

# **2023 California Ridgway's Rail Surveys for the San Francisco Estuary Invasive *Spartina* Project**

Report to:

State Coastal Conservancy  
San Francisco Estuary Invasive *Spartina* Project  
1515 Clay St., 10<sup>th</sup> Floor  
Oakland, CA 94612

Prepared by:



Olofson Environmental, Inc.  
1001 42<sup>nd</sup> Street, Suite 230  
Oakland, California 94608  
Contact: [jen@olofsonenvironmental.com](mailto:jen@olofsonenvironmental.com)

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## 1. Introduction

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Annual monitoring for the endangered California Ridgway's rail (*Rallus obsoletus obsoletus*; formerly California clapper rail, *Rallus longirostris obsoletus*) is an essential component of the State Coastal Conservancy's Invasive *Spartina* Project (ISP). California Ridgway's rails are year-round residents of the tidal wetlands of the San Francisco Estuary and co-occur with native and non-native *Spartina*. The ISP requires information on the number of rails at each site for the planning and permitting of *Spartina* treatment. Additionally, annual breeding-season surveys provide a standardized measure of Ridgway's rail presence and distribution in *Spartina*-invaded marshes throughout the Estuary. Results from these surveys also contribute to the understanding of the species and provide an important metric of tidal marsh restoration in the San Francisco Bay.

In collaboration with partner organizations, including Point Blue Conservation Science (PBCS), Don Edwards National Wildlife Refuge (DENWR), Avocet Research Associates (ARA), San Pablo Bay National Wildlife Refuge (SPBNWR), and East Bay Regional Park District (EBRPD), Olofson Environmental, Inc. (OEI) conducted surveys for California Ridgway's rails to inform the ISP about rail populations at sites slated for *Spartina* treatment in 2023 (Permit Number TE118356). Trained and permitted biologists performed standard-protocol surveys at 95 ISP sub-areas (made up of 98 rail "sites") between January 15 and April 15, 2023. The data were entered into the California Avian Data Center (CADC), an online database hosted by PBCS and part of the larger Avian Knowledge Network (AKN). Data were then downloaded from CADC, imported into GIS, and summarized by ISP sub-area boundaries.

Only results from surveys conducted by OEI in 2023 are presented in this report. The ISP relies on partner organizations to conduct surveys and report results collected at other *Spartina*-invaded sites that are not surveyed by OEI. The summary data presented here represent unique detections of Ridgway's rails within the areas surveyed by OEI. These data should not be misinterpreted to be a range-wide population estimate or a comprehensive count of Ridgway's rails at all *Spartina*-invaded sites.

For a complete list of ISP subareas and associated survey organizations, see **Appendix I: Complete List of 2023 *Spartina* Treatment Sub-Areas and Ridgway's Rail Survey Plans.**

## Species Account

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The **California Ridgway's rail** is classified as endangered by both the U.S. Fish and Wildlife Service and the State of California. Although once abundant in marshes ranging from Marin to San Luis Obispo, the loss of habitat through the historic conversion of marsh to development drove the population to such low numbers to necessitate legal protection. The subspecies' present range is limited to the tidal marshes of the San Francisco Estuary. California Ridgway's rails occur only in salt and brackish tidal marsh habitat and require vegetative cover suitable for both nesting and refuge during high tide events (U.S. Fish and Wildlife Service 2013). Marshes where they occur are characterized by unrestricted daily tidal

flows through a network of well-developed channels. Channel density has been shown to be the most important landscape feature to positively influence Ridgway's rail density (Liu et al. 2012). Additionally, large continuous marshes with a low perimeter-area ratio support higher densities of California Ridgway's rail (Liu et al. 2012). Habitat loss or degradation and predators are among the biggest threats to the rail (USFWS 2013). Recent analysis by Point Blue estimated the total population of Ridgway's rails in the Estuary to be about 1,426 individuals between 2019 – 2021 (Wood 2022).

In addition to Ridgway's rails, OEI records other rail species detected during surveys, including California black rails, Virginia rails, and sora. **California black rail (*Laterallus jamaicensis coturniculus*)** is listed as threatened under the California Endangered Species Act (CESA) and is a fully protected species in the State of California. In the San Francisco Estuary, black rails are most abundant in tidal marshes with some freshwater input (Evens et al. 1991). They nest primarily in pickleweed-dominated marshes with patches or borders of bulrushes, often near the mouths of creeks. Black rails build nests in tall grasses or other marsh vegetation during spring and lay about six eggs. Nests are usually constructed of pickleweed and are placed directly on or slightly above the substrate in vegetation. The California black rail breeding season in the San Francisco Estuary spans February through August.

**Virginia rail (*Rallus limicola*)** is listed as a species of “least concern” on the IUCN Red List but is protected under the US Migratory Bird Act. Virginia rails have a wide distribution and are found in brackish and freshwater marshes across North America. Virginia rails are year-round residents of the marshes where they occur in the San Francisco Estuary. Virginia rails are similar in appearance to Ridgway's rails, though are smaller with grey cheeks. In the Bay Area, the distributions of the two species overlap, but are loosely divided along a salinity gradient where Virginia rails tend to occupy brackish marshes and Ridgway's rails occupy salt marshes.

**Sora (*Porzana carolina*)** is listed as a species of “least concern” on the IUCN Red List but is protected under the US Migratory Bird Act. Soras are common in North America and are year-round residents in the marshes where they occur in the San Francisco Estuary. Soras are most often found in freshwater marshes without tidal inundation, although they do occur in brackish marshes and occasionally higher-salinity tidal wetlands.

## 2. Study Area

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OEI conducted surveys for the Invasive *Spartina* Project at 62 transects covering 95 ISP sub-areas in nine reporting regions: Marin, San Francisco Peninsula, San Mateo, Dumbarton South, Union City, Hayward, San Leandro Bay, Bay Bridge North, and Petaluma (**Figure 1**). The study area spanned the counties of Alameda, Contra Costa, Marin, San Mateo, Santa Clara, and Sonoma. Summary survey results for each site are represented in map Figures 2 - 21. For a complete list of ISP survey stations and their geographic coordinates in UTM, see **Appendix II: 2023 Survey Station Coordinates**.

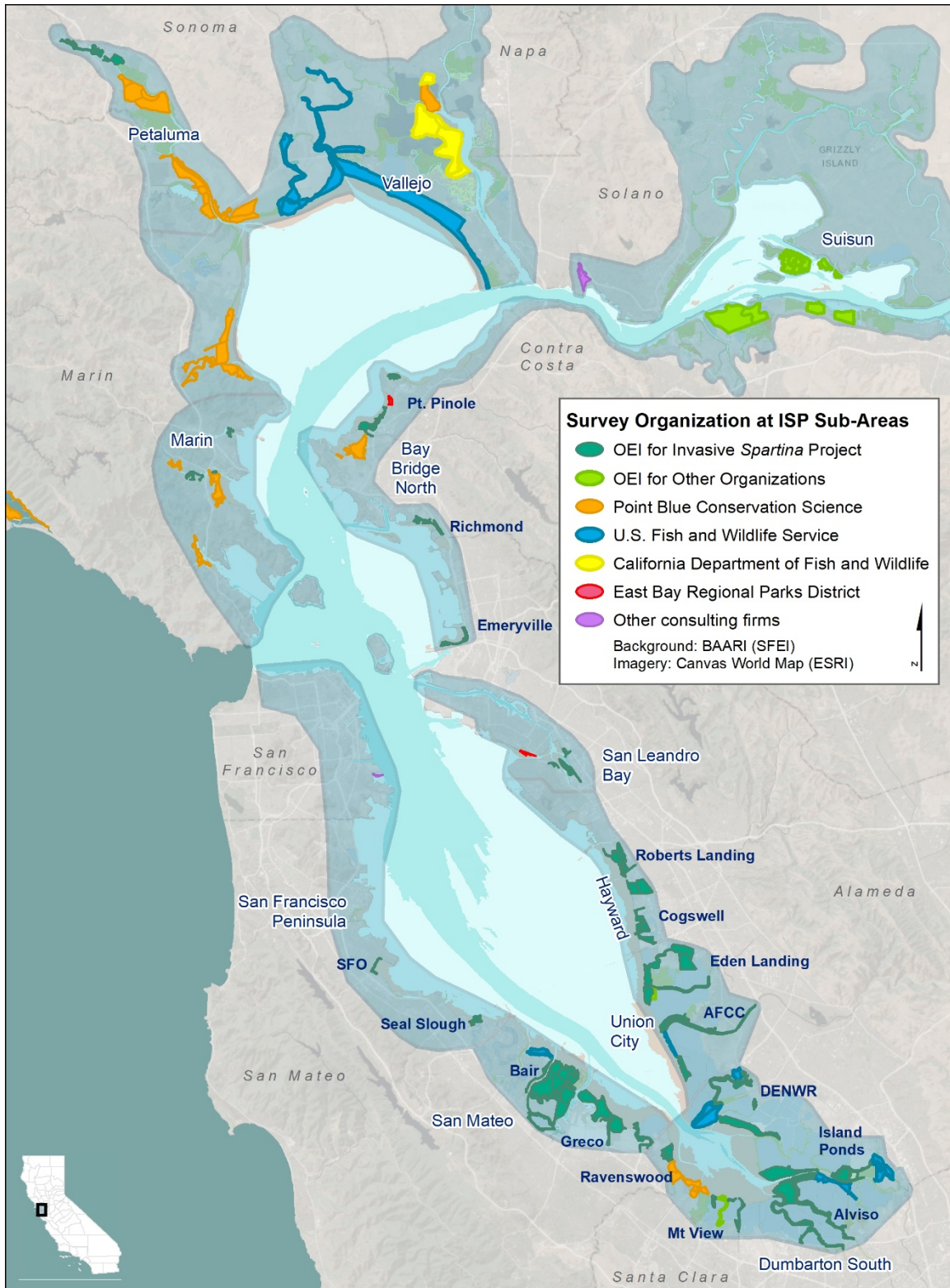
### Surveys for Other Organizations

OEI also conducted surveys for several other projects, including: the South Bay Salt Pond Restoration Project (SBSPRP) Phase II and the Military Ocean Terminal at Concord (MOTCO). These OEI surveys included eleven transects covering six ISP sub-areas. Survey details for these eleven transects are included in **Appendix III: 2023 OEI Survey Results for Each Round**.

Partner organizations surveyed an additional 29 ISP sub-areas over 39 transects. Rail survey data from partner organizations are not included in this report; rather, the results from those surveys are reported by the survey organizations themselves.

For a complete list of all ISP sub-areas and associated survey organizations, see **Appendix I: Complete List of 2023 *Spartina* Treatment Sub-Areas and Ridgway's Rail Survey Plans**.

## 2. Study Area



**Figure 1.** Regional boundaries of ISP sites surveyed for California Ridgway's rail by OEI and others in 2023 are shown in light blue and labeled in blue text with white border. Other firms that conducted surveys at ISP sub-areas were: Avocet Research Associates at Southampton Marsh in Benicia and Environmental Science Associates at Heron's Head Marsh in San Francisco.



### 3. Methods

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Ridgway's rail surveys for the ISP were conducted using the Site-specific Protocol for Monitoring Marsh Birds (Wood et al, 2016, hereafter "NAM Protocol") based on the North American Survey Protocol (Conway 2016). Data were summarized in CADC, imported into GIS, and analyzed according to recommendations in the NAM Protocol.

#### 3.1 Field Methods

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California Ridgway's rail surveys were conducted by OEI at 95 ISP sub-areas in 2023 using the NAM survey protocol. Surveys were conducted by the following trained and permitted field biologists at Olofson Environmental, Inc.: Jen McBroom, Jeanne Hammond, Tobias Rohmer, Simon Gunner, Brian Ort, Melanie Anderson, Lindsay Domecus, Dylan Pastor, Stephanie Chen, Isabella Sanchez-Mendoza, Dorothy Aldridge, and Daniel Stephens.

The NAM Protocol is a transect point count survey with broadcast of vocalizations of two species of rail (black rails and Ridgway's rails) on every survey round and at every survey station. Each transect is visited for three rounds during the survey season between January 15 and April 15. Detections of Ridgway's rails, black rails, Virginia rails, and sora are recorded during surveys. Data recorded includes species, call type for auditory detections, and an estimate of the distance and direction to the bird. The NAM Protocol is part of the FWS Site-specific Survey Protocol (Wood 2016) and is based on the North American Marsh Bird Monitoring Protocol. The NAM Protocol was developed to increase standardization and decrease the variance in survey results. It was first implemented in 2017 and is the standard call-count survey protocol in the Estuary.

#### 3.2 Data Management

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Data were recorded in the field on paper datasheets, and GPS units or GIS phone applications were used to navigate to survey stations. Each rail observation was recorded on the datasheet with time detected, call type, number of rails, distance, and direction to the observed rail. Additionally, each rail was assigned a unique map reference identifier and the approximate location of each detected rail was recorded on a paper field map allowing for interpretation of repeat detections of any individuals. Compasses and rulers were used to accurately plot rails on paper maps. At sites with overlap between other observers, birds were plotted together on a single map to determine which detections were unique. Observations of potential predators of rail nests, young, or adults were noted.

Researchers entered data into CADC, an online database developed and hosted by PBCS in support of the NAM Protocol. By using a shared database with common tables and field headings, results can be readily shared and analyzed by partner organizations.

Each observer entered their own data into CADC and then reviewed their data for quality and accuracy. Once all data from all observers were entered into CADC, rail detections were imported into GIS to determine where Ridgway's rails occurred with reference to ISP sub-area boundaries.

#### 3.3 Data Interpretation

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In accordance with recommendations in the NAM Protocol, several metrics were used to evaluate Ridgway's rails numbers at sites and regions presented in this report: highest minimum count (by site); index of relative density (by site), annual rate of change (by region), average annual rate of change over five-years (by region), and occupancy by black rail, Virginia rail, and sora (by site). The definitions and equations used to calculate these metrics are excerpted from the site-specific survey protocol (Wood 2016) and are summarized below.

**Highest Minimum Count** is the minimum number of unique rails detected during the survey round with the highest count. Birds that were detected from more than one station or by more than one observer during a single round were counted only once toward the total number of rails detected in a round. Birds that were detected outside of survey time were included in the summary and counted toward the total. Once all data were summed for each round at each site, the round with the highest count was reported as the number of rails detected at each site (termed the "highest minimum count").






**Index of relative density** is the number of unique rails detected per unit area and is calculated as follows. For each visit, the total number of unique birds detected within 200 meters of an observer is calculated. That count is then divided by the area of rail habitat within 200 meters of the survey stations. The area of rail habitat was calculated in GIS by buffering 200 meters around each survey station and clipping the buffered area to the marsh habitat at the site, generally excluding both upland and mudflat areas. The resulting densities for each visit are then averaged.

As an example, assume 3, 6 and 5 unique birds are detected within 200 m of 7 survey points during three visits to a given marsh study area (assume that each point is surrounded by 100% rail habitat). The index of relative density for the study area would be calculated as  $14 \text{ rails} / (7 \text{ points} * 31 \text{ acres} * 3 \text{ visits}) = 0.022 \text{ rails/acre}$ . Each unique bird is only counted once (e.g., the same bird heard from two different survey points would only be counted once). The area surveyed at each point is adjusted accordingly if there is less than 100% rail habitat within the 200-meter radius.

The index of relative density was categorized into bins and displayed geographically on maps (**Figures 2 – 21**). Density bins were based on density estimates outlined in the Tidal Marsh Recovery Plan (TMRP; U.S. Fish and Wildlife Service 2013). In the TMRP, the average rail population required for rail recovery was developed by multiplying the minimum marsh acreage for each recovery unit by rail densities at calculated percentiles of observed winter populations. In this report, the highest density bin represents sub-areas where rails were detected at a density greater than the 90<sup>th</sup> percentile of observed winter densities in the South San Francisco Bay Recovery Unit, 0.45 rails/acre (or 1.11 rails/hectare). The next density demarcation is 0.15 rails/acre (or 0.37 rails/hectare), which is the 60<sup>th</sup> percentile of observed winter densities. Below this level falls sub-areas where rails were detected at a density less than 0.04 rails/acre (or 0.1 rails/hectare). Sub-areas where rails were not detected within 200 meters of the observer are shaded green. This category does not indicate absence; rails may have been detected beyond 200 meters

and are therefore present at the sub-area but cannot be included in the density calculation.

**Table 1.** Density bins developed based on density estimates outlined in the TMRP (USFWS 2013).

Density Bins	Relative Density (rails per acre)	Description
 Not detected within 200m	0	Rails were not detected within 200 meters of the observer. Note, this category does not indicate absence; rails may have been detected beyond 200 meters within the survey site but cannot be included in the density calculation.
 Low	< 0.04	Rails detected at a density less than 0.04 rails/acre (or 0.1 rails/hectare)
 Mid	0.04 - 0.15	Rails detected at density less than the 60 <sup>th</sup> percentile of observed winter densities reported in the TMRP but greater than the low category.
 High	0.15 - 0.45	Rails detected at density between the 60 <sup>th</sup> to 90 <sup>th</sup> percentile of observed winter densities reported in the TMRP.
 Very high	> 0.45	Rails detected at density greater than 90 <sup>th</sup> percentile of observed winter densities reported in the TMRP.

**Index of occupancy** is the maximum proportion of occupied survey points in a study area and was calculated for three other rail species: black rails (BLRA), Virginia rails (VIRA), and sora (SORA). For each visit to a study area, the total number of points occupied by each species was calculated; to be considered occupied, at least one bird of the species of interest was detected from the survey point. The maximum number of occupied points across all visits is divided by the total number of points that were surveyed in the study area to arrive at the index of occupancy. For example, assume 3, 0 and 2 points were occupied by Virginia rails at a study area with 14 points across three visits in a given year. The “index of occupancy” for the study area would be  $3/14 = 0.21$ . This is considered a minimum occupancy index (known as “naïve” occupancy) because we know that detection probability is  $<1$ , which means the true occupancy could be  $>3$  points. Only unique birds are considered for occupancy (the same bird detected at two points would result in only one point considered occupied).

**Index of one-year rate of change** for the total highest minimum count was calculated at each Region using the following equation:

$$m = \frac{(p2 - p1)}{p1} \times 100\%$$

where  $p1$  is the total highest minimum count for the previous year and  $p2$  is the total highest minimum count in the current year. For example, if the total highest minimum count for rails at site DESFB was 33 birds for 2014 and 35 birds for 2015, the index of the annual rate of population change would be:  $((35 - 33)/33 \times 100\%) = 6.06\%$ .

**Index of compound annual rate of change over a five-year period ( $\bar{m}$ )** is a simple index of the average annual rate of change between two time points, calculated using the total highest minimum count (summed across one or more study areas) and was obtained using the following equation:

$$\bar{m} = \left[ \left( \frac{p2}{p1} \right)^{(1/(t2-t1))} - 1 \right] \times 100\%$$

where  $p1$  is the total highest minimum count for the first year,  $p2$  is the total highest minimum count for the last year,  $t1$  is the start year, and  $t2$  is the end year ( $t2 - t1 = 5$  in this five-year analysis). For example, if the total highest minimum count of Ridgway's rails at DESFB was 28 birds for 2010 and 36 birds for 2015, the index of the average annual rate of change would be:  $[(36/28)^{(1/[2015 - 2010])} - 1] \times 100\% = 5.15\%$  increase per year.

**Caveats:** It is important to note that the preceding metrics of highest minimum count, relative density, occupancy, and population change do not consider factors such as detection probability, habitat covariates, etc.; thus, they should be interpreted with caution. More reliable estimates of population size and change over time will be calculated by PBCS using hierarchical models at an interval of approximately every five years. However, the simpler metrics provided above are easy to calculate and may allow managers to detect substantial changes in true abundance (assuming count indices are correlated with true abundance) over short time periods, which could be important for early detection of issues and implementing potential management interventions. The formulas for the above metrics (except for the formulas involving the index of relative density) assume that the same study areas are surveyed every year. If the number of study areas or transects within study areas changes over time (e.g., the number of survey points changes) then adjustments to the analyses will be required.

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## 4. Survey Results

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Surveyors at OEI detected 516 Ridgway's rails at ISP sub-areas in 2023. In 2022, surveyors detected 504 Ridgway's rails at the same subset of sub-areas, representing a very slight increase of 2% over the prior year at sub-areas surveyed by OEI. On a longer five-year timescale, rail detections have declined at a rate of 8% each year since 2018 at the same subset of sub-areas.

The five-year trend shows declines across all groups of sub-areas regardless of treatment status. At sub-areas where treatment has been ongoing since 2012, rails are declining by about 8% a year since 2018; at sub-areas where treatment was authorized in 2018, rails are declining by about 18% per year since 2018; and at sub-areas where treatment had not occurred for over a decade, rails are declining by about 6% per year since 2018.

The one-year trend differs between treatment groups, declining only at sub-areas where treatment was authorized in 2018 (-12%). There was a slight increase since last year at the group of sub-areas where treatment has been ongoing since 2012 (+2%) and at the sub-areas where treatment had not occurred in over a decade (+6%).

Trends and summary results by region are described below. Summary data for each sub-area are included in **Table 2** and detailed survey results from each round are included in **Appendix III**.

**The Marin Region** extends from the Golden Gate Bridge to the Richmond Bridge in Marin County (**Figure 2**). OEI surveyed three transects spanning seven sub-areas in the Marin Region in 2023; PBCS surveyed an additional four transects spanning five sub-areas in the Region. OEI detected a total of seven Ridgway's rails in the Marin Region in 2023, a decline of eleven rails since 2022 and a 14% decline since 2018. However, meaningful population trends are difficult to detect at the small number of transects surveyed by OEI in Marin in 2023.

**The San Francisco Peninsula Region** extends from the Golden Gate Bridge to the San Mateo Bridge (**Figure 3**) and represents an urban shoreline with little marsh habitat. In 2023, OEI surveyed three sub-areas the San Francisco Peninsula Region and ESA surveyed one additional sub-area (Heron's Head 12b). Only one Ridgway's rail was detected in the Region in 2023.

Trends are difficult to identify at low densities and when rails are not detected. Rails have been detected in the Region intermittently (present in 2021 and 2023 but not detected in 2020 and 2022). The fragmented low-quality habitat in this Region will never support a large stable population of rails. There are few opportunities for restoration or enhancement of wetlands in this urban landscape and the creation of new habitat would likely require expensive environmental engineering.

**The San Mateo Region** extends from the San Mateo Bridge to the Dumbarton Bridge on the west side of the Bay (**Figure 3**). OEI surveyed twelve transects spanning 16 sub-areas within the San Mateo Region in 2023. DENWR conducted surveys at one transect (RESH-T1) at Redwood Shores (02a.3). OEI surveyed an additional transect along Ravenswood Slough (RAV-T2) in support of the South Bay Salt Pond Restoration Project (SBSPRP); however, Ridgway's rail detections from that transect may be duplicative to detections from the ISP transect RAV-T1 and thus these results are excluded from the analysis.

OEI detected a total of 98 Ridgway's rails in the San Mateo Region in 2023 (**Table 2**), an increase of 31% since 2022 but a 13% decrease since 2018. This Region contains one sub-area, B2 North Quadrant East (02c.1b), where treatment was limited to seed-suppression from 2012 to 2018. This treatment restriction was lifted in 2018 and B2 North Quadrant East has been fully treated since then. OEI detected four rails at the sub-area in 2023 and a combined total of 15 rails at B2 North marsh.

