

San Francisco Estuary Invasive *Spartina* Project 2023-2024 Monitoring and Treatment Report

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TABLE OF CONTENTS

1. Introduction	2
2. Treatment and Monitoring Completed 2023-2024.....	5
2.1 Bay-wide Inventory.....	5
<i>Bay-wide Inventory Methods</i>	<i>5</i>
<i>Bay-wide Inventory Results</i>	<i>8</i>
2.2 Regional Inventory and Treatment.....	17
<i>Region 2: San Francisco Peninsula.....</i>	<i>24</i>
<i>Region 3: San Mateo.....</i>	<i>28</i>
<i>Region 4: Dumbarton South.....</i>	<i>34</i>
<i>Region 5: Union City.....</i>	<i>39</i>
<i>Region 6: Hayward</i>	<i>43</i>
<i>Region 7: San Leandro Bay.....</i>	<i>48</i>
<i>Region 8: Bay Bridge North</i>	<i>52</i>
<i>Region 9: Suisun.....</i>	<i>56</i>
<i>Region 10: Vallejo</i>	<i>60</i>
<i>Region 11: Petaluma.....</i>	<i>64</i>
<i>Region 12: Outer Coast</i>	<i>63</i>
3. Special Topics	66
3.1 Phase 2 Implementation for Resuming Treatment at Previously Restricted Sites ...	66
3.2 Influence of Rainfall Levels on <i>Spartina</i> Management	73
3.3 Large Scale Restoration and the South Bay Salt Pond Restoration Project.....	76
3.4 Enhanced Inventory and Treatment Effort at Bair Island Marshes.....	81
3.5 New Infestations and Sub-Areas Added in 2023-2024.....	83
4. Considerations for 2025.....	85
5. References	87

Appendix I. Target Species Descriptions	
Appendix II. ISP Program Areas	
Appendix III. 2023 Regional Tables	
Appendix IV. 2023 Post-season Inventory Plan Update	
Appendix V. 2024 Post-season Inventory Plan Update	

List of Figures

Figure 1. ISP Reporting Regions and 2023 survey efforts throughout San Francisco Bay Estuary.....	11
Figure 2. ISP Reporting Regions and 2024 survey efforts throughout San Francisco Bay Estuary.....	12
Figure 3. Net Area and Percentage of Bay Total of Invasive <i>Spartina</i> in 2024 by ISP Reporting Region and Classification of Invasive <i>Spartina</i> Eradication by Sub-area.	13
Figure 4. Bay-wide trend of invasive <i>Spartina</i> from 2004-2024 by net cover (acres) and treatment authorization since 2010.	16
Figure 5. Distribution of invasive <i>Spartina</i> in 2024 across the 32 sub-areas of Reporting Region 1: Marin. Sub- areas with current infestation are labeled in pink, while those with no detection of invasive <i>Spartina</i> are labeled in green.....	19
Figure 6. Distribution of invasive <i>Spartina</i> in 2024 within the Corte Madera Creek Watershed of ISP's Marin Region. Sub- areas with current infestation are labeled in pink, while those with no detection of invasive <i>Spartina</i> are labeled in green.	20
Figure 7. ISP biologists are finding fewer instances of <i>Spartina densiflora</i> during the twice-annual surveys. Most detections at this point are small seedlings such as this plant from January 2024, which are very challenging to find hidden amongst healthy native vegetation. All detected instances of <i>S. densiflora</i> are removed manually and disposed offsite.....	22
Figure 8. Distribution of invasive <i>Spartina</i> in 2022 across the 35 sub-areas of Reporting Region 2: San Francisco Peninsula. Sub-areas with current infestation are labeled in pink, while those with no detection of invasive <i>Spartina</i> are labeled in green.	25
Figure 9. Airboat treatment at Central Bair in 2024; the new approach (discussed above) to adapt to the increased vegetation establishment at this maturing restoration site. The airboat is returning to treat a patch of hybrid <i>S.</i> <i>alterniflora</i> that was detected the prior year by experienced ISP biologists conducting focused on-the-ground surveys.....	29
Figure 10. Distribution of invasive <i>Spartina</i> in 2024 across the 26 sub-areas of Reporting Region 3: San Mateo. Sub- areas with current infestation are labeled in pink, while those with no detection of invasive <i>Spartina</i> are labeled in green.....	31
Figure 11. Distribution of invasive <i>Spartina</i> in 2024 across the 26 sub-areas of Reporting Region 4: Dumbarton South. Sub-areas with current infestation are labeled in pink, while those with no detection of invasive <i>Spartina</i> are labeled in green.....	36
Figure 12. Hybrid <i>S. alterniflora</i> in the Island Ponds (05i) restoration marshes can reach substantial heights enabled by high nutrient input from Coyote Creek and the San Jose Wastewater Treatment Facility and growing in competition for sunlight within dense stands of alkali bulrush (<i>Bolboschoenus maritimus</i>).	38
Figure 13. Distribution of invasive <i>Spartina</i> in 2024 across the 21 sub-areas of Reporting Region 5: Union City. Sub- areas with current infestation are labeled in pink, while those with no detection of invasive <i>Spartina</i> are labeled in green.....	40
Figure 14. Initiation of full treatment at Cogswell B Main (20n.3) in 2023, utilizing an Intelli-Spray system that enables applicators to haul up to 850ft of hose from a truck staged on an adjacent levee. This equipment was	

