California Ridgway's Rail Surveys for the San Francisco Estuary Invasive *Spartina* Project 2019

Report to:

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

Prepared by:

Olofson Environmental, Inc.
1001 42nd Street, Suite 230
Oakland, California 94608
Contact: jen@olofsonenvironmental.com

January 13, 2020

ACKNOWLEDGEMENTS

This report was designed and prepared under the direction of Jen McBroom, the Invasive *Spartina* Project Ridgway's Rail Monitoring Manager, with considerable hard work by other OEI biologists and staff, including Anastasia Ennis, Brian Ort, Jeanne Hammond, Kevin Eng, Nate Deakers, Pim Laulikitnont, Simon Gunner, Stephanie Chen, Tobias Rohmer, Melanie Anderson, and Lindsay Faye.

This report was prepared for the California Coastal Conservancy's San Francisco Estuary Invasive *Spartina* Project with support and funding from the following contributors:

California Coastal Conservancy

California Wildlife Conservation Board (MOU #99-054-01 and subsequent)

Table of Contents

Table of Figures

Table of Tables

This page is intentionally left blank.

1. Introduction

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.

In collaboration with partner organizations, including Point Blue Conservation Science (PBCS), Don Edwards National Wildlife Refuge (DENWR), Avocet Research and Associates (ARA) and San Pablo Bay National Wildlife Refuge (SPBNWR), 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 2019 (Permit Number TE118356-4.2). Trained and permitted biologists performed standard-protocol surveys at 99 ISP sub-areas (made up of 105 rail "sites") between January 15 and April 15, 2019. The data were entered into an access database shared between partner organizations, exported into GIS, and then summarized by ISP sub-area boundaries.

Only results of surveys conducted for the ISP by OEI in 2019 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 2019 Spartina Treatment Sub-Areas and Ridgway's Rail Survey Plans.

Species Account

The California Ridgway's rail is classified as endangered by both the U.S. Fish and Wildlife Service (Federal Register 50 CFR 17.11) and the State of California (California Code of Regulations Title 14, Section 670.5). Its 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 and degradation and predators are among the biggest threats to the rail (USFWS 2013).

Between 2009 to 2011, PBCS estimated that the average total population was about 1,167 individuals (Liu et al. 2012). However, the number of rails detected in 2019 by all survey organizations at the subset of marshes where surveys occurred exceeds the extrapolated population estimate from that study period, indicating that the population is likely greater now. Recent analysis by PBCS confirms that rail density in both San Francisco Bay and San Pablo Bay has increased since the previous published analysis (PBCS unpublished data).

2. Study Area

OEI conducted surveys for California Ridgway's rail at 99 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 Francisco, San Mateo, Santa Clara, and Sonoma. Summary survey results for each site are represented within one of four maps: North Bay (**Figure 2**), West Bay (**Figure 3**), South Bay (**Figure 4**), and East Bay (**Figure 5**).

Surveys by Partner Organizations

Partner organizations surveyed an additional 25 ISP sub-areas (36 rail program sites). Rail survey data from partner organizations are not included in this report; rather, the results from those surveys are reported on by the survey organizations themselves.

For a complete list of all ISP sub-areas and associated survey organizations, see **Appendix I**: Complete List of 2019 Spartina Treatment Sub-Areas and Ridgway's Rail Survey Plans. For a complete list of OEI survey stations and their geographic coordinates in UTM, see **Appendix II**: 2019 Survey Station Coordinates.

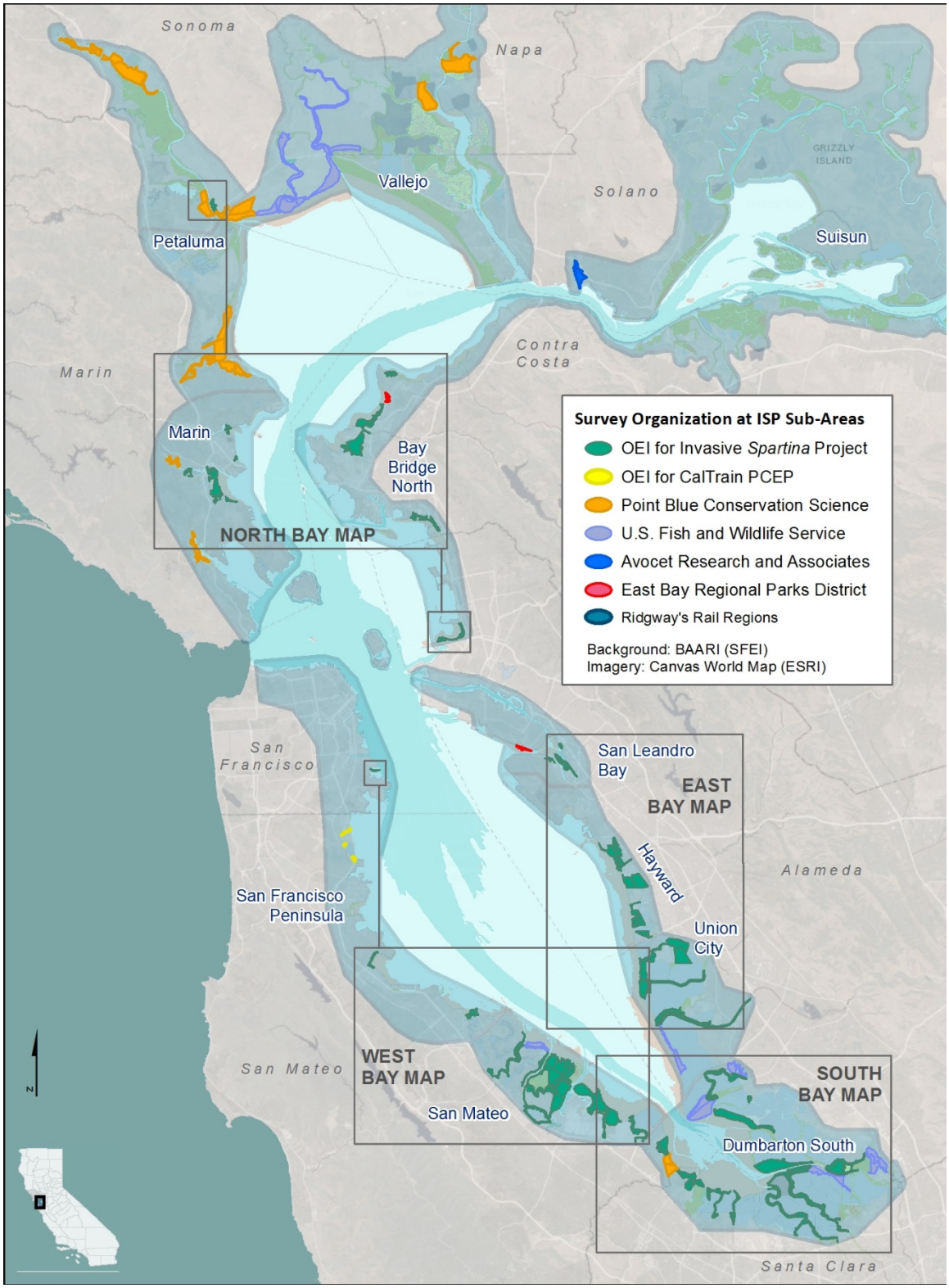

Figure 1. Regional boundaries of ISP sites surveyed for California Ridgway's rail by OEI and others in 2019.

3. Methods

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 an Access database and analyzed according to recommendations in the NAm Protocol.

3.1 Field Methods

California Ridgway's rail surveys were conducted at 99 ISP sub-areas between January 15 and April 15, 2019, using the NAm survey protocol. Surveys were conducted by the following trained and permitted field biologists at Olofson Environmental, Inc.: Jen McBroom, Jeanne Hammond, Stephanie Chen, Tobias Rohmer, Anastasia Ennis, Simon Gunner, Kevin Eng, Nate Deakers, Pim Laulikitnont, Brian Ort, Melanie Anderson, and Lindsay Faye.

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. 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

Data were recorded in the field on paper datasheets and GPS units 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. Compass 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. Potential predators of rail nests, young, or adults were noted.

Researchers entered data into a multi-organization shared Access database developed by Point Blue and the National Wildlife Refuge 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. The organization of the shared Marsh Bird Database is outlined in the SOP 2 of the Site-specific Protocol for Monitoring Marsh Birds (Wood et al, 2016).

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

3.3 Data Interpretation

In accordance with recommendations in the NAm Protocol, several metrics were used to evaluate Ridgway's' rails numbers at the sites presented in this report: highest minimum count; index of relative density, annual rate of change, average annual rate of change, and occupancy by black rail (BLRA), Virginia rail (VIRA), and sora (SORA). 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 a survey point (either within or outside of the survey time) is calculated. The maximum 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 upland and mudflat areas.

For 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 6 rails/(7 points*31 acres) = 0.0277 rails/acre. This is considered a minimum density index because we know that detection probability is <1, which means the true abundance could be >6 birds. 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 (**Figure 2 – 5**). 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 90th percentile of observed winter densities in the South San Francisco Bay Recovery Unit, 0.45 rails/acre (or 1.11 rails/hectare). The next demarcation is 0.15 rails/acre (or 0.37 rails/hectare), which is the 60th percentile of observed winter densities; sub-areas above this demarcation are shaded dark orange and those below are shaded light orange. Below this 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 survey stations are shaded green.

This category does not indicate absence; rails may have been detected beyond 200 meters and are 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 survey station. Note, this category does not indicate absence; rails may have been detected beyond survey area and are present at the 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 60th percentile of observed winter densities reported in the TMRP
High	0.15 - 0.45	Rails detected at density between the 60th to 90th percentile of observed winter densities reported in the TMRP
Very high	> 0.45	Rails detected at density greater than 90th percentile of observed winter densities reported in the TMRP

Index of one-year rate of change for the total highest minimum count (summed across all transects) was calculated 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 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*100%)= 6.06%.

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

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

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, $t2$ is the end year ($t2$ - $t1$ = 5 in this five year analysis). For example, if the total highest minimum count of CA 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]*100% = 5.15% increase per year.

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 were 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 being occupied).

Caveats: It is important to point out that the preceding metrics of highest minimum count, relative density, population change and occupancy do not take into account factors such as detection probability, habitat covariates, etc.; thus, they should be interpreted with caution. More reliable estimates of population change will be calculated by PBCS using hierarchical models on an interval of approximately every 5 years. However, the simpler metrics provided above are easy to calculate and may allow managers to detect large changes in true abundance (assuming count indices are correlated with true abundance) over short time periods, which could be important for management interventions. The formulas for the above metrics (except for the formulas involving the index of relative density) assume that the exact same study areas are being 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.

4. Survey Results

OEI detected 825 California Ridgway's rails at 70 of the 99 sub-areas surveyed by OEI for the ISP in 2019. This is a decrease of -17% since 2018 (calculated as annual rate of change), but a 7% increase since 2014 (calculated as compound 5-year rate of change). The trend is consistent in the group of sub-areas where non-native *Spartina* has been treated (-23% annual change, +2% 5-year change) and in sub-areas where *Spartina* treatment was restricted from 2011 to 2018 (-7% annual change, +20% 5-year change). The average relative density at all sub-areas where rails were present was 0.29 Ridgway's rails per acre. The average relative density at sub-areas where *Spartina* treatment has occurred annually since 2011 is 0.16 rails per acre. At the eleven formerly restricted sub-areas (where treatment was restricted from 2011 to 2018), the average relative density is 0.75 rails per acre.

Results from each region are summarized below and analysis for each sub-area is provided in Table 2. 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 twelve sub-areas in the Marin Region in 2019 (Table 2). PBCS surveyed an additional three sub-areas in the region, including Creekside Park (04g). OEI detected a total of 84 Ridgway's rails in the Marin Region in 2019. This represents a 17% increase over 2018 detections and a 3% decrease since 2014 at the same subset of sub-areas.

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. OEI surveyed four sub-areas in this Region in 2019. One rail was detected at SFO, the only rail detected in the San Francisco Peninsula Region in 2019. This represents an 80% decrease since 2018 and a 27% decrease since 2014 at the same subset of sub-areas. Trends are difficult to identify at these low densities. 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 18 sub-areas within the San Mateo Region in 2019. DENWR conducted surveys at an additional sub-area, Redwood Shores (02a.3). OEI detected a total of 155 Ridgway's rails in the San Mateo Region in 2019 (Table 2). This represents a 24% decrease since 2018, but a 4% increase since 2014 at the same subset of sub-areas.

This region contains a previously restricted sub-area where full treatment resumed in 2018: B2 North Quadrant West (02c.1a). A total of 22 rails were detected in the sub-area in 2019, one more rail than was detected at the sub-area in 2018.

The Dumbarton South Region includes all marshes south of the Dumbarton Bridge, from Newark to Mountain View (**Figure 4**). In 2019, OEI conducted surveys at 15 sub-areas in the Dumbarton South Region. DENWR also surveyed six sub-areas: Dumbarton/Audubon (05b), LaRiviere Marsh (05d), Mayhew's Landing (05e), Coyote Creek Lagoon (05f.3), Cargill Pond (W Suites Hotel) (05g), and Coyote Creek South East (15a.5). PBCS surveyed one additional sub-area: Faber and Laumeister (15b).

OEI detected a total of 150 Ridgway's rails in the Dumbarton South Region in 2019 (Table 2). This represents a decline of 38% since 2018, but a 9% increase since 2014 at the same subset of sub-areas. There are likely many more rails in the region that are not detected by surveys, since there are large 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 fourteen sub-areas in the region in 2019. DENWR surveyed an additional two sub-areas in 2019: Ideal Marsh - North (21a) and Ideal Marsh - South (21b). OEI detected a minimum of 22 Ridgway's rails (Table 2). There was no change (0%) from 2018 numbers, but this represents an 8% increase from 2014 detections at the same subset of sub-areas. Notably, rails were detected for the first time at Eden Landing Reserve - South (13k) (AKA North Creek Marsh), a young restoration site where ISP has heavily invested in *Spartina foliosa* plantings.

OEI surveyed every other station at AFCC Mouth (01a), AFCC Lower (01b), and AFCC Pond 3 (01f) and surveyed two of the three transects along OAC (13a, b, c) again in 2019. This is a reduced effort from 2017 and years prior, but it is a more efficient way to survey the lower density rails at these sub-areas.

The Hayward Region in Alameda County extends from the Oakland International Airport south to the San Mateo Bridge (**Figure 5**). OEI surveyed 18 sub-areas in the Hayward Region. OEI detected 188 Ridgway's rails in 2019 (Table 2). This represents a decline of 15% since last year and a 29% increase since 2014 at the same subset of sub-areas.

The Hayward Region contains several sub-areas where treatment permissions changed in 2018, including Cogswell Section B and Citation Marsh North which were divided into five sub-areas so that portions of each marsh could be fully treated. Of the seven sub-areas with changed treatment permissions, only three were treated in 2018 due to time and funding limitations; they were: San Lorenzo Creek North (20h.1), Cogswell - Sec B South (20n.2), and Cogswell - Sec C (20o). In 2019, treatment will occur at these three sub-areas as well as the two other previously-restricted sub-areas where treatment is now permitted: Citation Marsh Channels (20d.2a) and Cogswell - Sec B Bayfront (20n.1). Additionally, seed-suppression will occur in 2019 at Cogswell Section B Main (20n.3), but will not occur at North Marsh (20f) due to limited efficacy and logistical constraints. Citation Marsh North Main (20d.2b) remains a restricted treatment sub-area; no treatment will occur at this sub-area under the current Biological Opinion.

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 eight sub-areas within the region, including Arrowhead Marsh, which was surveyed using the NAm protocol again this season for the

second year in a row. EBRPD surveyed an additional sub-area: Elsie Roemer (17a). OEI detected 142 Ridgway's rails in San Leandro Bay in 2019. This represents a decline of 2% since last year, but an increase of 12% since 2014. Note that Arrowhead Marsh was surveyed using different methods in 2014, making it difficult to compare over this time period. Excluding Arrowhead from the analysis, rail detections in the region have increased by 22% since 2014.

The San Leandro Bay Region includes two previously-restricted sub-areas where treatment is now permitted: Damon Marsh (17d.4) and Fan Marsh Wings (17j.1). These two sub-areas were treated for the first time in seven years last summer. Treatment is still prohibited at three sub-areas in the San Leandro Bay Region: Arrowhead Marsh East (17c.2), Fan Marsh Main (17j.2), and MLK New Marsh (17h).

The Bay Bridge North Region is located 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 six transects spanning ten sub-areas in 2019. EBRPD surveyed one additional sub-area: Giant Marsh (10c). OEI detected 70 Ridgway's rails in the region in 2019, an increase of 1% since last year and a 5% decrease since 2014 at the same subset of sub-areas.

