2015

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

Coastal Conservancy

California Ridgway's Rail Surveys for the San Francisco Estuary Invasive *Spartina* Project 2015

Report to:

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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). The most recent analysis from Point Blue Conservation Science (PBCS) estimates that the average total population was about 1,167 individuals between 2009 to 2011 (Liu, et al., 2012). The present range of the California Ridgway's rail is limited to the tidal marshes of the San Francisco Estuary, with the exception of occasional observations along the Outer Coast.

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).

In collaboration with partner organizations, including 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 2015. Trained and permitted biologists performed standard-protocol surveys at 158 *Spartina*-invaded sites between January 15 and April 15, 2015. The data were gathered in a geodatabase for analysis and summarized on a site-by-site basis.

The results of surveys conducted in 2015 by OEI and, where available, by DENWR are presented in this report. The ISP relies on partner organizations to collect and report survey results collected at other *Spartina*-invaded sites not surveyed by OEI or DENWR. The summary data presented here represent unique detections of Ridgway's rails within the areas surveyed by OEI and DENWR. These data are not extrapolated beyond the surveyed areas and should not be misinterpreted to be a range-wide population estimate or a comprehensive count of Ridgway's rails at all *Spartina*-invaded sites.

Where available, data from 2010 to 2014 are also included in this report. However, caution should be used when comparing survey results between years. Rails are very difficult to detect and survey results can be highly variable even when there is a stable population. Weather, timing, and observer can all bias results. Additionally, because survey organizations may survey a slightly different subset of sites and survey stations each year, regional summary data presented here cannot be directly compared to past years' reports since survey

effort on a regional scale is not the same each year. The best way to understand Bay-wide trends is through rigorous statistical analysis, which is beyond the scope of this report.

2. Study Area

OEI conducted surveys for California Ridgway's rail within 158 tidal marsh sites (making up 153 Spartina treatment "sub-areas") on the San Francisco Estuary. The study area spanned the counties of Alameda, Contra Costa, Marin, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma (**Figure 1**). Note that the number of sites surveyed for rails exceeds the number of Spartina treatment sub-areas. This is because several sub-areas are divided into smaller sites by partner organizations. For example, the sub-area code "08" includes two rail sites: Palo Alto Baylands and Palo Alto Harbor.

All of the 158 sites surveyed contained non-native *Spartina*, and all but 10 sites were slated for treatment by the ISP in 2015. The remaining 10 sites, shown in red on Figure 1, were surveyed to track local trends in rail populations even though the *Spartina* at these sites would not be treated in 2015. Sixteen of the sub-areas surveyed, shown in orange on Figure 1, were surveyed in previous years by Point Blue Conservation Science (PBCS), and 2015 was the first year OEI conducted surveys at those locations.

Fourteen sites surveyed by OEI in previous years were not surveyed in 2015. These sites were excluded because recent *Spartina* inventory reported no non-native *Spartina* remaining to require treatment, and rail surveys at the sites in recent years had not documented any rails.

DENWR conducted surveys for Ridgway's rail at 12 sites with non-native *Spartina*, including LaRiviere Marsh, Coyote Creek and Islands Ponds, Ideal Marsh North and South, AFCC Marshes, and Whale's Tail South (shown in purple in Figure 1). While the method and details of these surveys are not described in this report, the data from these sites were analyzed along with OEI data and included in the results.

Nine additional sites with non-native *Spartina* were surveyed by others in 2015, but their data and results were not included in this study.

To facilitate presentation and evaluation of rail survey information, the ISP has grouped sites into nine larger reporting regions (**Figure 1**), including Bay Bridge North, San Leandro Bay, Hayward, Union City, Dumbarton South, San Mateo, San Francisco Peninsula, Marin, and San Pablo Bay. **Table 1** provides a summary of survey information for each site surveyed by OEI, grouped by reporting region.

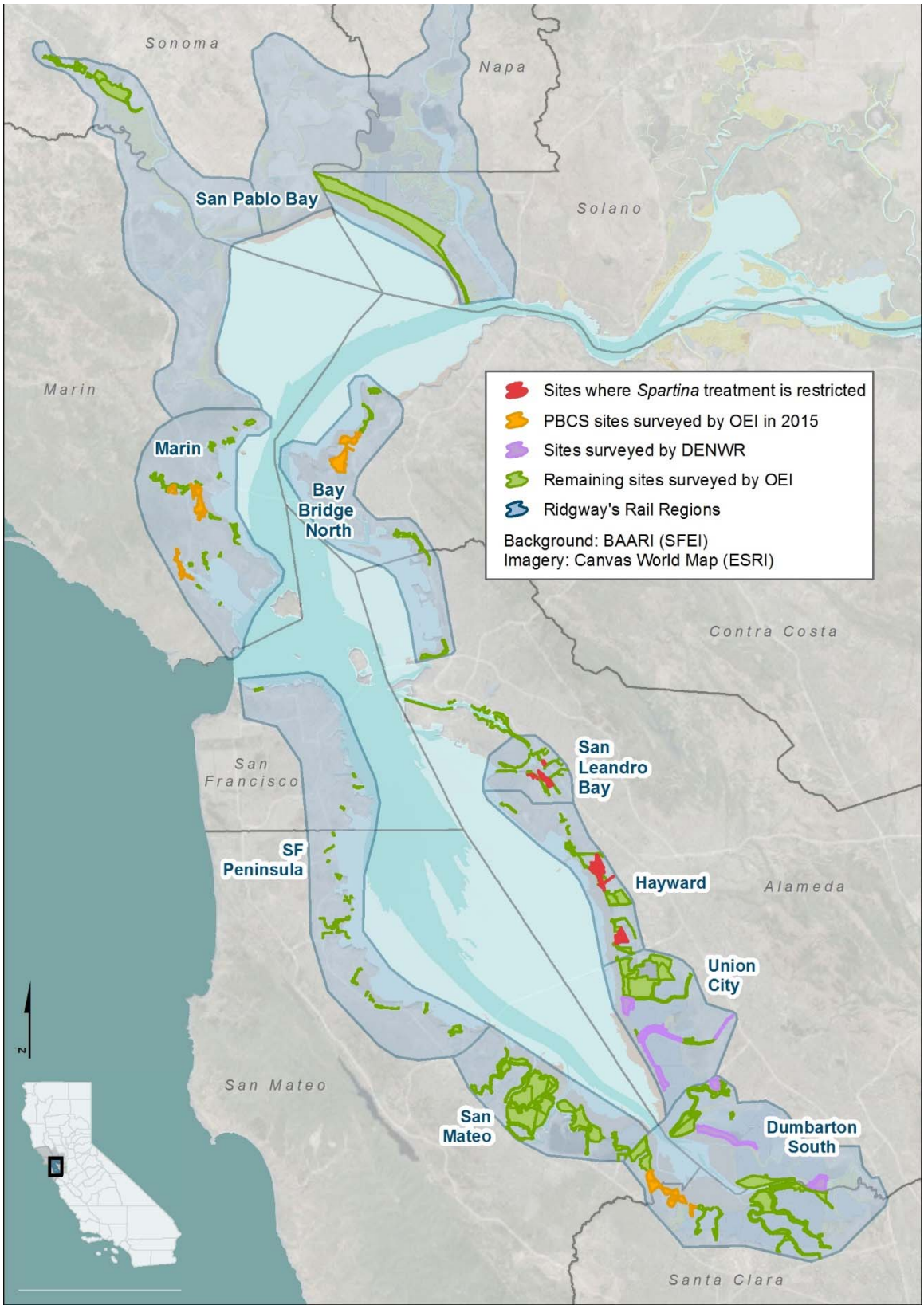

Figure 1. Regional boundaries of sites surveyed for California Ridgway's rail by OEI and DENWR in 2015.

Table 1. Summary of site information grouped by region. Survey protocols are described in detail in the Methods Section 3.1. Site areas were defined in GIS based on the intersection of *Spartina* treatment sub-areas and areas where rails could potentially be found (generally excluding areas such as large mudflats and riprap shorelines). Survey area and the proportion of site surveyed were calculated assuming a 200 meter detection area around each survey station, though rails were frequently detected beyond this threshold. Survey area was considered null for sites lacking suitable breeding habitat during the initial F-survey site assessment.

REGION: Bay Bridge North						
Site Name and ID	**Survey Protocol**	**Number of Stations**	**Station Placement**	**Site Area (ha)**	**Survey Area (ha)**	**Proportion of Site Surveyed**
Emeryville Crescent - East (06a)	C	2	marsh edge	21.93	5.89	27%
Emeryville Crescent - West (06b)	A	7	road	12.75	12.75	100%
Whittel Marsh (10a)	A	4	footpath	18.16	17.37	96%
Southern Marsh (10b)	F	-	-	3.09	-	-
Giant Marsh (10c)	A	4	footpath	11.75	11.49	98%
Wildcat Marsh (22a)	A	8	boardwalk	117.14	53.56	46%
San Pablo Marsh (22b)	A	5	boardwalk	65.60	40.90	62%
Rheem Creek Area (22c)	A	4	footpath	10.04	8.99	89%
Stege Marsh (22d)	A	2	footpath	11.46	10.65	93%
Meeker Slough (22d)	A	2	footpath	9.70	8.54	88%
Hoffman Marsh (22e)	A	3	footpath	14.58	13.55	93%
Albany Shoreline (22f)	F	-	-	5.30	-	-
REGION: San Leandro Bay						
Site Name and ID	**Survey Protocol**	**Number of Stations**	**Station Placement**	**Site Area (ha)**	**Survey Area (ha)**	**Proportion of Site Surveyed**
Elsie Roemer (17a)	C	7	footpath	7.19	7.06	98%
Bay Farm Island (17b)	F	-	-	3.07	-	-
Arrowhead Marsh (17c)	B	1	marsh edge	17.77	5.95	33%
Airport Channel - Fan Shore (17d.1)	F	-	-	3.04	-	-
MLK Regional Shoreline - Damon (17d.4)	A	3	footpath	4.09	4.09	100%
San Leandro Creek (17e)	A	7	footpath	2.99	2.99	100%
Oakland Inner Harbor (17f)	F	-	-	13.02	-	-
Coast Guard Is (17g)	F	-	-	1.26	-	-
MLK New Marsh (17h)	A	7	footpath	13.89	13.86	100%
Coliseum Channels (17i)	F	-	-	5.43	-	-
Fan Marsh (17j)	A	3	road & levee	5.05	4.99	99%
Airport Channel (17k)	F	-	-	1.64	-	-
Doolittle Pond (17l)	C	2	footpath	1.34	0.84	63%
Alameda Island - East (17m)	F	-	-	2.36	-	-

(Table 1 continued on next page)

Table 1. Summary of site information, continued from previous page.

REGION: Hayward						
Site Name and ID	**Survey Protocol**	**Number of Stations**	**Station Placement**	**Site Area (ha)**	**Survey Area (ha)**	**Proportion of Site Surveyed**
Oro Loma - East (07a)	A	8	old levee	79.74	51.73	65%
Oro Loma - West (07b)	A	16	old levee	52.90	42.97	81%
Oyster Bay Regional Shoreline (20a)	F	-	-	4.61	-	-
Oakland Golf Links (20b)	F	-	-	0.78	-	-
Dog Bone Marsh (20c)	F	-	-	2.85	-	-
Citation Marsh (20d)	A	7	levee	45.09	27.65	61%
East Marsh (20e)	A	0	footpath	15.04	4.55	30%
North Marsh (20f)	A	6	footpath	35.99	33.71	94%
Bunker Marsh (20g)	A	4	footpath	14.49	13.71	95%
San Lorenzo Creek (20h)	A	8	marsh edge	10.93	10.61	97%
Bockman Channel (20i)	F	-	-	1.01	-	-
Sulphur Creek (20j)	A	3	footpath	3.33	3.33	100%
Hayward Landing (20k)	C	1	footpath	1.24	1.24	100%
Johnson's Landing (20l)	F	-	-	4.10	-	-
Cogswell - Sec A (20m)	A	7	footpath	14.11	14.06	100%
Cogswell - Sec B (20n)	A	7	footpath	40.53	37.28	92%
Cogswell - Sec C (20o)	A	7	footpath	20.15	20.11	100%
Hayward Shoreline Outliers (20p)	F	-	-	1.57	-	-
San Leandro Shoreline Outliers (20q)	F	-	-	4.68	-	-
Oakland Airport (20r)	C	3	road	7.66	5.23	68%
HARD Marsh (20s)	A	5	footpath	26.65	21.32	80%
San Leandro Marina (20t)	F	-	-	3.93	-	-
Estudillo Creek Channel (20u)	F	-	-	5.81	-	-
Hayward Landing Canal (20v)	F	-	-	4.79	-	-
Triangle Marsh - Hayward (20w)	C	2	footpath	5.00	3.67	74%

(Table 1 continued on next page)

Table 1. Summary of site information, continued from previous page.

Site Name and ID	Survey Protocol	Number of Stations	Station Placement	Site Area (ha)	Survey Area (ha)	Proportion of Site Surveyed
REGION: Union City						
AFCC - Upper (01c)	G	13	levee	30.47	29.61	97%
AFCC - Strip Marsh (01e)	F	-	-	2.94	-	-
OAC - North Bank (13a)	A	6	levee	10.87	10.11	93%
OAC - Island (13b)	A	9	footpath	37.94	34.99	92%
OAC - South Bank (13c)	A	6	footpath	9.75	8.98	92%
Whale's Tail - North (13d)	A	8	footpath	56.89	26.63	47%
OAC - Upstream 20 Tide Gates (13g)	F	-	-	10.14	-	-
Eden Landing - North Creek (13h)	F	-	-	14.51	-	-
Eden Landing - Pond 10 (13i)	F	-	-	87.46	-	-
Eden Landing - Mt Eden Creek (13j)	C	6	footpath	50.52	24.95	49%
Eden Landing Reserve - South (13k)	C	4	footpath	96.98	16.21	17%
Eden Landing Reserve - North (13l)	C	4	levee	92.99	32.41	35%
Eden Landing - Ponds E8A, E9, E8X (13m)	F	-	-	272.71	-	-
REGION: Dumbarton South						
Ravenswood Open Space Preserve (02j)	F	-	-	9.19	-	-
SF2 (02n)	F	-	-	98.18	-	-
Calaveras Point (05a.2)	A	8	levee	184.41	28.86	16%
Dumbarton/Audubon (05b)	A	7	levee	201.34	72.00	36%
Newark Slough (05c)	A	7	bay trail	97.27	21.25	22%
Mayhew's Landing (05e)	C	2	footpath	11.31	8.51	75%
Cargill Pond (W Suites Hotel) (05g)	C	1	footpath	7.36	7.09	96%
Plummer Creek Mitigation (05h)	C	3	footpath	6.73	6.55	97%
Palo Alto Baylands (08)	A	7	footpath	47.02	29.92	64%
Palo Alto Harbor (08)	A	6	footpath	51.94	35.68	69%
Charleston Slough (15a.1)	A	2	footpath	14.66	10.72	73%
Mountain View Slough (15a.1)	A	2	levee	29.94	8.85	30%
Stevens Creek to Long Point (15a.2)	A	5	levee	23.03	14.52	63%
Guadalupe Slough (15a.3)	A	8	levee	127.96	35.92	28%
Alviso Slough (15a.4)	A	8	levee	176.58	25.39	14%
Coyote Creek South East (15a.5)	A	8	levee	84.34	42.01	50%
Knapp Tract (15a.6)	F	-	-	154.94	-	-
Faber Marsh (15b)	A	5	footpath	46.87	40.63	87%
Laumeister Marsh (15b)	A	6	footpath	36.54	22.43	61%
Stevens Creek (15c)	C	2	levee	11.27	8.42	75%
Cooley Landing (16)	A	8	footpath	70.86	45.07	64%

(Table 1 continued on next page)

Table 1. Summary of site information, continued from previous page.

REGION: San Mateo						
Site Name and ID	**Survey Protocol**	**Number of Stations**	**Station Placement**	**Site Area (ha)**	**Survey Area (ha)**	**Proportion of Site Surveyed**
Belmont Slough (02a.1)	A	8	footpath	72.08	27.44	38%
Redwood Shores (02a.3)	A	6	footpath	52.25	23.58	45%
Redwood Shores Mitigation Bank (02a.4)	F	-	-	35.96	-	-
Corkscrew Slough (02b.1)	A	7	boat	92.03	33.08	36%
Steinberger Slough (02b.2)	C	6	footpath	42.74	16.61	39%
B2 North Quadrant (02c)	A	7	boat	211.71	86.32	41%
B2 South Quadrant (02d)	A	6	levee	76.12	35.51	47%
West Point Slough - NW (02e)	A	1	road	2.15	2.15	100%
Greco Island - North (02f)	A	8	boardwalk	206.85	63.84	31%
West Point Slough - SW / E (02g)	A	4	road	16.12	10.44	65%
Greco Island - South (02h)	A	6	old levee	96.28	40.35	42%
Ravenswood Slough (02i)	A	7	footpath	47.68	27.61	58%
Middle Bair N (02k)	A	5	boardwalk	89.68	46.83	52%
Middle Bair SE (02k)	A	3	boardwalk	81.05	26.90	33%
Inner Bair Island Restoration (02l)	C	4	footpath	24.13	15.73	65%
Pond B3 Bair Island Restoration (02m)	F	-	-	166.67	-	-
Middle Bair West (02o)	F	-	-	273.24	-	-
REGION: San Francisco Peninsula						
Site Name and ID	**Survey Protocol**	**Number of Stations**	**Station Placement**	**Site Area (ha)**	**Survey Area (ha)**	**Proportion of Site Surveyed**
Pier 94 (12a)	F	-	-	1.68	-	-
Pier 98/Heron's Head (12b)	A	2	footpath	4.42	4.13	93%
Yosemite Channel (12e)	F	-	-	1.34	-	-
Candlestick Cove (12f)	F	-	-	0.75	-	-
Crissy Field (12g)	F	-	-	5.76	-	-
Colma Creek (18a)	F	-	-	2.81	-	-
Sam Trans Peninsula (18e)	C	1	footpath	5.78	1.66	29%
Confluence Marsh (18f)	F	-	-	2.92	-	-
San Bruno Marsh (18g)	C	4	footpath	11.53	9.04	78%
San Bruno Creek (18h)	F	-	-	2.06	-	-
Brisbane Lagoon (19a)	F	-	-	4.19	-	-
Sierra Point (19b)	F	-	-	0.98	-	-
Oyster Point Marina (19d)	F	-	-	0.67	-	-
Oyster Point Park (19e)	F	-	-	0.96	-	-
Point San Bruno (19f)	F	-	-	1.06	-	-
Seaplane Harbor (19g)	F	-	-	1.67	-	-
SFO (19h)	A	4	road	10.18	6.60	65%
Mills Creek Mouth (19i)	F	-	-	1.11	-	-
Easton Creek Mouth (19j)	F	-	-	2.50	-	-
Sanchez Marsh (19k)	F	-	-	6.14	-	-
Burlingame Lagoon (19l)	F	-	-	2.16	-	-
Coyote Point Marina (19n)	F	-	-	4.85	-	-
Seal Slough (19p)	A	5	marsh edge	27.74	22.36	81%

(Table 1 continued on next page)

Table 1. Summary of site information, continued from previous page.

REGION: Marin						
Site Name and ID	**Survey Protocol**	**Number of Stations**	**Station Placement**	**Site Area (ha)**	**Survey Area (ha)**	**Proportion of Site Surveyed**
Blackie's Creek (03a)	F	-	-	0.22	-	-
Blackie's Creek Mouth (03b)	F	-	-	0.40	-	-
CMC Marsh Reserve (Heerdt Marsh) (04a)	A	6	marsh	31.21	31.17	100%
College of Marin (04b)	A	1	footpath	1.79	1.00	56%
Piper Park - East (04c)	A	2	marsh edge	4.09	4.06	99%
Piper Park - West (04d)	A	3	footpath	5.60	5.60	100%
Larkspur Ferry Landing Area (04e)	F	-	-	0.42	-	-
Riviera Circle (04f)	F	-	-	1.56	-	-
Creekside Park (04g)	A	4	footpath	8.40	8.40	100%
CMC - Upper (04h)	A	5	footpath	5.53	5.20	94%
CMC - Lower (04i)	A	2	footpath	6.44	2.55	40%
CMC - Mouth (04j)	A	5	footpath	7.35	6.94	94%
Boardwalk No. 1 (04k)	A	0	-	3.42	3.42	100%
Pickleweed Park (09)	A	3	footpath	5.73	5.73	100%
Brickyard Cove (23a)	F	-	-	16.97	-	-
Beach Drive (23b)	F	-	-	3.51	-	-
Loch Lomond Marina (23c)	F	-	-	1.86	-	-
San Rafael Canal Mouth (23d)	A	2	road	2.71	2.71	100%
Martas Marsh (23e)	A	5	levee	8.02	7.96	99%
San Clemente Creek (23e)	A	1	levee	7.59	3.77	50%
Muzzi Marsh (23e)	A	6	levee	56.03	39.68	71%
Paradise Cay (23f)	F	-	-	9.05	-	-
Greenwood Beach (23g)	F	-	-	1.60	-	-
Strawberry Point (23h)	F	-	-	5.57	-	-
Strawberry Cove (23i)	F	-	-	4.27	-	-
Bothin Marsh (23j)	A	8	footpath	42.96	32.53	76%
Sausalito (23k)	F	-	-	2.22	-	-
Starkweather Park (23l)	F	-	-	3.36	-	-
Triangle Marsh - Marin (23n)	C	2	road	7.73	5.87	76%
REGION: San Pablo Bay - Vallejo and Petaluma						
Site Name and ID	**Survey Protocol**	**Number of Stations**	**Station Placement**	**Site Area (ha)**	**Survey Area (ha)**	**Proportion of Site Surveyed**
Petaluma River - Upper (24a)	A	3	footpath	55.91	25.64	46%
Grey's Field (24b)	A	3	footpath	43.94	13.08	30%
Ellis Creek (24c)	A	2	footpath	218.28	8.44	4%
San Pablo Bay NWR Shoreline (26b)	C	5	levee	1043.14	19.60	2%

3. Methods

3.1 Field Methods

California Ridgway's rail surveys were conducted between January 15 and April 15, 2015, using standardized survey protocols approved by the USFWS (**Appendix I**: 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.: Jeanne Hammond, Jeffrey Lewis, Jen McBroom, Stephanie Chen, Tobias Rohmer, Whitney Thornton, Ilana Stein, Anastasia Ennis, Simon Gunner, Nina Hill, and Monica Oey.

