California Ridgway's Rail Surveys for the San Francisco Estuary Invasive *Spartina* Project 2017

Report to:

The State Coastal Conservancy
San Francisco Estuary Invasive *Spartina* Project
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We are especially grateful for the support of our partners who shared Ridgway's rail survey data that they collected over the past six years: Point Blue Conservation Science (formerly PRBO), Don Edwards National Wildlife Refuge, and Avocet Research and Associates.

Coastal Conservancy

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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.

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, with the exception of occasional observations along the outer coast in Tomales Bay. 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).

Between 2009 to 2011, Point Blue Conservation Science (PBCS) estimated that the average total population was about 1,167 individuals (Liu, et al., 2012). However, the number of rails detected in 2017 exceeds the extrapolated population estimate from that study period, indicating that the population is likely greater now.

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 2017 (Permit Number TE118356-4). Trained and permitted biologists performed standard-protocol surveys at 137 *Spartina*-invaded sites between January 15 and April 15, 2017. The data were entered into an access database shared between partner organizations, exported into GIS, and then summarized on a site-by-site basis.

The results of surveys conducted in 2017 by OEI 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 2017 Spartina Treatment Sites and Ridgway's Rail Survey Plans by Site.

2. Study Area

OEI conducted surveys for California Ridgway's rail within 137 tidal marsh sites in the San Francisco Estuary. To facilitate presentation and evaluation of rail survey information, these sites were grouped into nine reporting regions: Bay Bridge North, San Leandro Bay, Hayward, Union City, Dumbarton South, San Mateo, San Francisco Peninsula, Marin, and Vallejo (**Figure 1**). The study area spanned the counties of Alameda, Contra Costa, Marin, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma.

All of the 137 sites surveyed contained non-native *Spartina*, and all but 11 sites were slated for full treatment by the ISP in 2017. The remaining 11 sites (shown in red on Figure 1) were surveyed to track local trends in rail populations even though *Spartina* treatment has been restricted at these sites since 2011. Partner organizations surveyed an additional 57 ISP rail sites that were treated for non-native *Spartina* in 2017. Rail survey data from these sites are not included in this report; the results from these surveys are reported on by the survey organizations. For a complete list of all ISP sites and associated survey organizations, see **Appendix I**: Complete List of 2017 Spartina Treatment Sites and Ridgway's Rail Survey Plans by Site. For a complete list of OEI survey stations and their geographic coordinates in UTM, see **Appendix II**: 2017 Survey Station Coordinates.

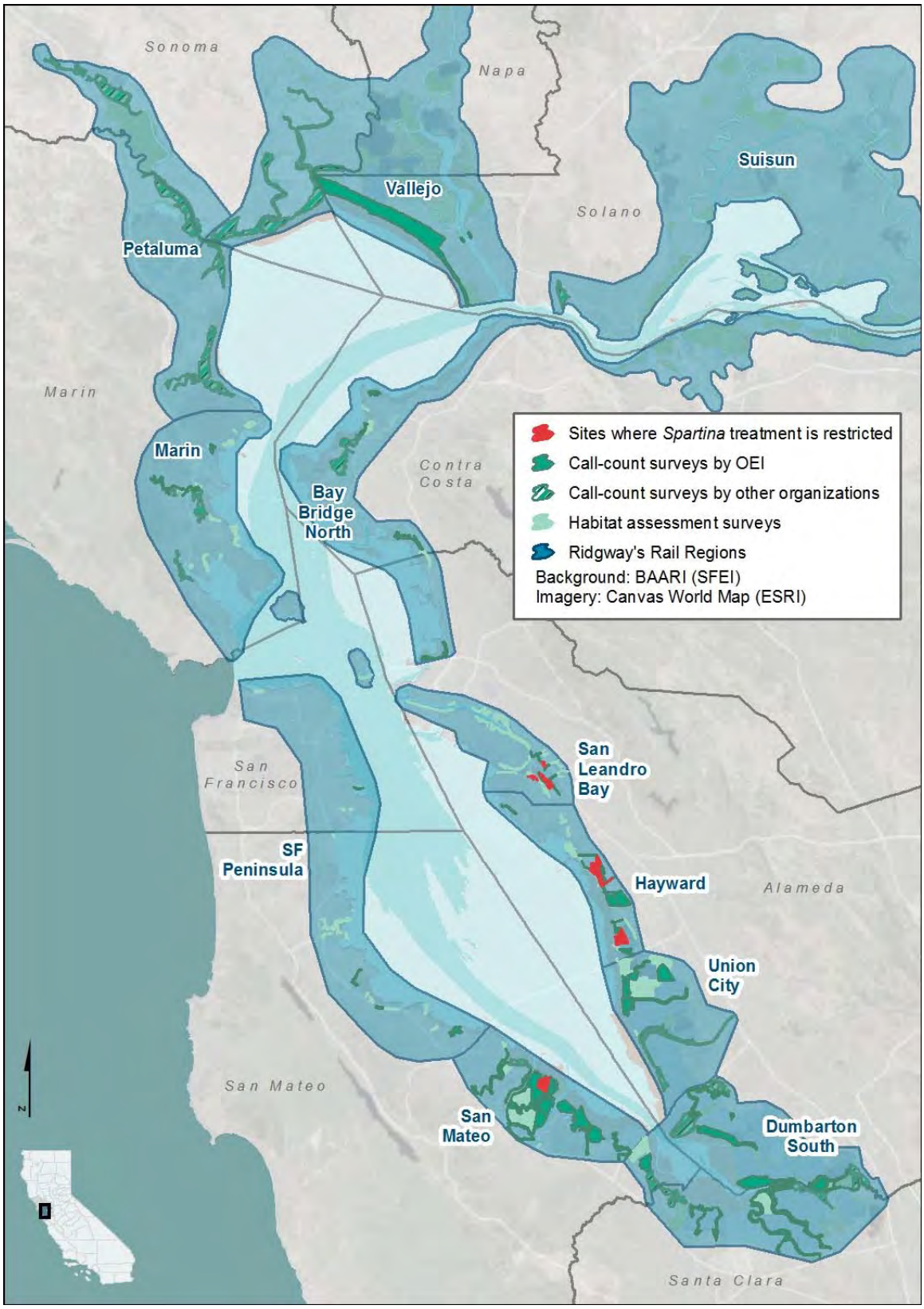

Figure 1. Regional boundaries of ISP sites surveyed for California Ridgway's rail by OEI and others in 2017.

3. Methods

Ridgway's rail surveys for the ISP were conducted using several field methods including call-count surveys and habitat assessment surveys. In coordination with other survey organizations, the Site-specific Protocol for Monitoring Marsh Birds (Wood et al, 2016, hereafter "NAm Protocol") based on the North American Survey Protocol (Conway 2016) was initiated at a large subset of site in 2017. 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 between January 15 and April 15, 2017, using standardized survey protocols approved by the USFWS (**Appendix III**: Standard Survey Protocols for Ridgway's Rails in the San Francisco Estuary). 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, and Brian Ort.

As part of an ongoing project, USFWS Inventory and Monitoring (I&M) Program and PBCS developed a rail survey protocol (NAm Protocol) compatable with the widely-used North American Marsh Bird Monitoring Protocol (Conway 2016). Analysis by PBCS during a pilot study period spanning 2012 to 2015 demonstrated that the NAm Protocol improved the ability to detect rails and model the rail population. After several years of pilot study and analysis, the NAm Protocol was published (Wood et al. 2016) and initiated at a large subset of sites in 2017.

Last year, PBCS completed an analysis comparing the, with Protocol A and determined that the NAm Protocol increased both detection probability and the ability to estimate abundance (Nur et al, 2016). As part of an ongoing evaluation of the differences in count estimates resulting from the two protocol types (A and NAm), OEI and PBCS selected sites using a paired design to be surveyed using either the NAm Protocol or Protocol A. This will allow a final comparison between previously used protocols and the standardized new one to develop inter-annual data comparisons. ISP anticipates a complete transition of call-count surveys to the NAm Protocol for the 2018 survey season.

OEI surveyed 137 *Spartina*-invaded sites for Ridgway's rails or for presence of rail habitat. Call count surveys were conducted at 75 sites: 43 sites were surveyed using NAm Protocol, 28 sites were surveyed using Protocol A, one site was surveyed using Protocol B, and two sites were surveyed using Protocol G in support of another project for the Alameda County Flood Control District (ACFCD). The remaining 63 sites were evaluated for the presence of habitat only (F-survey) and were deemed unlikely to be used by breeding rails. A brief description of each survey protocol employed by OEI biologists in 2017 is summarized below and the full protocol descriptions are included in **Appendix III:** Standard Survey Protocols for Ridgway's Rails in the San Francisco Estuary.

Protocol A is a transect point count survey with conditional playback on the third round. Observers record all rails detected for a 10-minute period at each station along a transect. Three rounds of surveys are conducted at dawn or at dusk during the season. If rails are not detected after the first two rounds at a given station, the observer broadcasts rail vocalizations to elicit a response (A.K.A. conditional playback).

Protocol B is a stationary survey, where each observer stays at a single survey station for the entire two-hour survey window at dawn or dusk. If there is more than one survey station, observers must collaborate to determine whether any rails detected were duplicates. This protocol produces data that is not suitable for Estuary-wide population analysis and was used only at Arrowhead Marsh (17c) in 2017 in order to maintain consistency between past years survey results at that sites.

Protocol F is a habitat assessment. An observer visits a site before the survey season and determines whether suitable habitat is present to support breeding rails. If habitat is present, the site is surveyed using a call-count protocol.

Protocol G is a stationary survey, like Protocol B; however, this protocol requires four rounds of surveys and playback during the third and fourth rounds. Protocol G is used to determine absence of rails at sites where proposed construction activities may impact any rails at the site. This protocol produces data that is not suitable for Estuary-wide population analysis and was used at two sites in 2017 in support of projects for ACFCD: Bockman Channel (20i) and Estudillo Creek (20u).

Protocol NAm 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 will be the standard call-count survey protocol moving forward.

3.2 Data Management

Data were recorded in the field on paper datasheets (**Appendix IV**). GPS units were used to navigate to survey stations. Each rail observation was recorded on a paper 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.

Beginning in 2017, researchers began entering data into a multi-organization shared Access database developed by Point Blue and the National Wildlife Refuge in support of the newly adopted 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 site boundaries.

3.3 Data Interpretation

In accordance with recommendations in the NAm Protocol, several metrics were used to evaluate Ridgways' 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 metrices 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 m 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*12.57 ha) = 0.0682 rails/ha. 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). Unique birds detected while moving to or from transects in a study area or between points (outside of the official survey time) would not be included unless they were detected within 200 m of a survey point. The area surveyed at each point is adjusted accordingly if there is less than 100% rail habitat within the 200 m radius.

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 *p*1 is the total highest minimum count for the previous year and *p*2 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 annual average 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 *p*1 is the total highest minimum count for the first year, *p*2 is the total highest minimum count for the last year, *t*1 is the start year, *t*2 is the end year (*t*2 - *t*1 = 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. 2017 Survey Results

OEI detected 616 California Ridgway's rails at 47 of sites surveyed by OEI for the ISP in 2017. No Ridgway's rails were detected at the remaining 90 sites, 64 of which were deemed unsuitable to support breeding rails (surveyed using Protocol F only). Detailed survey results from each round are included in **Appendix V**.

4.1 Marin Region

The Marin Region extends from the Golden Gate Bridge to the Richmond Bridge in Marin County (**Figure 2 - Figure 4**). The region contains many small, disconnected sites scattered along the shoreline and some larger, older marshes at the mouth of Corte Madera Creek. The shoreline is fairly developed, with a variety of wetland habitat types, including several marinas, tidal lagoons, flood control channels, small fragmented marshes, large restored marshes, invaded mudflats, and several creeks and sloughs. The Marin Region has had relatively little impact from hybrid *Spartina*, which never gained a substantial foothold in the area. The Corte Madera Creek Complex, however, has been the epicenter for the invasive *Spartina densiflora* invasion in the Bay.

The region includes 30 ISP rail sites, 18 of which were surveyed by OEI in 2017 (**Table 1**). PBCS surveyed an additional eight sites, including the more densely occupied tidal marshes in the Corte Madera Complex. OEI detected a total of 21 rails in the Marin Region in 2017 and PBCS detected 46 Ridgway's rails at the other eight sites surveyed in 2017.

At the sites that OEI surveys within the region, which are small tidal wetlands in Marin's residential neighborhoods along the Bay, rail numbers were generally up at both the one-year and five-year time scale. However, the overall trend in the region when including the larger marshes in the Corte Madera complex surveyed by PBCS shows a slightly negavite trend.

An outlier to the declining regional trend is Pickleweed Park (AKA Tiscornia Marsh). Surprisingly, this small marsh fragment had one of the highest density rail populations of all sites surveyed by OEI in 2017. The site is small, relatively isolated, and does not support exceptional rail habitat, however it has supported an intermittent population of Ridgway's rails. Rails were entirely absent from the site from 2013 to 2015 and reappeared in 2016. It is likely a pair has been successfully breeding at the site since then, but because of the isolated nature of the site, juveniles have not been able to easily disperse, increasing the density of rails at the small marsh.

Table 1. Summary of survey results in the Marin Region at sites surveyed by OEI in 2017. Survey area and survey counts were considered null for sites lacking suitable breeding habitat (Protocol F).

County	Site Name (ID)	Survey Protocol	Site Hectares	% Site Surveyed	Ridgway's Rail Indices				Other Rail Occupancy		
					Highest Count	Relative Density	One-year Δ	Five-year Δ	BLRA	VIRA	SORA
Marin	Blackie's Creek (03a)	F	0.2	-	-	-	-	-	-	-	-
Marin	Blackie's Creek Mouth (03b)	F	0.4	-	-	-	-	-	-	-	-
Marin	Larkspur Ferry Landing Area (04e)	F	0.4	-	-	-	-	-	-	-	-
Marin	Riviera Circle (04f)	F	1.6	-	-	-	-	-	-	-	-
Marin	Creekside Park (04g)	A	8.4	100%	4	0.36	-20%	-20%	0	0	0
Marin	CMC - Upper (04h)	A	5.5	95%	2	0.19	↑	-8%	0	0	0
Marin	CMC - Lower (04i)	NAm	6.4	45%	0	0.00	→	→	0	0	0
Marin	CMC - Mouth (04j)	NAm	7.3	95%	2	0.29	↑	0%	0	0	0
Marin	Pickleweed Park (9)	NAm	5.7	100%	11	1.92	83%	62%	0	0	0
Marin	Brickyard Cove (23a)	F	17	-	-	-	-	-	-	-	-
Marin	Beach Drive (23b)	F	3.5	-	-	-	-	-	-	-	-
Marin	Loch Lomond Marina (23c)	F	1.9	-	-	-	-	-	-	-	-
Marin	San Rafael Canal Mouth (23d)	NAm	2.7	100%	2	0.74	0%	0%	0	0	0
Marin	Paradise Cay (23f)	F	9	-	-	-	-	-	-	-	-
Marin	Greenwood Beach (23g)	F	1.6	-	-	-	-	-	-	-	-
Marin	Strawberry Point (23h)	F	5.6	-	-	-	-	-	-	-	-
Marin	Strawberry Cove (23i)	F	4.3	-	-	-	-	-	-	-	-
Marin	Triangle Marsh - Marin (23n)	F	7.7	-	-	-	-	-	-	-	-

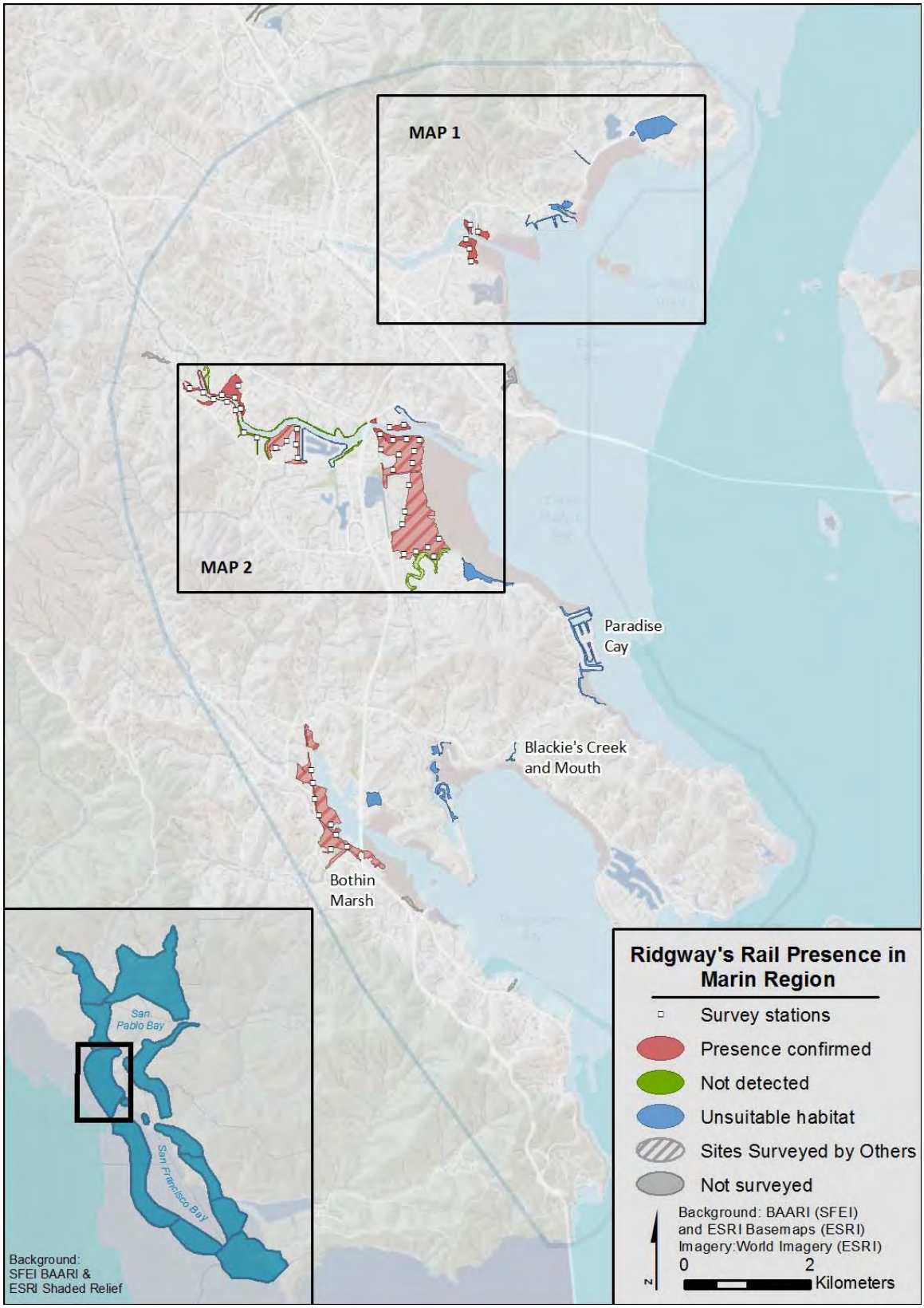

Figure 2. Overview map of Marin Region, showing locations for inset map for close-up maps.

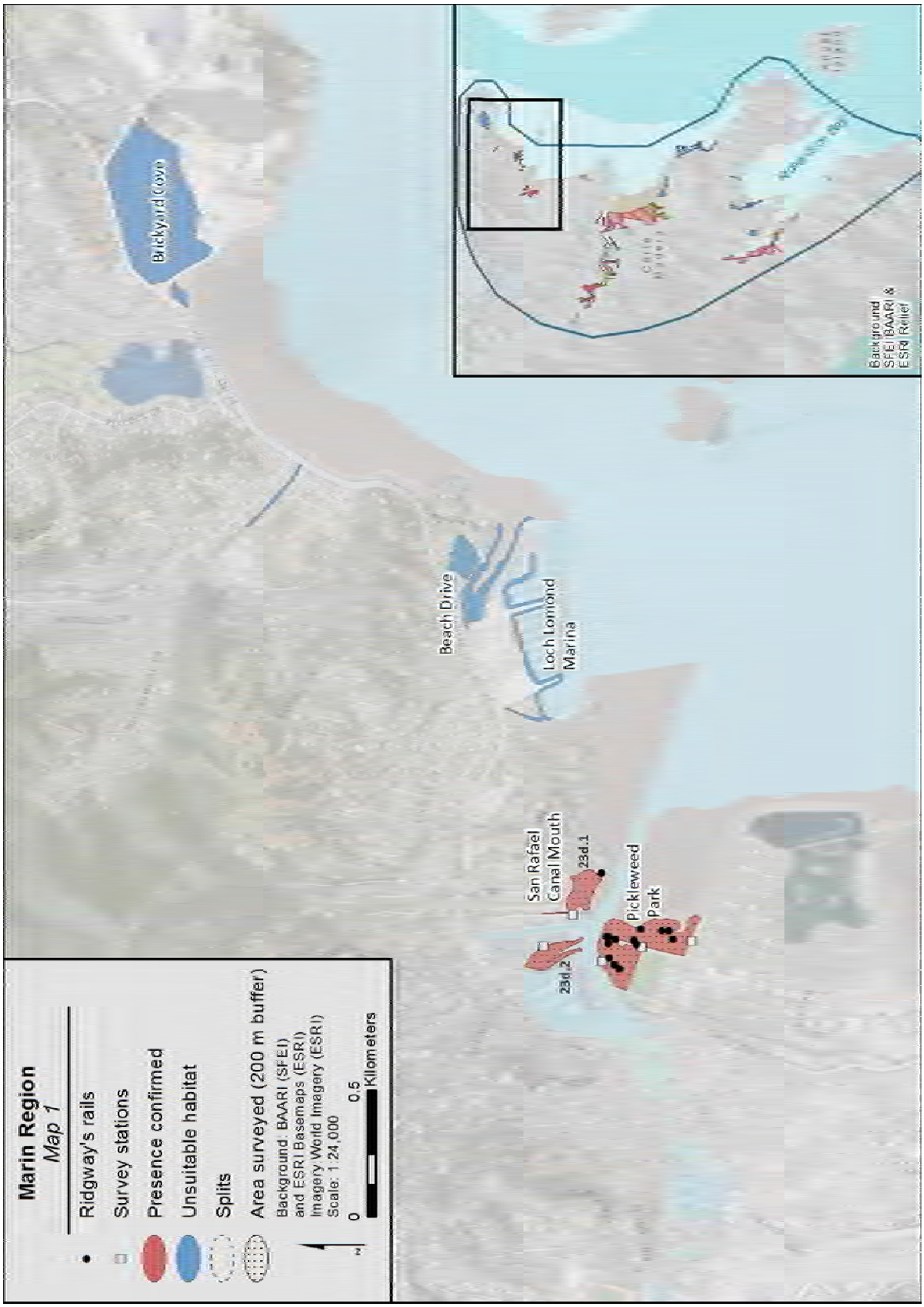

Figure 3. Inset Map 1 of Marin Region, showing Ridgway's rail detections and area surveyed.

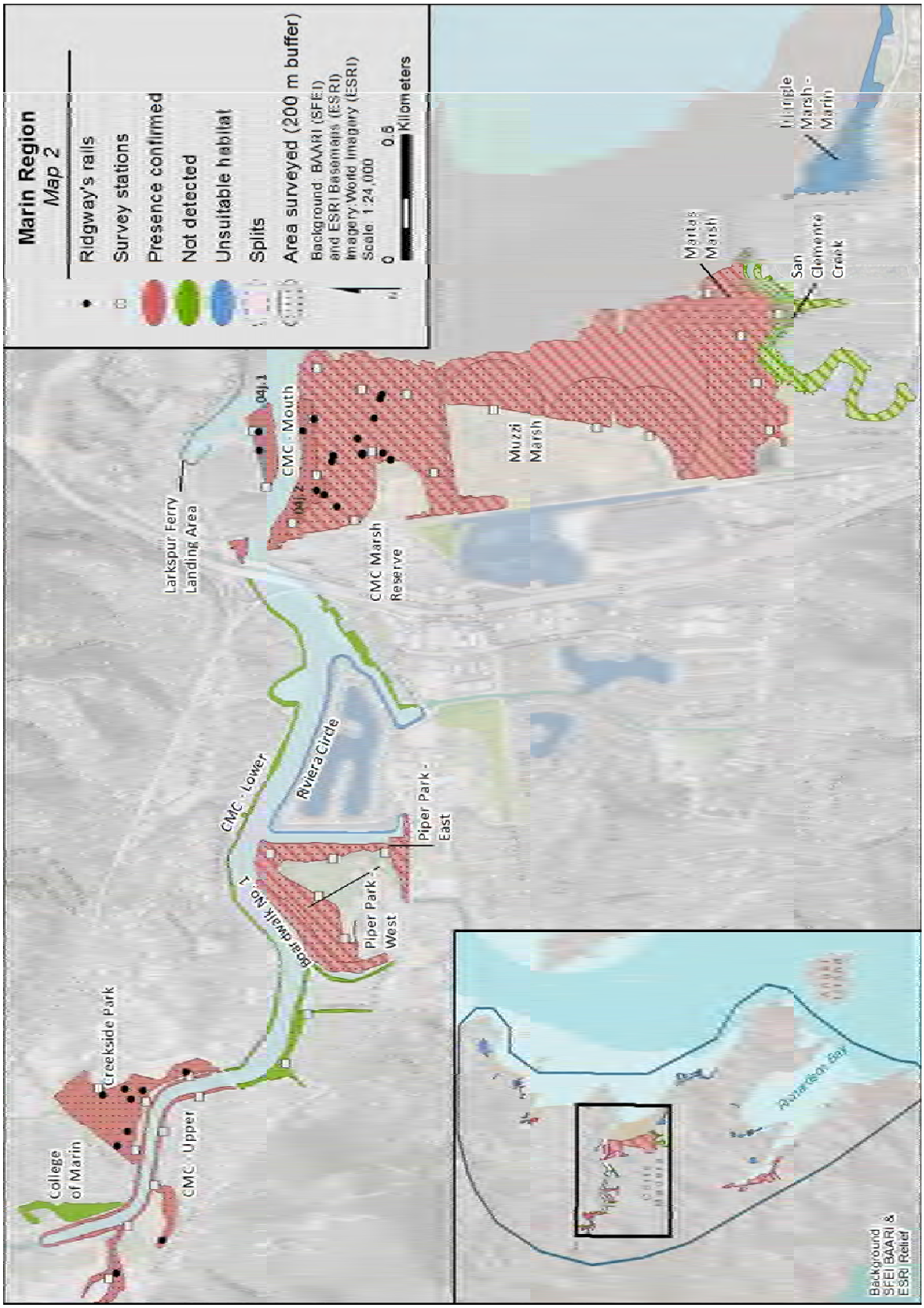

Figure 4. Map 2 of Marin Region showing Ridgway's rail detections and area surveyed.

4.2 San Francisco Peninsula Region

The San Francisco Peninsula Region extends from the Golden Gate Bridge to the San Mateo Bridge (**Figure 5 - Figure 9)**. This urban region is highly developed and includes several marinas, tidal lagoons, flood control channels, small fragmented patches of remnant marsh, invaded mudflats, and the mouths of several creeks and sloughs. A wide range of land uses can be found here, from San Francisco International Airport (SFO) and shipyards, to light and heavy industry, to commercial and residential development. It includes the cluster of sites within the Colma Creek Complex, as well as the scattered sites along the length of the Peninsula.

The region includes 34 ISP rail sites, 22 of which were surveyed by OEI in 2017 (**Table 2**Table 7.). Non-native *Spartina* was not detected at the remaining 12 sites in 2016 so surveys were deemed unnecessary. OEI conducted NAm protocol at all four sites where call-count surveys were conducted. The remaining 18 sites were assessed for the presence of Ridgway's rail habitat (Protocol F), which was determined to be lacking and no further surveys were necessary.

Once again in 2017, Ridgway's rails were detected at only one site in the region: SFO. The vast majority of the sites in the region are smaller than 10 hectares with high perimeter-to-area ratios. Additionally, the sites are mostly isolated, so dispersal to and from these marshes would be a challenge for juveniles. The absence of rails is expected with the lack of habitat availability in the region. Unfortunately, because of the fragmented nature of the small tidal wetlands in the region, there are very few opportunities to restore and enhance the shoreline. Where possible, ISP Restoration Program has reintroduced native *Spartina foliosa* to the region. However, the largely riprap shoreline, small tidal wetlands, and mudflats in this region are unlikely to support suistainable rail populations without large-scale habitat creation.

Table 2. Summary of survey results in the San Francisco Peninsula Region at sites surveyed by OEI in 2017. Survey area and survey counts were considered null for sites lacking suitable breeding habitat (Protocol F).