**The Dumbarton South Region** includes all marshes south of the Dumbarton Bridge, from Newark to Mountain View (**Figure 4**). In 2023, OEI conducted surveys at 17 sub-areas in the Dumbarton South Region. DENWR also surveyed four sub-areas: Dumbarton/Audubon (05b), La Riviere Marsh (05d), Coyote Creek Lagoon (05f.3), and Coyote Creek South-East (15a.5). PBCS surveyed an additional four transects spanning two sub-areas: Faber and Laumeister Marshes (15b) and Palo Alto Baylands (08). OEI also conducted surveys along a transect at Mountain View Slough (15a.1) in support of SBSRP (see **Appendix III** for survey details).

OEI detected a total of 92 rails in the Region in 2023, up from 87 rails detected in 2022 at the same subset of sub-areas. This represents a one-year increase of 10% since 2022 but a 10% decline over the five-year timespan since 2018. OEI and other survey partners only detect a portion of the rails present in the Region since there are extensive tracts of tidal wetlands that are not included in the survey effort or are beyond the threshold of detection from the survey stations.

**The Union City Region** in Alameda County extends from the San Mateo Bridge to the Dumbarton Bridge (**Figure 5**). OEI surveyed 15 sub-areas in the region in 2023. DENWR surveyed one additional sub-area in 2023: Ideal Marsh - North (21a). OEI also conducted surveys along two additional transects in the Region: AFCC-T5 at ISP sub-area AFCC Lower (01b) and OAC-T4 at ISP sub-areas Whale's Tail South (13e) and Cargill Mitigation Marsh (13f) (see **Appendix III** for survey details).

OEI detected a minimum of 48 Ridgway's rails in the Union City Region in 2023 (**Table 2**), one more detection than the previous year and 15% annual increase since 2018. Notably, rails have increased over the past five years at the sub-areas where native *Spartina foliosa* has been planted by the ISP: Eden Landing Reserve - South (13k) (aka North Creek Marsh) and Cargill Mitigation Marsh (13f).

**The Hayward Region** in Alameda County extends from the Oakland International Airport south to the San Mateo Bridge (**Figure 5**). OEI surveyed 19 sub-areas in the Hayward Region. OEI detected 151 Ridgway's rails in 2023 (**Table 2**), a decrease of 4% since 2022 and 7% since 2018.

The Hayward Region contains seven sub-areas where treatment permissions changed with the ISP's 2018 Biological Opinion as part of the Phase 1 Treatment Plan, allowing portions of marshes to be fully treated to phase in hybrid *Spartina* removal over time: Citation Marsh Upper (20d.2a), Bunker Marsh (20g), San Lorenzo Creek North (20h.1), Cogswell B Bayfront (20n.1), Cogswell B South (20n.2), Cogswell C (20o), and Cogswell Section B Main (20n.3; seed-suppression only from 2018-2022). Citation Marsh Central (20d.2b) and North Marsh (20f) were restricted from any treatment under the 2018-2022 Biological Opinion, however a new Biological Opinion issued after the 2023 rail survey season will allow for treatment at these two sub-areas as part of the Phase 2 Treatment Plan.



**The San Leandro Bay Region** in Alameda County is bounded by the cities of Oakland and Alameda (**Figure 5**) and is surrounded by commercial development, landfills, highways, and the Oakland International Airport. OEI surveyed nine sub-areas within the region. EBRPD surveyed one additional sub-area: Elsie Roemer (17a). OEI detected 85 Ridgway's rails in San Leandro Bay in 2023. This represents a decline of 3% since 2022 and a decline of 7% since 2018.

The San Leandro Bay Region includes two previously restricted sub-areas where treatment was permitted in 2018 as part of the Phase 1 Treatment Plan: Damon Marsh (17d.4) and Fan Marsh Wings (17j.1). These two sub-areas are small marshes that have been highly impacted by non-native *Spartina* and have little native vegetation. As expected, rail numbers have declined as non-native *Spartina* has been treated and removed at these sub-areas. Fan Marsh Wings (17j.1) is a marshy culvert alongside Doolittle Drive and has intermittently supported one to two rails in the past. No rails have been detected at this sub-area since 2019. Damon Marsh (17d.4) is another small marsh, occupying an area of less than four acres. No rails have been detected at Damon Marsh since 2021.

In August 2023, the Phase 2 Treatment Plan was authorized and *Spartina* treatment at the three remaining untreated sub-areas [Arrowhead Marsh East (17c.2), Fan Marsh Main (17j.2), and MLK New Marsh (17h)] will be phased in over the next ten years. Survey results from 2023 will serve as a baseline to monitor the rail population at these sub-areas.

**The Bay Bridge North Region** is in Alameda and Contra Costa Counties, extending from the Bay Bridge in Emeryville to Point Pinole north of the City of Richmond in the North Central Bay (**Figure 2**). OEI conducted surveys at five transects spanning eight sub-areas in 2023. EBRPD surveyed one additional sub-area: Giant Marsh (10c). OEI detected 34 Ridgway's rails in the region in 2023, the same number as detected in the prior year, but a decline of 6% since 2018.

**The Petaluma Region** includes the tidal wetlands along the Petaluma River, which are lumped into four large sub-areas. OEI conducted surveys for the ISP at two transects spanning the two smallest sub-areas: Petaluma River – Upper (24a) and Grey's Field (24b) (**Figure 2**). No Ridgway's rails were detected by OEI at either sub-area; however OEI only surveys a very small fraction of the habitat in the Region. PBCS surveyed thirteen additional transects and detected over 190 unique Ridgway's rails in the Petaluma Region in 2023.

#### 4. Results

**Table 2.** Summary of survey results at all sub-areas surveyed by OEI using the North American Protocol (NA<sub>m</sub>) in 2023, grouped by region. Relative density is a ratio of rails per acre, calculated as the number of birds detected within 200 meters of the observer; a zero in this column does not necessarily indicate absence from the site as birds may have been detected beyond 200 meters. Occupancy calculations are shown on a transect level, rather than sub-area level.

Sub-Area Name (Code)	Transect	Area (acres)	% Area Surveyed	RIRA Indices		Occupancy		
				Highest Count	Relative Density (rails/acre)	BLRA	SORA	VIRA
<b>Marin Region</b>								
Piper Park - East (04c)	PIPE-T1	10.1	99%	2	0.25	0	0	0
Piper Park - West (04d)	PIPE-T1	13.8	100%	3	0.36	0	0	0
CMC - Mouth (04j.1)	CMCM-T1	6.0	100%	0	0.00	0	0	0
Boardwalk No. 1 (04k)	PIPE-T1	8.4	100%	2	0.20	0	0	0
Pickleweed Park (09)	PIPK-T1	14.2	100%	0	0.00	0.67	0	0
<i>San Rafael Canal Mouth (23d) - split into two sub-areas in 2011</i>						0	0	0
San Rafael Canal East (23d.1)	PIPK-T1	3.6	100%	0	0.00	-	-	-
San Rafael Canal West (23d.2)	PIPK-T1	3.1	100%	0	0.00	-	-	-
<b>San Francisco Peninsula Region</b>								
SFO (19h)	SFO-T1	25.1	81%	1	0.00	0	0	0
<i>Seal Slough (19p) - split into two sub-areas in 2011</i>						0	0	0
Seal Slough Central (19p.1)	SEAL-T1	37.8	85%	0	0.00	-	-	-
Seal Slough Peripheral (19p.2)	SEAL-T1	30.8	75%	0	0.00	-	-	-
<b>San Mateo Region</b>								
Corkscrew Slough (02b.1)	CORK-T1	227.4	36%	15	0.14	0	0	0
Steinberger Slough (02b.2)	RESH-T2	105.6	50%	5	0.02	0	0	0
<i>B2 North Quadrant (02c) - split into three sub-areas in 2011 and 2012</i>						0	0	0
B2 North - West (02c.1a)	OBEN-T1	150.5	47%	9	0.09	-	-	-
B2 North - East (02c.1b) <sup>1</sup>	OBEN-T1	146.0	72%	4	0.03	-	-	-
B2 North - South (02c.2)	OBEN-T2	226.7	56%	2	0.01	0	0	0
<i>B2 South Quadrant (02d) - split into four sub-areas in 2011 and 2012</i>						0	0	0
B2 South - West (02d.1a)	OBES-T1	38.3	75%	0	0.00	-	-	-
B2 South - East (02d.1b)	OBES-T1	23.2	45%	0	0.00	-	-	-
B2 South - 2 (02d.2)	OBES-T1	58.8	73%	3	0.06	-	-	-
B2 South - 3 (02d.3)	OBES-T1	67.9	22%	0	0.00	-	-	-
Greco Island - North (02f)	GRIN-T1	511.1	31%	3	0.00	0	0	0
West Point Slough - SW / E (02g)	WPSS-T1	39.8	65%	0	0.00	0	0	0
Greco Island - South (02h)	GRIS-T1	237.9	49%	25	0.21	0	0	0
Ravenswood Slough (02i)	RAV-T1	117.8	58%	14	0.16	0	0	0
<i>Deepwater Slough (02k) - grouped into one sub-area by ISP Control Program</i>						0	0	0
Middle Bair N (02k)	MBE-T1	221.6	52%	15	0.12	-	-	-
Middle Bair SE (02k)	MBE-T1	200.3	33%	0	0.00	-	-	-
Inner Bair Island Restoration (02l)	IBI-T1	59.6	65%	0	0.00	0	0	0
Pond B3 Bair Island Restoration (02m)	OBW-T1	411.8	24%	3	0.04	0	0	0

Table 2 continued on the next page.



Sub-Area Name (Code)	Transect	Area (acres)	% Area Surveyed	RIRA Indices		Occupancy		
				Highest Count	Relative Density (rails/acre)	BLRA	SORA	VIRA
<b>Dumbarton South Region</b>								
Mowry Marsh North (05a.1)	MOWN-T1	417.4	29%	17	0.11	0	0	0
Calaveras Point (05a.2)	CAPT-T1	478.7	14%	19	0.26	0	0	0
<i>Newark Slough (05c) - split into two sub-areas in 2011</i>						0	0	0
Newark Slough - West (05c.1)	NEWS-T1	167.3	15%	4	0.10	-	-	-
Newark Slough - East (05c.2)	NEWS-T1	73.1	52%	6	0.13	-	-	-
Mayhew's Landing (05e)	MALA-T1	27.9	81%	0	0.00	0	0	0
Coyote Creek - Mud Slough (05f)	A21-T1	210.2	41%	1	0.01	0.25	0.13	0.13
Cargill Pond (W Suites Hotel) (05g)	MALA-T1	18.2	99%	0	0.00	0	0	0
Plummer Creek Mitigation (05h)	PLCM-T1	28.4	57%	0	0.00	0.67	0	0.67
Island Ponds - A21 (05i)	A21-T1	159.2	50%	3	0.05	0.13	0.25	0.25
<i>Charleston Slough to Mountain View Slough - grouped into one sub-area by ISP Control Program</i>						0	0	0
Charleston Slough (15a.1)	MVSL-T1	36.2	73%	5	0.09	-	-	-
Mountain View Slough (15a.1)	MVSL-T1	30.9	66%	0	0.00	-	-	-
Mountain View Slough Channel (15a.1)	MVSL-T2	43.1	99%	0	0.00	0	0.13	0
Stevens Creek to Long Point (15a.2)	STEV-T1	56.9	86%	0	0.00	0	0	0
Guadalupe Slough (15a.3)	GUSL-T2	316.2	29%	4	0.05	0	0.13	0
Alviso Slough (15a.4)	ALSL-T2	459.9	17%	15	0.23	0	0	0
Knapp Tract (15a.6)	KNAP-T1	382.9	32%	0	0.00	0	0	0
Stevens Creek (15c)	STEV-T1	27.9	75%	0	0.00	0	0	0
<i>Cooley Landing (16) - split into two sub-areas in 2011</i>						0	0	0
Cooley Landing Central (16.1)	COLA-T1	41.9	91%	10	0.15	-	-	-
Cooley Landing East (16.2)	COLA-T1	133.2	55%	8	0.08	-	-	-
<b>Union City Region</b>								
AFCC - Mouth (01a)	AFCP-T1	23.6	60%	0	0.00	0	0	0
AFCC - Lower (01b)	AFCP-T2	135.4	69%	0	0.00	0	0	0
AFCC - Upper (01c)	AFCC-T4	75.3	90%	0	0.00	0	0.13	0.13
AFCC - to I-880 (01d)	AFCC-T4	39.7	23%	0	0.00	0	0	0
AFCC - Pond 3 (01f)	AFCP-T1	130.9	69%	0	0.00	0	0	0
OAC - North Bank (13a)	OAC-T3	26.9	67%	1	0.05	0	0	0
OAC - Island (13b)	OAC-T2	93.7	97%	10	0.21	0	0	0
OAC - South Bank (13c)	OAC-T2	24.1	100%	6	0.14	0	0	0
Whale's Tail - North (13d)	WTN-T1	140.6	49%	2	0.04	0	0	0
Whale's Tail - South (13e)	WTS-T1	149.3	51%	8	0.11	0	0.13	0
Cargill Mitigation Marsh (13f)	OAC-T4	47.2	100%	8	0.09	0	0	0
Eden Landing - Mt Eden Creek (13j)	EDEN-T1	124.8	49%	0	0.00	0	0	0
Eden Landing Reserve - South (13k)	ELRS-T1	239.6	36%	11	0.22	0	0	0
Eden Landing Reserve - North (13l)	ELRS-T1	229.8	18%	2	0.02	0	0	0
Ideal Marsh - South (21b)	IMAS-T1	131.2	67%	0	0.00	0	0	0

Table 2 continued on the next page.

#### 4. Results

Sub-Area Name (Code)	Transect	Area (acres)	% Area Surveyed	RIRA Indices		Occupancy		
				Highest Count	Relative Density (rails/acre)	BLRA	SORA	VIRA
<b>Hayward Region</b>								
Oro Loma - East (07a)	ORLW-T1	197.1	54%	0	0.00	0	0	0
Oro Loma - West (07b)	ORLW-T3	130.7	55%	0	0.00	0	0	0
Dog Bone Marsh (20c)	NORT-T1	7.0	58%	0	0.00	0	0	0
<i>Citation Marsh (20d) - split into three sub-areas in 2012 and 2018</i>						0	0	0
Citation Marsh South (20d.1)	CITA-T1	44.4	44%	5	0.21	-	-	-
Citation Marsh Upper (20d.2a) <sup>1</sup>	CITA-T1	36.0	69%	14	0.53	-	-	-
Citation Marsh Central (20d.2b) <sup>2</sup>	CITA-T1	35.8	80%	25	1.18	-	-	-
East Marsh (20e)	SLRZ-T1	37.2	26%	2	0.08	0	0	0
North Marsh (20f) <sup>2</sup>	NORT-T1	94.2	94%	51	0.85	0.17	0.33	0.17
Bunker Marsh (20g) <sup>1</sup>	BUNK-T1	35.8	95%	7	0.29	0	0	0
<i>San Lorenzo Creek (20h) - split into two sub-areas in 2012</i>						0	0	0
San Lorenzo Creek - North (20h.1) <sup>1</sup>	SLRZ-T1	12.0	96%	2	0.14	-	0	-
San Lorenzo Creek - South (20h.2)	SLRZ-T1	10.4	96%	0	0.00	-	0	-
Johnson's Landing (20i)	COGS-T2	10.1	91%	0	0.00	0	0	0
Cogswell - Sec A (20m)	COGS-T1	34.9	100%	8	0.33	0	0	0
<i>Cogswell - Sec B - split into three sub-areas in 2018</i>						0	0	0
Cogswell B - Bayfront (20n.1) <sup>1</sup>	COGS-T3	11.9	89%	3	0.00	-	0	-
Cogswell B - South (20n.2) <sup>1</sup>	COGS-T3	33.9	95%	4	0.15	-	0	-
Cogswell B - Main (20n.3) <sup>2</sup>	COGS-T3	55.5	91%	21	0.44	-	0	-
Cogswell - Sec C (20o) <sup>1</sup>	COGS-T2	49.8	100%	9	0.31	0	0	0
HARD Marsh (20s)	HARD-T1	65.9	80%	0	0.00	0	0	0
Triangle Marsh - Hayward (20w)	COGS-T1	12.4	35%	0	0.00	0	0	0
<b>San Leandro Bay Region</b>								
<i>Arrowhead Marsh (17c) - split into two sub-areas in 2011</i>						0	0	0
Arrowhead Marsh West (17c.1)	ARHE-T2	21.2	97%	7	0.28	-	-	-
Arrowhead Marsh East (17c.2) <sup>2</sup>	ARHE-T2	22.7	90%	21	1.65	-	-	-
<i>MLK Regional Shoreline (17d) - split into five sub-areas in 2011</i>						0	0	0
Damon Marsh (17d.4) <sup>1</sup>	MLKS-T1	10.6	100%	0	0.00	-	-	-
Damon Slough (17.5)	MLKS-T1	3.8	65%	0	0.00	-	-	-
<i>San Leandro Creek (17e) - split into two sub-areas in 2011</i>						0	0	0
San Leandro Creek North (17e.1)	MLKR-T1	2.0	99%	0	0.00	-	-	-
San Leandro Creek South (17e.2)	MLKR-T1	5.3	17%	0	0.00	-	-	-
MLK New Marsh (17h) <sup>2</sup>	MLKR-T1	34.3	100%	40	2.00	0	0.33	0
<i>Fan Marsh (17j) - split into two sub-areas in 2018</i>						0	0	0
Fan Marsh Wings (17j.1) <sup>1</sup>	FANM-T1	2.4	57%	0	0.00	-	-	-
Fan Marsh Main (17j.2) <sup>2</sup>	FANM-T1	10.1	100%	17	3.10	-	-	-

Table 2 continued on the next page.

Sub-Area Name (Code)	Transect	Area (acres)	% Area Surveyed	RIRA Indices		Occupancy		
				Highest Count	Relative Density (rails/acre)	BLRA	SORA	VIRA
<b>Bay Bridge North Region</b>								
Emeryville Crescent - East (06a)	EMCR-T1	54.2	7%	0	0.00	0	0	0
Emeryville Crescent - West (06b)	EMCR-T1	31.5	99%	2	0.05	0	0	0
Whittel Marsh (10a)	PTPN-T1	44.9	96%	0	0.00	0.25	0	0
<i>San Pablo Marsh (22b) - split into two sub-areas in 2011</i>						0	0	0
San Pablo Marsh East (22b.1)	RIF-T1	31.5	79%	2	0.00	-	-	-
San Pablo Marsh West (22b.2)	RIF-T1	130.6	60%	6	0.02	-	-	-
Rheem Creek Area (22c)	RCRA-T1	26.8	79%	4	0.23	0	0	0
Meeker Slough (22d)	STEG-T1	30.5	90%	12	0.60	0	0	0
Stege Marsh (22d)	STEG-T1	31.5	93%	8	0.31	0	0	0
Hoffman Marsh (22e)	STEG-T1	38.5	91%	0	0.00	0	0	0
<b>Suisun Region</b>								
Ryer Island (27b)	RYSE-T1	587.3	10%	0	0.00	0.14	0.14	0.43
Freeman Island (27b)	FREE-T1	85.8	48%	0	0.00	0.25	0.50	0.50
Snag Island (27b)	SNAG-T1	24.8	84%	0	0.00	0.00	0.00	0.67
Concord Naval Weapons Station (27d)	PEM-T2	335.4	33%	0	0.00	0.75	0.25	0.75
MOTCO Area 1 (27d)	MOT1-T1	216.7	44%	0	0.00	0.80	0.20	0.80
MOTCO Area 2 (27d)	MOT2-T1	248.5	33%	0	0.00	0.14	0.14	0.14
<b>Petaluma Region</b>								
Petaluma River - Upper (24a)	PDF-T1	138.1	34%	0	0.00	0.33	0.00	0.33
Grey's Field (24b)	GRFI-T1	108.6	27%	0	0.00	1.00	0.00	0.67

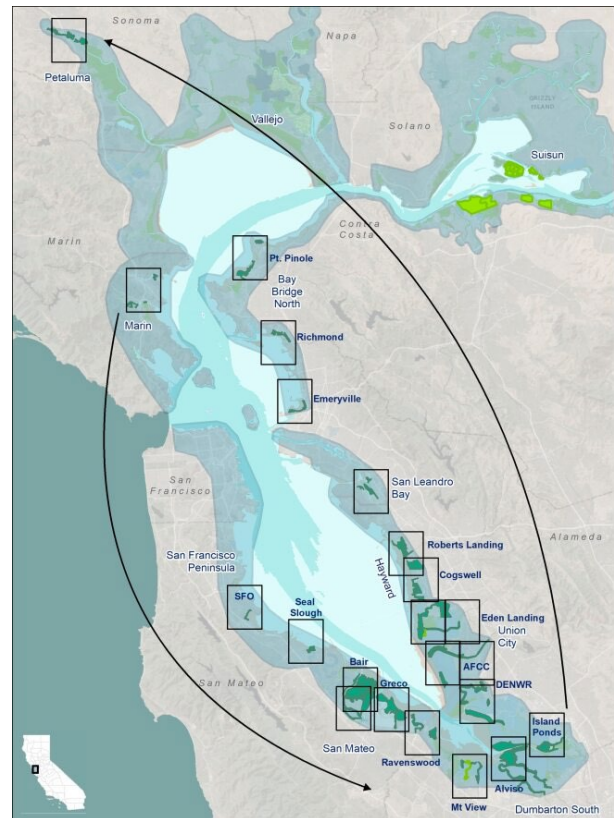
End of Table 2.

## Map Figures

The following maps display an estimate of the location of Ridgway's rails detected during surveys and the calculated relative density for each sub-area. Map figures are organized geographically, beginning with the Marin Region and moving counterclockwise around the Bay. All of the following map figures are shown at the same 1:24,000 scale.

White circles show the estimated location of each unique Ridgway's rail detected during every round conducted by OEI using the North American Protocol (NAM) in 2023. Relative density of Ridgway's rails at each sub-area are represented by different colors in the following map figures (see Table 1 for a key to relative density). Darker shading represents the assumed survey area of 200 meters around each survey station. See the below for a list of map figures.

- Figure 2. Marin Region.
- Figure 3. SF Peninsula Region - SFO.
- Figure 4. SF Peninsula Region - Seal Slough.
- Figure 5. San Mateo Region - Outer Bair Island.
- Figure 6. San Mateo Region - Inner Bair Island.
- Figure 7. San Mateo Region - Greco Island.
- Figure 8. San Mateo Region - Ravenswood Slough and Dumbarton South Region - Cooley Landing.
- Figure 9. Dumbarton South Region - Mountain View.
- Figure 10. Dumbarton South Region – Alviso/Calaveras.
- Figure 11. Dumbarton South Region - Island Ponds.
- Figure 12. Dumbarton South Region - DENWR.
- Figure 13. Union City Region - AFCC.
- Figure 14. Union City Region - Eden Landing.
- Figure 15. Hayward Region - Cogswell Marshes.
- Figure 16. Hayward Region - Roberts Landing.
- Figure 17. San Leandro Bay Region.
- Figure 18. Bay Bridge North Region - Emeryville.
- Figure 19. Bay Bridge North Region - Richmond.
- Figure 20. Bay Bridge North Region - Point Pinole.
- Figure 21. Petaluma Region.



