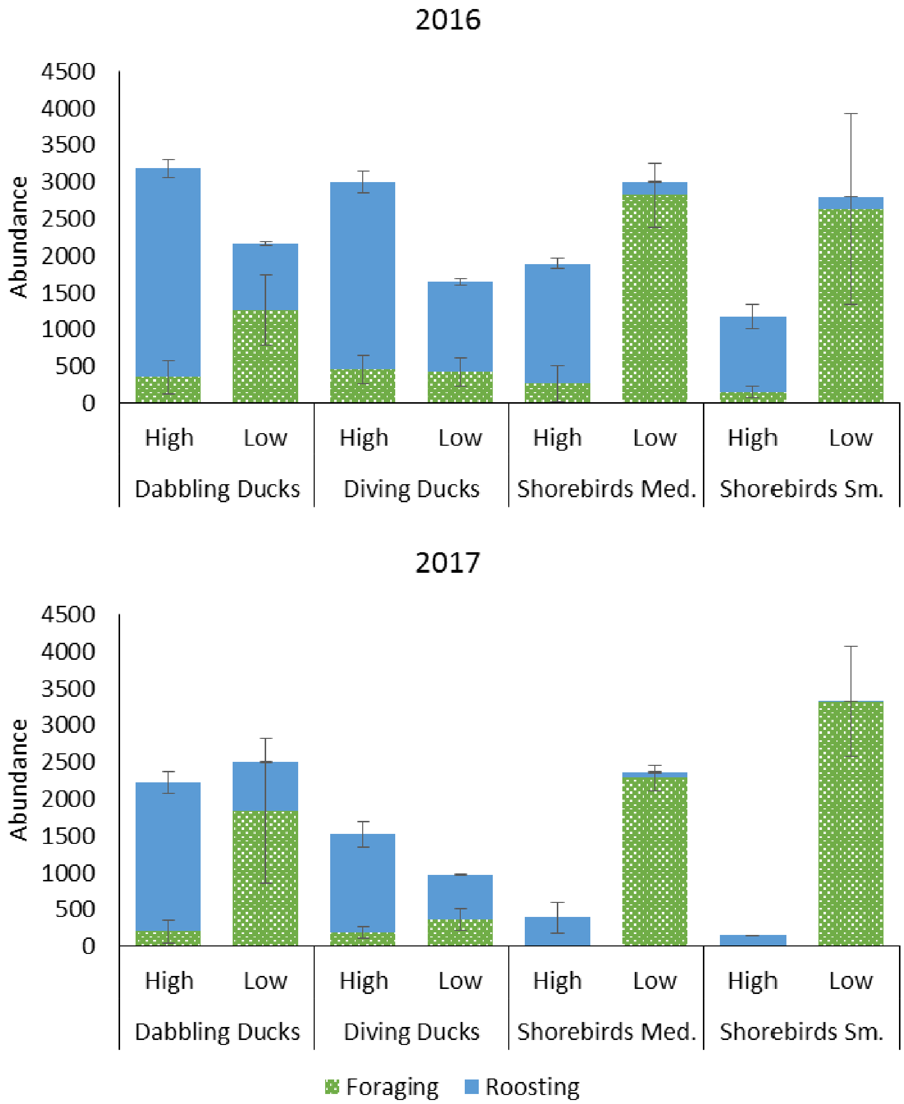
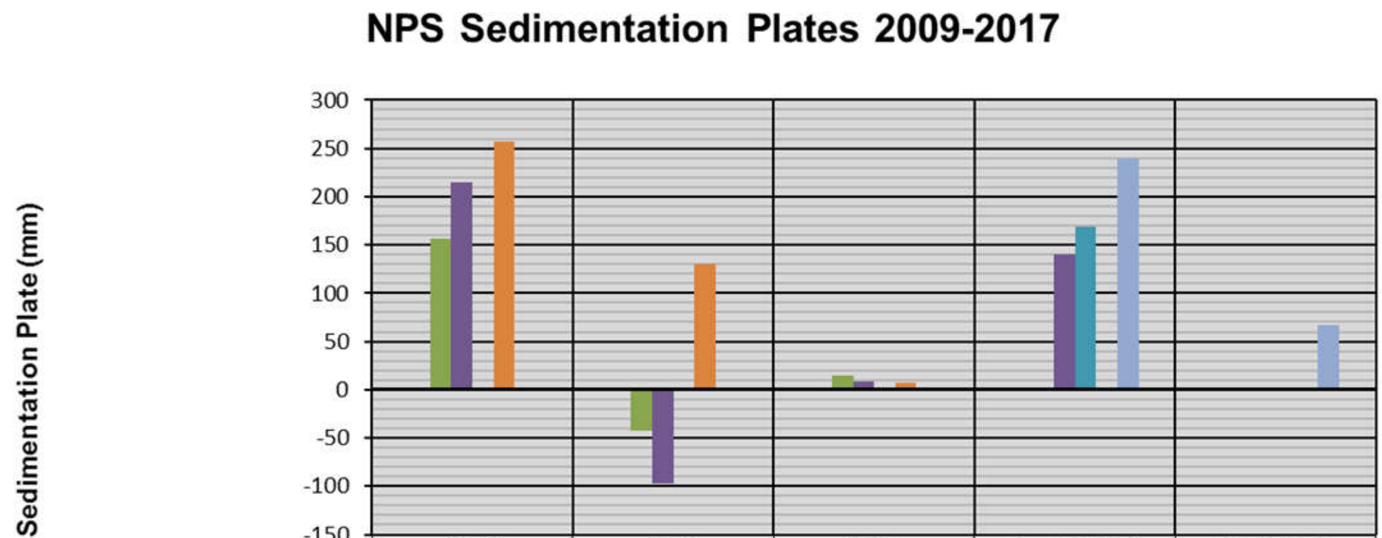