not available in the early years of the project and greatly enhances efficiency in treating large stands of hybrid <i>S. alterniflora</i> . This has facilitated substantial reductions of the infestation reported above for 2023-2024.	44
Figure 15. Distribution of invasive <i>Spartina</i> in 2024 across the 30 sub-areas of Reporting Region 6: Hayward. Sub-areas with current infestation are labeled in pink, while those with no detection of invasive <i>Spartina</i> are labeled in green.	46
Figure 16. Distribution of invasive <i>Spartina</i> in 2024 across the 21 sub-areas of Reporting Region 7: San Leandro Bay. Sub-areas with current infestation are labeled in pink, while those with no detection of invasive <i>Spartina</i> are labeled in green.	50
Figure 17. Distribution of invasive <i>Spartina</i> in 2024 across the 13 sub-areas of Reporting Region 8: Bay Bridge North. Sub-areas with current infestation are labeled in pink, while those with no detection of invasive <i>Spartina</i> are labeled in green.	54
Figure 18. Distribution of invasive <i>Spartina</i> in 2024 in the six sub-areas of Reporting Region 9: Suisun. Sub-areas with current infestation are labeled in pink, while those with no detection of invasive <i>Spartina</i> are labeled in green.	58
Figure 19. Distribution of invasive <i>Spartina</i> in 2024 across the four sub-areas of Reporting Region 10: Vallejo. Sub-areas with current infestation are labeled in pink, while those with no detection of invasive <i>Spartina</i> are labeled in green.	62
Figure 20. Distribution of invasive <i>Spartina</i> in 2024 across the four sub-areas of Reporting Region 11: Petaluma. Sub-areas with current infestation are labeled in pink, while those with no detection of invasive <i>Spartina</i> are labeled in green.	65
Figure 21. Distribution of invasive <i>Spartina</i> in 2024 across the five sub-areas of Reporting Region 12: Outer Coast. Sub-areas with current infestation are labeled in pink, while those with no detection of invasive <i>Spartina</i> are labeled in green.	64
Figure 22. Distribution map of ISP Sub-areas in Phase 1 and Phase 2 of resuming treatment Plan after restrictions were put in place in 2011.	67
Figure 23. Treatment of hybrid <i>S. alterniflora</i> on the mudflat at the Phase 1 site Cogswell B Bayfront (20n.2). Phase 2 treatment began at the adjacent Cogswell B Main (20n.3) in 2023, which will greatly reduce the invasion pressure on this mudflat from the annual flood of hybrid seed dispersed by its neighbor.	68
Figure 24. Initiating full treatment at Fan Marsh in 2023. In the absence of treatment during the 12-year hiatus, the infestation of hybrid <i>S. alterniflora</i> rebounded to pre-ISP levels, completely engulfing the all available tidal marsh habitat at this site.	70
Figure 25. Distribution map of large scale restoration marshes of South San Francisco Bay.	79
Figure 26. Map showing the location of Doolittle Drive Mitigation Marsh (15d), established in 2023.	83
Figure 27. Map showing the location of Martinez (27e), established in 2024.	84

List of Tables

Table 1. Inventory timing for <i>Spartina</i> by species in 2023 and 2024.....	8
Table 2. Summary of Invasive <i>Spartina</i> Mapped in 2023 and 2024	10
Table 3. Summary of Invasive <i>Spartina</i> Mapped in 2023 and 2024 by Species and Treatment Status	10
Table 4. Sub-areas with historic infestation where no invasive <i>Spartina</i> was detected in 2023, 2024, or both years.	15
Table 5. Summary of 2023-2024 Invasive <i>Spartina</i> Cover by Reporting Region.....	17
Table 6. Summary of 2024 invasive <i>Spartina</i> mapped and treated by sub-area within Reporting Region 1: Marin...21	
Table 7. Summary of 2024 invasive <i>Spartina</i> mapped and treated by sub-area within Reporting Region 2: San Francisco Peninsula.	26
Table 8. Summary of 2024 invasive <i>Spartina</i> mapped and treated by sub-area within Reporting Region 3: San Mateo.	32
Table 9. Summary of 2024 invasive <i>Spartina</i> mapped and treated by sub-area within Reporting Region 4: Dumbarton South.	37
Table 10. Summary of 2024 invasive <i>Spartina</i> mapped and treated by sub-area within Reporting Region 5: Union City.....	41
Table 11. Summary of 2024 invasive <i>Spartina</i> mapped and treated by sub-area within Reporting Region 6: Hayward.	47
Table 12. Summary of 2024 invasive <i>Spartina</i> mapped and treated by sub-area within Reporting Region 7: San Leandro Bay.....	51
Table 13. Summary of 2024 invasive <i>Spartina</i> mapped and treated by sub-area within Reporting Region 8: Bay Bridge North.	55
Table 14. Summary of 2024 invasive <i>Spartina</i> mapped and treated by sub-area within Reporting Region 9: Suisun.	59
Table 15. Summary of 2024 invasive <i>Spartina</i> mapped and treated by sub-area within Reporting Region 10: Vallejo.	63
Table 16. Summary of 2024 invasive <i>Spartina</i> mapped and treated by sub-area within Reporting Region 11: Petaluma.	66
Table 17. Summary of 2024 invasive <i>Spartina</i> mapped and treated by sub-area within Reporting Region 12: Outer Coast.....	65
Table 18. ISP activities at the Phase Sites from 2018 to 2024.	72

1. INTRODUCTION

By the early 1970s, four non-native cordgrasses, including *Spartina alterniflora* (Atlantic smooth cordgrass), *S. densiflora* (Chilean cordgrass), *S. anglica* (English cordgrass), and *S. patens* (salt meadow cordgrass), had been introduced to the San Francisco Estuary ('Estuary' or 'Bay' throughout this report). Each of these species is known to be invasive outside of its native range, and each has demonstrated varying degrees of invasiveness since establishing in the Estuary. *Spartina* species are closely related, and both *S. alterniflora* and *S. densiflora* subsequently hybridized with native *S. foliosa*. Offspring of hybrid *S. alterniflora* × *foliosa* backcrossed with both parent species, producing an extremely robust and fertile "hybrid swarm," which invaded habitat throughout the Estuary, threatening the ecological integrity of the existing tidal wetlands and mudflats as well as the potential for future restoration efforts. For further detail on each species of *Spartina* found in the Estuary, see **Appendix I**.