County	Site Name (ID)	Survey Protocol	Site Hectares	% Site Surveyed	Ridgway's Rail Indices				Other Rail Occupancy		
					Highest Count	Relative Density	One-year Δ	Five-year Δ	BLRA	VIRA	SORA
San Francisco	Pier 98/Heron's Head (12b)	NAm	4.4	94%	0	0.00	→	-100%	0	0	0
San Francisco	Hunters Point Naval Reserve (12d)	F	0.5	-	-	-	-	-	-	-	-
San Francisco	Yosemite Channel (12e)	F	1.3	-	-	-	-	-	-	-	-
San Francisco	Candlestick Cove (12f)	F	0.7	-	-	-	-	-	-	-	-
San Francisco	Crissy Field (12g)	F	5.8	-	-	-	-	-	-	-	-
San Francisco	Yerba Buena Island (12h)	F	4.5	-	-	-	-	-	-	-	-
San Mateo	Colma Creek (18a)	F	2.8	-	-	-	-	-	-	-	-
San Mateo	Navigable Slough (18b)	F	1.2	-	-	-	-	-	-	-	-
San Mateo	Sam Trans Peninsula (18e)	F	5.8	-	-	-	-	-	-	-	-
San Mateo	Confluence Marsh (18f)	F	2.9	-	-	-	-	-	-	-	-
San Mateo	San Bruno Marsh (18g)	F	11.5	-	-	-	-	-	-	-	-
San Mateo	San Bruno Creek (18h)	F	2.1	-	-	-	-	-	-	-	-
San Mateo	Point San Bruno (19f)	F	1.1	-	-	-	-	-	-	-	-
San Mateo	Seaplane Harbor (19g)	F	1.7	-	-	-	-	-	-	-	-
San Mateo	SFO (19h)	NAm	10.2	65%	7	0.76	600%	18%	0	0	0
San Mateo	Mills Creek Mouth (19i)	F	1.1	-	-	-	-	-	-	-	-
San Mateo	Easton Creek Mouth (19j)	F	2.5	-	-	-	-	-	-	-	-
San Mateo	Sanchez Marsh (19k)	NAm	6.1	100%	0	0.00	→	→	0	0	0
San Mateo	Burlingame Lagoon (19l)	F	2.2	-	-	-	-	-	-	-	-
San Mateo	Coyote Point Marina (19n)	F	4.9	-	-	-	-	-	-	-	-
San Mateo	San Mateo Creek (19o)	F	1.2	-	-	-	-	-	-	-	-
San Mateo	Seal Slough (19p)	NAm	27.7	81%	0	0.00	→	→	0	0	0

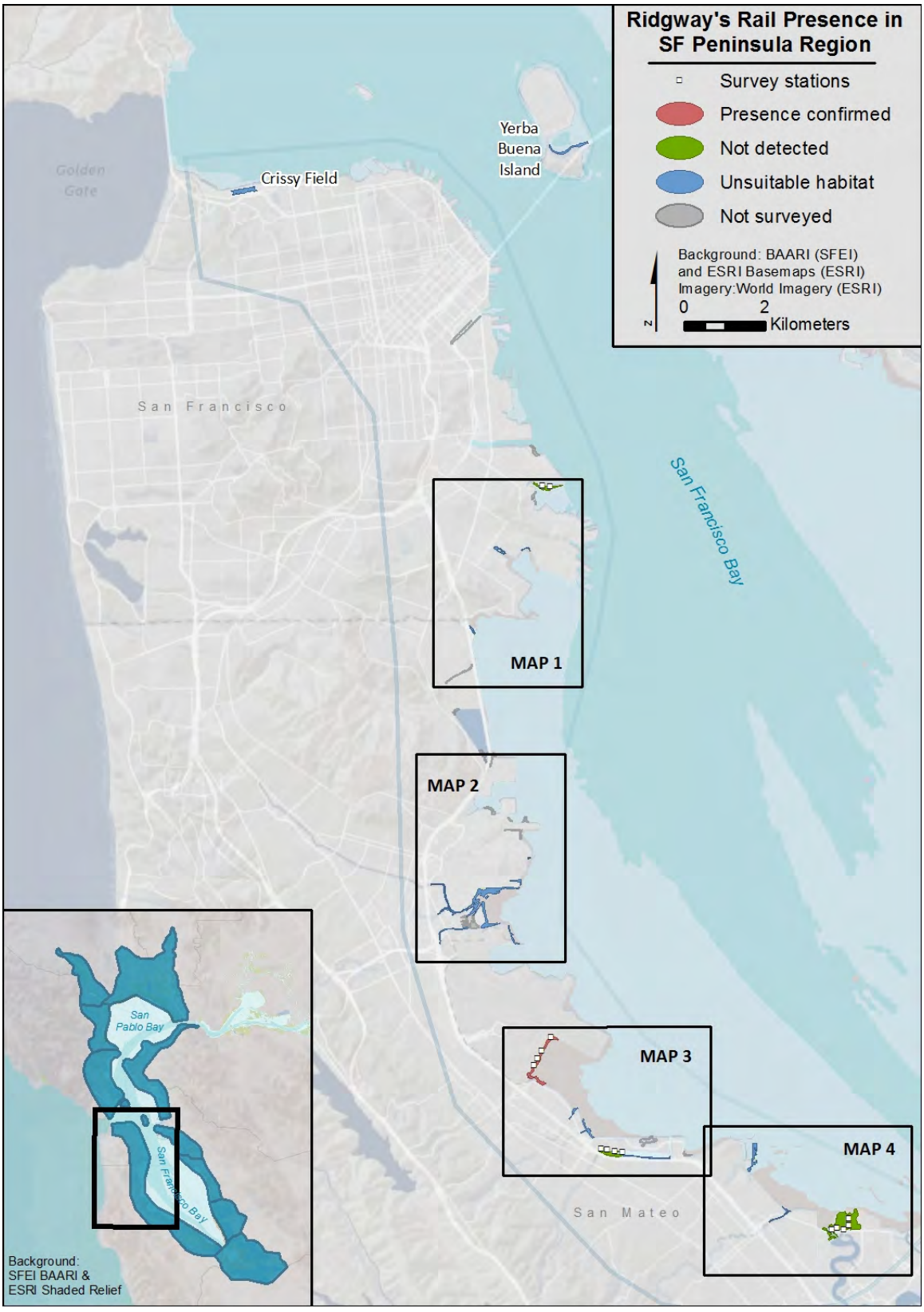

Figure 5. Overview map of San Francisco Bay Region, showing inset map for close-up maps.

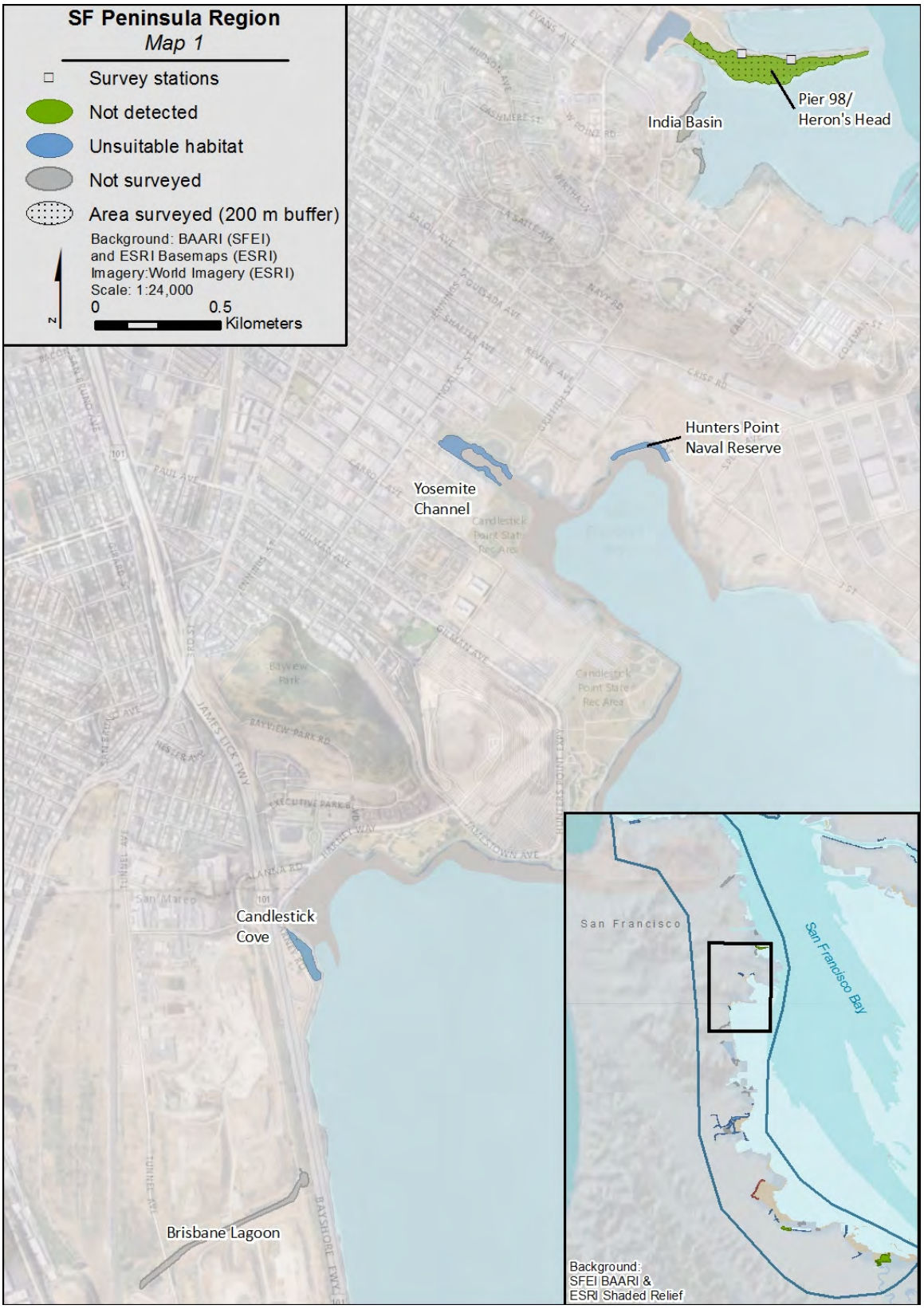

Figure 6. Map 1 of SF Peninsula Region showing Ridgway's rail detections and area surveyed.

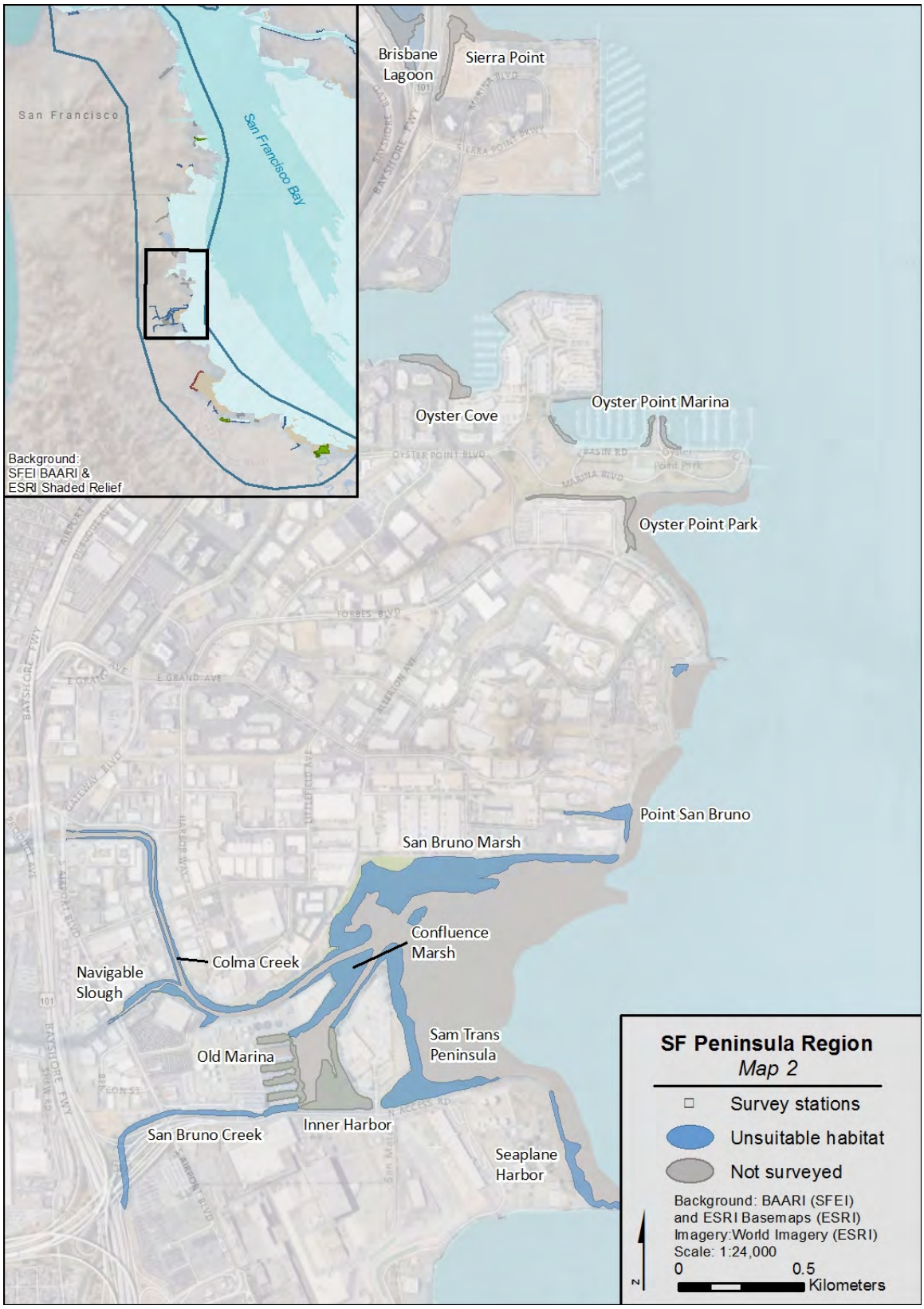

Figure 7. Map 2 of SF Peninsula Region showing Ridgway's rail detections and area surveyed.

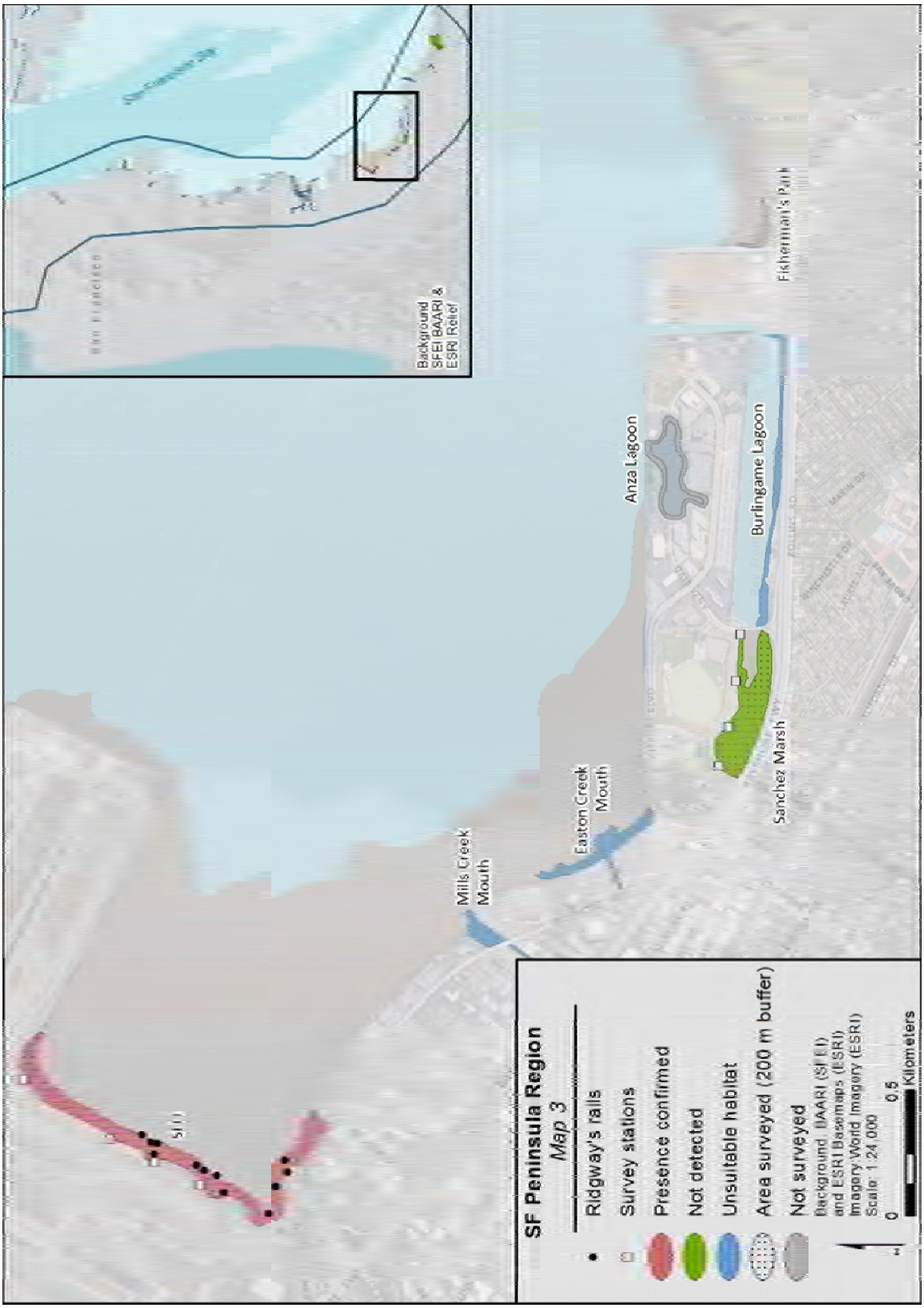

Figure 8. Map 3 of SF Peninsula Region showing Ridgway's rail detections and area surveyed.

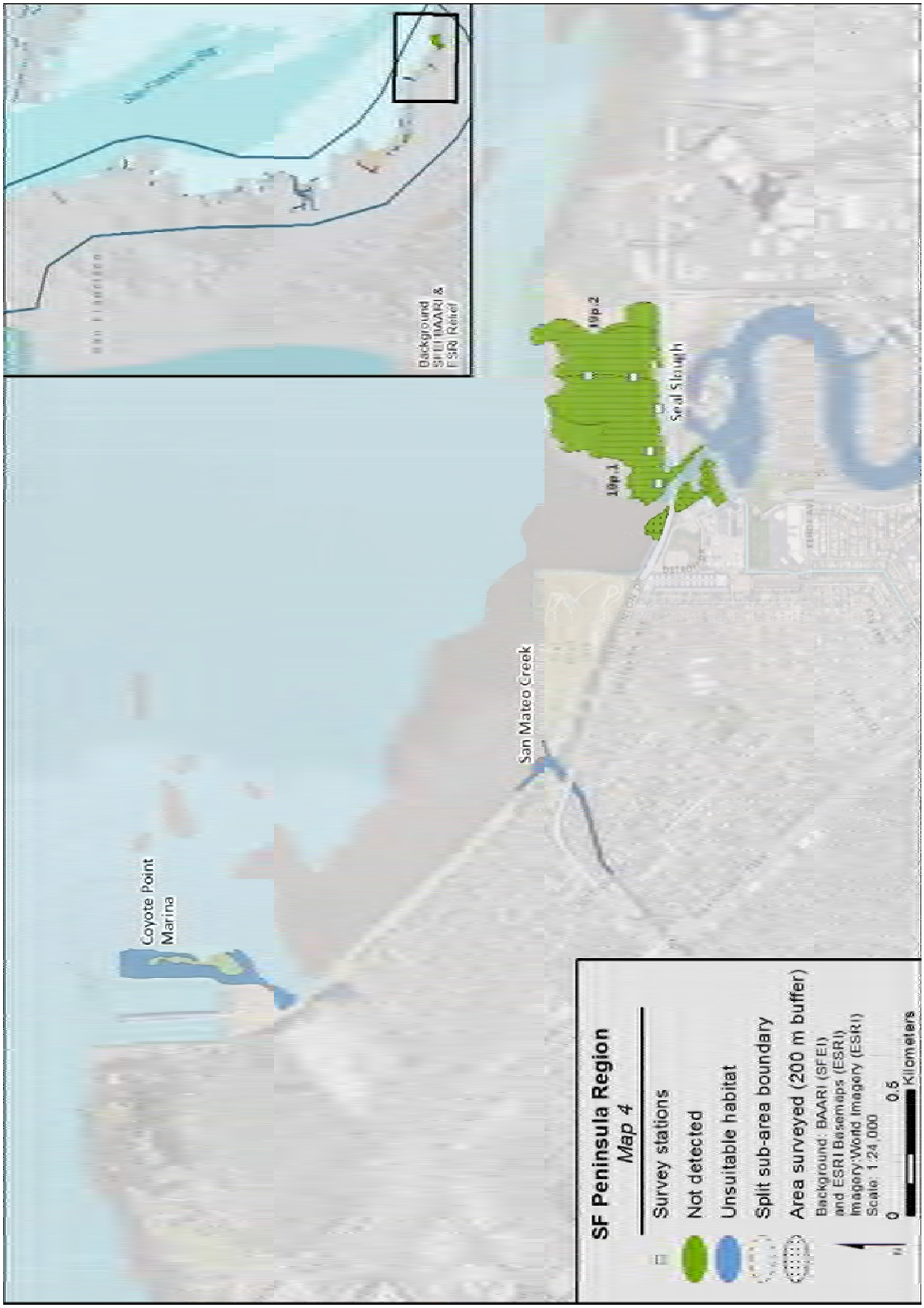

Figure 9. Map 4 of SF Peninusla Region showing Ridgway's rail detections and area surveyed.

4.3 San Mateo Region

The San Mateo region extends from the San Mateo Bridge to the Dumbarton Bridge on the west side of the Bay (**Figure 10 - Figure 14**). This region contains a variety of wetland habitats, including marsh islands, active and inactive commercial salt ponds, large tidal channels, and bayfront strip marshes. The older marsh parcels in the region support a diverse vegetative community and extensive dendritic channel complexes. These large marshes have a low perimeter-area ratio and are disconnected from the urban mainland by wide sloughs. They provide high-quality habitat for Ridgway's rails.

The region includes 20 ISP rail sites, 18 of which were surveyed by OEI in 2017 and one of which (Redwood Shores) was surveyed by DENWR staff. OEI detected a minimum of 114 Ridgway's rails in the San Mateo Region in 2017 (**Table 3**) and DENWR detected an additional six rails at Redwood Shores. Rail numbers are slightly down on the one-year time scale (-4%), but are increasing in the region on the five-year time scale (+4%).

A portion of one site within the region, B2 North (02c), is unique in the Bay in that it has been experimentally treated for invasive *Spartina* using a sub-lethal dose of herbicide (seed suppression) in order to prevent seed set and clonal expansion while still retaining vegetative structure for Ridgway's rails. Rail numbers at this site have been increasing, both within the experimental portion of the site in the north-east and in the fully treated remainder of the site. However, non-native *Spartina* remains a significant component of the overall habitat in the marsh.

The Coastal Conservancy has invested in rail habitat enhancements in the region, including the construction of high tide refuge islands at B2 North, Bird Island, Belmont Slough, Corkscrew Slough, Middle Bair (Deepwater Slough), and Greco Island North. Additionally, the ISP Restoration Program has planted thousands of *Grindelia stricta* seedlings in the region, particularly at Greco North and B2 North. The size of the marshes within the region and the potential habitat available through the restoration of salt ponds should continue to support a stable rail population in the years to come.

Table 3. Summary of survey results in the San Mateo Region at sites surveyed by OEI in 2017. Survey area and survey counts were considered null for sites lacking suitable breeding habitat (Protocol F). Sites that were split according to treatment permissions in 2011 are shown in grey font.

County	Site Name (ID)	Survey Protocol	Site Hectares	% Site Surveyed	Ridgway's Rail Indices				Other Rail Occupancy		
					Highest Count	Relative Density	One-year Δ	Five-year Δ	BLRA	VIRA	SORA
San Mateo	Belmont Slough (02a.1)	NAm	72.1	38%	10	0.33	67%	27%	0	0	0
San Mateo	Redwood Shores Mitigation Bank (02a.4)	F	36	-	-	-	-	-	-	-	-
San Mateo	Corkscrew Slough (02b.1)	NAm	92	36%	11	0.21	-31%	-8%	0	0	0
San Mateo	Steinberger Slough (02b.2)	NAm	42.7	49%	0	0.00	→	→	0	0	0
San Mateo	B2 North Quadrant (02c)[1]	A	211.7	58%	19	0.07	-27%	8%	0	0	0
San Mateo	B2 North Quadrant - NW (02c.1a)	-	60.9	47%	5	0.07	25%	20%	0	0	0
San Mateo	B2 North Quadrant - NE (02c.1b)[1]	-	59	72%	14	0.14	17%	5%	0	0	0
San Mateo	B2 North Quadrant - S (02c.2)	-	91.9	26%	0	0.00	-100%	→	0	0	0
San Mateo	B2 South Quadrant (02d)	A	76.1	52%	3	0.08	-50%	-6%	0	0	0
San Mateo	West Point Slough - NW (02e)	NAm	2.1	100%	0	0.00	-100%	→	0	0	0
San Mateo	Greco Island - North (02f)	NAm	206.8	27%	11	0.00	120%	2%	0	0	0
San Mateo	West Point Slough - SW / E (02g)	NAm	16.1	65%	0	0.00	→	-100%	0	0	0
San Mateo	Greco Island - South (02h)	A	96.3	42%	25	0.30	-34%	3%	0	0	0
San Mateo	Ravenswood Slough (02i)	A	47.7	58%	16	0.36	100%	74%	0	0	0
San Mateo	Middle Bair N (02k) [AKA Deepwater Slough]	A	89.7	52%	17	0.00	-6%	-2%	0	0	0
San Mateo	Middle Bair SE (02k) [AKA Deepwater Slough]	A	81	33%	2	0.00	↑	0%	0	0	0
San Mateo	Inner Bair Island Restoration (02l)	NAm	24.1	65%	0	0.00	→	→	0	0	0
San Mateo	Pond B3 Bair Is Restoration (02m)	F	166.7	-	-	-	-	-	-	-	-
San Mateo	Middle Bair West (02o)	F	273.2	-	-	-	-	-	-	-	-
San Mateo	Foster City (19q)	F	2.2	-	-	-	-	-	-	-	-
San Mateo	Maple Street Channel (19s)	F	0.3	-	-	-	-	-	-	-	-

[1] Bair B2 North Quadrant NE (02c.1b) has been treated using a "seed suppression" instead of full treatment since 2012 in accordance with the ISP's Biological Opinion.

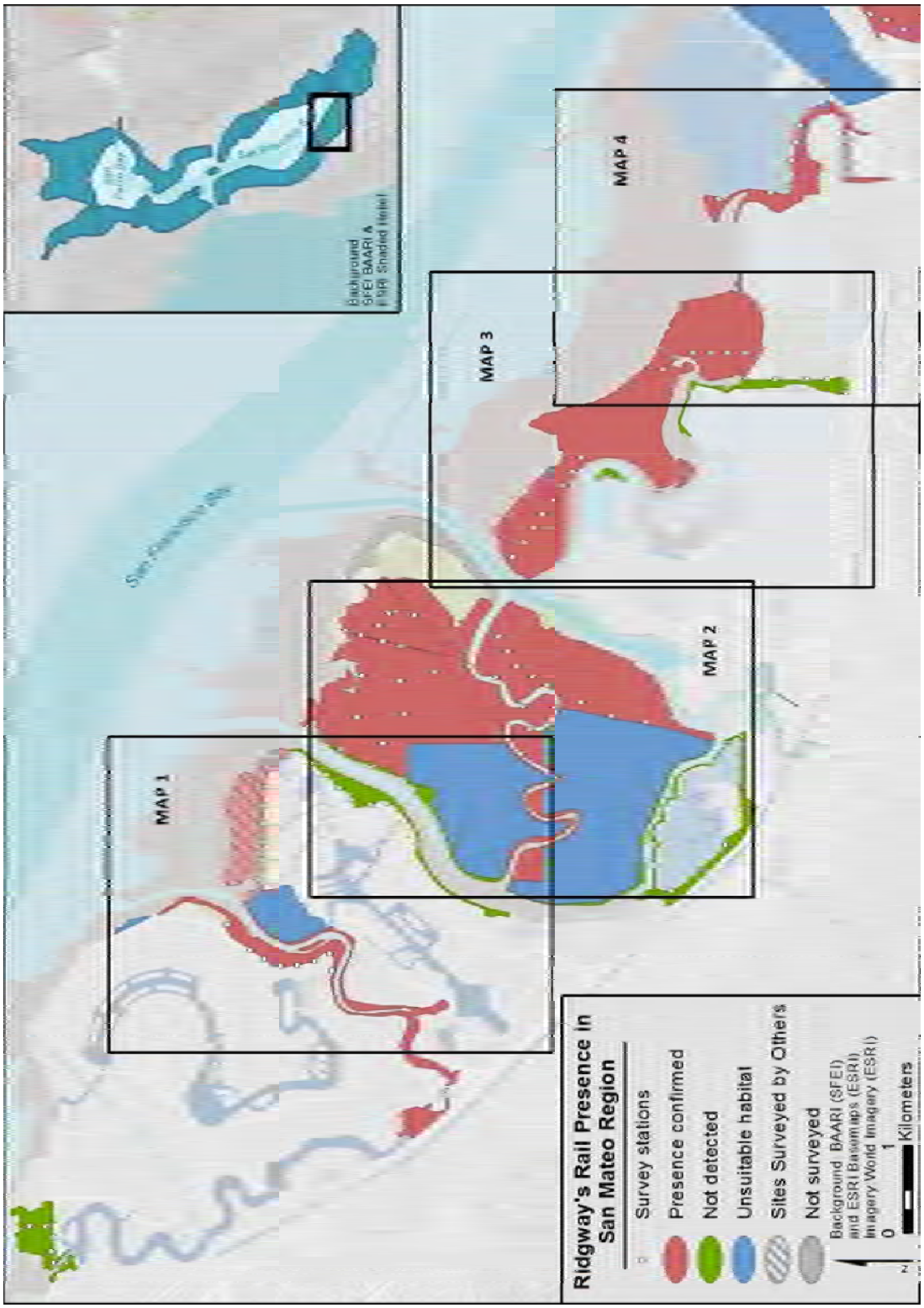

Figure 10. Overview map of San Mateo Region, showing inset map for close-up maps.