In 2015, OEI surveyed 158 *Spartina*-invaded sites for Ridgway's rails or for presence of rail habitat. Call count surveys were conducted at 97 sites: 76 sites were surveyed using Protocol A, 19 sites were surveyed using Protocol C, one site was surveyed using Protocol B, and one site was surveyed using Protocol G. The remaining 61 sites were evaluated for the presence of habitat only (F-survey) and were deemed unlikely to be used by breeding rails. A description of each survey protocol employed by ISP biologists in 2015 is summarized below.

3.1.1. Protocol A: Passive Call Count Survey

Protocol A is the standard survey protocol written by USFWS biologists and used by researchers throughout the San Francisco Estuary. This survey type is used at sites where Ridgway's rails have been observed within the past two years. Typically, survey stations are placed at 200-meter (m) intervals on peripheral paths around the site. The number of survey stations established at each site varied due to site size, configuration, and accessibility. **Table 1** shows the number of survey stations at each site. The locations of the survey stations were entered into a GIS and navigated to in the field using a GPS unit. For consistency and repeatability, all efforts were made to use the same survey station locations that were established during the previous survey seasons (see Appendix II: 2015 SURVEY STATION COORDINATES for a complete list of survey stations used in 2015).

Sites were visited at least three times during the season, with at least two weeks between visits. During the first two rounds, a trained observer stood at each point for 10 minutes, recording all rails detected visually or aurally. For each bird or pair of birds detected the observer recorded: (1) the number of birds, (2) the call type (see **Table 2**), (3) the minute in which the bird(s) called, and (4) distance and angle on a pre-printed datasheet. Additionally, the approximate locations of each rail/pair were plotted on a field map of the site. If during the first two rounds, no Ridgway's rails were detected within a 200 meter radius of a survey station, pre-recorded Ridgway's rail vocalizations were broadcasted after the first five minutes of passive survey during round three. Broadcasts were played for no longer than one minute to elicit a response from rails. The standardized pre-recorded vocalizations were provided by USFWS and were played from a compact disc or mp3 player with portable speakers. If a Ridgway's rail responded during the broadcast call, the speakers and player were immediately turned off to avoid harassment of rails.

3.1.2. Protocol C: Active Call Count Survey

A modified protocol for call count surveys was developed by USFWS and ISP staff to maximize the chances of detecting rails at sites that have a low probability of supporting Ridgway's rails. Protocol C is identical to the standard survey (Protocol A), except that it allows permitted biologists to play pre-recorded rail vocalizations during all three visits to a site. If a rail is detected, the recording must be immediately switched off and cannot be played again within 200 meters of the detection for the remainder of the season.

Sites that are surveyed using Protocol C are typically isolated, small marsh patches that provide marginal or low-quality rail habitat and where Ridgway's rails have not been detected during the prior two years. To determine whether Protocol C is appropriate to use, sites are first evaluated by a rail biologist using Protocol F. However, if a site was surveyed using Protocol C in previous years, it will continue to be surveyed using active call counts until either (1) the site is reevaluated using Protocol F and habitat is determined absent, or (2) a Ridgway's rail is detected, at which point the site will be surveyed using passive surveys (Protocol A).

3.1.3. Protocol B: Stationary Call Count Survey

Protocol B is a stationary call count survey, used infrequently and generally only at sites where Ridgway's rails occur at a high density. 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 2-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. Currently only two sites in the bay are surveyed using Protocol B: Arrowhead Marsh (surveyed by both ISP and EBRPD) and La Riviere (surveyed by DENWR).

3.1.4. Protocol F: Habitat Assessment Survey

This protocol was developed for the ISP in 2005, with guidance from Jules Evens (ARA) and Joy Albertson (USFWS), to determine whether apparently marginal habitat meets a suggested minimum set of criteria for likely Ridgway's rail use. These criteria include restoration status, salinity, tidal regime, marsh size and configuration, levee configuration, marsh elevation, presence of upper marsh vegetation, degree of non-native *Spartina* invasion, distance from the nearest marsh with known Ridgway's rails, degree of channelization, and amount of open water (ponding). If at least four criteria related to probable Ridgway's rail presence were met, there was sufficient probability that Ridgway's rails were present, and a recommendation was made for further call count surveys, usually Protocol C. If these criteria were not met, the site was assumed to not support Ridgway's rails, and no further rail surveys were recommended. Marginal and low-quality sites are (re)evaluated in this fashion every year.

3.1.5. Protocol G: Stationary Survey with Broadcast to Determine Absence

In 2009, the USFWS developed a draft survey protocol for consultants to determine Ridgway's rail absence from a marsh. This protocol was created in order to help biologists determine rail absence from a marsh when construction activities are planned in or adjacent to tidal wetlands during rail breeding season (February 1 to September 1) and surveys are recommended by a USFWS staff to assess potential impacts to rails.

Similar to Protocol B, Protocol G 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, with broadcast of vocalizations played during the third and fourth rounds. 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.

OEI conducted Protocol G surveys at one site in 2015: AFCC – Upper in the Union City Region. This site is typically surveyed using either Protocol A or C by DENWR. However, because OEI was contracted to survey this site using Protocol G for the Alameda County Flood Control District (ACFCD), DENWR did not conduct surveys at the site in 2015.

3.2 Data Management

Staff at OEI used ArcGIS 10.2 (Environmental Systems Research Institute, Redlands, CA) to create a versioned geodatabase to store and manage call count survey data in 2015. The design of the database was based on a preexisting Access database developed by Point Blue Conservation Science in 2005, but has been modified to suit the needs of the ISP. All table elements of the Access database were preserved in the database, along with the spatial components of the data (see **Appendix III**: Database Design for complete geodatabase design).

Data were recorded in the field on paper datasheets (**Appendix IV**: Survey Forms), on paper field maps, and in handheld Yuma GPS units with ArcPad 10.2 mapping software (Environmental Systems Research Institute, Redlands, CA). The GPS units were used both to navigate to survey stations and to digitally record data in the field. During a survey, stations and site boundaries were updated in ArcPad with current visit information, such as weather data and other environmental variables.

Each rail observation was recorded on a paper datasheet with time detected, call type, number of rails, distance, confidence interval for estimated 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/pairs. 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. All other bird species observed at the site were recorded at the bottom of the datasheet. Potential predators of rail nests, young, or adults were also noted.

In the office, data were uploaded from the GPS units and checked in to the geodatabase. Each observer maintained his/her own data in the geodatabase during the field season. Data entered into ArcPad in the field were added to the geodatabase and reviewed for quality and accuracy. Additionally, rail observation data that were recorded on a datasheet in the field

were entered into the geodatabase. OEI staff used the Direction/Length tool in ArcGIS 10.2 to enter the direction (in degrees) and distance (in meters) in order to create a line feature, which were called 'offsets'. A point feature, called 'location,' was created at the end of each offset line to represent the location of each unique rail/pair. When a rail was detected from more than one station, the location point feature was moved toward the intersection of the offset lines, to triangulate a more precise position of the observed rail.

At the end of the field season, all data were proofed against original datasheets for accuracy before analysis. For sites requiring multiple concurrent surveyors, the data for each round were re-evaluated to minimize duplicate counting of rail/pairs when detected by multiple surveyors.

3.3 Data Interpretation

2015 Survey Data

Each type of detection represented a standardized count of individual Ridgway's rails (**Table 2**). For instance, a clatter, which may represent a single unmated bird or a pair, was recorded as a range of one to two birds according to ISP protocol. Different survey organizations make different assumptions of the upper number of rails represented by the varying call types, however, the minimum count is the same for all survey organizations. Thus, for the purposes of our analysis, we report the minimum of the range in rails detected so that data are comparable across years and survey organizations.

The minimum number of detected Ridgway's rails was summed at the end of each round to estimate the total number of rails detected at each site on each round. 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. Once all data were summed for each round at each site, we used the round with the highest minimum count to determine the final minimum number of rails detected for each site.

To visualize these data in maps, survey results are transformed into a density calculation. First, we estimated the survey area, which is based on an assumed detection threshold of 200 meters, beyond which our ability to detect Ridgway's rails is diminished. Survey area is calculated as the area of marsh within 200 meters of each survey station (see **Table 1**). Then, we divided the minimum number of rails detected during the highest survey round by the survey area to estimate the density at the site.

Table 2. Ridgway's rail detection types and the number of rails represented by each detection type according to the varying protocols of each survey organizations.

Detection Code	Detection Type	Number of rails assigned to each call type (by survey organization)		
		ISP	DENWR	PBCS
C	*clatter*	1 - 2	1 - 2	1
D	duet	2	2	2
K	*kek*	1 - 2	1	1
B	*kek-kek-burr*	1 - 2	1	1
KH	*kek-hurrah*	1 - 2	1 - 2	1
AK	*agitated kek*	1 - 2	1	1
SQ	*squawk*	1 - 2	1	1
CH	*churr*	1 - 2	1	1
V	visual	1 - 2	1	1

Six-year Trends

In order to estimate the direction of change in rail data over time, we calculated a linear trend at

each site and for each region over the past six years. We assigned a simple up (↗), down (↘), or straight/stable (→) arrow based on the direction indicated by the slope of the line (rounded to the nearest tenth). This does not imply statistical significance nor that a straight line is the best fit for the data. Instead it offers a quick, simple, and repeatable method to briefly evaluate change in rail data over time. Additionally, we calculated the average number of Ridgway's rails detected over the past six years and calculated the change from the average in 2015.

There are few data gaps over the last six years at the subset of sites included in this report; the sites where they occur are dealt with in one of two ways. Sites with data missing at the beginning of the time series are excluded from the regional summary and are given a trend line at the site level based on the years where data are available. Alternatively, data gaps from the middle of the time series are assigned an average from the year preceding and the year following the gap. These data gaps are included in the regional trends.

4. 2015 Survey Results

A minimum of 670 California Ridgway's rails were present at 51 of the 158 sites surveyed by OEI in 2015. No Ridgway's rails were detected in 2015 at the remaining 107 sites, 61 of which were deemed unsuitable to support breeding rails (surveyed using Protocol F only). Detailed survey results from 2015 are included in **Appendix V: 2015 OEI Survey Results for Each Round**. An additional 34 Ridgway's rails were detected at eleven sites surveyed by staff at Don Edwards National Wildlife Refuge (DENWR). These results are from the Dumbarton South and Union City Regions and are included in the following tables and figures.

Because most sites have been continuously surveyed for the past six years, we are able to compare 2015 regional results with data collected since 2010. Some sites are excluded from the regional summary below because they were not surveyed at the beginning of the time series. These sites include Calaveras Marsh, Coyote Creek SE, and Guadalupe Slough (from the Dumbarton South Region), and represent an additional 35 Ridgway's rails detected in 2015 that are excluded from the table below (**Table 3**).

Ridgway's rail numbers have greatly increased in the past year at the ten sites where *Spartina* control has been prohibited since 2011 (**Figure 2**). These ten sites are limited to only two regions: San Leandro Bay and Hayward Regions. The increase in detections over last year at these ten sites represents an increase of over 55%. In contrast, the number of Ridgway's rails detected at the remaining subset of sites surveyed by OEI has been relatively stable during the study period (**Figure 2**).

Table 3. Survey results from 2010 to 2015 collected by OEI and DENWR summarized across all regions.

	Minimum Number of Ridgway's Rails Detected on High Count								
Region	2010	2011	2012	2013	2014	2015	6-year Average	Change from 6-year Average	6-year Trend
Bay Bridge North	48	44.5	44	53	77	85	59	+26	↗
San Leandro Bay	79	59	53	59	66	88	67	+21	↗
Hayward	57	69	55	38	41	81	57	+24	↗
Union City	24	24	40	25	20	29	27	+2	↘
Dumbarton South	153	166.5	186	150	153	180	165	+15	↗
San Mateo	104	105	97	108	104	134	109	+25	↗
San Francisco Peninsula	7	9	4	6	4	3	6	-3	↘
Marin	100	145	102	55	94	68	94	-26	↘
San Pablo Bay	5	6	5	4	3	2	4	-2	↘
TOTAL	**577**	**628**	**586**	**498**	**562**	**670**	**587**	**83**	↗

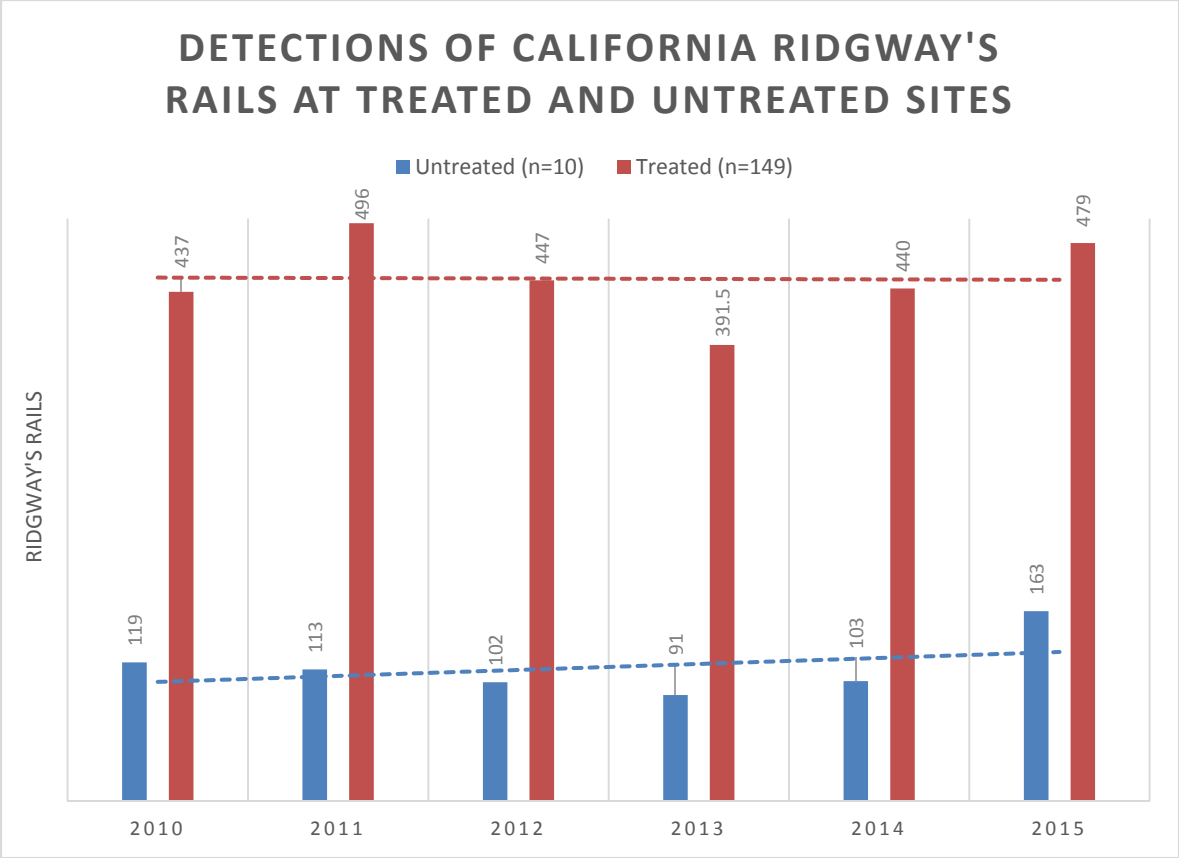

Figure 2. Survey results from 2010 to 2015 at 149 sites without restrictions on *Spartina* treatment (shown in blue) and at the 10 sites where treatment of non-native *Spartina* has been prohibited since 2011 (shown in red). Note that **t**his subset of sites only includes those surveyed by OEI and DENWR; this does not represent a range-wide population estimate**.**

4.1 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 3**). 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 largest and oldest oil refinery on the West Coast operated by Chevron Corporation. The northern portion of this region hosts some large remnant tidal marshes, while those in the southern portion are small isolated marshes.

The region includes twelve ISP rail sites, all of which were surveyed by OEI in 2015 (**Table 4**). Passive call count surveys (Protocol A) were conducted at nine sites and active call count surveys (Protocol C) at one site. Two of the 12 sites, Southern Marsh (10b) and Albany Shoreline (22f), were evaluated for Ridgway's rail habitat (using Protocol F), which was determined to be absent from the sites, and so no further surveys were conducted at those locations.

In general, rail numbers seem to be increasing within the Bay Bridge North Region. At the small marshes at Stege and Meeker Slough, numbers have increased greatly in recent years, rising from a two rails detected in 2010 to a total of 14 in 2015. Wildcat Marsh has also shown a large increase in the past two years, with a minimum of 40 rails detected during the first round.

Table 4. Summary survey results from 2010-2015 at the Bay Bridge North Region.

Site Name (ID)	Minimum Number of Ridgway's Rails Detected on High Count						6-year Average	Change from 6-year Average	6-year Trend
	2010	2011	2012	2013	2014	2015			
Emeryville Crescent - East (06a)	0	0	0	0	0	0	0	0	-
Emeryville Crescent - West (06b)	8	4	0	1	2	0	3	-3	↘
Whittel Marsh (10a)	1	0	1	2	0	3	1	+2	↗
Southern Marsh (10b)	1	0	0	0	0	0	0	0	↘
Giant Marsh (10c)	0	0	1	0	1	0	0	0	↗
Wildcat Marsh (22a)[1]	13	6	10	17	31	40	20	+21	↗
San Pablo Marsh (22b)[1]	22	26	20	12	33	23	23	0	↗
Rheem Creek Area (22c)	1	6	9	11	4	4	6	-2	↗
Meeker Slough (22d)[2]	2	*1.5*	1	3	2	7	3	4	↗
Stege Marsh (22d)[2]	0	*1*	2	6	4	7	3	+4	↗
Hoffman Marsh (22e)	0	0	0	1	0	1	0	+1	↗
Albany Shoreline (22f)	0	0	0	0	0	0	0	0	-
Bay Bridge North Region TOTAL	**48**	**44.5**	**44**	**53**	**77**	**85**	**59**	**+26**	**↗**

[1] These sites have been surveyed by staff at PBCS for all years except 2015.

[2] Data gaps in the middle of the time series were assigned data based on the average of the preceding and subsequent years and are noted by grey italics and shading.

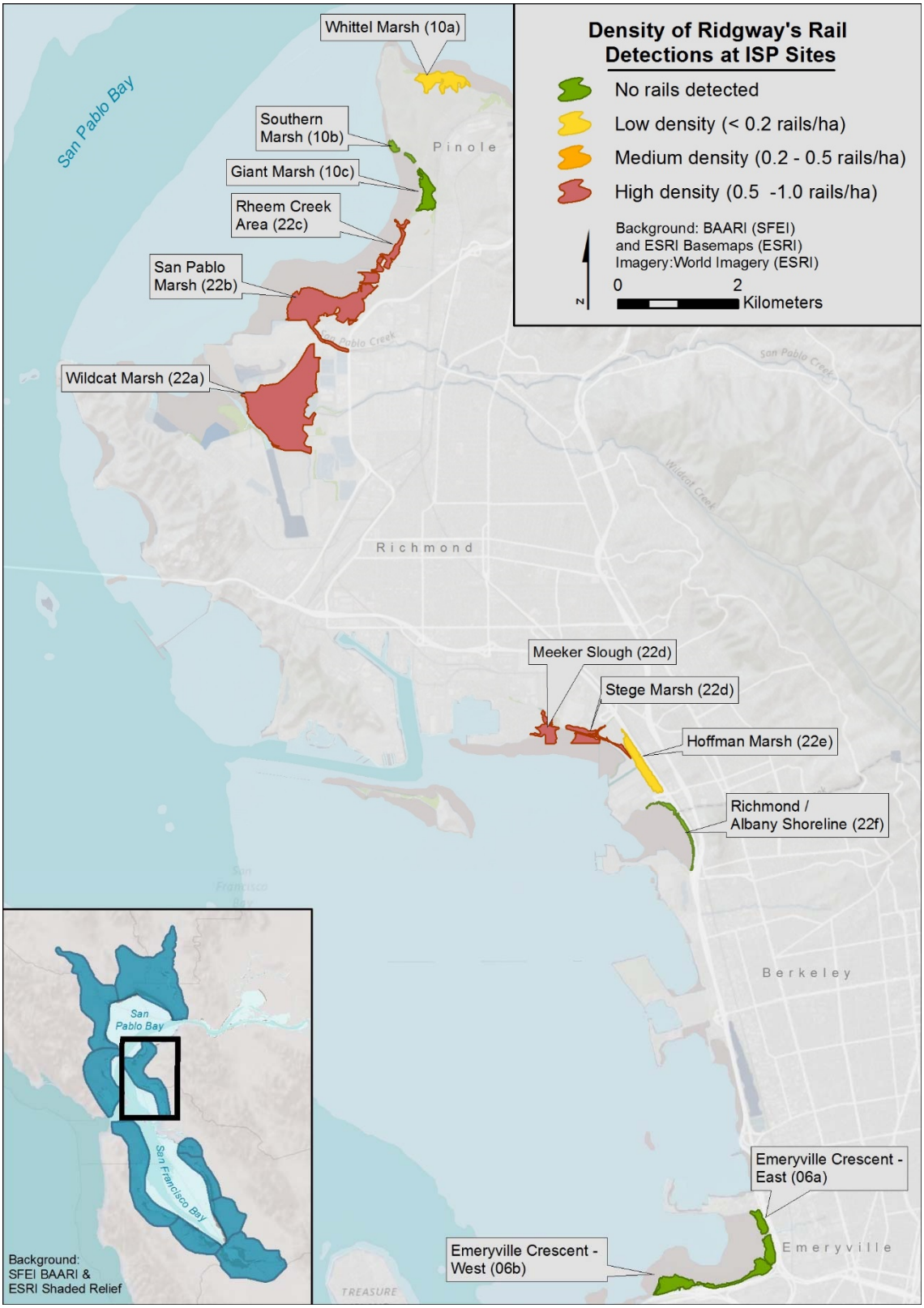

Figure 3. Density of Ridgway's rails detected in 2015 at sites in the Bay Bridge North Region. Density was calculated based on the minimum number of rails detected during the highest round count within the survey area. All sites shown were surveyed by OEI.

4.2 San Leandro Bay Region

The San Leandro Bay Region in Alameda County is bounded by the cities of Oakland and Alameda (**Figure 4**) and is surrounded by commercial development, landfills, highways, and the Oakland Airport. It is a highly urbanized tidal estuary ringed mostly by rip-rap levees, with a few small fragmented parcels of tidal wetlands that evolved in recent decades in places where sediment has accumulated along the shoreline. There are few marshes in the region that have typical marsh characteristics such as channels. One of these marshes is Arrowhead Marsh, which formed when the earthen dam at Lake Chabot ruptured in the 1860's.MLK New Marsh is a young mid-sized marsh that was restored to tidal action in 2000.

The region includes 14 ISP rail sites, all of which were surveyed by OEI in 2015 (**Table 5**). Passive call count surveys (Protocol A) were conducted at four sites and active call count surveys (Protocol C) 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 six years and will continue to be surveyed using this method to maintain consistency between years. Six of the 14 sites were evaluated for Ridgway's rail habitat (using Protocol F), which was determined to be absent from the sites, and so no further surveys were conducted at those locations.