The San Francisco Estuary Invasive *Spartina* Project (ISP) was established in 2000 by the California State Coastal Conservancy (Conservancy), in partnership with the U.S. Fish and Wildlife Service (USFWS), in response to the invasion of non-native *Spartina* and its observed impacts on the Estuary at the time. Non-native *Spartina* had been determined to pose many serious threats to the Estuary, as was described in the ISP's Programmatic Environmental Impact Statement/Environmental Impact Report (PEIS/EIR; California State Coastal Conservancy and U.S. Fish and Wildlife Service. 2003). Predicted impacts of invasive *Spartina* in the Estuary included the destruction and degradation of endangered species habitat, loss of mudflats that are vital for shorebird foraging, loss of urban flood control capacity, creation of mosquito-breeding areas by impounding water, corruption of tidal saltmarsh restoration efforts, and the possible eventual extinction of native *Spartina foliosa*. The purpose of the ISP is to implement a regional program to eradicate invasive *Spartina* species from and minimize ecological impacts to the Estuary. This goal is being accomplished through a coordinated program of inventory mapping and treatment that is planned and supervised by ISP biologists and implemented by a bay-wide network of partners, including hundreds of landowners, resource agencies, contractors, grantees, and stakeholder groups throughout the nine counties of the Bay Area.

The project has been supported since 2000 by a combination of state (77%), federal (19%), and local/other funds (4%) totaling \$58.8M. The program expenditure for 2023 and 2024 seasons was approximately \$7.3M with \$4.7M of that for invasive *Spartina* treatment and monitoring, \$800K for Ridgway's rail research, monitoring, and permitting, and \$0.9M for wetland habitat restoration through revegetation and construction of high tide refuge islands.

Working within annual windows of plant growth, limited access opportunities due to tides, and presence of endangered species in the work area, the ISP conducts mapping and treatment of invasive *Spartina* annually throughout up to ~70,000 acres of potential habitat.

Defining “Area”

The ISP uses the terms “net area” and “treatment area” to define the extent of non-native *Spartina*.

Net area refers to the size of the infestation if the space between stems were subtracted from the overall footprint of the plant or clump of plants. Net area is the metric typically used in botanical surveys.

Treatment area describes the area that will be directly affected by treatment. Treatment area is a separate measurement used for planning, and it is generally five to ten times greater than the net area of a given instance of invasive *Spartina*.

Unless otherwise noted in the text, all references to area in this report are net

Since 2008, inventory efforts have been conducted primarily on the ground or using boats. Most sites are inventoried each year to allow thorough and focused mapping and potential collection of genetic samples, and to map precise locations of invasive *Spartina* plants to inform treatment. Having the target plant locations identified and mapped prior to treatment allows treatment crews to work more efficiently by reducing search effort, enhancing worker safety, and minimizing disturbance to the marsh. A small number of sites with substantial mudflat components are mapped via airboat at the same time as treatment due to logistical concerns. Biologists map invasive *Spartina* plants they have detected using rugged handheld tablet PCs with Global Positioning System (GPS) to spatially demarcate each feature. A cover class is assigned to each feature to record the density of living invasive *Spartina* within that feature’s delineated boundary (see inset: Defining “Area”). All *Spartina* data are cloud-based and readily accessible to staff for real-time coordination in the field.

During treatment, ISP biologists use GPS- and GIS-functional tablets to guide OEI qualified herbicide applicators, contracted applicators, and/or agency personnel to each previously mapped invasive *Spartina* feature and update each instance of *Spartina* on the tablet to record that day’s treatment activity (e.g., “sprayed”, “dug”, “not treated”, “sub-optimally treated,” etc.). This methodology has been implemented by ISP since 2009 and has greatly improved the ability to achieve thorough treatment of sites in the limited time available with the treatment crew(s) for a given day. For further detail on the methods employed by ISP for treatment, monitoring, and other work, please see **Appendix II**.

In 2011 and 2012, the USFWS placed treatment restrictions on a number of sub-areas, resulting ultimately in 11 restricted sub-areas, located primarily in Central East Bay. During consultation with USFWS in 2018, some of these 11 sub-areas were split into smaller pieces, resulting in 15

sub-areas. In its 2018 Biological Opinion for the Project, the USFWS permitted full treatment to be reinitiated at nine of the 15 sub-areas, a period referred to going forward as “Phase 1 of re-initiation.” By the end of the 2020 season, treatment had been reinitiated in all nine Phase 1 sub-areas authorized for full treatment, and significant progress toward eradication was being made. In 2023, USFWS issued a new ten-year Biological Opinion, which authorized reinitiation of treatment at all six remaining sub-areas between 2023 and 2027. These sites came to be called the “Phase 2” sites and treatment began at three of them in 2023. During inventory the previous year (2022), ISP biologists mapped a total of 20.7 acres of invasive *Spartina*, 87% of which was in the six sub-areas where treatment had been restricted since 2011.

The Project has made tremendous progress toward eradication since 2005, when inventory and treatment began throughout the Estuary and in the neighboring coastal areas. Historic infestations have been reduced by greater than 97% within the Estuary, completely eradicated from the Point Reyes National Seashore and Bolinas Lagoon, and very nearly eradicated from Tomales Bay.

Section 2 provides information on recent inventory and treatment activities. For a more complete history of the invasion and treatment activities, see the 2012 ISP Monitoring and Treatment Report, subsequent annual reports from 2013 to 2016, and biennial reports since 2017.

2. TREATMENT AND MONITORING COMPLETED 2023-2024

The ISP's activities and progress over the two-year 2023-2024 period are described in this section, first from a bay-wide perspective, and then in more detail for each of 12 reporting regions (see inset at right and **Figure 1**). The reporting regions are based on regions initially defined by USFWS for assessment of California Ridgway's rail (*Rallus obsoletus obsoletus*) populations. The reporting region boundaries also take into consideration natural and political landscape features, similarities in land management, geographic proximity and ecological connectedness of the treatment sub-areas, site access, and general impact of invasive *Spartina* on the region. ISP uses these reporting regions to cohesively present treatment and monitoring data in a manner suitable for correlation with California Ridgway's rail ("Ridgway's rail") data. Information presented here predominantly reflects data from the 2024 season, though activities from 2023 are included as needed and where specifically identified.