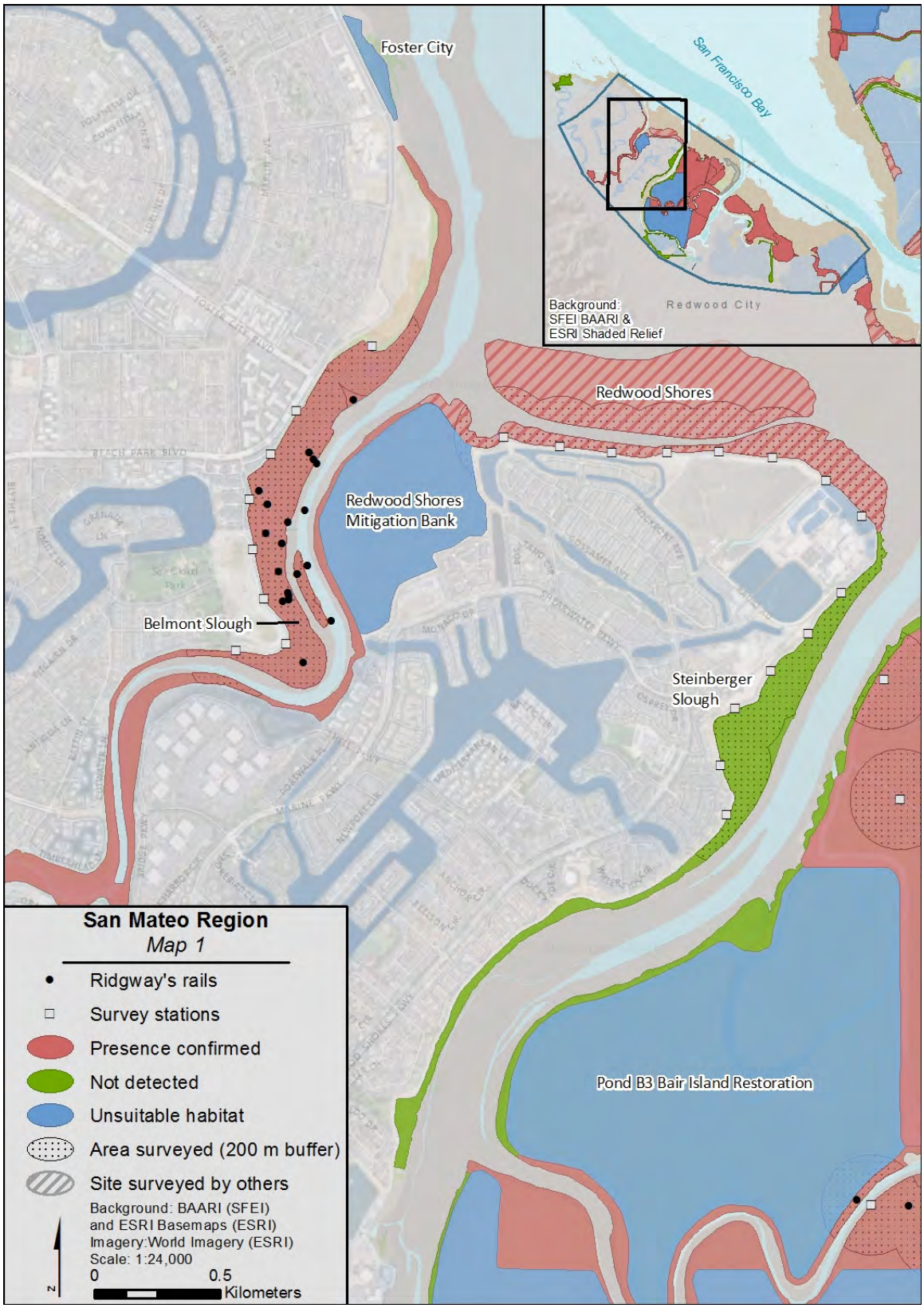

Figure 11. Map 1 of San Mateo Region showing Ridgway's rail detections and area surveyed.

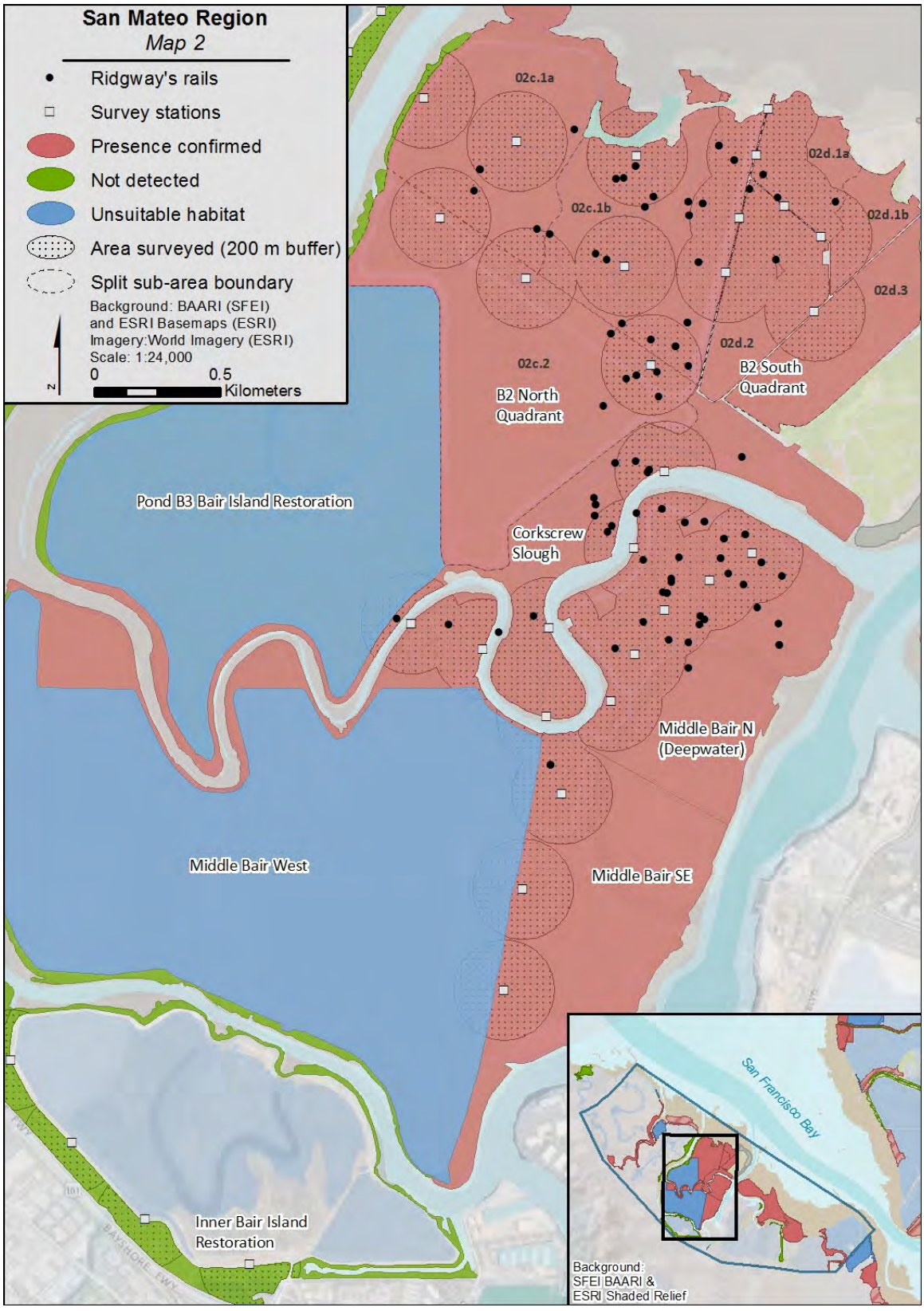

Figure 12. Map 2 of San Mateo Region showing Ridgway's rail detections and area surveyed.

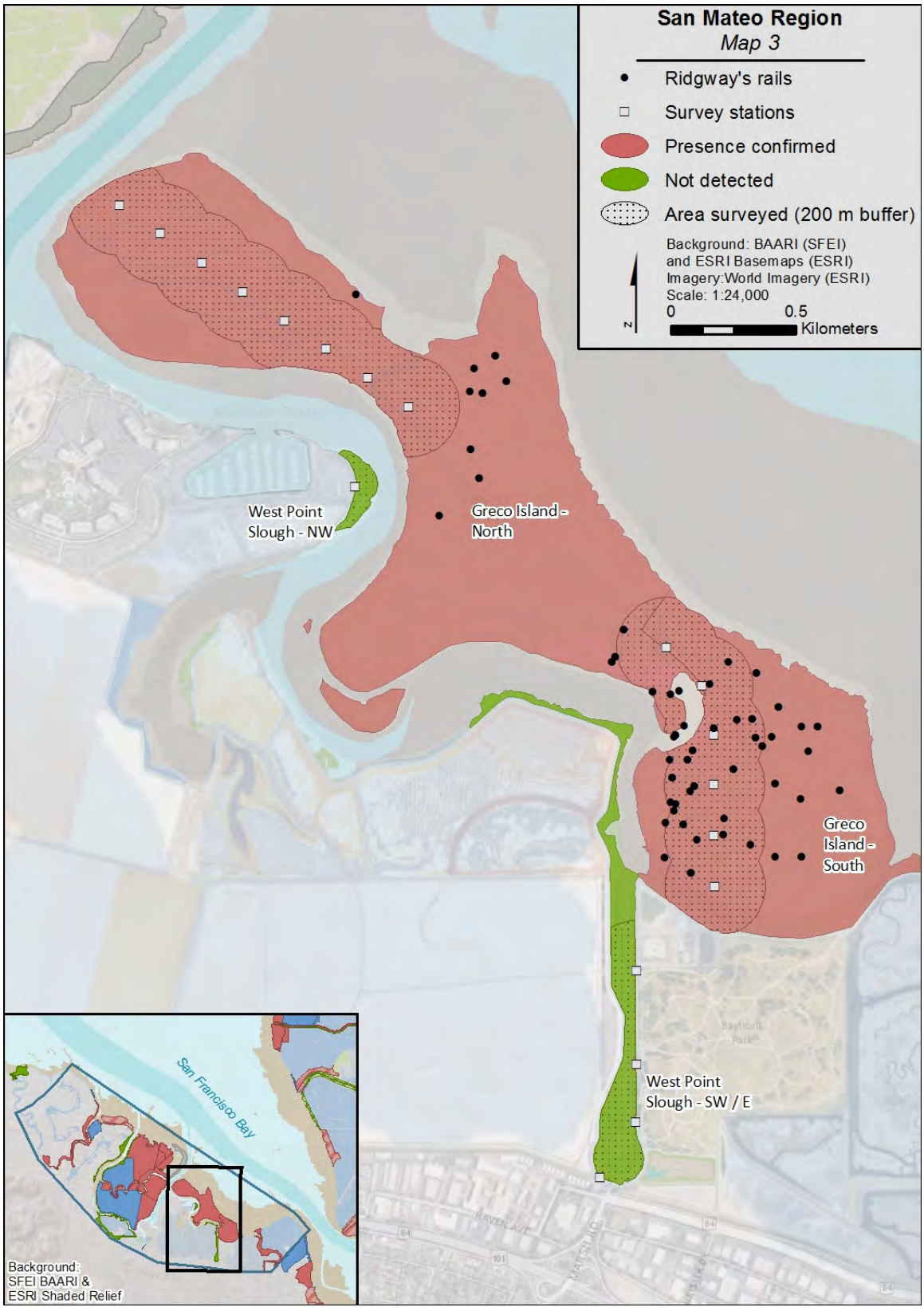

Figure 13. Map 3 of San Mateo Region showing Ridgway's rail detections and area surveyed.

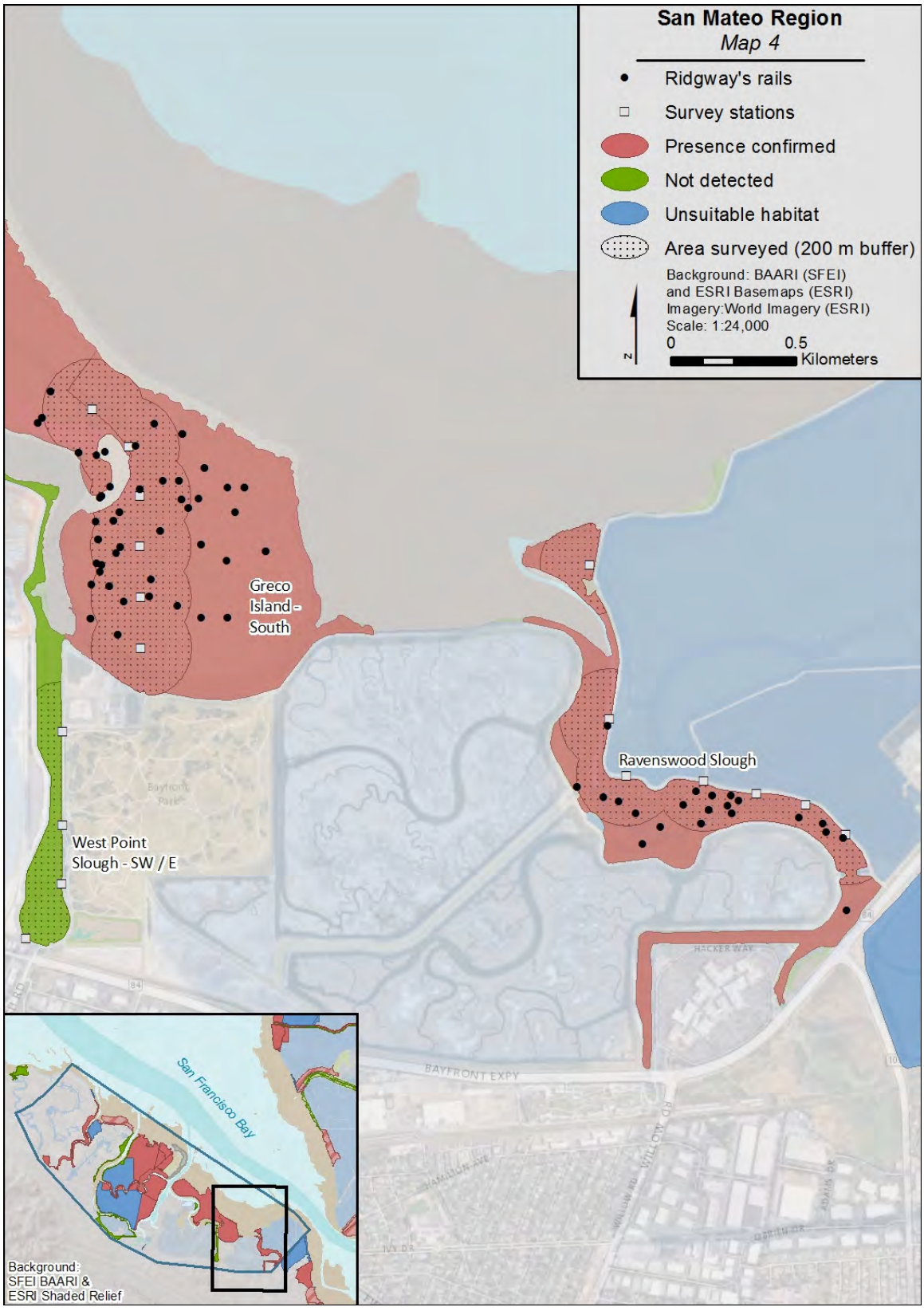

Figure 14. Map 4 of San Mateo Region showing Ridgway's rail detections and area surveyed.

4.4 Dumbarton South Region

Dumbarton South includes all marshes south of the Dumbarton Bridge, from Newark to Mountain View (**Figure 15 - Figure 22**). Sites in this region are generally large parcels of mature marshes on managed and protected lands. They include a variety of habitat types, including freshwater creeks, restored salt ponds, tidal and brackish sloughs, creek deltas, fringing tidal marsh benches, and historic tidal marsh plains. The complex vegetative structure and channel networks of the tidal marshes in the region provide excellent habitat for Ridgway's rails. Accordingly, the region supports large numbers of Ridgway's rails and has some of the most densely occupied sites in the Estuary.

In 2017, OEI conducted surveys at 16 of the 34 ISP rail sites in the region (**Table 4**). DENWR surveyed six sites in the region and PBCS surveyed an additional four. The remaining sites in the region were not surveyed in 2017.

OEI conducted a thorough survey at Island Pond A21 for the second time since it was restored in 2006 and detected nine Ridgway's rails within the site boundary. This is a significant increase from three rails detected in 2016 and none the year before when it was surveyed by staff at DENWR. The site has been rapidly colonized by native vegetation, predominantly native *Spartina foliosa*, since it was restored to tidal action. Ridgway's rails have, in turn, responded quickly to the restoration.

Rail numbers are increasing in the Dumbarton South Region at both the one-year time scale (+41%) and the five-year time scale (+4%). This region represents one of the largest Ridgway's rail population centers in the Estuary. OEI detected a minimum of 138 rails in the region, while DENWR detected an additional 60 rails and PBCS detected over 175 more rails in the Dumbarton South Region. There are likely many more rails than that in the region since there are many large tracts of tidal wetlands that are not included in the survey effort or are beyond our threshold of detection.

The region's extensive native tidal wetlands are also being expanded with the restoration of several large tracts of former salt evaporator ponds to marsh. In addition to the large-scale restoration of the former salt ponds, the Coastal Conservancy has funded the installation of high tide refuge islands over the past several years at Cooley Landing, Palo Alto Baylands, and Dumbarton Marsh, as well as the installation of native *Grindelia stricta*. These restoration and enhancement efforts will enable the continued support of the large rail population center in this region.

Table 4. Summary of survey results in the Dumbarton South Region at sites surveyed by OEI in 2017. Survey area and survey counts were considered null for sites lacking suitable breeding habitat (Protocol F).

County	Site Name (ID)	Survey Protocol	Site Hectares	% Site Surveyed	Ridgway's Rail Indices				Other Rail Occupancy		
					Highest Count	Relative Density	One-year Δ	Five-year Δ	BLRA	VIRA	SORA
San Mateo	Ravenswood Open Space (02j)	F	9.2	-	-	-	-	-	-	-	-
San Mateo	SF2 (02n)	F	98.2	-	-	-	-	-	-	-	-
Alameda	Mowry Marsh North (05a.1)	NAm	168.9	29%	15	0.10	NA	-1%	0	0	0
Alameda	Calaveras Point (05a.2)	NAm	184.4	16%	42	0.73	100%	3%	0	0	0
Alameda	Newark Slough (05c)	NAm	97.3	28%	18	0.47	125%	18%	0	0	0
Alameda	Coyote Creek - Mud Slough (05f)	NAm	85.1	42%	4	0.11	-75%	NA	0	0	0
Alameda	Plummer Creek Mitigation (05h)	NAm	6.7	98%	0	0.00	→	→	0.33	0.67	0
Alameda	Island Ponds - A21 (05i)	NAm	64.4	50%	9	0.09	200%	NA	0	0	0
Santa Clara	Charleston Slough (15a.1)	A	14.7	73%	3	0.09	↑	-10%	0	0	0
Santa Clara	Mountain View Slough (15a.1)	A	29.9	30%	1	0.09	-50%	-20%	0	0	0
Santa Clara	Stevens Creek to Long Point (15a.2)	NAm	23	63%	2	0.14	100%	↑	0	0	0
Santa Clara	Guadalupe Slough (15a.3)	NAm	128	29%	10	0.19	400%	58%	0	0	0
Santa Clara	Alviso Slough (15a.4)	A	176.6	17%	12	0.13	50%	64%	0	0	0
Santa Clara	Knapp Tract (15a.6)	F	154.9	-	-	-	-	-	-	-	-
Santa Clara	Stevens Creek (15c)	NAm	11.3	75%	4	0.48	300%	↑	0	1.00	0
San Mateo	Cooley Landing (16)	A	70.9	64%	18	0.36	80%	78%	0	0	0

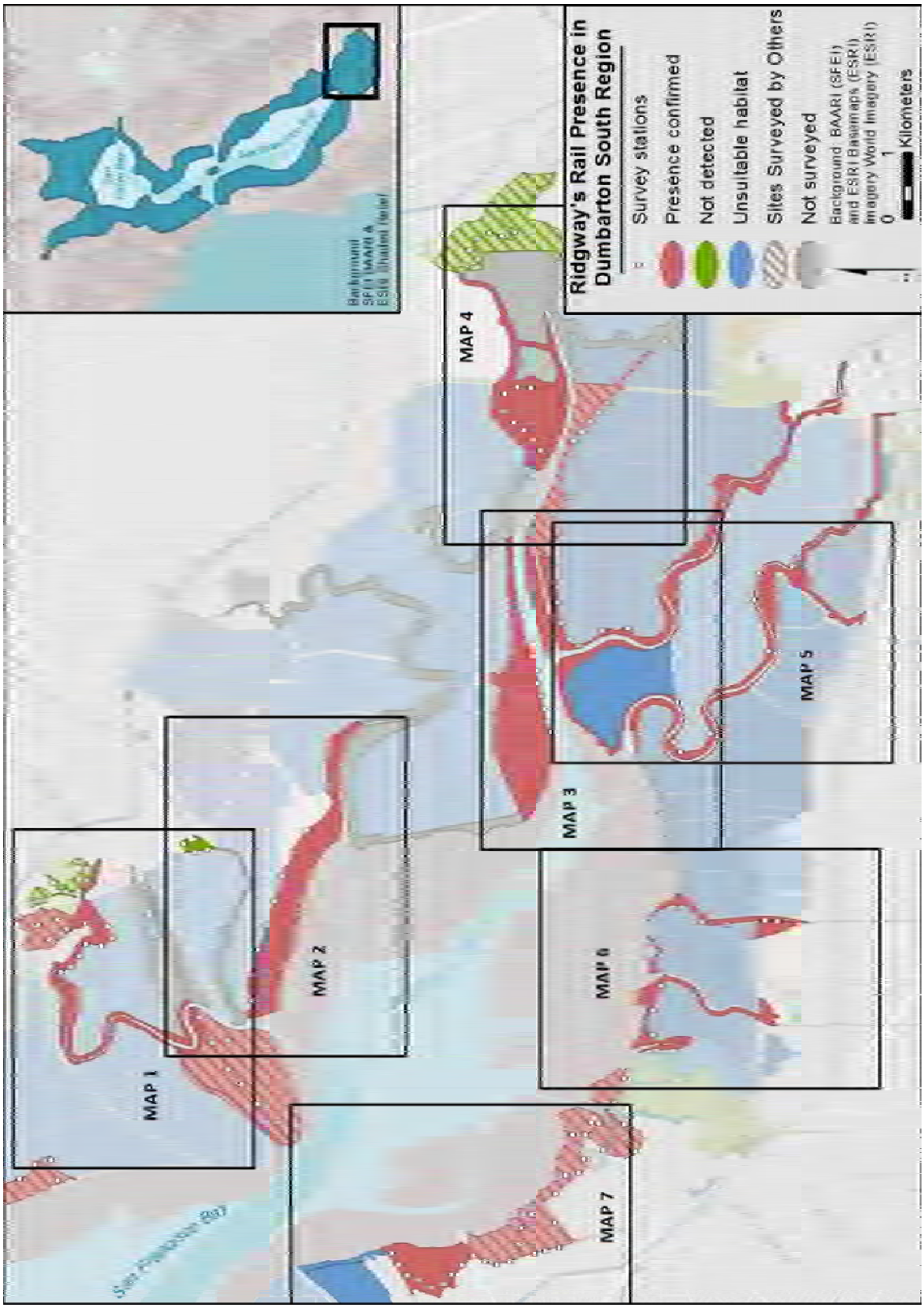

Figure 15. Overview map of Dumbarton South Region, showing inset map for close-up maps.

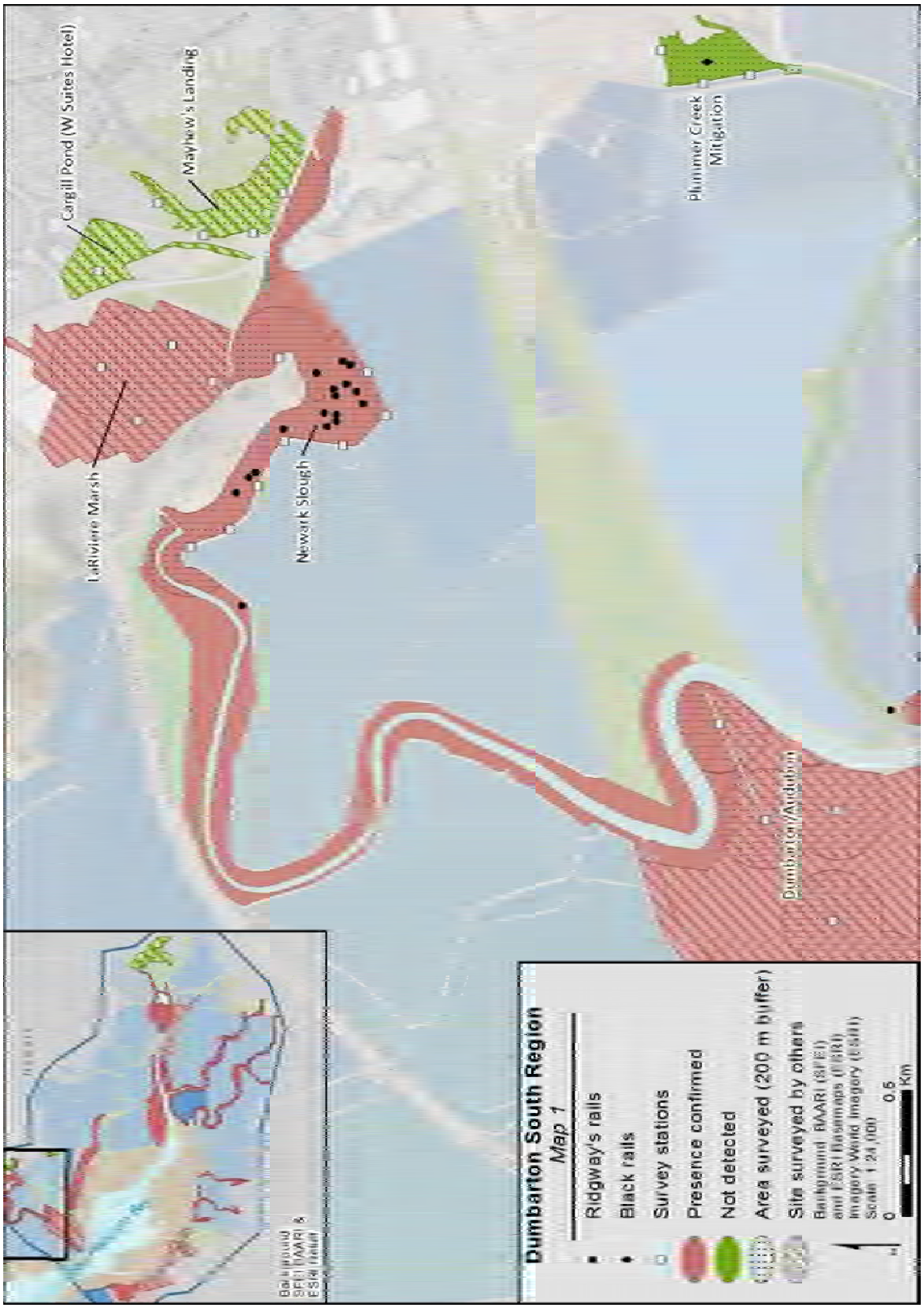

Figure 16. Map 1 of Dumbarton South Region showing Ridgway's rail detections and area surveyed.