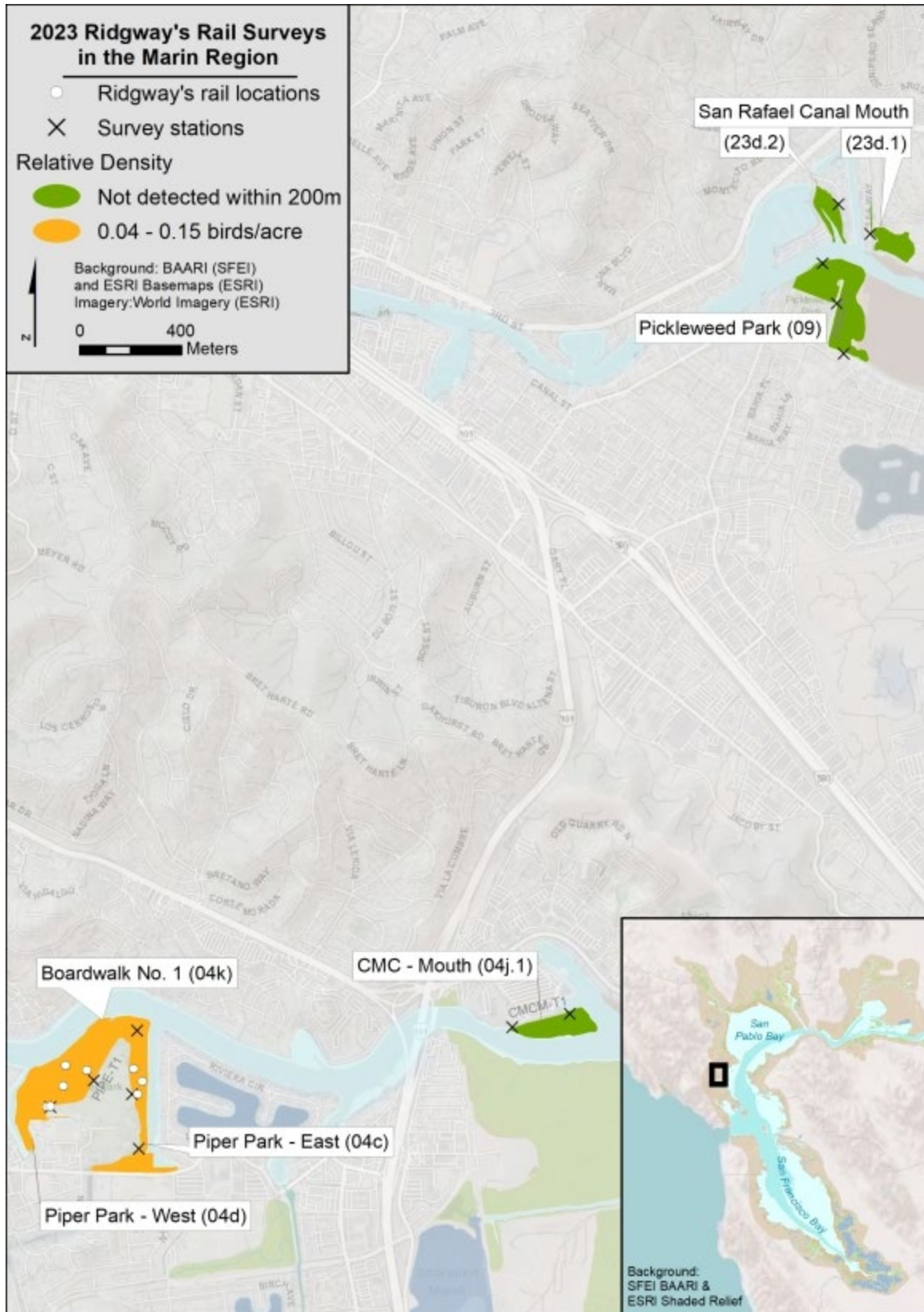
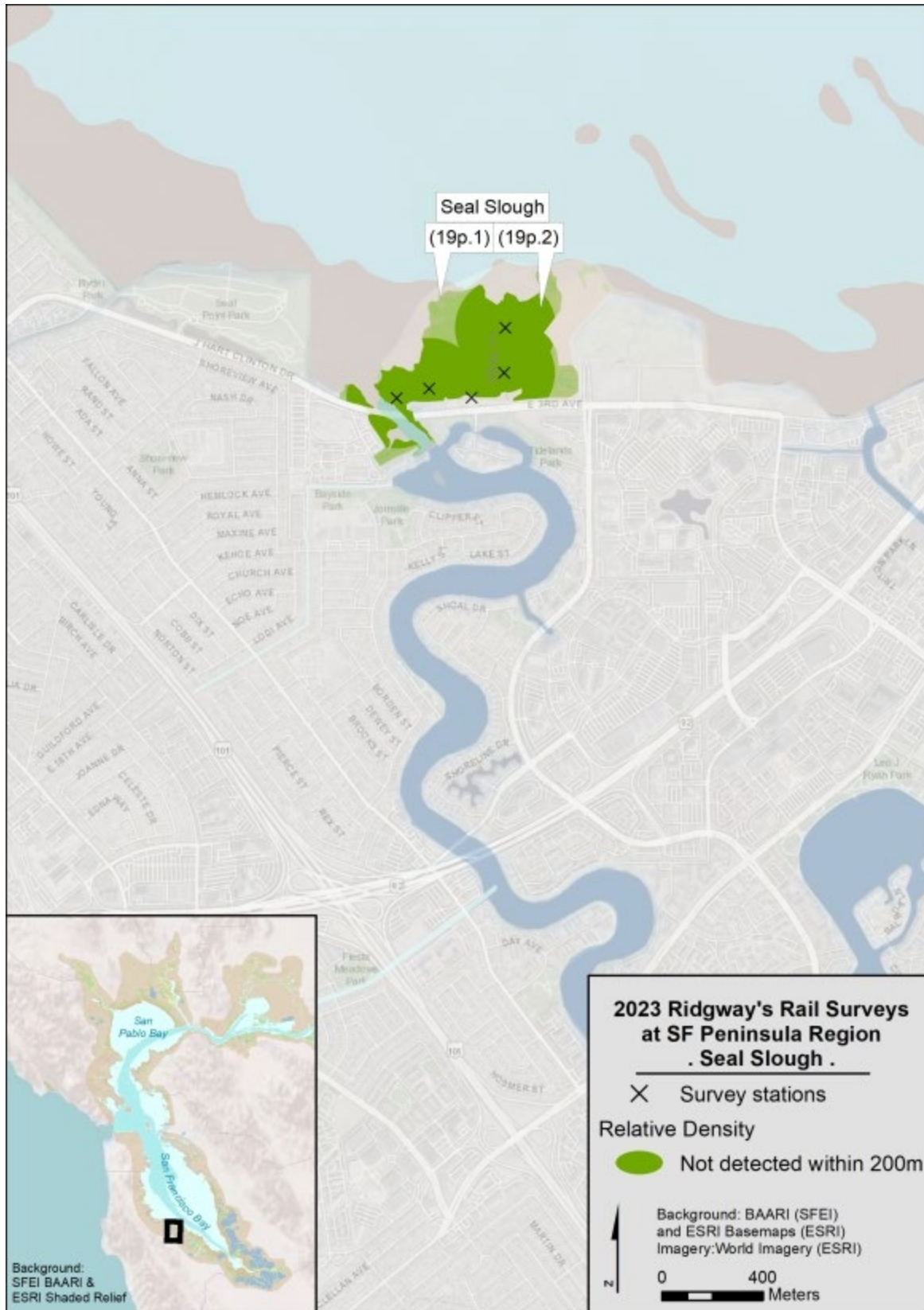


Figure 2. ISP survey results in the Marin Region.



**Figure 3.** ISP survey results at SFO in the San Francisco Peninsula Region. Note that one Ridgway’s rail was detected at the sub-area, however it was detected from beyond 200 meters away and is thus excluded from the density analysis.





**Figure 4.** ISP survey results at Seal Slough in the San Francisco Peninsula Region.

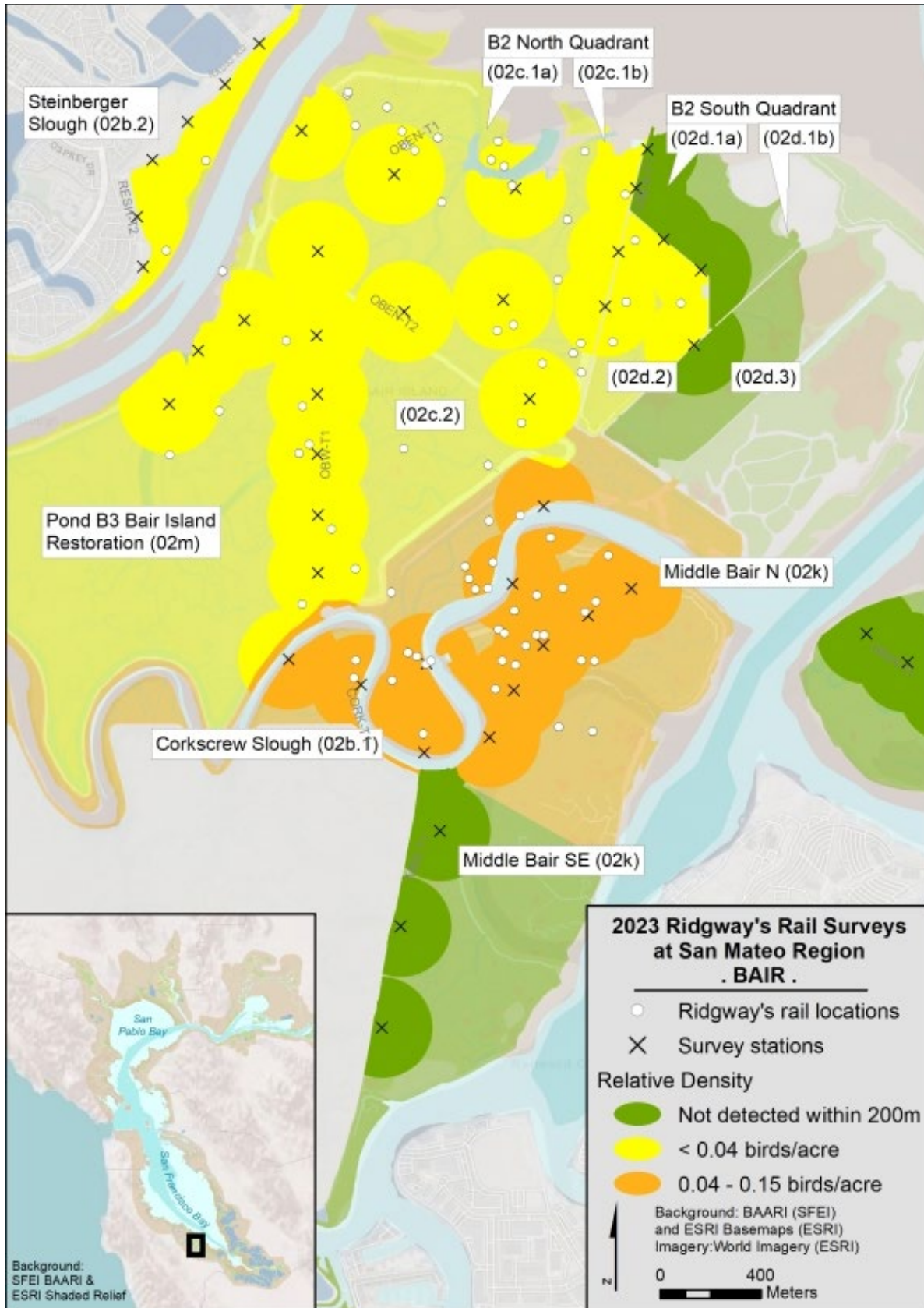
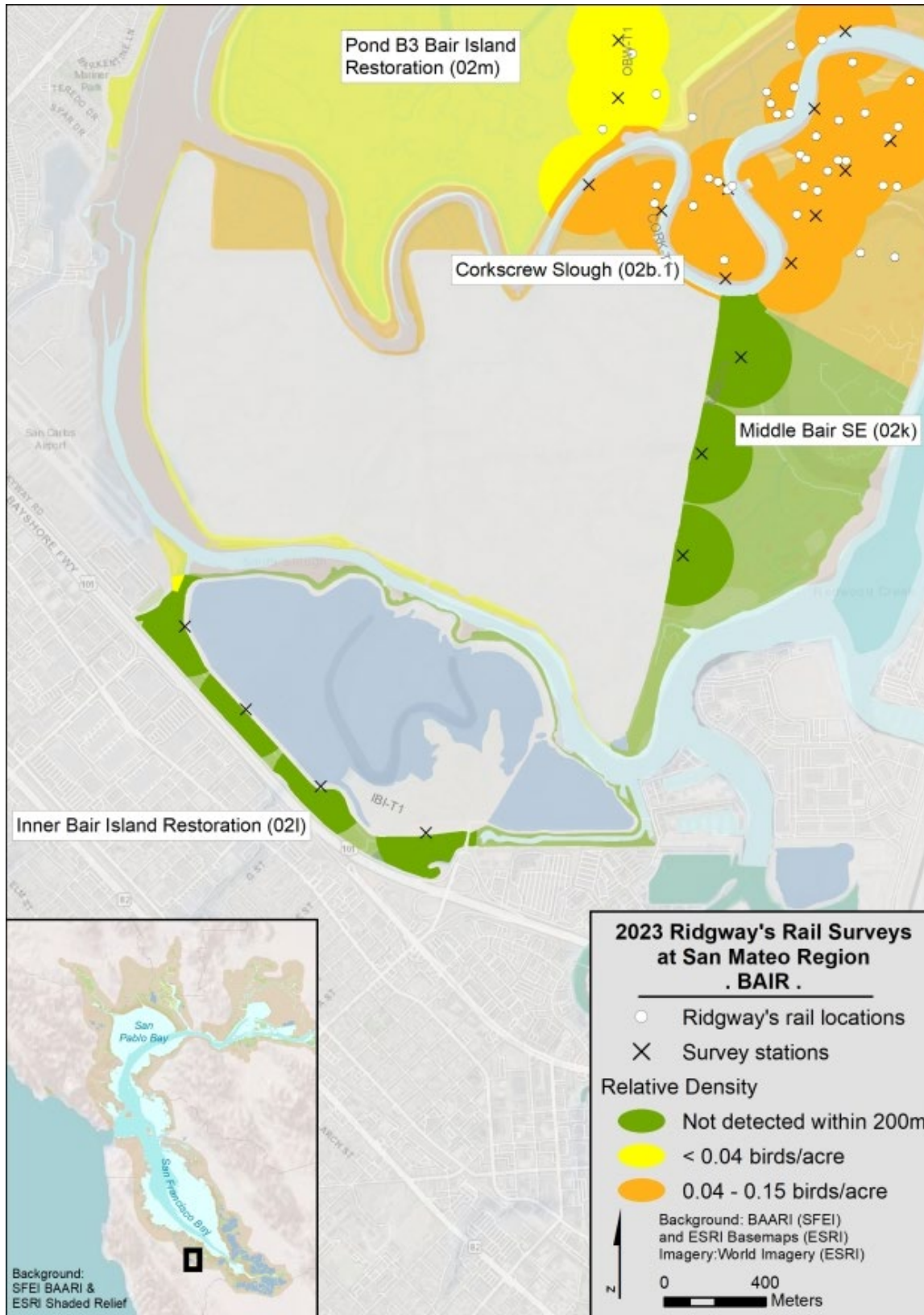
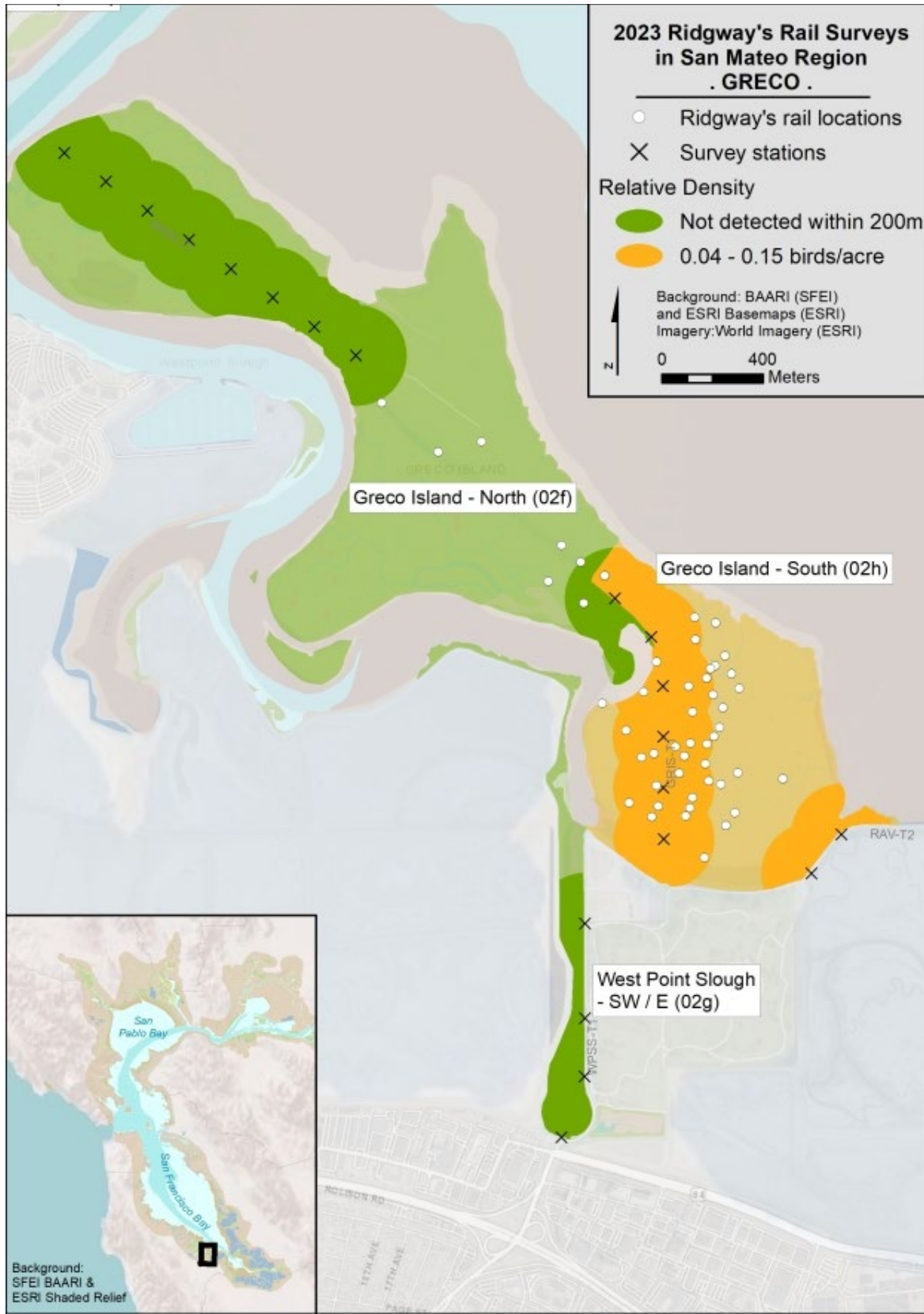


Figure 5. ISP survey results around Outer Bair Island in the San Mateo Region.

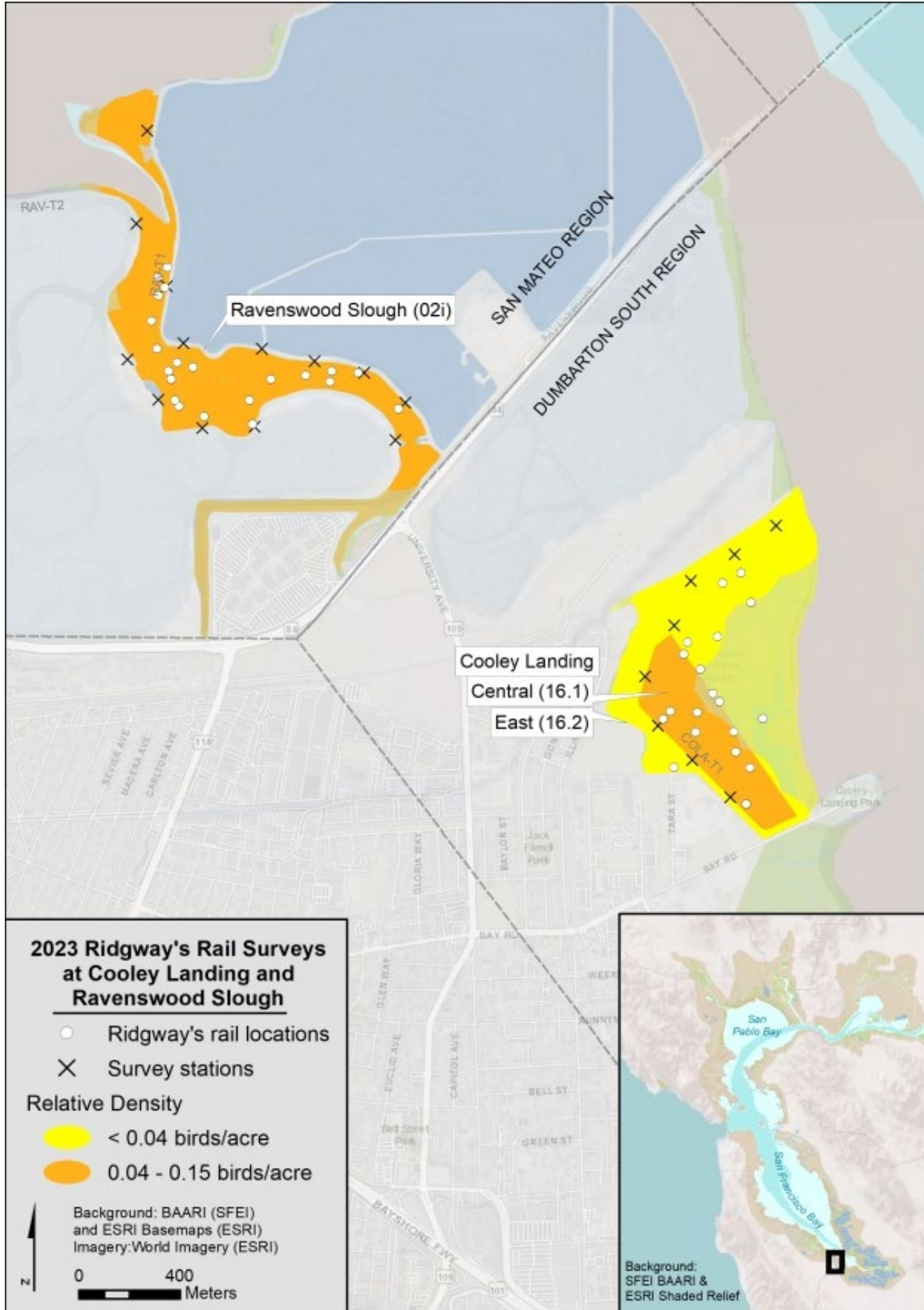




**Figure 6.** ISP survey results around Inner Bair Island in the San Mateo Region.



**Figure 7.** ISP survey results around Greco Island in the San Mateo Region.



**Figure 8.** ISP survey results at Ravenswood Slough in the San Mateo Region and at Cooley Landing in the Dumbarton South Region.