Figure 5-7. Mean (±SE) high or low-tide monthly abundance of foraging (green plaid) and roosting (solid blue) birds of the four most abundant guilds at the Napa Plant Site in the winter (Dec-Feb) in 2016 and 2017. (Compliments of USGS)

Figure 5-8. Napa Plant Site Sediment Plate Locations.



	CB-8	B-3	CB-2	Central Unit	North Unit
2009 Placement Measurement (Base)(mm)	NA	NA	NA	0	NS
2010 Placement Measurement (Base)(mm)	0	0	0	NS	NS
2012 Measurement (mm)	156.33	-43	14.33	NS	NS
2013 Measurement (mm)	215.00	-97.03	8.17	139.7	NS
2014 Measurement (mm)	NS	NS	NS	169.17	NS
2015 Measurement (mm)	257.00	129.75	7.50	NS	NS
2016 Measurement (mm)		NS	NS	239	66.67
2017 Measurement (mm)	NS	NS	NS	NS	NS

Figure 5-9. Napa Plant Site sedimentation plate data for all units for 2009-2017. “NS” are locations not sampled for that year. The majority were not required for that given year.

Attachment 6

Napa Plant Site:
Summary of Water Quality Data

ATTACHMENT 6

Salinity reduction and other requirements pertaining to the 2008, 2009, and 2010 breach events for the North Unit, Central Unit, and South Unit, respectively, were deemed met by within 3 months of breach events. In addition, monthly water quality sampling was required until water quality performance objectives were met for three consecutive months. Since permit requirements were met prior to 2012, Biennial Reports no longer require water quality data collection and reporting for dissolved oxygen (mg/l and % saturation), salinity, specific conductivity, pH, and temperature. Attachment 6 will only covers mercury data for Napa Plant Site.

Mercury Data

<u>North, Central and South Units</u>
<u>Mercury Data</u>
(Compliments of SFEI)
In 2016 and 2017, SFEI (San Francisco Estuary Institute) and UC Davis conducted mercury biosentinel sampling at 11 North Bay wetland sites, which included the Napa River Salt Marsh and Napa Plant Site Restoration Projects (Figure 3-12). Please refer to the “Mercury Data” section and associated figures in Attachment 3 for detailed information referring to the Napa Plant Site.

Attachment 7

References

References

Department of Fish and Game. 2009. 2009 Biennial Report. California Department of Fish and Game, Bay-Delta Region (3), Napa, CA.

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