ISP Reporting Regions

Region 1. Marin
Region 2. San Francisco Peninsula
Region 3. San Mateo
Region 4. Dumbarton South
Region 5. Union City
Region 6. Hayward
Region 7. San Leandro Bay
Region 8. Bay Bridge North
Region 9. Suisun
Region 10. Vallejo
Region 11. Petaluma
Region 12. Outer Coast

2.1 Bay-wide Inventory

Bay-wide Inventory Methods

There are approximately 70,000 acres of potential *Spartina* habitat within the ISP Project Area. Factors including but not limited to staff availability, budget, the length of the growing season (June to November), and appropriate tide windows for the fieldwork constrain the Project's ability to complete inventory (and treatment) in all areas every year. To make the best use of available resources, ISP Managers plan each season by setting priorities according to relative invasion pressure and frequency of inventory. These decisions are informed by historic presence of invasive *Spartina*, proximity to invasive *Spartina* seed sources, habitat suitability for colonization by invasive *Spartina*, and time since the area was thoroughly surveyed for invasive *Spartina*.

Prioritized sub-areas are assigned to one of three inventory categories: (1) complete inventory, (2) partial inventory, or (3) coarse inventory. Sub-areas prioritized for complete inventory typically have recent known infestation, high risk of colonization, or several years have passed since the last thorough inventory and the sub-area requires reassessment. Partial inventory is conducted in portions of larger sub-areas where there are known isolated infestations that pose limited threat of expansion to other portions of that marsh, or to adjacent marshes. Coarse inventory is conducted in sub-areas with heavy infestations, such as where treatment has been restricted due to permit requirements (details in **Section 3.1**), or where this level of

data is sufficient to inform the level of treatment planned for that sub-area. Coarse inventory may be conducted as a less detailed form of standard inventory or by using a 25x25 meter grid method¹. No inventory is conducted in low-priority sub-areas, those with no historic infestation and low risk of colonization, or where a recent thorough inventory concluded there was low risk. Sub-areas where treatment was restricted in 2011 and where treatment has not yet resumed do not receive thorough inventory. Rather, they are surveyed biennially by grid in odd-numbered years. Once treatment resumes, more frequent and detailed inventory will be conducted to inform treatment and track progress.

Leading up to the 2023 field season, ISP's Section 7 consultation with U.S Fish & Wildlife Service resulted in a new Biological Opinion for ISP activities from 2023 to 3033. In addition to permitting efforts already underway, it also authorized resuming treatment at the final six sub-areas where treatment has been suspended since 2011; treatment resumed in three of these in 2023 and the other three are permitted for treatment to begin by either 2025 or 2027 (**Special Topic 3.1**). This did not impact inventory efforts or methods in 2023 because the formerly restricted sites were already planned to be inventoried by grid. However, treatment and treatment monitoring increased substantially for those three sub-areas in 2023, and inventory monitoring increased significantly in 2024 as more spatially explicit data was needed to inform more targeted treatment (transitioning from grids to points, lines and polygons). See Regional **Sections 2.2** Regions 6 and 7 plus **Special Topic 3.1** for further detail.

Another planning consideration for the 2023 field season was climatic: after years of extreme drought, the wet winter of 2022-2023 increased concern for inventory efforts in 2023 based on experience from the similar climatic conditions of winter 2016-2017. The 2017 inventory season was physically very difficult for staff and also resulted in the first ever project-wide increase in hybrid *S. alterniflora* since full treatment began in 2005. Lessons learned from fieldwork during the 2017 field season that were considered when planning for the 2023 and 2024 field seasons included:

- Tidal marsh vegetation was denser across many species, which made physical movement through marshes more difficult and time consuming for biologists;
- Native marsh vegetation developed taller and denser stands that inhibited detectability of invasive *Spartina* that may have been 'hiding' within or underneath these stands;
- Both native *S. foliosa* and invasive hybrid *S. alterniflora* were more abundant, which made identification of young plants more difficult prior to when they became more established and expressed their mature morphological traits.

¹ The grid method was developed by ISP in 2008 to map major infestations, but its use is now limited to the sub-areas where treatment has not resumed and sometimes their direct neighbors. Mapping by grid follows the rationale that detailed surveys are not needed to inform treatment and is intended to keep track of bay-wide infestation levels at these most invaded marshes.

- The flipside to this is that the freshwater influx prompted more established clones of hybrid *S. alterniflora* to exhibit morphological traits that make identification much easier; and
- The amount of seed dispersed by hybrid *S. alterniflora* in 2016 resulted in increased new recruits in subsequent years (e.g. first increase detected in 2017).

While planning the 2023 and 2024 seasons and with these concerns in mind, ISP Managers determined the following approaches:

1. Certain sub-areas or portions of sub-areas would receive neither inventory nor treatment due to reduced detection levels and increased physical constraints to finding hybrid *S. alterniflora* deep in tall, dense vegetation. These sub-areas were mainly in the brackish portions of the Bay where bulrush growth was stimulated by the influx of fresh water (e.g., Alviso Slough [05a.4], Island Ponds [05i], etc.);
2. Certain sub-areas would be inventoried and treated simultaneously. In these marshes, biologists would reference prior years' inventory and treatment data while wearing a backpack sprayer to map and treat continuing instances of hybrid *S. alterniflora* in a single visit. While this approach does not allow for a full inventory of the site, obvious new hybrid *S. alterniflora* plants detected *en route* to reach prior years' plants will also be mapped and treated, and then included for the next year's inventory and treatment;
3. Results from 2023 inventory and the bay-wide increase in infestation propelled ISP Managers to develop new inventory approaches in 2024. A larger team of less-experienced seasonal technicians were hired to work specifically in certain sub-areas of Bair Island, where they conducted both inventory and treatment under supervision of more senior ISP biologists. This was implemented to address a much larger area of the problematic site, and free up time for more experienced staff to conduct more difficult and sensitive inventory elsewhere in the Estuary. (See Region 3 of **Section 2.2** and **Special Topic 3.4** for further details).