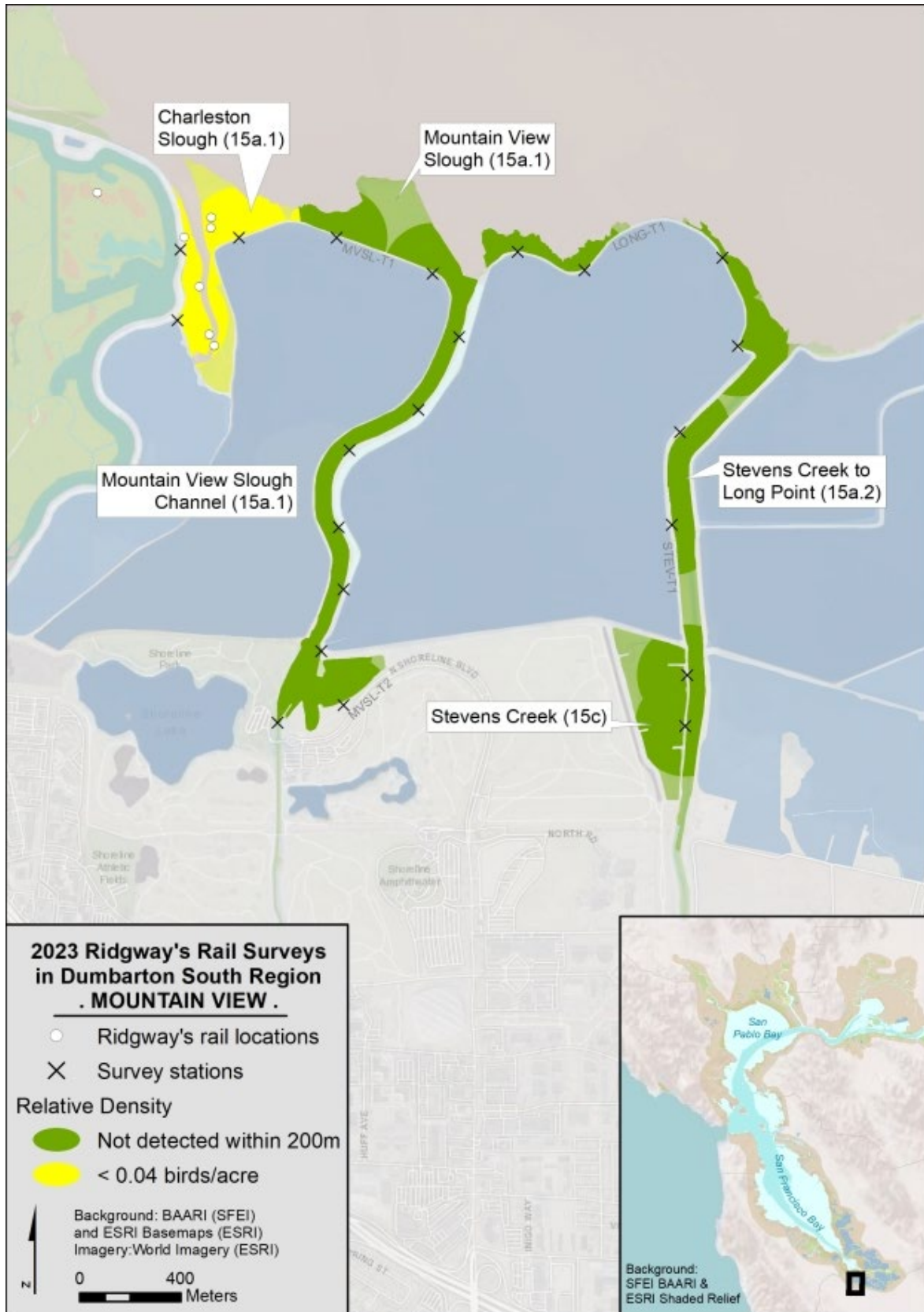


Figure 9. ISP survey results in the Mountain View area in the Dumbarton South Region.

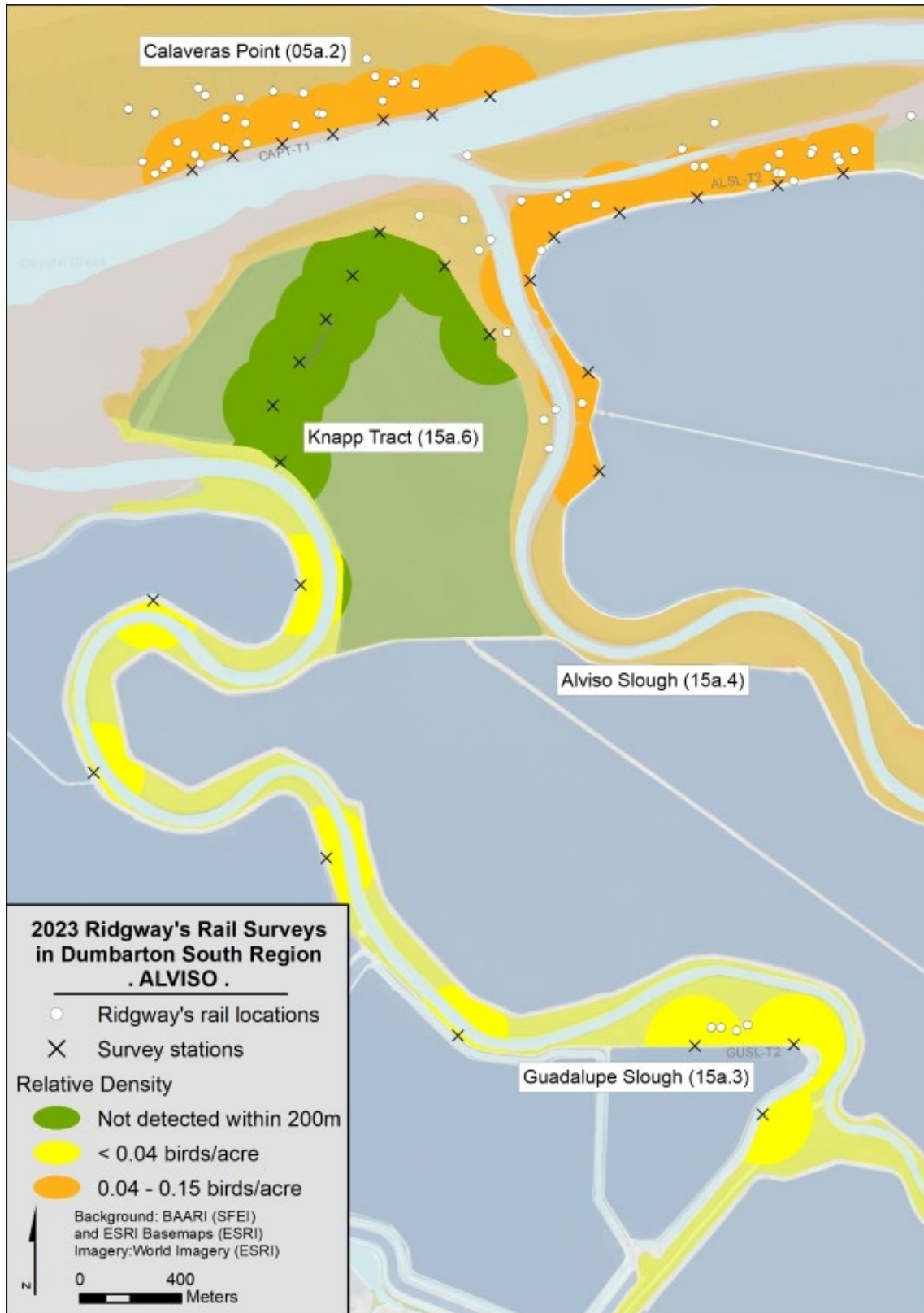
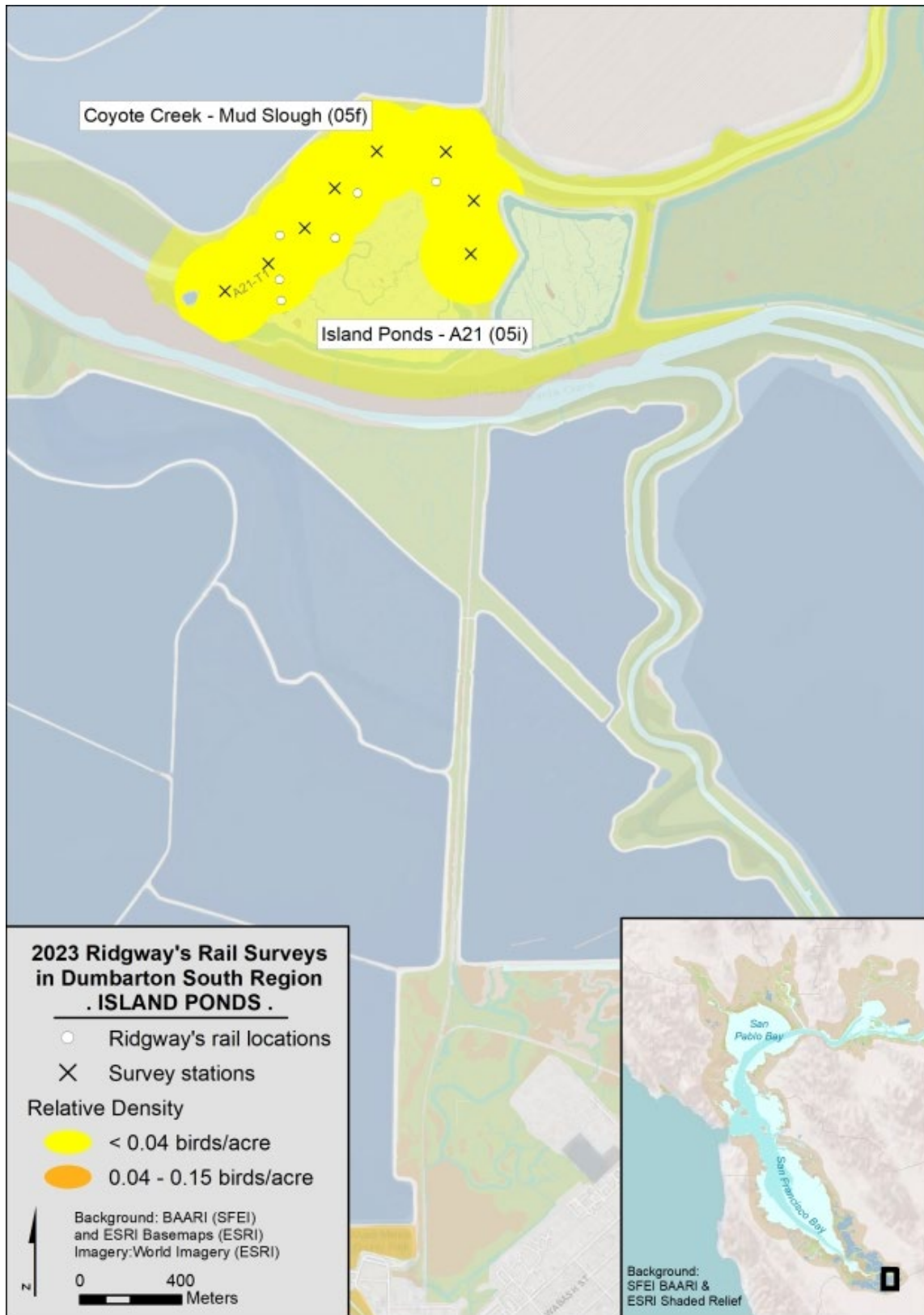
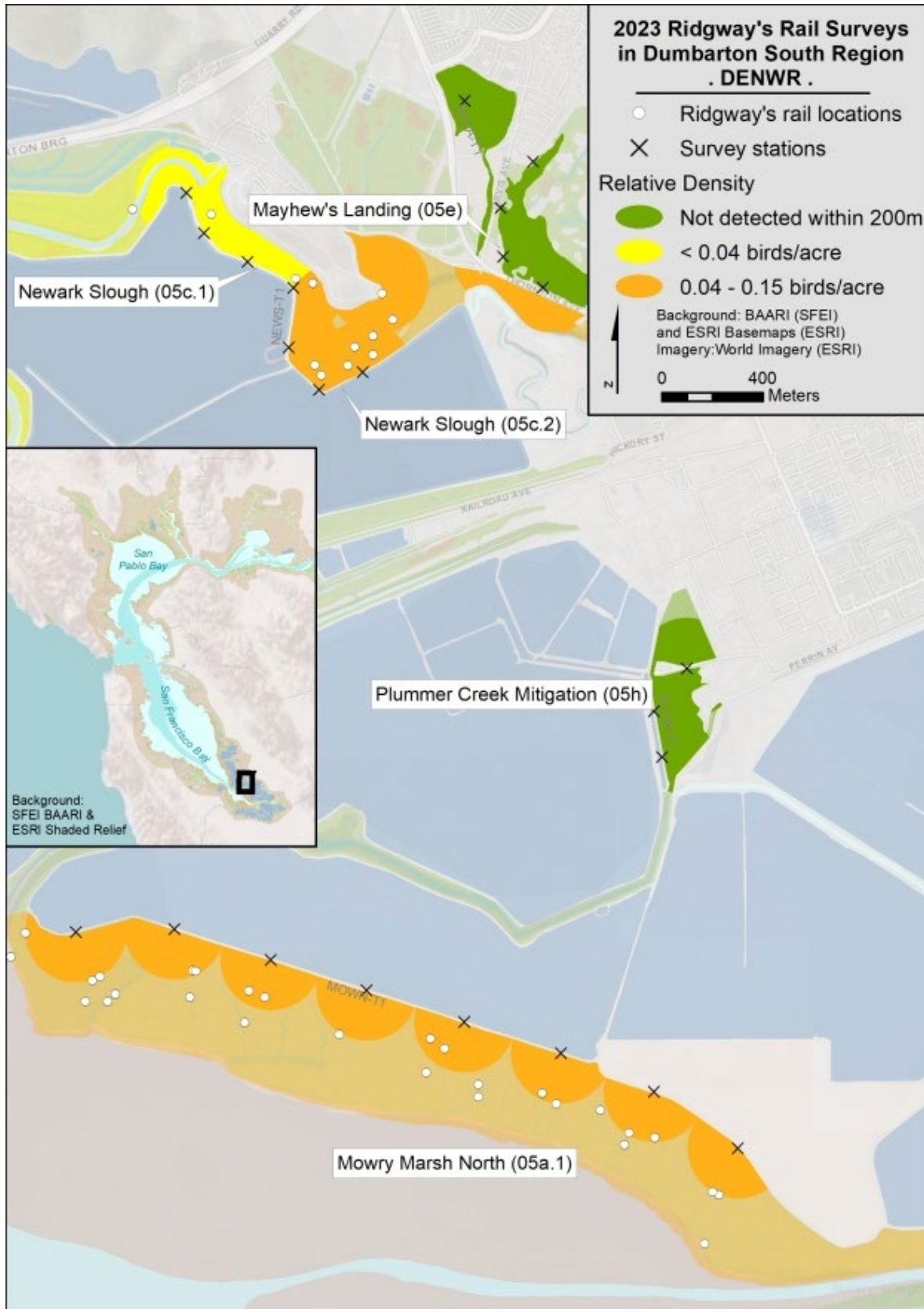


Figure 10. ISP survey results in the Alviso area in the Dumbarton South Region.



**Figure 11.** Survey results at Island Ponds in the Dumbarton South Region.





**Figure 12.** Survey results around Don Edwards National Wildlife Refuge in the Dumbarton South Region.



Figure 13. Survey results at AFCC in the Union City Region (continued next page).





Figure 13 continued.



Figure 14. Survey results at Eden Landing in the Union City Region (continued next page).

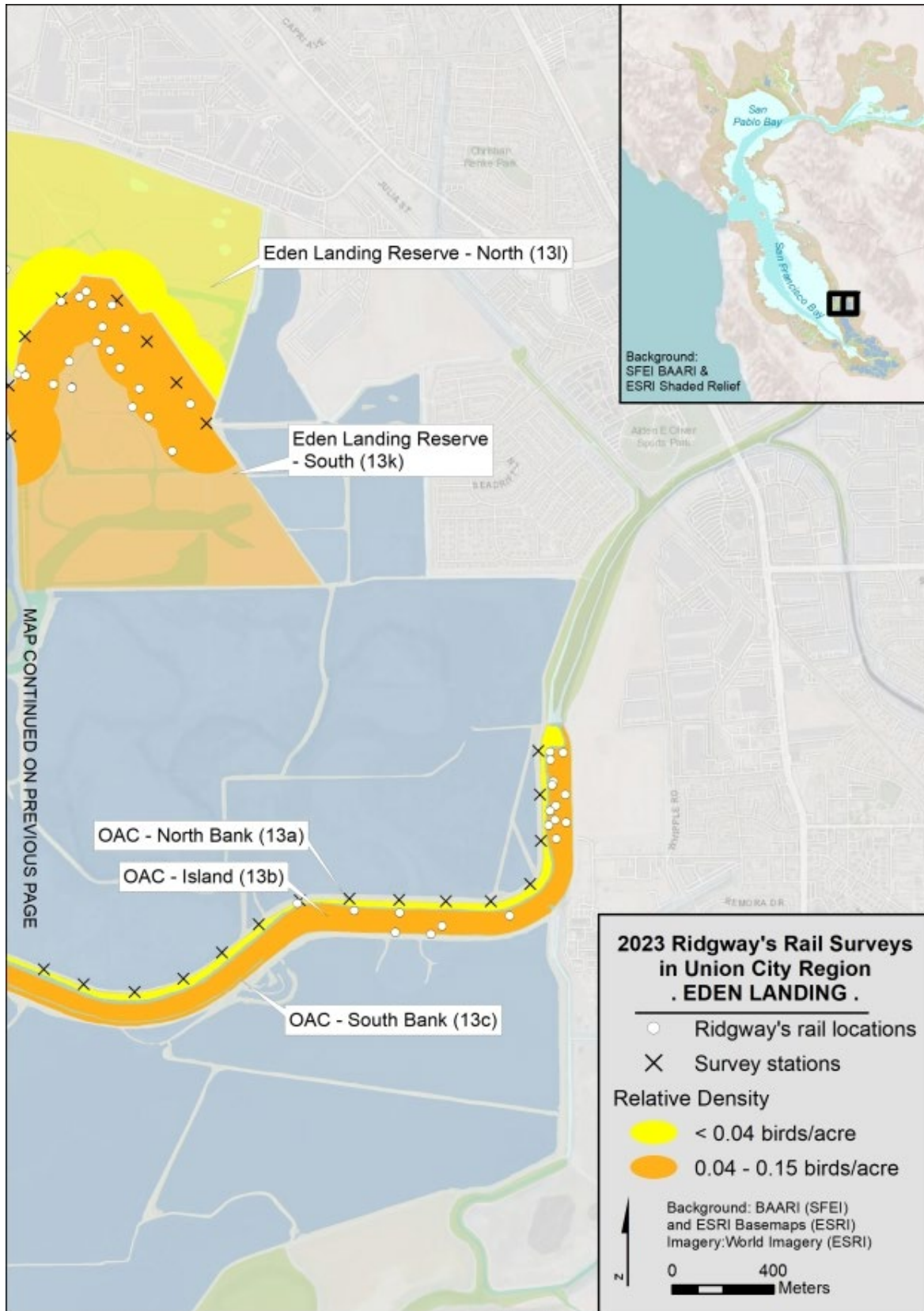


Figure 14 continued.



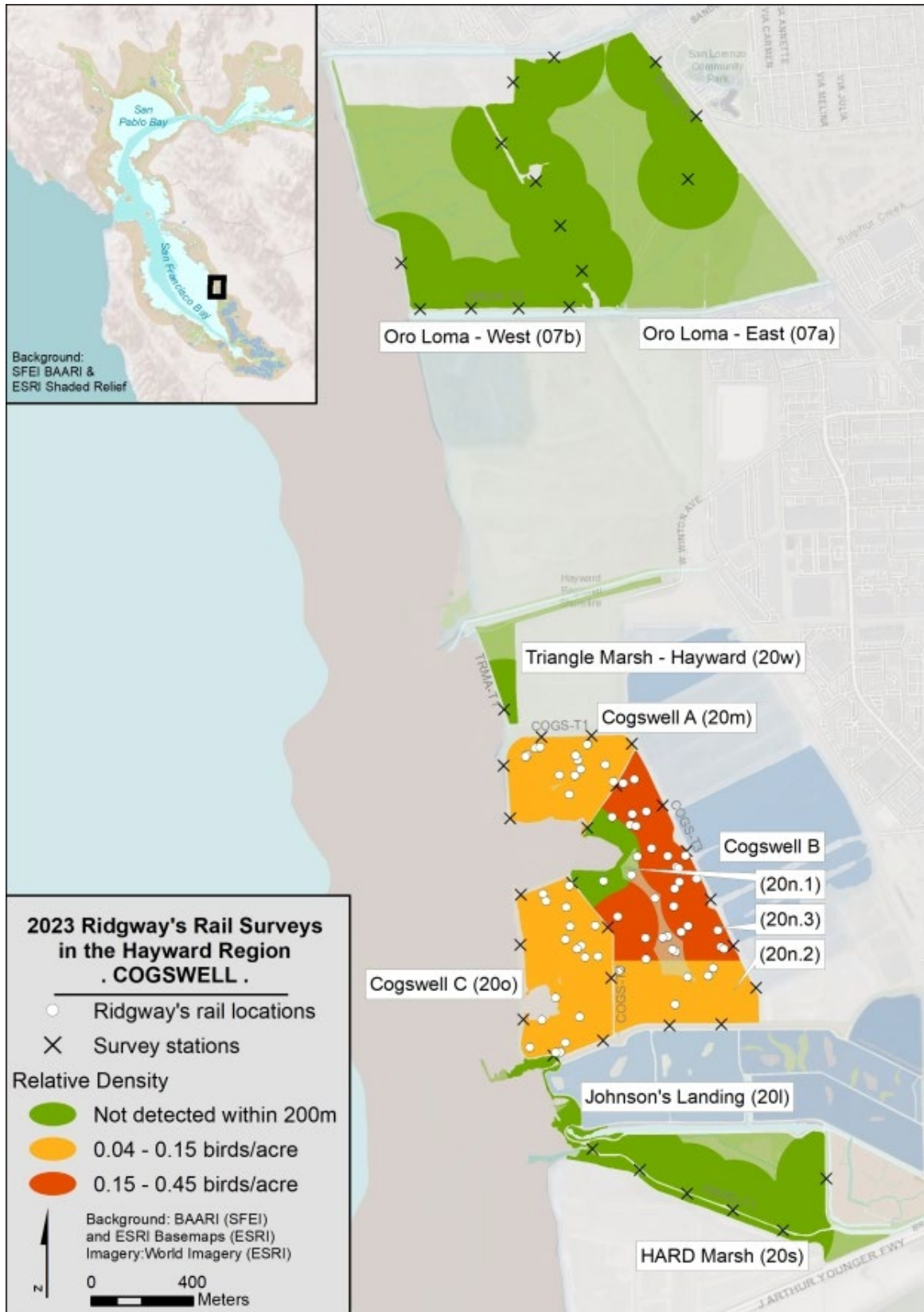


Figure 15. Survey results near the Cogswell Marshes in the Hayward Region.