The San Leandro Bay Region has some of the largest remaining populations of non-native *Spartina* in the entire estuary. Four of the fourteen sites in the region have been left entirely or partly untreated since 2011 due concerns over rails dependent on the cover provided by the hybrid *Spartina*. In 2015, nearly all of the rails detected in the region were detected within the four sites where *Spartina* treatment is restricted, and they were often detected at very high densities. In fact, out of all of the sites in the Bay that OEI surveyed in 2015, only five sites were categorized at 'very high density' (defined as greater than one rail detected per hectare surveyed); and three of those five sites, Arrowhead Marsh, MLK New Marsh, and Damon Marsh, were untreated sites in San Leandro Bay -. To note, Arrowhead Marsh is surveyed using Protocol B, which may result in over-counting birds. However, the density of rails at this site likely would still qualify as very high even if it were surveyed using standard protocols.

The high densities and large increases in rail numbers in the region are thought to be attributable to the increasing hybrid *Spartina* cover at the sites with treatment restrictions. Hybrid *Spartina* provides taller and thicker vegetative cover than native *Spartina foliosa* and it is likely that the Ridgway's rail population in this region currently exceeds what the native ecosystem could support here. Additionally, native *Spartina foliosa* is nearly absent from the region, having been outcompeted 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. 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 the efforts to accelerate restoration in the region. As non-native *Spartina* grows and spreads, there are fewer and fewer suitable areas to reintroduce native plants.

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.

Table 5. Survey results from 2010-2015 in the San Leandro Bay Region. Sites where *Spartina* control work has been suspended since 2011 are noted in grey.

Site Name (ID)	Minimum Number of Ridgway's Rails Detected on High Count						6-year Average	Change from 6-year Average	6-year Trend
	2010	2011	2012	2013	2014	2015			
Elsie Roemer (17a)	1	0	0	0	0	0	0	0	↘
Bay Farm Island (17b)	0	0	0	0	0	0	0	0	-
Arrowhead Marsh (17c)	41	31	32	34	35	45	36	+9	↗
Airport Channel - Fan Shore (17d.1)	1	2	0	0	0	0	1	-1	↘
MLK Regional Shoreline - Damon (17d.4)	5	4	1	2	2	2	3	-1	↘
San Leandro Creek (17e)	3	1	0	0	0	2	1	+1	↘
Oakland Inner Harbor (17f)	0	0	0	0	0	0	0	0	-
Coast Guard Is (17g)	0	0	0	0	0	0	0	0	-
MLK New Marsh (17h)	14	13	18	21	25	30	20	+10	↗
Coliseum Channels (17i)	0	0	0	0	0	0	0	0	-
Fan Marsh (17j)	12	8	2	2	4	9	6	+3	↘
Airport Channel (17k)	0	0	0	0	0	0	0	0	-
Doolittle Pond (17l)	1	0	0	0	0	0	0	0	↘
Alameda Island - East (17m)	1	0	0	0	0	0	0	0	↘
San Leandro Bay Region TOTAL	**79**	**59**	**53**	**59**	**66**	**88**	**67**	**+21**	↗

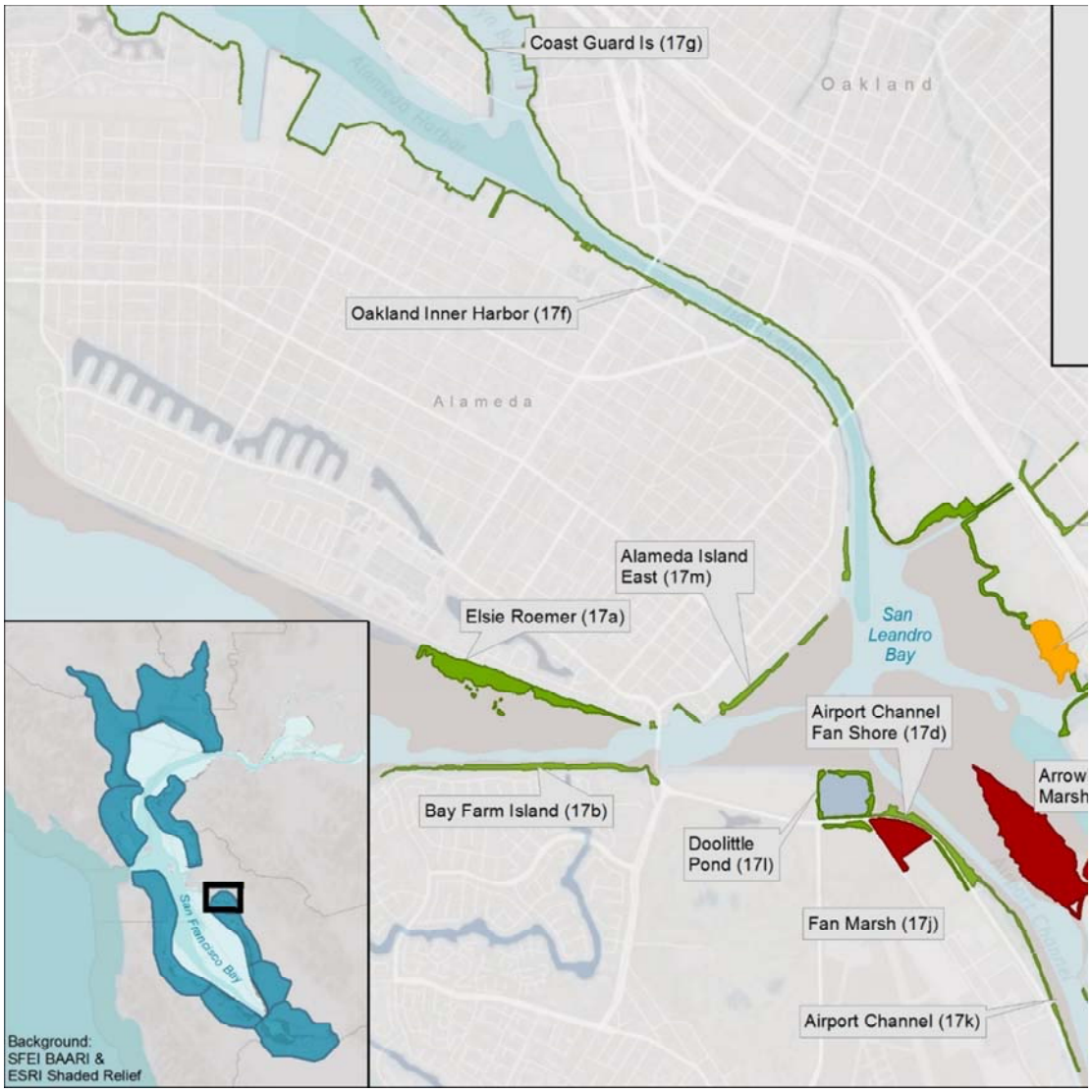

Figure 4. Density of Ridgway's rail detected in 2015 at ISP sites in the San Leandro Bay Region. Density was calculated based on the minimum number of rails detected during the highest round count within the survey area.

4.3 Hayward Region

The Hayward Region in Alameda County extends from the Oakland Airport south to the San Mateo Bridge (**Figure 6**). Most of the sites within the region are mid-sized marshes that were restored to tidal flow in recent decades. These sites generally exhibit the simple vegetative composition and channel structure characteristic of young restoration marshes. The lack of channel density and vegetative structure provides mediocre habitat and cover from predators for Ridgway's rails. Additionally, there are many predators within this region that were frequently observed during surveys, including a den of red foxes on a levee adjacent to one of the large marsh complexes (Robert's Landing).

OEI surveyed all 25 sites within the region and detected a minimum of 81 Ridgway's rails at eight of the 25 sites (**Table 6**). No rails were found at the remaining 17 sites. Six sites within the Hayward Region have had treatment restrictions since 2011 and hybrid *Spartina* cover has been expanding at these sites since then. In 2015, rail surveys suggest a positive response in rail detections corresponding with the increase in non-native *Spartina* cover. Large increases in rail numbers are particularly evident at the Cogswell Marshes, where two of the three sites have not been treated since 2011. The combined total number of rails detected in the Cogswell Complex increased from 15 rails in 2014 to 39 rails in 2015 (an increase of 160% in a single year). Also, notably, North Marsh (20f) within the Robert's Landing Complex increased from six rails detected in 2014 to 27 rails detected in 2015 (an increase of 350%). Interestingly, the other three untreated sites in the Robert's Landing Complex (Bunker Marsh, Citation Marsh, and San Lorenzo Creek) show stable to decreasing trends. The rail population at these sites may be depressed due to fox predation from the resident red foxes.

The Coastal Conservancy has heavily invested in revegetation and other habitat enhancements in the region, particularly at the Cogswell Complex. They have funded the installation of six high tide refuge islands at the Cogswell Complex 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 three years (**Figure 5**).

Like San Leandro Bay, this region lacks native *Spartina foliosa*, which has been 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. The ISP hopes to expand *Spartina foliosa* planting areas as more sites in the Hayward Region near eradication.

Figure 5. Mature *Grindelia stricta* planted at Cogswell Marsh in 2011 by the ISP Restoration

Table 6. Survey results from 2010 to 2015 in the Hayward Region. Sites where *Spartina* control work has been suspended since 2011 are noted in grey.

Site Name (ID)	Minimum Number of Ridgway's Rails Detected on High Count						6-year Average	Change from 6-year Average	6-year Trend
	2010	2011	2012	2013	2014	2015			
Oro Loma - East (07a)	4	6	4	1	1	1	3	-2	↘
Oro Loma - West (07b)	0	0	1	3	0	1	1	0	↗
Oyster Bay Regional Shoreline (20a)	0	0	0	0	0	0	0	0	-
Oakland Golf Links (20b)	0	0	0	0	0	0	0	0	-
Dog Bone Marsh (20c)	0	0	0	0	0	0	0	0	-
Citation Marsh (20d)	5	20	6	2	9	7	8	-1	↘
East Marsh (20e)	0	1	0	1	2	0	1	-1	↗
North Marsh (20f)	12	14	8	5	6	27	12	+15	↗
Bunker Marsh (20g)	4	8	8	5	6	6	6	0	→
San Lorenzo Creek (20h)	3	4	2	1	1	0	2	-2	↘
Bockman Channel (20i)	0	0	0	0	0	0	0	0	-
Sulphur Creek (20j)	0	0	0	0	0	0	0	0	-
Hayward Landing (20k)	0	1	0	0	0	0	0	0	↘
Johnson's Landing (20l)	0	0	0	0	0	0	0	0	-
Cogswell - Sec A (20m)	6	3	0	1	0	2	2	0	↘
Cogswell - Sec B (20n)	20	9	17	18	13	26	17	+9	↗
Cogswell - Sec C (20o)	3	2	8	1	2	11	5	+7	↗
Hayward Shoreline Outliers (20p)	0	0	0	0	0	0	0	0	-
San Leandro Shoreline Outliers (20q)	0	0	0	0	0	0	0	0	-
Oakland Airport (20r)	0	0	0	0	0	0	0	0	-
HARD Marsh (20s)	0	0	1	0	1	0	0	0	↗
San Leandro Marina (20t)	0	0	0	0	0	0	0	0	-
Estudillo Creek Channel (20u)	0	0	0	0	0	0	0	0	-
Hayward Landing Canal (20v)	0	0	0	0	0	0	0	0	-
Triangle Marsh - Hayward (20w)	0	1	0	0	0	0	0	0	↘
Hayward Region TOTAL	**57**	**69**	**55**	**38**	**41**	**81**	**57**	**+24**	↗

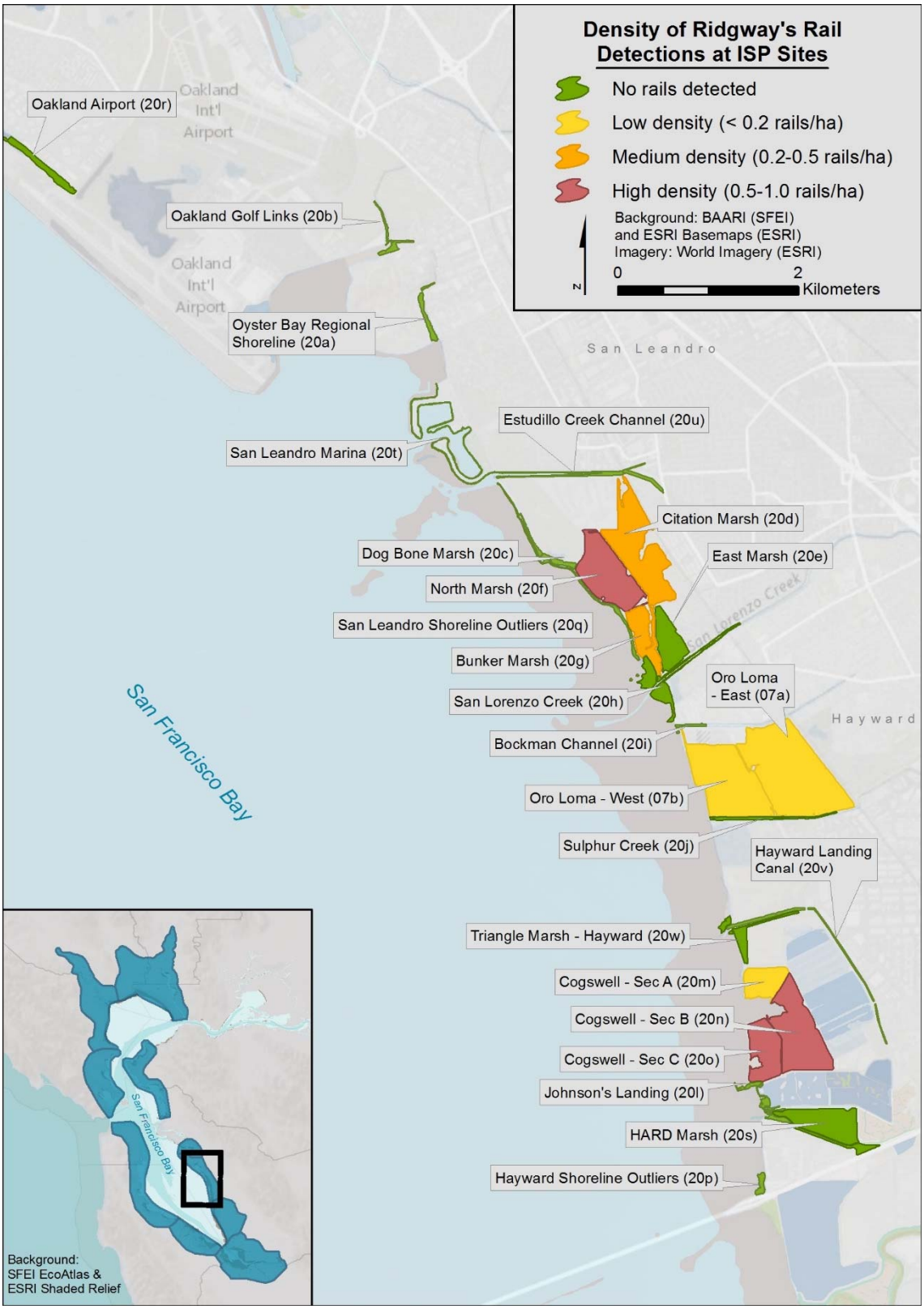

Figure 6. Density of Ridgway's rail detected in 2015 at ISP sites in the Hayward Region. Density was calculated based on the minimum number of rails detected during the highest round count within the survey area.

4.4 Union City Region

The Union City Region in Alameda County extends from the San Mateo Bridge to the Dumbarton Bridge (**Figure 8**). 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 Complex, 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 20 sites in the region in 2015 and detected a minimum of four Ridgway's rails (**Table 7**). One of these 13 sites, AFCC Upper, was surveyed by OEI for the Alameda County Flood Control District (ACFCD) using the USFWS consultant protocol (Protocol G), which is used to determine if rails are absent from the site. The remaining eight sites were surveyed by staff at DENWR, who detected an additional 25 Ridgway's rails within the region in 2015. These data are also presented in the table below.

Ridgway's rail detections in the region have increased since 2014 and the current count is slightly above the six-year average. However, the overall six-year trend is still slightly negative and the marshes in the region generally have a low density of rails.

There has been a deficiency of *Spartina foliosa* in the region since it was overrun by the invasion and subsequent removal of hybrid *Spartina*. The ISP Restoration Program has been reintroducing native *Spartina,* as well as *Grindelia stricta*, to the region over the past four years. In a portion of AFCC where these plantings have had a chance to mature, several Ridgway's rails were detected by DENWR within 150 meters of the plantings (**Figure 7**). This area of AFCC did not support any rails in 2010 and 2011. It is likely that these mature plantings are being used by the rails detected here this year. As both the larger salt pond restoration sites and the ISP plantings mature, more rail habitat will become available and the region's rail population is expected to increase in both size and density.

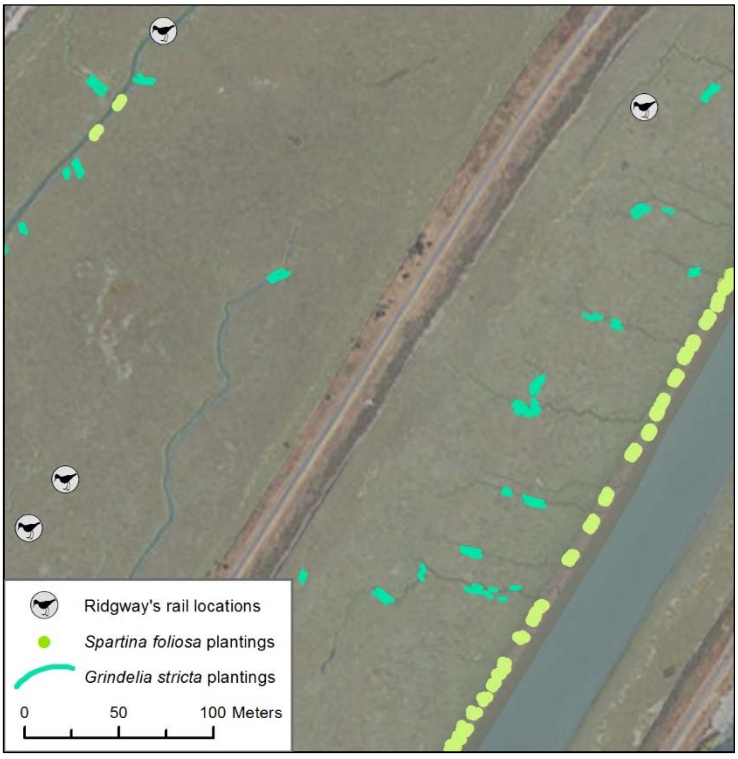

Figure 7. Locations of Ridgway's rails detected by DENWR in 2015 relative to mature ISP *Grindelia stricta* and *Spartina foliosa* plantings at AFCC – Lower (01c).

Table 7. Survey results from 2010 to 2015 in the Union City Region, including sites surveyed by staff at DENWR.

Site Name (ID)	Minimum Number of Ridgway's Rails Detected on High Count						6-year Average	Change from 6-year Average	6-year Trend
	2010	2011	2012	2013	2014	2015			
AFCC - Mouth (01a)[1, 2]	*1*	0	0	2	0	1	1	0	↗
AFCC - Lower (01b)[2]	1	0	3	1	1	1	1	0	→
AFCC - Upper (01c)[3]	0	1	0	0	0	0	0	0	↘
AFCC - to I-880 (01d)[2]	0	0	0	0	0	0	0	0	-
AFCC - Strip Marsh (01e)	0	0	0	0	0	0	0	0	-
AFCC - Pond 3 (01f)[1, 2]	*1*	1	6	2	2	3	3	+1	→
OAC - North Bank (13a)[1]	*1*	0	0	1	1	0	1	-1	↗
OAC - Island (13b)[1]	*5*	2	3	5	4	2	4	-2	↗
OAC - South Bank (13c)[1]	*0*	0	0	0	0	0	0	0	-
Whale's Tail - North (13d)[1]	*5*	8	8	2	3	2	5	-3	↘
Whale's Tail - South (13e)[1, 2]	*6*	6	9	5	1	7	6	+1	↘
Cargill Mitigation Marsh (13f)[1, 2]	*0*	0	0	0	0	3	1	+3	↗
OAC - Upstream 20 Tide Gates (13g)[1]	*0*	0	0	0	0	0	0	0	-
Eden Landing - North Creek (13h)	0	0	0	0	0	0	0	0	-
Eden Landing - Pond 10 (13i)	0	0	0	0	0	0	0	0	-
Eden Landing - Mt Eden Creek (13j)	2	2	0	0	0	0	1	-1	↘
Eden Landing Reserve - South (13k)	0	0	0	0	0	0	0	0	-
Eden Landing Reserve - North (13l)	0	0	0	0	0	0	0	0	-
Eden Landing - Ponds E8A, E9, E8X (13m)	0	0	0	0	0	0	0	0	-
Ideal Marsh - North (21a)[2]	*0*	0	0	1	0	0	0	0	→
Ideal Marsh - South (21b)[2]	*2*	4	11	6	8	10	7	+3	↗
Union City Region TOTAL	**24**	**24**	**40**	**25**	**20**	**29**	**27**	**+2**	↘

[1] Data gaps from 2010 in the Union City Region were assigned data based on the average of 2009 (not shown) and 2011 survey results and are noted by grey italics and shading.

[2] Data at these sites were collected by staff at DENWR.