In addition to the bay-wide efforts to minimize impacts of hybrid *S. alterniflora*, the Project also continued work to eradicate two other types of invasive *Spartina*: *S. anglica*, and *S. densiflora* and its hybrids, though these species are currently found only in small numbers in Marin County, so the level of effort is far less. (See **Appendix 1**). Inventory and simultaneous manual removal of *S. densiflora* is conducted semi-annually in January and June when these plants are most easily detectable. In January, most native marsh vegetation is senescent, which makes the more evergreen *S. densiflora* stand out visually. In June, *S. densiflora* flowers, so the presence of an inflorescence can help with detection during that round of surveys. The Project previously surveyed for and treated a fourth invasive *Spartina*, *S. patens*, which is found only in Southampton Marsh at Benicia State Recreation Area. Management of this species was transitioned to the California Department of State Parks in 2020 and any ongoing work at Southampton Marsh on *S. patens* is no longer reported by the ISP.

Timing of completed inventory by target species is shown in **Table 1**. **Figures 1 and 2** show the location of the ISP reporting regions, inventory boundaries, and status of survey completion for 2023 and 2024. **Appendices IV and V** provide the level of inventory conducted at each ISP sub-area in 2023 and 2024.

Table 1. Inventory timing for *Spartina* by species in 2023 and 2024

<i>Spartina</i> species	Time frame of 2023 inventory	Time frame of 2024 inventory
hybrid <i>S. alterniflora</i>	May 25, 2023 – November 8, 2023	May 20, 2024 – November 12, 2024*
<i>S. densiflora</i> and hybrids (I)	June 5, 2023 – July 24, 2023	June 3, 2024 – June 18, 2024
<i>S. densiflora</i> and hybrids (II)	January 2, 2024 – February 2, 2024	January 6, 2025 – January 31, 2025
<i>S. anglica</i>	June 5, 2023 – July 20, 2023	June 10, 2024 – November 4, 2024

*with a single December 6, 2024 outlier event

Bay-wide Inventory Results

Project biologists inventoried 28,000 acres (39%) of the ~70,000-acre Project Area in 2023 and 26,000 acres (36%) in 2024 (**Figures 1 and 2**). In 2023, a total of 22.9 acres of invasive *Spartina* was mapped, which was an 11% increase over the 2022 total. This was only the second time since treatment began in 2005 that an estuary-wide increase over the previous year was detected. Inventory in 2024 detected an estuary total of 19.0 acres, which reflects a 17% decrease from 2023, and is the first time in Project history that the infestation total dropped below 20 acres (**Table 2; Figures 3 and 4**). The increased infestation observed in 2023 was the result of the previous wet winter and early spring as the Project also experienced during the 2017 season. This increase happened concurrently with initiating treatment at three sub-areas that had been restricted from treatment since 2011; reductions in these three sub-areas are what caused the estuary-wide total to drop to its lowest level of 19.0 acres. Of the remaining invasive *Spartina* in the Estuary, 13.3 acres (70%) of hybrid *S. alterniflora* is located within the three sub-areas of Central San Francisco Bay where treatment has not yet resumed since restrictions were established in 2011. See **Section 3.1** for more detail on these three sub-areas as well as those where treatment resumed prior to 2023.

All but 0.08 m² of invasive *Spartina* mapped in 2024 was hybrid *S. alterniflora* (**Table 3**), with 99.0% of the estuary's infestation found in four reporting regions (listed here in order of decreasing invasive *Spartina* cover):

- Region 6: Hayward – 7.9 acres
- Region 7: San Leandro Bay – 6.8 acres
- Region 3: San Mateo – 3.6 acres
- Region 4: Dumbarton South – 0.6 acres

The infestation remaining in three sub-areas with temporary treatment restrictions in regions 6 and 7 accounted for 88% and 95%, respectively, of the infestation in these two regions. Region

3 had the next largest infestation that is also due primarily to the former treatment restriction that was in place for B2 North East (02c.1b) from 2011 to 2018, during which time adjacent large-scale restoration sites were either being opened or early in their development and were highly susceptible to invasion. Of the top four, Region 4 had by far the lowest level of infestation but had experienced slight increases in recent years. The marshes of Region 4 are complex and contain abundant native *S. foliosa*, which, coupled with large marsh sizes and difficult access, made surveying and treating the infestations there a formidable task. Region 4 also contains the bulk of upcoming large-scale marsh restoration actions being planned by the South Bay Salt Pond Restoration Project—Phase 2, so continued efforts and diligence remain integral here to ensure the success of native marsh restoration efforts.

The two regions with the highest 2024 infestations included sub-areas that were restricted from 2011 to 2023 (“Phase 1” and “Phase 2” sub-areas) and both included sub-areas where future treatment is now authorized in the 2023-2033 Biological Opinion, but where treatment had not yet resumed due to the phased approach. See **Section 3.1** for further discussion of these sub-areas and progress.