The Petaluma Region includes the tidal wetlands along the Petaluma River, which are lumped into four large sub-areas. OEI conducted surveys at one transect in the region: Carl's Marsh within the Lower Petaluma River (24d) sub-area (**Figure 2**). PBCS surveyed four additional transects overlapping with the other three sub-areas. OEI detected 13 Ridgway's rails at Carl's Marsh in 2019, representing a small percentage of the rails in the entire region.

Table 2. Summary of survey results at all sub-areas surveyed by OEI for ISP in 2019, grouped by Region. Relative density is a ratio of rails per acre, calculated from the number of birds detected within 200 meters of a survey station; a zero in this column does not necessarily indicate absence from the site as birds may have been detected beyond 200 meters. Percent change cannot be calculated when a value is zero; in these instances, arrows are used to show the change from zero. Occupancy calculations are shown on a transect level, rather than sub-area level.

				RIRA Indices				Occupancy		
Sub-Area Name (Code)	Transect	Site Area (acres)	% of Site Surveyed	Highest Count	Relative Density	One year Δ	Five year Δ	BLRA	SORA	VIRA
Marin Region										
CMC Marsh Reserve (04a)	HEER	77.1	96%	27	0.30	59%	-13%	0	0	0
Piper Park - East (04c)	PIPE	10.1	99%	4	0.40	33%	10%	0	0	0
Piper Park - West (04d)	PIPE	13.8	100%	7	0.51	75%	23%	0	0	0
CMC - Mouth (04j) - split into two sub-areas in 2011								0	0	0
CMC - Mouth North (04j.1)	CMCM-T1	6.0	100%	0	0.00	-100%	-100%	-	-	-
CMC - Mouth South (04j.2)	CMCM-T1	12.2	92%	1	0.09	↑	↑	-	-	-
Boardwalk No. 1 (04k)	PIPE	8.4	100%	0	0.00	-100%	→	0	0	0
Pickleweed Park (09)	PIPK-T1	14.2	100%	0	0.00	-100%	→	0	0	0

Table 2 continued on next page

Sub-Area Name (Code)	Transect	Site Area (acres)	% of Site Surveyed	RIRA Indices: Highest Count	RIRA Indices: Relative Density	RIRA Indices: One year Δ	RIRA Indices: Five year Δ	Occupancy: BLRA	Occupancy: SORA	Occupancy: VIRA
Marin Region (continued)										
San Rafael Canal Mouth (23d) - split into two sub-areas in 2011								0	0	0
San Rafael Canal Mouth East (23d.1)	PIPK-T1	3.6	100%	0	0.00	→	-100%	-	-	-
San Rafael Canal Mouth West (23d.2)	PIPK-T1	3.1	100%	0	0.00	-100%	→	-	-	-
Muzzi and Martas Marsh (23e) - grouped into one sub-area by ISP control program								0	0	0
Muzzi Marsh (23e)	MUZZ	138.5	55%	34	0.21	13%	2%	-	-	-
Martas Marsh (23e)	MUZZ	19.8	99%	9	0.46	-10%	20%	-	-	-
San Clemente Creek (23e)	MUZZ	20.9	54%	2	0.18	↑	-4%	-	-	-
Starkweather Park (23l)	STRK-T1	8.3	100%	0	0.00	-	→	0	0	0
Triangle Marsh - Marin (23n)	TRF-T1	19.1	77%	0	0.00	-	-	0	0	0
SF Peninsula Region										
Pier 98/Heron's Head (12b)	HEHE-T1	10.9	93%	0	0.00	→	-100%	0	0	0
SFO (19h)	SFO-T1	31.0	68%	1	0.05	-75%	-23%	0	0	0
Seal Slough (19p) – split into two sub-areas in 2011								0	0	0
Seal Slough Central (19p.1)	SEAL-T1	37.8	85%	0	0.00	-100%	→	-	-	-
Seal Slough Peripheral (19p.2)	SEAL-T1	30.8	75%	0	0.00	→	→	-	-	-
San Mateo Region										
Belmont Slough (02a) - split into three sub-areas in 2011 and 2012								0	0	0
Belmont Slough Mouth (02a.1a)	BELM-T1	51.1	75%	0	0.00	-100%	-100%	-	-	-
Belmont Slough South (02a.1b)	BELM-T1	17.7	81%	0	0.00	-100%	-100%	-	-	-
Belmont Slough to Steinberger (02a.2)	BELM-T1	109.3	14%	1	0.07	-50%	↑	-	-	-
Corkscrew Slough (02b.1)	CORK-T1	227.4	36%	16	0.13	-6%	-4%	0	0	0
Steinberger Slough (02b.2)	RESH-T2	105.6	39%	2	0.05	0%	↑	0	0	0
B2 North Quadrant (02c) - split into three sub-areas in 2011 and 2012								0	0	0
B2 North Quadrant West (02c.1a)	OBEN-T1	150.4	47%	5	0.03	-67%	↑	-	-	-
B2 North Quadrant East (02c.1b)	OBEN-T1	145.7	47%	22	0.17	5%	29%	-	-	-
B2 North Quadrant South (02c.2)	OBEN-T2	227.0	26%	1	0.00	-50%	↑	-	-	-

Table 2 continued on next page

Sub-Area Name (Code)	Transect	Site Area (acres)	% of Site Surveyed	RIRA Indices: Highest Count	RIRA Indices: Relative Density	RIRA Indices: One year Δ	RIRA Indices: Five year Δ	Occupancy: BLRA	Occupancy: SORA	Occupancy: VIRA
San Mateo region (continued)										
B2 South Quadrant (02d) - split into three sub-areas in 2011 and 2012								0	0	0
B2 South Quadrant West (02d.1a)	OBES-T1	38.3	75%	4	0.07	-56%	10%	-	-	-
B2 South Quadrant East (02d.1b)	OBES-T1	23.2	45%	0	0.00	→	→	-	-	-
B2 South Quadrant 2 (02d.2)	OBES-T1	58.8	73%	4	0.05	-50%	27%	-	-	-
B2 South Quadrant 3 (02d.3)	OBES-T1	67.9	22%	0	0.00	→	→	-	-	-
Greco Island - North (02f)	GRIN-T1	511.1	27%	7	0.02	-63%	-1%	0	0	0
West Point Slough - SW / E (02g)	WPSS-T1	39.8	65%	3	0.12	-25%	↑	0	0	0
Greco Island - South (02h)	GRIS-T1	237.9	42%	54	0.32	38%	7%	0	0	0
Ravenswood Slough (02i)	RAV-T1	117.8	58%	10	0.10	-64%	33%	0	0	0
Deepwater Slough (02k) - grouped into one sub-area by ISP control program								0	0	0
Middle Bair N (02k)	MBE-T1	221.6	44%	26	0.09	25%	-2%	-	-	-
Middle Bair SE (02k)	MBE-T1	200.3	48%	2	0.00	-18%	-25%	-	-	-
Inner Bair Island Restoration (02l)	IBI-T1	59.6	64%	0	0.00	→	→	0	0	0
Dumbarton Region										
Mowry Marsh North (05a.1)	MOWN-T1	417.4	29%	24	0.08	-4%	1%	0	0	0
Calaveras Point (05a.2)	CAPT-T1	478.8	14%	21	0.26	-32%	1%	0	0	0
Newark Slough (05c) - split into two sub-areas in 2011								0	0	0
Newark Slough West (05c.1)	NEWS-T1	167.3	15%	2	0.00	-71%	-4%	-	-	-
Newark Slough East (05c.2)	NEWS-T1	73.1	37%	10	0.33	0%	52%	-	-	-
Coyote Creek - Mud Slough (05f)	A21-T1	211.3	41%	1	0.01	-50%	→	0	0	0
Plummer Creek Mitigation (05h)	PLCM-T1	16.6	97%	0	0.00	-100%	→	0	0	1.00
Island Ponds - A21 (05i)	A21-T1	159.2	50%	2	0.03	-33%	↑	0	0	0
Palo Alto Baylands (08) – grouped into one sub-area by ISP control program								-	-	-
Palo Alto Baylands (08)	PAB	116.2	74%	14	0.14	-52%	-4%	0	0	0.14
Palo Alto Harbor (08)	PAHA	132.9	68%	32	0.25	-47%	8%	0	0	0
Charleston to Mountain View Sl (15a.1) - grouped into one sub-area by ISP control program								0	0	0
Charleston Slough (15a.1)	MVSL-T1	36.2	60%	3	0.15	-18%	-4%	-	-	-
Mountain View Slough (15a.1)	MVSL-T1	74.0	30%	1	0.00	↑	-4%	-	-	-
Stevens Creek to Long Point (15a.2)	STEV-T1	56.9	63%	3	0.08	-25%	↑	0	0	0
Guadalupe Slough (15a.3)	GUSL-T1	317.5	28%	3	0.03	-25%	20%	0	0	0
Alviso Slough (15a.4)	ALSL-T2	460.2	17%	12	0.09	-43%	38%	0	0	0
Stevens Creek (15c)	STEV-T1	27.9	75%	2	0.10	-33%	↑	0	0.20	0.20

Table 2 continued on next page

Sub-Area Name (Code)	Transect	Site Area (acres)	% of Site Surveyed	RIRA Indices: Highest Count	RIRA Indices: Relative Density	RIRA Indices: One year Δ	RIRA Indices: Five year Δ	Occupancy: BLRA	Occupancy: SORA	Occupancy: VIRA
Dumbarton South Region (continued)										
Cooley Landing (16) - split into two sub-areas in 2011								0	0	0
Cooley Landing Central (16.1)	COLA-T1	42.0	91%	8	0.13	-43%	46%	-	-	-
Cooley Landing East (16.2)	COLA-T1	133.1	55%	11	0.04	-52%	18%	-	-	-
Union City Region										
AFCC - Mouth (01a)	AFCP-T1	23.6	60%	0	0.00	→	→	0	0	0
AFCC - Lower (01b)	AFCP-T2	135.4	39%	0	0.00	-100%	-100%	0	0	0.14
AFCC - Upper (01c)	AFCC-T4	75.3	63%	0	0.00	-	→	0	0	0
AFCC - to I-880 (01d)	AFCC-T4	39.7	23%	0	0.00	-	→	0	0	0
AFCC - Pond 3 (01f)	AFCP-T2	130.9	69%	0	0.00	→	-100%	0	0	0.14
OAC - North Bank (13a)	OAC-T2	29.4	65%	2	0.05	-50%	10%	0	0	0
OAC - Island (13b)	OAC-T2	95.8	68%	8	0.12	100%	10%	0.11	0.06	0.11
OAC - South Bank (13c)	OAC-T2	25.8	60%	3	0.19	50%	↑	0	0	0
Whale's Tail - North (13d)	WTN-T1	140.6	46%	1	0.00	↑	-23%	0	0	0
Whale's Tail - South (13e)	WTS-T1	149.3	51%	2	0.03	-67%	10%	0	0	0
Cargill Mitigation Marsh (13f)	WTS-T1	47.2	79%	1	0.00	0%	↑	0	0	0
Eden Landing - Mt Eden Creek (13j)	EDEN-T1	124.8	49%	1	0.02	-50%	↑	0	0	0
Eden Landing Reserve - South (13k)	ELRS-T1	239.6	36%	4	0.02	↑	↑	0	0	0
Eden Landing Reserve - North (13l)	ELRS-T1	229.8	18%	0	0.00	→	→	0	0	0
Hayward Region										
Oro Loma - East (07a)	ORLW-T1	197.1	54%	0	0.00	→	-100%	0	0	0
Oro Loma - West (07b)	ORLW-T3	130.7	55%	2	0.03	-33%	↑	0	0	0
Dog Bone Marsh (20c)	NORT-T1	7.6	59%	1	0.22	0%	↑	0	0	0
Citation Marsh (20d) - - split into three sub-areas in 2012 and 2018								0	0.29	0.14
Citation Marsh South (20d.1)	CITA-T1	44.4	44%	4	0.15	300%	↑	-	-	-
Citation Marsh Channels (20d.2a)	CITA-T1	7.5	100%	5	0.66	-38%	15%	-	-	-
Citation Marsh North Main (20d.2b)	CITA-T1	64.3	71%	32	0.41	-24%	30%	-	-	-
East Marsh (20e)	SLRZ-T1	37.2	26%	5	0.21	0%	15%	0	0	0
North Marsh (20f)	NORT-T1	91.6	94%	56	0.52	-14%	50%	0	0.57	0.57
Bunker Marsh (20g)	BUNK-T1	35.9	95%	24	0.56	14%	27%	0	0.33	0
San Lorenzo Creek (20h) - split into two sub-areas in 2011								0	0	0
San Lorenzo Creek North (20h.1)	SLRZ-T1	11.8	98%	2	0.09	0%	10%	-	-	-
San Lorenzo Creek South (20h.2)	SLRZ-T1	10.7	93%	0	0.00	→	→	-	-	-
Cogswell - Sec A (20m)	COGS-T1	34.9	100%	1	0.03	-86%	↑	0	0	0

Table 2 continued on next page

Sub-Area Name (Code)	Transect	Site Area (acres)	% of Site Surveyed	RIRA Indices: Highest Count	RIRA Indices: Relative Density	RIRA Indices: One year Δ	RIRA Indices: Five year Δ	Occupancy: BLRA	Occupancy: SORA	Occupancy: VIRA
Hayward Region (continued)										
Cogswell - Sec B (20n) – split into three sub-areas in 2018								0	0.14	0.14
Cogswell B - Bayfront (20n.1)	COGS-T3	11.9	89%	6	0.38	20%	10%	-	-	-
Cogswell B - South (20n.2)	COGS-T3	33.9	95%	15	0.31	-6%	20%	-	-	-
Cogswell B - Main (20n.3)	COGS-T3	55.5	91%	16	0.16	-38%	13%	-	-	-
Cogswell - Sec C (20o)	COGS-T2	49.8	100%	16	0.22	-6%	46%	0	0	0
HARD Marsh (20s)	HARD-T1	65.9	80%	3	0.06	0%	20%	0	0	0
Triangle Marsh - Hayward (20w)	TRMA-T1	12.4	35%	0	0.00	→	→	0	0	0
San Leandro Region										
Arrowhead Marsh (17c) - split into two sub-areas in 2011								0	0	0
Arrowhead Marsh West (17c.1)	ARHE-T2	21.2	97%	3	0.14	-73%	4%	-	-	-
Arrowhead Marsh East (17c.2)	ARHE-T2	22.7	90%	38	1.85	27%	-1%	-	-	-
MLK Regional Shoreline - Damon (17d.4)	MLKS-T1	10.6	100%	17	1.51	13%	47%	0	0	0.33
San Leandro Creek (17e) - split into two sub-areas in 2011								0	0	0
San Leandro Creek North (17e.1)	MLKR-T1	2.0	100%	2	0.98	↑	↑	-	-	-
San Leandro Creek South (17e.2)	MLKR-T1	5.3	17%	0	0.00	→	→	-	-	-
MLK New Marsh (17h)	MLKR-T1	34.3	100%	59	1.49	2%	14%	14%	43%	0%
Fan Marsh (17j) – split into two sub-areas in 2018								0	0.67	0
Fan Marsh Wings (17j.1)	FANM-T1	2.3	59%	1	0.74	-50%	↑	-	-	-
Fan Marsh Main (17j.2)	FANM-T1	10.1	100%	22	2.18	-24%	35%	-	-	-
Bay Bridge North Region										
Emeryville Crescent - East (06a)	EMCR-T1	54.2	7%	0	0.00	→	→	0	0	0
Emeryville Crescent - West (06b)	EMCR-T1	31.5	99%	1	0.00	-50%	-16%	0	0	0
Whittel Marsh (10a)	PTPN-T1	44.9	96%	2	0.05	-67%	↑	0	0	0
Wildcat Marsh (22a)	WIMA	325.1	41%	18	0.07	-18%	-14%	0.25	0	0
San Pablo Marsh (22b) - split into two sub-areas in 2011								0.40	0	0
San Pablo Marsh East (22b.1)	RIF	31.5	79%	9	0.24	13%	1%	-	-	-
San Pablo Marsh West (22b.2)	RIF	130.6	60%	14	0.14	0%	-14%	-	-	-
Rheem Creek Area (22c)	RCRA-T1	26.8	79%	8	0.28	167%	10%	0.50	0.25	0
Stege Marsh (22d) – grouped into one sub-area by ISP control program								0	0	0
Stege Marsh (22d)	STEG-T1	31.5	93%	7	0.24	75%	7%	-	-	-
Meeker Slough (22d)	STEG-T1	30.6	90%	11	0.29	38%	35%	-	-	-
Hoffman Marsh (22e)	STEG-T1	38.5	91%	0	0.00	-100%	→	0	0	0
Petaluma Region										
Carl's Marsh (24d)	PRM	54.3	94%	13	0.22	-32%	6%	0	0.17	0.17