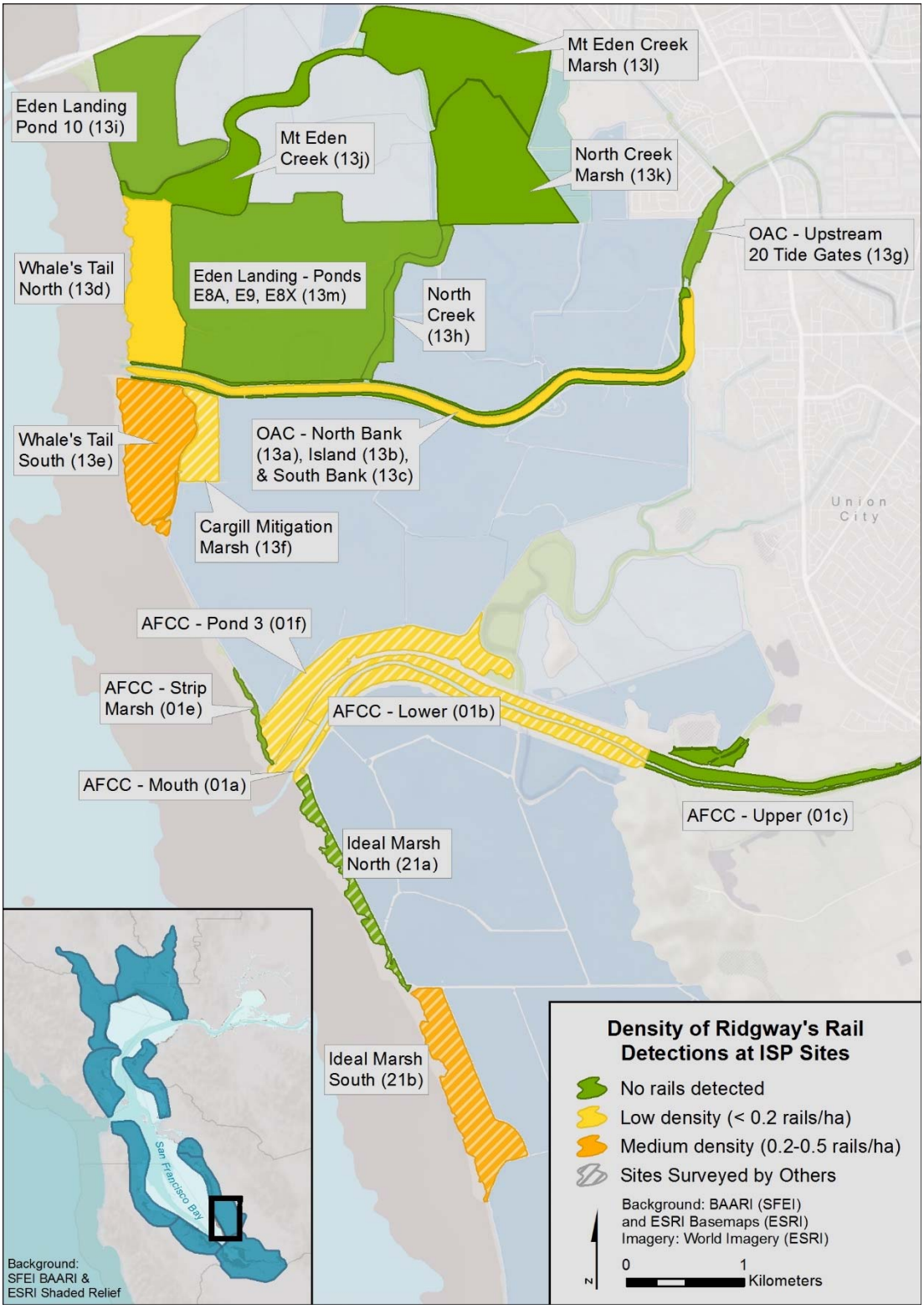

Figure 8. Density of Ridgway's rail detected in 2015 at ISP sites in the Union City Region. Density was calculated based on the minimum number of rails detected during the highest round count within the survey area. Sites not surveyed by the ISP were surveyed by biologists at the Don Edwards National Wildlife Refuge (DENWR).

4.5 Dumbarton South Region

Dumbarton South includes all marshes south of the Dumbarton Bridge, from Newark to Mountain View (**Figure 9**). 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, such as Laumeister and Faber Marshes.

In 2015, OEI conducted surveys at 24 of the 30 ISP rail sites in the region (**Table 8**). Five of the 24 sites that were surveyed by OEI in 2015 are typically surveyed by PBCS. These include the some of the most heavily occupied sites in the region: Faber and Laumeister Marshes and the marshes of the Palo Alto Baylands. Additionally, biologists at DENWR conducted surveys in the region at three sites included in the table below: La Riviere Marsh (05d), Coyote Creek/Mud Slough (05f), and Island Ponds/A21 (05i). Though staff from DENWR did not detect any rails during their rail surveys at Coyote Creek and the Island Ponds, they did detect several rails in the area during surveys for salt marsh harvest mouse at the end of July 2015 (Rachel Tertes, personal communication, July 28, 2015). Because this is well within the rail breeding season, it is likely that there are breeding rails occupying these two sites that were not detected during call-count surveys.

Rail numbers are trending upward in the Dumbarton South Region. This region represents one of the largest Ridgway's rail population centers in the Bay. Survey results from 2015 indicate a minimum of 180 rails in the region, however there are likely many more rails than that since there are many large tracts of tidal wetlands that are not included in the survey effort. The region's extensive native tidal wetlands are also being expanded with the restoration of several large tracts of former salt ponds to marsh. In fact, one of the more recently restored marshes, Island Ponds A21, is already occupied by rails.

In addition to the restoration of the former salt ponds, the Coastal Conservancy has funded other habitat enhancements in the region to promote the Bay-wide rail population. Over the past several years, high tide refuge islands have been installed at Cooley Landing and more recently at Palo Alto Baylands. Additional islands are planned for installation at Dumbarton Marsh this winter.

Table 8. Survey results from 2010 to 2015 in the Dumbarton South Region.

Site Name (ID)	Minimum Number of Ridgway's Rails Detected on High Count						6-year Average	Change from 6-year Average	6-year Trend
	2010	2011	2012	2013	2014	2015			
Ravenswood Open Space Preserve (02j)	0	0	0	0	0	0	0	0	-
SF2 (02n)[1]	-	-	-	-	0	0	0	0	-
Calaveras Point (05a.2)[1]	-	-	37	19	16	13	21	-8	↘
Dumbarton/Audubon (05b)	13	13	34	25	21	22	21	+1	↗
Newark Slough (05c)	5	5	8	5	3	3	5	-2	↘
LaRiviere Marsh (05d)[2]	14	17	18	20	11	9	15	-6	↘
Mayhew's Landing (05e)[1]	-	0	0	0	0	0	0	0	-
Coyote Creek (05f)[1, 2]	-	-	0	0	0	0	0	0	-
Cargill Pond (W Suites Hotel) (05g)[1]	-	0	0	0	0	0	0	0	-
Plummer Creek Mitigation (05h)[1]	-	-	0	0	0	0	0	0	-
Island Ponds (05i)[2]	0	0	0	0	0	0	0	0	-
Palo Alto Baylands (08)[3]	20	13	13	12	14	15	15	+1	↘
Palo Alto Harbor (08)[3]	17	13	12	15	18	24	17	+8	↗
Mountain View Slough (15a.1)[4]	2	*2.5*	3	0	1	2	2	0	↘
Charleston Slough (15a.1)[3]	2	1	5	3	0	3	2	+1	→
Stevens Creek to Long Point (15a.2)	0	0	0	1	0	0	0	0	→
Guadalupe Slough (15a.3)[1]	-	-	1	0	1	4	2	+3	↗
Alviso Slough (15a.4)	9	4	1	3	2	9	5	+4	↘
Coyote Creek South East (15a.5)[1]	-	9	6	6	8	18	9	+9	↗
Knapp Tract (15a.6)	0	0	0	0	0	0	0	0	-
Faber Marsh (15b)[3]	49	66	69	25	50	46	51	-5	↘
Laumeister Marsh (15b)[3]	19	30	22	25	28	43	28	+15	↗
Stevens Creek (15c)	0	0	0	0	0	0	0	0	-
Cooley Landing (16)	3	2	1	16	5	4	5	-1	↗
Dumbarton South Region TOTAL	**153**	**167**	**186**	**150**	**153**	**180**	**165**	**+15**	**↗**

[1] Sites missing data from the beginning of the time period are excluded from the regional total. The trends and averages for these sites represent less than six years of data.

[2] Data at these sites were collected by staff at DENWR.

[3] These sites have been surveyed by staff at PBCS for all years except 2015.

[4] Data gaps in the middle of the time series were assigned data based on the average of the preceding and subsequent years and are noted by grey italics and shading.

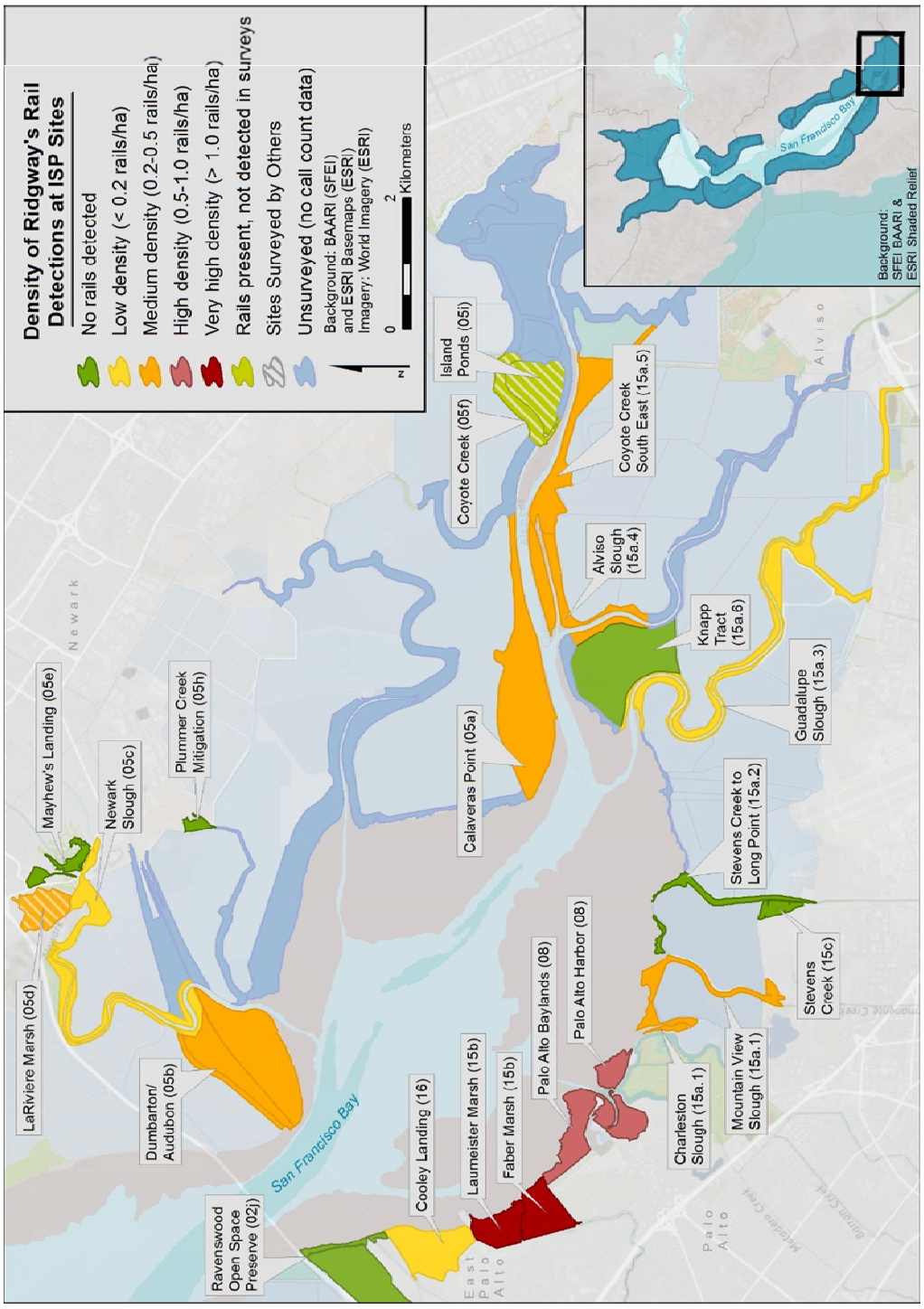

Figure 9. Density of Ridgway's rail detected in 2015 at ISP sites in the Dumbarton South Region. Density was calculated based on the minimum number of rails detected during the highest round count within the survey area. LaRiviere, Mayhew's, and a small portion of Coyote Creek and Island Ponds were surveyed by DENWR. The remaining sites were surveyed by OEI, including Faber, Laumeister, and the Palo Alto Marshes, which are typically surveyed by PBCS. Note, no rails were detected during standard surveys at Island Ponds (05i) and Coyote Creek (05f), however they were detected in July 2015 when DENWR staff were in the area for other surveys.

4.6 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**). 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 19 ISP rail sites, all of which were surveyed by OEI in 2015. OEI detected a minimum of 134 Ridgway's rails in the San Mateo Region in 2015, a continuation of the positive trend in the region (**Table 9**). Most sites had small to moderate increases, indicating a steady upward trend. Ravenswood Slough, however, showed an increase of 500%, rising from two rails detected in 2014 to 12 rails in 2015. This site has shown a boom-bust cycle in the past, increasing from three birds to nine birds and back down to one bird over the years 2010 to 2012.

B2 North also had a notable increase of 260% over the past year, recovering from the decline in 2014. Portions of this site have restrictions on *Spartina* control due to concerns over Ridgway's rails still reliant on invasive *Spartina* for habitat. The north-east portion of B2 North Quadrant, where most of the Ridgway's rails are detected, may only be treated with a sub-lethal dose of herbicide in order to prevent seed set while still retaining vegetative structure for Ridgway's rails (seed suppression). These specific restrictions have been in place since 2012 and non-native *Spartina* is still a significant component of the overall habitat in that portion of the marsh. The ISP is currently monitoring the effects of seed suppression on the height and density of non-native *Spartina* to ensure that it is effective refuge habitat for Ridgway's rails.

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, and Middle Bair (Deepwater Slough). Nine more high tide refuge islands are planned for installation this winter at 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.

Table 9. Survey results from 2010 to 2015 in the San Mateo Region. *Spartina* control work has been restricted to a low dose of herbicide (for seed suppression) in portions of B2 North since 2011 (noted in grey).

Site Name (ID)	Minimum Number of Ridgway's Rails Detected on High Count						6-year Average	Change from 6-year Average	6-year Trend
	2010	2011	2012	2013	2014	2015			
Belmont Slough (02a.1)	3	4	3	3	5	7	4	+3	↗
Redwood Shores (02a.3)	2	2	6	1	0	0	2	-2	↘
Redwood Shores Mitigation Bank (02a.4)	0	0	0	0	0	0	0	0	-
Corkscrew Slough (02b.1)	22	12	17	13	16	15	16	-1	↘
Steinberger Slough (02b.2)	0	0	0	0	0	0	0	0	-
B2 North Quadrant (02c)	14	22	12	20	5	18	15	+3	↘
B2 South Quadrant (02d)	7	6	4	9	3	6	6	0	↘
West Point Slough - NW (02e)	1	2	0	1	0	0	1	-1	↘
Greco Island - North (02f)	9	3	10	6	6	8	7	+1	→
West Point Slough - SW / E (02g)	1	0	1	0	0	0	0	0	↘
Greco Island - South (02h)	24	22	22	22	32	31	26	+6	↗
Ravenswood Slough (02i)	3	9	1	2	2	12	5	+7	↗
Middle Bair SE (02k)	8	9	2	7	7	0	6	-6	↘
Middle Bair N (02k)	10	14	19	24	28	37	22	+15	↗
Inner Bair Island Restoration (02l)	0	0	0	0	0	0	0	0	-
Pond B3 Bair Island Restoration (02m)	0	0	0	0	0	0	0	0	-
San Mateo Region TOTAL	**104**	**105**	**97**	**108**	**104**	**134**	**109**	**+25**	↗

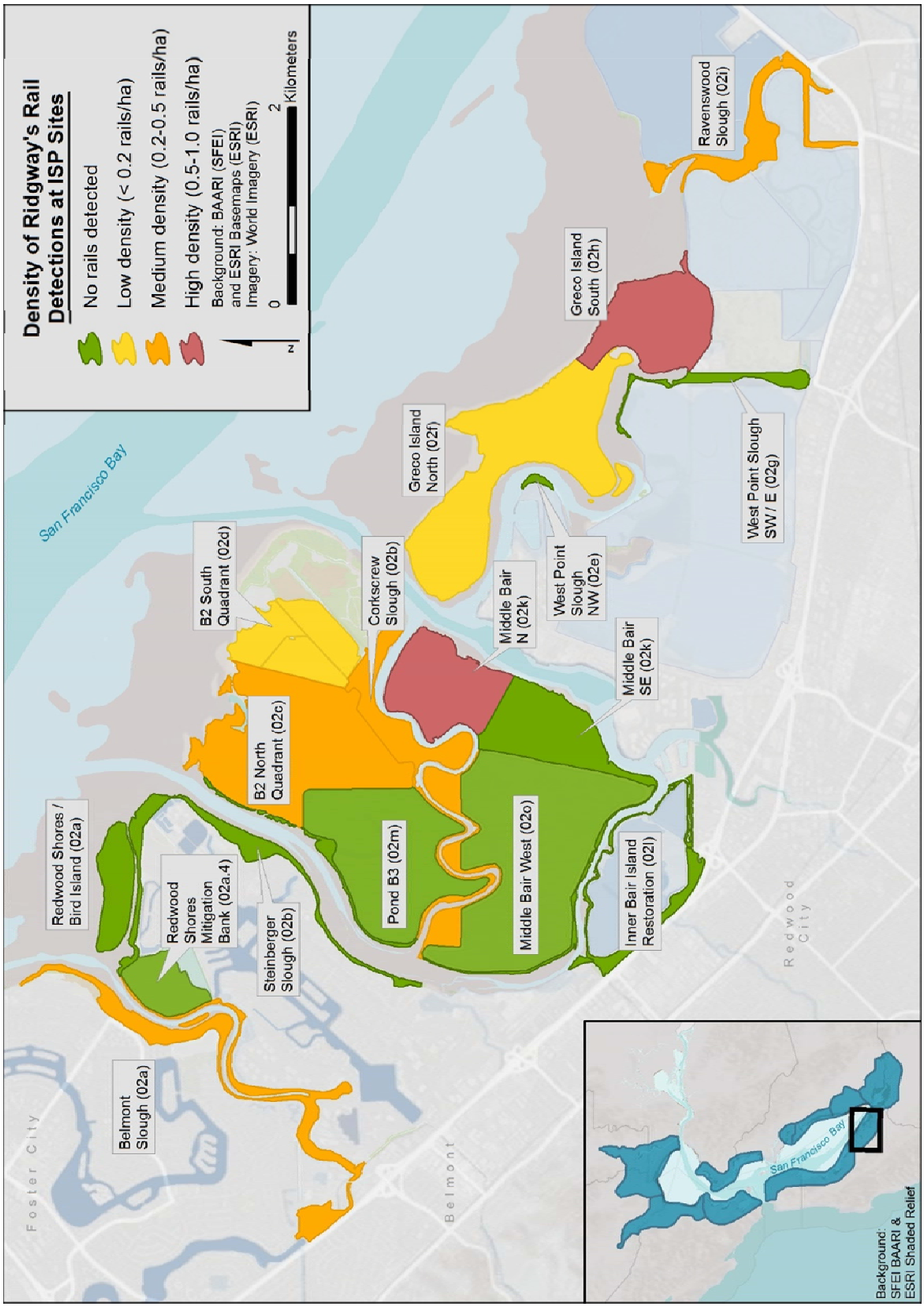

Figure 10. Density of Ridgway's rail detected in 2015 at ISP sites in the San Mateo Region. Density was calculated based on the minimum number of rails detected during the highest round count within the survey area.

4.7 San Francisco Peninsula Region

The San Francisco Peninsula Region extends from the Golden Gate Bridge to the San Mateo Bridge (**Figure 11**). 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 marshes within the Colma Creek complex, as well as the scattered sites along the length of the Peninsula.

The region includes 34 ISP rail sites, all of which were surveyed by OEI in 2015 (**Table 10**). OEI conducted passive call count surveys (Protocol A) at three sites and active call count surveys (Protocol C) at two sites. The remaining 29 sites were assessed for the presence of Ridgway's rail habitat, which was determined to be lacking and no further surveys were necessary.

In 2015, Ridgway's rails were detected at only one site in the region: SFO. No rails were detected at Heron's Head this year and it seems likely that Ridgway's rails are once again absent from San Francisco County. 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 and dispersal to and from these marshes would be a challenge for juveniles. The absence of rails is to be expected with the lack of habitat availability in the region.

There are very few opportunities for habitat enhancement along this urban shoreline. Portions of the Colma Creek complex have been experimentally planted with native *Spartina foliosa* (Whitney Thornton, Romburg Tiburon Center, SFSU) and San Mateo County has continued to plant along the upland transition zone within the Colma Complex. The remaining marsh fragments in the region offer little opportunity for enhancement and are unlikely to sustain rail populations in the future.

Table 10. Survey results from 2010 to 2015 in the San Francisco Peninsula Region.