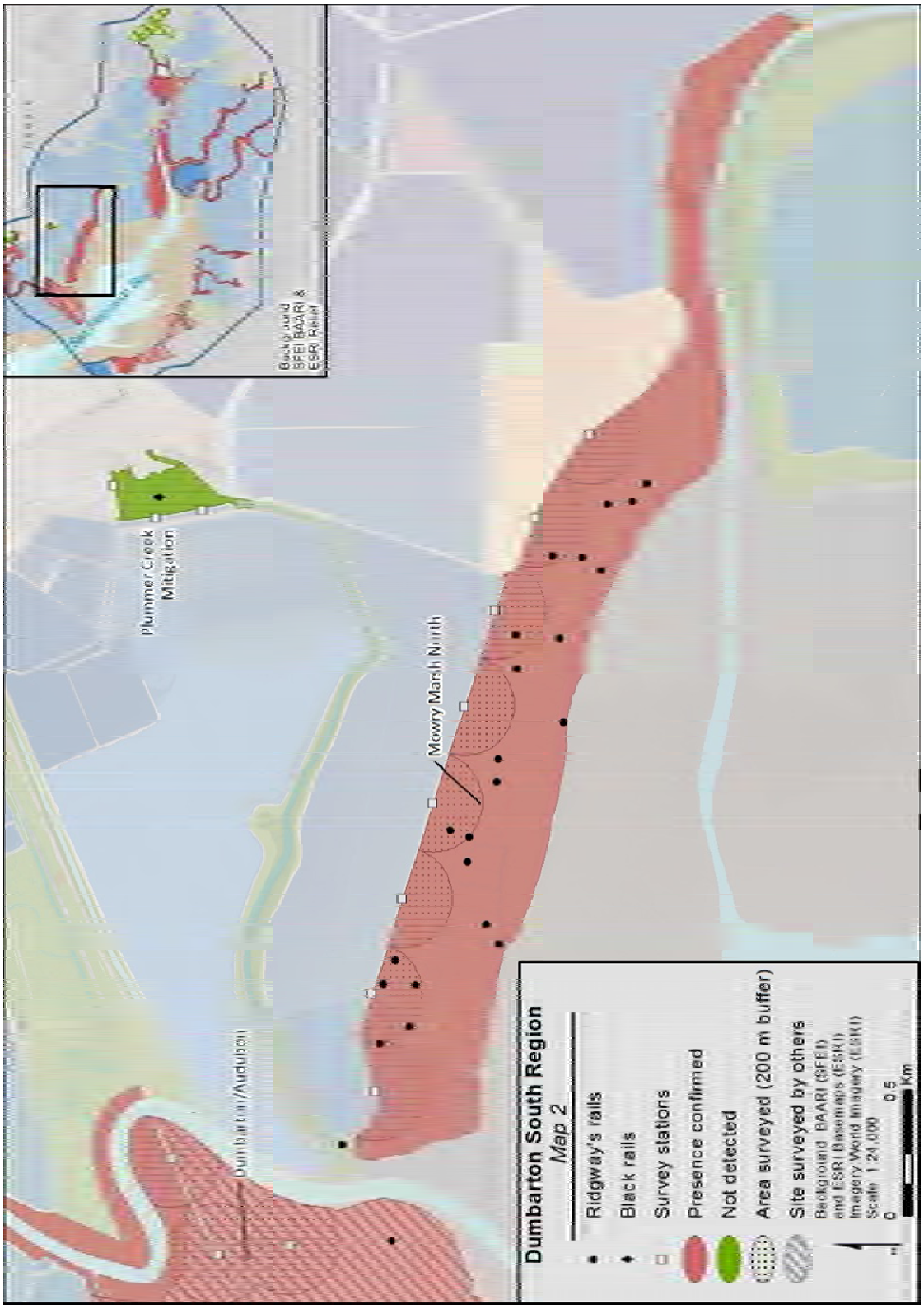

Figure 17. Map 2 of Dumbarton South Region showing Ridgway's rail detections and area surveyed.

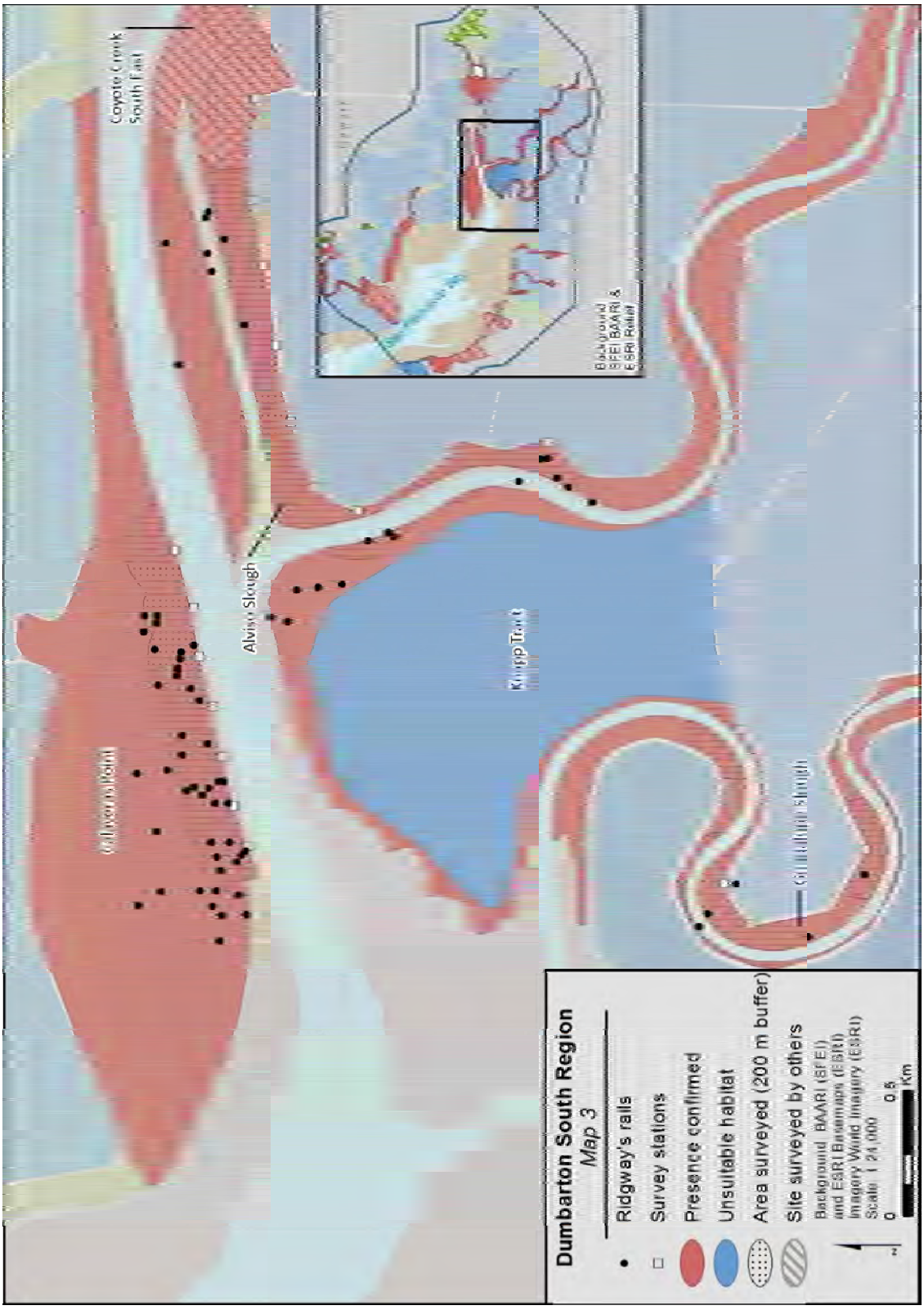

Figure 18. Map 3 of Dumbarton South Region showing Ridgway's rail detections and area surveyed.

Figure 19. Map 4 of Dumbarton South Region showing Ridgway's rail detections and area surveyed.

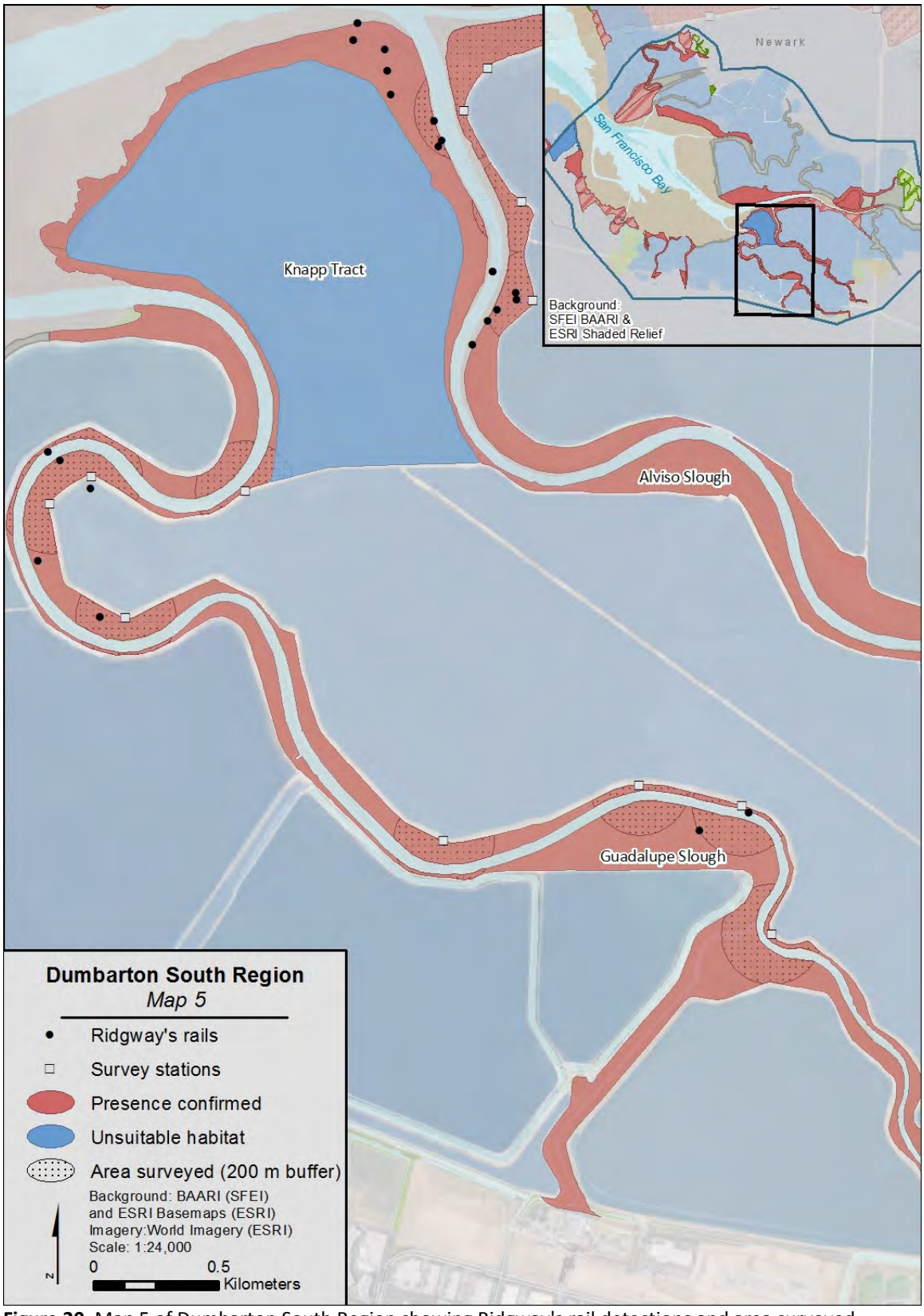

Figure 20. Map 5 of Dumbarton South Region showing Ridgway's rail detections and area surveyed.

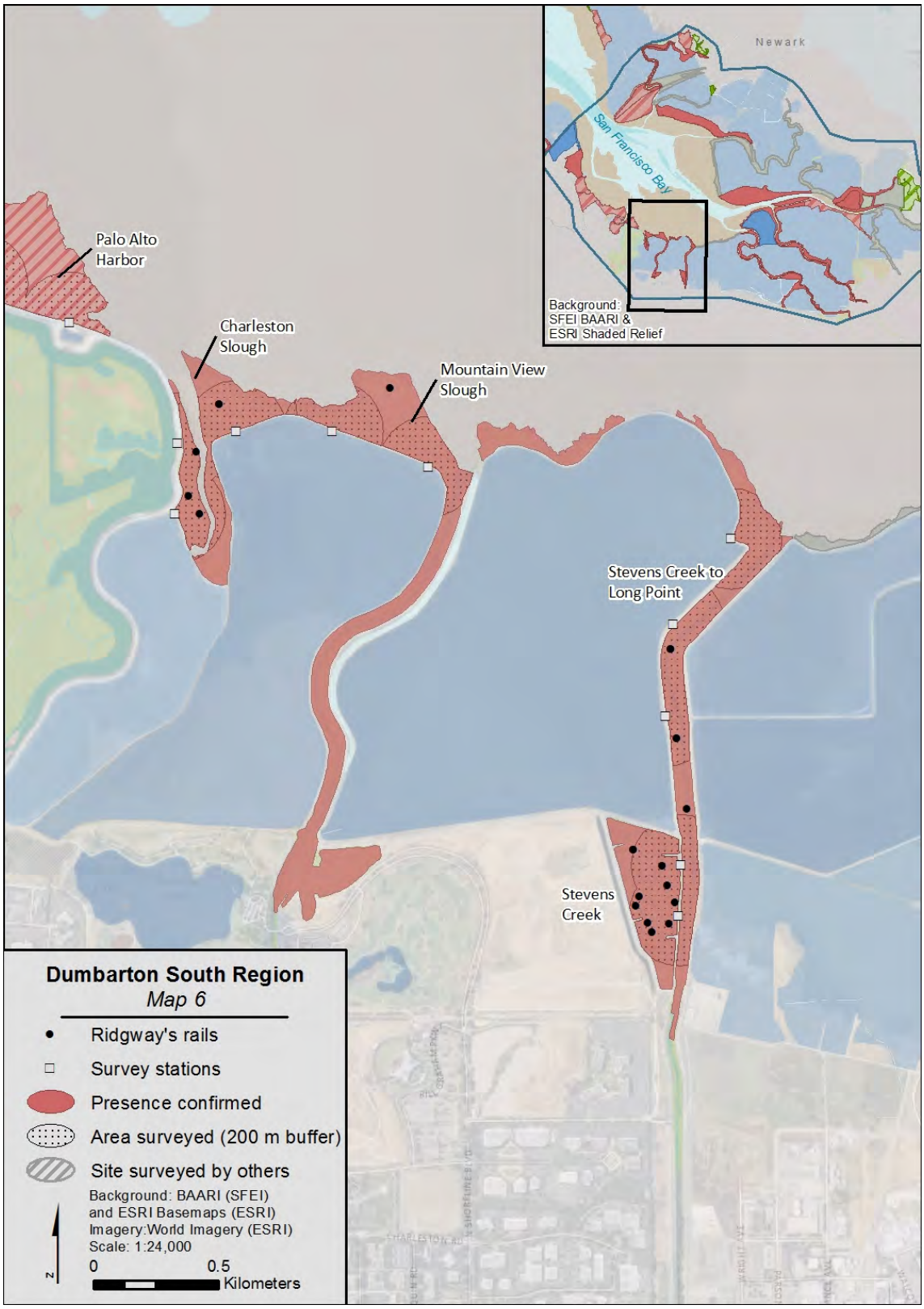

Figure 21. Map 6 of Dumbarton South Region showing Ridgway's rail detections and area surveyed.

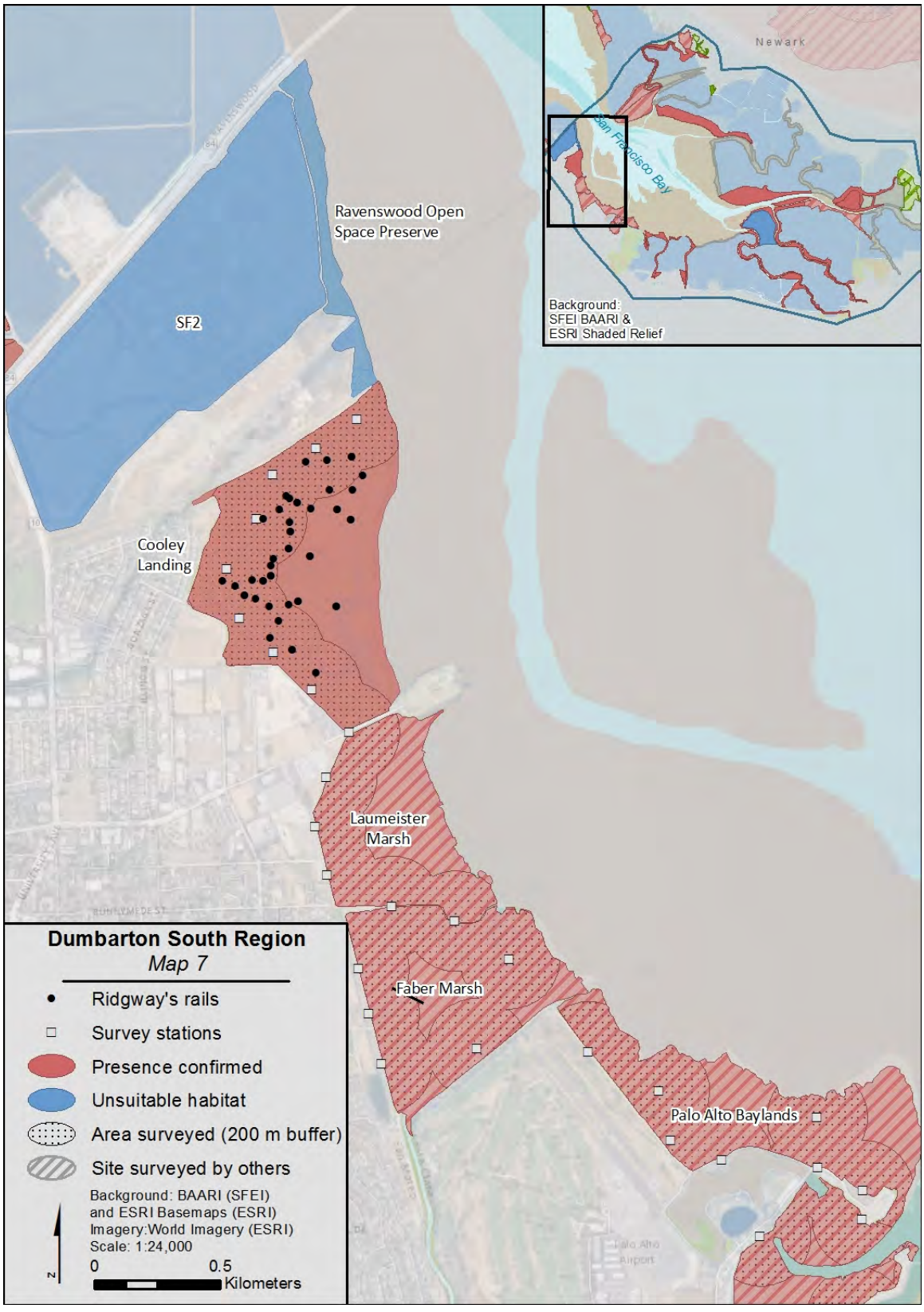

Figure 22. Map 7 of Dumbarton South Region showing Ridgway's rail detections and area surveyed.

4.5 Union City Region

The Union City Region in Alameda County extends from the San Mateo Bridge to the Dumbarton Bridge (**Figure 23**). There are a variety of habitats in this region, including mature restoration marshes, flood control channels, young restoration sites with little vegetation, and mudflats. The region includes the Eden Landing Ecological Reserve, which is an important component of the larger South Bay Salt Pond Restoration Project. Although the Union City Region was the epicenter of the original *Spartina* invasion, it now has one of the lowest remaining infestations in the Estuary.

OEI surveyed 13 of the 21 sites in the region in 2017 and detected a minimum of 22 Ridgway's rails (**Table 5**). Seven other sites were surveyed by staff at DENWR, who detected an additional seven Ridgway's rails within the region in 2017. The rail numbers in the region are slightly increased over the previous year (+4%) and at about average for the entire period. However, the beginning of the study period marked a peak in the rail numbers in the region and so the five-year change shows a slight decline at -6%.

In general, the marshes in the region have a low density of rails, in part due to a deficiency of *Spartina* species. Because the initial hybrid *Spartina* invasion began here, much of the native *Spartina foliosa* in the region was swamped and extirpated by the expansion of non-native *Spartina*. The subsequent treatment and successful removal of much of the hybrid *Spartina* has left the region bereft of *Spartina*. In response, the ISP Restoration Program has been reintroducing native *Spartina,* as well as *Grindelia stricta*, to the region over the past six years. As these plantings continue to mature, more rail habitat will become available and the region's rail population is expected to increase in response.

Table 5. Summary of survey results in the Union City Region at sites surveyed by OEI in 2017. Survey area and survey counts were considered null for sites lacking suitable breeding habitat (Protocol F).

County	Site Name (ID)	Survey Protocol	Site Hectares	% Site Surveyed	Ridgway's Rail Indices				Other Rail Occupancy		
					Highest Count	Relative Density	One-year Δ	Five-year Δ	BLRA	VIRA	SORA
Alameda	AFCC - Strip Marsh (01e)	F	2.9	-	-	-	-	-	-	-	-
Alameda	OAC - North Bank (13a)	NAm	10.9	92%	1	0.10	↑	↑	0	0	0
Alameda	OAC - Island (13b)	NAm	37.9	92%	9	0.26	125%	25%	0	0	0.04
Alameda	OAC - South Bank (13c)	NAm	9.7	93%	0	0.00	→	→	0	0	0
Alameda	Whale's Tail - North (13d)	NAm	56.9	47%	1	0.04	-50%	-34%	0	0	0
Alameda	Whale's Tail - South (13e)	NAm	60.4	51%	7	0.03	75%	-5%	0	0	0
Alameda	Cargill Mitigation Marsh (13f)	NAm	19.1	79%	4	0.20	↑	↑	0	0	0
Alameda	Eden Landing - North Creek (13h)	F	14.5	-	-	-	-	-	-	-	-
Alameda	Eden Landing - Pond 10 (13i)	F	87.5	-	-	-	-	-	-	-	-
Alameda	Eden Landing - Mt Eden Creek (13j)	NAm	50.5	49%	0	0.00	-100%	→	0	0	0
Alameda	Eden Landing Reserve - South (13k)	NAm	97	36%	0	0.00	→	→	0	0	0
Alameda	Eden Landing Reserve - North (13l)	F	93	-	-	-	-	-	-	-	-
Alameda	Eden Landing - Ponds E8A, E9, E8X (13m)	F	272.7	-	-	-	-	-	-	-	-

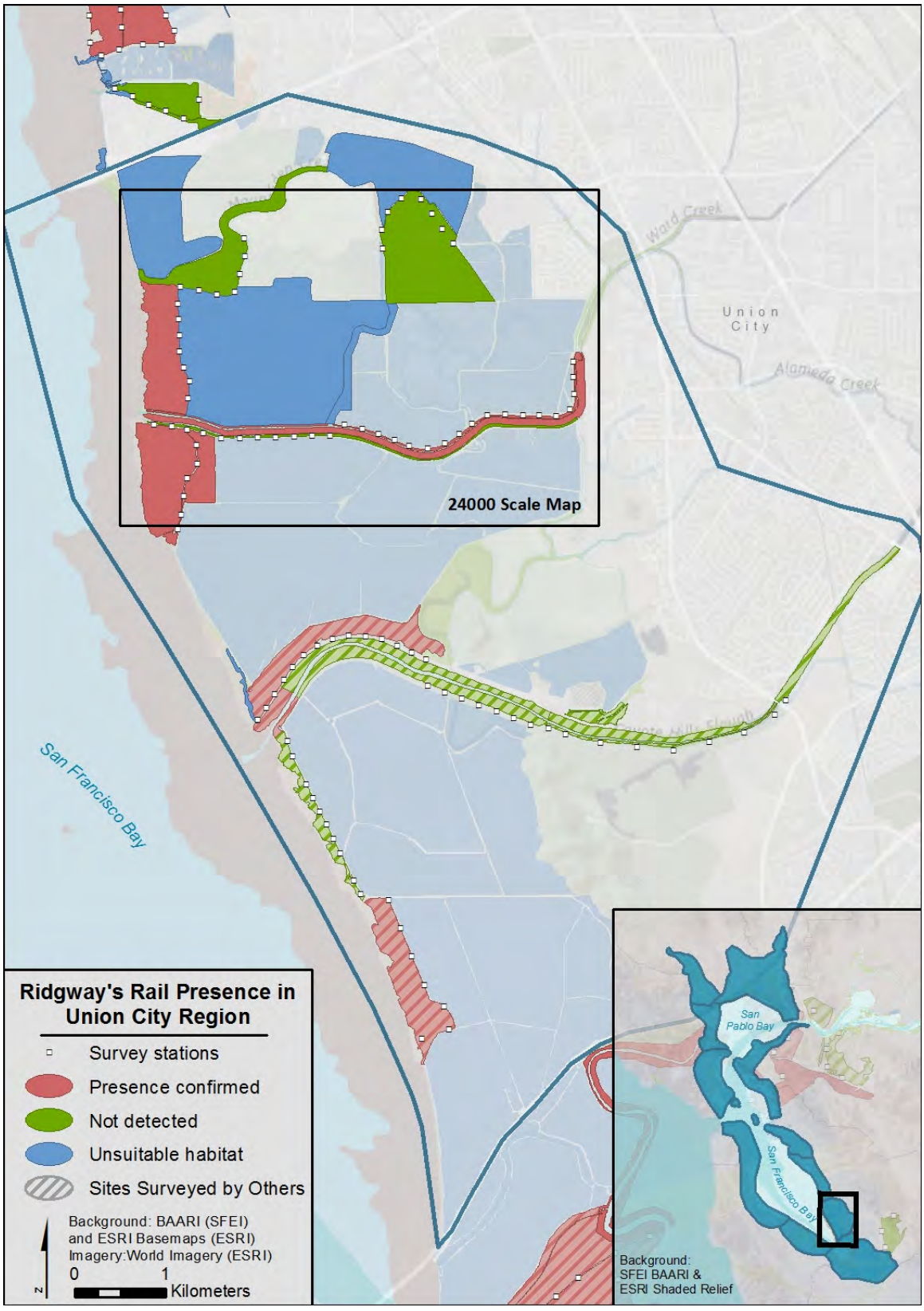

Figure 23. Overview Map of Union City Region, showing inset map for close-up maps.

Figure 24. Map 1 of Union City region showing Ridgway's rail detections and area surveyed.

4.6 Hayward Region

The Hayward Region in Alameda County extends from the Oakland International Airport south to the San Mateo Bridge (**Figure 25** - **Figure 27**). Most of the sites within the region are mid-sized marshes that were restored to tidal flow in recent decades. These young restoration sites exhibit a lack of channel density and vegetative structure and thus provide mediocre habitat for Ridgway's rails. However, as in the case of San Leandro Bay, the Hayward Region still has large stands of hybrid *Spartina* remaining at the six sites in the region where treatment is prohibited. The cover provided by non-native *Spartina* offers protection from predators, which are particularly abundant in the region.

OEI surveyed all 25 sites within the region, two of which were surveyed using Protocol G in support of other projects and agencies in the region. A minimum of 168 Ridgway's rails were detected at nine sites; no rails were found at the remaining 16 sites (**Table 6**). Rail numbers are increasing in the region at both the one-year time scale (+51%) and the five-year time scale (+25%).

The vast majority of the rails detected in this region occur at the six sites/split-sites with treatment restrictions. Non-native *Spartina* has increased rapidly in the absence of treatment since 2011 and rails have responded positively to the habitat provided by non-native *Spartina*. Unfortunately, the majority of the marsh acreage within this region is currently under treatment restrictions, and thus there is little opportunity to establish native habitat and rail populations in the remaining marsh fragments in the region.

The Coastal Conservancy has invested heavily in revegetation and other habitat enhancements in the region. They funded the installation of six high tide refuge islands at Cogswell and an additional two islands at Bunker Marsh in the Robert's Landing Complex. Additionally, thousands of *Grindelia stricta* seedlings have been planted in the region over the past four years.