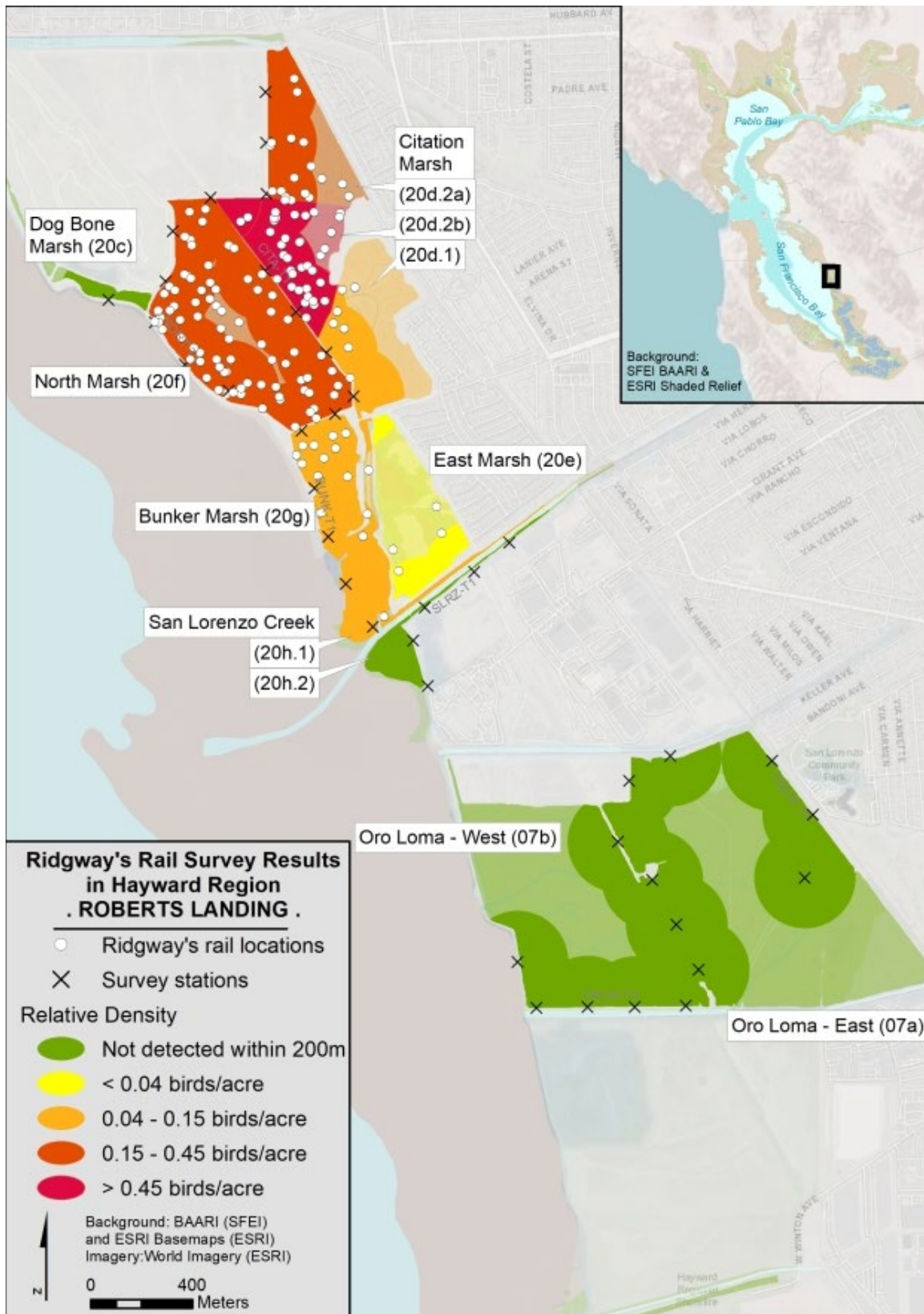


Figure 16. Survey results near Roberts Landing in the Hayward Region.



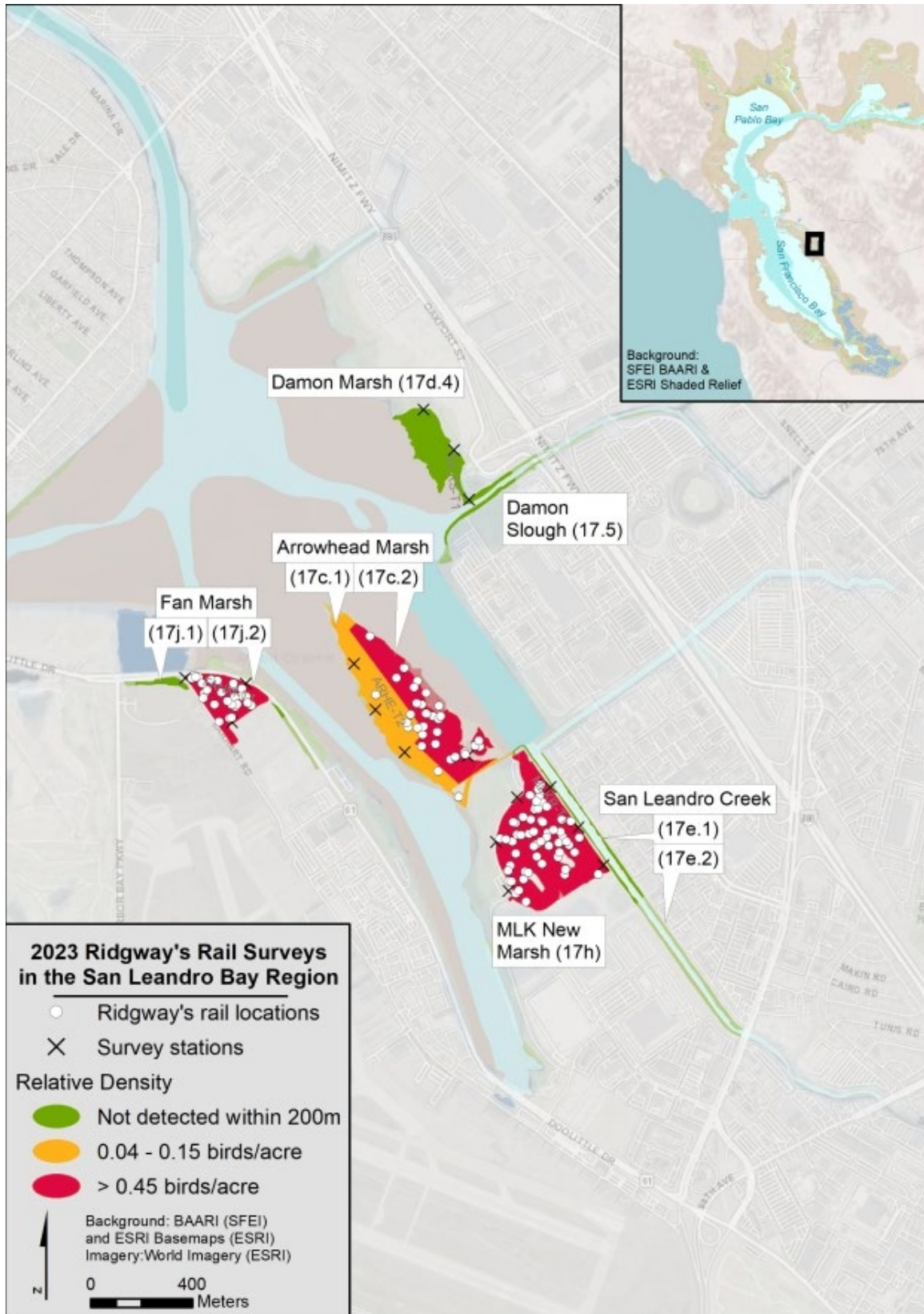


Figure 17. Survey results in the San Leandro Region.

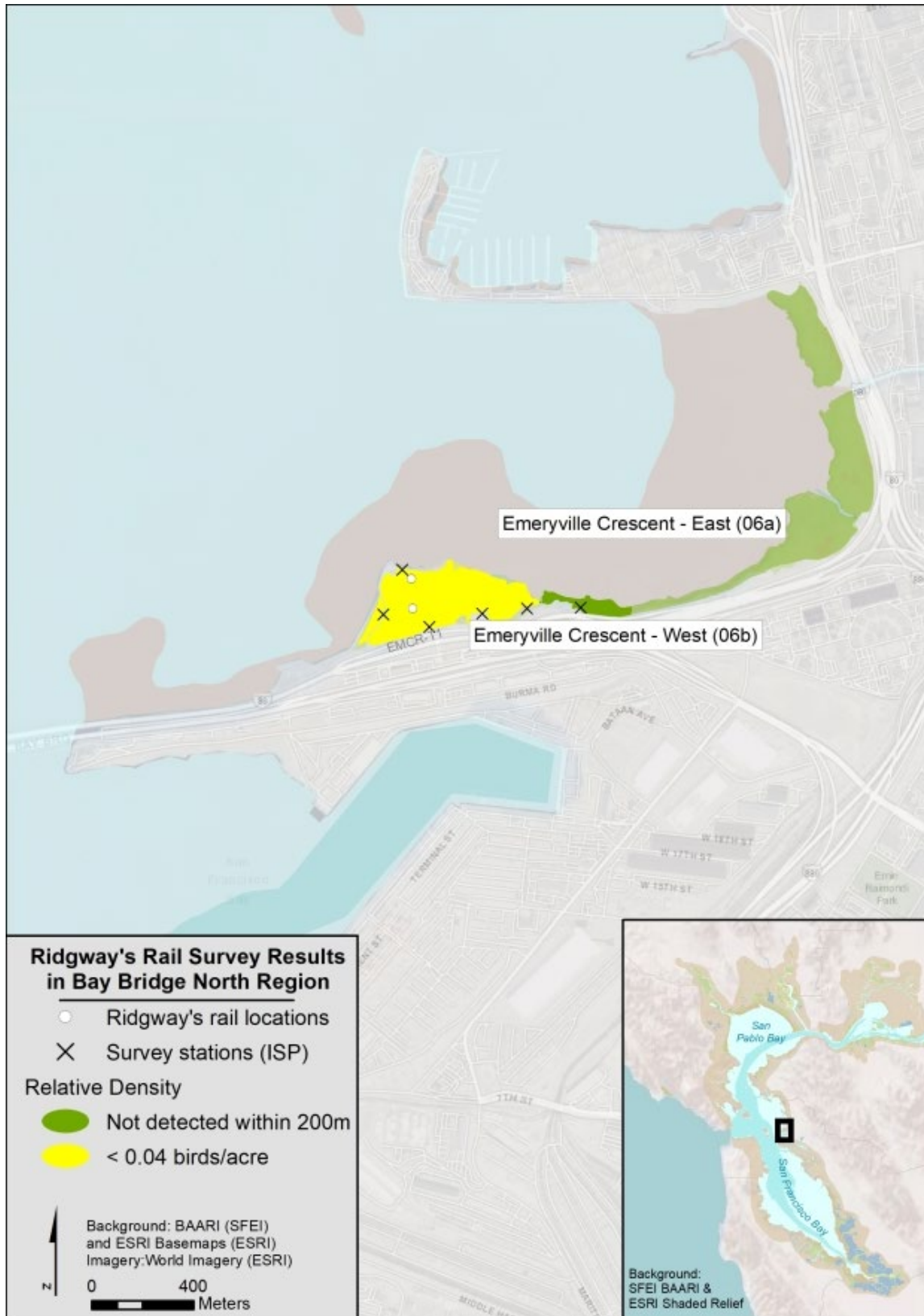


Figure 18. Survey results in Emeryville in the Bay Bridge North Region.



Figure 19. Survey results in Richmond in the Bay Bridge North Region.



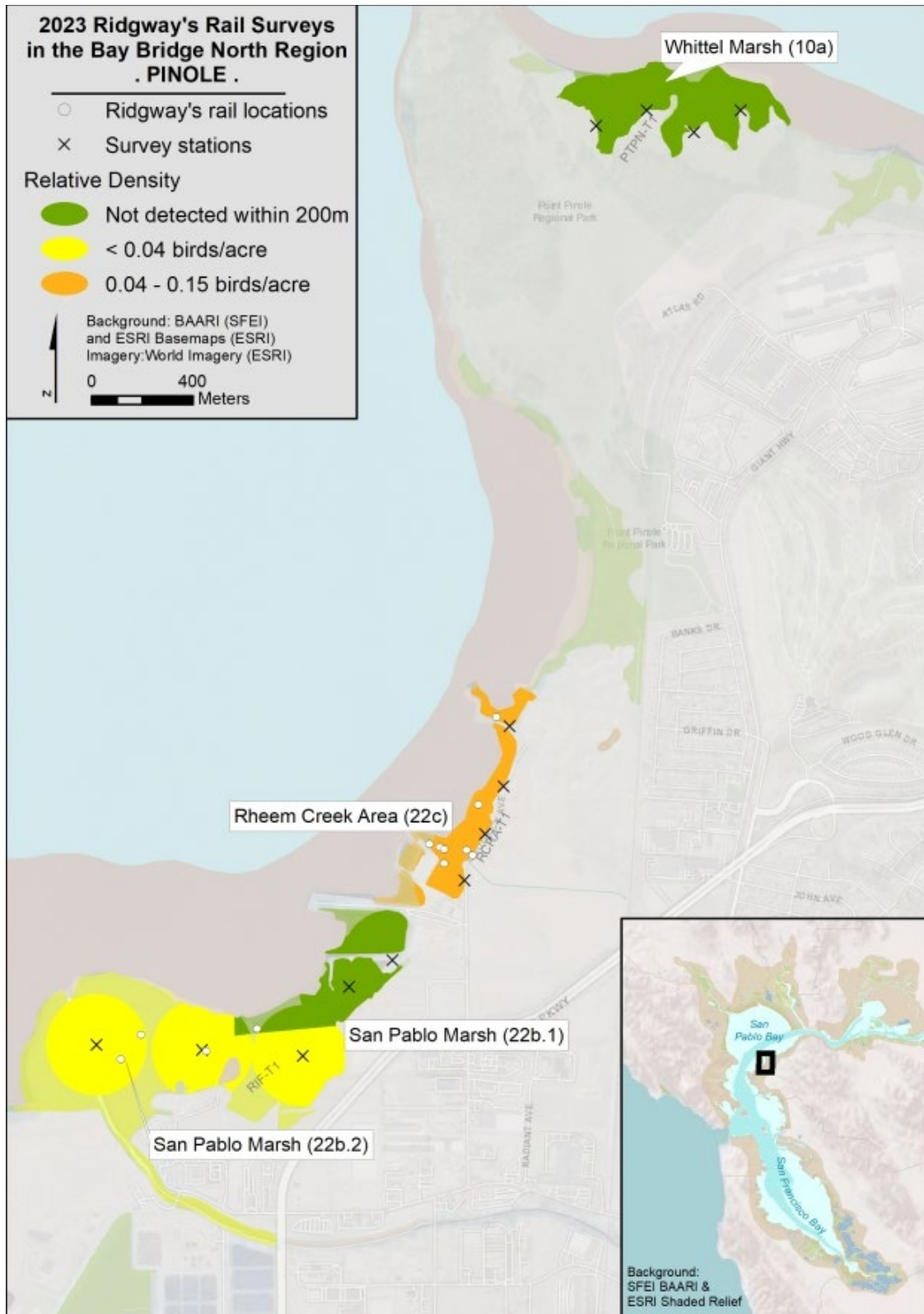


Figure 20. Survey results around Point Pinole in the Bay Bridge North Region.

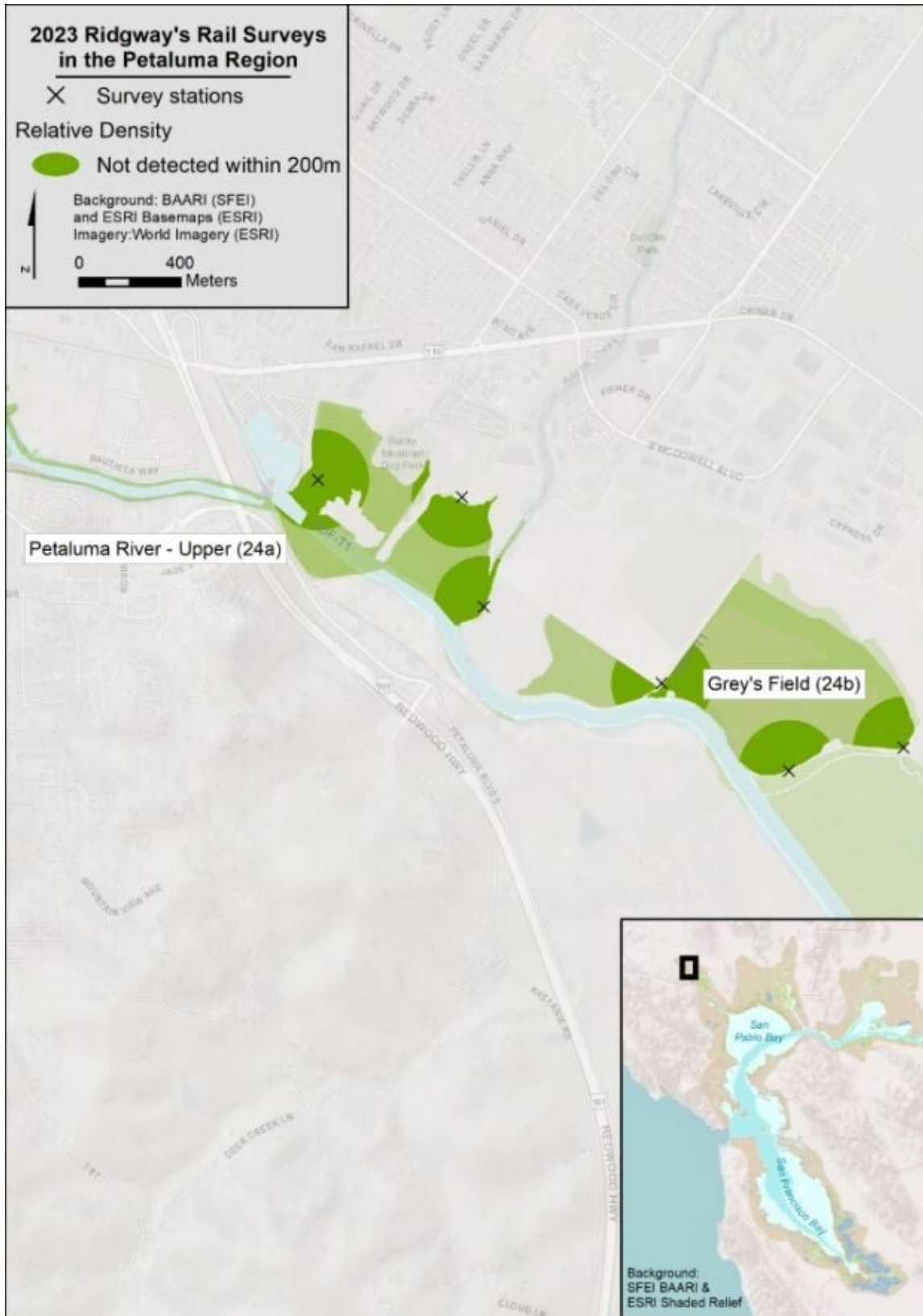


Figure 21. 2023 survey results in the Petaluma Region.

## 5. Permits

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Surveys were conducted under the authority of U.S. Fish and Wildlife Service permit TE118356-4. Surveys were required by and conducted pursuant to conditions of the Programmatic Formal Intra-Service Endangered Species Consultation on the San Francisco Estuary Invasive *Spartina* Project and subsequent additional formal intra-Service consultations on implementation of the San Francisco Estuary Invasive *Spartina* Project. Permission for site access was granted by East Bay Regional Park District, the City of San Leandro, California Department of Fish and Wildlife, Cargill, City of Mountain View, Mid-Peninsula Regional Open Space District, Redwood City Marina, SFO International Airport, and Don Edwards San Francisco Bay National Wildlife Refuge.

### 6. References

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## Appendix I: Complete List of 2023 *Spartina* Treatment Sub-Areas and Ridgway's Rail Survey Plans

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### **KEY to Survey Organizations:**

- **ARA** = Avocet Research Associates (contact Jules Evens)
- **CDFW** = California Department of Fish and Wildlife (contact Karen Taylor)
- **EBRPD** = East Bay Regional Park District (contact David Riensche)
- **ESA** = Environmental Science Associates (contact Len Liu)
- **ISP** = Olofson Environmental, Inc. for the Invasive *Spartina* Project (contact Jen McBroom)
- **OEI** = Olofson Environmental, Inc. for an outside agency or company (contact Jen McBroom)
- **PBCS** = Point Blue Conservation Science (contact Julian Wood)
- **DENWR** = Don Edwards National Wildlife Refuge (contact Rachel Tertes)
- **SPBNWR** = San Pablo Bay National Wildlife Refuge (contact Meg Marriott)



**Appendix I:** Complete list of 2023 *Spartina* treatment sub-areas and associated Ridgway's rail sites and survey plans by survey organization, survey type, and transect.