Site Name (ID)	Minimum Number of Ridgway's Rails Detected on High Count						6-year Average	Change from 6-year Average	6-year Trend
	2010	2011	2012	2013	2014	2015			
Middle Bair West (02o)	0	0	0	0	0	0	0	0	-
Pier 94 (12a)	-	0	0	0	0	0	0	0	-
Pier 98/Heron's Head (12b)	1	1	1	3	1	0	1	-1	↘
Yosemite Channel (12e)	0	0	0	0	0	0	0	0	-
Candlestick Cove (12f)	0	1	0	0	0	0	0	0	↘
Crissy Field (12g)	-	0	0	0	0	0	0	0	-
Colma Creek (18a)	0	0	0	0	0	0	0	0	-
Sam Trans Peninsula (18e)	1	0	0	0	0	0	0	0	↘
Confluence Marsh (18f)	1	2	0	0	0	0	1	-1	↘
San Bruno Marsh (18g)	0	0	0	0	0	0	0	0	-
San Bruno Creek (18h)	0	0	0	0	0	0	0	0	-
Brisbane Lagoon (19a)	0	0	0	0	0	0	0	0	-
Sierra Point (19b)	0	0	0	0	0	0	0	0	-
Oyster Point Marina (19d)	0	0	0	0	0	0	0	0	-
Oyster Point Park (19e)	0	0	0	0	0	0	0	0	-
Point San Bruno (19f)	2	0	0	0	0	0	0	0	↘
Seaplane Harbor (19g)	0	0	0	0	0	0	0	0	-
SFO (19h)	1	2	3	2	3	3	2	+1	↗
Mills Creek Mouth (19i)	0	0	0	0	0	0	0	0	-
Easton Creek Mouth (19j)	0	0	0	0	0	0	0	0	-
Sanchez Marsh (19k)	0	0	0	0	0	0	0	0	-
Burlingame Lagoon (19l)	0	0	0	0	0	0	0	0	-
Coyote Point Marina (19n)	0	0	0	0	0	0	0	0	-
Seal Slough (19p)	1	3	0	1	0	0	1	-1	↘
SF Peninsula Region TOTAL	**7**	**9**	**4**	**6**	**4**	**3**	**6**	**-3**	**↘**

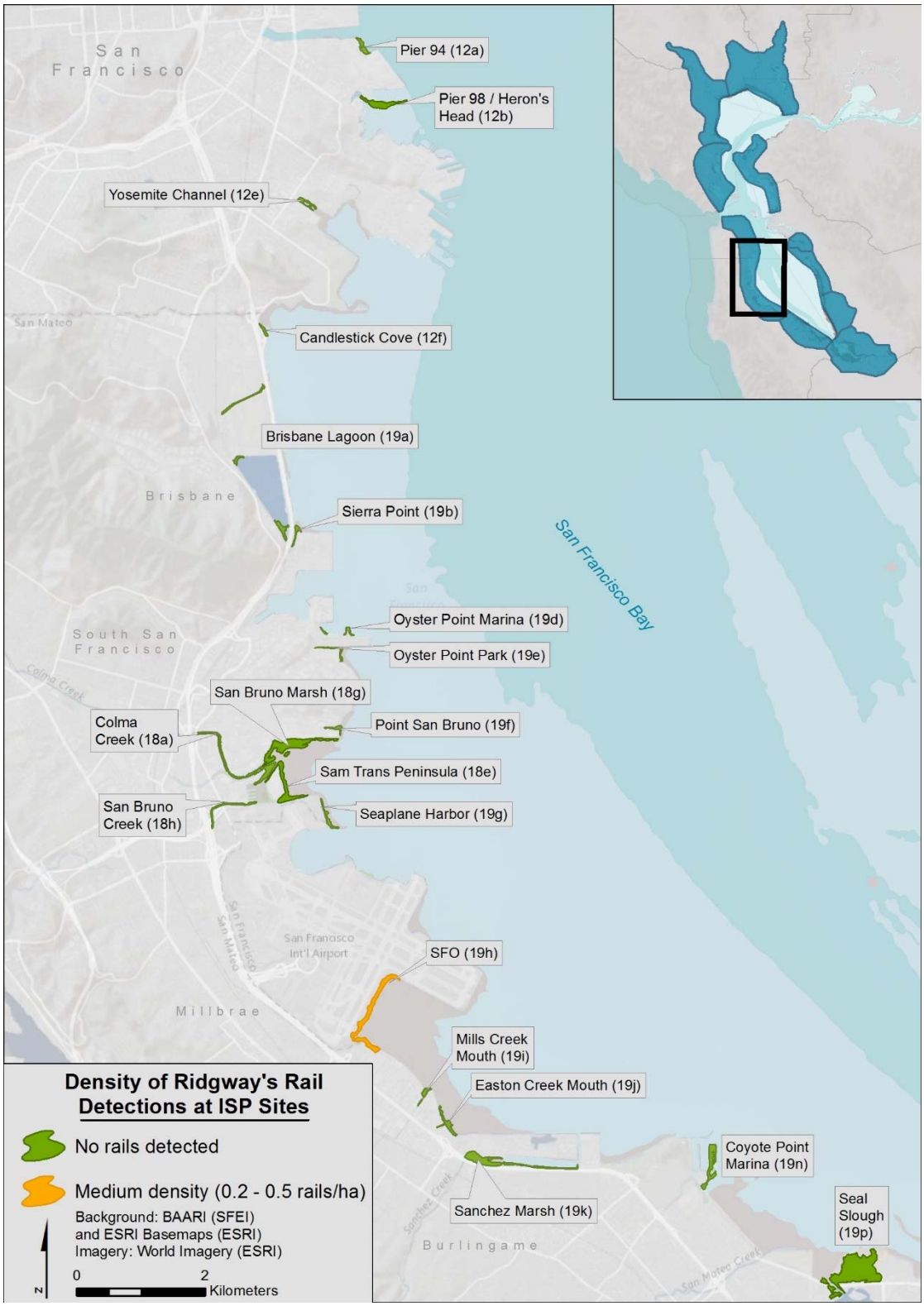

Figure 11. Density of Ridgway's rail detected in 2015 at ISP sites in the SF Peninsula Region. Density was calculated based on the minimum number of rails detected during the highest round count within the survey area. Note: Crissy Field (site 12g) is located in northern San Francisco and is not displayed on this map; the site does not provide habitat for Ridgway's rails.

4.8 Marin Region

The Marin Region extends from the Golden Gate Bridge to the Richmond Bridge in Marin County (**Figure 12**). 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 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 thirty ISP rail sites, twenty-six of which were surveyed by OEI in 2015 (**Table 11**). Typically, PBCS surveys the more densely occupied tidal marshes in the Corte Madera Complex; however, OEI surveyed these sites in 2015. OEI detected a total of 68 rails in the Marin Region in 2015.

Rail numbers are trending downward in the Marin Region over the past six years. There was a notable decline in rail detections at CMC Marsh Reserve (04a), which went from 45 rails detected in2014 to 19 rails detected in 2015. A resident of the Greenbrae boardwalk, which lies along the northern boundary of the site, reported a sighting of a coyote taking Ridgway's rail from the marsh on at least one occasion and coyotes were seen at both CMC Marsh Reserve and Piper Park on multiple occasions (Sandra Guldman, personal communication, June 23, 2015). Despite local declines, Muzzi Marsh and CMC Marsh Reserve still rank as high density rail sites.

Though impacts from invasive *Spartina* removal have been minimal in the region, the Coastal Conservancy has invested in habitat enhancement in the region to boost bay-wide rail populations. Last year, five high tide refuge islands were installed at Muzzi Marsh and three more islands are planned for installation this winter.

Table 11. Survey results from 2010 to 2015 in the Marin Region.

Site Name (ID)	Minimum Number of Ridgway's Rails Detected on High Count						6-year Average	Change from 6-year Average	6-year Trend
	2010	2011	2012	2013	2014	2015			
Blackie's Creek (03a)	0	0	0	0	0	0	0	0	-
Blackie's Creek Mouth (03b)	0	0	0	0	0	0	0	0	-
CMC Marsh Reserve (04a)[1]	34	45	32	20	45	19	33	-14	↘
College of Marin (04b)	0	0	0	0	0	0	0	0	-
Piper Park - East (04c)[1]	4	6	4	4	2	4	4	0	↘
Piper Park - West (04d)[1]	4	6	4	3	2	4	4	0	↘
Larkspur Ferry Landing Area (04e)	0	0	0	0	0	0	0	0	-
Riviera Circle (04f)	0	0	0	0	0	0	0	0	-
Creekside Park (04g)	8	9	12	3	9	4	8	-4	↘
CMC - Upper (04h)	4	8	3	2	2	2	4	-2	↘
CMC - Lower (04i)	0	0	0	1	0	0	0	0	→
CMC - Mouth (04j)[1]	4	5	2	2	1	1	3	-2	↘
Boardwalk No. 1 (04k)[2]	4	*2*	0	0	0	1	1	0	↘
Pickleweed Park (09)	10	8	1	0	0	0	3	-3	↘
Brickyard Cove (23a)	0	0	0	0	0	0	0	0	-
Beach Drive (23b)	0	0	0	0	0	0	0	0	-
Loch Lomond Marina (23c)	0	0	0	0	0	0	0	0	-
San Rafael Canal Mouth (23d)	2	2	2	1	1	0	1	-1	↘
Muzzi Marsh (23e)[1]	19	42	28	15	25	27	26	+1	↘
San Clemente Creek (23e)[1, 2]	2	2	6	*4*	2	0	3	-3	↘
Martas Marsh (23e)[1, 2]	0	8	6	*4.5*	3	3	4	-1	↘
Paradise Cay (23f)	0	0	0	0	0	0	0	0	-
Greenwood Beach (23g)	0	0	0	0	0	0	0	0	-
Strawberry Point (23h)	0	0	0	0	0	0	0	0	-
Strawberry Cove (23i)	0	0	0	0	0	0	0	0	-
Bothin Marsh (23j)[1]	5	4	2	4	2	3	3	0	↘
Sausalito (23k)	0	0	0	0	0	0	0	0	-
Starkweather Park (23l)	0	0	0	0	0	0	0	0	-
Triangle Marsh - Marin (23n)	0	0	0	0	0	0	0	0	-
Marin Region TOTAL	**100**	**147**	**102**	**63.5**	**94**	**68**	**96**	**-28**	**↘**

[1] These sites have been surveyed by staff at PBCS for all years except 2015.

[2] Data gaps in the middle of the time series were assigned data based on the average of the preceding and subsequent years and are noted by grey italics and shading.

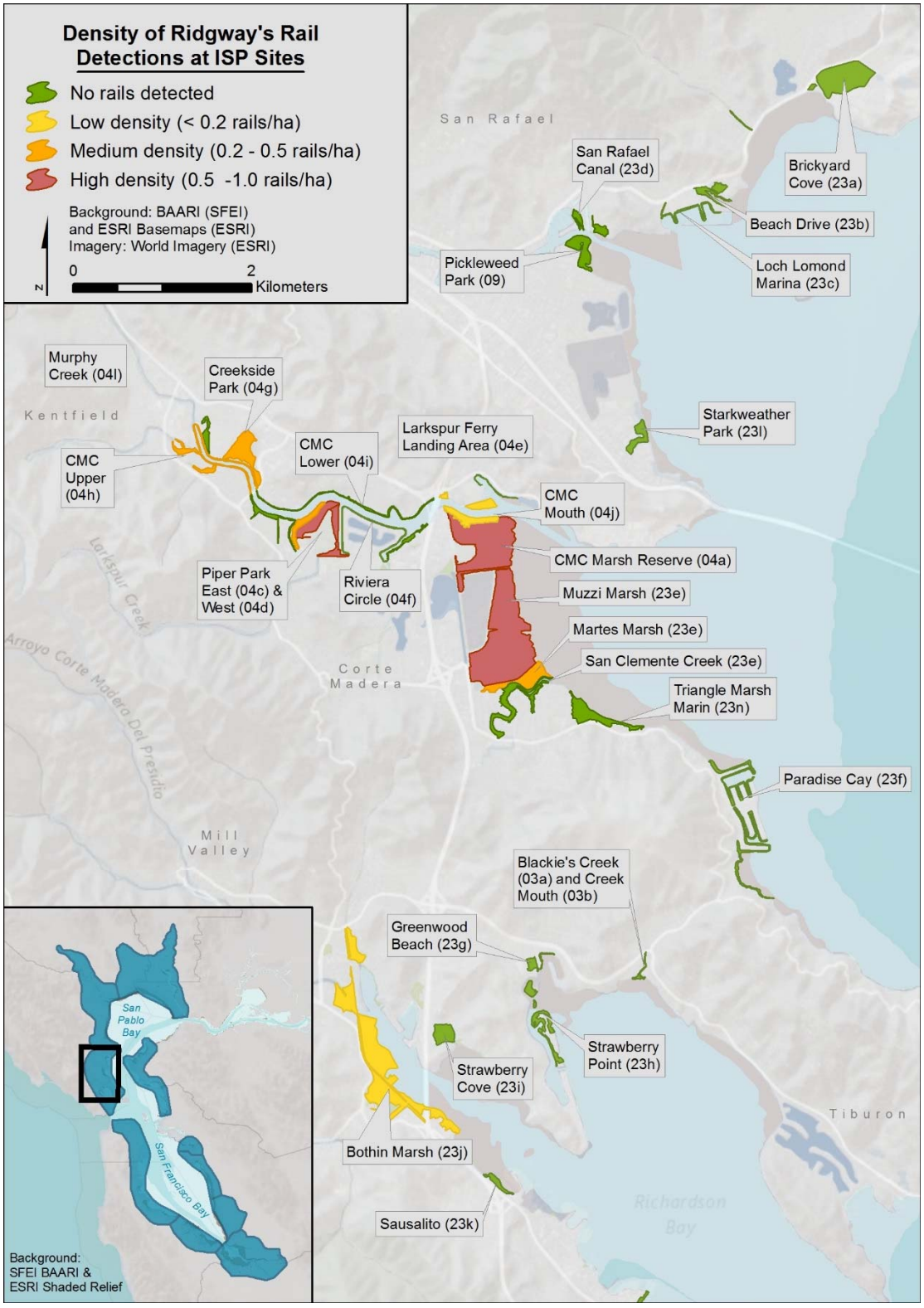

Figure 12. Density of Ridgway's rail detected in 2015 at ISP sites in the Marin Region. Density was calculated based on the minimum number of rails detected during the highest round count within the survey area. Despite local declines, Muzzi Marsh and Corte Madera Ecological Reserve still rank as high density sites.

4.9 San Pablo Bay – Vallejo and Petaluma Regions

San Pablo Bay includes both the Vallejo and Petaluma Regions (**Figure 13**). The Petaluma Region includes some of the largest and most densely occupied marshes in the North Bay, including McInnis Marsh, Gallinas Creek, and the marshes along the Petaluma River. Many of these sites were not surveyed in 2015. OEI surveyed only a very small portion of the region where invasive *Spartina* is present and requires treatment.

Of the four small marsh areas surveyed by OEI in2015, only two Ridgway's rails were detected in a small pocket marsh along upper Petaluma River (**Table 12**). No rails were detected in the small portion of San Pablo Bay NWR Shoreline (AKA Mare Island Shoreline) that OEI surveys.

OEI survey results represent a very small portion of this very large region and should not be misinterpreted to indicate that there is a small Ridgway's rail population in the region. In fact, PBCS detected over 200 Ridgway's rails in the Petaluma Region in 2014 (Elrod, et al., 2014).

Table 12. Survey results from 2010 to 2015 in the San Pablo Bay Region.

Site Name (ID)	Minimum Number of Ridgway's Rails Detected on High Count						6-year Average	Change from 6-year Average	6-year Trend
	2010	2011	2012	2013	2014	2015			
Petaluma River - Upper (24a)[1]	3	*2*	1	1	2	2	2	0	↘
Grey's Field (24b)	1	0	0	0	0	0	0	0	↘
Ellis Creek (24c)	1	4	4	3	1	0	2	-2	↘
San Pablo Bay NWR Shoreline (26b)	0	0	0	0	0	0	0	0	-
San Pablo Bay Regions TOTAL	**5**	**6**	**5**	**4**	**3**	**2**	**4**	**-2**	**↘**

[1] Data gaps in the middle of the time series were assigned data based on the average of the preceding and subsequent years and are noted by grey italics and shading.

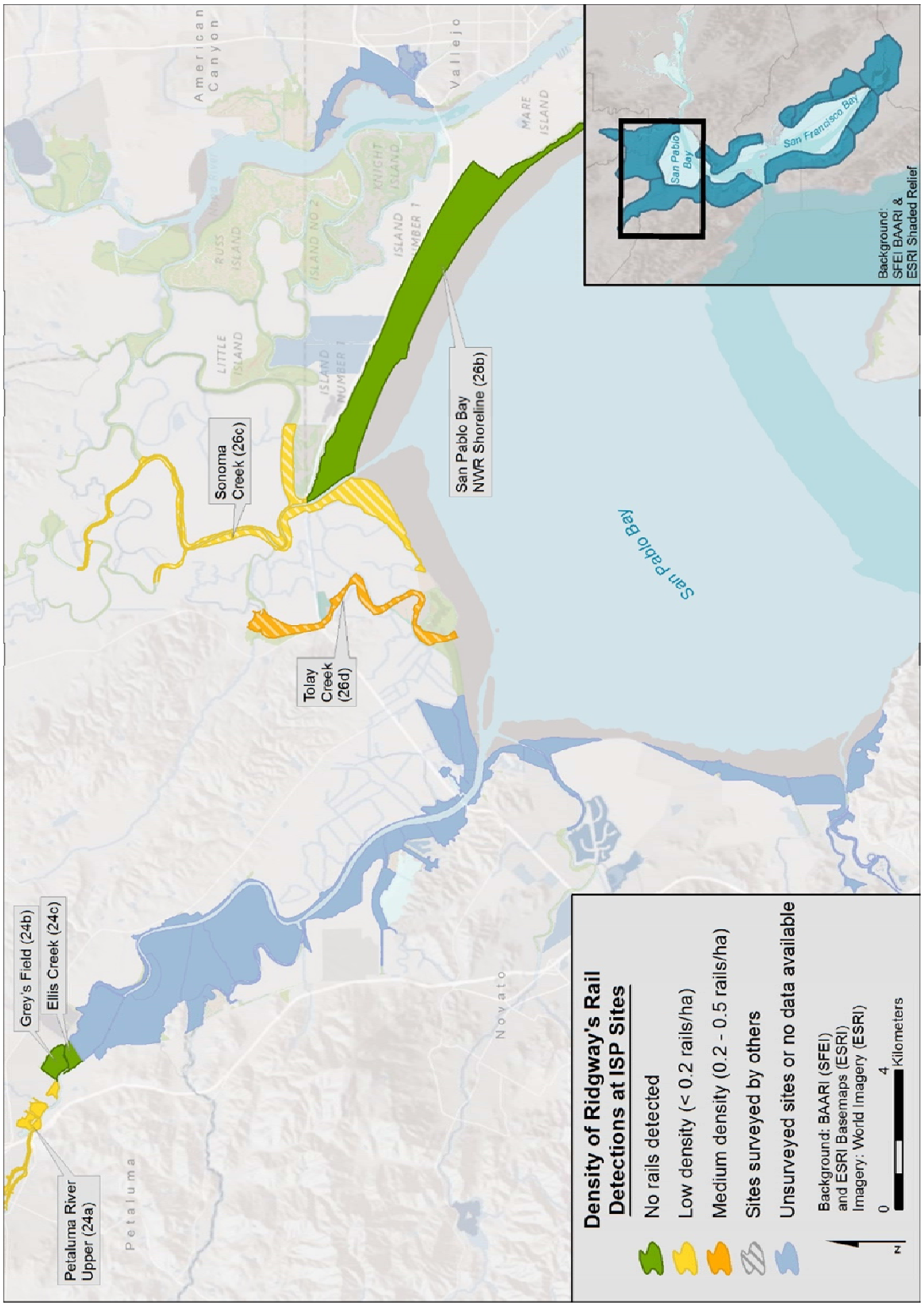

Figure 13. Density of Ridgway's rail detected in 2015 at ISP sites in San Pablo Bay (Petaluma and Vallejo Regions). Density was calculated based on the minimum number of rails detected during the highest round count within the survey area. Sites not surveyed by the ISP were surveyed by DENWR staff (shown in stripes in map). Data collected by others should be considered draft data.

5. Discussion

The number of California Ridgway's rails detected in 2015 at OEI sites is the highest since 2010. In 2015, OEI biologists detected a total of 670 rails, which is an increase of 83 detections over the six year average. After several years of negative trend, rail numbers are finally in an upward trajectory.

Ridgway's rail numbers have increased most notably at the ten sites where *Spartina* control has been prohibited since 2011. In the last year alone, rail detections increased by 60 birds at just those ten sites combined, representing an increase of 58%. Cogswell C (20o) saw an increase of 450%, when detections increased from 2 rails in 2014 to 11 rails in 2015. Similarly, North Marsh increased by 350%, from 6 rails detected in 2014 to 27 rails detected in 2015. Two other sites (Cogswell B and Fan Marsh) had increases of 100% or greater. It is likely that the increased hybrid *Spartina* cover at these sites is providing an added habitat value and the rail numbers are positively responding to the expansion of *Spartina*.

Full treatment of hybrid *Spartina* will not be permitted at these ten sites until rail numbers have increased by an average of 80 rails bay-wide over 2010 numbers for three consecutive years (including data from our partners at DENWR, PBCS, and SPBNWR). Preliminary analysis of 2015 data indicate that the first year of this goal may have been achieved this season (final analysis is pending 2015 survey results from SPBNWR). If the rail trend remains stable or positive for the next two seasons, phased *Spartina* treatment may resume at the restricted sites as soon as 2017.

Currently, an El Niño weather pattern is predicted for the 2015-2016 winter, which may bring increased rains and storms. If large storms coincide with king tides, tidal wetlands will experience extreme flooding, reducing available vegetative cover and putting Ridgway's rails at risk to predation. Given these predictions and potential scenarios, it is possible that there will be a decline in rail numbers next season.

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. So far, about 40 islands have been installed and an additional 20 islands are planned for installation this winter.

Ultimately, the most effective means to increase the Ridgway's rail population in the Estuary will probably 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 Project and the restoration of the Napa-Sonoma Baylands. As more of these newly breached sites mature and become vegetated, biologists expect to see rails colonize and increase in numbers in response. In fact, Ridgway's rails were confirmed as present at the 10-year old Island Pond A21 this year.

PBCS has proposed a study to examine the most efficient way to increase rail populations, whether it is through revegetation, high tide refuge islands, predator control, or large-scale conversion of land back to tidal marsh. Results from this study could help guide future management decisions to best promote the recovery of Ridgway's rails in the Bay.

6. Permits

Surveys were conducted under the authority of U.S. Fish and Wildlife Service permit TE118356-3 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

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Appendix I: 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:

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 clapper rail calls and distinguish CLRA 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. The call types should be coded as follows:

Call Code	Call Description	Number of Birds Indicated*
C	Clapper/clatter by one individual	1-2 birds
D	"Duet"- two individuals clattering simultaneously	2 or more birds, depending on situation
K	"kek"	1-2 birds
AK	agitated "kek"	1-2 birds
KH	"kek-hurrah"	1-2 birds
B	"kek-burr"	1-2 birds
V	Visual sighting	1-2 birds per sighting
SK	"squawk"	1-2 birds
SC	"screech"	1-2 birds
CH	"chur"	1-2 birds
P	"purr"	1-2 birds

* See data interpretation section below for more details about determining number of birds per detection type.

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.

Survey Specifics – Standard Protocol Types

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*. Used at two sites in the Bay: Arrowhead Marsh and LaRiviere Marsh. Requires one person at each station for 1½ hour. Typically 3 survey rounds, with recording played at end of 3rd round if no prior detections.
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.
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.
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.

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 two sites in the Bay: LaRiviere Marsh and 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 C. Protocol C (ISP modified transect survey) was developed to more efficiently confirm presence or absence of California Ridgway's rails at certain non-native *Spartina*-invaded sites, so that *Spartina* control could be undertaken at sites with no rails during rail nesting season. Protocol C surveys are implemented only at sites where the probability of Ridgway's rail presence is relatively low, i.e., at sites where Ridgway's rails have not been previously detected, but where marginally suitable habitat or other conditions suggest that rails may be present. Protocol C differs from Protocol A (USFWS standard transect survey) in that it allows the broadcasting of pre-recorded Ridgway's rail vocalizations beginning on the initial round of surveys in order to elicit responses from birds in the marsh. If a Ridgway's rail responds, the broadcast is immediately discontinued and not repeated on subsequent survey rounds at that station, and *Spartina* control at that location is postponed until times authorized by the USFWS Section 7 Biological Opinion. If Ridgway's rail presence is determined using Protocol C, the survey is completed using Protocol A in order to determine the number of birds present at the site.