Table 2. Summary of Invasive *Spartina* Mapped in 2023 and 2024

# Sub-Areas	Potential Invasive <i>Spartina</i> Habitat (ac)	Proportion of Acreage Authorized for Full Treatment	Net Cover 2023 (ac)	Net Cover 2024 (ac)	Change Since 2023 (ac)	% Change Since 2023	Peak Year	Peak Amount (ac)	% Change Since Peak	% Remaining since Peak
223	71,359	99.8%	22.9	19.0	-3.9	-17.0%	2005	805	-97.6%	2.4%

Table 3. Summary of Invasive *Spartina* Mapped in 2023 and 2024 by Species and Treatment Status

<i>Spartina</i> species	Net Cover 2024	Net Cover 2023	Change Since 2023	% Change Since 2023	Peak Year	Peak Amount	Change Since Peak	% Change Since Peak	% Remaining since Peak
<i>S. alterniflora</i> x <i>foliosa</i>									
Sub-areas with 2024 Full Treatment Authorized	13.3 ac.	13.3 ac.	0.00	0.0%	2005	763.5 ac.	-750.2 ac.	-99.6%	1.9%
Sub-areas with 2024 Treatment Restrictions	5.7 ac.	9.6 ac.	-3.90 ac.	-40.6%	2006	41.5 ac.	-35.8 ac.	-86.3%	7.8%
TOTAL	19.0 ac.	22.9 ac.	-3.90 ac.	-17.0%	2005	805 ac.	-786.0 ac.	-97.6%	2.4%
<i>S. densiflora</i>	0.05 m ²	0.24 m ²	-0.19 m ²	-79.2%	2005	4.17 ac.	-4.1699 ac.	-99.9997%	0.0003%
<i>S. densiflora</i> x <i>foliosa</i>	0.03 m ²	0.07 m ²	-0.04 m ²	-57.1%	2005	347.8 m ²	-347.77 m ²	-99.99%	0.01%
<i>S. anglica</i>	0	0.05 m ²	-0.05 m ²	-100%	2006	382.6 m ²	-382.63 m ²	-100%	0.00%

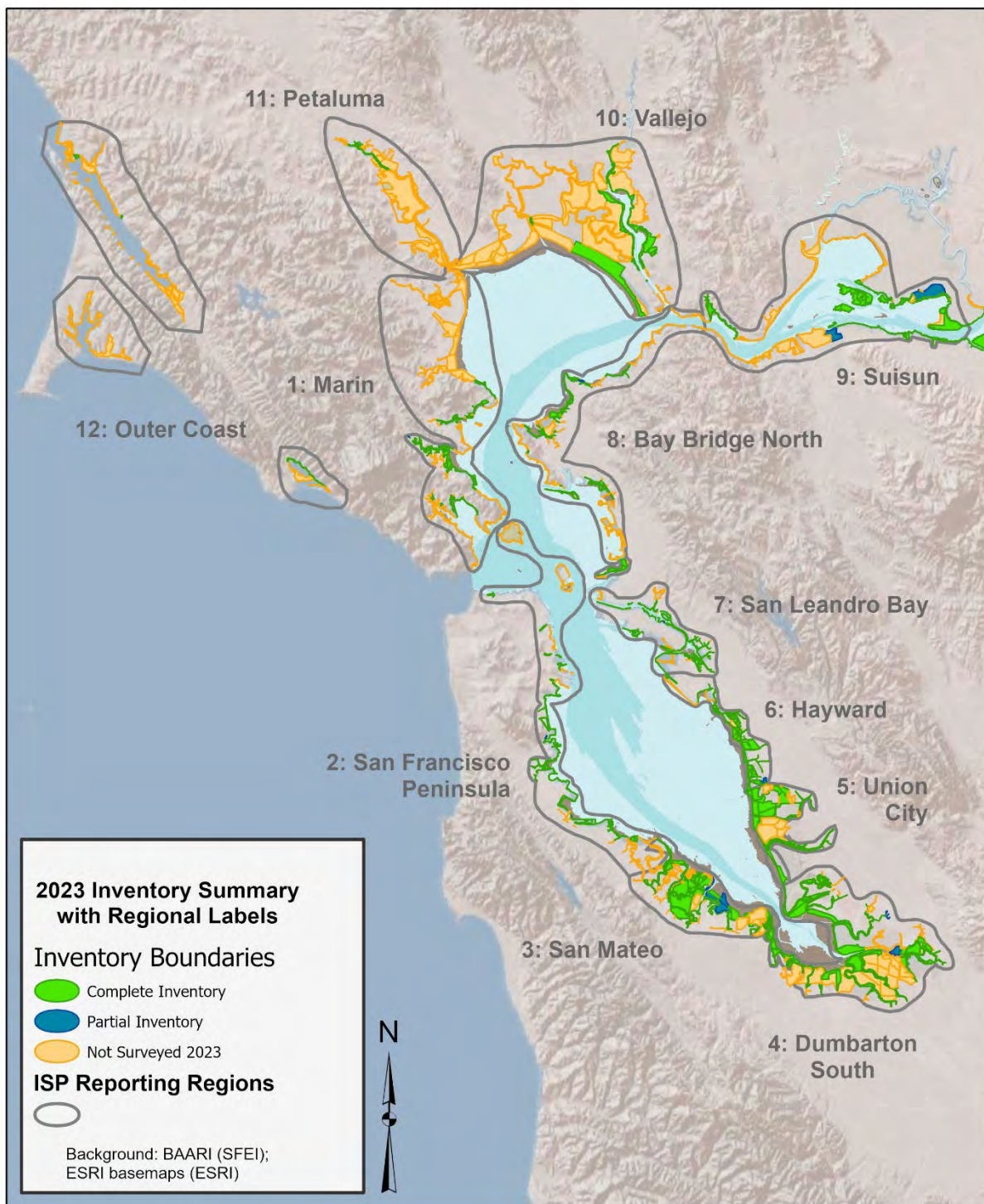


Figure 1. ISP Reporting Regions and 2023 survey efforts throughout San Francisco Bay Estuary.