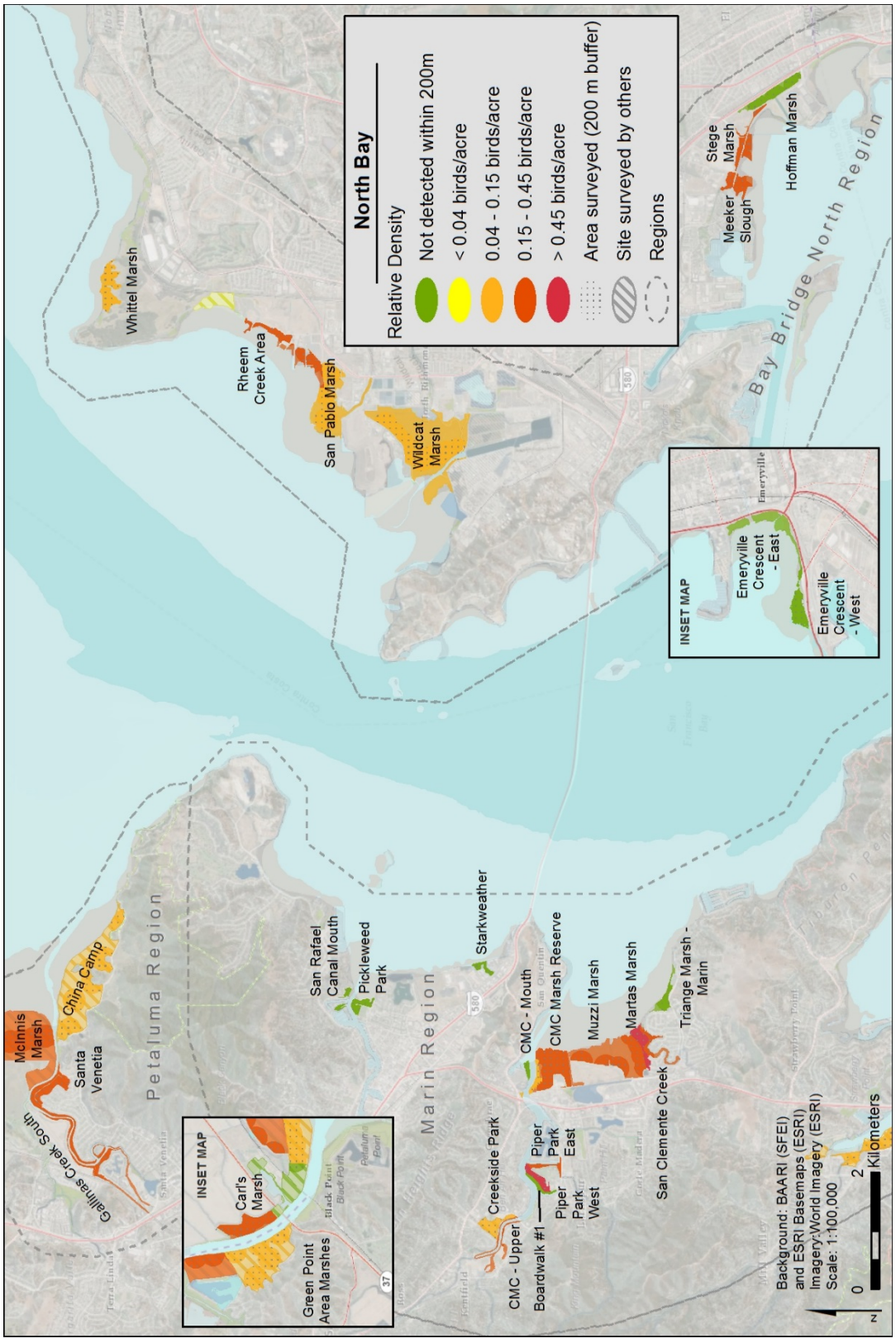

Figure 2. Overview map of North Bay, showing summary results at sub-areas in the Bay Bridge North and Marin Regions. To see survey stations and rail locations, view the map attachment named North Bay (scaled to 1:24,000 on a 24x36 poster).

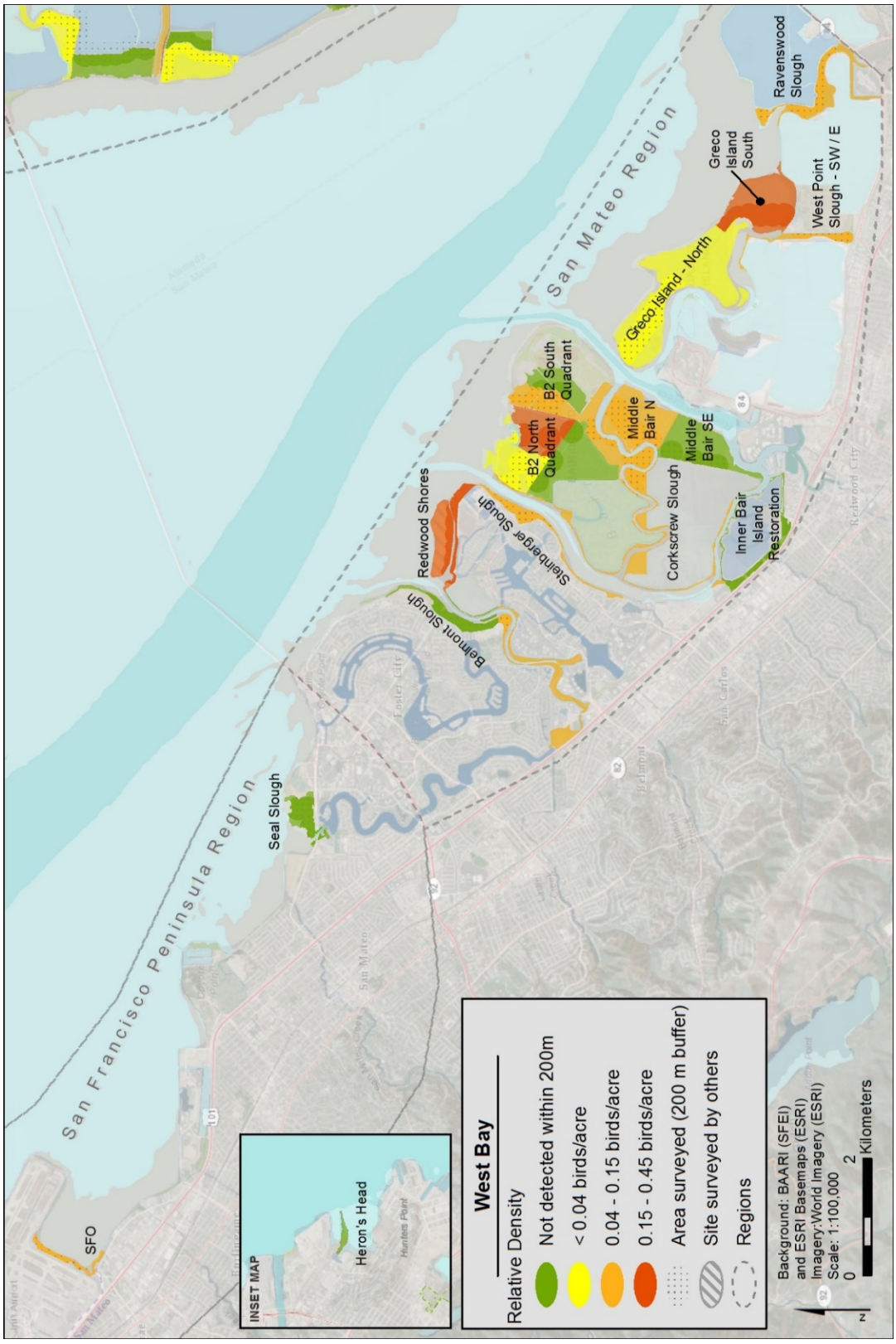

Figure 3. Overview map of West Bay, showing summary results at sub-areas in the SF Peninsula and San Mateo Regions. To see survey stations and rail locations, view the map attachment named West Bay (scaled to 1:24,000 on a 24x36 poster).

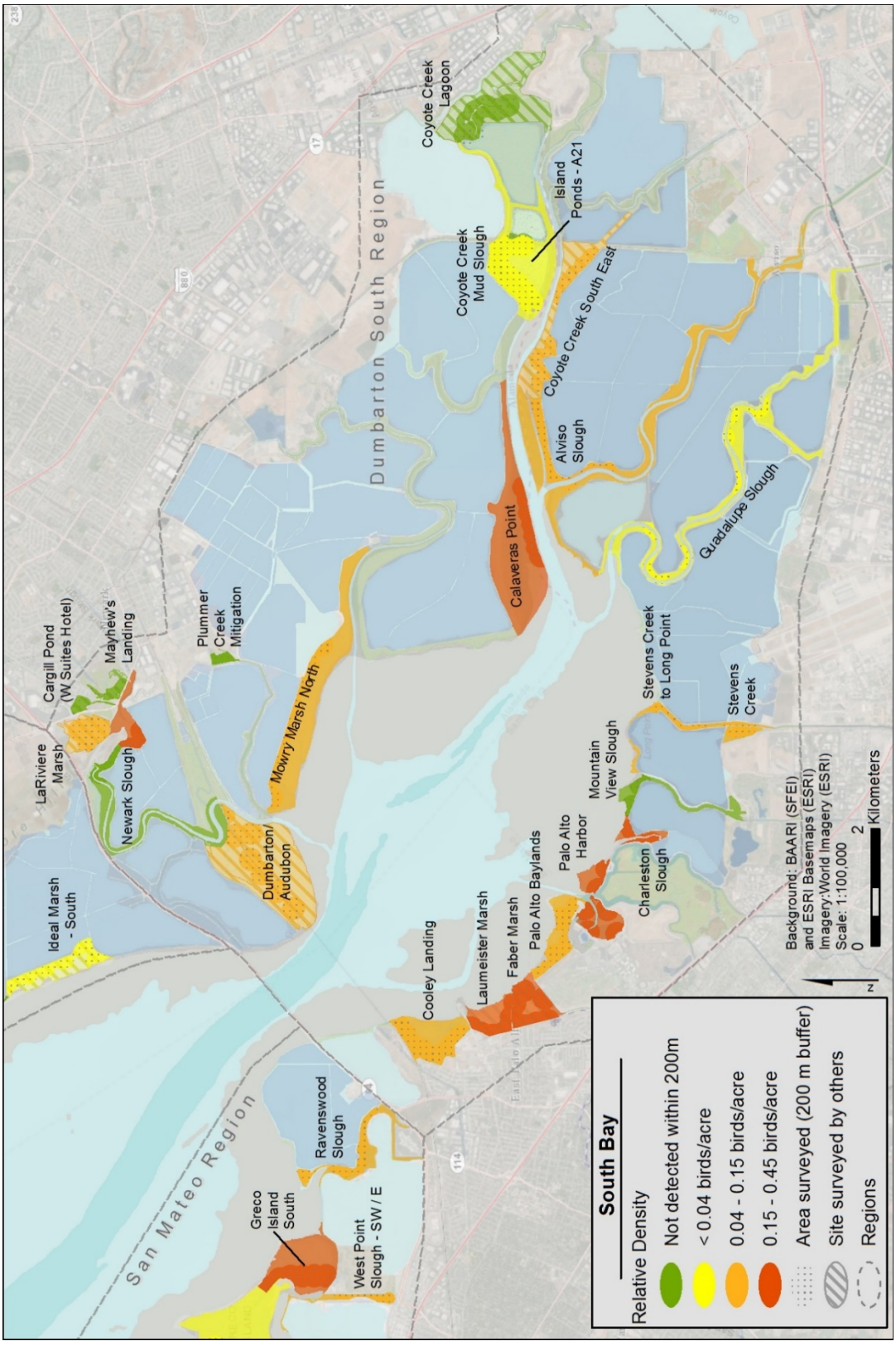

Figure 4. Overview map of South Bay, showing summary results at sub-areas in the Dumbarton South Region. To see survey stations and rail locations, view the map attachment named South Bay (scaled to 1:24,000 on a 24x36 poster).

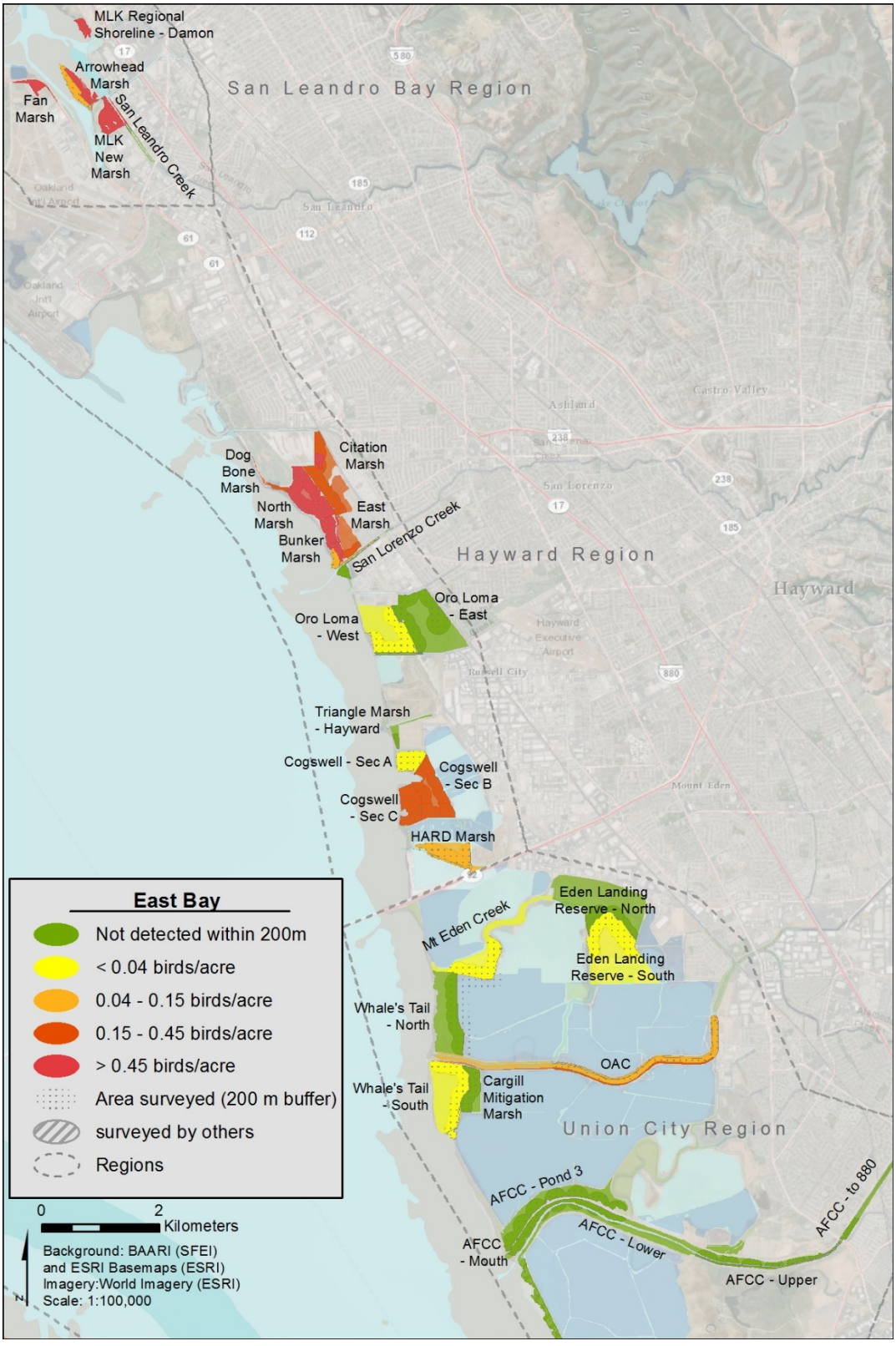

Figure 5. Overview map of East Bay, showing summary results at sub-areas in the Union City, Hayward, and San Leandro Bay Regions. To see survey stations and rail locations, view the map attachment named East Bay (scaled to 1:24,000 on a 24x36 poster).

This page is intentionally left blank.