This region lacks native *Spartina foliosa*, which was lost to the invasion of hybrid *Spartina*. Over the past three years, native *Spartina foliosa* has been reintroduced at several carefully selected sites where hybrid *Spartina* is nearing eradication: Oro Loma - East (07a), Johnson's Landing (20l), Cogswell – Sec A (20m), HARD Marsh (20s), and Triangle Marsh – Hayward (20w). Unfortunately, some of these efforts were put on hold when hybrid *Spartina* propagules from adjacent untreated sites began invading revegetation plots. Still, based on early successes with native *Spartina* plantings, this region remains a good candidate for revegetation efforts when treatment of hybrid *Spartina* resumes at the six sites where it is currently prohibited.

Table 6. Summary of survey results in the Hayward Region at sites surveyed by OEI in 2017. Survey area and survey counts were considered null for sites lacking suitable breeding habitat (Protocol F). Sites that were split according to treatment permissions in 2011 are shown in grey font.

County	Site Name (ID)	Survey Protocol	Site Hectares	% Site Surveyed	Ridgway's Rail Indices				Other Rail Occupancy		
					Highest Count	Relative Density	One-year Δ	Five-year Δ	BLRA	VIRA	SORA
Alameda	Oro Loma - East (07a)	A	79.7	65%	0	0.00	-100%	-100%	0	0	0
Alameda	Oro Loma - West (07b)	A	52.9	81%	1	0.00	0%	0%	0	0	0
Alameda	Oyster Bay Regional Shoreline (20a)	F	4.6	-	-	-	-	-	-	-	-
Alameda	Oakland Golf Links (20b)	F	0.8	-	-	-	-	-	-	-	-
Alameda	Dog Bone Marsh (20c)	A	2.8	59%	0	0.00	-100%	→	0	0	0
Alameda	Citation Marsh (20d)	A	45.1	61%	32	0.47	167%	40%	0	0	0.14
Alameda	Citation Marsh - South (20d.1)	-	18	44%	0	0.00	→	-100%	0	0	0
Alameda	Citation Marsh - North (20d.2)[1]	-	27.1	73%	32	0.66	167%	45%	0	0	0.20
Alameda	East Marsh (20e)[2]	A[2]	15	30%	0	0.00	-100%	→	0	0	0
Alameda	North Marsh (20f)[1]	A	36	94%	58	0.83	41%	49%	0	0	0.14
Alameda	Bunker Marsh (20g)[1]	A	14.5	95%	17	1.02	21%	16%	0	0	0
Alameda	San Lorenzo Creek (20h)	A	10.9	63%	2	0.29	100%	0%	0	0	0
Alameda	San Lorenzo Creek - North (20h.1) [1]	-	5.5	98%	2	0.37	100%	0%	0	0	0
Alameda	San Lorenzo Creek - South (20h.2)	-	5.5	95%	0	0.00	→	→	0	0	0
Alameda	Bockman Channel (20i)[3]	G	1	100%	0	0.00	→	→	0	0	0
Alameda	Sulphur Creek (20j)	F	3.3	-	-	-	-	-	-	-	-
Alameda	Hayward Landing (20k)	NAm	1.2	100%	0	0.00	→	→	0	0	0
Alameda	Johnson's Landing (20l)	F	4.1	-	-	-	-	-	-	-	-
Alameda	Cogswell - Sec A (20m)	NAm	14.1	100%	4	0.21	100%	↑	0	0	0
Alameda	Cogswell - Sec B (20n) [1]	NAm	40.5	92%	41	0.56	71%	19%	0	0	0.14
Alameda	Cogswell - Sec C (20o) [1]	NAm	20.1	100%	13	0.40	86%	10%	0	0	0
Alameda	Hayward Shore Outliers (20p)	F	1.6	-	-	-	-	-	-	-	-
Alameda	San Leandro Shore Outlier (20q)	F	4.7	-	-	-	-	-	-	-	-
Alameda	Oakland Airport (20r)	NAm	7.7	68%	0	0.00	→	→	0	0	0
Alameda	HARD Marsh (20s)	A	26.7	80%	0	0.00	-100%	-100%	0	0	0
Alameda	San Leandro Marina (20t)	F	3.9	-	-	-	-	-	-	-	-
Alameda	Estudillo Creek Channel (20u)[3]	G	5.8	70%	0	0.00	→	→	0	0	0
Alameda	Hayward Landing Canal (20v)	F	4.8	-	-	-	-	-	-	-	-
Alameda	Triangle Marsh - Hayward (20w)	NAm	5	73%	0	0.00	→	→	0	0	0

[1] Six sites or split-sites where treatment of non-native *Spartina* has been prohibited since 2011.
[2] East Marsh was surveyed from the adjacent transect at San Lorenzo Creek Mouth.
[3] Sites were surveyed by OEI in support of work for the Alameda County Flood Control District using Protocol G.

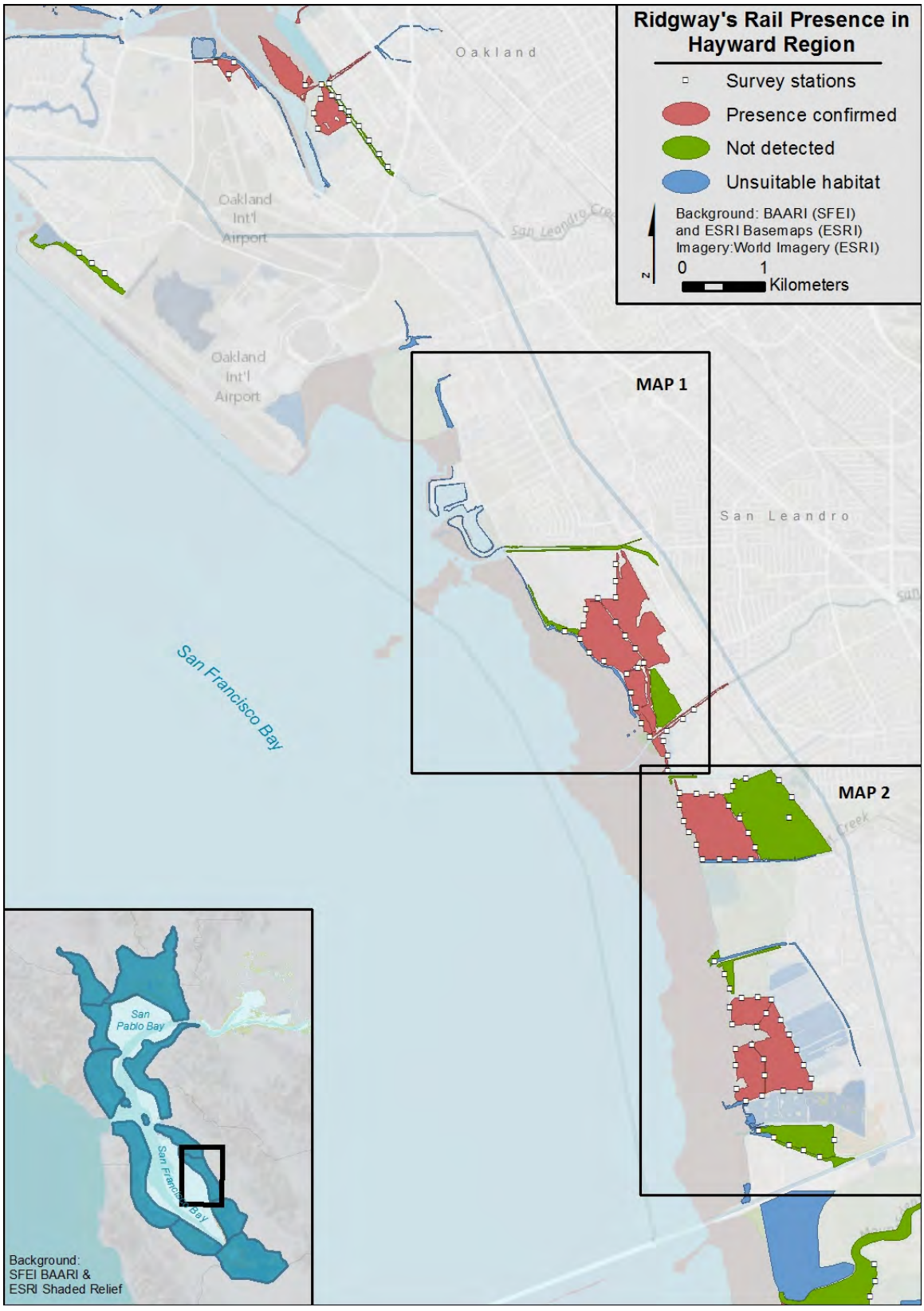

Figure 25. Overview Map of Hayward Region, showing inset map for close-up maps.

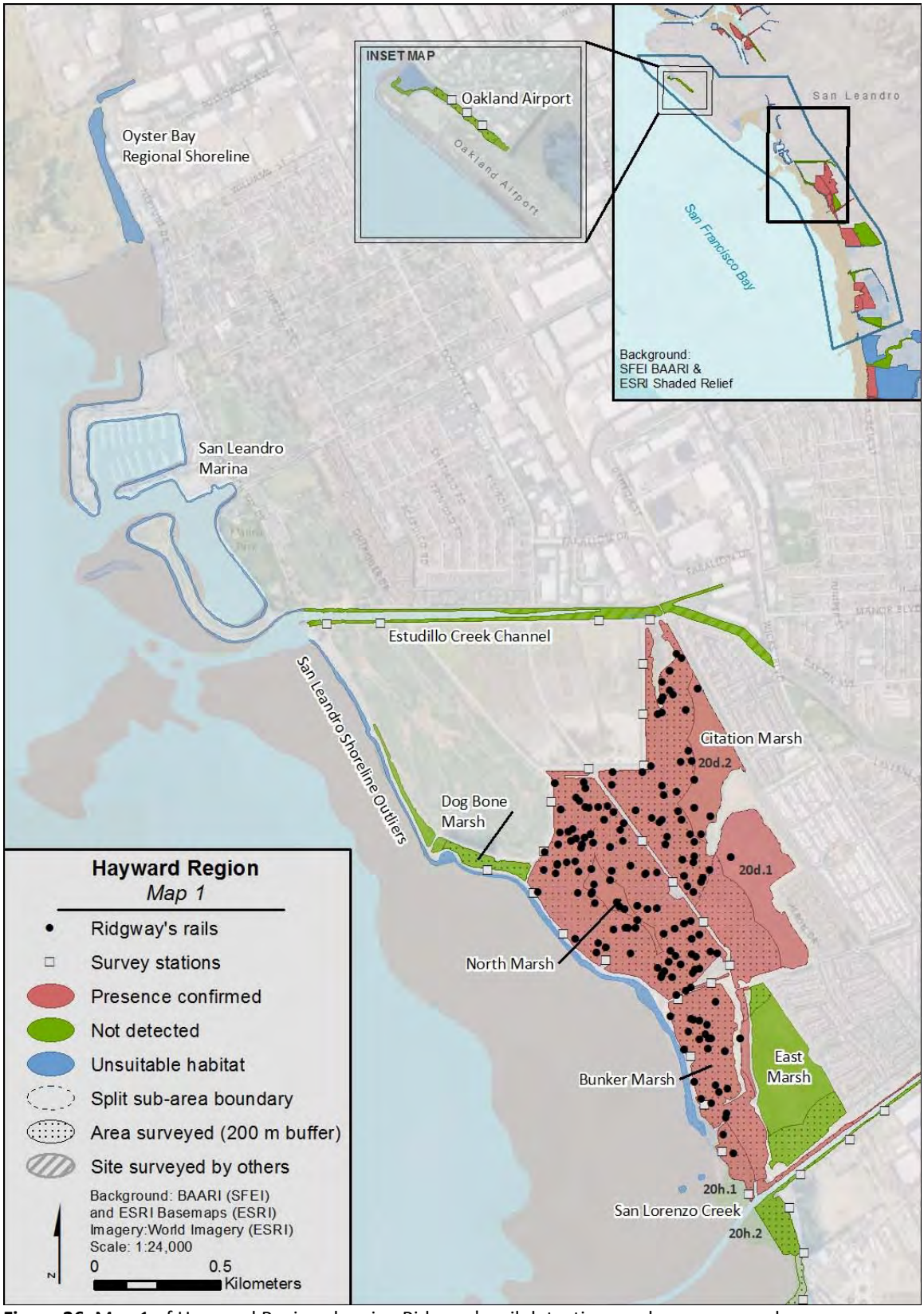

Figure 26. Map 1 of Haywayd Region showing Ridgway's rail detections and area surveyed.

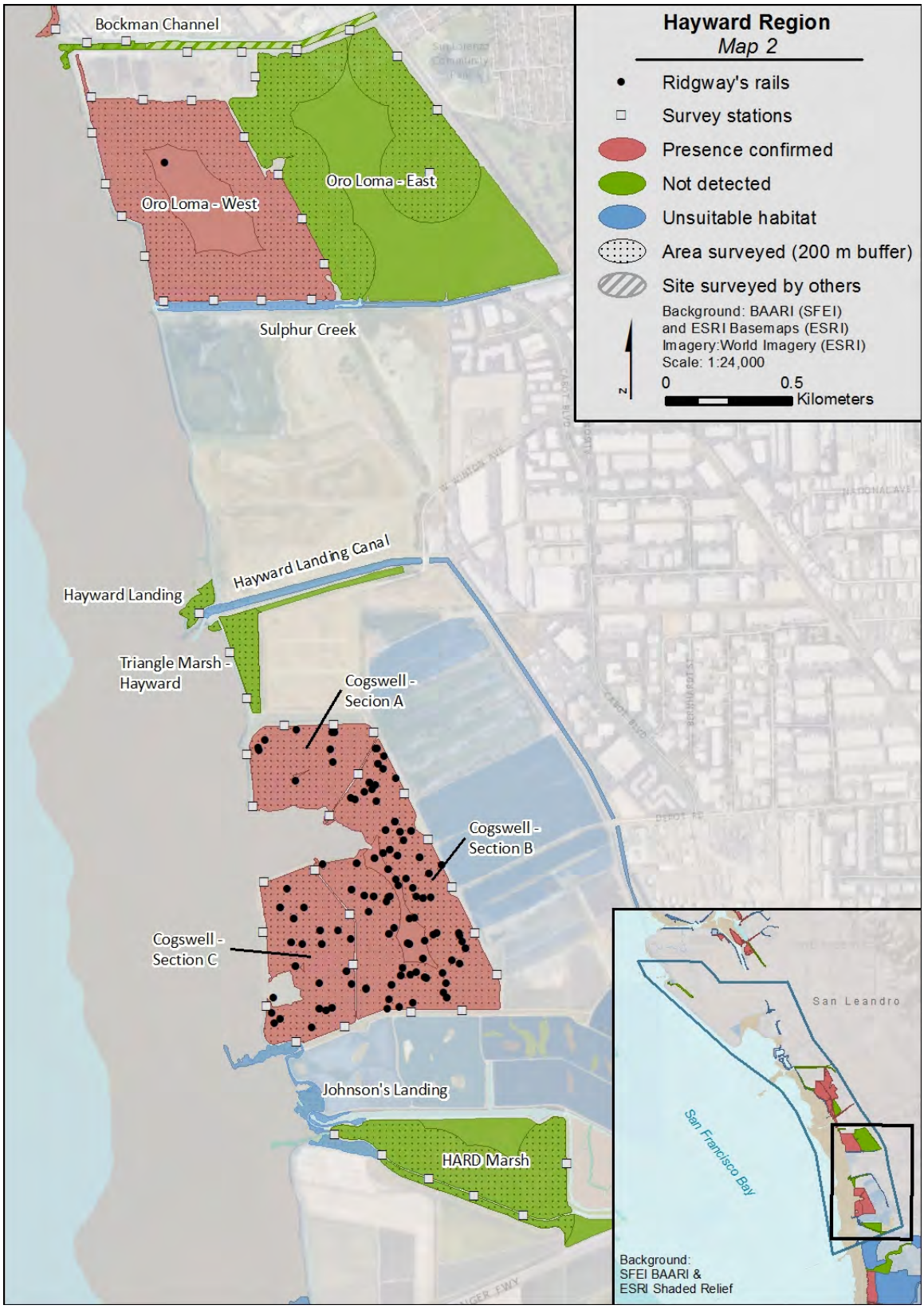

Figure 27. Map 2 of Haywayd Region showing Ridgway's rail detections and area surveyed.

4.7 San Leandro Bay Region

The San Leandro Bay Region in Alameda County is bounded by the cities of Oakland and Alameda (**Figure 28** and **Figure 29**) and is surrounded by commercial development, landfills, highways, and the Oakland International Airport. It is a highly urbanized tidal estuary ringed mostly by rip-rap levees, with a few fragmented parcels of small tidal wetlands that developed in recent decades in places where sediment has accumulated along the shoreline. Most of the marshes in the region have few if any natural tidal channels and high edge-to-area ratios. An exception is Arrowhead Marsh, which formed when the earthen dam at Lake Chabot ruptured in the 1860's. This mars has networks of tidal channels and is mostly surrounded by water rather than upland edge.

The region includes 14 ISP rail sites, five of which were surveyed using call-count protocols and the remaining surveyed by habitat assessment only in 2017 (Table 7). Passive call count surveys (Protocol A) were conducted at two sites and the NAm Protocol was conducted at two sites. One site, Arrowhead Marsh, was surveyed using the stationary survey (Protocol B), where all rails are recorded for a full two-hour period. Though the method is not comparable with other sites, Arrowhead Marsh has been surveyed using this method for the past seven years.

OEI detected 138 rails in the region in 2017, all of which were within the four sites where *Spartina* treatment has been prohibited since 2011. It is worth noting that Arrowhead Marsh is surveyed using Protocol B, which likely results in an over-estimate of rails and is not comparable to results from other sites.

Rail numbers are up in the San Leandro Bay Region at both the one-year time scale (+27%) and the five-year time scale (+21%). The rising trend and high densities of rails in the region are attributable to the hybrid *Spartina* cover which has been expanding since 2011. It is likely that the Ridgway's rail population in this region currently exceeds what a native condition could support. Additionally, native *Spartina foliosa* is nearly absent from the region, having been outcompeted and extirpated by non-native *Spartina*. The only location where native *Spartina* can be found is where it has been planted at Elsie Roemer by ISP, and far upstream in the Coliseum Channels.

ISP and its partners implemented a restoration plan in the region in an effort to improve the native habitat for Ridgway's rails before *Spartina* control resumes at the restricted sites. Several years ago, the Conservancy funded the installation of five high tide refuge islands and plantings of both *Grindelia stricta* and native *Spartina foliosa* within the region. Unfortunately, the combination of the expansion of hybrid *Spartina* and the limited availability of tidal marsh habitat has inhibited restoration efforts in the region. As non-native *Spartina* grows and spreads, there are fewer and fewer suitable areas to reintroduce native plants and ISP has tabled revegetation efforts in the area until there is better control of hybrid *Spartina*.

Ridgway's rail populations in the region are likely to decline when *Spartina* control work is permitted to resume, especially since this region will not have any *Spartina*, native or otherwise, to provide that necessary component of rail habitat. This region presents a unique opportunity to identify creative solutions to the competing management of endangered species and the eradication of a noxious weed.

Table 7. Summary of survey results in the San Leandro Bay Region at sites surveyed by OEI in 2017. Survey area and survey counts were considered null for sites lacking suitable breeding habitat (Protocol F). Sites that were split according to treatment permissions in 2011 are shown in grey font.

County	Site Name (ID)	Survey Protocol	Site Hectares	% Site Surveyed	Ridgway's Rail Indices				Other Rail Occupancy		
					Highest Count	Relative Density	One-year Δ	Five-year Δ	BLRA	VIRA	SORA
Alameda	Elsie Roemer (17a)	F	7.2	-	-	-	-	-	-	-	-
Alameda	Bay Farm Island (17b)	F	3.1	-	-	-	-	-	-	-	-
Alameda	Arrowhead Marsh (17c)	B	17.8	33%	60	6.89	94%	13%	0	0	0
Alameda	Arrowhead Marsh - West (17c.1)	-	9.2	47%	6	0.93	200%	↑	0	0	0
Alameda	Arrowhead Marsh - East (17c.2)[1]	-	8.6	19%	54	22.03	86%	11%	0	0	0
Alameda	Airport Channel - Fan Shore (17d.1)	F	3	-	-	-	-	-	-	-	-
Alameda	MLK Regional Shoreline - Damon (17d.4)[1]	NAm	11.5	48%	4	0.73	-33%	32%	0	0	0
Alameda	San Leandro Creek (17e)	A	3	100%	0	0.00	-100%	→	0	0	0
Alameda	Oakland Inner Harbor (17f)	F	13	-	-	-	-	-	-	-	-
Alameda	Coast Guard Is (17g)	F	1.3	-	-	-	-	-	-	-	-
Alameda	MLK New Marsh (17h)[1]	A	13.9	100%	49	2.60	-4%	22%	0	0	0.29
Alameda	Coliseum Channels (17i)	F	5.4	-	-	-	-	-	-	-	-
Alameda	Fan Marsh (17j)[1]	NAm	5	100%	25	5.01	25%	66%	0	0	0.33
Alameda	Airport Channel (17k)	F	1.6	-	-	-	-	-	-	-	-
Alameda	Doolittle Pond (17l)	F	1.3	-	-	-	-	-	-	-	-
Alameda	Alameda Island - East (17m)	F	2.4	-	-	-	-	-	-	-	-

[1] Four sites or split-sites where treatment of non-native *Spartina* has been prohibited since 2011.

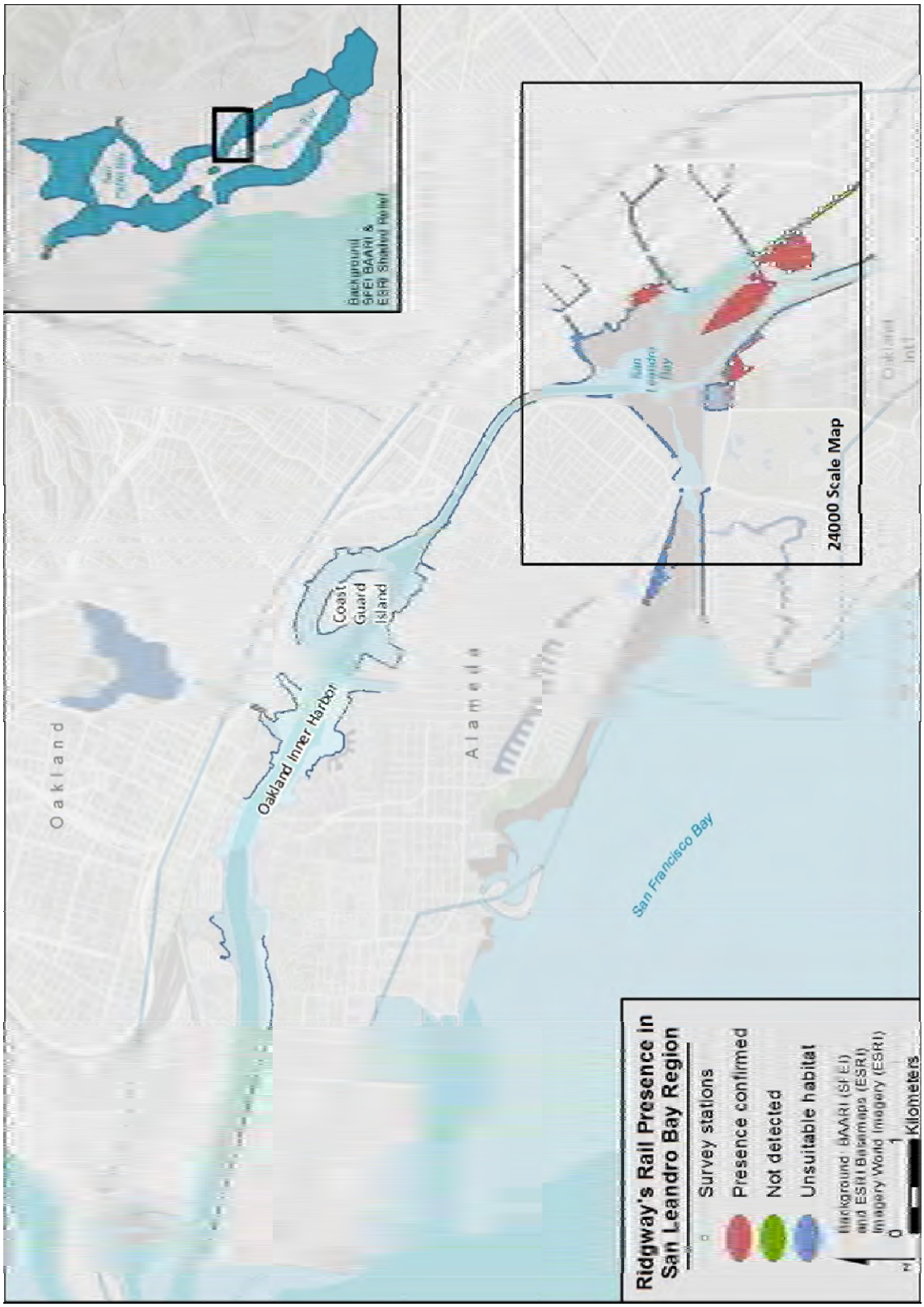

Figure 28. Overview Map of San Leandro Region, showing inset map for close-up maps.

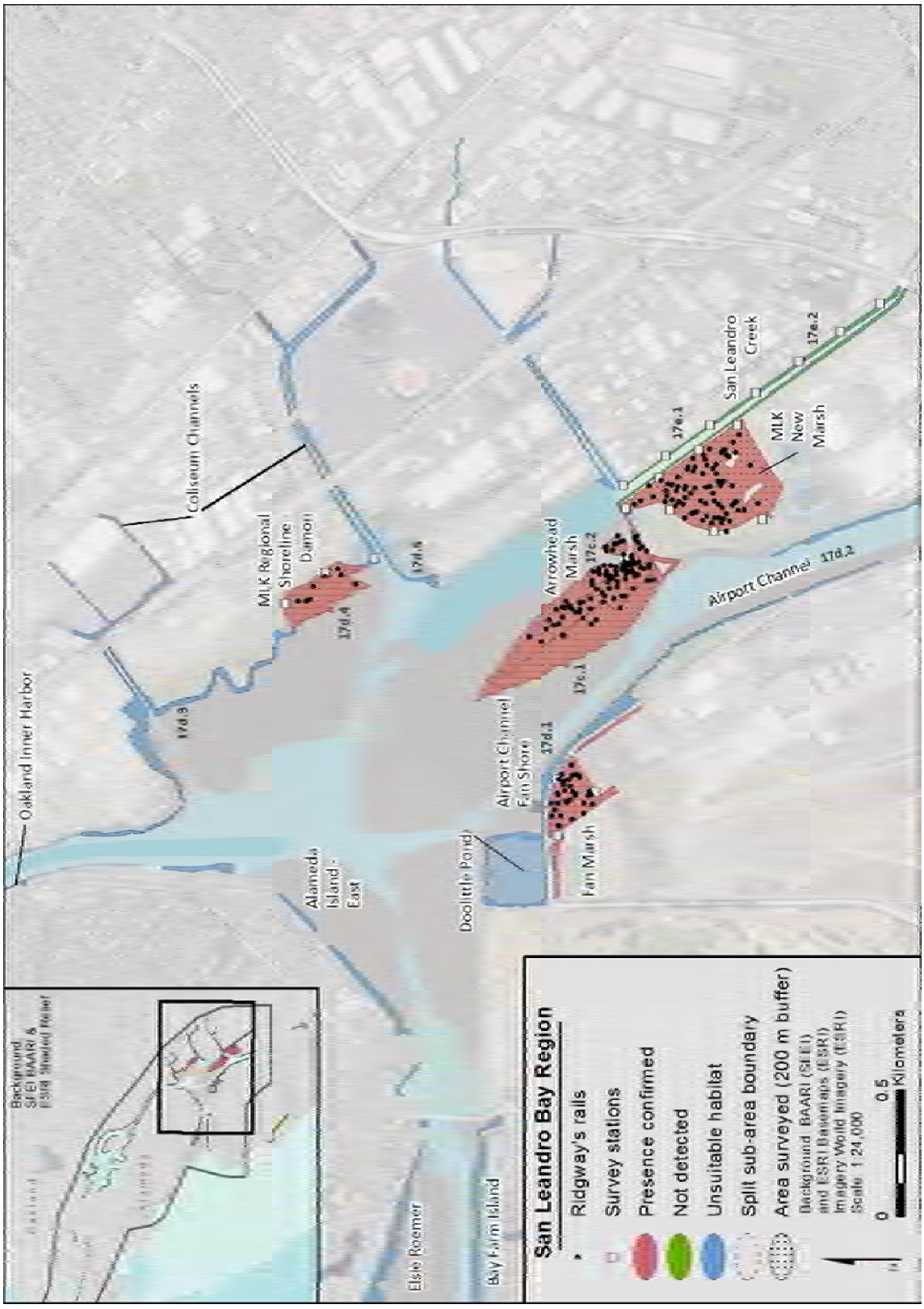

Figure 29. Map 1 of San Leandro Region showing Ridgway's rail detections and area surveyed.