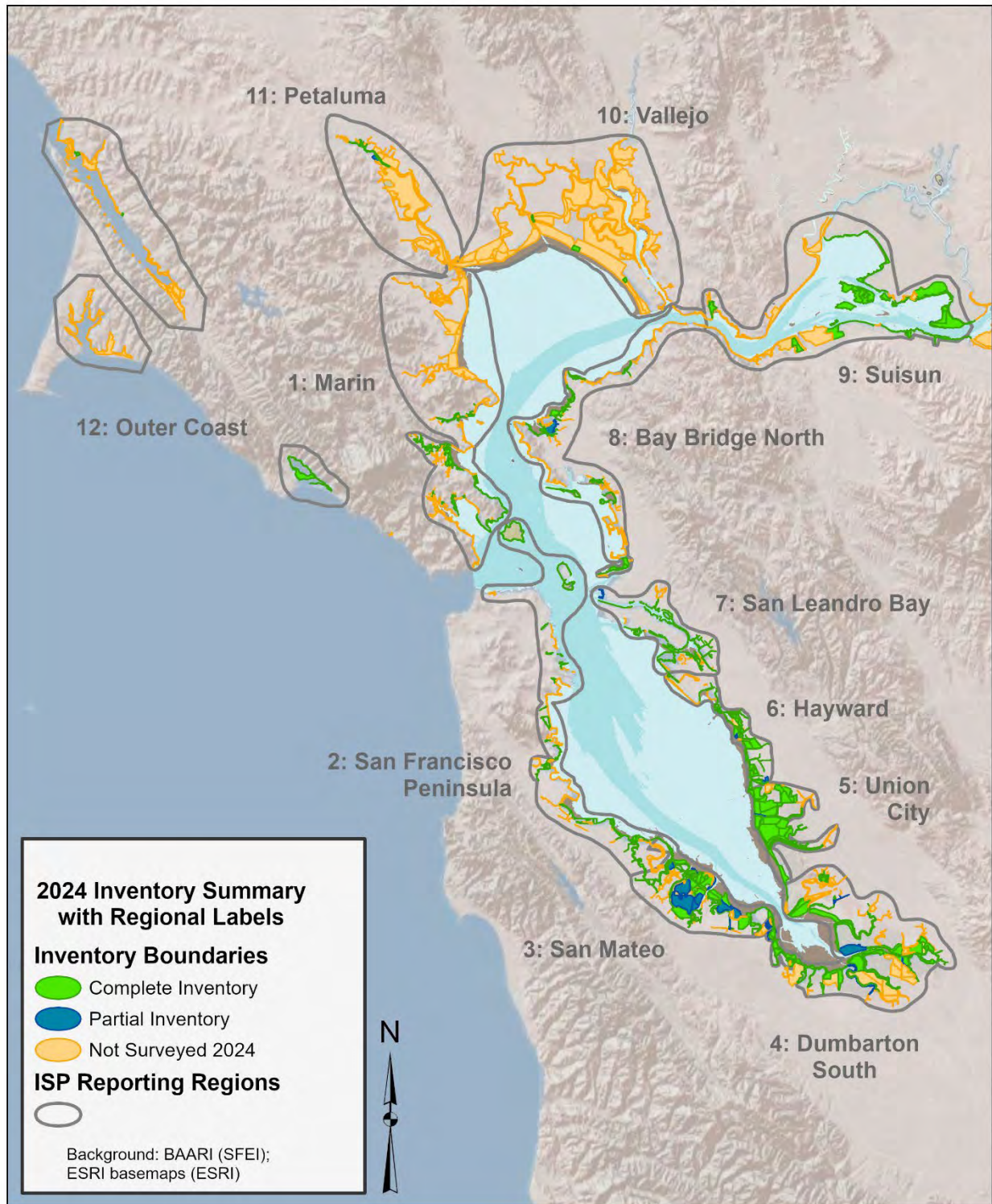


Figure 2. ISP Reporting Regions and 2024 survey efforts throughout San Francisco Bay Estuary.