5. Discussion

The number of rails detected by OEI in 2019 was down from the previous year at the same subset of sub-areas (-17% average annual rate of change). This trend is mirrored at both treated and restricted sub-areas, and it does not seem related to *Spartina* treatment. Instead the decline is likely due in part to the El Niño weather pattern this year. The increase in storm events may have affected adult rail mortality, but it also interfered with the ability to detect rails. Surveys during the months of February and March were conducted during marginal weather conditions in short windows of opportunity between major storms. In a normal year, call counts peak in mid-February (Liu et al. 2012). However, this year peak call-counts mostly occurred in January, before the majority of the stormy weather arrived in the Bay. It is still uncertain whether the decline in rail detections during surveys is a reflection of an actual population decline or whether it is due to decreased probability of detection.

Despite the negative one-year trend, there is still a positive trend in the longer-term five-year growth rate (+7% compound rate of change since 2014). In fact, the total number of rails detected in 2019 is the third largest number of rails detected in a season when compared to the past nine seasons of survey data at the same subset of sub-areas. The positive 5-year trend was observed at both treated (2% growth rate) and restricted (20% growth rate) sub-areas, although at different degrees of increase. The sub-areas where *Spartina* treatment was restricted after 2011 experienced rapid changes in the cover and composition of the marshes, as hybrid *Spartina* quickly expanded and recolonized the tidal marsh habitat. A corresponding rapid increase in rail numbers followed the expansion of hybrid at the restricted treatment sub-areas. The steadier pace of population growth at the treated sub-areas is a better indication of the positive trajectory of the baywide population.

The average relative density at all sub-areas surveyed by OEI where rails were present was 0.29 Ridgway's rails per acre. This average is greater than the 75th percentile of observed winter densities (0.23 rails/acre) as reported in the TMRP (USFWS 2013). Rail densities were much greater at the eleven previously restricted sub-areas (0.75 rails per acre) than in sub-areas where *Spartina* treatment has been on-going (0.16 rails per acre). Some of the disparity between the density estimates at treated versus restricted sub-areas might in part be due to an inherit bias in site-selection: OEI surveys many smaller low-quality marshes because of the presence of non-native *Spartina*, while partner organization focus their efforts on higher quality native marshes with substantial rail populations. However, despite the skew of the results presented in this report, the relative densities at the eleven formerly restricted sub-areas are among the highest of any of the sub-areas surveyed in 2019.

Spartina Treatment Effects

In the 2018 Biological Opinion, the Service estimated that rails inhabiting the previously-restricted sub-areas may be lost due to mortality or exhibit decreased reproductive success due to loss of hybrid *Spartina* cover when treatment of these sub-areas resumes. Last year, full treatment resumed at six sub-areas: B2 North Quadrant East (02c.1b), San Lorenzo Creek North (20h.1), Cogswell - Sec B South (20n.2), Cogswell – Sec C (20o), Damon Marsh (17d.4), and Fan Marsh Wings (17j.1). Of these six sub-areas where restrictions were lifted

and where treatment resumed in 2018, there was no net loss in rail numbers: a total of 73 rails were detected in both 2018 and 2019 at these six sub-areas.

Habitat changes due to *Spartina* treatment are not expected to occur until the first growing season following the initiation of treatment. Thus, rail response to the 2018 treatment season is unlikely to be observed until the 2020 call-count surveys; this is referred to as the lag effect. In 2019, treatment was initiated at an additional two of the previously restricted sub-areas: Bunker Marsh (20g) and Cogswell – Sec B Bayfront (20n.1). Additionally Cogswell – Sec B Main (20n.3) was treated with a sub-lethal dose of herbicide to suppress seed set (called "seed suppression). Rail response at these three sub-areas is not expected to be observed until 2021 call-count surveys.

Recommendations

Habitat enhancement and restoration may ameliorate the effects of the temporary loss of cover due to *Spartina* removal. Additionally, the slower-paced phased treatment of the previously-restricted sub-areas will also stem declines as the habitat converts from invasive *Spartina* meadows to native marshes. The ISP is working to rapidly reestablish native vegetation and high tide refuge to support and increase the bay-wide Ridgway's rail population. These efforts include extensive revegetation of both *Grindelia stricta* and *Spartina foliosa* plantings. Additionally, the Coastal Conservancy has invested in the construction of high tide refuge islands. Approximately 60 islands have been installed to date.

Ultimately, the most effective means to increase the Ridgway's rail population in the Estuary in the long term will be to increase the amount of salt marsh habitat available through the restoration of large tracts of tidal wetlands. Many of these efforts are already well on their way through the South Bay Salt Pond Restoration Project and the restoration of the Napa-Sonoma Baylands. As more of these newly-breached sites mature and become vegetated, biologists expect to see Ridgway's rails colonize and increase in numbers in response to the restored habitat. The first evidence of this positive rail response can already be seen in some recently restored sites that now support rails, including Island Ponds A21 in Coyote Creek, Eden Landing Reserve South (13k, AKA North Creek Marsh), and Sonoma Baylands Restoration at the mouth of the Petaluma River, which already supports a substantial rail population at a fairly high density. These large tracts of native marshlands are the key to the resiliency of the rail and the ecosystem in the face of an uncertain future due to climate change.

6. Permits

Surveys were conducted under the authority of U.S. Fish and Wildlife Service permit TE118356-4 and a Memorandum of Understanding with the California Department of Fish and Wildlife. 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, Westpoint Harbor, SFO International Airport, and Don Edwards San Francisco Bay National Wildlife Refuge.

This page is intentionally left blank.

7. References

Conway, C. J. and M. E. Seamans. 2016. National Wildlife Refuge System Protocol Framework for Inventory and Monitoring of Secretive Marsh Birds. Inventory and Monitoring, National Wildlife Refuge System, U.S. Fish and Wildlife Service, Fort Collins, CO.

Liu, L., Wood, J., Nur, N., Salas, L., & Jongsomjit, D. 2012. California Clapper Rail (Rallus longirostris obsoletus) Population monitoring: 2005-2011 *PRBO Technical Report to the California Department of Fish and Game*. Petaluma, CA: PRBO Conservation Science.

Nur, N., L. Salas, J.K. Wood, and M. Elrod. 2016. An Evaluation of Two Secretive Marsh Bird Survey Protocols in San Francisco Bay. Final Report to the U.S. Fish and Wildlife Service, Pacific Southwest Region Refuge Inventory and Monitoring Initiative. Point Blue Conservation Science. Petaluma, CA.

SFEI (San Francisco Estuary Institute). 2002. Bay Area EcoAtlas 1.50 beta 4 (http://www.sfei.org).

Wood, J.K., Nur, N., Salas, L. and O.M.W. Richmond. 2016. Site-specific Protocol for Monitoring Marsh Birds: Don Edwards San Francisco Bay and San Pablo Bay National Wildlife Refuges. Prepared for the U.S. Fish and Wildlife Service, Pacific Southwest Region Refuge Inventory and Monitoring Initiative. Point Blue Conservation Science. Petaluma, CA.

U.S. Fish and Wildlife Service. 2013. Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California. Sacramento, California. xviii+ 605 pp. (http://www.fws.gov/sacramento/es/Recovery-Planning/Tidal-Marsh/Documents/TMRP_Volume1_RP.pdf)

This page is intentionally left blank.

Appendix I: Complete List of 2019 *Spartina* Treatment Sub-Areas and Ridgway's Rail Survey Plans

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)
- **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 2019 *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
Area 01: Alameda Flood Control Channel in Union City Region				
AFCC - Mouth (01a)	ISP	NAm	AFCP-T1	Formerly surveyed by DENWR
AFCC - Lower (01b)	ISP	NAm	AFCP-T1; AFCP-T2	Formerly surveyed by DENWR
AFCC - Upper (01c)	ISP	NAm	AFCC-T4	Formerly surveyed by DENWR
AFCC - to I-880 (01d)	ISP	NAm	AFCC-T4	Formerly surveyed by DENWR
AFCC - Strip Marsh (01e)	none	none	none	Insufficient habitat (2017)
AFCC - Pond 3 (01f)	ISP	NAm	AFCP-T1; AFCP-T2	Formerly surveyed by DENWR
Area 02: Bair and Greco Complex in San Mateo Region				
Belmont to Steinberger Slough (02a)	-	-	-	Split into five sub-areas in 2011 and 2012
Belmont Slough Mouth (02a.1a)	ISP	NAm	BELM-T1	
Belmont Slough South (02a.1b)	ISP	NAm	BELM-T1	
Belmont Slough to Steinberger (02a.2)	ISP	NAm	BELM-T1	
Redwood Shores (02a.3)	DENWR	NAm	RESH-T1	
Redwood Shores Mitigation Bank (02a.4)	none	none	none	Insufficient habitat (2017)
Steinberger to Redwood Creek (02b)	-	-	-	Split into three sub-areas in 2011
Corkscrew Slough (02b.1)	ISP	NAm	CORK-T1	
Steinberger Slough (02b.2)	ISP	NAm	RESH-T2	
Redwood Creek (02b.2)	none	none	none	Not surveyed
B2 North Quadrant (02c)	-	-	-	Split into three sub-areas in 2011 and 2012
B2 North Quadrant West (02c.1a)	ISP	NAm	OBEN-T1	
B2 North Quadrant East (02c.1b)	ISP	NAm	OBEN-T1	
B2 North Quadrant South (02c.2)	ISP	NAm	OBEN-T2	
B2 South Quadrant (02d)	-	-	-	Split into four sub-areas in 2011 and 2012
B2 South Quadrant West (02d.1a)	ISP	NAm	OBES-T1	
B2 South Quadrant East (02d.1b)	ISP	NAm	OBES-T1	
B2 South Quadrant 2 (02d.2)	ISP	NAm	OBES-T1	
B2 South Quadrant 3 (02d.3)	ISP	NAm	OBES-T1	
West Point Slough - NW (02e)	none	none	none	No site access in 2019
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	
Ravenswood Open Space Preserve (02j)	none	none	none	Insufficient habitat (2017)
Deepwater Slough (02k)	-	-	-	Grouped into one sub-area by ISP control program
Middle Bair N (02k)	ISP	NAm	MBE-T1	
Middle Bair SE (02k)	ISP	NAm	MBE-T1	
Inner Bair Island Restoration (02l)	ISP	NAm	IBI-T1	
Pond B3 Bair Island Restoration (02m)	none	none	none	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
Area 03: Blackies Pasture and Mouth in Marin Region				
Blackie's Creek (03a)	none	none	none	Insufficient habitat (2017)
Blackie's Creek Mouth (03b)	none	none	none	Insufficient habitat (2017)
Area 04: Corte Madera Creek in Marin Region				
CMC Marsh Reserve (04a)	ISP	NAm	HEER-T1	Typically surveyed by PBCS
College of Marin (04b)	none	none	none	Insufficient habitat (2019)
Piper Park - East (04c)	ISP	NAm	PIPE-T1	Typically surveyed by PBCS
Piper Park - West (04d)	ISP	NAm	PIPE-T1	Typically surveyed by PBCS
Larkspur Ferry Landing Area (04e)	none	none	none	Insufficient habitat (2017)
Riviera Circle (04f)	none	none	none	Insufficient habitat (2017)
Creekside 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
CMC - Mouth (04j)	-	-	-	Split into two sub-areas in 2011
CMC - Mouth North (04j.1)	ISP	NAm	CMC-T1	Not surveyed
CMC - Mouth South (04j.2)	ISP	NAm	CMC-T1	
Boardwalk No. 1 (04k)	ISP	NAm	PIPE-T1	Typically surveyed by PBCS
Murphy Creek (04l)	none	none	none	Insufficient habitat (2016)
Area 05: Coyote Creek / Mowry in Dumbarton South Region				
Mowry Marsh (05a.1)	-	-	-	Grouped into one sub-area by ISP control program
Mowry Marsh North (05a.1)	ISP	NAm	MOWN-T1	
Mowry Marsh South Bayshore (05a.1)	none	none	none	Not surveyed
Mowry Slough Upper (05a.1)	none	none	none	Not surveyed
Mowry Marsh South (05a.1)	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
Dumbarton/Audubon (05b)	DENWR	NAm	DUMA-T2	
Dumbarton/Audubon East (05b)	none	none	none	Not surveyed
Plummer Creek (05b)	none	none	none	Not surveyed
Newark Slough (05c)	-	-	-	Split into two sub-areas in 2011
Newark Slough West (05c.1)	ISP	NAm	NEWS-T1	
Newark Slough East (05c.2)	ISP	NAm	NEWS-T1	
LaRiviere Marsh (05d)	DENWR	NAm	LARV-T1	
Mayhew's Landing (05e)	DENWR	NAm	MALA-T1	
Coyote Creek - Alameda County (05f)	-	-	-	Grouped into one sub-area by ISP control program
Coyote Creek - Mud Slough (05f)	ISP	NAm*	A21-T1	*surveyed from adjacent site
Coyote Creek - North (05f)	none	none	none	Not surveyed
Coyote Creek Lagoon (05f)	DENWR	NAm	CCL-T1	
Cargill Pond (W Suites Hotel) (05g)	DENWR	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
Island Ponds - A21 (05i)	ISP	NAm	A21-T1	
Island Ponds - A20 (05i)	none	none	none	Not surveyed
Island Ponds - A19 (05i)	none	none	none	Not surveyed

Sub-area Name (ID)	Survey Organization	Survey Type	Transect	Notes
Area 06: Emeryville Crescent in Bay Bridge North Region				
Emeryville Crescent - East (06a)	ISP	NAm	EMCR-T1	
Emeryville Crescent - West (06b)	ISP	NAm	EMCR-T1	
Area 07: Oro Loma in Hayward Region				
Oro Loma - East (07a)	ISP	NAm	ORLW-T1	
Oro Loma - West (07b)	ISP	NAm	ORLW-T3	
Area 08: Palo Alto Baylands in Dumbarton South Region				
Palo Alto Baylands (08)	-	-	-	Grouped into one sub-area by ISP control program
Palo Alto Baylands (08)	ISP	NAm	PAB	Typically surveyed by PBCS
Palo Alto Harbor (08)	ISP	NAm	PAHA	Typically surveyed by PBCS
Area 09: Pickleweed Park in Marin Region				
Pickleweed Park (09)	ISP	NAm	PIPK-T1	
Area 10: Point Pinole Marshes in Bay Bridge North Region				
Whittel Marsh (10a)	ISP	NAm	PTPN-T1	
Southern Marsh (10b)	none	none	none	Insufficient habitat (2017)
Giant Marsh (10c)	EBRPD	unknown	n/a	
Breuner Marsh Restoration (10d)	none	none	none	Insufficient habitat (2017)
Area 11: Carquinez Straits in Vallejo Region				
Southampton Marsh (11)	ARA	G	n/a	
Area 12: Southeast San Francisco in San Francisco Bay Region				
Pier 94 (12a)	none	none	none	Insufficient habitat (2016)
Pier 98/Heron's Head (12b)	ISP	NAm	HEHE-T1	
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)
Area 13: Whales Tail Complex in Union City Region				
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	
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	
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	*surveyed from adjacent site
Eden Landing - Ponds E8A, E9, E8X (13m)	none	none	none	Insufficient habitat (2017)

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

Sub-area Name (ID)	Survey Organization	Survey Type	Transect	Notes
Fan Marsh (17j)	-	-	-	Split into two sub-areas in 2019
Fan Marsh Wings (17j.1)	ISP	NAm	FANM-T1	
Fan Marsh Main (17j.2)	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)
Area 18: Colma Creek/ San Bruno in San Francisco Peninsula Region				
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)
Area 19: West San Francisco Bay in San Francisco Peninsula Region				
Brisbane Lagoon (19a)	OEI	G	n/a	surveyed by OEI for CalTrain
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)	ISP	NAm	SANC-T1	
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
Seal Slough Central (19p.1)	ISP	NAm	SEAL-T1	
Seal Slough Peripheral (19p.2)	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)
Area 20: San Leandro / Hayward Shoreline in Hayward Region				
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
Citation Marsh South (20d.1)	ISP	NAm	CITA-T1	
Citation Marsh North Channels (20d.2a)	ISP	NAm	CITA-T1	Split in 2018
Citation Marsh North Main (20d.2b)	ISP	NAm	CITA-T1	Split in 2018
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
San Lorenzo Creek North (20h.1)	ISP	NAm	SLRZ-T1	
San Lorenzo Creek South (20h.2)	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
Cogswell - Sec B Bayfront (20n.1)	ISP	NAm	COGS-T3	
Cogswell - Sec B South (20n.2)	ISP	NAm	COGS-T3	
Cogswell - Sec B Main (20n.3)	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	
Area 21: Ideal Marsh in Union City Region				
Ideal Marsh - North (21a)	DENWR	NAm	IMAN-T1	Not surveyed
Ideal Marsh - South (21b)	DENWR	NAm	IMAS-T1	Not surveyed
Area 22: Two Points Complex in Bay Bridge North Region				
Wildcat Marsh (22a)	ISP	NAm	WIMA	Typically surveyed by PBCS
San Pablo Marsh (22b)	-	-	-	Split into two sub-areas in 2011
San Pablo Marsh East (22b.1)	ISP	NAm	RIF	Typically surveyed by PBCS
San Pablo Marsh West (22b.2)	ISP	NAm	RIF	Typically surveyed by PBCS
Rheem Creek Area (22c)	ISP	NAm	RCRA-T1	
Stege Marsh (22d)	-	-	-	Grouped into one sub-area by ISP control program
Stege Marsh (22d)	ISP	NAm	STEG-T1	
Meeker Slough (22d)	ISP	NAm	STEG-T1	
Hoffman Marsh (22e)	ISP	NAm	STEG-T1	
Albany Shoreline (22f)	none	none	none	Insufficient habitat (2017)
Area 23: Marin Outliers in Marin and Petaluma Regions				
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
San Rafael Canal Mouth East (23d.1)	ISP	NAm	PIPK-T1	
San Rafael Canal Mouth West (23d.2)	ISP	NAm	PIPK-T1	