4.8 Bay Bridge North Region

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 (**Figure 30** - **Figure 33**). This shoreline is heavily urbanized: the southern half is predominantly commercial, industrial and high-density residential developments; the northern half is lined with single-family residential communities and the one of the largest and oldest oil refinery on the West Coast operated by Chevron Corporation. The northern portion of this region, which hosts some large remnant tidal marshes, was surveyed by PBCS, while the smaller isolated marshes in the southern portion were surveyed by OEI.

The region includes 14 ISP rail sites, ten of which were surveyed by OEI in 2017 (**Table 8**). Two additional sites in the region were surveyed by PBCS and one site was surveyed by EBRPD. OEI detected eight Ridgway's rails in the region in 2017, EBRPD detected one, and PBCS detected 45 rails. At the one-year time scale, rail numbers are down in the region by about -13%. However, at the five-year time scale, rail numbers are still trending in the positive at +4%.

Table 8. Summary of survey results in the Bay Bridge North Region at sites surveyed by OEI in 2017. Survey area and survey counts were considered null for sites lacking suitable breeding habitat (Protocol F).

					Ridgway's Rail Indices				Other Rail Occupancy		
County	Site Name (ID)	Survey Protocol	Site Hectares	% Site Surveyed	Highest Count	Relative Density	One-year Δ	Five-year Δ	BLRA	VIRA	SORA
Alameda	Emeryville Crescent - East (06a)	NAm	21.9	27%	0	0.00	→	→	0	0	0
Alameda	Emeryville Crescent - West (06b)	NAm	12.8	100%	0	0.00	-100%	→	0	0	0
Contra Costa	Whittel Marsh (10a)	A	18.2	95%	2	0.12	-33%	15%	0.50	0	0
Contra Costa	Southern Marsh (10b)	F	3.1	-	-	-	-	-	-	-	-
Contra Costa	Breuner Marsh Restoration (10d)	F	34	-	-	-	-	-	-	-	-
Contra Costa	Rheem Creek Area (22c)	A	10	78%	5	0.38	-29%	-11%	0.50	0	0
Contra Costa	Meeker Slough (22d)	A	9.7	88%	1	0.09	-75%	-13%	0	0	0
Contra Costa	Stege Marsh (22d)	A	11.5	93%	0	0.09	-100%	-100%	0	0	0
Contra Costa	Hoffman Marsh (22e)	A	14.6	93%	0	0.00	→	→	0	0	0
Alameda	Albany Shoreline (22f)	F	5.3	-	-	-	-	-	-	-	-

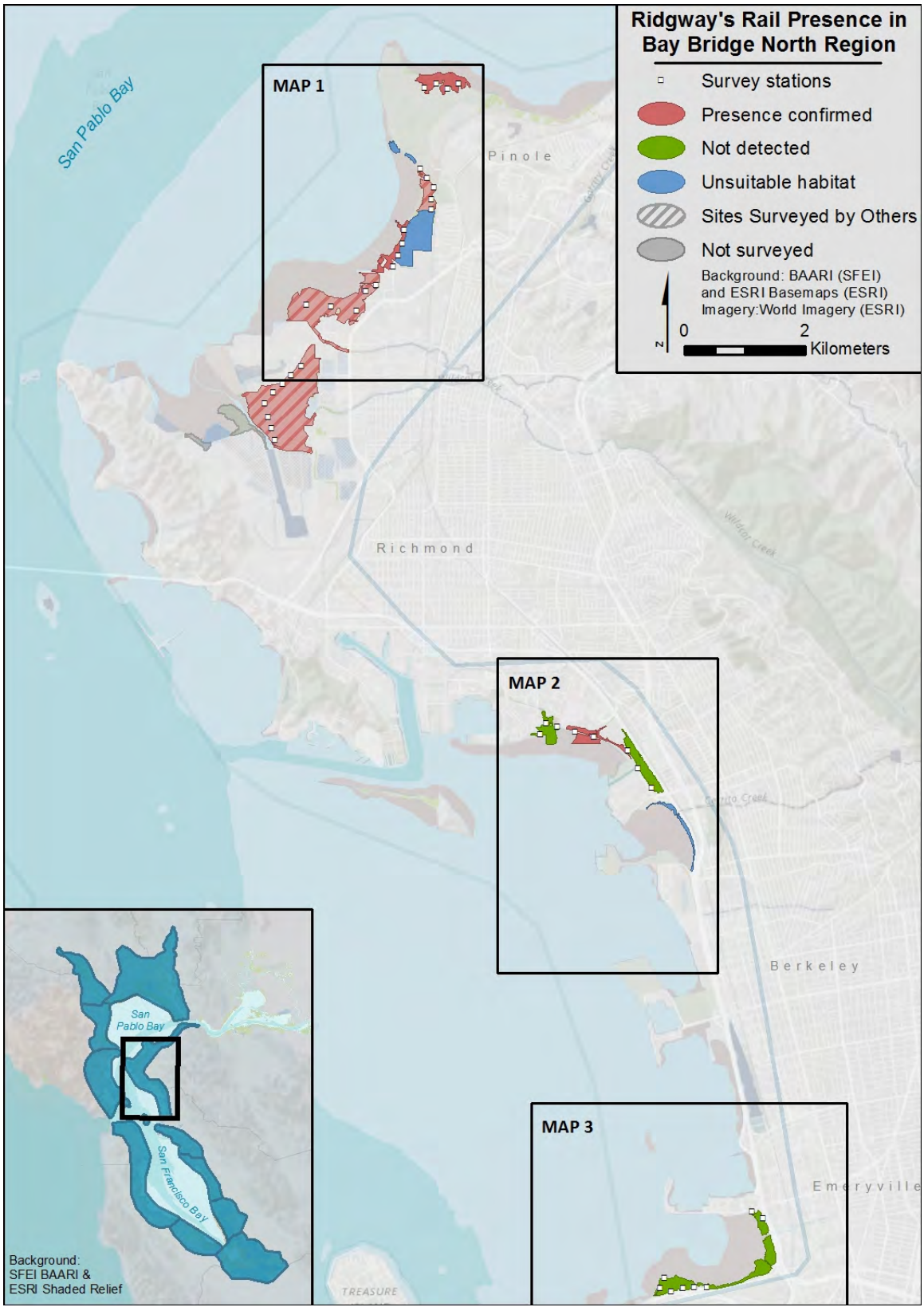

Figure 30. Overview map of Bay Bridge North Region, showing inset map for close-up maps.

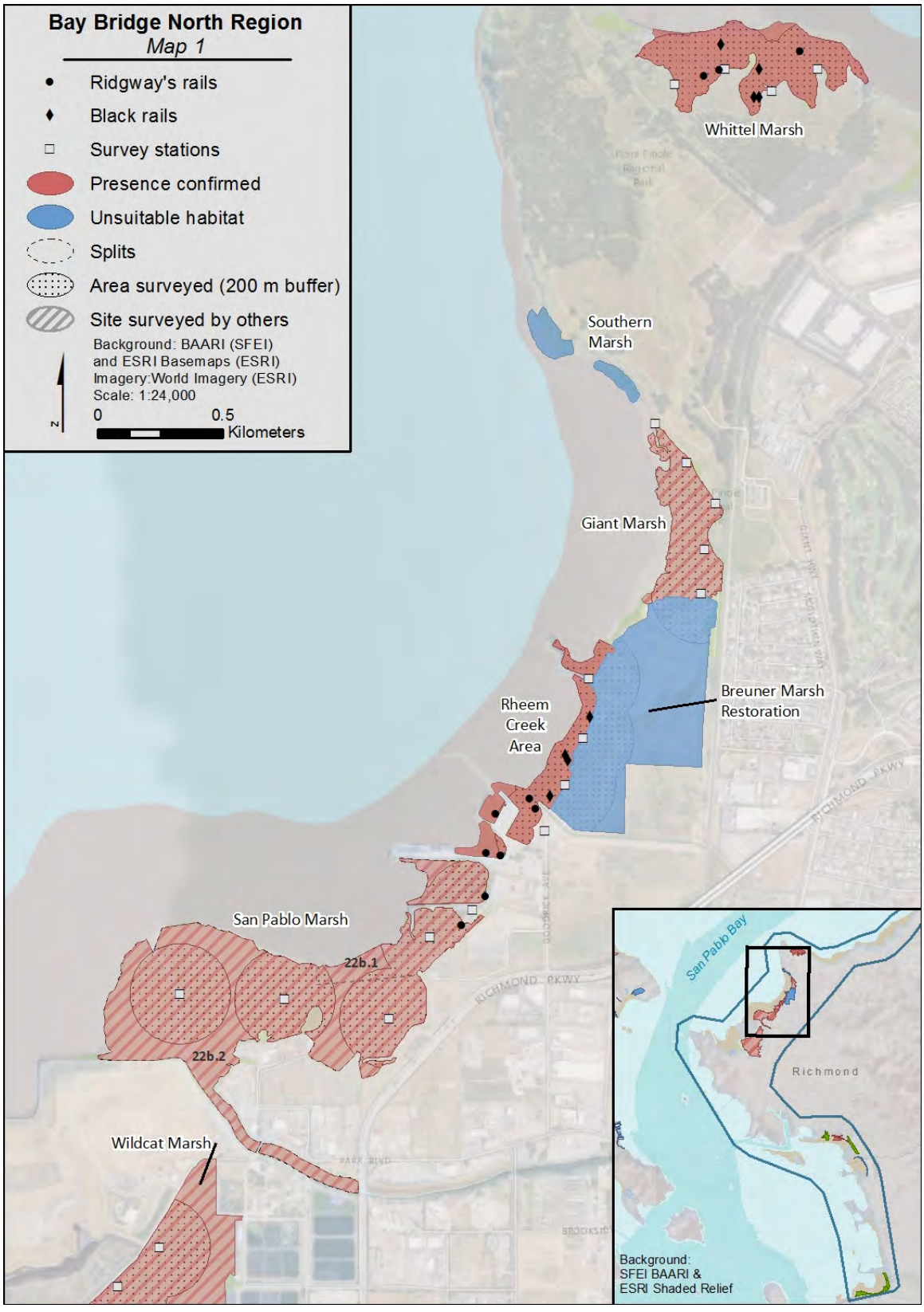

Figure 31. Map 1 of Bay Bridge North Region showing Ridgway's rail detections and area surveyed.

Figure 32. Map 2 of Bay Bridge North Region showing Ridgway's rail detections and area surveyed.

Figure 33. Map 3 of Bay Bridge North Region showing Ridgway's rail detections and area surveyed.

4.9 Vallejo Region

The Vallejo Region stretches from the Petaluma River Mouth to the Carquinez Straight and includes many large marshes in the Napa/Sonoma wetland complex (**Figure 34** and **Figure 35**). The region has 34 sites, however only twelve were surveyed in 2017. Most of the sites were surveyed by other organizations: PBCS surveyed two sites, SPBNWR surveyed six sites, and CDFW surveyed three sites. Invasive *Spartina* has a very small presence in the region and the survey effort by OEI was minimal.

In 2017, OEI surveyed a small portion of one marsh within this large region: San Pablo Bay NWR Shoreline (AKA Mare Island Shoreline) (**Table 9**). No rails were detected in the portion of the site that OEI surveys. However, OEI only surveys 2% of this very large site, so the lack of rail detections by OEI does not indicate an absence of Ridgway's rails at the site. In fact, refuge staff did detect a rail within the site boundary from the Sonoma Creek transect at the other end of the site. This is far from the Spartina infestation, but is technically still wihin the large site boundary.

Although OEI did not detect any rails in the region this year, at least 90 rails were detected by other organizations. A lack of data within the region makes historical comparisons difficult but numbers seem to be up from 2016, when 62 rails were detected at the same subset of sites. The rail population in this region will likely continue to increase as many of the large-scale restoration efforts in the area come on-line.

Table 9. Summary of survey results at the only site OEI surveyed for ISP in the Vallejo Region in 2017.

County	Site Name (ID)	Survey Protocol	Site Hectares	% Site Surveyed	Ridgway's Rail Indices				Other Rail Occupancy		
					Highest Count	Relative Density	One-year Δ	Five-year Δ	BLRA	VIRA	SORA
Solano	San Pablo Bay NWR Shoreline (26b)	NAm	1043.1	2%	0	0.00	→	→	0	0.40	0

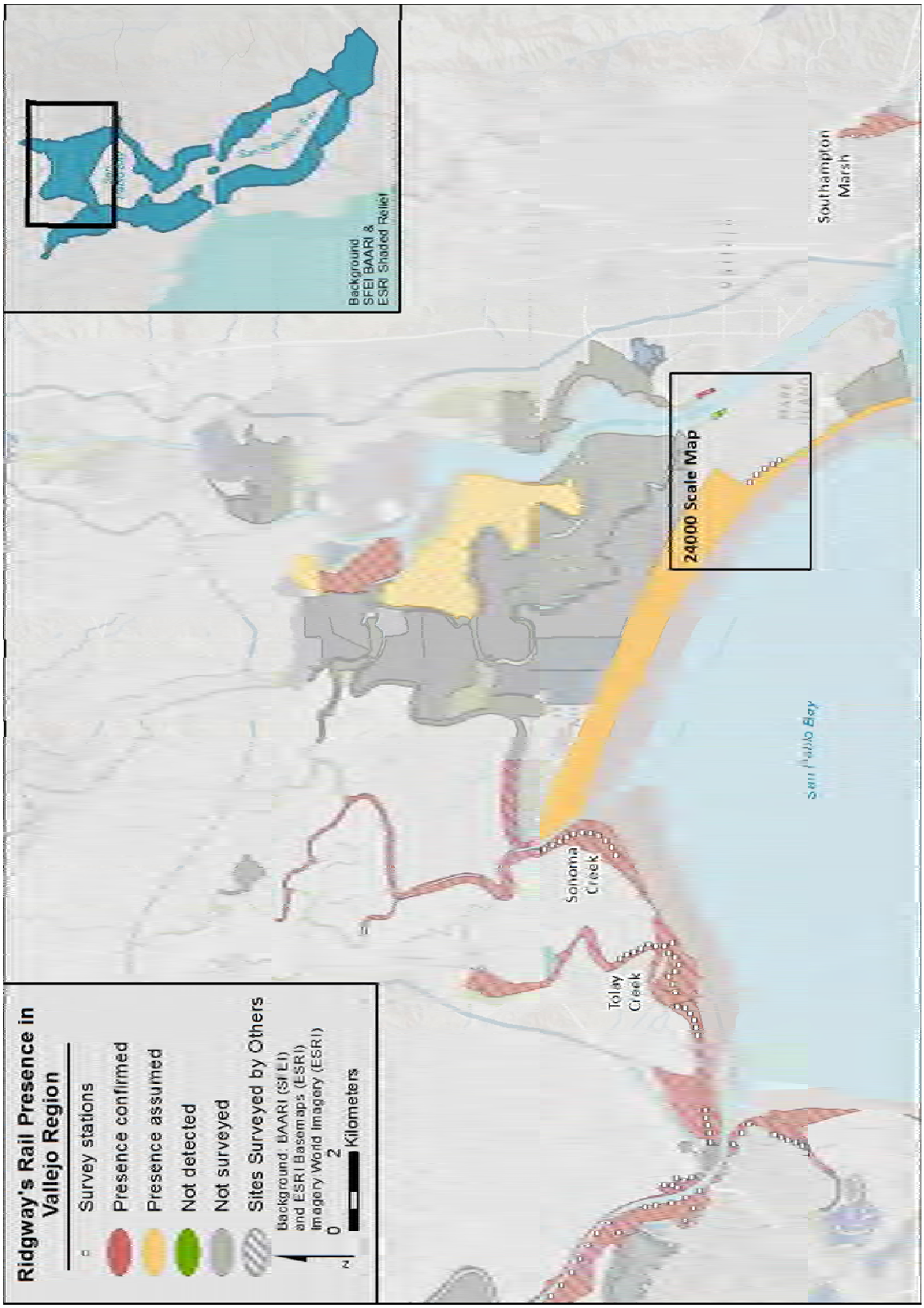

Figure 34. Overview map of 2017 Ridgway's rail survey results in the Vallejo Region. See Figure 35 for inset map.

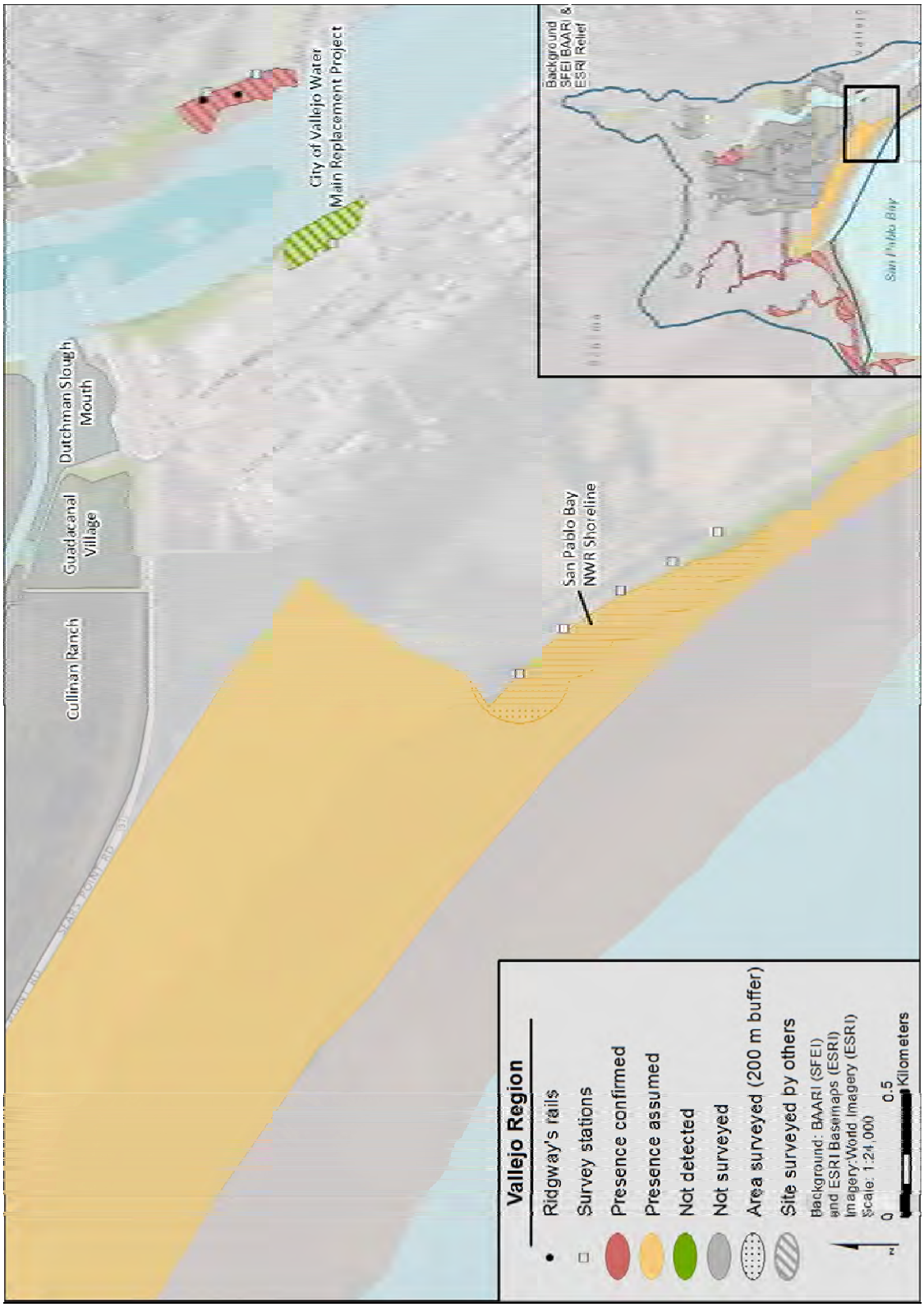

Figure 35. Close up map of survey results in the Vallejo Region.

5. Discussion

The number of California Ridgway's rails detected at the subset of sites surveyed by OEI in 2017 has continued to increase, on whole. The greatest gains observed are at the sites where non-native *Spartina* has not been treated in over five years. However, rail numbers are also growing at native sites where non-native *Spartina* is an insignificant component of the habitat. It is worth noting that the subset of sites that are surveyed by OEI for the ISP are focused on sites with a non-native *Spartina* component (past or present), skewing the results of this report toward the evaluation of the sites with the greatest impacts from non-native *Spartina*.

It is clear that the non-native hybrid *Spartina* cover at the eleven sites that have not been treated in over five years is providing added habitat value and the rail numbers are positively responding to the expansion of *Spartina*. The resumption of treatment at these sites will result in local declines to rail numbers. Mechanisms to reduce these loses must be identified and enacted. Habitat enhancement and restoration may ameliorate the effects of the temporary loss of cover due to *Spartina* removal. However more extreme solutions, such as translocation, should be considered, particularly at sites where the native condition cannot support the number of rails currently present.

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. The efficacy of these enhancements for Ridgway's rails remains to be determined. Currently PBCS is working on a multi-year analysis of call-count data to identify the response of rail populations at sites with habitat enhancements. However, it will take several more years before the magnitude of the rail response can be identified.

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. Island Pond A21 is an example of the positive response by rails to restoration.

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.

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)

Appendix I: Complete List of 2017 Spartina Treatment Sites and Ridgway's Rail Survey Plans by Site

KEY to Survey Organizations:

- **ARA** = Avocet Research Associates (contact Jules Evens)
- **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 2017 *Spartina* treatment sub-areas and associated Ridgway's rail sites and survey plans by survey organization (key to acronyms of survey organizations follows) and survey type (see Appendix II for complete descriptions of survey protocols).

MARIN REGION			
Site Name and ID	**Survey Organization**	**Survey Type**	**Notes**
Blackie's Creek (03a)	ISP	F	
Blackie's Creek Mouth (03b)	ISP	F	
CMC Marsh Reserve (04a)	PRBO	A	AKA "Heerdt Marsh" by PBCS
College of Marin (04b)	ISP*	A	surveyed from adjacent transect at CMC - Upper (04h)
Piper Park - East (04c)	PRBO	NAm	Grouped as one site "Piper Park" by PBCS
Piper Park - West (04d)	PRBO	NAm	Grouped as one site "Piper Park" by PBCS
Larkspur Ferry Landing Area (04e)	ISP	F	
Riviera Circle (04f)	ISP	F	
Creekside Park (04g)	ISP	A	
CMC - Upper (04h)	ISP	A	
CMC - Lower (04i)	ISP	NAm	
CMC - Mouth (04j)	ISP	NAm	
CMC - Mouth - North (04j.1)	*ISP*	*NAm*	Site split based in 2011 BO
CMC - Mouth - South (04j.2)	*ISP*	*NAm*	Site split based in 2011 BO
Boardwalk No. 1 (04k)	PRBO	NAm	Grouped as one site "Piper Park" by PBCS
Murphy Creek (04l)	none	none	
Pickleweed Park (9)	ISP	NAm	AKA "Tiscornia Park" by the ISP Control Program
Brickyard Cove (23a)	ISP	F	
Beach Drive (23b)	ISP	F	
Loch Lomond Marina (23c)	ISP	F	
San Rafael Canal Mouth (23d)	ISP	NAm	
San Rafael Canal Mouth East (23d.1)	*ISP*	*NAm*	Site split based in 2011 BO
San Rafael Canal Mouth West (23d.2)	*ISP*	*NAm*	Site split based in 2011 BO
Muzzi and Martas Marsh (23e)	PRBO	A	Grouped into one sub-area by ISP Control Program
Martas Marsh (23e)	*PRBO*	*A*	
San Clemente Creek (23e)	*PRBO*	*A*	
Muzzi Marsh (23e)	*PRBO*	*A*	
Paradise Cay (23f)	ISP	F	
Greenwood Beach (23g)	ISP	F	AKA "Greenwood Cove" by the ISP Control Program
Strawberry Point (23h)	ISP	F	
Strawberry Cove (23i)	ISP	F	
Bothin Marsh (23j)	PRBO	A	
Sausalito (23k)	none	none	
Starkweather Park (23l)	none	none	
Triangle Marsh - Marin (23n)	ISP	F	

SAN FRANCISCO PENINSULA REGION			
Site Name and ID	**Survey Organization**	**Survey Type**	**Notes**
Pier 94 (12a)	none	none	
Pier 98/Heron's Head (12b)	ISP	NAm	
India Basin (12c)	none	none	
Hunters Point Naval Reserve (12d)	ISP	F	
Yosemite Channel (12e)	ISP	F	
Candlestick Cove (12f)	ISP	F	
Crissy Field (12g)	ISP	F	
Yerba Buena Island (12h)	ISP	F	
Mission Creek (12i)	none	none	
Colma Creek (18a)	ISP	F	
Navigable Slough (18b)	ISP	F	
Old Marina (18c)	none	none	AKA "Old Shipyard" by the ISP Control Program
Inner Harbor (18d)	none	none	
Sam Trans Peninsula (18e)	ISP	F	
Confluence Marsh (18f)	ISP	F	
San Bruno Marsh (18g)	ISP	F	
San Bruno Creek (18h)	ISP	F	
Brisbane Lagoon (19a)	none	none	
Sierra Point (19b)	none	none	
Oyster Cove (19c)	none	none	
Oyster Point Marina (19d)	none	none	
Oyster Point Park (19e)	none	none	
Point San Bruno (19f)	ISP	F	
Seaplane Harbor (19g)	ISP	F	
SFO (19h)	ISP	NAm	
Mills Creek Mouth (19i)	ISP	F	
Easton Creek Mouth (19j)	ISP	F	
Sanchez Marsh (19k)	ISP	NAm	
Burlingame Lagoon (19l)	ISP	F	
Fisherman's Park (19m)	none	none	
Coyote Point Marina (19n)	ISP	F	
San Mateo Creek (19o)	ISP	F	
Seal Slough (19p)	ISP	NAm	Site split based in 2011 BO
Seal Slough - West (19p.1)	*ISP*	*NAm*	
Seal Slough - East (19p.2)	*ISP*	*NAm*	
Anza Lagoon (19r)	none	none	

SAN MATEO REGION			
Site Name and ID	**Survey Organization**	**Survey Type**	**Notes**
Belmont Slough (02a.1)	ISP	NAm	Site split based in 2011 and 2012 BO
Belmont Slough - Mouth (02a.1a)	*ISP*	*NAm*	
Belmont Slough - Central (02a.1b)	*ISP*	*NAm*	
Belmont Slough - South (02a.2)	*ISP*	*NAm*	
Redwood Shores (02a.3)	DENWR	NAm	AKA "Bird Island" by the ISP Control Program
Redwood Shores Mitigation Bank (02a.4)	ISP	F	
Corkscrew Slough (02b.1)	ISP	NAm	
Steinberger Sl to Redwood Crk (02b.2)	-	-	Grouped into one sub-area by ISP Control Program
Steinberger Slough (02b.2)	*ISP*	*NAm*	
Redwood Creek (02b.2)	*none*	*none*	
B2 North Quadrant (02c)	ISP	A	Site split based in 2011 and 2012 BO
B2 North Quadrant - NW (02c.1a)	*ISP*	*A*	
B2 North Quadrant - NE (02c.1b)	*ISP*	*A*	
B2 North Quadrant - S (02c.2)	*ISP*	*A*	
B2 South Quadrant (02d)	ISP	A	Site split based in 2011 and 2012 BO
B2 South Quadrant - NW (02d.1a)	*ISP*	*A*	
B2 South Quadrant - NE (02d.1b)	*ISP*	*A*	
B2 South Quadrant - S (02d.2)	*ISP*	*A*	
B2 South Quadrant - E (02d.3)	*ISP*	*A*	
West Point Slough - NW (02e)	ISP	NAm	
Greco Island - North (02f)	ISP	NAm	
West Point Slough - SW / E (02g)	ISP	NAm	
Greco Island - South (02h)	ISP	A	
Ravenswood Slough (02i)	ISP	A	
Deepwater Slough (02k)	ISP	A	Grouped into one sub-area by ISP Control Program
Middle Bair N (02k)	*ISP*	*A*	
Middle Bair SE (02k)	*ISP*	*A*	
Inner Bair Island Restoration (02l)	ISP	NAm	
Pond B3 Bair Island Restoration (02m)	ISP	F	
Middle Bair West (02o)	ISP	F	AKA "Central Bair Restoration" by ISP Control Program
Foster City (19q)	ISP	F	
Maple Street Channel (19s)	ISP	F	