The suitability of using Protocol C is determined based on whether Ridgway's rails have been previously detected at the site, and whether conditions at the site suggest that Ridgway's rails may be present. The ISP regularly reviews Ridgway's rail records from all known sources to identify locations where Ridgway's rails have been detected in the past. Also, the ISP evaluates all planned *Spartina* treatment sites for potential habitat, and conducts habitat assessment surveys (Protocol F) at any locations that are thought to be potentially, albeit marginally, suitable Ridgway's rail habitat. If the ISP plans to do *Spartina* control at a location where (1) the collective records do not indicate Ridgway's rails have been detected for the prior two years, and (2) the habitat at the site is determined to be at least marginally sufficient for Ridgway's rails, then a Protocol C survey would be performed. If the ISP requires Ridgway's rail data at locations where Ridgway's rail presence was previously confirmed within the prior two years, it would use Protocol A (Standard USFWS transect), rather than Protocol C. Generally speaking, Protocol C surveys are conducted at sites that have a low probability of Ridgway's rail presence.

Protocol F. The San Francisco Estuary Invasive *Spartina* Project (ISP) is required (under the USFWS Biological Opinion dated September 2005) to conduct surveys for California Ridgway's rails (*Rallus obsoletus obsoletus*) to determine Ridgway's rail presence or absence prior to treatment of non-native *Spartina*. Sites that are clearly insufficient to support Ridgway's rails, e.g., reaches of concrete rip-rap with a scattering of small non-native *Spartina* clones, do not require Ridgway's rail surveys. However, 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 may become more prevalent as marshes once fully invaded by hybrid *Spartina* are 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.

If call count surveys are required, the biologist will generally recommend using Ridgway's rail call count survey protocol C, which is conducted at apparently low quality sites where Ridgway's rails are not likely and have not been previously documented. However, it is possible that the site is adjacent to another marsh that is known to support rails and in that case a standard call count Protocol A survey will be recommended.

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 *Salicornia virginica*, 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, playback of 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.

Recorded Call Playback Procedure

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.

Data Interpretation and Data Analysis

Use the following key to determine how many birds to record for each detection type. Use your judgment to avoid redundancy (overlap) and interpret uncertainty as a range. Keep in mind the part of the breeding season in which your survey occurs.

Detection type	Code	Number of birds	Description	Notes and Exceptions
Clatter	C	1 - 2	Primary territorial call. Rapid series of kek notes, often trailing off at the end.	• Usually clattering individuals are paired. • Often it's difficult to determine whether one or two birds are calling, if completely synchronized • Example scenario: at the end of a survey session you have 4 distinct duets, 3 single clatters away from duets and away from one another. The estimate for breeding birds would be 11-14 (# duets x 2 = 8 + 3-6 birds represented by clatters).
Duet	D	2	Two bird clattering simultaneously.	• Usually given by a pair, or less often, neighboring territorial males (J. Evens pers. obs. 2005).
Kek	K	1-2	Single sharp "kek" call, given singly or in series, with significant space between calls (as compared to clatter, which is very rapid).	• Given by males, most often when unmated or prior to setting up pair bond. However, can be given by a mated male throughout the breeding season, thus the range of 1-2 birds. • Sometimes paired/breeding birds make random keks or kek-burrs intermingled with clatters, especially at the beginning of the breeding season. If you hear a single kek followed by a duet in the same location, the kekking individual is likely part of the duet pair and would not be counted separately.
Agitated Kek	AK	1-2	As above but higher pitched, rougher, and with what can be interpreted as an element of alarm. Mid-way between kek and squawk or screech.	• As above, the call may indicate either an unmated or mated male, thus the range of 1-2 birds.
Kek-burr	B	1-2	One or several rapid "kek" calls followed by a more attenuated, "burrrr". Often repeated constantly over many minutes, and can be heard about 1 km away, depending on conditions.	• Given by female Ridgway's rails, primarily during pair bond formation or when fertile and soliciting a copulation with her mate. • The call may indicate either an unmated or mated female, thus the range of 1-2 birds.
Visual	V	1- 2		• Ridgway's rails are most often seen when foraging along tidal channel banks, often near the shelter of overhanging vegetation. They are often seen crossing channels, and regularly swim across open water within a channel. • A sighting of one bird may indicate the presence of a pair; thus record as 1 – 2 birds.

Detection type	Code	Number of birds	Description	Notes and Exceptions
The following descriptions were not included in Albertson & Downard 2004 or Spautz 2005, but are provided here for completeness.				
Kek-hurrah	KH	1-2	Series of "kek" calls attenuating drastically in pace and pitch toward the end	• Thought to be primarily given by males
Squawk	SK	1-2	More highly agitated than an agitated kek	• Typically given only once as an alarm call. Bird may later make other vocalizations.
Screech	SC	1-2	More rare than a squawk. Like a squawk but even more high-pitched.	• Typically given only once as an alarm call.
Churr	CH	1-2	Similar to the last syllable in a kek-bur call	• Typically given by a female.
Purr	P	1-2	Very soft, like churr or burr.	• Typically given by a female at the nest.

Appendix II: 2015 Survey Station Coordinates

REGION: Bay Bridge North

Sub-area Code	Site Name	Point ID	X Coordinate	Y Coordinate
06a	Emeryville Crescent - East	EMCR07	560954	4186746
06a	Emeryville Crescent - East	EMCR14	561702	4187997
06a	Emeryville Crescent - East	EMCR15	561891	4187888
06b	Emeryville Crescent - West	EMCR01	560433	4186905
06b	Emeryville Crescent - West	EMCR02	560250	4186896
06b	Emeryville Crescent - West	EMCR03	560177	4186720
06b	Emeryville Crescent - West	EMCR04	560358	4186670
06b	Emeryville Crescent - West	EMCR05	560565	4186723
06b	Emeryville Crescent - West	EMCR06	560742	4186744
10a	Whittel Marsh	PTPN01	556260	4206711
10a	Whittel Marsh	PTPN02	556460	4206771
10a	Whittel Marsh	PTPN03	556645	4206685
10a	Whittel Marsh	PTPN04	556830	4206771
10c	Giant Marsh	PPF01	556238	4205274
10c	Giant Marsh	PPF05	556420	4205053
10c	Giant Marsh	PPF06	556443	4204834
10c	Giant Marsh	PPF07	556234	4204657
22a	Wildcat Marsh	WIMA02	553708	4201035
22a	Wildcat Marsh	WIMA03	553655	4201231
22a	Wildcat Marsh	WIMA04	553598	4201446
22a	Wildcat Marsh	WIMA05	553731	4201639
22a	Wildcat Marsh	WIMA06	553891	4201784
22a	Wildcat Marsh	WIMA07	554041	4201921
22a	Wildcat Marsh	WIMA08	554207	4202077
22a	Wildcat Marsh	WIMA09	553759	4200843
22b	San Pablo Creek	RCRA06b	555529	4203429
22b	San Pablo Marsh	RIF03	555123	4202989
22b	San Pablo Marsh	RIF09	554287	4203087
22b	San Pablo Marsh	RIF10	554704	4203067
22b	San Pablo Marsh	RIF11	555284	4203315
22c	Rheem Creek Area	RCRA03	555821	4203918
22c	Rheem Creek Area	RCRA04	555895	4204106
22c	Rheem Creek Area	RCRA05	555917	4204343
22c	Rheem Creek Area	RCRA12	555741	4203735
22d	Stege Marsh	MEEK03	558280	4196127
22d	Stege Marsh	MEEK04	558463	4196076
22d	Stege Marsh	MEEK05	558183	4195946
22d	Stege Marsh	MEEK06	558770	4195989
22d	Stege Marsh	MEEK07	559080	4195902
22e	Hoffman Marsh	HOM06	559640	4195672
22e	Hoffman Marsh	HOM07	559818	4195374
22e	Hoffman Marsh	HOM08	560031	4195055

REGION: San Leandro Bay

Sub-area Code	Site Name	Point ID	X Coordinate	Y Coordinate
17a	Elsie Roemer	ELRO01	566123	4178720
17a	Elsie Roemer, Crab Cove	ELRO01	566123	4178720
17a	Elsie Roemer, Crab Cove	ELRO02	566243	4178686
17a	Elsie Roemer, Crab Cove	ELRO03	566367	4178650
17a	Elsie Roemer, Crab Cove	ELRO04	566478	4178616
17a	Elsie Roemer, Crab Cove	ELRO05	566617	4178557
17a	Elsie Roemer, Crab Cove	ELRO06	566752	4178506
17a	Elsie Roemer, Crab Cove	ELRO07	566904	4178458
17d	MLK Regional Shoreline	MLKS09	569336	4178901
17d	MLK Regional Shoreline	MLKS10	569456	4178741
17d	MLK Regional Shoreline	MLKS11	569515	4178546
17e	San Leandro Creek	SLEA01	569805	4177557
17e	San Leandro Creek	SLEA02	569923	4177386
17e	San Leandro Creek	SLEA03	570046	4177211
17e	San Leandro Creek	SLEA04	570174	4177030
17e	San Leandro Creek	SLEA05	570298	4176856
17e	San Leandro Creek	SLEA06	570418	4176690
17e	San Leandro Creek	SLEA07	570529	4176533
17h	MLK New Marsh	MLKR01	569671	4177003
17h	MLK New Marsh	MLKR02	569622	4177196
17h	MLK New Marsh	MLKR03	569706	4177372
17h	MLK New Marsh	MLKR04	569712	4177546
17h	MLK New Marsh	MLKR05	569837	4177413
17h	MLK New Marsh	MLKR06	569948	4177254
17h	MLK New Marsh	MLKR07	570046	4177104
17i	Coliseum Channels	LineK01	569726	4178633
17i	Coliseum Channels	LineK02	569917	4178807
17i	Coliseum Channels	LineK03	570102	4178895
17i	Coliseum Channels	LineK04	570291	4178925
17j	Fan Marsh	FANM01	568582	4177668
17j	Fan Marsh	FANM03	568635	4177820
17j	Fan Marsh	FANM04	568768	4177689
17l	Doolittle Pond	DOPO03	568130	4177879
17l	Doolittle Pond	DOPO04	568396	4177885

REGION: Hayward

Sub-area Code	Site Name	Point ID	X Coordinate	Y Coordinate
07a	Oro Loma - East	ORLW17	574749	4168949
07a	Oro Loma - East	ORLW18	574912	4169047
07a	Oro Loma - East	ORLW19	575313	4169028
07a	Oro Loma - East	ORLW20	575474	4168815
07a	Oro Loma - East	ORLW21	575441	4168567
07b	Oro Loma - West	ORLW01	574936	4168382
07b	Oro Loma - West	ORLW02	575023	4168204
07b	Oro Loma - West	ORLW03	574972	4168062
07b	Oro Loma - West	ORLW04	574771	4168057
07b	Oro Loma - West	ORLW05	574584	4168057
07b	Oro Loma - West	ORLW06	574382	4168054
07b	Oro Loma - West	ORLW07	574308	4168235
07b	Oro Loma - West	ORLW08	574215	4168393
07b	Oro Loma - West	ORLW09	574150	4168521
07b	Oro Loma - West	ORLW10	574098	4168723
07b	Oro Loma - West	ORLW11	574095	4168866
07b	Oro Loma - West	ORLW12	574302	4168857
07b	Oro Loma - West	ORLW13	574495	4168854
07b	Oro Loma - West	ORLW14	574661	4168784
07b	Oro Loma - West	ORLW15	574739	4168633
07b	Oro Loma - West	ORLW16	574840	4168558
20c	Dogbone Marsh	DOGB01	572695	4170847
20d	Citation Marsh	CITA01	573661	4170466
20d	Citation Marsh	CITA02	573555	4170639
20d	Citation Marsh	CITA03	573435	4170800
20d	Citation Marsh	CITA04	573314	4170961
20d	Citation Marsh	CITA05	573318	4171265
20d	Citation Marsh	CITA06	573316	4171466
20d	Citation Marsh	CITA07	573314	4171666
20f	North Marsh	NORT01	573097	4171251
20f	North Marsh	NORT02	572949	4171118
20f	North Marsh	NORT03	572920	4170920
20f	North Marsh	NORT04	572877	4170757
20f	North Marsh	NORT05	572997	4170591
20f	North Marsh	NORT06	573168	4170488
20f	North Marsh	NORT08	573588	4170397
20g	Bunker Marsh	BUNK01	573456	4170331
20g	Bunker Marsh	BUNK02	573507	4170104
20g	Bunker Marsh	BUNK03	573561	4169912
20g	Bunker Marsh	BUNK04	573631	4169725
20h	San Lorenzo Creek	SLRZ01	573737	4169556
20h	San Lorenzo Creek	SLRZ02	573659	4169471
20h	San Lorenzo Creek	SLRZ03	573943	4169633
20h	San Lorenzo Creek	SLRZ04	574138	4169774

REGION: Hayward (continued)

Sub-area Code	Site Name	Point ID	X Coordinate	Y Coordinate
20h	San Lorenzo Creek	SLRZ05	574277	4169889
20h	San Lorenzo Creek	SLRZ07	573896	4169503
20h	San Lorenzo Creek	SLRZ08	573955	4169323
20h	San Lorenzo Creek	SLRZ09	573951	4169136
20j	Sulphur Creek	SULF04	575178	4168030
20j	Sulphur Creek	SULF05	575382	4168032
20j	Sulphur Creek	SULF06	575580	4168049
20l	Johnson's Landing	JOLA02	575064	4164736
20l	Johnson's Landing	JOLA03	574999	4164923
20l	Johnson's Landing	JOLA04	574909	4165104
20m	Cogswell - Sec A	COGS01	574738	4166041
20m	Cogswell - Sec A	COGS02	574713	4166250
20m	Cogswell - Sec A	COGS03	574862	4166363
20m	Cogswell - Sec A	COGS04	575059	4166368
20m	Cogswell - Sec A	COGS05	575218	4166336
20m	Cogswell - Sec A	COGS06	575158	4166170
20m	Cogswell - Sec A	COGS07	575043	4166004
20n	Cogswell - Sec B	COGS15	575367	4165223
20n	Cogswell - Sec B	COGS16	575572	4165228
20n	Cogswell - Sec B	COGS17	575710	4165373
20n	Cogswell - Sec B	COGS18	575620	4165538
20n	Cogswell - Sec B	COGS19	575531	4165722
20n	Cogswell - Sec B	COGS20	575436	4165912
20n	Cogswell - Sec B	COGS21	575340	4166092
20o	Cogswell - Sec C	COGS08	574984	4165788
20o	Cogswell - Sec C	COGS09	575124	4165612
20o	Cogswell - Sec C	COGS10	575138	4165412
20o	Cogswell - Sec C	COGS11	575105	4165165
20o	Cogswell - Sec C	COGS12	574791	4165248
20o	Cogswell - Sec C	COGS13	574779	4165542
20o	Cogswell - Sec C	COGS14	574781	4165740
20p	Hayward Landing	HALA01	574524	4166812
20r	Oakland Airport	OAKA01	566746	4175486
20r	Oakland Airport	OAKA02	566898	4175357
20r	Oakland Airport	OAKA03	567055	4175234
20s	HARD Marsh	HARD01	575252	4164654
20s	HARD Marsh	HARD02	575438	4164560
20s	HARD Marsh	HARD03	575619	4164493
20s	HARD Marsh	HARD04	575816	4164414
20s	HARD Marsh	HARD05	575988	4164619
20w	Triangle Marsh - Hayward	TRMA01	574647	4166655
20w	Triangle Marsh - Hayward	TRMA02	574714	4166471

REGION: Union City

Sub-area Code	Site Name	Point ID	X Coordinate	Y Coordinate
01c	AFCC - Upper	AFCC41	579889	4157882
01c	AFCC - Upper	AFCC42	580082	4157819
01c	AFCC - Upper	AFCC43	580276	4157756
01c	AFCC - Upper	AFCC44	580478	4157732
01c	AFCC - Upper	AFCC45	580678	4157707
01c	AFCC - Upper	AFCC46	580880	4157683
01c	AFCC - Upper	AFCC47	581081	4157659
01c	AFCC - Upper	AFCC48	581284	4157669
01c	AFCC - Upper	AFCC49	581478	4157718
01c	AFCC - Upper	AFCC50	581674	4157767
01c	AFCC - Upper	AFCC51	581875	4157797
01c	AFCC - Upper	AFCC52	582072	4157840
01c	AFCC - Upper	AFCC53	582238	4157960
13a	OAC - North Bank	ALCK10	577579	4161047
13a	OAC - North Bank	ALCK11	577774	4161008
13a	OAC - North Bank	ALCK12	577954	4160949
13a	OAC - North Bank	ALCK13	578133	4160880
13a	OAC - North Bank	ALCK14	578290	4160821
13a	OAC - North Bank	ALCK15	578491	4160791
13a	OAC - North Bank	ALCK16	578684	4160842
13a	OAC - North Bank	ALCK17	578837	4160946
13a	OAC - North Bank	ALCK18	578983	4161058
13a	OAC - North Bank	ALCK19	579146	4161152
13a	OAC - North Bank	ALCK20	579342	4161159
13a	OAC - North Bank	ALCK21	579538	4161155
13a	OAC - North Bank	ALCK22	579723	4161150
13a	OAC - North Bank	ALCK23	579901	4161149
13a	OAC - North Bank	ALCK24	580056	4161217
13a	OAC - North Bank	ALCK25	580098	4161389
13a	OAC - North Bank	ALCK26	580095	4161571
13a	OAC - North Bank	ALCK27	580088	4161744
13c	OAC - South Bank	OACS01	576227	4160905
13c	OAC - South Bank	OACS02	576429	4160900
13c	OAC - South Bank	OACS03	576629	4160907
13c	OAC - South Bank	OACS04	576829	4160914
13c	OAC - South Bank	OACS05	577029	4160921
13c	OAC - South Bank	OACS06	577225	4160925
13c	OAC - South Bank	OACS07	577426	4160925
13d	Whale's Tail - North	WTN10	575754	4162376
13d	Whale's Tail - North	WTN4	575865	4161341
13d	Whale's Tail - North	WTN5	575886	4161530
13d	Whale's Tail - North	WTN6	575813	4161676
13d	Whale's Tail - North	WTN7	575771	4161849
13d	Whale's Tail - North	WTN8	575767	4162027
13d	Whale's Tail - North	WTN9	575762	4162212
13f	OAC - South Bank	WTS37	576032	4160957
13j	Eden Landing - Mt Eden Creek	EDEN01	576480	4163098

REGION: Union City (continued)

Sub-area Code	Site Name	Point ID	X Coordinate	Y Coordinate
13j	Eden Landing - Mt Eden Creek	EDEN02	576489	4162896
13j	Eden Landing - Mt Eden Creek	EDEN03	576430	4162704
13j	Eden Landing - Mt Eden Creek	EDEN04	576379	4162512
13j	Eden Landing - Mt Eden Creek	EDEN05	576179	4162480
13j	Eden Landing - Mt Eden Creek	EDEN06	575980	4162529
13j	Eden Landing - Mt Eden Creek	WTN11	575778	4162563
13k	Eden Landing Reserve - South	ELRS01	578202	4163533
13k	Eden Landing Reserve - South	ELRS02	578057	4163383
13k	Eden Landing Reserve - South	ELRS03	577994	4163189
13k	Eden Landing Reserve - South	ELRS04	578001	4162988
13l	Eden Landing Reserve - North	ELRN01	577956	4164180
13l	Eden Landing Reserve - North	ELRN02	578072	4164015
13l	Eden Landing Reserve - North	ELRN03	578199	4163845

REGION: Dumbarton South

Sub-area Code	Site Name	Point ID	X Coordinate	Y Coordinate
16	Cooley Landing	COLA05	576891	4148770
16	Cooley Landing	COLA06	576956	4148944
16	Cooley Landing	COLA07	577129	4149051
16	Cooley Landing	COLA08	577293	4149164
16	Cooley Landing	COLA09	576775	4148568
16	Cooley Landing	COLA10	576825	4148373
16	Cooley Landing	COLA11	576961	4148238
16	Cooley Landing	COLA12	577112	4148090
05a	Calaveras Point	CAPT09	586281	4146933
05a	Calaveras Point	CAPT10	586088	4146915
05a	Calaveras Point	CAPT11	585889	4146857
05a	Calaveras Point	CAPT12	585689	4146818
05a	Calaveras Point	CAPT13	585492	4146774
05a	Calaveras Point	CAPT14a	585333	4146717
05a	Calaveras Point	CAPT15	584921	4146583
05a	Calaveras Point	CAPT08	586510	4147007
05b	Dumbarton/Audubon	DUMW02	579307	4150947
05b	Dumbarton/Audubon	DUMW04	579600	4151224
05b	Dumbarton/Audubon	DUMW06	579902	4151484
05b	Dumbarton/Audubon	DUMW08	580144	4151687
05b	Dumbarton/Audubon	DUMW10	580586	4151671
05b	Dumbarton/Audubon	DUMW12	580548	4151955
05b	Dumbarton/Audubon	DUMW14	580932	4152142
05c	Newark Slough	NEW02	581705	4154094
05c	Newark Slough	NEW03	581878	4153982
05c	Newark Slough	NEW04	582059	4153878
05c	Newark Slough	NEW05	582040	4153642
05c	Newark Slough	NEW06	582159	4153474
05c	Newark Slough	NEW07	582333	4153544
05c	Newark Slough	NEW09	581635	4154254
05e	Mayhew's Landing	3-May	582878	4154195
05e	Mayhew's Landing	5-May	583046	4153879
05g	Cargill Pond (W Suites Hotel)	1-May	582737	4154617
05h	Plummer Creek Mitigation	PLCM01	583615	4152372
05h	Plummer Creek Mitigation	PLCM02	583484	4152202
05h	Plummer Creek Mitigation	PLCM03	583517	4152021
08	Palo Alto Baylands	PAB14	578746	4146217
08	Palo Alto Baylands	PAB16	579129	4146185
08	Palo Alto Baylands	PAB17	579308	4146093
08	Palo Alto Baylands	PAHA01	579302	4145979
08	Palo Alto Baylands	PAHA02	578898	4145912
08	Palo Alto Baylands	PAHA03	578873	4145418
08	Palo Alto Baylands	PAHA04	579282	4145587
08	Palo Alto Baylands	PAHA05	579627	4145741
08	Palo Alto Baylands	PAHA06	579993	4145586

REGION: Dumbarton South (continued)