Sub-area Name (ID)	Survey Organization	Survey Type	Transect	Notes
Muzzi and Martas Marsh (23e)	-	-	-	Grouped into one sub-area by ISP control program
Martas Marsh (23e)	ISP	NAm	MUZZ	Typically surveyed by PBCS
San Clemente Creek (23e)	ISP	NAm	MUZZ	Typically surveyed by PBCS
Muzzi Marsh (23e)	ISP	NAm	MUZZ	Typically surveyed by PBCS
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)	ISP	NAm	STRK-T1	
Novato (23m)	-	-	-	Grouped into one sub-area by ISP control program
Hamilton South (23m)	PBCS	NAm	MIN-T1	
Mitchell Fragment (23m)	none	none	none	Not surveyed
Santa Venetia (23m)	PBCS	NAm	STVE-T1	
Gallinas Creek North (23m)	none	none	none	Not surveyed
McInnis Marsh (23m)	PBCS	NAm	MIM-T1	
Novato Creek Mouth (23m)	none	none	none	Not surveyed
Gallinas Creek South (23m)	PBCS	NAm	GACM-T1	Not surveyed
Hamilton North (23m)	none	none	none	Not surveyed
Novato Creek Mid Reach (23m)	none	none	none	Not surveyed
Triangle Marsh - Marin (23n)	ISP	NAm	TRF-T1	
China Camp (23o)	PBCS	NAm	CCM-T1	
Petaluma River - Upper (24a)	PBCS	NAm	PDF-T1	
Grey's Field (24b)	PBCS	NAm	GRFI-T1	
Area 24: Petaluma River in Petaluma Region				
Petaluma Marsh (24c)	-	-	-	Grouped into one sub-area by ISP control program
Tule Slough (24c)	none	none	none	Not surveyed
False Slough (24c)	none	none	none	Not surveyed
Lakeville Marina (24c)	none	none	none	Not surveyed
Ellis Creek (24c)	PBCS	NAm*	GRFI-T1	*surveyed from adjacent site
Petaluma Marsh Expansion Project (24c)	none	none	none	Not surveyed
San Antonio Creek (E) (24c)	none	none	none	Not surveyed
Petaluma River (C) (24c)	none	none	none	Not surveyed
San Antonio Creek (A) (24c)	none	none	none	Not surveyed
Mira Monte Slough (B) (24c)	none	none	none	Not surveyed
Mud Hen Slough (D) (24c)	none	none	none	Not surveyed
Schultz Slough (24c)	none	none	none	Not surveyed
Gambini Marsh (24c)	none	none	none	Not surveyed
Woloki Slough (24c)	none	none	none	Not surveyed

Sub-area Name (ID)	Survey Organization	Survey Type	Transect	Notes
Lower Petaluma River (24d)	-	-	-	Grouped into one sub-area by ISP control program
Day Island Wildlife Area (24d)	none	none	None	Not surveyed
Petaluma River - West Side (24d)	PBCS	NAm	GRPT-T1	
Carl's Marsh (24d)	ISP	NAm	PRM-T1	
Green Point Area Marshes (24d)	PBCS	NAm	GRPT-T1	
Sonoma Marina (24d)	PBCS	NAm*	SBR-T1	*surveyed from adjacent site
Petaluma River - Lower (24d)	none	none	none	Not surveyed
Black John Slough North (24d)	none	none	none	Not surveyed
Black John Slough A (24d)	none	none	none	Not surveyed
Bahia Channel (24d)	none	none	none	Not surveyed
Black John Slough B (24d)	none	none	none	Not surveyed
Area 25: Outer Coast in Outer Coast Region				
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)	none	none	none	Not surveyed
Bolinas Lagoon - South (25e)	none	none	none	Not surveyed
Area 26: North San Pablo Bay in Petaluma and Vallejo Regions				
Napa River (26a)	-	-	-	Grouped into one sub-area by ISP control program
Coon Island (26a)	PBCS	NAm	COIS-T1	
Fly Bay (26a)	CDFW	NAm	no data	
Napa Tract Salt Pond 5 (26a)	CDFW	NAm	no data	
Napa Tract Salt Pond 4 (26a)	CDFW	NAm	no data	
White Slough Marsh (26a)	none	none	none	Not surveyed
Fagan Slough (26a)	PBCS	NAm	FAGA-T1	
Pond 2A Restoration (26a)	none	none	none	Not surveyed
Napa Centennial Marsh (26a)	none	none	none	Not surveyed
Bull Island (26a)	none	none	none	Not surveyed
Napa Plant Site Restoration (26a)	none	none	none	Not surveyed
Skaggs Island Bridge / Napa Slough (26a)	none	none	none	Not surveyed
Dutchman Slough Mouth (26a)	none	none	none	Not surveyed
Napa Tract Salt Pond 7 (26a)	none	none	none	Not surveyed
Napa Tract Intake Pond 1A (26a)	none	none	none	Not surveyed
Hudeman Slough (26a)	none	none	none	Not surveyed
Napa Tract Intake Pond 1 (26a)	none	none	none	Not surveyed
Napa Tract Salt Pond 6A (26a)	none	none	none	Not surveyed
Napa Tract Salt Pond 6 (26a)	none	none	none	Not surveyed
Guadacanal Village (26a)	none	none	none	Not surveyed
Dutchman Slough (26a)	none	none	none	Not surveyed
Napa Tract Salt Pond 2 (26a)	none	none	none	Not surveyed
Napa Tract Salt Pond 3 (26a)	none	none	none	Not surveyed
Napa Tract Salt Pond 7A (26a)	none	none	none	Not surveyed
China Slough (26a)	none	none	none	Not surveyed
Devil's Slough (26a)	none	none	none	Not surveyed
Cullinan Ranch (26a)	none	none	none	Not surveyed

Sub-area Name (ID)	Survey Organization	Survey Type	Transect	Notes
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
Lower Tubbs Island (26d)	SPBNWR	NAm	LTI-T1,T2,T3	
Tolay Creek (26d)	SPBNWR	NAm	TC-T1	
Tubbs Island Restoration (26d)	SPBNWR	NAm	TS-T1	
Petaluma River Mouth (26d)	PBCS	NAm	RMA	
Sonoma Baylands Restoration (26d)	PBCS	NAm	SBR-T1	
Sonoma Baylands East (26d)	SPBNWR	NAm	SMW-T1,T2	
Area 27: Suisun Marshes in Suisun Region				
Point Buckler (27a)	none	none	none	
MOTCO Islands (27b)	none	none	none	
Honker Bay (27c)	none	none	none	

Appendix II: 2019 Survey Station Coordinates in UTM (NAD83, Zone 10)

This page is intentionally left blank.

Appendix II: Survey stations by site and transect ID. Geographic coordinates are in UTM (NAD83, Zone10).

Sub-Area Name (ID)	Transect	Station ID	X-coordinate	Y-coordinate
MARIN REGION				
CMC - Mouth (04j)	CMCM-T1	CMCM12	542958	4199629
CMC - Mouth (04j)	CMCM-T1	CMCM13	543185	4199682
CMC - Mouth (04j)	CMCM-T1	CMCM14	542814	4199523
CMC - Mouth (04j)	CMCM-T1	CMCM15	543007	4199427
CMC - Mouth (04j)	CMCM-T1	CMCM16	543234	4199447
CMC Marsh Reserve (04a)	HEER	CEF01	543102	4199205
CMC Marsh Reserve (04a)	HEER	CEF03	543330	4199066
CMC Marsh Reserve (04a)	HEER	CEF05	543015	4198956
CMC Marsh Reserve (04a)	HEER	CEF13	543351	4199248
CMC Marsh Reserve (04a)	HEER	CEF16	542823	4199275
CMC Marsh Reserve (04a)	HEER	CEF20	543437	4199425
Muzzi Marsh (23e)	MUZZ	MUZZ02	543270	4198714
Muzzi Marsh (23e)	MUZZ	MUZZ04	543198	4198296
Muzzi Marsh (23e)	MUZZ	MUZZ06	543162	4198086
Muzzi Marsh (23e)	MUZZ	MUZZ08	543187	4197605
Muzzi Marsh (23e)	MUZZ	MUZZ09	543380	4197655
Muzzi Marsh (23e)	MUZZ	MUZZ10	543569	4197718
Muzzi Marsh (23e)	MUZZ	MUZZ11	543740	4197849
Muzzi Marsh (23e)	MUZZ	MUZZ12	543657	4197566
Piper Park (04c)	PIPE	PIF03	541478	4199615
Piper Park (04c)	PIPE	PIPE01	541484	4199149
Piper Park (04c)	PIPE	PIPE02	541459	4199364
Piper Park (04d)	PIPE	PIPE04	541308	4199419
Piper Park (04d)	PIPE	PIPE05	541136	4199313
Pickleweed Park (9)	PIPK-T1	PIPK01	544265	4202286
Pickleweed Park (9)	PIPK-T1	PIPK02	544239	4202484
Pickleweed Park (9)	PIPK-T1	PIPK03	544183	4202641
San Rafael Canal Mouth (23d)	PIPK-T1	SRCM01	544244	4202876
San Rafael Canal Mouth (23d)	PIPK-T1	SRCM02	544370	4202758
Starkweather Park (23l)	STRK-T1	STRK01	544935	4200408
Starkweather Park (23l)	STRK-T1	STRK02	544765	4200300
Starkweather Park (23l)	STRK-T1	STRK03	544923	4200595
Triangle Marsh - Marin (23n)	TRF-T1	TRF02	544339	4197235
Triangle Marsh - Marin (23n)	TRF-T1	TRF03	544579	4197186
SAN FRANCISCO PENINSULA REGION				
Pier 98/Heron's Head (12b)	HEHE-T1	HEHE01	555235	4176946
Pier 98/Heron's Head (12b)	HEHE-T1	HEHE02	555429	4176923
Seal Slough (19p)	SEAL-T1	SEAL01	562560	4158484
Seal Slough (19p)	SEAL-T1	SEAL03	562728	4158450
Seal Slough (19p)	SEAL-T1	SEAL04	562857	4158548
Seal Slough (19p)	SEAL-T1	SEAL05	562861	4158725
Seal Slough (19p)	SEAL-T1	SEAL07	562432	4158448
SFO (19h)	SFO-T1	SFO04	555438	4163237
SFO (19h)	SFO-T1	SFO05	555203	4162889
SFO (19h)	SFO-T1	SFO06	555111	4162711
SFO (19h)	SFO-T1	SFO07	555019	4162530

Sub-Area Name (ID)	Transect	Station ID	X-coordinate	Y-coordinate
SAN MATEO REGION				
Belmont Slough (02a)	BELM-T1	BELM01	566369	4156426
Belmont Slough (02a)	BELM-T1	BELM02	566069	4156168
Belmont Slough (02a)	BELM-T1	BELM03	565966	4155996
Belmont Slough (02a)	BELM-T1	BELM04	565882	4155814
Belmont Slough (02a)	BELM-T1	BELM05	565895	4155614
Belmont Slough (02a)	BELM-T1	BELM06	565938	4155419
Belmont Slough (02a)	BELM-T1	BELM07	566028	4155239
Belmont Slough (02a)	BELM-T1	BELM08	565828	4155213
Corkscrew Slough (02b)	CORK-T1	CORK01	569367	4153611
Corkscrew Slough (02b)	CORK-T1	CORK02a	569244	4153305
Corkscrew Slough (02b)	CORK-T1	CORK03	568904	4152988
Corkscrew Slough (02b)	CORK-T1	CORK04	568894	4152635
Corkscrew Slough (02b)	CORK-T1	CORK05	568642	4152904
Corkscrew Slough (02b)	CORK-T1	CORK06	568356	4153005
Greco Island - North (02f)	GRIN-T1	GRIN11	570647	4153106
Greco Island - North (02f)	GRIN-T1	GRIN12	570811	4152993
Greco Island - North (02f)	GRIN-T1	GRIN13	570976	4152877
Greco Island - North (02f)	GRIN-T1	GRIN14	571140	4152762
Greco Island - North (02f)	GRIN-T1	GRIN15	571306	4152647
Greco Island - North (02f)	GRIN-T1	GRIN16	571471	4152533
Greco Island - North (02f)	GRIN-T1	GRIN17	571635	4152418
Greco Island - North (02f)	GRIN-T1	GRIN18	571800	4152305
Greco Island - South (02h)	GRIS-T1	GRIS01	573018	4150394
Greco Island - South (02h)	GRIS-T1	GRIS02	573016	4150596
Greco Island - South (02h)	GRIS-T1	GRIS03	573015	4150799
Greco Island - South (02h)	GRIS-T1	GRIS04	573014	4150998
Greco Island - South (02h)	GRIS-T1	GRIS05	572969	4151193
Greco Island - South (02h)	GRIS-T1	GRIS06	572825	4151345
Inner Bair Island Restoration (02l)	IBI-T1	IBI11	567713	4150454
Inner Bair Island Restoration (02l)	IBI-T1	IBI13	567298	4150636
Inner Bair Island Restoration (02l)	IBI-T1	IBI15	567004	4150939
Inner Bair Island Restoration (02l)	IBI-T1	IBI17	566763	4151267
Deepwater Slough (02k)	MBE-T1	MBE01	569714	4153286
Deepwater Slough (02k)	MBE-T1	MBE02	569544	4153178
Deepwater Slough (02k)	MBE-T1	MBE03	569366	4153061
Deepwater Slough (02k)	MBE-T1	MBE04	569249	4152883
Deepwater Slough (02k)	MBE-T1	MBE05	569153	4152697
Middle Bair SE (02k)	MBE-T1	MBSE02	568726	4151546
Middle Bair SE (02k)	MBE-T1	MBSE04	568800	4151947
Middle Bair SE (02k)	MBE-T1	MBSE06	568955	4152326
B2 North Quadrant (02c)	OBEN-T1	OBE12	569256	4154869
B2 North Quadrant (02c)	OBEN-T1	OBE14	569206	4154429
B2 North Quadrant (02c)	OBEN-T1	OBE16	568775	4154924
B2 North Quadrant (02c)	OBEN-T2	OBE06	569311	4154036
B2 North Quadrant (02c)	OBEN-T2	OBE09	568814	4154381
B2 North Quadrant (02c)	OBEN-T2	OBE11	568471	4154620
B2 North Quadrant (02c)	OBEN-T2	OBE19	568408	4155098
B2 South Quadrant (02d)	OBES-T1	OBE04	569963	4154250
B2 South Quadrant (02d)	OBES-T1	OBE22	569611	4154402
B2 South Quadrant (02d)	OBES-T1	OBE23	569663	4154619