DUMBARTON SOUTH REGION			
Site Name and ID	**Survey Organization**	**Survey Type**	**Notes**
Ravenswood Open Space Preserve (02j)	-	-	Sub-area split by ISP Control Program to fit into two regions
Ravenswood Open Space Preserve (north of Hwy 84) (02j.1)	*none*	*none*	*part of San Mateo Region according to ISP Control Program*
Ravenswood Open Space Preserve (south of Hwy 84) (02j.2)	*ISP*	*F*	*part of Dumbarton South Region according to ISP Control Program*
SF2 (02n)	ISP	F	
Mowry Marsh and Slough (05a.1)	-	-	Grouped into one sub-area by ISP Control Program
Mowry Marsh North (05a.1)	*ISP*	*NAm*	
Mowry Marsh South Bayshore (05a.1)	*none*	*none*	
Mowry Slough Upper (05a.1)	*none*	*none*	
Mowry Marsh South (05a.1)	*none*	*none*	
Calaveras Point (05a.2)	ISP	NAm	
Dumbarton/Audubon (05b)	-	-	Grouped into one sub-area by ISP Control Program
Dumbarton/Audubon East (05b)	*none*	*none*	
Plummer Creek (05b)	*none*	*none*	
Dumbarton/Audubon (05b)	*DENWR*	*NAm*	
Newark Slough (05c)	ISP	NAm	Site split based on 2011 BO
Newark Slough West (05c.1)	*ISP*	*NAm*	
Newark Slough East (05c.2)	*ISP*	*NAm*	
LaRiviere Marsh (05d)	DENWR	NAm	
Mayhew's Landing (05e)	DENWR	NAm	
Coyote Creek-Alameda County (05f)	-	-	Grouped into one sub-area by ISP Control Program
Coyote Creek - Mud Slough (05f)	*ISP**	*NAm*	surveyed from adjacent transect at Island Ponds - A21 (05i)
Coyote Creek - North (05f.2)	*none*	*none*	
Coyote Creek Lagoon (05f.3)	*DENWR*	*NAm*	
Cargill Pond (W Suites Hotel) (05g)	DENWR	NAm	
Plummer Creek Mitigation (05h)	ISP	NAm	
Island Ponds (A21-A19) (05i)	-	-	Grouped into one sub-area by ISP Control Program
Island Ponds - A20 (05i)	*none*	*none*	
Island Ponds - A21 (05i)	*ISP*	*NAm*	
Island Ponds - A19 (05i)	*none*	*none*	
Palo Alto Baylands (8)	-	-	Grouped into one sub-area by ISP Control Program
Palo Alto Baylands (8)	*PRBO*	*NAm*	
Palo Alto Harbor (8)	*PRBO*	*A*	AKA "Palo Alto Harbor Hooks Island" by PBCS
Charleston Slough to Mt. View Sl (15a.1)	ISP	A	Grouped into one sub-area by ISP Control Program
Charleston Slough (15a.1)	*ISP*	*A*	
Mountain View Slough (15a.1)	*ISP*	*A*	

Dumbarton South Region continued on following page

DUMBARTON SOUTH REGION (continued)			
Site Name and ID	**Survey Organization**	**Survey Type**	**Notes**
Stevens Ck. to Guadalupe Sl (15a.2)	-	-	Grouped into one sub-area by ISP Control Program
Stevens Creek to Long Point (15a.2)	*ISP*	*NAm*	
Guadalupe to Stevens Bayfront (15a.2)	*none*	*none*	
Guadalupe Slough (15a.3)	ISP	NAm	
Alviso Slough (15a.4)	ISP	A	
Coyote Ck to Artesian Slough (15a.5)	-	-	Grouped into one sub-area by ISP Control Program
Coyote Creek South East (15a.5)	*DENWR*	*NAm*	
Coyote Creek South Tributary Marsh (15a.5)	*none*	*none*	
Artesian Slough (15a.5)	*none*	*none*	
Knapp Tract (15a.6)	ISP	F	
Pond A17 (15a.7)	none	none	
Faber/ Laumeister Marsh (15b)	PRBO	NAm	Grouped into one sub-area by ISP Control Program
Faber Marsh (15b)	*PRBO*	*NAm*	
Laumeister Marsh (15b)	*PRBO*	*NAm*	
Stevens Creek (15c)	ISP	NAm	AKA "Shoreline Regional Park" by ISP Control Program
Cooley Landing (16)	ISP	A	Site split based on 2011 BO
Cooley Landing - Central (16.1)	*ISP*	*A*	
Cooley Landing - Outer (16.2)	*ISP*	*A*	

UNION CITY REGION			
Site Name and ID	**Survey Organization**	**Survey Type**	**Notes**
AFCC - Mouth (01a)	DENWR	NAm	Grouped into site "AFCC" by DENWR
AFCC - Lower (01b)	DENWR	NAm	Grouped into site "AFCC" by DENWR
AFCC - Upper (01c)	DENWR	NAm	Grouped into site "AFCC" by DENWR
AFCC - to I-880 (01d)	DENWR	NAm	Grouped into site "AFCC" by DENWR
AFCC - Strip Marsh (01e)	ISP	F	
AFCC - Pond 3 (01f)	DENWR	NAm	AKA "Ecology Marsh"
OAC - North Bank (13a)	ISP	NAm	
OAC - Island (13b)	ISP	NAm	
OAC - South Bank (13c)	ISP	NAm	
Whale's Tail - North (13d)	ISP	NAm	
Whale's Tail - South (13e)	ISP	NAm	
Cargill Mitigation Marsh (13f)	ISP	NAm	
OAC - Upstream 20 Tide Gates (13g)	none	none	
Eden Landing - North Creek (13h)	ISP	F	
Eden Landing - Pond 10 (13i)	ISP	F	
Eden Landing - Mt Eden Creek (13j)	ISP	NAm	
Eden Landing Reserve - South (13k)	ISP	NAm	
Eden Landing Reserve - North (13l)	ISP	F	
Eden Landing - Ponds E8A, E9, E8X (13m)	ISP	F	
Ideal Marsh - North (21a)	DENWR	NAm	
Ideal Marsh - South (21b)	DENWR	NAm	

HAYWARD REGION			
Site Name and ID	**Survey Organization**	**Survey Type**	**Notes**
Oro Loma - East (07a)	ISP	A	
Oro Loma - West (07b)	ISP	A	
Oyster Bay Regional Shoreline (20a)	ISP	F	
Oakland Golf Links (20b)	ISP	F	
Dog Bone Marsh (20c)	ISP	A	
Citation Marsh (20d)	ISP	A	Site split based on 2012 BO
Citation Marsh - South (20d.1)	*ISP*	*A*	
Citation Marsh - North (20d.2)	*ISP*	*A*	
East Marsh (20e)	ISP*	A	Surveyed from adjacent transect at San Lorenzo Creek (20h.1)
North Marsh (20f)	ISP	A	
Bunker Marsh (20g)	ISP	A	
San Lorenzo Creek (20h)	ISP	A	Site split based on 2012 BO
San Lorenzo Creek - North (20h.1)	*ISP*	*A*	
San Lorenzo Creek - South (20h.2)	*ISP*	*A*	
Bockman Channel (20i)	OEI	G	
Sulphur Creek (20j)	ISP	F	
Hayward Landing (20k)	ISP	NAm	
Johnson's Landing (20l)	ISP	F	
Cogswell - Sec A (20m)	ISP	NAm	
Cogswell - Sec B (20n)	ISP	NAm	
Cogswell - Sec C (20o)	ISP	NAm	
Hayward Shoreline Outliers (20p)	ISP	F	
San Leandro Shoreline Outliers (20q)	ISP	F	
Oakland Airport (20r)	ISP	NAm	
HARD Marsh (20s)	ISP	A	
San Leandro Marina (20t)	ISP	F	
Estudillo Creek Channel (20u)	OEI	G	
Hayward Landing Canal (20v)	ISP	F	
Triangle Marsh - Hayward (20w)	ISP	NAm	

SAN LEANDRO BAY REGION			
Site Name and ID	**Survey Organization**	**Survey Type**	**Notes**
Elsie Roemer (17a)	ISP	F	
Bay Farm Island (17b)	ISP	F	
Arrowhead Marsh (17c)	ISP	B	Site split based on 2012 BO
Arrowhead Marsh - West (17c.1)	*ISP*	*B*	
Arrowhead Marsh - East (17c.2)	*ISP*	*B*	
MLK Regional Shoreline	-	-	Site split based on 2012 BO
Airport Channel - Fan Shore (17d.1)	*ISP*	*F*	
Airport Channel - South (17d.2)	*ISP*	*F*	
MLK Regional Shoreline - North (17d.3)	*ISP*	*F*	
MLK Regional Shoreline - Damon (17d.4)	*ISP*	*NAm*	
MLK Regional Shoreline - South (17d.5)	*ISP*	*F*	
San Leandro Creek (17e)	ISP	A	Site split based on 2011 BO
San Leandro Creek - North (17e.1)	*ISP*	*A*	
San Leandro Creek - South (17e.2)	*ISP*	*A*	
Oakland Inner Harbor (17f)	ISP	F	
Coast Guard Is (17g)	ISP	F	
MLK New Marsh (17h)	ISP	A	
Coliseum Channels (17i)	ISP	F	
Fan Marsh (17j)	ISP	NAm	
Airport Channel (17k)	ISP	F	
Doolittle Pond (17l)	ISP	F	
Alameda Island - East (17m)	ISP	F	

BAY BRIDGE NORTH REGION			
Site Name and ID	**Survey Organization**	**Survey Type**	**Notes**
Emeryville Crescent - East (06a)	ISP	NAm	
Emeryville Crescent - West (06b)	ISP	NAm	
Whittel Marsh (10a)	ISP	A	
Southern Marsh (10b)	ISP	F	
Giant Marsh (10c)	EBRPD	A	
Breuner Marsh Restoration (10d)	ISP	F	
Wildcat Marsh (22a)	PRBO	A	
San Pablo Marsh (22b)	PRBO	NAm	Site split based on 2011 BO; AKA "San Pablo Creek" and "Richmond Fragment" by PBCS
San Pablo Marsh - North (22b.1)	*PRBO*	*NAm*	
San Pablo Marsh - South (22b.2)	*PRBO*	*NAm*	
Rheem Creek Area (22c)	ISP	A	
Stege Marsh (22d)	ISP	A	Grouped into one sub-area by ISP Control Program
Stege Marsh (22d)	*ISP*	*A*	
Meeker Slough (22d)	*ISP*	*A*	
Hoffman Marsh (22e)	ISP	A	
Albany Shoreline (22f)	ISP	F	

SUISUN REGION			
Site Name and ID	**Survey Organization**	**Survey Type**	**Notes**
Southampton Marsh (11)	ARA	G	AKA "Benecia State Recreation Area" by ARA
Point Buckler (27a)	ISP	F	
MOTCO Islands (27b)	none	none	
Honker Bay (27c)	none	none	
VALLEJO REGION			
Site Name and ID	**Survey Organization**	**Survey Type**	**Notes**
White Slough/Napa River (26a)	-	-	Grouped into one large sub-area in the Marin Region by ISP Control Program
White Slough Marsh (26a)	*none*	*none*	
Coon Island (26a)	*PRBO*	*NAm*	
Fagan Slough (26a)	*none*	*none*	
Pond 2A Restoration (26a)	*none*	*none*	
Napa Centennial Marsh (26a)	*none*	*none*	
Fly Bay (26a)	*CaDFG*	*NAm*	
Bull Island (26a)	*none*	*none*	
Napa Plant Site Restoration (26a)	*none*	*none*	
Dutchman Slough Mouth (26a)	*none*	*none*	
Napa Tract Salt Pond 7 (26a)	*none*	*none*	
Napa Tract Intake Pond 1A (26a)	*none*	*none*	
Hudeman Slough (26a)	*none*	*none*	
Napa Tract Intake Pond 1 (26a)	*none*	*none*	
Napa Tract Salt Pond 6A (26a)	*none*	*none*	
Napa Tract Salt Pond 6 (26a)	*none*	*none*	
Guadacanal Village (26a)	*none*	*none*	
Dutchman Slough (26a)	*none*	*none*	
Napa Tract Salt Pond 2 (26a)	*none*	*none*	
Napa Tract Salt Pond 3 (26a)	*none*	*none*	
Napa Tract Salt Pond 7A (26a)	*none*	*none*	
Napa Tract Salt Pond 5 (26a)	*CaDFG*	*NAm*	
Napa Tract Salt Pond 4 (26a)	*CaDFG*	*NAm*	
China Slough (26a)	*none*	*none*	
Devil's Slough (26a)	*none*	*none*	
Cullinan Ranch (26a)	*none*	*none*	
White Slough Marsh (26a)	*none*	*none*	
San Pablo Bay NWR Shoreline (26b)	ISP	NAm	
Sonoma Creek (26c)	SPBNWR	NAm	
Sonoma Baylands (26d)	SPBNWR	NAm	Grouped into one large sub-area in the Marin Region by ISP Control Program
Lower Tubbs Island (26d)	*SPBNWR*	*NAm*	
Tolay Creek (26d)	*SPBNWR*	*NAm*	
Tubbs Island Restoration (26d)	*SPBNWR*	*NAm*	

PETALUMA REGION			
Site Name and ID	**Survey Organization**	**Survey Type**	**Notes**
Novato (23m)	-	-	Grouped into one large sub-area by ISP Control Program
Hamilton South (23m)	*PRBO*	*A*	
Gallinas Creek South (23m)	*none*	*none*	
Mitchell Fragment (23m)	*PRBO*	*NAm*	
Santa Venetia (23m)	*PRBO*	*A*	
Gallinas Creek North (23m)	*PRBO*	*NAm*	
McInnis Marsh (23m)	*PRBO*	*NAm*	
Hamilton North (23m)	*none*	*none*	
Novato Creek Mid Reach (23m)	*none*	*none*	
Novato Creek Mouth (23m)	*PRBO*	*NAm*	
China Camp (23o)	PRBO	A	
Petaluma River - Upper (24a)	PRBO	A	AKA "Petaluma Dog Park" by PBCS
Grey's Field (24b)	PRBO	A	AKA "Gray's Ranch" by PBCS
Petaluma Marsh (24c)	-	-	Grouped into one large sub-area by ISP Control Program
Tule Slough (24c)	*none*	*none*	
Ellis Creek (24c)	*PRBO**	*A*	Surveyed from adjacent transect at Grey's Field (24b)
Petaluma Marsh Expansion Project (24c)	*none*	*none*	
San Antonio Creek (E) (24c)	*none*	*none*	
Petaluma River (C) (24c)	*none*	*none*	
San Antonio Creek (A) (24c)	*none*	*none*	
Mira Monte Slough (B) (24c)	*none*	*none*	
Mud Hen Slough (D) (24c)	*none*	*none*	
Schultz Slough (24c)	*none*	*none*	
Gambini Marsh (24c)	*none*	*none*	
Petaluma Marsh (24c)	*none*	*none*	
False Slough (24c)	*none*	*none*	
Lakeville Marina (24c)	*none*	*none*	
Woloki Slough (24c)	*none*	*none*	
Lower Petaluma River - Downstream of San Antonio Creek	-	-	Grouped into one large sub-area by ISP Control Program
Day Island Wildlife Area (24d)	*PRBO*	*A*	
Petaluma River - West Side (24d)	*PRBO*	*A*	
Petaluma River - Lower (24d)	*PRBO*	*adj*	
Black John Slough North (24d)	*PRBO*	*NAm*	
Black John Slough A (24d)	*PRBO*	*NAm*	
Bahia Channel (24d)	*none*	*none*	
Black John Slough B (24d)	*none*	*none*	
Carl's Marsh (24d)	*PRBO*	*NAm*	
Sonoma Marina (24d)	*none*	*none*	
Green Point Area Marshes (24d)	*PRBO*	*A*	
Sonoma Baylands	-	-	Grouped into one sub-area by ISP Control Program
Petaluma River Mouth (26d)	*PRBO*	*A*	
Sonoma Baylands Restoration (26d)	*SPBNWR*	*NAm*	
Sonoma Baylands East (26d)	*SPBNWR*	*NAm*	

Appendix II: 2017 Survey Station Coordinates in UTM (NAD83, Zone 10)

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

MARIN REGION

Site Name (ID)	Transect	Station ID	X-coordinate	Y-coordinate
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
Creekside Park (04g)	CSPK-T2	CRPA01	540284	4200157
Creekside Park (04g)	CSPK-T2	CRPA04	540477	4200115
Creekside Park (04g)	CSPK-T2	CRPA05	540583	4199940
Creekside Park (04g)	CSPK-T2	CRPA06	540535	4200305
CMC - Upper (04h)	CSPK-T2	UCMC01	539765	4200265
CMC - Upper (04h)	CSPK-T2	UCMC02	539978	4200186
CMC - Upper (04h)	CSPK-T2	UCMC03	540142	4200079
CMC - Lower (04i)	LCMC-T1	LCMC11	540632	4199553
CMC - Lower (04i)	LCMC-T1	LCMC12	540831	4199466
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
CMC - Upper (04h)	UCMC-T1	UCMC04	540358	4200046
CMC - Upper (04h)	UCMC-T1	UCMC05	540500	4199902

SAN FRANCISCO PENINSULA REGION

Site Name (ID)	Transect	Station ID	X-coordinate	Y-coordinate
Pier 98/Heron's Head (12b)	HEHE-T1	HEHE01	555235	4176946
Pier 98/Heron's Head (12b)	HEHE-T1	HEHE02	555429	4176923
Sanchez Marsh (19k)	SANC-T1	PAF01	556703	4160468
Sanchez Marsh (19k)	SANC-T1	SANC03	557028	4160398
Sanchez Marsh (19k)	SANC-T1	SANC04	557215	4160382
Sanchez Marsh (19k)	SANC-T1	SANC05	556844	4160430
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

SAN MATEO REGION

Site Name (ID)	Transect	Station ID	X-coordinate	Y-coordinate
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	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
Corkscrew Slough (02b)	CORK-T1	CORK02a	569244	4153305
Greco Island - North (02f)	GRIN-T1	GRIN17	571635	4152418
Greco Island - North (02f)	GRIN-T1	GRIN18	571800	4152305
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 - 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	MBSE06	568955	4152326
Middle Bair SE (02k)	MBE-T1	MBSE02	568726	4151546
Middle Bair SE (02k)	MBE-T1	MBSE04	568800	4151947
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

San Mateo Region continued on following page

SAN MATEO REGION (continued)

Site Name (ID)	Transect	Station ID	X-coordinate	Y-coordinate
B2 South Quadrant (02d)	OBES-T1	OBE22	569611	4154402
B2 South Quadrant (02d)	OBES-T1	OBE23	569663	4154619
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	RESH16	567956	4155133
Steinberger Slough (02b)	RESH-T2	RESH15	567780	4154559
Steinberger Slough (02b)	RESH-T2	RESH17	568105	4155282
Steinberger Slough (02b)	RESH-T2	RESH18	568239	4155444
Steinberger Slough (02b)	RESH-T2	RESH13	567756	4154757
Steinberger Slough (02b)	RESH-T2	RESH14	567816	4154983
West Point Slough - NW (02e)	WPSN-T1	WPSN03	571586	4151985
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

Site Name (ID)	Transect	Station ID	X-coordinate	Y-coordinate
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	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
Calaveras Point (05a)	CAPT-T1	CAPT08	586510	4147007
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
Fan Marsh (17j)	FANM-T1	FANM05	568410	4177818
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

Dumbarton South Region continued on following page

DUMBARTON SOUTH REGION continued

Site Name (ID)	Transect	Station ID	X-coordinate	Y-coordinate
Charleston Slough (15a)	MVSL-T1	CHSL01	580426	4145106
Charleston Slough (15a)	MVSL-T1	CHSL03	580657	4145153
Mountain View Slough (15a)	MVSL-T1	MVSL04	581043	4145153
Mountain View Slough (15a)	MVSL-T1	MVSL05	581422	4145011
Charleston Slough (15a)	MVSL-T1	CHSL04	580414	4144826
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
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

Site Name (ID)	Transect	Station ID	X-coordinate	Y-coordinate
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 - South Bank (13c)	OAC-T1	OACS01	576227	4160905
OAC - South Bank (13c)	OAC-T1	OACS02	576429	4160900
OAC - South Bank (13c)	OAC-T1	OACS03	576629	4160907
OAC - South Bank (13c)	OAC-T1	OACS04	576829	4160914
OAC - South Bank (13c)	OAC-T1	OACS05	577029	4160921
OAC - South Bank (13c)	OAC-T1	OACS06	577225	4160925
OAC - South Bank (13c)	OAC-T1	OACS07	577426	4160925
OAC - South Bank (13f)	OAC-T1	WTS37	576032	4160957
OAC - North Bank (13a)	OAC-T2	ALCK10	577579	4161047
OAC - North Bank (13a)	OAC-T2	ALCK11	577774	4161008
OAC - North Bank (13a)	OAC-T2	ALCK12	577954	4160949
OAC - North Bank (13a)	OAC-T2	ALCK13	578133	4160880
OAC - North Bank (13a)	OAC-T2	ALCK14	578290	4160821
OAC - North Bank (13a)	OAC-T2	ALCK15	578491	4160791
OAC - North Bank (13a)	OAC-T2	ALCK16	578684	4160842
OAC - North Bank (13a)	OAC-T2	ALCK17	578837	4160946
OAC - North Bank (13a)	OAC-T2	ALCK18	578983	4161058
OAC - North Bank (13a)	OAC-T3	ALCK19	579146	4161152
OAC - North Bank (13a)	OAC-T3	ALCK20	579342	4161159
OAC - North Bank (13a)	OAC-T3	ALCK21	579538	4161155
OAC - North Bank (13a)	OAC-T3	ALCK22	579723	4161150
OAC - North Bank (13a)	OAC-T3	ALCK23	579901	4161149
OAC - North Bank (13a)	OAC-T3	ALCK24	580056	4161217
OAC - North Bank (13a)	OAC-T3	ALCK25	580098	4161389
OAC - North Bank (13a)	OAC-T3	ALCK26	580095	4161571
OAC - North Bank (13a)	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

Union City Region continued on following page

UNION CITY REGION (continued)

Site Name (ID)	Transect	Station ID	X-coordinate	Y-coordinate
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

Site Name (ID)	Transect	Station ID	X-coordinate	Y-coordinate
North Marsh (20f)	BUNK-T1	NORT08	573588	4170397
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
San Lorenzo Creek (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
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

Hayward Region continued on following page

HAYWARD REGION (continued)

Site Name (ID)	Transect	Station ID	X-coordinate	Y-coordinate
North Marsh (20f)	NORT-T1	NORT06	573168	4170488
Oakland Airport (20r)	OAKA-T1	OAKA01	566746	4175486
Oakland Airport (20r)	OAKA-T1	OAKA02	566898	4175357
Oakland Airport (20r)	OAKA-T1	OAKA03	567055	4175234
Oro Loma - East (07a)	ORLW-T1	ORLW22	574705	4168708
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 - West (07b)	ORLW-T2	ORLW08	574215	4168393
Oro Loma - West (07b)	ORLW-T2	ORLW09	574150	4168521
Oro Loma - West (07b)	ORLW-T2	ORLW10	574098	4168723
Oro Loma - West (07b)	ORLW-T2	ORLW11	574095	4168866
Oro Loma - West (07b)	ORLW-T2	ORLW12	574302	4168857
Oro Loma - West (07b)	ORLW-T2	ORLW13	574495	4168854
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)	SLEA-T1	SLRZ09	573951	4169136
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
Hayward Landing (20p)	TRMA-T1	HALA01	574524	4166812
Triangle Marsh - Hayward (20w)	TRMA-T1	TRMA01	574647	4166655

SAN LEANDRO BAY REGION

Site Name (ID)	Transect	Station ID	X-coordinate	Y-coordinate
Arrowhead Marsh (17c)	ARHE-T2	ARHE01	569510	4177535
Fan Marsh (17j)	FANM-T1	FANM01	568582	4177668
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
San Leandro Creek (17e)	SLEA-T1	SLEA01	569805	4177557
San Leandro Creek (17e)	SLEA-T1	SLEA02	569923	4177386
San Leandro Creek (17e)	SLEA-T1	SLEA03	570046	4177211
San Leandro Creek (17e)	SLEA-T1	SLEA04	570174	4177030
San Leandro Creek (17e)	SLEA-T1	SLEA05	570298	4176856
San Leandro Creek (17e)	SLEA-T1	SLEA06	570418	4176690
San Leandro Creek (17e)	SLEA-T1	SLEA07	570529	4176533

BAY BRIDGE NORTH REGION

Site Name (ID)	Transect	Station ID	X-coordinate	Y-coordinate
Emeryville Crescent - East (06a)	EMCR-T1	EMCR07	560954	4186746
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-T2	EMCR14	561702	4187997
Emeryville Crescent - East (06a)	EMCR-T2	EMCR15	561891	4187888
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
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
Hoffman Marsh (22e)	STEG-T1	HOM06	559640	4195672
Hoffman Marsh (22e)	STEG-T1	HOM07	559818	4195374
Hoffman Marsh (22e)	STEG-T1	HOM08	560031	4195055

VALLEJO REGION

Site Name (ID)	Transect	Station ID	X-coordinate	Y-coordinate
San Pablo Bay NWR Shoreline (26b)	MAIS-T1	MAIS12	561920	4217008
San Pablo Bay NWR Shoreline (26b)	MAIS-T1	MAIS13	561807	4217214
San Pablo Bay NWR Shoreline (26b)	MAIS-T1	MAIS14	561653	4217439
San Pablo Bay NWR Shoreline (26b)	MAIS-T1	MAIS15	561476	4217615

Appendix III: Standard Survey Protocols for Ridgway's Rails in the San Francisco Estuary

San Francisco Estuary Invasive *Spartina* Project

California Ridgway's Rail Survey Protocols

General Survey Requirements for Protocol A and B:

1) *Permits*. Obtain required survey permits: USFWS Endangered Species Permit, ESA Section 10(a)(1)(A); California DFG permit (i.e. Memorandum of Understanding); site-specific permissions (e.g., Special Use Permit from a NWR).

2) *Training*. Observers must be trained to identify Ridgway's rail calls and distinguish RIRA calls from other marsh bird species (see Rail Training document, April 2004). Observers must also be trained to minimize disturbance while conducting surveys (see Walking in the Marsh document, April 2004).

3) *Tides and moon phase*. Conduct surveys when tidal sloughs are less than bank full, <4.5-ft NGVD at the nearest tide station. Tide height at bank full will vary by site. Avoid high (flood) tides. Full moon periods should be avoided during active surveys when tape playback is utilized, as birds may be attracted out of cover or a response may be elicited, increasing the likelihood of predation. There is also evidence of reduced calling rates during full moon periods.

4) *Survey Timing*. Morning surveys should be initiated 1 hour before sunrise and extended no more than 1.5 hours after sunrise; evening surveys should begin 1 hour prior to sunset and extend no more than 1 hour following sunset. Surveys at a particular location should be spaced at least 1 week apart and should be conducted at both sunrise and sunset.

5) *Weather*. Record wind velocities and weather; conduct surveys at winds <10 mph; do not conduct surveys during heavy rainfall.

6) *Seasonality*. Conduct surveys between January 15 and mid-April.

7) *Survey Stations*. Stations should be spaced approximately 200m apart. Stations should be placed on boardwalks or levee tops when possible to minimize disturbance. When surveys are conducted within a marsh, stations should be placed away from slough/channel edges to minimize disturbance to rail species.

8) *Data collection*. All rail vocalizations should be recorded, noting the call type, location, and time. Locations where rails are detected should be plotted on a map during the survey with numbered reference codes that correspond to detections on the datasheet.

   If the bird was definitely or possibly previously detected, e.g., as part of a pair, make this clear on the datasheet. Make a note when birds were detected simultaneously or nearly so, to verify that they were separate individuals. Calls of other rail species should also be recorded as above, with species clearly marked.

9) *Disturbance*. Record all information on disturbance (e.g., predator sightings or boats) detected during surveys.

10) Review the WRMP CLRA protocol (Evens 2002) for other general information (http://www.wrmp.org/docs/protocols/Wetland%20Birds.pdf, p.21 Rails). Defer to the requirements listed above if they are more restrictive than the WRMP protocol.

Recorded Call Playback Procedure for Protocol A and G

A standardized recording of Ridgway's rail calls should be obtained from USFWS. The recording should include a combination of clatter and duet calls, and there should be at least four complete calls with at least 5 seconds of silence between calls. The recording should be of good quality, and should be played at a volume of 80-90 dB at 1-meter distance from the speaker. A digital sound level meter should be used to calibrate the playback device.

The survey should begin with an initial 5-minute passive listening period, followed by 1-minute of Ridgway's rail calls, and completed with a 4-minute passive listening period (10-minutes/survey). Tape playbacks should be broadcast in all directions over the marsh at a station. Assume rails can hear tapes at distances of ≤200 m.

Note: Only play recorded Ridgway's rail calls at stations when you are certain rails have not yet been detected within a 200-m radius. As soon as a Ridgway's rail is detected, stop the recording.