Sub-area Code	Site Name	Point ID	X Coordinate	Y Coordinate
08	Palo Alto Baylands	PAB02	578414	4146399
08	Palo Alto Baylands	PAB13	578934	4146250
08	Palo Alto Baylands	PAB21	578282	4146571
08	Palo Alto Baylands	PAB22	578151	4146732
15a	Charleston Slough	CHSL01	580426	4145106
15a	Charleston Slough	CHSL03	580657	4145153
15a	Charleston Slough	CHSL04	580414	4144826
15a	Coyote Creek South East	COYE5A	588951	4146466
15a	Coyote Creek South East	COYE5C	588689	4146707
15a	Coyote Creek South East	COYE5E	588312	4146686
15a	Coyote Creek South East	COYE6B	590413	4145832
15a	Coyote Creek South East	COYE6C	590265	4145968
15a	Coyote Creek South East	COYE6D	590121	4146110
15a	Coyote Creek South East	COYE6E	589970	4146243
15a	Coyote Creek South East	COYE6F	589817	4146372
15a	Guadalupe Slough	GUSL02	587891	4143002
15a	Guadalupe Slough	GUSL03	587773	4143515
15a	Guadalupe Slough	GUSL04	587365	4143596
15a	Guadalupe Slough	GUSL05	586585	4143375
15a	Guadalupe Slough	GUSL06	585318	4144262
15a	Guadalupe Slough	GUSL07	585019	4144717
15a	Guadalupe Slough	GUSL08	585795	4144766
15a	Guadalupe Slough	GUSL09	585184	4144825
15a	Stevens Creek to Long Point	LONG09	582630	4144724
15a	Stevens Creek to Long Point	LONG10	582401	4144385
15a	Stevens Creek to Long Point	LONG11	582369	4144019
15a	Alviso Slough	MAL01	586761	4146451
15a	Alviso Slough	MAL02	586668	4146281
15a	Alviso Slough	MAL04	586898	4145918
15a	Alviso Slough	MAL06	586942	4145527
15a	Alviso Slough	MAL07	587021	4146548
15a	Alviso Slough	MAL08	587328	4146607
15a	Alviso Slough	MAL09	587646	4146656
15a	Alviso Slough	MAL10	587905	4146704
15a	Mountain View Slough	MVSL04	581043	4145153
15a	Mountain View Slough	MVSL05	581422	4145011
15b	Faber/Laumeister Marsh	EPA03	577339	4146797
15b	Faber/Laumeister Marsh	EPA04	577298	4146978
15b	Faber/Laumeister Marsh	EPA06	577432	4147225
15b	Faber/Laumeister Marsh	EPA07	577682	4147166
15b	Faber/Laumeister Marsh	EPA08	577172	4147349
15b	Faber/Laumeister Marsh	EPA09	577126	4147543
15b	Faber/Laumeister Marsh	EPA10	577170	4147738
15b	Faber/Laumeister Marsh	EPA11	577260	4147918
15b	Faber/Laumeister Marsh	EPA12	577391	4146599
15b	Faber/Laumeister Marsh	EPA14	577769	4146659

REGION: Dumbarton South (continued)

Sub-area Code	Site Name	Point ID	X Coordinate	Y Coordinate
15c	Stevens Creek	STEV01	582431	4143425
15c	Stevens Creek	STEV02	582421	4143224

REGION: San Mateo

Sub-area Code	Site Name	Point ID	X Coordinate	Y Coordinate
02a	Belmont Slough	BELM01	566369	4156426
02a	Belmont Slough	BELM02	566069	4156168
02a	Belmont Slough	BELM03	565966	4155996
02a	Belmont Slough	BELM04	565882	4155814
02a	Belmont Slough	BELM05	565895	4155614
02a	Belmont Slough	BELM06	565938	4155419
02a	Belmont Slough	BELM07	566028	4155239
02a	Belmont Slough	BELM08	565828	4155213
02a	Redwood Shores/ Bird Island	RESH01	568179	4155891
02a	Redwood Shores/ Bird Island	RESH02	567964	4155983
02a	Redwood Shores/ Bird Island	RESH03	567751	4156006
02a	Redwood Shores/ Bird Island	RESH04	567545	4156002
02a	Redwood Shores/ Bird Island	RESH06	567118	4156026
02a	Redwood Shores/ Bird Island	RESH07	566894	4156065
02b	Corkscrew Slough	CORK01	569367	4153611
02b	Corkscrew Slough	CORK03	568904	4152988
02b	Corkscrew Slough	CORK04	568894	4152635
02b	Corkscrew Slough	CORK05	568642	4152904
02b	Corkscrew Slough	CORK06	568356	4153005
02b	Steinberger Slough	RESH16	567956	4155133
02b	Steinberger Slough	RESH15	567780	4154559
02b	Steinberger Slough	RESH17	568105	4155282
02b	Steinberger Slough	RESH18	568239	4155444
02b	Steinberger Slough	RESH13	567756	4154757
02b	Steinberger Slough	RESH14	567816	4154983
02b	Steinberger Slough	CORK02a	569244	4153305
02c	B2 North Quadrant	OBE06	569311	4154036
02c	B2 North Quadrant	OBE09	568814	4154381
02c	B2 North Quadrant	OBE11	568471	4154620
02c	B2 North Quadrant	OBE12	569256	4154869
02c	B2 North Quadrant	OBE14	569206	4154429
02c	B2 North Quadrant	OBE16	568775	4154924
02c	B2 North Quadrant	OBE19	568408	4155098
02d	B2 South Quadrant	OBE05	570128	4154401
02d	B2 South Quadrant	OBE25	569779	4155053
02d	B2 South Quadrant	OBE26	569843	4154667
02d	B2 South Quadrant	OBE27	569990	4154545
02d	B2 South Quadrant	OBES07	570261	4154520
02d	B2 South Quadrant	OBES24	569733	4154871
02e	West Point Slough - NW	WPSN03	571586	4151985
02f	Greco Island - North	GRIN17	571635	4152418
02f	Greco Island - North	GRIN18	571800	4152305
02f	Greco Island - North	GRIN11	570647	4153106
02f	Greco Island - North	GRIN12	570811	4152993
02f	Greco Island - North	GRIN13	570976	4152877
02f	Greco Island - North	GRIN14	571140	4152762

REGION: San Mateo (continued)

Sub-area Code	Site Name	Point ID	X Coordinate	Y Coordinate
02f	Greco Island - North	GRIN16	571471	4152533
02f	Greco Island - North	GRIN15	571306	4152647
02g	West Point Slough - SW / E	WPSS09	572707	4150059
02g	West Point Slough - SW / E	WPSS10	572706	4149686
02g	West Point Slough - SW / E	WPSS11	572704	4149455
02g	West Point Slough - SW / E	WPSS12	572561	4149237
02h	Greco Island - South	GRIS01	573018	4150394
02h	Greco Island - South	GRIS02	573016	4150596
02h	Greco Island - South	GRIS03	573015	4150799
02h	Greco Island - South	GRIS04	573014	4150998
02h	Greco Island - South	GRIS05	572969	4151193
02h	Greco Island - South	GRIS06	572825	4151345
02i	Ravenswood Slough	RAV02	575826	4149650
02i	Ravenswood Slough	RAV03	575665	4149768
02i	Ravenswood Slough	RAV04	575468	4149813
02i	Ravenswood Slough	RAV05	575260	4149863
02i	Ravenswood Slough	RAV06	574884	4150110
02i	Ravenswood Slough	RAV09	574950	4149885
02i	Ravenswood Slough	RAV10	574806	4150724
02k	Middle Bair N	MBE01	569714	4153286
02k	Middle Bair N	MBE02	569544	4153178
02k	Middle Bair N	MBE03	569366	4153061
02k	Middle Bair N	MBE04	569249	4152883
02k	Middle Bair N	MBE05	569153	4152697
02k	Middle Bair SE	MBSE06	568955	4152326
02k	Middle Bair SE	MBSE02	568726	4151546
02k	Middle Bair SE	MBSE04	568800	4151947
02l	Inner Bair Island Restoration	IBI11	567713	4150454
02l	Inner Bair Island Restoration	IBI13	567298	4150636
02l	Inner Bair Island Restoration	IBI15	567004	4150939
02l	Inner Bair Island Restoration	IBI17	566763	4151267

REGION: SF Peninsula

Sub-area Code	Site Name	Point ID	X Coordinate	Y Coordinate
12b	Pier 98/Heron's Head	HEHE01	555235	4176946
12b	Pier 98/Heron's Head	HEHE02	555429	4176923
18e	Sam Trans Peninsula	STPN07	553711	4165938
18g	San Bruno Marsh	SBMA01	553847	4166947
18g	San Bruno Marsh	SBMA02	554049	4166950
18g	San Bruno Marsh	SBMA03	554248	4166959
18g	San Bruno Marsh	SBMA06	553599	4166863
19h	SFO	SFO04	555438	4163237
19h	SFO	SFO05	555203	4162889
19h	SFO	SFO06	555111	4162711
19h	SFO	SFO07	555019	4162530
19p	Seal Slough	SEAL01	562560	4158484
19p	Seal Slough	SEAL03	562728	4158450
19p	Seal Slough	SEAL04	562857	4158548
19p	Seal Slough	SEAL05	562861	4158725
19p	Seal Slough	SEAL07	562432	4158448

REGION: Marin

Sub-area Code	Site Name	Point ID	X Coordinate	Y Coordinate
9	Pickleweed Park	PIPK01	544265	4202286
9	Pickleweed Park	PIPK02	544239	4202484
9	Pickleweed Park	PIPK03	544183	4202641
04a	CMC Marsh Reserve	CEF01	543102	4199205
04a	CMC Marsh Reserve	CEF03	543330	4199066
04a	CMC Marsh Reserve	CEF05	543015	4198956
04a	CMC Marsh Reserve	CEF13	543351	4199248
04a	CMC Marsh Reserve	CEF16	542823	4199275
04a	CMC Marsh Reserve	CEF20	543437	4199425
04b	College of Marin	CMER03	540053	4200235
04c	Piper Park - East	PIF03	541478	4199615
04c	Piper Park - East	PIPE01	541484	4199149
04c	Piper Park - East	PIPE02	541459	4199364
04d	Piper Park - West	PIPE04	541308	4199419
04d	Piper Park - West	PIPE05	541136	4199313
04g	Creekside Park	CRPA01	540284	4200157
04g	Creekside Park	CRPA04	540477	4200115
04g	Creekside Park	CRPA05	540583	4199940
04g	Creekside Park	CRPA06	540535	4200305
04h	CMC - Upper	UCMC01	539765	4200265
04h	CMC - Upper	UCMC02	539978	4200186
04h	CMC - Upper	UCMC03	540142	4200079
04h	CMC - Upper	UCMC04	540358	4200046
04h	CMC - Upper	UCMC05	540500	4199902
04i	CMC - Lower	LCMC11	540632	4199553
04i	CMC - Lower	LCMC12	540831	4199466
04j	CMC - Mouth	CMCM12	542958	4199629
04j	CMC - Mouth	CMCM13	543185	4199682
04j	CMC - Mouth	CMCM14	542814	4199523
04j	CMC - Mouth	CMCM15	543007	4199427
04j	CMC - Mouth	CMCM16	543234	4199447
23d	San Rafael Canal Mouth	SRCM01	544244	4202876
23d	San Rafael Canal Mouth	SRCM02	544370	4202758
23e	Muzzi and Martas Marsh	MUZZ01	543288	4198900
23e	Muzzi and Martas Marsh	MUZZ02	543270	4198714
23e	Muzzi and Martas Marsh	MUZZ03	543233	4198500
23e	Muzzi and Martas Marsh	MUZZ04	543198	4198296
23e	Muzzi and Martas Marsh	MUZZ05	543304	4198234
23e	Muzzi and Martas Marsh	MUZZ06	543162	4198086
23e	Muzzi and Martas Marsh	MUZZ07	543002	4197678
23e	Muzzi and Martas Marsh	MUZZ08	543187	4197605
23e	Muzzi and Martas Marsh	MUZZ09	543380	4197655
23e	Muzzi and Martas Marsh	MUZZ10	543569	4197718
23e	Muzzi and Martas Marsh	MUZZ11	543740	4197849
23e	Muzzi and Martas Marsh	MUZZ12	543657	4197566

REGION: Marin (continued)

Sub-area Code	Site Name	Point ID	X Coordinate	Y Coordinate
23j	Bothin Marsh	BOMA02	541730	4193948
23j	Bothin Marsh	BOMA10	542024	4192899
23j	Bothin Marsh	BOMA11	542019	4193285
23j	Bothin Marsh	THF11	542280	4192937
23j	Bothin Marsh	THF12	542094	4193120
23j	Bothin Marsh	THF14	541822	4193435
23j	Bothin Marsh	THF15	541764	4193696
23n	Triangle Marsh - Marin	TRF02	544339	4197235
23n	Triangle Marsh - Marin	TRF03	544579	4197186

REGION: San Pablo Bay (Petaluma & Vallejo)

Sub-area Code	Site Name	Point ID	X Coordinate	Y Coordinate
24a	Petaluma River - Upper	PDF11	534944	4230455
24a	Petaluma River - Upper	PDF12	534648	4230802
24a	Petaluma River - Upper	PDF13	533995	4231302
24a	Petaluma River - Upper	PDF14B	534143	4231048
24b	Grey's Field	GRFI01	536303	4230247
24b	Grey's Field	GRFI02	535350	4230500
24b	Grey's Field	GRFI03A	536005	4230253
26b	San Pablo Bay NWR Shoreline	MAIS11	562041	4216826
26b	San Pablo Bay NWR Shoreline	MAIS12	561920	4217008
26b	San Pablo Bay NWR Shoreline	MAIS13	561807	4217214
26b	San Pablo Bay NWR Shoreline	MAIS14	561653	4217439
26b	San Pablo Bay NWR Shoreline	MAIS15	561476	4217615

Appendix III: Database Design

Feature	Fields	Description
	QC	Date when data was checked for quality (QC'd)
Offset - a line feature connecting survey station to bird observed; contains data on every detection.	OBJECTID	Unique ID of object automatically assigned by ESRI
	Shape	Shape type of object automatically defined by ESRI (LINE)
	Shape_Length	Automatically calculates shape length in meters
	PointID	6-character alphanumeric code for station identification
	Round	Round number (1, 2, or 3)
	DateSurv	Date when survey was conducted
	TimeDet	Time when rail was detected
	FieldRef	Code to ID bird in field on field map and datasheet
	Direction	Compass direction to rail
	Distance	Distance to rail (estimated in meters)
	DistConf	Length value (in meters) representing confidence in distance estimate (eg: +/- # meters)
	Species	4 letter AOU code for species of rail detected
	CallCode	Type of call or detection (for all types of rails)
	MinUniq	Minimum in range of unique rail detected at this location (nullify field if bird was previously recorded and counted on same DATE & site)
	MaxUniq	*Assumed* maximum in range of unique rail detected at this location (nullify field if bird was previously recorded and counted on same DATE & site); assume that detected rail may have a mate
	MinDet	Minimum in range of unique rail detected at this location (nullify field if bird was previously recorded and counted on same DATE & site); NOTE - this field is identical to MinUniq
	MaxDet	*Actual* maximum in range of unique rail detected at this location (nullify field if bird was previously recorded and counted on same DATE & site); do not make assumptions about pairs
	NonSite	Select "Yes" if rail was detected outside of survey site (in SiteDet column enter site in which rail was detected)
	NonSurv	Select "Yes" if rail was detected outside of survey time or between stations
	SiteDet	ISP Monitoring Program subsite code (4-letter subsite code) where rail was detected
	SiteCode	ISP Control Program alphanumeric subsite code (ISP site number + ISP subsite letter) where rail was detected
	Observer	Primary observer conducting survey
	Notes	Enter any relevant information regarding this specific offset
	QC	Date when data was checked for quality (QC'd)
	UniqueID	Unique ID of individual rail detected (PRIMARY KEY)
	ConwayMin	Minute in which rail was detected during 10 minute survey period
	ObsX	X-coordinate of observer if different than location of PointID (ie if observer was between survey stations when rail was detected)
	ObsY	Y-coordinate of observer if different than location of PointID (ie if observer was between survey stations when rail was detected)
	Repeat	Select "Yes" if rail was already counted from a different survey station on the same date and round

Feature	Fields	Description
Location - a point feature at approximate location of observed rail; contains data on each unique detection.	OBJECTID	Unique ID of object automatically assigned by ESRI
	Shape	Shape type of object automatically defined by ESRI (POINT)
	SiteCode	ISP Control Program alphanumeric subsite code (ISP site number + ISP subsite letter)
	Species	4 letter AOU code for species of rail detected
	FieldRef	Code to ID bird in field on field map
	DateSurv	Date when survey was conducted
	Observer	Primary observer conducting survey
	Round	Round number (1, 2, or 3)
	QC	Date when data was checked for quality (QC'd)
	Notes	Enter any relevant information regarding this location
	UniqueID	Unique ID of individual rail detected (PRIMARY KEY)

Feature	Fields	Description
Visit - a point feature defining survey station (location of observer); contains data regarding visit to each survey station, including weather data (which was previously recorded by round in a separate table).	OBJECTID	Unique ID of object automatically assigned by ESRI
	Shape	Shape type of object automatically defined by ESRI (POINT)
	SiteName	Full name of site (eg: Elsie Roemer)
	ISPCode	ISP control program alphanumeric site code (eg: 17a)
	ISPPoint	6-character alphanumeric code for station identification
	SurvDate	Date when survey was conducted
	Start	Starting time of station visit
	SurvType	Type of survey being conducted
	Tape	Enter "Yes" if tape will be played at this station on this round
	Round	Round number (1, 2, or 3)
	Observer	Primary observer conducting survey
	Detections	Enter "Yes" if rails were detected during the station visit
	Temp	Temperature (in Fahrenheit)
	Wind	Wind speed (in mph)
	WindDir	Wind direction (eg: 'wind is blowing from **NE**')
	Cloud	Cloud cover at beginning of survey (expressed as percent of cloud covering sky)
	Sky	Brief description of sky using a coded domain based on the national prorocol (0-clear or a few clouds, 1-partly cloudy or variable sky, 2-cloudy or overcast, 4-fog or smoke, 5-drizzle, 6-rain, or 8-showers)
	Noise	Measurement of the noise at the survey station in decibles (dbC)
	NoiseEst	Estimate of the noise at the survey station using a coded domain based on the national protocol (0-none, 1-faint, 2-moderate, 3-loud, or 4-intense)
	AvianPred	Enter "Yes" if any avian predators/raptors were observed from the survey station, including predators of nests and young
	MamPred	Enter "Yes" if any mammalian predators/signs were observed from the survey station, including predators of nests and young
	PredNotes	Note the type of predator observed
	Notes	Enter any relevant information regarding this specific detection
	X_Coord	X-Coordinate of point in UTMs (Nad 83 Zone 10)
	Y_Coord	Y-Coordinate of point in UTMs (Nad 83 Zone 10)
	QC	Date when data was checked for quality (QC'd)
	Multiple	Enter "Yes" if there was more than one observer recording data at the survey station

Feature	Fields	Description
Site Description - a polygon defining site boundary; contains site descriptions, including observations on pollution and land use.	OBJECTID	Unique ID of object automatically assigned by ESRI
	Shape	Shape type of object automatically defined by ESRI (POLYGON)
	ISPName	Full name of site (ex: Elsie Roemer)
	ISPCode	ISP control program alphanumeric site code (ex: 17a)
	ISPSite	CLRA program 4-letter site ID (ex: ELRO)
	Region	CLRA program region name
	SiteHA	Site area in hectares
	SurvHA	Site area surveyed in hectares, assuming a 200 meter listening threshold around each survey station
	Observer	Primary observer conducting survey
	SurvDate	Date when survey was conducted
	SiteQual	Site Quality: overall quality of habitat for CLRA breeding and foraging
	Disturb	Disturbances to wetland, including construction, restoration, fire, etc.
	Pollut	Pollution at site, including point source, run-off, trash, etc
	SiteNotes	Notes regarding site
	Type2015	Type of survey being conducted

Appendix IV: Survey Forms

Entered:________________

California Ridgway's Rail Survey Form 2015

Target Site__________________________**Adjacent Site(s)**______________________**Round**______ **Date** (mm/dd/yy)___________

Observer(s)_______________________**Multiple?** _____**Survey Type**___________ **Time: Start**_____________________**End**______________

Station # -- or -- Bird Species	Tape	Time	Dir. (º)	Dist (m)	Range (m)	Min 1	Min 2	Min 3	Min 4	Min 5	Min 6	Min 7	Min 8	Min 9	Min 10	Outside time?	Outside site?	Notes	Map Ref	Unique Count
																		Site min / max:		

Site Notes: ____

____

Other Birds at Site

____
____
____
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____
____

Birds beyond Site

____
____
____
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____
____
____
____
____
____
____
____

V visual

<u>Ridgway's Rail</u>
D duet
C clatter
K kek
B kek-burr
KH kek-hurah
~~**H** hoo~~
SK squawk
P purr

<u>Yellow Rail:</u>
cc click-click
ca cackle
whz wheeze

<u>Black Rail:</u>
kkk kic-kic-kerr
gr grrr
cht churt
tch tch (laugh)

<u>Pied-billed Grebe:</u>
ow owhoop
hy hyena

<u>Cmn Moorhen:</u>
wo wipe-out
gu giddy-up

<u>Virginia Rail:</u>
g grunt
t tick-it
ki kicker
sqk squawk
kk kikik

<u>American Bittern:</u>
pl pump-er-lunk
cp chu-peep
ko kok

<u>Sora:</u>
wh whinny
pw per-weep
kee keep

<u>Least Bittern:</u>
coo coo
kak kak
ert ert

<u>American Coot:</u>
hu hic-up
hk honk

Revised 1/6/2015 JTM

Page___of___

Survey form for call count surveys using Protocol A and C.

ISP CLAPPER RAIL HABITAT ASSESSMENT (F-SURVEY) 2015

Site Name (& ID): _____ **Photo?** _____

Surveyor: _____ **Date:** _____ **Time:** _____ **Tide:** _____

Channels
0 Invaded shoreline or only 1st order
1 2nd order
2 3rd order
3 4th order +

Distance from Bay*
0 >500m
1 20-500 m
2 1-20 m (outboard levee)
3 0 m (direct connection)
*or major channel/creek/river

Distance from nearest known CLRA
0 > 1000 m
1 500 - 1000 m
2 200 - 500 m
3 1 - 200 m
4 Recently detected at site

Hydrology
0 Extremely muted (dry or ponded)
1 Slightly muted
2 Fully tidal

Salinity
0 Freshwater
1 Brackish
2 Salt marsh

Marsh Size
0 0 - 5 ha
1 5 - 25 ha
2 25 - 50 ha
3 > 50 ha

Perimeter:Area Ratio
0 > 8%
1 4 - 8%
2 2.5 - 4%
3 < 2.5%

Vegetative Structure
0 <50% vegetated
1 >50% vegetated, but ceiling is <15cm
2 >50% vegetated, and ceiling is 15-30cm
3 >50% vegetated, and ceiling is >30cm

Overall Marsh Quality
0 Poor
1 Fair
2 Good
3 Excellent

Final Determination
F Unlikely to support any CLRA
F May support migrant CLRA, but not a breeding pair
C May support breeding CLRA
A Breeding CLRA likely present

Raptors: _____

Mammals: _____

Surrounding Land Use: _____

Disturbance: _____

Site Notes: _____

Datasheet for habitat evaluation using Protocol F.