Sub-Area Name (ID)	Transect	Station ID	X-coordinate	Y-coordinate
SAN MATEO REGION (continued)				
B2 South Quadrant (02d)	OBES-T1	OBE25	569779	4155053
B2 South Quadrant (02d)	OBES-T1	OBE26	569843	4154667
B2 South Quadrant (02d)	OBES-T1	OBE27	569990	4154545
B2 South Quadrant (02d)	OBES-T1	OBES24	569733	4154871
Ravenswood Slough (02i)	RAV-T1	RAV02	575826	4149650
Ravenswood Slough (02i)	RAV-T1	RAV03	575665	4149768
Ravenswood Slough (02i)	RAV-T1	RAV04	575468	4149813
Ravenswood Slough (02i)	RAV-T1	RAV05	575260	4149863
Ravenswood Slough (02i)	RAV-T1	RAV06	574884	4150110
Ravenswood Slough (02i)	RAV-T1	RAV09	574950	4149885
Ravenswood Slough (02i)	RAV-T1	RAV10	574806	4150724
Steinberger Slough (02b)	RESH-T2	RESH13	567756	4154757
Steinberger Slough (02b)	RESH-T2	RESH14	567816	4154983
Steinberger Slough (02b)	RESH-T2	RESH15	567780	4154559
Steinberger Slough (02b)	RESH-T2	RESH16	567956	4155133
Steinberger Slough (02b)	RESH-T2	RESH17	568105	4155282
Steinberger Slough (02b)	RESH-T2	RESH18	568239	4155444
West Point Slough - SW / E (02g)	WPSS-T1	WPSS09	572707	4150059
West Point Slough - SW / E (02g)	WPSS-T1	WPSS10	572706	4149686
West Point Slough - SW / E (02g)	WPSS-T1	WPSS11	572704	4149455
West Point Slough - SW / E (02g)	WPSS-T1	WPSS12	572561	4149237
DUMBARTON SOUTH REGION				
Island Ponds - A21 (05i)	A21-T1	A21-1	589676	4146880
Island Ponds - A21 (05i)	A21-T1	A21-2	589848	4146987
Island Ponds - A21 (05i)	A21-T1	A21-3	590549	4147430
Island Ponds - A21 (05i)	A21-T1	A21-4	589991	4147127
Island Ponds - A21 (05i)	A21-T1	A21-5	590110	4147286
Island Ponds - A21 (05i)	A21-T1	A21-6	590276	4147430
Island Ponds - A21 (05i)	A21-T1	A21-7	590658	4147236
Island Ponds - A21 (05i)	A21-T1	A21-8	590646	4147026
Alviso Slough (15a)	ALSL-T2	MAL01	586761	4146451
Alviso Slough (15a)	ALSL-T2	MAL02	586668	4146281
Alviso Slough (15a)	ALSL-T2	MAL04	586898	4145918
Alviso Slough (15a)	ALSL-T2	MAL06	586942	4145527
Alviso Slough (15a)	ALSL-T2	MAL07	587021	4146548
Alviso Slough (15a)	ALSL-T2	MAL08	587328	4146607
Alviso Slough (15a)	ALSL-T2	MAL09	587646	4146656
Alviso Slough (15a)	ALSL-T2	MAL10	587905	4146704
Calaveras Point (05a)	CAPT-T1	CAPT08	586510	4147007
Calaveras Point (05a)	CAPT-T1	CAPT09	586281	4146933
Calaveras Point (05a)	CAPT-T1	CAPT10	586088	4146915
Calaveras Point (05a)	CAPT-T1	CAPT11	585889	4146857
Calaveras Point (05a)	CAPT-T1	CAPT12	585689	4146818
Calaveras Point (05a)	CAPT-T1	CAPT13	585492	4146774
Calaveras Point (05a)	CAPT-T1	CAPT14a	585333	4146717

Sub-Area Name (ID)	Transect	Station ID	X-coordinate	Y-coordinate
DUMBARTON SOUTH REGION (continued)				
Cooley Landing (16)	COLA-T1	COLA05	576891	4148770
Cooley Landing (16)	COLA-T1	COLA06	576956	4148944
Cooley Landing (16)	COLA-T1	COLA07	577129	4149051
Cooley Landing (16)	COLA-T1	COLA08	577293	4149164
Cooley Landing (16)	COLA-T1	COLA09	576775	4148568
Cooley Landing (16)	COLA-T1	COLA10	576825	4148373
Cooley Landing (16)	COLA-T1	COLA11	576961	4148238
Cooley Landing (16)	COLA-T1	COLA12	577112	4148090
Guadalupe Slough (15a)	GUSL-T1	GUSL02	587891	4143002
Guadalupe Slough (15a)	GUSL-T1	GUSL03	587773	4143515
Guadalupe Slough (15a)	GUSL-T1	GUSL04	587365	4143596
Guadalupe Slough (15a)	GUSL-T1	GUSL05	586585	4143375
Guadalupe Slough (15a)	GUSL-T1	GUSL06	585318	4144262
Guadalupe Slough (15a)	GUSL-T1	GUSL07	585019	4144717
Guadalupe Slough (15a)	GUSL-T1	GUSL08	585795	4144766
Guadalupe Slough (15a)	GUSL-T1	GUSL09	585184	4144825
Mowry Marsh North (05a)	MOWN-T1	MOSL10	581198	4151329
Mowry Marsh North (05a)	MOWN-T1	MOSL12	581587	4151341
Mowry Marsh North (05a)	MOWN-T1	MOSL14	581968	4151220
Mowry Marsh North (05a)	MOWN-T1	MOSL16	582349	4151098
Mowry Marsh North (05a)	MOWN-T1	MOSL18	582734	4150973
Mowry Marsh North (05a)	MOWN-T1	MOSL20	583117	4150850
Mowry Marsh North (05a)	MOWN-T1	MOSL22	583484	4150697
Mowry Marsh North (05a)	MOWN-T1	MOSL24	583816	4150474
Charleston Slough (15a)	MVSL-T1	CHSL01	580426	4145106
Charleston Slough (15a)	MVSL-T1	CHSL03	580657	4145153
Charleston Slough (15a)	MVSL-T1	CHSL04	580414	4144826
Mountain View Slough (15a)	MVSL-T1	MVSL04	581043	4145153
Mountain View Slough (15a)	MVSL-T1	MVSL05	581422	4145011
Newark Slough (05c)	NEWS-T1	NEW02	581705	4154094
Newark Slough (05c)	NEWS-T1	NEW03	581878	4153982
Newark Slough (05c)	NEWS-T1	NEW04	582059	4153878
Newark Slough (05c)	NEWS-T1	NEW05	582040	4153642
Newark Slough (05c)	NEWS-T1	NEW06	582159	4153474
Newark Slough (05c)	NEWS-T1	NEW07	582333	4153544
Newark Slough (05c)	NEWS-T1	NEW09	581635	4154254
Palo Alto Baylands (8)	PAB	PAB07	578542	4146295
Palo Alto Baylands (8)	PAB	PAB14	578746	4146217
Palo Alto Baylands (8)	PAB	PAB16	579129	4146185
Palo Alto Baylands (8)	PAB	PAB17	579308	4146093
Palo Alto Baylands (8)	PAB	PAB18	579124	4146384
Palo Alto Baylands (8)	PAB	PAB19	578494	4146491
Palo Alto Baylands (8)	PAB	PAB20	578214	4146646
Palo Alto Harbor (8)	PAHA	PAHA01	579302	4145979
Palo Alto Harbor (8)	PAHA	PAHA02	578898	4145912
Palo Alto Harbor (8)	PAHA	PAHA03	578873	4145418
Palo Alto Harbor (8)	PAHA	PAHA04	579282	4145587
Palo Alto Harbor (8)	PAHA	PAHA05	579627	4145741
Palo Alto Harbor (8)	PAHA	PAHA06	579993	4145586

Sub-Area Name (ID)	Transect	Station ID	X-coordinate	Y-coordinate
DUMBARTON SOUTH REGION (continued)				
Plummer Creek Mitigation (05h)	PLCM-T1	PLCM01	583615	4152372
Plummer Creek Mitigation (05h)	PLCM-T1	PLCM02	583484	4152202
Plummer Creek Mitigation (05h)	PLCM-T1	PLCM03	583517	4152021
Stevens Creek to Long Point (15a)	STEV-T1	LONG09	582630	4144724
Stevens Creek to Long Point (15a)	STEV-T1	LONG10	582401	4144385
Stevens Creek to Long Point (15a)	STEV-T1	LONG11	582369	4144019
Stevens Creek (15c)	STEV-T1	STEV01	582431	4143425
Stevens Creek (15c)	STEV-T1	STEV02	582421	4143224
UNION CITY REGION				
AFCC - Upper (01c)	AFCC-T4	AFCC19	580009	4157650
AFCC - Upper (01c)	AFCC-T4	AFCC21	580393	4157555
AFCC - Upper (01c)	AFCC-T4	AFCC23	580793	4157508
AFCC - Upper (01c)	AFCC-T4	AFCC25	581190	4157474
AFCC - Upper (01c)	AFCC-T4	AFCC27	581585	4157557
AFCC - Upper (01c)	AFCC-T4	AFCC29	581966	4157673
AFCC - Upper (01c)	AFCC-T4	AFCC31	582309	4157863
AFCC - to I-880 (01d)	AFCC-T4	AFCC33	582544	4158195
AFCC - Pond 3 (01a)	AFCP-T1	AFCP02	576726	4157943
AFCC - Pond 3 (01f)	AFCP-T1	AFCP04	576913	4158254
AFCC - Pond 3 (01f)	AFCP-T1	AFCP06	577134	4158519
AFCC - Pond 3 (01f)	AFCP-T2	AFCP08	577453	4158695
AFCC - Pond 3 (01f)	AFCP-T2	AFCP10	577812	4158729
AFCC - Pond 3 (01f)	AFCP-T2	AFCP12	578156	4158628
AFCC - Pond 3 (01f)	AFCP-T2	AFCP14	578481	4158477
Eden Landing - Mt Eden Creek (13j)	EDEN-T1	EDEN01	576480	4163098
Eden Landing - Mt Eden Creek (13j)	EDEN-T1	EDEN02	576489	4162896
Eden Landing - Mt Eden Creek (13j)	EDEN-T1	EDEN03	576430	4162704
Eden Landing - Mt Eden Creek (13j)	EDEN-T1	EDEN04	576379	4162512
Eden Landing - Mt Eden Creek (13j)	EDEN-T1	EDEN05	576179	4162480
Eden Landing - Mt Eden Creek (13j)	EDEN-T1	EDEN06	575980	4162529
Eden Landing - Mt Eden Creek (13j)	EDEN-T1	WTN11	575778	4162563
Eden Landing Reserve - South (13k)	ELRS-T1	ELRS01	578202	4163533
Eden Landing Reserve - South (13k)	ELRS-T1	ELRS02	578057	4163383
Eden Landing Reserve - South (13k)	ELRS-T1	ELRS03	577994	4163189
Eden Landing Reserve - South (13k)	ELRS-T1	ELRS04	578001	4162988
Eden Landing Reserve - South (13k)	ELRS-T1	ELRS05	578422	4163525
Eden Landing Reserve - South (13k)	ELRS-T1	ELRS06	578540	4163362
Eden Landing Reserve - South (13k)	ELRS-T1	ELRS07	578657	4163200
Eden Landing Reserve - South (13k)	ELRS-T1	ELRS08	578777	4163039
OAC (13a 13b 13c)	OAC-T2	ALCK10	577579	4161047
OAC (13a 13b 13c)	OAC-T2	ALCK11	577774	4161008
OAC (13a 13b 13c)	OAC-T2	ALCK12	577954	4160949
OAC (13a 13b 13c)	OAC-T2	ALCK13	578133	4160880
OAC (13a 13b 13c)	OAC-T2	ALCK14	578290	4160821
OAC (13a 13b 13c)	OAC-T2	ALCK15	578491	4160791
OAC (13a 13b 13c)	OAC-T2	ALCK16	578684	4160842
OAC (13a 13b 13c)	OAC-T2	ALCK17	578837	4160946
OAC (13a 13b 13c)	OAC-T2	ALCK18	578983	4161058
OAC (13a 13b 13c)	OAC-T3	ALCK19	579146	4161152

Sub-Area Name (ID)	Transect	Station ID	X-coordinate	Y-coordinate
UNION CITY REGION (continued)				
OAC (13a 13b 13c)	OAC-T3	ALCK20	579342	4161159
OAC (13a 13b 13c)	OAC-T3	ALCK21	579538	4161155
OAC (13a 13b 13c)	OAC-T3	ALCK22	579723	4161150
OAC (13a 13b 13c)	OAC-T3	ALCK23	579901	4161149
OAC (13a 13b 13c)	OAC-T3	ALCK24	580056	4161217
OAC (13a 13b 13c)	OAC-T3	ALCK25	580098	4161389
OAC (13a 13b 13c)	OAC-T3	ALCK26	580095	4161571
OAC (13a 13b 13c)	OAC-T3	ALCK27	580088	4161744
Whale's Tail - North (13d)	WTN-T1	WTN10	575754	4162376
Whale's Tail - North (13d)	WTN-T1	WTN4	575865	4161341
Whale's Tail - North (13d)	WTN-T1	WTN5	575886	4161530
Whale's Tail - North (13d)	WTN-T1	WTN6	575813	4161676
Whale's Tail - North (13d)	WTN-T1	WTN7	575771	4161849
Whale's Tail - North (13d)	WTN-T1	WTN8	575767	4162027
Whale's Tail - North (13d)	WTN-T1	WTN9	575762	4162212
Whale's Tail - South (13e)	WTS-T1	WTS22	575754	4159900
Whale's Tail - South (13e)	WTS-T1	WTS23	575792	4160057
Whale's Tail - South (13e)	WTS-T1	WTS24	575813	4160265
Whale's Tail - South (13e)	WTS-T1	WTS28	575489	4161055
Whale's Tail - South (13e)	WTS-T1	WTS29	575688	4161029
Whale's Tail - South (13e)	WTS-T1	WTS30	575854	4160992
Whale's Tail - South (13e)	WTS-T1	WTS31	575960	4160824
Whale's Tail - South (13e)	WTS-T1	WTS32	575969	4160626
Whale's Tail - South (13e)	WTS-T1	WTS33	575857	4160461
HAYWARD REGION				
Bunker Marsh (20g)	BUNK-T1	BUNK01	573456	4170331
Bunker Marsh (20g)	BUNK-T1	BUNK02	573507	4170104
Bunker Marsh (20g)	BUNK-T1	BUNK03	573561	4169912
Bunker Marsh (20g)	BUNK-T1	BUNK04	573631	4169725
Bunker Marsh (20f)	BUNK-T1	NORT08	573588	4170397
Bunker Marsh (20h)	BUNK-T1	SLRZ01	573737	4169556
Citation Marsh (20d)	CITA-T1	CITA01	573661	4170466
Citation Marsh (20d)	CITA-T1	CITA02	573555	4170639
Citation Marsh (20d)	CITA-T1	CITA03	573435	4170800
Citation Marsh (20d)	CITA-T1	CITA04	573314	4170961
Citation Marsh (20d)	CITA-T1	CITA05	573318	4171265
Citation Marsh (20d)	CITA-T1	CITA06	573316	4171466
Citation Marsh (20d)	CITA-T1	CITA07	573314	4171666
Cogswell - Sec C (20o)	COGS-T2	COGS08	574984	4165788
Cogswell - Sec C (20o)	COGS-T2	COGS09	575124	4165612
Cogswell - Sec C (20o)	COGS-T2	COGS10	575138	4165412
Cogswell - Sec C (20o)	COGS-T2	COGS11	575105	4165165
Cogswell - Sec C (20o)	COGS-T2	COGS12	574791	4165248
Cogswell - Sec C (20o)	COGS-T2	COGS13	574779	4165542
Cogswell - Sec C (20o)	COGS-T2	COGS14	574781	4165740
Cogswell - Sec C (20o)	COGS-T2	JOLA04	574909	4165104
Cogswell - Sec B (20n)	COGS-T3	COGS15	575367	4165223
Cogswell - Sec B (20n)	COGS-T3	COGS16	575572	4165228
Cogswell - Sec B (20n)	COGS-T3	COGS17	575710	4165373