San Francisco Estuary Invasive *Spartina* Project

Summary of California Ridgway's Rail Survey Protocols

Type	Common Protocol Name	Description
A	Standard USFWS Transect Survey	*As described in Albertson & Downard, 2004 and Spautz 2005*. Used for most sites where rails are expected to occur. One or more observers move from station to station, remaining at each station for 10-minutes. 3 survey rounds, with recording played at end of 3rd round if no prior detections.
B	Standing or Stationary Survey	*As described in Albertson & Downard, 2004 and Spautz 2005*. Now used at one site in the Bay: Arrowhead Marsh. Requires one person at each station for 2 hours. Typically, 3 survey rounds. Produces data that is not suitable for Estuary-wide population analysis.
C	ISP-Modified Transect Survey	*Originally described in Zaremba & Albertson, 2004*; modified in Spautz & Albertson 2006. Used to determine presence or absence of RIRA at sites with low potential for RIRA presence, where *Spartina* control activities are planned. Same as Type A, except recording is played from first survey round. Recordings are discontinued upon detection and surveys proceed using Protocol A. *[Protocol discontinued in 2017]*
E	Winter High Tide Survey	*Described by EBRPD pers. comm*. RIRA are flushed out of marsh habitat by airboat and counted during winter high tide. Produces data that is not suitable for Estuary-wide population analysis. *[Protocol discontinued in 2017]*
F	Preliminary Habitat Suitability Assessment	Quick assessment by RIRA biologist to determine if suitable RIRA habitat is present; if habitat is suitable, a call count survey is conducted (typically using protocol C).
G	Standing or stationary survey to determine absence (AKA consultant protocol)	As described by *USFWS Draft Survey Protocol, 2009*; modified in January 2015 to include broadcast. Used to determine absence of RIRA at sites where proposed construction activities may impact any rails present at the site. Similar to Protocol B, but with four survey rounds, with recording played during the 3rd and 4th round if no prior detections. Produces data that is not suitable for Estuary-wide population analysis.
NAm	2-species North American Secretive Marsh Bird Protocol	As described in FINAL Site-specific Protocol for Monitoring Marsh Birds (Version 1.0, January 2017) and based on the North American Marsh Bird Monitoring Protocols by Conway, 2011. This protocol is a transect survey (similar to Type A), but requires broadcast of two special-status focal species (RIRA and BLRA) during all survey rounds.

Protocol A. The Protocol A transect survey is the standard method of survey for most marshes in the Bay. Listening stations are established at approximately 200-meter intervals along a transect, preferably along the edge of the marsh. The first two of three surveys are passive (listening) for 10-minutes at each station. On the third survey, if a Ridgway's rail was not previously detected within 200 meters of a listening station during the two previous passive surveys or incidentally within the season, recorded calls are played, according to the "*Recorded Call Playback Procedure*" described below. If a Ridgway's rail has been previously detected within 200 meters of a listening station, the third survey should also be passive. There should be a minimum of 2 weeks between surveys.

Protocol B. The Protocol B stationary survey is only used at Arrowhead Marsh. The Protocol B stationary survey requires a sufficient number of observers to have one person at each listening station. Listening stations are established along a grid or transect, with stations set apart by 200 meters or more. Observers are present at each station for an entire 1.5-hour survey period. When calls are recorded, the observer must take care to record the exact time and direction, and best estimate of the distance of the call, so that the data can be reconciled with other observers' data. Reconciliation of data from multiple observers must be planned and closely supervised by a scientist with expertise in field data interpretation. The Protocol B stationary survey is a passive listening survey, and does not include playing of recorded calls. Protocol B surveys are typically conducted for three rounds.

Protocol F. Protocol F was developed to assess the quality of the Ridgway's rail habitat at marginal sites where rails have not been previously documented and are not likely to occur so that a determination of rail absence could be made without call count surveys where habitat is obviously lacking. Sites requiring *Spartina* control exhibit a continuum of habitat characteristics, many of which are documented Ridgway's rail habitat requirements (e.g., extensive channels for foraging and vegetated upper marsh for refuge during high tides). This makes it difficult in some cases to determine whether the habitat at the site is of sufficiently high quality to require a call count survey. In 2005, the ISP developed a standardized method to document the decision as to whether or not a Ridgway's rail survey was required (Protocol F).

ISP staff consulted with Joy Albertson and Jules Evens to develop a list of required habitat elements for Ridgway's rails based on field knowledge and published sources. This information was used to develop a field checklist to assess the habitat using multiple criteria and to document the decision as to whether the marsh will require a formal Ridgway's rail call count survey. The habitat assessment is typically completed at sites where Ridgway's rails have previously not been documented. Protocol F may also be employed in sites with historic Ridgway's rail presence, but where there have been no detections over the prior two years of formal survey. This scenario has become more prevalent as marshes once fully invaded by hybrid *Spartina* have been treated and the resulting landscape is no longer suitable to support rail populations.

The process of determining whether the site is of sufficient quality to require a call count survey is based on a cumulative score of positive characteristics. Patches with no necessary habitat elements are considered very poor habitat in which Ridgway's rail use is "highly unlikely," and require no further Ridgway's rail survey; such sites are determined to be available for early non-native *Spartina* treatment. If the site is poor but is geographically near enough to good habitat or known rail habitat to potentially provide habitat for at least some Ridgway's rail activities (such as foraging or shelter), it will require a call count survey.

Potentially good habitat with at least two positive characteristics will also be likely to require a call count survey, but this will be site-dependent. Possibly good habitat or likely good habitat (with at least four or six characteristics, respectively) will require a call count survey (Protocol A or C).

Habitat characteristics documented to be associated with California Ridgway's rails and included on the habitat assessment datasheet include the following:

1. Young or mature restoration site (at least 50% vegetated)
2. Upper marsh vegetation present
3. Vegetated levee slopes
4. Marsh patch size > 10 ha
5. Closer than 500 m to nearest marsh with documented Ridgway's rail presence
6. Fully tidal
7. Saline
8. High proportion of *Sarcocornia pacifica*, tall hybrid *Spartina* clones, and/or *Grindelia stricta* cover
9. At least a few second and third order channels, or highly channelized

Habitat characteristics associated with California Ridgway's rail absence and included on the habitat assessment datasheet as negative characteristics include the following:

1. New restoration site < 50% vegetated
2. Upper marsh vegetation absent
3. Levee slopes unvegetated
4. Small marsh patch size (< 1 ha)
5. Distance to nearest known marsh with Ridgway's rails > 1000 m
6. Sparse vegetation in rip-rap
7. Highly muted tidal regime or non-tidal
8. Freshwater

Protocol G. In 2009, the USFWS developed a draft survey protocol for consultants to determine Ridgway's rail absence from a marsh. This protocol should be employed if construction or other impactful activities are planned in or adjacent to a tidal marsh during rail breeding season (February 1 to September 1) and surveys are recommended by a USFWS staff assisting with a Biological Opinion or other permit to assess potential impacts.

Similar to Protocol B, this is a stationary survey conducted by multiple observers stationed at 200 meter intervals around the survey area. Surveys are conducted for four rounds between January 15 and April 15. In the most recent protocol, recorded vocalizations are broadcast for the third and fourth rounds if no rails have been previously detected within 200 meters of the station. Because this protocol is used to establish rail absence, if rails are detected at any time during the four rounds of surveys, surveys can cease and presence is established at the site.

Protocol NAm: The North American (NAm) Survey Protocol as used in the San Francisco Estuary 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 will be the standard call-count survey protocol moving forward. The complete protocol is titled "Site-specific Protocol for Monitoring Marsh Birds Don Edward San Francisco Bay and San Pablo Bay National Wildlife Refuges" Survey ID Numbers FF08RSFB00-003 and FF08RSNP00-008 and can be found online here: https://ecos.fws.gov/ServCat/Reference/Profile/68062.

Appendix IV: Survey Forms

San Francisco Bay Secretive Marsh Bird Survey Form

Observer (last, first) ______________________ **Study Area(s) 1** ________________ **2** ________________ **3** ________________

Add'l observers ____________________________________ **Transect** ____________ **Visit** ____ **Date** (mm-dd-yyyy) ____-____-______

Protocol [ ] 2-sp North American Marsh Bird Protocol OR [ ] Other (please describe) ____

Weather **Wind** ____ mph/kph/Beaufort Code **Temp** ____ °F/°C **Sky code** ____ **Noise** ____ dbA/dbC/Noise code

Map Ref. Code	Point	Start Time (24-hr) -OR- Species Code	Bearing (°)	Distance (m)	Study Area Detected	Min 1 - passive	Min 2 - passive	Min 3 - passive	Min 4 - passive	Min 5 - passive	Min 6 – BLRA broadcast	Min 7 – RIRA broadcast	Min 8 - passive	Min 9 - passive	Min 10 - passive	Playback Halted? (Y/N)	Outside Study Area? (Y/N)	Outside Time? (Y/N)	Duplicate Bird?* (Y/N)	Comment Number

Comments/Predators and predator events: ____

*See reverse for codes

Initials: Entered_____ Proofed_____ Scanned_____ Page____of____

Olofson Environmental, Inc.
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Oakland, California 94606

Survey form for transect call-count surveys using Protocol A or NAm.

California Ridgway's Rail Survey Form 2017 for Protocol B or G

Target Site(s) 1 _____ 2 _____ 3 _____ Round _____ Date (mm/dd/yy)

_____

Observer _____ Survey Type _____ Time: Start_____ End

_____

Weather **Wind** _____ mph/kph/Beaufort Code **Temp** _____°F/°C **Sky code** _____ **Noise** _____dbA/dbC/Noise code

Study Area Detected Fill in if bird is detected outside Study Area 1; otherwise leave blank	Station ID	Broadcast?	Species	Time	Bearing (°)	Distance (m)	Call Type	Outside time?	Outside site?	Duplicate bird?	Notes	Map Ref	Unique Count

Site Notes:

_____

_____

_____

Datasheet for stationary call-count surveys using Protocol B or Protocol G.

Appendix V: 2017 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

- **A** = Protocol A: passive transect survey
- **B** = Protocol B: passive stationary survey (Arrowhead Marsh only)
- **F** = Protocol F: habitat assessment
- **G** = Protocol G: active stationary survey (consultant's survey)
- **NAm** = Protocol NAm: North American Secretive Marsh Bird transect survey (AKA Site-specific Protocol and 2-species (2S) survey)

Key to Broadcast?

- **All** = Broadcast was used at every station on every survey round (protocol 2S)
- **R3 =** Broadcast was used on round 3 at stations where rails were not detected within 200m on previous survey rounds (protocol A); see Notes for specific stations where broadcast was employed
- **R3, R4** = Broadcast was used on the third and fourth survey rounds in accordance with the consultant surveys (protocol G)
- **No** = Broadcast was not used on any round because rails were detected within 200m of all survey stations (protocol A)
- **"-"** = Not applicable, no broadcast

Key to Observer

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

MARIN REGION

Project	Site Name and ID	Protocol	Broadcast?	Round 1				Round 2				Round 3				
				Date	Observer	Temp (°F)	# RIRA	Date	Observer	Temp (°F)	# RIRA	Date	Observer	Temp (°F)	# RIRA	Notes
ISP	Blackie's Creek (03a)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Blackie's Creek Mouth (03b)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Larkspur Ferry Landing Area (04e)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Riviera Circle (04f)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Creekside Park (04g)	A	R3	1/30/2017	TR	34	1	2/23/2017	TR	48	2	3/15/2017	SC	48	**4**	R3 broadcast at CRPA01, 05
ISP	CMC - Upper (04h)	A	R3	1/31/2017	PL	41	**2**	2/23/2017	AE	47	0	3/15/2017	KE	59	1	R3 broadcast at UCMC02-05
ISP	CMC - Lower (04i)	2S	All	1/31/2017	PL	40	0	2/23/2017	AE	48	0	3/15/2017	KE	59	0	
ISP	CMC - Mouth (04j)	2S	All	2/7/2017	SG	59	**2**	2/23/2017	KE	51	2	3/15/2017	JM	53	0	
ISP	Pickleweed Park (09)	2S	All	1/24/2017	PL	52	5	2/13/2017	AE	45	3	3/6/2017	PL	52	**11**	
ISP	Brickyard Cove (23b)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Beach Drive (23b)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Loch Lomond Marina (23c)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	San Rafael Canal Mouth (23d)	2S	All	1/24/2017	PL	52	**2**	2/13/2017	AE	45	0	3/6/2017	PL	52	0	
ISP	Paradise Cay (23f)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Greenwood Beach (23g)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Strawberry Point (23h)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Strawberry Cove (23i)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Starkweather Park (23l)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat

SAN FRANCISCO PENINSULA REGION

Project	Site Name and ID	Protocol	Broadcast?	Round 1				Round 2				Round 3				Notes
				Date	Observer	Temp (°F)	# RIRA	Date	Observer	Temp (°F)	# RIRA	Date	Observer	Temp (°F)	# RIRA	
ISP	Pier 98/Heron's Head (12b)	2S	All	2/1/2017	AE	50	0	2/21/2017	TR	55	0	3/14/2017	PL	67	0	
ISP	Hunters Point Naval Reserve (12d)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Yosemite Channel (12e)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Candlestick Cove (12f)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Crissy Field (12g)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Yerba Buena Island (12h)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Colma Creek (18a)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Navigable Slough (18b)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Sam Trans Peninsula (18e)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	San Bruno Marsh (18g)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	San Bruno Creek (18h)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Oyster Cove (19c)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Oyster Point Park (19e)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Point San Bruno (19f)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Seaplane Harbor (19g)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	SFO (19h)	2S	All	1/23/2017	TR	50	4	2/13/2017	TR	46	2	3/13/2017	TR	67	**7**	
ISP	Mills Creek Mouth (19i)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Easton Creek Mouth (19j)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Sanchez Marsh (19k)	2S	All	2/1/2017	TR	45	0	2/23/2017	PL	51	0	3/13/2017	AE	74	0	
ISP	Burlingame Lagoon (19l)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Coyote Point Marina (19n)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Seal Slough (19p)	2S	All	2/8/2017	KE	68	0	3/1/2017	BO	39	0	3/23/2017	AE	54	0	

SAN MATEO REGION

Project	Site Name and ID	Protocol	Broadcast?	Round 1				Round 2				Round 3				
				Date	Observer	Temp (°F)	# RIRA	Date	Observer	Temp (°F)	# RIRA	Date	Observer	Temp (°F)	# RIRA	Notes
ISP	Belmont Slough (02a.1)	2S	All	2/10/2017	AE	56	**10**	2/28/2017	TR	50	6	3/28/2017	PL	49	9	
ISP	Redwood Shores Mitigation Bank (02a.4)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Corkscrew Slough (02b.1)	2S	All	2/16/2017	KE	64	**11**	3/7/2017	BO	49	7	3/20/2017	SC	57	1	
ISP	Steinberger Slough (02b.2)	2S	All	2/8/2017	TR	59	0	2/28/2017	AE	49	0	3/15/2017	PL	53	0	
ISP	B2 North Quadrant (02c)	A	R3	2/16/2017	TR	61	4	3/7/2017	TR	43	17	4/3/2017	JM	53	**19**	Partial treatment at site; R3 broadcast at OBE06, 09, 11, 16, 19
ISP	B2 South Quadrant (02d)	A	R3	2/16/2017	SG	61	0	3/7/2017	JM	44	2	3/20/2017	AE	56	**3**	R3 broadcast at OBE04, 22, 23, 24, 25, 26
ISP	West Point Slough - NW (02e)	2S	All	1/23/2017	AE	52	0	2/10/2017	TR	49	0	3/7/2017	PL	60	0	
ISP	Greco Island - North (02f)	2S	All	2/16/2017	AE	63	3	3/7/2017	SC	43	**11**	3/20/2017	JM	57	0	
ISP	West Point Slough - SW / E (02g)	2S	All	1/23/2017	AE	50	0	2/10/2017	TR	49	0	3/7/2017	PL	60	0	
ISP	Greco Island - South (02h)	A	No	1/24/2017	TR	51	18	2/27/2017	JM	41	**25**	3/27/2017	TR	43	13	
ISP	Ravenswood Slough (02i)	A	R3	2/7/2017	AE	58	6	2/28/2017	PL	39	**16**	3/15/2017	TR	50	6	R3 broadcast at RAV01, 06, 10
ISP	Middle Bair N (02k)	A	R3	2/16/2017	JM	64	16	3/7/2017	JH	40	**17**	3/20/2017	TR	50	4	R3 broadcast at MBE05
ISP	Middle Bair SE (02k)	A	R3	2/16/2017	JM	64	**2**	3/7/2017	JH	40	0	3/20/2017	TR	50	0	R3 broadcast at MBE02, 04
ISP	Inner Bair Island Restoration (02l)	2S	All	1/23/2017	BO	48	0	2/24/2017	TR	38	0	3/29/2017	PL	50	0	
ISP	Pond B3 Bair Island Restoration (02m)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Middle Bair West (02o)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Foster City (19q)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Maple Street Channel (19s)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat

DUMBARTON SOUTH REGION

Project	Site Name and ID	Protocol	Broadcast?	Round 1				Round 2				Round 3				Notes
				Date	Observer	Temp (°F)	# RIRA	Date	Observer	Temp (°F)	# RIRA	Date	Observer	Temp (°F)	# RIRA	
ISP	Ravenswood Open Space Preserve (02j)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	SF2 (02n)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Mowry Marsh North (05a.1)	2S	All	2/15/2017	JM	50	7	3/14/2017	TR	74	14	3/29/2017	JM	50	**15**	
ISP	Calaveras Point (05a.2)	2S	All	1/19/2017	TR	53	19	3/2/2017	SC	66	8	3/17/2017	PL	57	**42**	
ISP	Newark Slough (05c)	2S	All	1/27/2017	SG	39	**18**	2/21/2017	PL	58	6	3/13/2017	KE	54	4	
ISP	Coyote Creek – Mud Slough (05f)	2S	All	1/19/2017	SC	56	2	3/2/2017	JM	66	2	3/17/2017	ND	47	**4**	
ISP	Plummer Creek Mitigation (05h)	2S	All	2/15/2017	ND	51	0	3/8/017	SG	61	0	3/27/2017	ND	49	0	
ISP	Island Ponds (05i)	2S	All	1/19/2017	SC	56	3	3/2/2017	JM	66	**9**	3/17/2017	ND	47	0	
ISP	Charleston Slough (15a.1)	A	R3	1/27/2017	TR	33	0	2/27/2017	SC	52	2	3/29/2017	TR	48	**3**	R3 broadcast at CHSL01, 03
ISP	Mountain View Slough (15a.1)	A	R3	1/27/2017	TR	33	**1**	2/27/2017	SC	52	0	3/29/2017	TR	48	0	R3 broadcast at MVSL04, 05
ISP	Stevens Creek to Long Point (15a.2)	2S	All	1/27/2017	PL	36	2	2/13/2017	ND	50	1	3/6/2017	AE	52	**2**	
ISP	Guadalupe Slough (15a.3)	2S	All	1/30/2017	KE	39	1	3/10/2017	SC	50	**10**	4/6/2017	KE	56	1	
ISP	Alviso Slough (15a.4)	A	R3	1/30/2017	JM	45	9	2/15/2017	SC	68	8	3/10/2017	KE	55	**12**	R3 broadcast at MAL01, 02, 04, 06, 07, 08
ISP	Knapp Tract (15a.6)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Stevens Creek (15c)	2S	All	1/27/2017	PL	36	4	2/13/2017	ND	50	**4**	3/6/2017	AE	52	2	
ISP	Cooley Landing (16)	A	No	1/19/2017	AE	52	**18**	2/14/2017	TR	41	12	3/10/2017	ND	52	18	

UNION CITY REGION

Project	Site Name and ID	Protocol	Broadcast?	Round 1				Round 2				Round 3				Notes
				Date	Observer	Temp (°F)	# RIRA	Date	Observer	Temp (°F)	# RIRA	Date	Observer	Temp (°F)	# RIRA	
ISP	AFCC - Strip Marsh (01e)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	OAC - North Bank (13a)	2S	All	1/30/2017	SG	42	0	2/27/2017	TR	50	0	3/16/2017	TR	55	**1**	
ISP	OAC - Island (13b)	2S	All	1/30/2017	SC	38	3	2/27/2017	JH	55	**9**	3/16/2017	ND	57	3	
ISP	OAC - South Bank (13c)	2S	All	1/27/2017	KE	41	0	2/15/2017	AE	66	0	3/16/2017	SG	57	0	
ISP	Whale's Tail - North (13d)	2S	All	2/15/2017	KE	74	1	3/17/2017	AE	48	0	4/3/2017	BO	57	**1**	
ISP	Whale's Tail – South (13e)	2S	All	1/27/2017	JM	47	1	2/15/2017	TR	60	5	3/16/2017	JH	55	**7**	
ISP	Cargill Mitigation Marsh (13f)	2S	All	1/27/2017	JM	47	0	2/15/2017	TR	60	**4**	3/16/2017	JH	55	0	
ISP	Eden Landing - North Creek (13h)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Eden Landing – Pond 10 (13i)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Eden Landing - Mt Eden Creek (13j)	2S	All	1/24/2017	SC	43	0	2/15/2017	BO	62	0	3/8/2017	BO	60	0	
ISP	Eden Landing Reserve - South (13k)	2S	All	1/27/2017	ND	40	0	2/28/2017	KE	46	0	3/16/2017	PL	57	0	
ISP	Eden Landing Reserve - North (13l)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Eden Landing - Ponds E8A, E9, E8X (13m)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat

HAYWARD REGION

Project	Site Name and ID	Protocol	Broadcast?	Round 1				Round 2				Round 3				
				Date	Observer	Temp (°F)	# RIRA	Date	Observer	Temp (°F)	# RIRA	Date	Observer	Temp (°F)	# RIRA	Notes
ISP	Oro Loma - East (07a)	A	R3	1/19/2017	SG	54	0	2/24/2017	JM	36	0	3/13/2017	PL	74	0	R3 broadcast at ORLW16-22
ISP	Oro Loma - West (07b)	A	R3	1/19/2017	PL	55	**1**	2/24/2017	ND	38	0	3/13/2017	SG	73	0	R3 broadcast at ORLW01-13
ISP	Oyster Bay Regional Shoreline (20a)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Oakland Golf Links (20b)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Dogbone Marsh (20c)	A	No	1/24/2017	SG	56	0	2/13/2017	SC	43	0	3/8/2017	PL	66	0	
ISP	Citation Marsh (20d)	A	No	1/24/2017	SC	57	15	2/13/2017	JM	46	**32**	3/8/2017	TR	60	22	Partial treatment at site
ISP	East Marsh (20e)	A	No	1/26/2017	JM	57	0	2/27/2017	KE	51	0	3/14/2017	JH	55	0	
ISP	North Marsh (20f)	A	No	1/24/2017	SG	56	47	2/13/2017	SC	43	39	3/8/2017	PL	66	**58**	No treatment allowed
ISP	Bunker Marsh (20g)	A	No	1/24/2017	ND	55	10	2/13/2017	SG	44	**17**	3/8/2017	JM	70	4	No treatment allowed
ISP	San Lorenzo Creek (20h)	A	R3	1/26/2017	JM	57	0	2/27/2017	KE	51	**2**	3/14/2017	JH	55	1	R3 broadcast at SLRZ03-08
ACFCD	Bockman Channel (20i)	G	R3, R4	1/25/2017	BO KE KS ND PL SC	54	0	2/28/2017	AE BO KS SC SG PL	57	0	3/15/2017	AE BO SG	52	0	4th round on 3/30/17 by BO KS JM (no RIRA detected); Broadcast at BOCH01-06
ISP	Sulphur Creek (20j)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Hayward Landing (20k)	2S	All	2/7/2017	ND	60	0	3/2/2017	PL	42	0	3/29/2017	SC	49	0	
ISP	Johnson's Landing (20l)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Cogswell - Sec A (20m)	2S	All	2/7/2017	JH	58	2	3/1/2017	JM	41	**4**	3/23/2017	KE	30	3	
ISP	Cogswell - Sec B (20n)	2S	All	2/7/2017	TR	52	31	3/1/2017	JH	41	**41**	3/23/2017	JM	57	33	No treatment allowed
ISP	Cogswell - Sec C (20o)	2S	All	2/7/2017	JM	60	12	3/1/2017	SC	41	**13**	3/23/2017	TR	54	7	No treatment allowed
ISP	Hayward Shoreline Outliers (20p)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	San Leandro Shoreline Outliers (20q)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Oakland Airport (20r)	2S	All	2/8/2017	BO	58	0	3/1/2017	ND	39	0	3/27/2017	KE	63	0	
ISP	San Leandro Marina (20t)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	HARD Marsh (20s)	A	R3	2/7/2017	SC	60	0	3/1/2017	SG	41	0	3/23/2017	JH	56	0	R3 broadcast at HARD01-05, JOLA02
ACFCD	Estudillo Creek Channel (20u)	G	R3, R4	1/30/2017	BO JM KS SG	42	0	2/23/2017	BO KS ND SC	56	0	3/10/2017	BO AE	51	0	4th round on 3/30/17 by KE KS (no RIRA detected in site); Broadcast at ESCH01-04
ISP	Hayward Landing Canal (20v)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Triangle Marsh - Hayward (20w)	2S	All	2/7/2017	ND	60	0	3/2/2017	PL	42	0	3/29/2017	SC	49	0	

SAN LEANDRO BAY REGION

Project	Site Name and ID	Protocol	Broadcast?	Round 1				Round 2				Round 3				Notes
				Date	Observer	Temp (°F)	# RIRA	Date	Observer	Temp (°F)	# RIRA	Date	Observer	Temp (°F)	# RIRA	
ISP	Elsie Roemer (17a)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Bay Farm Island (17b)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Arrowhead Marsh (17c)	B	No	2/10/2017	SC	57	**60**	3/9/2017	JH	60	48	3/28/2017	JM	47	52	Partial treatment at site
ISP	Airport Channel - Fan Shore (17d.1)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	MLK Shoreline - Damon (17d.4)	2S	All	2/6/2017	TR	54	**4**	3/2/2017	TR	37	4	3/29/2017	JH	55	4	No treatment allowed
ISP	San Leandro Creek (17e)	A	R3	1/23/2017	SG	51	0	3/1/2017	JM	58	0	3/16/2017	SC	58	0	R3 broadcast at SLEA04, 05, 06, 07
ISP	Oakland Inner Harbor (17f)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Coast Guard Is (17g)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	MLK New Marsh (17h)	A	No	1/23/2017	SC	52	41	3/1/2017	TR	60	39	3/16/2017	JM	59	**49**	No treatment allowed
ISP	Coliseum Channels (17i)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Fan Marsh (17j)	2S	All	2/8/2017	JM	62	16	2/28/2017	JH	58	14	3/28/2017	SC	51	**25**	No treatment allowed
ISP	Airport Channel (17k)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Doolittle Pond (17l)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Alameda Island - East (17m)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat

BAY BRIDGE NORTH REGION

Project	Site Name and ID	Protocol	Broadcast?	Round 1				Round 2				Round 3				Notes
				Date	Observer	Temp (°F)	# RIRA	Date	Observer	Temp (°F)	# RIRA	Date	Observer	Temp (°F)	# RIRA	
ISP	Emeryville Crescent - East (06a)	2S	All	2/6/2017	JH	60	0	2/28/2017	JM	42	0	3/16/2017	KE	59	0	
ISP	Emeryville Crescent - West (06b)	2S	All	2/10/2017	KE	53	0	3/3/2017	AE	45	0	3/28/2017	JH	55	0	
ISP	Whittel Marsh (10a)	A	No	1/26/2017	SG	54	0	2/14/2017	JM	47	1	3/9/2017	SG	61	**2**	
ISP	Southern Marsh (10b)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Breuner Marsh Restoration (10d)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat
ISP	Rheem Creek Area (22c)	A	R3	2/8/2018	ND	61	**5**	2/28/2017	TR	36	0	3/16/2017	AE	55	1	R3 broadcast at RCRA04, 05
ISP	Meeker Slough (22d)	A	R3	2/8/17	SG	61	0	3/3/17	ND	43	0	3/28/17	KE	50	0	R3 broadcast at MEEK03, 04, 05
ISP	Stege Marsh (22d)	A	R3	2/8/17	SG	61	**1**	3/3/17	ND	43	0	3/28/17	KE	50	1	R3 broadcast at MEEK06
ISP	Hoffman Marsh (22e)	A	R3	2/8/17	SG	61	0	3/3/17	ND	43	0	3/28/17	KE	50	0	R3 broadcast at HOM06, 07, 08
ISP	Albany Shoreline (22f)	F	-	-	-	-	-	-	-	-	-	-	-	-	-	Insufficient habitat

VALLEJO REGION

Project	Site Name and ID	Protocol	Broadcast?	Round 1				Round 2				Round 3				Notes
				Date	Observer	Temp (°F)	# RIRA	Date	Observer	Temp (°F)	# RIRA	Date	Observer	Temp (°F)	# RIRA	
ISP	San Pablo Bay NWR Shoreline (26b)	2S	All	2/14/17	SG	46	0	3/1/2017	AE	39	0	3/30/2017	PL	55	0	