Sub-area Name (ID)	Survey Organization	Survey Type	Transect	Notes
<b>Area 01: Alameda Flood Control Channel in Union City Region</b>				
AFCC - Mouth (01a)	ISP	NAm	AFCP-T1	
AFCC - Lower (01b)	ISP	NAm	AFCP-T2	Also surveyed for SBSPRP from AFCP-T5 using NAm Protocol
AFCC - Upper (01c)	ISP	NAm	AFCC-T4	Also surveyed for SBSPRP from AFCP-T5 using NAm Protocol
AFCC - to I-880 (01d)	ISP	NAm	AFCC-T4	
AFCC - Strip Marsh (01e)	none	none	none	Insufficient habitat (2017)
AFCC - Pond 3 (01f)	ISP	NAm	AFCP-T1; AFCP-T2	
<b>Area 02: Bair and Greco Complex in San Mateo Region</b>				
Belmont to Steinberger Slough (02a)	-	-	-	Split into five sub-areas in 2011 and 2012
<i>Belmont Slough Mouth (02a.1a)</i>	none	none	none	Not surveyed in 2023
<i>Belmont Slough South (02a.1b)</i>	none	none	none	Not surveyed in 2023
<i>Belmont Slough to Steinberger (02a.2)</i>	none	none	none	Not surveyed in 2023
<i>Redwood Shores (02a.3)</i>	DENWR	NAm	RESH-T1	
<i>Redwood Shores Mitigation Bank (02a.4)</i>	none	none	none	Insufficient habitat (2017)
Steinberger to Redwood Creek (02b)	-	-	-	Split into three sub-areas in 2011
<i>Corkscrew Slough (02b.1)</i>	ISP	NAm	CORK-T1	
<i>Steinberger Slough (02b.2)</i>	ISP	NAm	RESH-T2	
<i>Redwood Creek (02b.2)</i>	none	none	none	Not surveyed
B2 North Quadrant (02c)	-	-	-	Split into three sub-areas in 2011 and 2012
<i>B2 North Quadrant West (02c.1a)</i>	ISP	NAm	OBEN-T1	
<i>B2 North Quadrant East (02c.1b)</i>	ISP	NAm	OBEN-T1	
<i>B2 North Quadrant South (02c.2)</i>	ISP	NAm	OBEN-T2	
B2 South Quadrant (02d)	-	-	-	Split into four sub-areas in 2011 and 2012
<i>B2 South Quadrant West (02d.1a)</i>	ISP	NAm	OBES-T1	
<i>B2 South Quadrant East (02d.1b)</i>	ISP	NAm	OBES-T1	
<i>B2 South Quadrant 2 (02d.2)</i>	ISP	NAm	OBES-T1	
<i>B2 South Quadrant 3 (02d.3)</i>	ISP	NAm	OBES-T1	
West Point Slough - NW (02e)	none	none	none	No site access – assume presence
Greco Island - North (02f)	ISP	NAm	GRIN-T1	
West Point Slough - SW / E (02g)	ISP	NAm	WPSS-T1	
Greco Island - South (02h)	ISP	NAm	GRIS-T1	
Ravenswood Slough (02i)	ISP	NAm	RAV-T1	Also surveyed by RAV-T2 for SBSPRP
Ravenswood Open Space Preserve (02j)	none	none	none	Insufficient habitat (2017)
Deepwater Slough (02k)	-	-	-	
<i>Middle Bair N (02k)</i>	ISP	NAm	MBE-T1	
<i>Middle Bair SE (02k)</i>	ISP	NAm	MBE-T1	
Inner Bair Island Restoration (02l)	ISP	NAm	IBI-T1	
Pond B3 Bair Island Restoration (02m)	ISP	NAm	OBW-T1	Insufficient habitat (2018)
SF2 (02n)	none	none	none	Insufficient habitat (2017)
Middle Bair West (02o)	none	none	none	Insufficient habitat (2017)

Sub-area Name (ID)	Survey Organization	Survey Type	Transect	Notes
<b>Area 03: Blackies Pasture and Mouth in Marin Region</b>				
Blackie's Creek (03a)	none	none	none	Insufficient habitat (2017)
Blackie's Creek Mouth (03b)	none	none	none	Insufficient habitat (2017)
<b>Area 04: Corte Madera Creek in Marin Region</b>				
CMC Marsh Reserve (04a)	PBCS	NAm	HEER-T1	
College of Marin (04b)	none	none	none	Insufficient habitat (2019)
Piper Park - East (04c)	ISP	NAm	PIPE-T1	
Piper Park - West (04d)	ISP	NAm	PIPE-T1	
Larkspur Ferry Landing Area (04e)	none	none	none	Insufficient habitat (2017)
Riviera Circle (04f)	none	none	none	Insufficient habitat (2017)
Creepside Park (04g)	PCBS	NAm	CSPK-T1	
CMC - Upper (04h)	PCBS	NAm*	CSPK-T1	*Surveyed from adjacent site
CMC - Lower (04i)	none	none	none	Not surveyed – assume presence
CMC - Mouth (04j)	-	-	-	Split into two sub-areas in 2011
<i>CMC - Mouth North (04j.1)</i>	ISP	NAm	CMCM-T1	
<i>CMC - Mouth South (04j.2)</i>	PBCS	NAm*	HEER-T1	*Surveyed from adjacent site
Boardwalk No. 1 (04k)	ISP	NAm	PIPE-T1	
Murphy Creek (04l)	none	none	none	Insufficient habitat (2016)
<b>Area 05: Coyote Creek / Mowry in Dumbarton South Region</b>				
Mowry Marsh (05a.1)	-	-	-	Grouped into one sub-area by ISP control program
<i>Mowry Marsh North (05a.1)</i>	ISP	NAm	MOWN-T1	
<i>Mowry Marsh South Bayshore (05a.1)</i>	none	none	none	Not surveyed
<i>Mowry Slough Upper (05a.1)</i>	none	none	none	Not surveyed
<i>Mowry Marsh South (05a.1)</i>	none	none	none	Not surveyed
Calaveras Point (05a.2)	ISP	NAm	CAPT-T1	
Dumbarton/Audubon (05b)	-	-	-	Grouped into one sub-area by ISP control program
<i>Dumbarton/Audubon (05b)</i>	DENWR	NAm	DUMA-T2	
<i>Dumbarton/Audubon East (05b)</i>	none	none	none	Not surveyed
<i>Plummer Creek (05b)</i>	none	none	none	Not surveyed
Newark Slough (05c)	-	-	-	Split into two sub-areas in 2011
<i>Newark Slough West (05c.1)</i>	ISP	NAm	NEWS-T1	
<i>Newark Slough East (05c.2)</i>	ISP	NAm	NEWS-T1	
LaRiviere Marsh (05d)	DENWR	NAm	LARV-T1	
Mayhew's Landing (05e)	ISP	NAm	MALA-T1	
Coyote Creek - Alameda County (05f)	-	-	-	Grouped into one sub-area by ISP control program
<i>Coyote Creek - Mud Slough (05f)</i>	ISP	NAm	A21-T1	Surveyed from adjacent site
<i>Coyote Creek - North (05f)</i>	none	none	none	Not surveyed
<i>Coyote Creek Lagoon (05f)</i>	DENWR	NAm	CCL-T1	
Cargill Pond (W Suites Hotel) (05g)	ISP	NAm	MALA-T1	Surveyed from adjacent site
Plummer Creek Mitigation (05h)	ISP	NAm	PLCM-T1	
Island Ponds (05i)	-	-	-	Grouped into one sub-area by ISP control program
<i>Island Ponds - A21 (05i)</i>	ISP	NAm	A21-T1	
<i>Island Ponds - A20 (05i)</i>	none	none	none	
<i>Island Ponds - A19 (05i)</i>	none	none	none	

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Sub-area Name (ID)	Survey Organization	Survey Type	Transect	Notes
<b>Area 06: Emeryville Crescent in Bay Bridge North Region</b>				
Emeryville Crescent - East (06a)	ISP	NAm	EMCR-T1	
Emeryville Crescent - West (06b)	ISP	NAm	EMCR-T1	
<b>Area 07: Oro Loma in Hayward Region</b>				
Oro Loma - East (07a)	ISP	NAm	ORLW-T1	
Oro Loma - West (07b)	ISP	NAm	ORLW-T3	
<b>Area 08: Palo Alto Baylands in Dumbarton South Region</b>				
Palo Alto Baylands (08)	-	-	-	Grouped into one sub-area by ISP control program
<i>Palo Alto Baylands (08)</i>	PBCS	NAm	PAB-T1	
<i>Palo Alto Harbor (08)</i>	PBCS	NAm	PAHA-T1	
<b>Area 09: Pickleweed Park in Marin Region</b>				
Pickleweed Park (09)	ISP	NAm	PIPK-T1	
<b>Area 10: Point Pinole Marshes in Bay Bridge North Region</b>				
Whittel Marsh (10a)	ISP	NAm	PTPN-T1	
Southern Marsh (10b)	none	none	none	Insufficient habitat (2017)
Giant Marsh (10c)	EBRPD	NAm	unknown	
Breuner Marsh Restoration (10d)	none	none	none	Insufficient habitat (2017)
<b>Area 11: Carquinez Straits in Vallejo Region</b>				
Southampton Marsh (11)	ARA	G	n/a	
<b>Area 12: Southeast San Francisco in San Francisco Bay Region</b>				
Pier 94 (12a)	none	none	none	Insufficient habitat (2016)
Pier 98/Heron's Head (12b)	ESA	G	n/a	
India Basin (12c)	none	none	none	Insufficient habitat (2014)
Hunters Point Naval Reserve (12d)	none	none	none	Insufficient habitat (2017)
Yosemite Channel (12e)	none	none	none	Insufficient habitat (2017)
Candlestick Cove (12f)	none	none	none	Insufficient habitat (2017)
Crissy Field (12g)	none	none	none	Insufficient habitat (2017)
Yerba Buena Island (12h)	none	none	none	Insufficient habitat (2017)
Mission Creek (12i)	none	none	none	Insufficient habitat (2016)
<b>Area 13: Whales Tail Complex in Union City Region</b>				
OAC - North Bank (13a)	ISP	NAm	OAC-T2; OAC-T3	
OAC - Island (13b)	ISP	NAm	OAC-T2; OAC-T3	
OAC - South Bank (13c)	ISP	NAm	OAC-T2; OAC-T3	Also surveyed for SBSPRP from OAC-T4 using NAm Protocol
Whale's Tail - North (13d)	ISP	NAm	WTN-T1	
Whale's Tail - South (13e)	ISP	NAm	WTS-T1	
Cargill Mitigation Marsh (13f)	ISP	NAm	WTS-T1	Also surveyed for SBSPRP from OAC-T4 using NAm Protocol
OAC - Upstream 20 Tide Gates (13g)	none	none	none	Insufficient habitat (2016)
Eden Landing - North Creek (13h)	none	none	none	Insufficient habitat (2017)
Eden Landing - Pond 10 (13i)	none	none	none	Insufficient habitat (2017)
Eden Landing - Mt Eden Creek (13j)	ISP	NAm	EDEN-T1	
Eden Landing Reserve - South (13k)	ISP	NAm	ELRS-T1	
Eden Landing Reserve - North (13l)	ISP	NAm	ELRS-T1	
Eden Landing - Ponds E8A, E9, E8X (13m)	none	none	none	Insufficient habitat (2017)

Sub-area Name (ID)	Survey Organization	Survey Type	Transect	Notes
<b>Area 15: South Bay Marshes in Dumbarton South Region</b>				
Charleston Slough to Mountain View Slough (15a.1)	-	-	-	Grouped into one sub-area by ISP control program
<i>Charleston Slough (15a.1)</i>	ISP	NAm	MVSL-T1	
<i>Mountain View Sl. Mouth (15a.1)</i>	ISP	NAm	MVSL-T1	
<i>Mountain View Slough (15a.1)</i>	SBSRP	NAm	MVSL-T2	
Stevens Creek to Guadalupe Slough (15a.2)	-	-	-	Grouped into one sub-area by ISP control program
<i>Stevens Creek to Long Point (15a.2)</i>	ISP	NAm	STEV-T1	
<i>Guadalupe to Stevens Bayfront (15a.2)</i>	none	none	none	Not surveyed
Guadalupe Slough (15a.3)	ISP	NAm	GUSL-T2	New transect in 2023
Alviso Slough (15a.4)	ISP	NAm	ALSL-T2	
Coyote Creek to Artesian Slough (15a.5)	-	-	-	Grouped into one sub-area by ISP control program
<i>Coyote Creek South East (15a.5)</i>	DENWR	NAm	COYE-T1	
<i>Coyote Creek South Tributary Marsh (15a.5)</i>	none	none	none	Not surveyed
<i>Artesian Slough (15a.5)</i>	none	none	none	Not surveyed
Knapp Tract (15a.6)	ISP	NAm	KNAP-T1	
Pond A17 (15a.7)	none	none	none	Insufficient habitat (2019)
Faber/Laumeister (15b)	-	-	-	Grouped into one sub-area by ISP control program
<i>Faber Marsh (15b)</i>	PBCS	NAm	FABE-T1	
<i>Laumeister Marsh (15b)</i>	PBCS	NAm	LAUM-T1	
Stevens Creek (15c)	ISP	NAm	STEV-T1	
<b>Area 16: Cooley Landing in Dumbarton South Region</b>				
Cooley Landing (16)	-	-	-	Split into two sub-areas in 2011
<i>Cooley Landing Central (16.1)</i>	ISP	NAm	COLA-T1	
<i>Cooley Landing East (16.2)</i>	ISP	NAm	COLA-T1	
<b>Area 17: San Leandro Bay in San Leandro Bay Region</b>				
Elsie Roemer (17a)	EBRPD	unknown	unknown	
Bay Farm Island (17b)	none	none	none	Insufficient habitat (2017)
Arrowhead Marsh (17c)	-	-	-	Split into two sub-areas in 2012
<i>Arrowhead Marsh West (17c.1)</i>	ISP	NAm	ARHE-T2	
<i>Arrowhead Marsh East (17c.2)</i>	ISP	NAm	ARHE-T2	
MLK Shoreline (17d)	-	-	-	Split into five sub-areas in 2011
<i>Airport Channel - Fan Shore (17d.1)</i>	none	none	none	Insufficient habitat (2017)
<i>Airport Channel - MLK Shoreline (17d.2)</i>	none	none	none	Insufficient habitat (2017)
<i>East Creek - MLK Shoreline (17d.3)</i>	none	none	none	Insufficient habitat (2017)
<i>MLK Regional Shoreline - Damon (17d.4)</i>	ISP	NAm	MLKS-T1	
<i>Elmhurst Creek - MLK Shoreline (17d.5)</i>	ISP	NAm*	MLKS-T1	*Surveyed from adjacent site
San Leandro Creek (17e)	-	-	-	Split into two sub-areas in 2011
<i>San Leandro Creek North (17e.1)</i>	ISP	NAm*	MLKR-T1	*Surveyed from adjacent site
<i>San Leandro Creek South (17e.2)</i>	ISP	NAm*	MLKR-T1	*Surveyed from adjacent site
Oakland Inner Harbor (17f)	none	none	none	Insufficient habitat (2017)
Coast Guard Is (17g)	none	none	none	Insufficient habitat (2017)
MLK New Marsh (17h)	ISP	NAm	MLKR-T1	
Coliseum Channels (17i)	none	none	none	Insufficient habitat (2017)

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Sub-area Name (ID)	Survey Organization	Survey Type	Transect	Notes
Fan Marsh (17j)	-	-	-	Split into two sub-areas in 2018
<i>Fan Marsh Wings (17j.1)</i>	ISP	NAm	FANM-T1	
<i>Fan Marsh Main (17j.2)</i>	ISP	NAm	FANM-T1	
Airport Channel (17k)	none	none	none	Insufficient habitat (2017)
Doolittle Pond (17l)	none	none	none	Insufficient habitat (2017)
Alameda Island - East (17m)	none	none	none	Insufficient habitat (2017)
<b>Area 18: Colma Creek/ San Bruno in San Francisco Peninsula Region</b>				
Colma Creek (18a)	none	none	none	Insufficient habitat (2017)
Navigable Slough (18b)	none	none	none	Insufficient habitat (2017)
Old Marina (18c)	none	none	none	Insufficient habitat (2014)
Inner Harbor (18d)	none	none	none	Insufficient habitat (2014)
Sam Trans Peninsula (18e)	none	none	none	Insufficient habitat (2017)
Confluence Marsh (18f)	none	none	none	Insufficient habitat (2017)
San Bruno Marsh (18g)	none	none	none	Insufficient habitat (2017)
San Bruno Creek (18h)	none	none	none	Insufficient habitat (2017)
<b>Area 19: West San Francisco Bay in San Francisco Peninsula Region</b>				
Brisbane Lagoon (19a)	none	none	none	Insufficient habitat
Sierra Point (19b)	none	none	none	Insufficient habitat (2015)
Oyster Cove (19c)	none	none	none	Insufficient habitat (2016)
Oyster Point Marina (19d)	none	none	none	Insufficient habitat (2015)
Oyster Point Park (19e)	none	none	none	Insufficient habitat (2016)
Point San Bruno (19f)	none	none	none	Insufficient habitat (2017)
Seaplane Harbor (19g)	none	none	none	Insufficient habitat (2017)
SFO (19h)	ISP	NAm	SFO-T1	
Mills Creek Mouth (19i)	none	none	none	Insufficient habitat (2017)
Easton Creek Mouth (19j)	none	none	none	Insufficient habitat (2017)
Sanchez Marsh (19k)	None	None	None	Insufficient habitat (2019)
Burlingame Lagoon (19l)	none	none	none	Insufficient habitat (2017)
Fisherman's Park (19m)	none	none	none	Insufficient habitat (2014)
Coyote Point Marina (19n)	none	none	none	Insufficient habitat (2017)
San Mateo Creek (19o)	none	none	none	Insufficient habitat (2017)
Seal Slough (19p)	-	-	-	Split into two sub-areas in 2011
<i>Seal Slough Central (19p.1)</i>	ISP	NAm	SEAL-T1	
<i>Seal Slough Peripheral (19p.2)</i>	ISP	NAm	SEAL-T1	
Foster City (19q)	none	none	none	Insufficient habitat (2017)
Anza Lagoon (19r)	none	none	none	Insufficient habitat (2016)
Maple Street Channel (19s)	none	none	none	Insufficient habitat (2017)
<b>Area 20: San Leandro / Hayward Shoreline in Hayward Region</b>				
Oyster Bay Regional Shoreline (20a)	none	none	none	Insufficient habitat (2017)
Oakland Golf Links (20b)	none	none	none	Insufficient habitat (2017)
Dog Bone Marsh (20c)	ISP	NAm	NORT-T1	
Citation Marsh (20d)	-	-	-	Split into three sub-areas in 2011 & 2018
<i>Citation Marsh South (20d.1)</i>	ISP	NAm	CITA-T1	
<i>Citation Marsh Upper (20d.2a)</i>	ISP	NAm	CITA-T1	Split in renegotiated in 2020
<i>Citation Marsh Central (20d.2b)</i>	ISP	NAm	CITA-T1	Split in renegotiated in 2020
East Marsh (20e)	ISP	NAm*	SLRZ-T1	*Surveyed from adjacent site
North Marsh (20f)	ISP	NAm	NORT-T1	



Sub-area Name (ID)	Survey Organization	Survey Type	Transect	Notes
Bunker Marsh (20g)	ISP	NAm	BUNK-T1	
San Lorenzo Creek (20h)	-	-	-	Split into two sub-areas in 2012
<i>San Lorenzo Creek North (20h.1)</i>	ISP	NAm	SLRZ-T1	
<i>San Lorenzo Creek South (20h.2)</i>	ISP	NAm	SLRZ-T1	
Bockman Channel (20i)	none	none	none	Insufficient habitat (2017)
Sulphur Creek (20j)	none	none	none	Insufficient habitat (2017)
Hayward Landing (20k)	none	none	none	Insufficient habitat (2017)
Johnson's Landing (20l)	none	none	none	Insufficient habitat (2017)
Cogswell - Sec A (20m)	ISP	NAm	COGS-T1	
Cogswell - Sec B (20n)	-	-	-	Split into three sub-areas in 2018
<i>Cogswell - Sec B Bayfront (20n.1)</i>	ISP	NAm	COGS-T3	
<i>Cogswell - Sec B South (20n.2)</i>	ISP	NAm	COGS-T3	
<i>Cogswell - Sec B Main (20n.3)</i>	ISP	NAm	COGS-T3	
Cogswell - Sec C (20o)	ISP	NAm	COGS-T2	
Hayward Shoreline Outliers (20p)	none	none	none	Insufficient habitat (2017)
San Leandro Shoreline Outliers (20q)	none	none	none	Insufficient habitat (2017)
Oakland Airport (20r)	none	none	none	
HARD Marsh (20s)	ISP	NAm	HARD-T1	
San Leandro Marina (20t)	none	none	none	Insufficient habitat (2017)
Estudillo Creek Channel (20u)	none	none	none	Insufficient habitat (2017)
Hayward Landing Canal (20v)	none	none	none	Insufficient habitat (2017)
Triangle Marsh - Hayward (20w)	ISP	NAm	TRMA-T1	
<b>Area 21: Ideal Marsh in Union City Region</b>				
Ideal Marsh - North (21a)	DENWR	NAm	IMAN-T1	
Ideal Marsh - South (21b)	ISP	NAm	IMAS-T1	
<b>Area 22: Two Points Complex in Bay Bridge North Region</b>				
Wildcat Marsh (22a)	PBCS	NAm	WIMA-T1	
San Pablo Marsh (22b)	-	-	-	Split into two sub-areas in 2011
<i>San Pablo Marsh East (22b.1)</i>	ISP	NAm	RIF-T1	
<i>San Pablo Marsh West (22b.2)</i>	ISP	NAm	RIF-T1	
Rheem Creek Area (22c)	ISP	NAm	RCRA-T1	
Stege Marsh (22d)	-	-	-	Grouped into one sub-area by ISP control program
<i>Stege Marsh (22d)</i>	ISP	NAm	STEG-T1	
<i>Meeker Slough (22d)</i>	ISP	NAm	STEG-T1	
Hoffman Marsh (22e)	ISP	NAm	STEG-T1	
Albany Shoreline (22f)	none	none	none	Insufficient habitat (2017)
<b>Area 23: Marin Outliers in Marin and Petaluma Regions</b>				
Brickyard Cove (23a)	none	none	none	Insufficient habitat (2017)
Beach Drive (23b)	none	none	none	Insufficient habitat (2017)
Loch Lomond Marina (23c)	none	none	none	Insufficient habitat (2017)
San Rafael Canal Mouth (23d)	-	-	-	Split into two sub-areas in 2011
<i>San Rafael Canal Mouth East (23d.1)</i>	ISP	NAm	PIPK-T1	
<i>San Rafael Canal Mouth West (23d.2)</i>	ISP	NAm	PIPK-T1	

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Sub-area Name (ID)	Survey Organization	Survey Type	Transect	Notes
Muzzi and Martas Marsh (23e)	-	-	-	Grouped into one sub-area by ISP control program
<i>Martas Marsh (23e)</i>	PBCS	NAm	MUZZ-T1	
<i>San Clemente Creek (23e)</i>	PBCS	NAm	MUZZ-T1	
<i>Muzzi Marsh (23e)</i>	PBCS	NAm	MUZZ-T1	
Paradise Cay (23f)	none	none	none	Insufficient habitat (2017)
Greenwood Beach (23g)	none	none	none	Insufficient habitat (2017)
Strawberry Point (23h)	none	none	none	Insufficient habitat (2017)
Strawberry Cove (23i)	none	none	none	Insufficient habitat (2017)
Bothin Marsh (23j)	PCBS	NAm	THF-T1	
Sausalito (23k)	none	none	none	Insufficient habitat (2015)
Starkweather Park (23l)	none	none	none	Insufficient habitat (2020)
Novato (23m)	-	-	-	Grouped into one sub-area by ISP control program
<i>Hamilton South (23m)</i>	PBCS	NAm	MIN-T1	
<i>Mitchell Fragment (23m)</i>	PBCS	NAm	GACR-T1	
<i>Santa Venetia (23m)</i>	PBCS	NAm	STVE-T1	
<i>Gallinas Creek North (23m)</i>	PBCS	NAm	GACR-T1	
<i>McInnis Marsh (23m)</i>	PBCS	NAm	MIM-T1	
<i>Novato Creek Mouth (23m)</i>	none	none	none	Not surveyed – assume presence
<i>Gallinas Creek South (23m)</i>	PBCS	NAm	GACM-T1	
<i>Hamilton North (23m)</i>	none	none	none	Not surveyed – assume presence
<i>Novato Creek Mid Reach (23m)</i>	none	none	none	Not surveyed – assume presence
Triangle Marsh - Marin (23n)	none	none	none	Insufficient habitat (2020)
China Camp (23o)	PBCS	NAm	CCM-T1	
<b>Area 24: Petaluma River in Petaluma Region</b>				
Petaluma River - Upper (24a)	ISP	NAm	PDF-T1	
Grey's Field (24b)	ISP	NAm	GRFI-T1	
Petaluma Marsh (24c)	-	-	-	Grouped into one sub-area by ISP control program
<i>Tule Slough (24c)</i>	PBCS	NAm	FASL-T1	
<i>False Slough (24c)</i>	PBCS	NAm	FASL-T1	
<i>Lakeville Marina (24c)</i>	none	none	none	Not surveyed – assume presence
<i>Ellis Creek (24c)</i>	OEI	NAm	ELCR-T2	Surveyed for City of Petaluma
<i>Petaluma Marsh Expansion Project (24c)</i>	none	none	none	Not surveyed – assume presence
<i>San Antonio Creek (E) (24c)</i>	none	none	none	Not surveyed – assume presence
<i>Petaluma River (C) (24c)</i>	none	none	none	Not surveyed – assume presence
<i>San Antonio Creek (A) (24c)</i>	none	none	none	Not surveyed – assume presence
<i>Mira Monte Slough (B) (24c)</i>	none	none	none	Not surveyed – assume presence
<i>Mud Hen Slough (D) (24c)</i>	none	none	none	Not surveyed – assume presence
<i>Schultz Slough (24c)</i>	PBCS	NAm	SCHU-T1	
<i>Gambini Marsh (24c)</i>	PBCS	NAm	SCHU-T1	
<i>Woloki Slough (24c)</i>	none	none	none	Not surveyed – assume presence