Sub-Area Name (ID)	Transect	Station ID	X-coordinate	Y-coordinate
	HAYWARD REGION			
Cogswell - Sec B (20n)	COGS-T3	COGS18	575620	4165538
Cogswell - Sec B (20n)	COGS-T3	COGS19	575531	4165722
Cogswell - Sec B (20n)	COGS-T3	COGS20	575436	4165912
Cogswell - Sec B (20n)	COGS-T3	COGS21	575340	4166092
Cogswell - Sec A (20m)	COGS-T4	COGS01	574738	4166041
Cogswell - Sec A (20m)	COGS-T4	COGS02	574713	4166250
Cogswell - Sec A (20m)	COGS-T4	COGS03	574862	4166363
Cogswell - Sec A (20m)	COGS-T4	COGS04	575059	4166368
Cogswell - Sec A (20m)	COGS-T4	COGS05	575218	4166336
Cogswell - Sec A (20m)	COGS-T4	COGS06	575158	4166170
Cogswell - Sec A (20m)	COGS-T4	COGS07	575043	4166004
Triangle Marsh - Hayward (20w)	COGS-T4	TRMA02	574714	4166471
HARD Marsh (20s)	HARD-T1	HARD01	575252	4164654
HARD Marsh (20s)	HARD-T1	HARD02	575438	4164560
HARD Marsh (20s)	HARD-T1	HARD03	575619	4164493
HARD Marsh (20s)	HARD-T1	HARD04	575816	4164414
HARD Marsh (20s)	HARD-T1	HARD05	575988	4164619
HARD Marsh (20s)	HARD-T1	JOLA02	575064	4164736
Dogbone Marsh (20c)	NORT-T1	DOGB01	572695	4170847
North Marsh (20f)	NORT-T1	NORT01	573097	4171251
North Marsh (20f)	NORT-T1	NORT02	572949	4171118
North Marsh (20f)	NORT-T1	NORT03	572920	4170920
North Marsh (20f)	NORT-T1	NORT04	572877	4170757
North Marsh (20f)	NORT-T1	NORT05	572997	4170591
North Marsh (20f)	NORT-T1	NORT06	573168	4170488
Oro Loma - East (07a)	ORLW-T1	ORLW16	574840	4168558
Oro Loma - East (07a)	ORLW-T1	ORLW17	574749	4168949
Oro Loma - East (07a)	ORLW-T1	ORLW18	574912	4169047
Oro Loma - East (07a)	ORLW-T1	ORLW19	575313	4169028
Oro Loma - East (07a)	ORLW-T1	ORLW20	575474	4168815
Oro Loma - East (07a)	ORLW-T1	ORLW21	575441	4168567
Oro Loma - East (07a)	ORLW-T1	ORLW22	574705	4168708
Oro Loma - West (07b)	ORLW-T3	ORLW01	574936	4168382
Oro Loma - West (07b)	ORLW-T3	ORLW02	575023	4168204
Oro Loma - West (07b)	ORLW-T3	ORLW03	574972	4168062
Oro Loma - West (07b)	ORLW-T3	ORLW04	574771	4168057
Oro Loma - West (07b)	ORLW-T3	ORLW05	574584	4168057
Oro Loma - West (07b)	ORLW-T3	ORLW06	574382	4168054
Oro Loma - West (07b)	ORLW-T3	ORLW07	574308	4168235
San Lorenzo Creek (20h)	SLRZ-T1	SLRZ03	573943	4169633
San Lorenzo Creek (20h)	SLRZ-T1	SLRZ04	574138	4169774
San Lorenzo Creek (20h)	SLRZ-T1	SLRZ05	574277	4169889
San Lorenzo Creek (20h)	SLRZ-T1	SLRZ07	573896	4169503
San Lorenzo Creek (20h)	SLRZ-T1	SLRZ08	573955	4169323

Sub-Area Name (ID)	Transect	Station ID	X-coordinate	Y-coordinate
SAN LEANDRO BAY REGION				
Arrowhead Marsh (17c)	ARHE-T2	ARHE01	569510	4177535
Arrowhead Marsh (17c)	ARHE-T2	ARHE04	569262	4177549
Arrowhead Marsh (17c)	ARHE-T2	ARHE05	569146	4177718
Arrowhead Marsh (17c)	ARHE-T2	ARHE06	569063	4177898
Fan Marsh (17j)	FANM-T1	FANM01	568582	4177668
Fan Marsh (17j)	FANM-T1	FANM05	568410	4177818
Fan Marsh (17j)	FANM-T1	FANM03	568635	4177820
MLK New Marsh (17h)	MLKR-T1	MLKR01	569671	4177003
MLK New Marsh (17h)	MLKR-T1	MLKR02	569622	4177196
MLK New Marsh (17h)	MLKR-T1	MLKR03	569706	4177372
MLK New Marsh (17h)	MLKR-T1	MLKR04	569712	4177546
MLK New Marsh (17h)	MLKR-T1	MLKR05	569837	4177413
MLK New Marsh (17h)	MLKR-T1	MLKR06	569948	4177254
MLK New Marsh (17h)	MLKR-T1	MLKR07	570046	4177104
MLK Regional Shoreline (17d)	MLKS-T1	MLKS09	569336	4178901
MLK Regional Shoreline (17d)	MLKS-T1	MLKS10	569456	4178741
MLK Regional Shoreline (17d)	MLKS-T1	MLKS11	569515	4178546
BAY BRIDGE NORTH REGION				
Emeryville Crescent - West (06b)	EMCR-T1	EMCR02	560250	4186896
Emeryville Crescent - West (06b)	EMCR-T1	EMCR03	560177	4186720
Emeryville Crescent - West (06b)	EMCR-T1	EMCR04	560358	4186670
Emeryville Crescent - West (06b)	EMCR-T1	EMCR05	560565	4186723
Emeryville Crescent - West (06b)	EMCR-T1	EMCR06	560742	4186744
Emeryville Crescent - East (06a)	EMCR-T1	EMCR07	560954	4186746
Whittel Marsh (10a)	PTPN-T1	PTPN01	556260	4206711
Whittel Marsh (10a)	PTPN-T1	PTPN02	556460	4206771
Whittel Marsh (10a)	PTPN-T1	PTPN03	556645	4206685
Whittel Marsh (10a)	PTPN-T1	PTPN04	556830	4206771
Rheem Creek Area (22c)	RCRA-T1	RCRA03	555821	4203918
Rheem Creek Area (22c)	RCRA-T1	RCRA04	555895	4204106
Rheem Creek Area (22c)	RCRA-T1	RCRA05	555917	4204343
Rheem Creek Area (22c)	RCRA-T1	RCRA12	555741	4203735
San Pablo Marsh (22b)	RIF	RCRA06	555455	4203421
San Pablo Marsh (22b)	RIF	RIF03	555123	4202989
San Pablo Marsh (22b)	RIF	RIF09	554287	4203087
San Pablo Marsh (22b)	RIF	RIF10	554704	4203067
San Pablo Marsh (22b)	RIF	RIF11	555284	4203315
Hoffman Marsh (22e)	STEG-T1	HOM06	559640	4195672
Hoffman Marsh (22e)	STEG-T1	HOM07	559818	4195374
Hoffman Marsh (22e)	STEG-T1	HOM08	560031	4195055
Stege Marsh (22d)	STEG-T1	MEEK03	558280	4196127
Stege Marsh (22d)	STEG-T1	MEEK04	558463	4196076
Stege Marsh (22d)	STEG-T1	MEEK05	558183	4195946
Stege Marsh (22d)	STEG-T1	MEEK06	558770	4195989
Stege Marsh (22d)	STEG-T1	MEEK07	559080	4195902
Wildcat Marsh (22a)	WIMA	WIMA02	553708	4201035
Wildcat Marsh (22a)	WIMA	WIMA03	553655	4201231
Wildcat Marsh (22a)	WIMA	WIMA04	553598	4201446
Wildcat Marsh (22a)	WIMA	WIMA05	553731	4201639

Sub-Area Name (ID)	Transect	Station ID	X-coordinate	Y-coordinate
BAY BRIDGE NORTH REGION (continued)				
Wildcat Marsh (22a)	WIMA	WIMA06	553891	4201784
Wildcat Marsh (22a)	WIMA	WIMA07	554041	4201921
Wildcat Marsh (22a)	WIMA	WIMA08	554207	4202077
Wildcat Marsh (22a)	WIMA	WIMA09	553759	4200843
PETALUMA REGION				
Carl's Marsh (24d)	PRM	CARL06	543429	4219109
Carl's Marsh (24d)	PRM	PRM13	543401	4219508
Carl's Marsh (24d)	PRM	PRM14	543226	4219601
Carl's Marsh (24d)	PRM	PRM16	543233	4219807
Carl's Marsh (24d)	PRM	PRM18	543178	4219486
Carl's Marsh (24d)	PRM	PRM19	543355	4219303

This page is intentionally left blank.

Appendix III: 2019 OEI Survey Results for Each Round

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 Protocol

- **NAm** = Protocol NAm: North American Secretive Marsh Bird transect survey (AKA Site-specific Protocol and 2-species (2S) survey)
- **Adj*** = Surveyed from an adjacent site and transect

Key to Observer

- **AE** = Anastasia Ennis
- **BO =** Brian Ort
- **JH** = Jeanne Hammond
- **JM** = Jen McBroom
- **KE** = Kevin Eng
- **LF** = Lindsay Faye
- **MA** = Melanie Anderson
- **ND** = Nate Deakers
- **PL** = Pim Laulikitnont
- **SG** = Simon Gunner
- **SC** = Stephanie Chen
- **TR** = Tobias Rohmer

This page is intentionally left blank.

MARIN REGION

Site Name (ID)	Protocol	Round 1					Round 2					Round 3					Notes
		Date	Observer	Temp (°F)	Wind (mph)	# RIRA	Date	Observer	Temp (°F)	Wind	# RIRA	Date	Observer	Temp (°F)	Wind (mph)	# RIRA	
CMC Marsh Reserve (04a)	NAm	1/17/2019	BO	58	4.4	10	2/19/2019	TR	34	0	22	3/15/2019	JH	65	3.6	**27**	
Piper Park – East (04c)	NAm	1/17/2019	LF	57	5.2	2	2/19/2019	KE	37	2.9	2	3/14/2019	AE	62	1	**4**	
Piper Park – West (04d)	NAm	1/17/2019	LF	57	5.2	1	2/19/2019	KE	37	2.9	2	3/14/2019	AE	62	1	**7**	
CMC - Mouth (04j)	NAm	1/17/2019	MA	56	6.8	**1**	2/19/2019	LF	37	3.2	0	3/19/2019	BO	50	0	0	
CMC - Mouth (04j.1)	NAm	-	-	-	-	*0*	-	-	-	-	*0*	-	-	-	-	*0*	2011 BO sub-area split
CMC - Mouth (04j.2)	NAm	-	-	-	-	***1***	-	-	-	-	*0*	-	-	-	-	*0*	2011 BO sub-area split
Boardwalk No. 1 (04k)	NAm	1/17/2019	LF	57	5.2	0	2/19/2019	KE	37	2.9	0	3/14/2019	AE	62	1	0	
Pickleweed Park (09)	NAm	1/17/2019	SG	57	2.2	0	2/7/2019	MA	36	1.7	0	3/7/2019	ND	52	1.9	0	
San Rafael Canal Mouth (23d)	NAm	1/17/2019	SG	57	2.2	0	2/7/2019	MA	36	1.7	0	3/7/2019	ND	52	1.9	0	
San Rafael Canal Mouth (23d.1)	NAm	-	-	-	-	*0*	-	-	-	-	*0*	-	-	-	-	*0*	2011 BO sub-area split
San Rafael Canal Mouth (23d.2)	NAm	-	-	-	-	*0*	-	-	-	-	*0*	-	-	-	-	*0*	2011 BO sub-area split
Muzzi/Martas Marsh (23e)	NAm	1/17/2019	-	-	-	29	2/19/2019	-	-	-	33	3/14/2019	-	-	-	**36**	ISP sub-area divided into multiple rail sites
Martas Marsh (23e)	NAm	1/17/2019	KE	57	6.2	**9**	2/19/2019	JM	34	2	7	3/14/2019	TR	69	3.1	2	
Muzzi Marsh (23e)	NAm	1/17/2019	KE	57	6.2	18	2/19/2019	JM	34	2	26	3/14/2019	TR	69	3.1	**34**	
San Clemente Creek (23e)	NAm	1/17/2019	KE	57	6.2	**2**	2/19/2019	JM	34	2	0	3/14/2019	TR	69	3.1	0	
Starkweather Park (23l)	NAm	1/22/2019	TR	40	0	0	3/8/2019	AE	50	2	0	3/28/2019	JH	58	0	0	
Triangle Marsh – Marin (23n)	NAm	1/22/2019	TR	40	0	0	3/8/2019	AE	50	2	0	3/28/2019	JH	58	0	0	

SAN FRANCISCO PENINSULA REGION

Site Name (ID)	Protocol	Round 1					Round 2					Round 3					Notes
		Date	Observer	Temp (°F)	Wind (mph)	# RIRA	Date	Observer	Temp (°F)	Wind (mph)	# RIRA	Date	Observer	Temp (°F)	Wind (mph)	# RIRA	
Pier 98/Heron's Head (12b)	NAm	1/17/2019	TR	57	5	0	2/8/2019	AE	47	2.5	0	3/11/2019	PL	46	0.9	0	
SFO (19h)	NAm	1/23/2019	TR	39	1.8	0	3/7/2019	JM	48	2	1	4/1/2019	AE	57	5	0	
Seal Slough (19p)	NAm	1/17/2019	PL	56	5.7	0	2/7/2019	AE	35	0	0	3/19/2019	LF	49	0	0	
Seal Slough (19p.1)	NAm	-	-	-	-	*0*	-	-	-	-	*0*	-	-	-	-	*0*	2011 BO sub-area split
Seal Slough (19p.2)	NAm	-	-	-	-	*0*	-	-	-	-	*0*	-	-	-	-	*0*	2011 BO sub-area split

SAN MATEO REGION

Site Name (ID)	Protocol	Round 1					Round 2					Round 3					Notes
		Date	Observer	Temp (°F)	Wind (mph)	# RIRA	Date	Observer	Temp (°F)	Wind (mph)	# RIRA	Date	Observer	Temp (°F)	Wind (mph)	# RIRA	
Belmont Slough (02a)	NAm	1/30/2019	AE	58	1	**1**	1/30/2019	PL	51	2.2	0	4/2/2019	LF	64	2.6	0	
Belmont Slough (02a.1a)	NAm	-	-	-	-	*0*	-	-	-	-	*0*	-	-	-	-	*0*	2011 sub-area split
Belmont Slough (02a.1b)	NAm	-	-	-	-	*0*	-	-	-	-	*0*	-	-	-	-	*0*	2011 sub-area split
Belmont Slough (02a.2)	NAm	-	-	-	-	***1***	-	-	-	-	*0*	-	-	-	-	*0*	2011 sub-area split
Corkscrew Slough (02b.1)	NAm	1/25/2019	SG	66	0	**16**	3/11/2019	LF	61	6.9	0	3/25/2019	BO	56	0.9	0	
Steinberger Slough (02b.2)	NAm	1/17/2019	AE	53	8	0	2/8/2019	MA	47	2.5	1	4/1/2019	JM	53	0	**2**	
B2 North Quadrant (02c)	NAm	2/11/2019	JM LF	52	2.7	14	2/28/2019	TR JM	50	0	**24**	3/29/2018	KE ND	54	0.9	16	two transects needed to survey sub-area
B2 North Quadrant (02c.1a)	NAm	-	-	-	-	***5***	-	-	-	-	*1*	-	-	-	-	*2*	2011 & 2012 sub-area split
B2 North Quadrant (02c.1b)	NAm	-	-	-	-	*9*	-	-	-	-	***22***	-	-	-	-	*14*	2011 & 2012 sub-area split
B2 North Quadrant (02c.2)	NAm	-	-	-	-	***0***	-	-	-	-	*1*	-	-	-	-	*0*	ISP sub-area split in 2011
B2 South Quadrant (02d.1a)	NAm	1/25/2019	PL	66	1.2	**8**	3/11/2019	SG	60	10.6	0	3/25/2019	ND	55	2	0	
B2 South Quadrant (02d.1a)	NAm	-	-	-	-	**4**	-	-	-	-	0	-	-	-	-	0	2011 & 2012 sub-area split
B2 South Quadrant (02d.1b)	NAm	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	2011 & 2012 sub-area split
B2 South Quadrant (02d.2)	NAm	-	-	-	-	**4**	-	-	-	-	0	-	-	-	-	0	2011 sub-area split
B2 South Quadrant (02d.3)	NAm	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	2011 sub-area split
Greco Island - North (02f)	NAm	1/25/2019	JM	64	3.4	**7**	3/11/2019	MA	60	8.9	5	3/25/2019	LF	58	2.6	0	
West Point Slough - SW / E (02g)	NAm	2/5/2019	LF	48	9.1	**3**	3/5/2019	TR	54	5.2	1	3/19/2019	AE	51	1	1	
Greco Island - South (02h)	NAm	1/31/2019	TR	60	1.6	**54**	2/18/2019	JM	50	6.8	39	4/3/2019	JM	52	3	19	
Ravenswood Slough (02i)	NAm	2/7/2019	TR	50	3.5	**10**	3/8/2019	LF	45	3.0	4	4/2/2019	TR	55	0	5	
Deepwater Slough (02k)	NAm	1/25/2019	-	-	-	**26**	3/11/2019	-	-	-	5	3/25/2019	-	-	-	6	ISP sub-area divided into multiple rail sites
Middle Bair SE (02k)	NAm	1/25/2019	TR	75	1.2	**26**	3/11/2019	JM	63	11	5	3/25/2019	JM	54	0	6	
Middle Bair N (02k)	NAm	1/25/2019	TR	75	1.2	0	3/11/2019	JM	63	11	0	3/25/2019	JM	54	0	0	
Inner Bair Island Restoration (02l)	NAm	1/23/2019	LF	58	2.7	0	3/1/2019	TR	54	2.9	0	4/2/2019	AE	54	2	0	