Appendix V: 2015 OEI Survey Results for Each Round

REGION: Bay Bridge North												
			Round 1			Round 2			Round 3			
Site Name and ID	**Site Quality**	**Survey Type**	**Date**	**Observer**	**# RIRA Detected**	**Date**	**Observer**	**# RIRA Detected**	**Date**	**Observer**	**# RIRA Detected**	**Notes**
Emeryville Crescent - East (06a)	Fair	C	1/28/2015	JM	0	2/23/2015	JL	0	3/26/2015	MO	0	
Emeryville Crescent - West (06b)	Fair	A	1/30/2015	SG	0	2/24/2015	JL	0	4/8/2015	MO	0	
Whittel Marsh (10a)	Good	A	1/16/2015	JL	0	2/9/2015	JL	1 - 2	3/11/2015	JL	**3 - 6**	
Southern Marsh (10b)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Giant Marsh (10c)	Good	A	1/16/2015	MO	0	2/9/2015	SG	0	3/11/2015	JM	0	
Wildcat Marsh (22a)	Excellent	A	1/27/2015	TR	**40 - 48**	2/18/2015	SC	4 - 6	3/17/2015	JM	7 - 12	
San Pablo Marsh (22b)	Excellent	A	2/13/2015	JL	7 - 12	3/2/2015	JL	9 - 12	3/19/2015	SC	**21 - 24**	3 BLRA detected during round 3
Rheem Creek Area (22c)	Good	A	2/12/2015	AE	0	3/10/2015	SG	**4**	4/8/2015	JM	3 - 4	1 BLRA detected during round 1
Stege Marsh (22d)	Good	A	2/2/2015	WT	7 - 8	2/25/2015	JM	4	4/3/2015	WT	**7 - 8**	
Meeker Marsh (22d)	Good	A	2/2/2015	WT	1 - 2	2/25/2015	JM	0	4/3/2015	WT	**7 - 8**	
Hoffman Marsh (22e)	Good	A	2/2/2015	WT	0	2/25/2015	JM	**1 - 2**	4/3/2015	WT	0	
Albany Shoreline (22f)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat

REGION: San Leandro Bay												
			Round 1			Round 2			Round 3			
Site Name and ID	**Site Quality**	**Survey Type**	**Date**	**Observer**	**# RIRA Detected**	**Date**	**Observer**	**# RIRA Detected**	**Date**	**Observer**	**# RIRA Detected**	**Notes**
Elsie Roemer (17a)	Poor	C	1/18/2015	JH	0	3/9/2015	SC	0	4/6/2015	SC	0	
Bay Farm Island (17b)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Arrowhead Marsh (17c)	Excellent	B	1/30/2015	TR	**45 - 52**	3/3/2015	JM	45 - 48	4/9/2015	JM	23 - 32	Split site
Arrowhead Marsh (17c.1)	Good	B	1/30/2015	TR	**6**	3/3/2015	JM	2 – 4	4/9/2015	JM	2	Treatment permitted
Arrowhead Marsh (17c.2)	Excellent	B	1/30/2015	TR	**39 – 46**	3/3/2015	JM	43 – 44	4/9/2015	JM	21 - 30	No treatment allowed
Airport Channel - Fan Shore (17d)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
MLK Regional Shoreline - Damon (17d)	Fair	A	2/3/2015	MO	1 - 2	2/23/2015	MO	0	4/3/2015	SC	**2**	No treatment allowed
San Leandro Creek (17e)	Fair	A	1/30/2015	JM	0	2/19/2015	AE	**2**	3/23/2015	SC	0	
Oakland Inner Harbor (17f)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Coast Guard Is (17g)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
MLK New Marsh (17h)	Excellent	A	1/30/2015	JL	17 - 20	2/19/2015	SC	**30 - 32**	3/23/2015	JM	18 - 20	No treatment allowed
Coliseum Channels (17i)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Fan Marsh (17j)	Good	A	1/19/2015	SC	5 - 6	2/18/2015	JH	**9 - 10**	3/20/2015	JL	6 - 8	No treatment allowed
Airport Channel (17k)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Doolittle Pond (17l)	Poor	C	1/19/2015	SC	0	2/18/2015	JH	0	3/20/2015	JL	0	
Alameda Island - East (17m)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat

REGION: Hayward												
			Round 1			Round 2			Round 3			
Site Name and ID	Site Quality	Survey Type	Date	Observer	# RIRA Detected	Date	Observer	# RIRA Detected	Date	Observer	# RIRA Detected	Notes
Oro Loma - East (07a)	Good	A	2/4/2015	JH	0	3/4/2015	WT	**1 - 2**	4/1/2015	WT	0	
Oro Loma - West (07b)	Good	A	2/4/2015	SC	0	3/4/2015	MO	**1 - 2**	4/1/2015	MO	0	
Oyster Bay Regional Shoreline (20a)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Oakland Golf Links (20b)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Dog Bone Marsh (20c)	Poor	F	2/17/2015	SC	0	3/5/2015	SC	0	3/31/2015	MO	0	Insufficient habitat
Citation Marsh (20d)	Excellent	A	2/17/2015	TR	2	3/5/2015	TR	**7 - 10**	3/31/2015	WT	7 - 8	Split site
Citation Marsh – South (20d.1)	Good	A	2/17/2015	TR	0	3/5/2015	TR	**0**	3/31/2015	WT	**2**	Treatment permitted
Citation Marsh – North (20d.2)	Excellent	A	2/17/2015	TR	2	3/5/2015	TR	**7 - 10**	3/31/2015	WT	5 - 6	No treatment allowed
East Marsh (20e)	Fair	A	2/17/2015	JL	0	3/5/2015	JL	0	3/31/2015	JL	0	
North Marsh (20f)	Good	A	2/17/2015	SC	8 - 10	3/5/2015	SC	25 - 28	3/31/2015	MO	**27 - 32**	No treatment allowed
Bunker Marsh (20g)	Good	A	2/17/2015	AE	5 - 8	3/5/2015	SG	**6 - 8**	3/31/2015	SG	2 - 4	No treatment allowed
San Lorenzo Creek (20h)	Fair	A	2/17/2015	JL	0	3/5/2015	JL	0	3/31/2015	JL	0	Split site
San Lorenzo Creek – North (20h.1)	Fair	A	2/17/2015	JL	0	3/5/2015	JL	0	3/31/2015	JL	0	No treatment allowed
San Lorenzo Creek – South (20h.2)	Fair	A	2/17/2015	JL	0	3/5/2015	JL	0	3/31/2015	JL	0	Treatment permitted
Bockman Channel (20i)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Sulphur Creek (20j)	Poor	A	2/4/2015	SG	0	3/4/2015	SG	0	4/1/2015	SG	0	
Hayward Landing (20k)	Fair	C	2/19/2015	MO	0	3/6/2015	SG	0	4/2/2015	MO	0	

REGION: Hayward (continued)												
			Round 1			Round 2			Round 3			
Site Name and ID	Site Quality	Survey Type	Date	Observer	# RIRA Detected	Date	Observer	# RIRA Detected	Date	Observer	# RIRA Detected	Notes
Johnson's Landing (20l)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Cogswell - Sec A (20m)	Good	A	2/3/2015	SG	**2**	3/3/2015	SG	1 - 2	3/23/2015	SG	1 - 2	
Cogswell - Sec B (20n)	Good	A	2/3/2015	JM	24 - 28	3/3/2015	TR	**25 - 34**	3/23/2015	JH	20 - 26	No treatment allowed
Cogswell - Sec C (20o)	Good	A	2/3/2015	SC	**11 - 14**	3/3/2015	JH	4	3/23/2015	TR	4	No treatment allowed
Hayward Shoreline Outliers (20p)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
San Leandro Shoreline Outliers (20q)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Oakland Airport (20r)	Fair	C	2/10/2015	NH	0	2/26/2015	MO	0	3/24/2015	SG	0	
HARD Marsh (20s)	Fair	A	2/3/2015	NH	0	3/3/2015	MO	0	3/23/2015	MO	0	
San Leandro Marina (20t)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Estudillo Creek Channel (20u)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Hayward Landing Canal (20v)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Triangle Marsh - Hayward (20w)	Fair	C	2/16/2015	MO	0	3/6/2015	SG	0	4/2/2015	MO	0	

REGION: Union City												
			Round 1			Round 2			Round 3			
Site Name and ID	Site Quality	Survey Type	Date	Observer	# RIRA Detected	Date	Observer	# RIRA Detected	Date	Observer	# RIRA Detected	Notes
AFCC – Upper (01c)	Fair	G	1/20/2015	JM*	0	2/9/2015	JM*	0	3/3/2015	SC*	0	Surveyed using protocol G; *observer is lead surveyor with assistants at each station
AFCC - Strip Marsh (01e)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
OAC - North Bank (13a)	Fair	A	1/23/2015	TR	0	2/17/2015	MO	0	3/9/2015	JL	0	
OAC - Island (13b)	Fair	A	1/23/2015	JL	0	2/17/2015	SG	0	3/9/2015	SG	**2**	
OAC - South Bank (13c)	Fair	A	1/20/2015	JL	0	2/11/2015	IS	0	3/10/2015	SG	0	
Whale's Tail - North (13d)	Good	A	2/10/2015	JM	0	3/12/2015	SC	**2**	3/26/2015	TR	0	
OAC - Upstream 20 Tide Gates (13g)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Eden Landing - North Creek (13h)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Eden Landing - Pond 10 (13i)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Eden Landing - Mt Eden Creek (13j)	Fair	C	1/23/2015	NH	0	2/17/2015	JM	0	4/8/2015	SC	0	
Eden Landing Reserve - South (13k)	Fair	C	1/23/2015	JM	0	2/17/2015	MO	0	4/8/2015	WT	0	
Eden Landing Reserve - North (13l)	Poor	C	1/23/2015	JM	0	2/17/2015	MO	0	4/8/2015	WT	0	
Eden Landing - Ponds E8A, E9, E8X (13m)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat

REGION: Dumbarton South												
			Round 1			Round 2			Round 3			
Site Name and ID	Site Quality	Survey Type	Date	Observer	# RIRA Detected	Date	Observer	# RIRA Detected	Date	Observer	# RIRA Detected	Notes
Ravenswood Open Space Preserve (02j)	Fair	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Calaveras Point (05a)	Excellent	A	2/13/2015	JL	9 - 12	2/27/2015	JL	9 - 12	3/26/2015	JL	**13 - 18**	
Dumbarton/Audubon (05b)	Excellent	A	1/19/2015	JL	**22 - 28**	2/19/2015	JL	0	3/18/2015	JM	3 - 4	
Newark Slough (05c)	Excellent	A	1/29/2015	SC	1 - 2	2/17/2015	WT	**3 - 4**	3/16/2015	SC	1 - 2	
Mayhew's Landing (05e)	Fair	C	2/5/2015	NH	0	2/19/2015	SG	0	4/2/2015	JL	0	
Cargill Pond (W Suites Hotel) (05g)	Fair	C	2/5/2015	NH	0	2/19/2015	SG	0	4/2/2015	JL	0	
Plummer Creek Mitigation (05h)	Good	C	2/5/2015	NH	0	2/19/2015	SG	0	4/2/2015	JL	0	
Palo Alto Baylands (08)	Excellent	A	2/12/2015	TR	**15 - 18**	3/2/2015	TR	12 - 14	3/18/2015	TR	10 - 14	
Palo Alto Harbor (08)	Excellent	A	2/12/2015	JM	**20 - 24**	3/2/2015	JM	15 - 20	3/18/2015	JH	16 - 22	
Charleston Slough (15a.1)	Good	A	1/21/2015	JM	1 - 2	2/17/2015	JM	1 - 2	3/19/2015	MO	**3 - 4**	
Mountain View Slough (15a.1)	Good	A	1/21/2015	JM	0	2/17/2015	JM	0	3/19/2015	MO	**2**	
Stevens Creek to Long Point (15a.2)	Fair	A	2/2/2015	JH	0	3/2/2015	MO	0	3/16/2015	MO	0	
Guadalupe Slough (15a.3)	Good	A	1/21/2015	WT	0	2/16/2015	JL	0	3/19/2015	SG	**4 - 6**	
Alviso Slough (15a.4)	Good	A	2/4/2015	JM	6	2/20/2015	JM	0	3/16/2015	JH	**9 - 12**	
Coyote Creek South East (15a.5)	Good	A	2/2/2015	TR	**18 - 22**	2/20/2015	JH	11 - 14	3/16/2015	JL	2	+8 BLRA in round 2; +2 BLRA in round 3
Knapp Tract (15a.6)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat

REGION: Dumbarton South (continued)												
			Round 1			Round 2			Round 3			
Site Name and ID	**Site Quality**	**Survey Type**	**Date**	**Observer**	**# RIRA Detected**	**Date**	**Observer**	**# RIRA Detected**	**Date**	**Observer**	**# RIRA Detected**	**Notes**
Faber Marsh (15b)	Excellent	A	2/5/2015	TR	**46 - 52**	3/2/2015	JM	38 - 42	3/19/2015	JM	39 - 56	
Laumeister Marsh (15b)	Excellent	A	2/5/2015	JM	**43 - 48**	3/2/2015	SC	20 - 28	3/19/2015	WT	25 - 42	
Stevens Creek (15c)	Good	C	2/2/2015	JH	0	3/2/2015	MO	0	3/16/2015	MO	0	
Cooley Landing (16)	Good	A	2/5/2015	SC	**4**	3/2/2015	WT	3 - 4	3/19/2015	JL	0	

REGION: San Mateo												
			Round 1			Round 2			Round 3			
Site Name and ID	Site Quality	Survey Type	Date	Observer	# RIRA Detected	Date	Observer	# RIRA Detected	Date	Observer	# RIRA Detected	Notes
Belmont Slough (02a)	Good	A	2/10/2015	TR	**7 - 8**	3/10/2015	AE	2 - 4	4/2/2015	AE	3 - 4	
Redwood Shores (02a)	Fair	A	2/4/2015	JL	0	2/20/2015	SC	0	3/18/2015	SC	0	
Redwood Shores Mitigation Bank (02a.4)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Corkscrew Slough (02b)	Good	A	2/11/2015	JL	**15 - 22**	2/26/2015	JL	6 - 10	3/27/2015	JL	3 - 4	
Steinberger Slough (02b)	Fair	C	2/4/2015	MO	0	2/20/2015	SG	0	3/18/2015	JL	0	
B2 North Quadrant (02c)	Good	A	1/29/2015	TR	18 - 22	2/24/2015	JM	**18 - 24**	3/11/2015	TR	4	Split site
B2 North Quadrant – West (02c.1a)	Good	A	1/29/2015	TR	1 – 2	2/24/2015	JM	**0**	3/11/2015	TR	**4**	Treatment allowed
B2 North Quadrant – East (02c.1b)	Good	A	1/29/2015	TR	15 - 18	2/24/2015	JM	**18 - 24**	3/11/2015	TR	0	Seed-suppression only; full treatment not permitted
B2 North Quadrant – East (02c.2)	Good	A	1/29/2015	TR	**2**	2/24/2015	JM	**0**	3/11/2015	TR	0	Treatment allowed
B2 South Quadrant (02d)	Good	A	2/11/2015	TR	4 - 6	2/26/2015	TR	**6**	3/27/2015	JM	0	
Greco Island - North (02f)	Good	A	2/11/2015	SC	**8 - 10**	2/26/2015	SC	4 - 6	3/27/2015	WT	1 - 4	
West Point Slough - SW / E (02g)	Good	A	2/10/2015	JL	0	3/5/2015	MO	0	4/3/2015	JM	0	
Greco Island - South (02h)	Excellent	A	1/20/2015	TR	23 - 30	2/19/2015	JM	17 - 30	3/20/2015	TR	**31 - 42**	
Ravenswood Slough (02i)	Good	A	2/4/2015	AE	9 - 12	3/2/2015	TR	5 - 8	3/19/2015	TR	**12**	

REGION: San Mateo (continued)												
			Round 1			Round 2			Round 3			
Site Name and ID	**Site Quality**	**Survey Type**	**Date**	**Observer**	**# RIRA Detected**	**Date**	**Observer**	**# RIRA Detected**	**Date**	**Observer**	**# RIRA Detected**	**Notes**
Middle Bair N (02k)	Excellent	A	2/11/2015	JM	**37 - 46**	2/26/2015	JM	24 - 26	3/27/2015	SC	0	
Middle Bair SE (02k)	Good	A	2/11/2015	JM	0	2/26/2015	JM	0	3/27/2015	SC	0	
Inner Bair Island Restoration (02l)	Fair	C	1/29/2015	MO	0	2/20/2015	AE	0	4/3/2015	AE	0	
Pond B3 Bair Island Restoration (02m)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Middle Bair West (02o)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Foster City (19q)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Maple Street Channel (19s)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat

REGION: SF Peninsula												
			Round 1			Round 2			Round 3			
Site Name and ID	Site Quality	Survey Type	Date	Observer	# RIRA Detected	Date	Observer	# RIRA Detected	Date	Observer	# RIRA Detected	Notes
Pier 94 (12a)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Pier 98/Heron's Head (12b)	Fair	A	2/9/2015	TR	0	3/4/2015	AE	0	3/31/2015	TR	0	
India Basin (12c)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Hunters Point Naval Reserve (12d)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Yosemite Channel (12e)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Candlestick Cove (12f)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Crissy Field (12g)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Yerba Buena Island (12h)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Mission Creek (12i)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Colma Creek (18a)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Navigable Slough (18b)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Old Marina (18c)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Inner Harbor (18d)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Sam Trans Peninsula (18e)	Poor	C	2/16/2015	SC	0	3/6/2015	AE	0	4/1/2015	AE	0	
Confluence Marsh (18f)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
San Bruno Marsh (18g)	Fair	C	2/16/2015	SG	0	3/6/2015	AE	0	4/1/2015	AE	0	
San Bruno Creek (18h)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Brisbane Lagoon (19a)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Sierra Point (19b)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat

REGION: SF Peninsula (continued)												
			Round 1			Round 2			Round 3			
Site Name and ID	**Site Quality**	**Survey Type**	**Date**	**Observer**	**# RIRA Detected**	**Date**	**Observer**	**# RIRA Detected**	**Date**	**Observer**	**# RIRA Detected**	**Notes**
Oyster Cove (19c)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Pier 94 (12a)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Seaplane Harbor (19g)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
SFO (19h)	Poor	A	1/21/2015	IS	0	2/18/2015	TR	0	4/1/2015	TR	**3 - 4**	
Mills Creek Mouth (19i)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Easton Creek Mouth (19j)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Sanchez Marsh (19k)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Burlingame Lagoon (19l)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Fisherman's Park (19m)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Coyote Point Marina (19n)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
San Mateo Creek (19o)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Seal Slough (19p)	Good	A	2/3/2015	AE	0	3/3/2015	AE	0	3/19/2015	AE	0	
Anza Lagoon (19r)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat

REGION: Marin												
			Round 1			Round 2			Round 3			
Site Name and ID	Site Quality	Survey Type	Date	Observer	# RIRA Detected	Date	Observer	# RIRA Detected	Date	Observer	# RIRA Detected	Notes
Blackie's Creek (03a)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Blackie's Creek Mouth (03b)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
CMC Marsh Reserve (04a)	Excellent	A	2/3/2015	TR	**19 - 26**	3/4/2015	JM	15 - 18	4/2/2015	JM	6 - 8	
College of Marin (04b)	Poor	A	1/23/2015	MO	0	2/18/2015	JM	0	3/20/2015	SG	0	
Piper Park - East (04c)	Good	A	1/23/2015	SC	0	2/18/2015	SG	2 - 4	3/20/2015	JM	**4 - 6**	
Larkspur Ferry Landing Area (04e)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Riviera Circle (04f)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Creekside Park (04g)	Good	A	1/23/2015	MO	2 - 4	2/18/2015	JM	0	3/20/2015	SG	**4**	+1 BLRA in round 2
CMC - Upper (04h)	Fair	A	1/23/2015	SG	0	2/18/2015	MO	0	3/20/2015	MO	**2**	
CMC - Lower (04i)	Fair	A	1/23/2015	SG	0	2/18/2015	MO	0	3/20/2015	MO	0	
CMC - Mouth (04j)	Fair	A	2/3/2015	JL	**1 - 2**	3/4/2015	WT	0	4/2/2015	SG	0	
Murphy Creek (04l)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Pickleweed Park (09)	Fair	A	1/15/2015	JL	0	2/9/2015	JM	0	3/30/2015	TR	0	
Brickyard Cove (23a)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Beach Drive (23b)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Loch Lomond Marina (23c)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
San Rafael Canal Mouth (23d)	Fair	A	1/15/2015	NH	0	2/9/2015	SC	0	3/30/2015	JL	0	
Muzzi Marsh (23e)	Excellent	A	2/3/2015	JM	**27 - 30**	3/4/2015	JH	22 - 32	4/2/2015	WT	20 - 26	

REGION: Marin (continued)												
			Round 1			Round 2			Round 3			
Site Name and ID	**Site Quality**	**Survey Type**	**Date**	**Observer**	**# RIRA Detected**	**Date**	**Observer**	**# RIRA Detected**	**Date**	**Observer**	**# RIRA Detected**	**Notes**
Paradise Cay (23f)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Greenwood Beach (23g)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Strawberry Point (23h)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Strawberry Cove (23i)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Bothin Marsh (23j)	Good	A	1/22/2015	JH	1 - 2	2/17/2015	WT	1 - 2	3/12/2015	JL	**3 - 6**	
Sausalito (23k)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Starkweather Park (23l)	Poor	F	-	-	-	-	-	-	-	-	-	Insufficient habitat
Triangle Marsh - Marin (23n)	Fair	C	1/15/2015	JL	0	2/9/2015	SC	0	3/30/2015	JL	0	

REGION: San Pablo Bay												
			Round 1			Round 2			Round 3			
Site Name and ID	**Site Quality**	**Survey Type**	**Date**	**Observer**	**# RIRA Detected**	**Date**	**Observer**	**# RIRA Detected**	**Date**	**Observer**	**# RIRA Detected**	**Notes**
Petaluma River - Upper (24a)	Good	A	2/4/2015	IS	0	2/25/2015	IS	0	3/18/2015	JH	**2**	+1 BLRA in round 3
Grey's Field (24b)	Good	A	2/4/2015	IS	0	2/25/2015	IS	0	3/18/2015	JH	0	+1 BLRA in round 3
Ellis Creek (24c)	Good	A	2/4/2015	IS	0	2/25/2015	IS	0	3/18/2015	JH	0	
San Pablo Bay NWR Shoreline (26b)	Fair	C	1/27/2015	SG	0	2/18/2015	IS	0	3/18/2015	IS	0	