Sub-area Name (ID)	Survey Organization	Survey Type	Transect	Notes
Lower Petaluma River (24d)	-	-	-	Grouped into one sub-area by ISP control program
<i>Day Island Wildlife Area (24d)</i>	none	none	none	Not surveyed
<i>Petaluma River - West Side (24d)</i>	PBCS	NAm	GRPT-T1	
<i>Carl's Marsh (24d)</i>	PBCS	NAm	PRM-T1	
<i>Green Point Area Marshes (24d)</i>	PBCS	NAm	GRPT-T1	
<i>Sonoma Marina (24d)</i>	PBCS	NAm	RMA-T1	
<i>Petaluma River - Lower (24d)</i>	PBCS	NAm	BJSN-T1	
<i>Black John Slough North (24d)</i>	PBCS	NAm	BJSN-T1	
<i>Black John Slough A (24d)</i>	PBCS	NAm	BJSN-T1	
<i>Bahia Channel (24d)</i>	none	none	none	Not surveyed
<i>Black John Slough B (24d)</i>	none	none	none	Not surveyed
<b>Area 25: Outer Coast in Outer Coast Region</b>				
Tom's Point, Tomales (25a)	none	none	none	Not surveyed
Limantour Estero (25b)	none	none	none	Not surveyed
Drakes Estero (25c)	none	none	none	Not surveyed
Bolinas Lagoon - North (25d)	PBCS	NAm	BOLA-T1	
Bolinas Lagoon - South (25e)	none	none	none	Not surveyed
<b>Area 26: North San Pablo Bay in Petaluma and Vallejo Regions</b>				
Napa River (26a)	-	-	-	Grouped into one sub-area by ISP control program
<i>Coon Island (26a)</i>	PBCS	NAm	COIS-T1	
<i>Fly Bay (26a)</i>	CDFW	NAm	FB-T1	
<i>Napa Tract Salt Pond 5 (26a)</i>	CDFW	NAm	NASL-T1	
<i>Napa Tract Salt Pond 4 (26a)</i>	CDFW	NAm	NACM-T1	
<i>White Slough Marsh (26a)</i>	none	none	none	Not surveyed
<i>Fagan Slough (26a)</i>	none	none	none	Not surveyed
<i>Pond 2A Restoration (26a)</i>	none	none	none	Not surveyed
<i>Napa Centennial Marsh (26a)</i>	CDFW	NAm	NACM-T1	
<i>Bull Island (26a)</i>	none	none	none	Not surveyed
<i>Napa Plant Site Restoration (26a)</i>	none	none	none	Not surveyed
<i>Skaggs Island Bridge / Napa Slough (26a)</i>	none	none	none	Not surveyed
<i>Dutchman Slough Mouth (26a)</i>	none	none	none	Not surveyed
<i>Napa Tract Salt Pond 7 (26a)</i>	none	none	none	Not surveyed
<i>Napa Tract Intake Pond 1A (26a)</i>	none	none	none	Not surveyed
<i>Hudeman Slough (26a)</i>	none	none	none	Not surveyed
<i>Napa Tract Intake Pond 1 (26a)</i>	none	none	none	Not surveyed
<i>Napa Tract Salt Pond 6A (26a)</i>	none	none	none	Not surveyed
<i>Napa Tract Salt Pond 6 (26a)</i>	none	none	none	Not surveyed
<i>Guadacanal Village (26a)</i>	none	none	none	Not surveyed
<i>Dutchman Slough (26a)</i>	none	none	none	Not surveyed
<i>Napa Tract Salt Pond 2 (26a)</i>	none	none	none	Not surveyed
<i>Napa Tract Salt Pond 3 (26a)</i>	none	none	none	Not surveyed
<i>Napa Tract Salt Pond 7A (26a)</i>	none	none	none	Not surveyed
<i>China Slough (26a)</i>	none	none	none	Not surveyed
<i>Devil's Slough (26a)</i>	none	none	none	Not surveyed
<i>Cullinan Ranch (26a)</i>	none	none	none	Not surveyed

## Appendix I: Survey Plans

<b>Sub-area Name (ID)</b>	<b>Survey Organization</b>	<b>Survey Type</b>	<b>Transect</b>	<b>Notes</b>
San Pablo Bay NWR Shoreline (26b)	none	none	none	Not surveyed
Sonoma Creek (26c)	SPBNWR	NAm	SC-T1,T2	
Sonoma Baylands (26d)	-	-	-	Grouped into one sub-area by ISP control program
<i>Lower Tubbs Island (26d)</i>	none	none	none	Not surveyed in 2023
<i>Tolay Creek (26d)</i>	SPBNWR	NAm	TC-T1	
<i>Tubbs Island Restoration (26d)</i>	SPBNWR	NAm	TS-T1	
<i>Petaluma River Mouth (26d)</i>	PBCS	NAm	RMA	
<i>Sonoma Baylands Restoration (26d)</i>	PBCS	NAm	SBR-T1	
<i>Sonoma Baylands East (26d)</i>	SPBNWR	NAm	SMW-T1	
<b>Area 27: Suisun Marshes in Suisun Region</b>				
Point Buckler (27a)	none	none	none	
MOTCO Islands (27b)	OEI	NAm	RYNW-T1, FREE-T1, SNAG-T1	Freeman, Snag, and Ryer Islands
Honker Bay (27c)	none	none	none	

**Appendix II: 2023 Survey Station Coordinates in UTM (NAD83, Zone 10)**

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Appendix II: 2023 Station Coordinates

Appendix II: Survey stations grouped by region and ordered by transect name.  
 Geographic coordinates are in UTM (NAD83, Zone10).

Transect Name	Sub-Area Code/s	Site Name/s	Point ID	X-coordinate	Y-coordinate
<b>MARIN REGION</b>					
CMCM-T1	04j.1	CMC - Mouth	CMCM12	542958	4199629
			CMCM13	543185	4199682
PIPE-T1	04c 04d 04k	Piper Park & Boardwalk 1	PIF03	541478	4199615
			PIPE01	541484	4199149
			PIPE02	541459	4199364
			PIPE04	541308	4199419
			PIPE05	541136	4199313
PIPK-T1	09 23d.1 23d.2	Pickleweed Park & San Rafael Canal Mouth	PIPK01	544265	4202286
			PIPK02	544239	4202484
			PIPK03	544183	4202641
			SRCM01	544244	4202876
			SRCM02	544370	4202758
<b>SAN FRANCISCO PENINSULA REGION</b>					
SEAL-T1	19p.1 19p.2	Seal Slough	SEAL01	562560	4158484
			SEAL03	562728	4158450
			SEAL04	562857	4158548
			SEAL05	562861	4158725
			SEAL07	562432	4158448
SFO-T1	19h	SFO	SFO04	555438	4163237
			SFO05	555203	4162889
			SFO06	555111	4162711
			SFO07	555019	4162530
			SFO18	554906	4162329
<b>SAN MATEO REGION</b>					
CORK-T1	02b.1	Corkscrew Slough	CORK01	569367	4153611
			CORK03	568904	4152988
			CORK04	568894	4152635
			CORK05	568642	4152904
			CORK06	568356	4153005
			CORK12	569244	4153305
GRIN-T1	02f	Greco Island - North	GRIN11	570647	4153106
			GRIN12	570811	4152993
			GRIN13	570976	4152877
			GRIN14	571140	4152762
			GRIN15	571306	4152647
			GRIN16	571471	4152533
			GRIN17	571635	4152418
			GRIN18	571800	4152305

Transect Name	Sub-Area Code/s	Site Name/s	Point ID	X-coordinate	Y-coordinate
<b>SAN MATEO REGION (continued)</b>					
GRIS-T1	02h	Greco Island - South	GRIS01	573018	4150394
			GRIS02	573016	4150596
			GRIS03	573015	4150799
			GRIS04	573014	4150998
			GRIS05	572969	4151193
			GRIS06	572825	4151345
IBI-T1	02i	Inner Bair Island Restoration	IBI11	567713	4150454
			IBI13	567298	4150636
			IBI15	567004	4150939
			IBI17	566763	4151267
MBE-T1	02k	Deepwater Slough	MBE01	569714	4153286
			MBE02	569544	4153178
			MBE03	569366	4153061
			MBE04	569249	4152883
			MBE05	569153	4152697
			MBSE02	568726	4151546
			MBSE04	568800	4151947
			MBSE06	568955	4152326
OBEN-T1	02c.1a 02c.1b	B2 North Quadrant	OBE12	569256	4154869
			OBE14	569206	4154429
			OBE16	568775	4154924
OBEN-T2	02c.2		OBE06	569311	4154036
			OBE09	568814	4154381
			OBE11	568471	4154620
			OBE19	568408	4155098
OBES-T1	02d.1a 02d.1b 02d.2 02d.3		OBE04	569963	4154250
			OBE22	569611	4154402
			OBE23	569663	4154619
		OBE25	569779	4155025	
		OBE26	569843	4154667	
		OBE27	569990	4154545	
		OBES24	569733	4154871	
OBW-T1	02m	Pond B3 Bair Island Restoration	OBW01	567882	4154015
			OBW02	567997	4154227
			OBW03	568180	4154348
			OBW04	568467	4154287
			OBW05	568469	4154054
			OBW06	568470	4153817
			OBW07	568471	4153575
			OBW08	568471	4153347
RAV-T1	02i	Ravenswood Slough	RAV02	575826	4149650
			RAV03	575665	4149768
			RAV04	575468	4149813
			RAV05	575260	4149863
			RAV06	574884	4150110
			RAV09	574950	4149885
			RAV10	574806	4150724

Appendix II: 2023 Station Coordinates

Transect Name	Sub-Area Code/s	Site Name/s	Point ID	X-coordinate	Y-coordinate
<b>SAN MATEO REGION (continued)</b>					
RESH-T2	02b.2	Steinberger Slough	RESH13	567756	4154757
			RESH14	567816	4154983
			RESH15	567780	4154559
			RESH16	567956	4155133
			RESH17	568105	4155282
			RESH18	568239	4155444
WPSS-T1	02g	West Point Slough - SW / E	WPSS09	572707	4150059
			WPSS10	572706	4149686
			WPSS11	572704	4149455
			WPSS12	572613	4149215
<b>DUMBARTON SOUTH REGION</b>					
A21-T1	05f 05i	Island Ponds - A21 & Mud Slough	A21-01	589676	4146880
			A21-02	589848	4146987
			A21-03	590549	4147430
			A21-04	589991	4147127
			A21-05	590110	4147286
			A21-06	590276	4147430
			A21-07	590658	4147236
			A21-08	590646	4147026
ALSL-T2	15a.4	Alviso Slough	MAL01	586761	4146451
			MAL02	586668	4146281
			MAL04	586898	4145918
			MAL06	586942	4145527
			MAL07	587021	4146548
			MAL08	587328	4146607
			MAL09	587646	4146656
			MAL10	587905	4146704
CAPT-T1	05a.2	Calaveras Point	CAPT08	586510	4147007
			CAPT09	586281	4146933
			CAPT10	586088	4146915
			CAPT11	585889	4146857
			CAPT12	585689	4146818
			CAPT13	585492	4146774
			CAPT16	585333	4146717
COLA-T1	16.1 16.2	Cooley Landing	COLA05	576891	4148770
			COLA06	576956	4148944
			COLA07	577129	4149051
			COLA08	577293	4149164
			COLA09	576775	4148568
			COLA10	576825	4148373
			COLA11	576961	4148238
			COLA12	577112	4148090

Transect Name	Sub-Area Code/s	Site Name/s	Point ID	X-coordinate	Y-coordinate
<b>DUMBARTON SOUTH REGION (continued)</b>					
GUSL-T2	15a.3	Guadalupe Slough	GUSL10	587586	4142986
			GUSL11	587710	4143262
			GUSL12	587319	4143257
			GUSL13	586383	4143298
			GUSL14	585863	4144000
			GUSL15	584943	4144336
			GUSL16	585178	4145016
KNAP-T1	15a.6	Knapp Tract	KNAP01	586508	4146066
			KNAP02	586330	4146335
			KNAP03	586072	4146469
			KNAP04	585967	4146298
			KNAP05	585861	4146126
			KNAP06	585757	4145956
			KNAP07	585651	4145786
			KNAP08	585680	4145562
MALA-T1	05e 05g	Mayhew's Landing Cargill Pond (W Suites Hotel)	MALA01	582737	4154617
			MALA02	583007	4154376
			MALA03	582878	4154195
			MALA04	582888	4154002
			MALA05	583046	4153879
MOWN-T1	05a.1	Mowry Marsh North	MOSL10	581198	4151329
			MOSL12	581587	4151341
			MOSL14	581968	4151220
			MOSL16	582349	4151098
			MOSL18	582734	4150973
			MOSL20	583117	4150850
			MOSL22	583484	4150697
MVSL-T1	15a.1	Charleston Slough	CHSL01	580426	4145106
			CHSL03	580657	4145153
			CHSL04	580414	4144826
		Mountain View Slough	MVSL04	581043	4145153
			MVSL05	581422	4145011
NEWS-T1	05c.1 05c.2	Newark Slough	NEW02	581705	4154094
			NEW03	581878	4153982
			NEW04	582059	4153878
			NEW05	582040	4153642
			NEW06	582159	4153474
			NEW07	582333	4153544
			NEW09	581635	4154254
PLCM-T1	05h	Plummer Creek Mitigation	PLCM01	583615	4152372
			PLCM02	583484	4152202
			PLCM03	583517	4152021

Appendix II: 2023 Station Coordinates

Transect Name	Sub-Area Code/s	Site Name/s	Point ID	X-coordinate	Y-coordinate
<b>DUMBARTON SOUTH REGION (continued)</b>					
STEV-T1	15a.2 15c	Stevens Creek to Long Point	LONG09	582630	4144724
			LONG10	582401	4144385
			LONG11	582369	4144019
			STEV01	582431	4143425
			STEV02	582421	4143224
<b>UNION CITY REGION</b>					
AFCC-T4	01c 01d	AFCC - Upper AFCC - to I-880	AFCC19	580009	4157650
			AFCC21	580393	4157555
			AFCC23	580793	4157508
			AFCC25	581190	4157474
			AFCC27	581585	4157557
			AFCC29	581966	4157673
			AFCC31	582309	4157863
			AFCC33	582544	4158195
AFCP-T1	01a 01b 01f	AFCC - Mouth & AFCC - Pond 3	AFCP02	576726	4157943
			AFCP04	576913	4158254
			AFCP06	577134	4158519
AFCP-T2	01b 01f	AFCC - Lower & AFCC - Pond 3	AFCP08	577453	4158695
			AFCP10	577812	4158729
			AFCP12	578156	4158628
			AFCP14	578481	4158477
EDEN-T1	13j	Eden Landing - Mt Eden Creek	EDEN01	576480	4163098
			EDEN02	576489	4162896
			EDEN03	576430	4162704
			EDEN04	576379	4162512
			EDEN05	576179	4162480
			EDEN06	575980	4162529
			WTN11	575778	4162563
ELRS-T1	13k 13l	Eden Landing Reserve - South (AKA North Creek Marsh) & Eden Landing Reserve - North	ELRS01	578202	4163533
			ELRS02	578057	4163383
			ELRS03	577994	4163189
			ELRS04	578001	4162988
			ELRS05	578422	4163525
			ELRS06	578540	4163362
			ELRS07	578657	4163200
			ELRS08	578777	4163039
IMAS-T1	21b	Ideal Marsh - South	IMAS12	577759	4155895
			IMAS14	578069	4155835
			IMAS16	578193	4155524
			IMAS18	578323	4155214
			IMAS20	578454	4154898
			IMAS22	578674	4154665
			IMAS24	578733	4154408
IMAS26	578451	4154320			



Transect Name	Sub-Area Code/s	Site Name/s	Point ID	X-coordinate	Y-coordinate
<b>UNION CITY REGION (continued)</b>					
OAC-T2	13a 13b 13c	OAC	ALCK10	577579	4161047
			ALCK11	577774	4161008
			ALCK12	577954	4160949
			ALCK13	578133	4160880
			ALCK14	578290	4160821
			ALCK15	578491	4160791
			ALCK16	578684	4160842
			ALCK17	578837	4160946
OAC-T3	13a 13b 13c	OAC	ALCK18	578983	4161058
			ALCK19	579146	4161152
			ALCK20	579342	4161159
			ALCK21	579538	4161155
			ALCK22	579723	4161150
			ALCK23	579901	4161149
			ALCK24	580056	4161217
			ALCK25	580098	4161389
WTN-T1	13d	Whale's Tail - North	ALCK26	580095	4161571
			ALCK27	580088	4161744
			WTN04	575865	4161341
			WTN05	575886	4161530
			WTN06	575813	4161676
			WTN07	575771	4161849
WTS-T1	13e	Whale's Tail - South	WTN08	575767	4162027
			WTN09	575762	4162212
			WTN10	575754	4162376
			WTS22	575754	4159900
			WTS23	575792	4160057
			WTS24	575813	4160265
			WTS28	575489	4161055
			WTS29	575688	4161029
BUNK-T1	20g	Bunker Marsh	WTS30	575854	4160992
			WTS31	575960	4160824
			WTS32	575969	4160626
			WTS33	575857	4160461
			BUNK01	573456	4170331
			BUNK02	573507	4170104
CITA-T1	20d.1 20d.2a 20d.2b	Citation Marsh	BUNK03	573561	4169912
			BUNK04	573631	4169725
			NORT08	573588	4170397
			SLRZ01	573737	4169556
			CITA01	573661	4170466
			CITA02	573555	4170639
			CITA03	573435	4170800
CITA-T1	20d.1 20d.2a 20d.2b	Citation Marsh	CITA04	573314	4170961
			CITA05	573318	4171265
			CITA06	573316	4171466
			CITA07	573314	4171666

Appendix II: 2023 Station Coordinates

Transect Name	Sub-Area Code/s	Site Name/s	Point ID	X-coordinate	Y-coordinate
<b>HAYWARD REGION (continued)</b>					
COGS-T1	20m 20w	Cogswell - Sec A & Triangle Marsh - Hayward	COGS01	574738	4166041
			COGS02	574713	4166250
			COGS03	574862	4166363
			COGS04	575059	4166368
			COGS05	575218	4166336
			COGS06	575158	4166170
			COGS07	575043	4166004
			TRMA02	574714	4166471
COGS-T2	20o 20l	Cogswell - Sec C & Johnson's Landing	COGS08	574984	4165788
			COGS09	575124	4165612
			COGS10	575138	4165412
			COGS11	575105	4165165
			COGS12	574791	4165248
			COGS13	574779	4165542
			COGS14	574781	4165740
			JOLA04	574909	4165104
COGS-T3	20n.1 20n.2 20n.3	Cogswell - Sec B	COGS15	575367	4165223
			COGS16	575572	4165228
			COGS17	575710	4165373
			COGS18	575620	4165538
			COGS19	575531	4165722
			COGS20	575436	4165912
			COGS21	575340	4166092
HARD-T1	20s	HARD Marsh	HARD01	575252	4164654
			HARD02	575438	4164560
			HARD03	575619	4164493
			HARD04	575816	4164414
			HARD05	575988	4164619
			JOLA02	575064	4164736
			NORT-T1	20f 20c	North Marsh & Dogbone Marsh
NORT01	573097	4171251			
NORT02	572949	4171118			
NORT03	572920	4170920			
NORT04	572877	4170757			
NORT05	572997	4170591			
NORT06	573168	4170488			
ORLW-T1	07a	Oro Loma - East	ORLW16	574840	4168558
			ORLW17	574749	4168949
			ORLW18	574912	4169047
			ORLW19	575313	4169028
			ORLW20	575474	4168815
			ORLW21	575441	4168567
			ORLW22	574705	4168708

Transect Name	Sub-Area Code/s	Site Name/s	Point ID	X-coordinate	Y-coordinate
<b>HAYWARD REGION (continued)</b>					
ORLW-T3	07b	Oro Loma - West	ORLW01	574936	4168382
			ORLW02	575023	4168204
			ORLW03	574972	4168062
			ORLW04	574771	4168057
			ORLW05	574584	4168057
			ORLW06	574382	4168054
			ORLW07	574308	4168235
SLRZ-T1	20e 20h.1 20h.2	San Lorenzo Creek & East Marsh	SLRZ03	573943	4169633
			SLRZ04	574138	4169774
			SLRZ05	574277	4169889
			SLRZ07	573896	4169503
			SLRZ08	573955	4169323
<b>SAN LEANDRO BAY REGION</b>					
ARHE-T2	17c.1 17c.2	Arrowhead Marsh	ARHE01	569510	4177535
			ARHE04	569262	4177549
			ARHE05	569146	4177718
			ARHE06	569063	4177898
FANM-T1	17j.1 17j.2	Fan Marsh	FANM01	568582	4177668
			FANM03	568635	4177820
			FANM05	568397	4177843
MLKR-T1	17h 17e.1 17e.2	MLK New Marsh & San Leandro Creek	MLKR01	569671	4177003
			MLKR02	569622	4177196
			MLKR03	569706	4177372
			MLKR05	569837	4177413
			MLKR06	569948	4177254
			MLKR07	570046	4177104
MLKS-T1	17d.4 17d.5	MLK Regional Shoreline: Damon Marsh & Damon Slough	MLKS09	569336	4178901
			MLKS10	569456	4178741
			MLKS11	569515	4178546
<b>BAY BRIDGE NORTH REGION</b>					
EMCR-T1	06a 06b	Emeryville Crescent - West & Emeryville Crescent - East	EMCR02	560250	4186896
			EMCR03	560177	4186720
			EMCR04	560358	4186670
			EMCR05	560565	4186723
			EMCR06	560742	4186744
			EMCR07	560954	4186746
			PTPN-T1	10a	Whittel Marsh
PTPN02	556460	4206771			
PTPN03	556645	4206685			
PTPN04	556830	4206771			
RCRA-T1	22c	Rheem Creek Area	RCRA03	555821	4203918
			RCRA04	555895	4204106
			RCRA05	555917	4204343
			RCRA12	555741	4203735

Appendix II: 2023 Station Coordinates

Transect Name	Sub-Area Code/s	Site Name/s	Point ID	X-coordinate	Y-coordinate
<b>BAY BRIDGE NORTH REGION (continued)</b>					
RIF-T1	22b.1 22b.2	San Pablo Marsh	RCRA06	555455	4203421
			RIF03	555102	4203043
			RIF09	554287	4203087
			RIF10	554704	4203067
			RIF11	555284	4203315
STEG-T1	22d 22e	Stege Marsh, Meeker Slough, & Hoffman Marsh	HOM06	559640	4195672
			HOM07	559818	4195374
			HOM08	560031	4195055
			MEEK03	558280	4196127
			MEEK04	558463	4196076
			MEEK05	558183	4195946
			MEEK06	558770	4195989
MEEK07	559080	4195902			
<b>PETALUMA REGION</b>					
GRFI-T1	24b	Grey's Field	GRFI01	536303	4230247
			GRFI02	535350	4230500
			GRFI03	535850	4230155
PDF-T1	24a	Petaluma River - Upper	PDF12	534648	4230802
			PDF13	533995	4231302
			PDF15	534562	4231234

### **Appendix III: 2023 OEI Survey Results for Each Round**

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The following tables describe the surveys conducted at each site including: the name of the project, the site name and ID code, the protocol used, whether broadcast was used, and the date, observer, temperature, and number of Ridgway's rails detected at the site for each round. A key to the tables is below.