DUMBARTON SOUTH REGION

Project	Site Name (ID)	Protocol	Round 1					Round 2					Round 3					Notes
			Date	Observer	Temp (°F)	Wind (mph)	# RIRA	Date	Observer	Temp (°F)	Wind (mph)	# RIRA	Date	Observer	Temp (°F)	Wind (mph)	# RIRA	
ISP	Mowry Marsh North (05a.1)	NAm	1/24/2019	JM	48	0	**24**	3/18/2019	TR	67	7.8	14	4/15/2019	PL	47	5.8	11	
ISP	Calaveras Point (05a.2)	NAm	2/1/2019	SC	55	5.6	4	3/13/2019	TR	60	63.3	17	3/26/2019	KE	64	2.5	**21**	
ISP	Newark Slough (05c)	NAm	1/30/2019	JM	58	5.8	9	2/19/2019	ND	35	1.5	**12**	3/8/2019	BO	45	12.0	2	
ISP	*Newark Slough (05c.1)*	NAm	-	-	-	-	***2***	-	-	-	-	***2***	-	-	-	-	*0*	2011 BO sub-area split
ISP	*Newark Slough (05c.2)*	NAm	-	-	-	-	*7*	-	-	-	-	***10***	-	-	-	-	*2*	2011 BO sub-area split
ISP	Coyote Creek - Mud Slough (05f)	NAm	2/1/2019	ND	54	3.0	**1**	3/19/2019	ND	50	2.7	0	3/26/2019	TR	63	4.6	0	surveyed from adjacent transect (A21-T1)
ISP	Plummer Creek Mitigation (05h)	NAm	1/23/2019	SG	58	7.5	0	3/4/2019	JH	48	0.6	0	3/22/2019	BO	54	5.4	0	
ISP	Island Ponds - A21 (05i)	NAm	2/1/2019	ND	54	3.0	**2**	3/19/2019	ND	50	2.7	1	3/26/2019	TR	63	4.6	**2**	
ISP	Palo Alto Baylands (08)	NAm	1/31/2019	-	-	-	**46**	2/21/2019	-	-	-	33	3/21/2019	-	-	-	32	ISP sub-area divided into multiple rail sites
ISP	*Palo Alto Baylands (08)*	NAm	1/31/2019	AE	60	2.0	**14**	2/21/2019	MA	43	4.8	14	3/21/2019	TR	47	1.5	11	
ISP	*Palo Alto Harbor (08)*	NAm	1/31/2019	PL	64	1.4	32	2/21/2019	TR	41	3.1	19	3/21/2019	JM	47	2.0	**21**	
ISP	Mountain View Slough (15a.1)	NAm	1/29/2019	TR	55	8.6	1	2/22/2019	JM	41	6.0	0	3/15/2019	AE	65	9.0	0	
ISP	Charleston Slough (15a.1)	NAm	1/29/2019	TR	55	8.6	**2**	2/22/2019	JM	41	6.0	**4**	3/15/2019	AE	65	9.0	2	
ISP	Stevens Creek to Long Point (15a.2)	NAm	1/28/2019	TR	60	2.2	1	3/7/2019	LF	50	1.5	1	4/2/2019	PL	54	1.4	**3**	
ISP	Guadalupe Slough (15a.3)	NAm	1/29/2019	JM	54	4.0	0	3/18/2019	MA	60	7.2	2	4/15/2019	ND	50	3.0	**3**	
ISP	Alviso Slough (15a.4)	NAm	1/29/2019	SG	59	9.3	11	3/18/2019	SG	70	4.4	**12**	4/15/2019	JM	48	5.0	4	
ISP	Stevens Creek (15c)	NAm	1/28/2019	TR	60	2.2	**2**	3/7/2019	LF	50	1.5	**2**	4/2/2019	PL	54	1.4	0	
ISP	Cooley Landing (16)	NAm	2/7/2019	KE	39	1.1	13	3/4/2019	TR	53	5.0	**19**	3/22/2019	ND	49	3.0	10	
ISP	*Cooley Landing (16.1)*	NAm	-	-	-	-	*6*	-	-	-	-	***8***	-	-	-	-	***1***	
ISP	*Cooley Landing (16.2)*	NAm	-	-	-	-	*7*	-	-	-	-	***11***	-	-	-	-	***9***	

UNION CITY REGION

Site Name (ID)	Protocol	Round 1					Round 2					Round 3					Notes
		Date	Observer	Temp (°F)	Wind (mph)	# RIRA	Date	Observer	Temp (°F)	Wind (mph)	# RIRA	Date	Observer	Temp (°F)	Wind (mph)	# RIRA	
AFCC - Mouth (01a)	NAm	1/23/2019	BO	51	3.0	0	3/7/2019	JM	50	6.0	0	4/4/2019	MA	55	4.1	0	typically surveyed by DENWR; reduced effort in 2018 & 2019
AFCC - Lower (01b)	NAm	1/23/2019	BO	51	3.0	0	3/7/2019	JM	50	6.0	0	4/4/2019	MA	55	4.1	0	typically surveyed by DENWR; reduced effort in 2018 & 2019
AFCC - Upper (01c)	NAm	2/11/2019	SG	52	3.0	0	3/5/2019	JM	51	2.4	0	4/1/2019	MA	58	1.0	0	
AFCC - to I-880 (01d)	NAm	2/11/2019	SG	52	3.0	0	3/5/2019	JM	51	2.4	0	4/1/2019	MA	58	1.0	0	
AFCC - Pond 3 (01f)	NAm	1/23/2019	BO	51	3.0	0	3/7/2019	JM	50	6.0	0	4/4/2019	MA	55	4.1	0	typically surveyed by DENWR; reduced effort in 2018 & 2019
OAC - North Bank (13a)	NAm	1/30/2019	JH	56	5.0	**2**	2/22/2019	MA	38	0.7	1	3/18/2019	ND	69	8.5	0	two transects survey sub-area
OAC - Island (13b)	NAm	1/30/2019	JH	56	5.0	4	2/22/2019	MA	38	0.7	5	3/18/2019	ND	69	8.5	**8**	two transects survey sub-area
OAC - South Bank (13c)	NAm	1/30/2019	JH	56	5.0	**3**	2/22/2019	MA	38	0.7	0	3/18/2019	ND	69	8.5	1	two transects survey sub-area
Whale's Tail - North (13d)	NAm	1/22/2019	KE	48	1.0	**1**	3/7/2019	KE	51	8.9	0	4/3/2019	AE	55	2.0	**1**	
Whale's Tail - South (13e)	NAm	1/29/2019	SC	63	12.8	1	2/22/2019	JH	34	3.0	0	3/19/2019	JM	49	2.0	**2**	
Cargill Mitigation Marsh (13f)	NAm	1/29/2019	SC	63	12.8	0	2/22/2019	JH	34	3.0	0	3/19/2019	JM	49	2.0	**1**	
Eden Landing - Mt Eden Creek (13j)	NAm	1/22/2019	BO	49	3.0	**1**	3/7/2019	JH	48	7.3	0	4/3/2019	KE	53	1.4	**1**	
Eden Landing Reserve - South (13k)	NAm	1/22/2019	SG	58	0	2	2/28/2019	MA	54	7.7	**4**	4/1/2019	KE	54	1.0	0	
Eden Landing Reserve – North (13l)	NAm	1/22/2019	SG	58	0	0	2/28/2019	MA	54	7.7	0	4/1/2019	KE	54	1.0	0	

HAYWARD REGION

Site Name (ID)	Protocol	Round 1					Round 2					Round 3					Notes
		Date	Observer	Temp (°F)	Wind (mph)	# RIRA	Date	Observer	Temp (°F)	Wind (mph)	# RIRA	Date	Observer	Temp (°F)	Wind (mph)	# RIRA	
Oro Loma - East (07a)	NAm	1/24/2019	MA	46	1.1	0	3/7/2019	SG	52	5.5	0	4/2/2019	KE	53	4.8	0	
Oro Loma - West (07b)	NAm	1/24/2019	KE	41	1.6	**2**	3/7/2019	BO	51	6.2	0	4/2/2019	MA	57	3.1	0	reduced survey effort in 2018 & 2019
Dog Bone Marsh (20c)	NAm	1/18/2019	KE	63	1.9	**1**	3/1/2019	SG	56	0	**1**	4/4/2019	JM	55	5.0	0	
Citation Marsh (20d)	NAm	1/18/2019	SG	62	0	37	3/1/2019	JM	56	0	30	4/4/2019	TR	55	4.8	**38**	
Citation Marsh (20d.1)	NAm	-	-	-	-	3	-	-	-	-	3	-	-	-	-	**4**	2012 BO sub-area split
Citation Marsh (20d.2a)	NAm	-	-	-	-	2	-	-	-	-	**5**	-	-	-	-	4	2012 BO sub-area split
Citation Marsh (20d.2b)	NAm	-	-	-	-	**32**	-	-	-	-	22	-	-	-	-	30	2018 BO sub-area split
East Marsh (20e)	adj	1/18/2019	ND	63	1.0	**5**	3/1/2019	ND	56	1.0	2	4/4/2019	ND	56	7.0	0	
North Marsh (20f)	NAm	1/18/2019	KE	63	1.9	55	3/1/2019	SG	56	0	**56**	4/4/2019	JM	55	5.0	39	
Bunker Marsh (20g)	NAm	1/18/2019	PL	62	1.5	**24**	3/1/2019	MA	57	1.5	12	4/4/2019	KE	56	5.6	5	
San Lorenzo Creek (20h)	NAm	1/18/2019	ND	63	1.0	**2**	3/1/2019	ND	56	1.0	**2**	4/4/2019	ND	56	7.0	0	
San Lorenzo Creek (20h.1)	NAm	-	-	-	-	**2**	-	-	-	-	**2**	-	-	-	-	0	2012 BO sub-area split
San Lorenzo Creek (20h.2)	NAm	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	2012 BO sub-area split
Cogswell - Sec A (20m)	NAm	2/6/2019	BO	62	3.6	0	2/28/2019	SG	56	8.5	0	3/21/2019	MA	48	2.17	**1**	
Cogswell - Sec B (20n)	NAm	2/6/2019	TR	53	3.1	29	2/28/2019	JM	55	9.0	19	3/21/2019	ND	49	1.5	**34**	
Cogswell - Sec B (20n.1)	NAm	-	-	-	-	4	-	-	-	-	3	-	-	-	-	**6**	2018 BO sub-area split
Cogswell - Sec B (20n.2)	NAm	-	-	-	-	9	-	-	-	-	8	-	-	-	-	**15**	2018 BO sub-area split
Cogswell - Sec B (20n.3)	NAm	-	-	-	-	**16**	-	-	-	-	8	-	-	-	-	13	2018 BO sub-area split
Cogswell - Sec C (20o)	NAm	2/6/2019	JH	48	3.6	**16**	2/28/2019	TR	56	11.9	10	3/21/2019	JM	46	2.8	14	
HARD Marsh (20s)	NAm	2/6/2019	SG	54	4.2	**3**	2/28/2019	ND	56	8.0	0	3/21/2019	BO	47	2.8	**3**	
Triangle Marsh - Hayward (20w)	NAm	2/6/2019	BO	62	3.6	0	2/28/2019	SG	56	8.5	0	3/21/2019	MA	48	2.7	0	

SAN LEANDRO BAY REGION

Site Name (ID)	Protocol	Round 1					Round 2					Round 3					Notes
		Date	Observer	Temp (°F)	Wind (mph)	# RIRA	Date	Observer	Temp (°F)	Wind (mph)	# RIRA	Date	Observer	Temp (°F)	Wind (mph)	# RIRA	
Arrowhead Marsh (17c)	NAm	1/22/2019	SC	61	0	**38**	2/19/2019	JH	42	7.3	20	3/19/2019	TR	59	2.7	**38**	
Arrowhead Marsh (17c.1)	NAm	-	-	-	-	**0**	-	-	-	-	**2**	-	-	-	-	3	2012 BO sub-area split
Arrowhead Marsh (17c.2)	NAm	-	-	-	-	**38**	-	-	-	-	18	-	-	-	-	35	2012 BO sub-area split
MLK Regional Shoreline - Damon (17d.4)	NAm	1/23/2019	KE	44	1.2	**17**	3/4/2019	JM	53	3.0	10	4/3/2019	TR	55	3.4	5	
San Leandro Creek (17e)	NAm	1/18/2013	TR	64	1.4	0	2/8/2019	JM	47	2.5	0	3/15/2019	JM	66	7.5	**2**	reduced survey effort in 2018 (dropped SLEA-T1)
San Leandro Creek (17e.1)	NAm	-	-	-	-	0	-	-	-	-	0	-	-	-	-	**2**	2012 BO sub-area split
San Leandro Creek (17e.2)	NAm	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	2012 BO sub-area split
MLK New Marsh (17h)	NAm	1/18/2019	TR	64	1.4	**59**	2/8/2019	JM	47	2.5	30	3/15/2019	JM	66	7.5	39	
Fan Marsh (17j)	NAm	1/23/2019	JH	52	2.0	13	2/21/2019	JM	40	6.0	13	3/19/2019	SG	63	2.9	**22**	
Fan Marsh(17j.1)	NAm	-	-	-	-	0	-	-	-	-	**1**	-	-	-	-	0	2018 BO sub-area split
Fan Marsh (17j.2)	NAm	-	-	-	-	13	-	-	-	-	12	-	-	-	-	**22**	2018 BO sub-area split

BAY BRIDGE NORTH REGION

Site Name (ID)	Protocol	Round 1					Round 2					Round 3					Notes
		Date	Observer	Temp (°F)	Wind (mph)	# RIRA	Date	Observer	Temp (°F)	Wind (mph)	# RIRA	Date	Observer	Temp (°F)	Wind (mph)	# RIRA	
Emeryville Crescent - East (06a)	NAm	1/22/2019	KE	58	0.9	0	2/21/2019	JH	38	8.0	0	4/1/2019	ND	49	2.5	0	reduced survey effort in 2018 (dropped EMCR-T2)
Emeryville Crescent - West (06b)	NAm	1/22/2019	KE	58	0.9	**1**	2/21/2019	JH	38	8.0	0	4/1/2019	ND	49	2.5	0	
Whittel Marsh (10a)	NAm	1/24/2019	LF	49	0	1	3/4/2019	MA	56	1.1	**2**	3/21/2019	SG	58	2.7	**2**	
Wildcat Marsh (22a)	NAm	1/21/2019	SG	57	2.6	**18**	3/9/2019	JH	43	4.0	8	4/2/2019	JM	53	6.0	8	
San Pablo Marsh (22b.1)	NAm	1/21/2019	JM	50	0	10	3/7/2019	TR	49	2.1	**25**	4/2/2019	ND	53	4.0	7	typically surveyed by PBCS
San Pablo Marsh (22b.1)	-	-	-	-	-	5	-	-	-	-	**9**	-	-	-	-	4	2011 BO sub-area split
San Pablo Marsh (22b.2)	-	-	-	-	-	5	-	-	-	-	**14**	-	-	-	-	3	2011 BO sub-area split
Rheem Creek Area (22c)	NAm	1/24/2019	PL	42	1.9	3	3/4/2019	ND	55	1.5	0	3/21/2019	JH	55	6.5	**8**	
Stege Marsh (22d)	NAm	1/24/2019	JH	52	4.0	5	3/7/2019	SG	51	2.7	**7**	4/3/2019	MA	53	3.5	5	
Meeker Slough (22d)	NAm	1/24/2019	JH	52	4.0	6	3/7/2019	SG	51	2.7	**11**	4/3/2019	MA	53	3.5	6	
Hoffman Marsh (22e)	NAm	1/24/2019	JH	52	4.0	0	3/7/2019	SG	51	2.7	0	4/3/2019	MA	53	3.5	0	

PETALUMA REGION

Site Name (ID)	Protocol	Round 1					Round 2					Round 3					Notes
		Date	Observer	Temp (°F)	Wind (mph)	# RIRA	Date	Observer	Temp (°F)	Wind (mph)	# RIRA	Date	Observer	Temp (°F)	Wind (mph)	# RIRA	
Carl's Marsh (24d)	NAm	1/28/2019	JM	55	1.5	6	2/18/2019	KE	34	4.9	5	3/13/2019	AE	59	6.0	**13**	typically surveyed by PBCS