#### Key to Observer

- **BO** = Brian Ort
- **DA** = Dorothy Aldridge
- **DP** = Dylan Pastor
- **DS** = Daniel Stephens
- **IS** = Isabella Sanchez-Mendoza
- **JH** = Jeanne Hammond
- **JM** = Jen McBroom
- **LD** = Lindsay Faye Domecus
- **MA** = Melanie Anderson
- **SG** = Simon Gunner
- **TR** = Tobias Rohmer



## MARIN REGION

Site Name (ID)	Transect	Round 1					Round 2					Round 3				
		Date	Observer	Temp (°C)	Wind (mph)	RIRA	Date	Observer	Temp (°C)	Wind (mph)	RIRA	Date	Observer	Temp (°C)	Wind (mph)	RIRA
CMC Mouth - North (04j.1)	CMCM-T1	1/23/23	LD	8	2	0	2/9/23	SG	6	0	0	3/8/23	MA	10	4	0
CMC Mouth - South (04j.2)	CMCM-T1	1/23/23	LD	8	2	0	2/9/23	SG	6	0	3	3/8/23	MA	10	4	0
Boardwalk No. 1 (04k)	PIPE-T1	1/23/23	LD	8	2	2	2/9/23	SG	6	4	0	3/8/23	MA	10	4	0
Piper Park - East (04c)	PIPE-T1	1/23/23	LD	8	2	1	2/9/23	SG	6	4	1	3/8/23	MA	10	4	2
Piper Park - West (04d)	PIPE-T1	1/23/23	LD	8	2	2	2/9/23	SG	6	4	1	3/8/23	MA	10	4	3
Pickleweed Park (09)	PIPK-T1	1/20/23	TR	10	2	0	2/9/23	JH	5	0	0	3/9/23	DP	6	3	0
San Rafael Canal Mouth East (23d.1)	PIPK-T1	1/20/23	TR	10	2	0	2/9/23	JH	5	0	0	3/9/23	DP	6	3	0
San Rafael Canal Mouth West (23d.2)	PIPK-T1	1/20/23	TR	10	2	0	2/9/23	JH	5	0	0	3/9/23	DP	6	3	0

**SAN FRANCISCO PENINSULA REGION**

Site Name (ID)	Transect	Round 1					Round 2					Round 3				
		Date	Observer	Temp (°C)	Wind (mph)	RIRA	Date	Observer	Temp (°C)	Wind (mph)	RIRA	Date	Observer	Temp (°C)	Wind (mph)	RIRA
Seal Slough Central (19p.1)	SEAL-T1	1/20/23	IS	8	7	0	2/9/23	DA	7	2	0	3/9/23	LD	7	7	0
Seal Slough Peripheral (19p.2)	SEAL-T1	1/20/23	IS	8	7	0	2/9/23	DA	7	2	0	3/9/23	LD	7	7	0
SFO (19h)	SFO-T1	2/8/23	TR	8	2	1	3/9/23	JM	7	7	0	3/23/23	SG	9	11	0

## SAN MATEO REGION

Site Name (ID)	Transect	Round 1					Round 2					Round 3				
		Date	Observer	Temp (°C)	Wind (mph)	RIRA	Date	Observer	Temp (°C)	Wind (mph)	RIRA	Date	Observer	Temp (°C)	Wind (mph)	RIRA
Corkscrew Slough (02b.1)	CORK-T1	1/26/23	MA	13	1	15	2/17/23	LD	4	2	2	3/15/23	IS	14	8	3
Greco Island - North (02f)	GRIN-T1	1/26/23	DP	18	3	0	2/17/23	TR	4	3	3	3/15/23	SG	12	6	0
Greco Island - South (02h)	GRIS-T1	1/18/23	TR	12	1	22	2/16/23	SG	12	0	25	3/20/23	JM	11	5	14
Inner Bair Island Restoration (02l)	IBI-T1	2/6/23	LD	11	7	0	3/2/23	TR	10	10	0	3/23/23	IS	10	9	0
Middle Bair N (02k)	MBE-T1	1/26/23	SG	23	3	15	2/17/23	IS	5	2	0	3/15/23	LD	14	9	8
Middle Bair SE (02k)	MBE-T1	1/26/23	SG	23	3	0	2/17/23	IS	5	2	0	3/15/23	LD	14	9	0
B2 North – East (02c.1a)	OBEN-T1	1/27/23	DP	13	2	4	3/2/23	SG	4	2	9	3/17/23	LD	8	5	1
B2 North – West (02c.1b)	OBEN-T1	1/27/23	DP	13	2	3	3/2/23	SG	4	2	4	3/17/23	LD	8	5	3
B2 North – South (02c.2)	OBEN-T2	1/27/23	TR	10	3	2	3/2/23	LD	4	2	0	3/17/23	IS	6	2	0
B2 South – West (02d.1a)	OBES-T1	1/26/23	IS	20	3	0	2/17/23	DP	9	5	0	3/15/23	DS	13	8	0
B2 South – East (02d.1b)	OBES-T1	1/26/23	IS	20	3	0	2/17/23	DP	9	5	0	3/15/23	DS	13	8	0
B2 South – 2 (02d.2)	OBES-T1	1/26/23	IS	20	3	3	2/17/23	DP	9	5	1	3/15/23	DS	13	8	0
B2 South – 3 (02d.3)	OBES-T1	1/26/23	IS	20	3	0	2/17/23	DP	9	5	0	3/15/23	DS	13	8	0
Pond B3 Bair Island Restoration (02m)	OBW-T1	1/27/23	LD	14	7	3	3/2/23	IS	4	2	3	3/17/23	TR	5	2	2
Ravenswood Slough (02i)	RAV-T1	1/31/23	TR	12	2	14	2/21/23	DA	8	4	7	4/17/23	LD	10	7	2
Steinberger Slough (02b.2)	RESH-T2	1/19/23	TR	9	2	0	2/7/23	LD	4	1	5	3/9/23	BO	6	5	0
West Point Slough - SW / E (02g)	WPSS-T1	1/20/23	LD	15	6	0	2/9/23	DS	5	2	0	3/9/23	IS	6	2	0

## DUMBARTON SOUTH REGION

Site Name (ID)	Transect	Round 1					Round 2					Round 3				
		Date	Observer	Temp (°C)	Wind (mph)	RIRA	Date	Observer	Temp (°C)	Wind (mph)	RIRA	Date	Observer	Temp (°C)	Wind (mph)	RIRA
Coyote Creek - Mud Slough (05f)	A21-T1	1/26/23	JM	18	6	1	2/16/23	IS	2	1	0	3/15/23	JH	9	1	0
Island Ponds - A21 (05i)	A21-T1	1/26/23	JM	18	6	3	2/16/23	IS	2	1	0	3/15/23	JH	9	1	3
Alviso Slough (15a.4)	ALSL-T2	2/1/23	JM	14	5	8	2/20/23	TR	16	4	15	4/6/23	BO	9	2	7
Calaveras Point (05a.2)	CAPT-T1	1/26/23	LD	18	1	19	2/16/23	MA	1	2	8	3/15/23	TR	6	4	14
Cooley Landing Central (16.1)	COLA-T1	2/2/23	SG	13	5	10	2/23/23	IS	3	4	1	3/22/23	DP	12	8	2
Cooley Landing East (16.2)	COLA-T1	2/2/23	SG	13	5	8	2/23/23	IS	3	4	3	3/22/23	DP	12	8	4
Guadalupe Slough (15a.3)	GUSL-T2	2/1/23	SG	13	4	4	2/21/23	DS	7	2	4	4/1/23	DP	12	1	0
Knapp Tract (15a.6)	KNAP-T1	1/26/23	TR	18	0	0	3/15/23	JM	8	3	0	4/2/23	JM	3	4	0
Long Point (15a.2)	LONG-T1	2/2/23	IS	10	5	0	3/7/23	LD	5	6	0	3/20/23	DP	9	8	0
Cargill Pond (W Suites Hotel) (05g)	MALA-T1	1/18/23	LD	12	0	0	2/6/23	DA	13	7	0	3/7/23	DP	10	6	0
Mayhew's Landing (05e)	MALA-T1	1/18/23	LD	12	0	0	2/6/23	DA	13	7	0	3/7/23	DP	10	6	0
Mowry Marsh North (05a.1)	MOWN-T1	1/31/23	JM	13	2	10	2/21/23	MA	9	3	17	4/17/23	JM	9	8	11
Charleston Slough (15a.1)	MVSL-T1	2/8/23	MA	4	0	5	3/3/23	SG	11	8	5	4/6/23	DS	6	3	0
Mountain View Slough (15a.1)	MVSL-T1	2/8/23	MA	4	0	0	3/3/23	SG	11	8	0	4/6/23	DS	6	3	0
Mountain View Slough Channel (15a.1) <sup>1</sup>	MVSL-T2	2/9/23	DP	3	0	0	3/6/23	LD	5	6	0	3/20/23	TR	12	5	0
Newark Slough - West (05c.1)	NEWS-T1	1/30/23	TR	13	3	0	3/5/23	JH	12	6	4	4/5/23	JM	6	3	1
Newark Slough - East (05c.2)	NEWS-T1	1/30/23	TR	13	3	3	3/5/23	JH	12	6	3	4/5/23	JM	6	3	6
Plummer Creek Mitigation (05h)	PLCM-T1	2/1/23	LD	13	2	0	3/2/23	BO	7	5	0	3/24/23	BO	5	2	0
Stevens Creek (15c)	STEV-T1	2/2/23	IS	10	5	0	3/7/23	LD	5	6	0	3/20/23	DP	9	8	0
Stevens Creek to Long Point (15a.2)	STEV-T1	2/2/23	IS	10	5	0	3/7/23	LD	5	6	0	3/20/23	DP	9	8	0

<sup>1</sup> Surveyed by OEI for Ducks Unlimited in support of the South Bay Salt Pond Restoration Project.

## UNION CITY REGION

Site Name (ID)	Transect	Round 1					Round 2					Round 3				
		Date	Observer	Temp (°C)	Wind (mph)	RIRA	Date	Observer	Temp (°C)	Wind (mph)	RIRA	Date	Observer	Temp (°C)	Wind (mph)	RIRA
AFCC - to I-880 (01d)	AFCC-T4	1/31/23	DA	13	2	0	3/7/23	IS		4	0	3/22/23	JM	13	10	0
AFCC - Upper (01c)	AFCC-T4	1/31/23	DA	13	2	0	3/7/23	IS		4	0	3/22/23	JM	13	10	0
AFCC - Lower (01b)	AFCC-T5	1/23/23	SG	4	6	0	2/17/23	DA	14	2	0	3/17/23	JM	6	0	0
AFCC - Mouth (01a)	AFCC-T1	1/20/23	BO	11	6	0	2/23/23	DS	4	8	0	3/16/23	BO	8	1	0
AFCC - Pond 3 (01f)	AFCC-T1	1/20/23	BO	11	6	0	2/23/23	DS	4	8	0	3/16/23	BO	8	1	0
AFCC - Lower (01b)	AFCC-T2	1/20/23	BO	11	6	0	2/23/23	DS	4	8	0	3/16/23	BO	8	1	0
Eden Landing - Mt Eden Creek (13j)	EDEN-T1	3/2/23	DA	3	1	0	3/17/23	DS	6	4	0	3/30/23	DP	7	4	0
Eden Landing Reserve - North (13l)	ELRS-T1	1/31/23	IS	12	2	2	3/2/23	DP	12	10	0	3/20/23	BO	12	5	0
Eden Landing Reserve - South (13k)	ELRS-T1	1/31/23	IS	12	2	11	3/2/23	DP	12	10	9	3/20/23	BO	12	5	7
Ideal Marsh - South (21b)	IMAS-T1	1/31/23	SG	12	5	0	2/20/23	DS	12	2	0	4/4/23	DP	11	6	0
OAC - Island (13b)	OAC-T2	1/31/23	DS	13	2	10	2/20/23	SG	16	2	4	4/5/23	IS	6	3	9
OAC - South Bank (13c)	OAC-T2	1/31/23	DS	13	2	3	2/20/23	SG	16	2	6	4/5/23	IS	6	3	0
OAC - North Bank (13a)	OAC-T3	1/31/23	BO	14	2	1	2/20/23	IS	14	3	0	4/5/23	DA	6	2	0
Cargill Mitigation Marsh (13f) <sup>1</sup>	OAC-T4	1/30/23	SG	11	8	0	2/20/23	BO	15	3	8	4/5/23	DS	6	7	0
Whale's Tail - North (13d)	WTN-T1	3/2/23	DP	4	2	2	3/17/23	SG	6	0	1	3/30/23	JM	5	2	2
Whale's Tail - South (13e)	WTS-T1	1/30/23	BO	8	5	4	2/20/23	SC	16	6	8	4/5/23	DP	4	6	0

<sup>1</sup> Surveyed by OEI for Ducks Unlimited in support of the South Bay Salt Pond Restoration Project.



## HAYWARD REGION

Site Name (ID)	Transect	Round 1					Round 2					Round 3				
		Date	Observer	Temp (°C)	Wind (mph)	RIRA	Date	Observer	Temp (°C)	Wind (mph)	RIRA	Date	Observer	Temp (°C)	Wind (mph)	RIRA
Bunker Marsh (20g)	BUNK-T1	1/19/23	IS	12	5	7	2/15/23	DP	14	5	6	3/24/23	SG	6	4	5
Citation Marsh – South (20d.1)	CITA-T1	1/19/23	LD	11	2	3	2/15/23	SG	12	7	5	3/24/23	TR	4	2	4
Citation Marsh – Upper (20d.2a)	CITA-T1	1/19/23	LD	11	2	11	2/15/23	SG	12	7	1	3/24/23	TR	4	2	14
Citation Marsh – Central (20d.2b)	CITA-T1	1/19/23	LD	11	2	17	2/15/23	SG	12	7	25	3/24/23	TR	4	2	20
Cogswell A (20m)	COGS-T1	2/7/23	DA	5	3	8	3/2/23	SG	10	12	6	3/20/23	DS	9	9	5
Triangle Marsh - Hayward (20w)	COGS-T1	2/7/23	DA	5	3	0	3/2/23	SG	10	12	0	3/20/23	DS	9	9	0
Cogswell C (20o)	COGS-T2	2/7/23	BO	8	2	8	3/2/23	MA	11	9	4	3/20/23	DP	10	9	9
Johnson's Landing (20l)	COGS-T2	2/7/23	BO	8	2	0	3/2/23	MA	11	9	0	3/20/23	DP	10	9	0
Cogswell B – Bayfront (20n.1)	COGS-T3	2/7/23	JH	8	3	3	3/2/23	JM	14	9	2	3/20/23	SG	9	4	1
Cogswell B – South (20n.2)	COGS-T3	2/7/23	JH	8	3	4	3/2/23	JM	14	9	4	3/20/23	SG	9	4	2
Cogswell B – Main (20n.3)	COGS-T3	2/7/23	JH	8	3	21	3/2/23	JM	14	9	10	3/20/23	SG	9	4	16
HARD Marsh (20s)	HARD-T1	2/20/23	DP	16	3	0	3/3/23	SC	12	11	0	3/20/23	IS	8	5	0
Dog Bone Marsh (20c)	NORT-T1	1/19/23	JM	13	6	0	2/15/23	BO	12	5	0	3/24/23	DA	6	7	0
North Marsh (20f)	NORT-T1	1/19/23	JM	13	6	51	2/15/23	BO	12	5	34	3/24/23	DA	6	7	32
Oro Loma - East (07a)	ORLW-T1	2/2/23	DA	13	3	0	3/6/23	IS	9	8	0	3/24/23	JM	7	9	0
Oro Loma - West (07b)	ORLW-T3	2/2/23	SC	12	2	0	3/6/23	DS	10	10	0	3/24/23	DP	7	3	0
East Marsh (20e)	SLRZ-T1	1/19/23	DA	11	2	2	2/15/23	LD	12	7	0	3/24/23	DS	6	7	2
San Lorenzo Creek – North (20h.1)	SLRZ-T1	1/19/23	DA	11	2	2	2/15/23	LD	12	7	0	3/24/23	DS	6	7	0
San Lorenzo Creek – South (20h.2)	SLRZ-T1	1/19/23	DA	11	2	0	2/15/23	LD	12	7	0	3/24/23	DS	6	7	0

## SAN LEANDRO BAY REGION

Site Name (ID)	Transect	Round 1					Round 2					Round 3				
		Date	Observer	Temp (°C)	Wind (mph)	RIRA	Date	Observer	Temp (°C)	Wind (mph)	RIRA	Date	Observer	Temp (°C)	Wind (mph)	RIRA
Arrowhead Marsh – West (17c.1)	ARHE-T2	1/23/23	JM	14	5	7	3/7/23	SG	5	3	2	3/23/23	JM	14	9	2
Arrowhead Marsh – East (17c.2)	ARHE-T2	1/23/23	JM	14	5	14	3/7/23	SG	5	3	21	3/23/23	JM	14	9	11
Fan Marsh – Wings (17j.1)	FANM-T1	1/18/23	JM	11	0	0	2/7/23	TR	5	0	0	3/9/23	SG	7	2	0
Fan Marsh – Main (17j.2)	FANM-T1	1/18/23	JM	11	0	10	2/7/23	TR	5	0	12	3/9/23	SG	7	2	17
MLK New Marsh (17h)	MLKR-T1	1/25/23	JM	6	0	40	3/7/23	JM	6	3	22	4/3/23	SC	13	11	31
San Leandro Creek – North (17e.1)	MLKR-T1	1/25/23	JM	6	0	0	3/7/23	JM	6	3	0	4/3/23	SC	13	11	0
San Leandro Creek – South (17e.2)	MLKR-T1	1/25/23	JM	6	0	0	3/7/23	JM	6	3	0	4/3/23	SC	13	11	0
MLK Regional Shoreline - Damon (17d.4)	MLKS-T1	1/17/23	BO	13	6	0	2/6/23	SC	13	4	0	3/8/23	TR	7	8	0
MLK Regional Shoreline - Damon Slough (17.5)	MLKS-T1	1/17/23	BO	13	6	0	2/6/23	SC	13	4	0	3/8/23	TR	7	8	0

## BAY BRIDGE NORTH REGION

Site Name (ID)	Transect	Round 1					Round 2					Round 3				
		Date	Observer	Temp (°C)	Wind (mph)	RIRA	Date	Observer	Temp (°C)	Wind (mph)	RIRA	Date	Observer	Temp (°C)	Wind (mph)	RIRA
Emeryville Crescent - East (06a)	EMCR-T1	2/1/23	DP	12	3	0	3/2/23	DA	13	1	0	3/24/23	MA	7	8	0
Emeryville Crescent - West (06b)	EMCR-T1	2/1/23	DP	12	3	0	3/2/23	DA	13	1	0	3/24/23	MA	7	8	2
Whittel Marsh (10a)	PTPN-T1	1/20/23	JH	10	3	0	2/8/23	DP	7	1	0	3/7/23	BO	9	2	0
Rheem Creek Area (22c)	RCRA-T1	1/19/23	BO	13	0	4	2/7/23	SG	6	1	4	3/7/23	DA	5	2	3
San Pablo Marsh – East (22b.1)	RIF-T1	2/2/23	BO	11	2	2	3/7/23	MA	5	1	0	3/23/23	DS	8	7	0
San Pablo Marsh – West (22b.2)	RIF-T1	2/2/23	BO	11	2	0	3/7/23	MA	5	1	6	3/23/23	DS	8	7	0
Hoffman Marsh (22e)	STEG-T1	1/20/23	SG	11	5	0	2/8/23	BO	6	1	0	3/9/23	DS	6	3	0
Meeker Slough (22d)	STEG-T1	1/20/23	SG	11	5	12	2/8/23	BO	6	1	10	3/9/23	DS	6	3	0
Stege Marsh (22d)	STEG-T1	1/20/23	SG	11	5	6	2/8/23	BO	6	1	2	3/9/23	DS	6	3	8

## SUISUN REGION

Site Name (ID)	Transect	Round 1					Round 2					Round 3				
		Date	Observer	Temp (°C)	Wind (mph)	RIRA	Date	Observer	Temp (°C)	Wind (mph)	RIRA	Date	Observer	Temp (°C)	Wind (mph)	RIRA
Freeman Island (27b)	FREE-T1	1/24/23	TR	3	3	0	2/9/23	JM	14	0	0	4/26/23	DS	11	3	0
MOTCO Area 1 (27d)	MOT1-T1	1/24/23	MA	6	4	0	2/9/23	IS	14	1	0	4/14/23	DS	7	3	0
MOTCO Area 2 (27d)	MOT2-T1	1/24/23	IS	4	2	0	2/9/23	LD	18	0	0	4/26/23	DP	16	6	0
Concord Naval Weapons Station (27d)	PEM-T2	1/23/23	JM	4	0	0	2/9/23	MA	14	1	0	4/14/23	JM	8	3	0
Point Edith Marsh (27d)	PEM-T2	1/23/23	JM	4	0	0	2/9/23	MA	14	1	0	4/14/23	JM	8	3	0
Ryer Island (27b)	RYSE-T1	1/24/23	TR	3	3	0	2/9/23	TR	15	4	0	4/26/23	JM	11	8	0
Snag Island (27b)	SNAG-T1	1/24/23	BO	6	5	0	2/9/23	JM	15	0	0	4/26/23	DS	11	7	0

NOTE: All surveys shown in table above were conducted by OEI in support of the Military Ocean Terminal Concord (MOTCO) Integrated National Resources Management Plans.

**PETALUMA REGION**

Site Name (ID)	Transect	Round 1					Round 2					Round 3				
		Date	Observer	Temp (°C)	Wind (mph)	RIRA	Date	Observer	Temp (°C)	Wind (mph)	RIRA	Date	Observer	Temp (°C)	Wind (mph)	RIRA
Grey's Field (24b)	GRFI-T1	2/6/23	JM	14	7	0	3/3/23	DA	10	6	0	3/20/23	BO	6	3	0
Petaluma River - Upper (24a)	GRFI-T1	2/6/23	JM	14	7	0	3/3/23	DA	10	6	0	3/20/23	BO	6	3	0