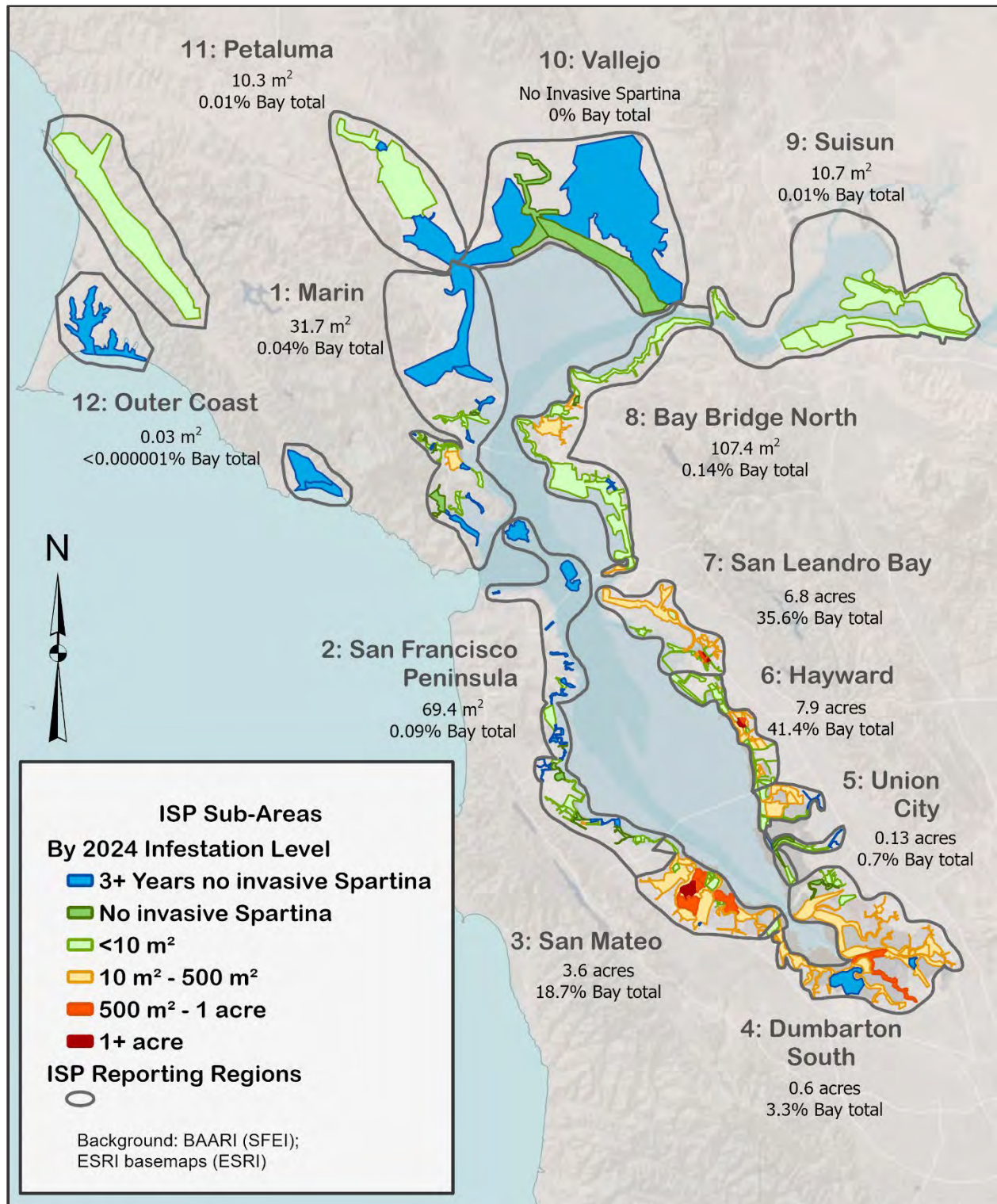


Figure 3. Net Area and Percentage of Bay Total of Invasive *Spartina* in 2024 by ISP Reporting Region and Classification of Invasive *Spartina* Eradication by Sub-area.

In 2023 there were 55 sub-areas with prior invasion history where no invasive *Spartina* was found, and in 2024 there were 59. Invasive *Spartina* was re-detected in six sub-areas in 2024 where none had been found in 2023 (**Table 4**). These were all small plants less than 1 m² that were treated and are discussed individually in **Section 2.2**. The Project began tracking “zero detect” sub-areas in 2014 at which time there were 25 “zero detect” sub-areas. This number has since then generally increased every year since, reaching 60 in 2022 before declining slightly to 59 in 2024.

Figure 4 illustrates bay-wide trends of invasive *Spartina* over the years since treatment began. Since the peak infestation of 805 acres in 2005, cover has dropped to 19.0 acres in 2024. In 2023, inventory was conducted by grid (explained above) at the six restricted treatment sub-areas including the three where treatment resumed in 2023 (Fan Marsh Main [17j.2], Citation Marsh Central [20d.2b], and Cogswell B Main [20n.3]). Inventory was not conducted in 2024 at the three sub-areas where treatment has not yet been initiated (Arrowhead Marsh East [17c.2], MLK/New Marsh [17h], North Marsh [20f]); data for these three sub-areas are carryovers from the 2023 inventory.

Table 4. Sub-areas with historic infestation where no invasive *Spartina* was detected in 2023, 2024, or both years.

Sub-areas that maintained "zero detect" status for both 2023 and 2024

Region	Code	Sub-area	Region	Code	Sub-area	Region	Code	Sub-area
1	03a	Blackie's Creek (above bridge)	2 (cont.)	12g	Crissy Field	2	19o	San Mateo Creek / Ryder Park
	03b	Blackie's Creek Mouth		12h	Yerba Buena Island	(cont.)	19r	Anza Lagoon
	04c	Piper Park East		12i	Mission Creek	3	19s	Maple Street Channel
	04d	Piper Park West		18a	Colma Creek	4	15d	Sunnyvale Baylands
	04k	Boardwalk No. 1 (Arkites)		18b	Navigable Slough	5	01d	Upper Channel - Union City Blvd to I-880
	04l	Murphy Creek		18c	Old Shipyard		01e	Strip Marsh No. of Channel Mouth
	23a	Brickyard Cove		18d	Inner Harbor		13g	Upstream of 20 Tide Gates
	23k	Sausalito		18f	Confluence Marsh	8	10d	Breuner Marsh Restoration
	23l	Starkweather Park		18h	San Bruno Creek		22e	Hoffman Marsh
	23m	Novato		19b	Sierra Point	10	26a	White Slough / Napa River
	23n	Triangle Marsh and shoreline		19c	Oyster Cove		26d	Sonoma Baylands
	23o	China Camp		19d	Oyster Point Marina	11	24b	Grey's Field
2	12a	Pier 94		19f	Point San Bruno		25b	Limantour Estero
	12b	Pier 98 / Heron's Head		19j	Easton Creek Mouth		25c	Drakes Estero
	12c	India Basin		19m	Fisherman's Park		25d	Bolinas Lagoon, North
	12d	Hunters Point Naval Reserve		19n	Coyote Point Marina / Marsh		25e	Bolinas Lagoon, South
	12f	Candlestick Cove						

Sub-areas achieving initial year of "zero detect" in 2024

Region	Code	Sub-area	2023 area (m ²)
1	23c	Loch Lomond Marina	0.012
	23i	Strawberry Cove	2.001
	23j	Bothin Marsh	1.53
2	18e	San Trans Peninsula	2.1
	19e	Oyster Point Park	0.13
	19g	Seaplane Harbor	<0.00001
5	01f	Pond 3 - AFCC	0.002
	21a	Ideal Marsh North	0.14
10	26b	San Pablo Bay NWR and Mare Island	0.56
	26c	Sonoma Creek	0.53

Sub-areas "zero detect" in 2023 and were re-infested in 2024

Region	Code	Sub-area	2024 area (m ²)
1	04e	Larkspur Ferry Landing Area	0.001
	23g	Greenwood Cove	0.005
2	12e	Yosemite Channel	0.005
	19i	Mills Creek Mouth	0.32
8	10b	Southern Marsh	0.830
	22d	Steger Marsh	0.78

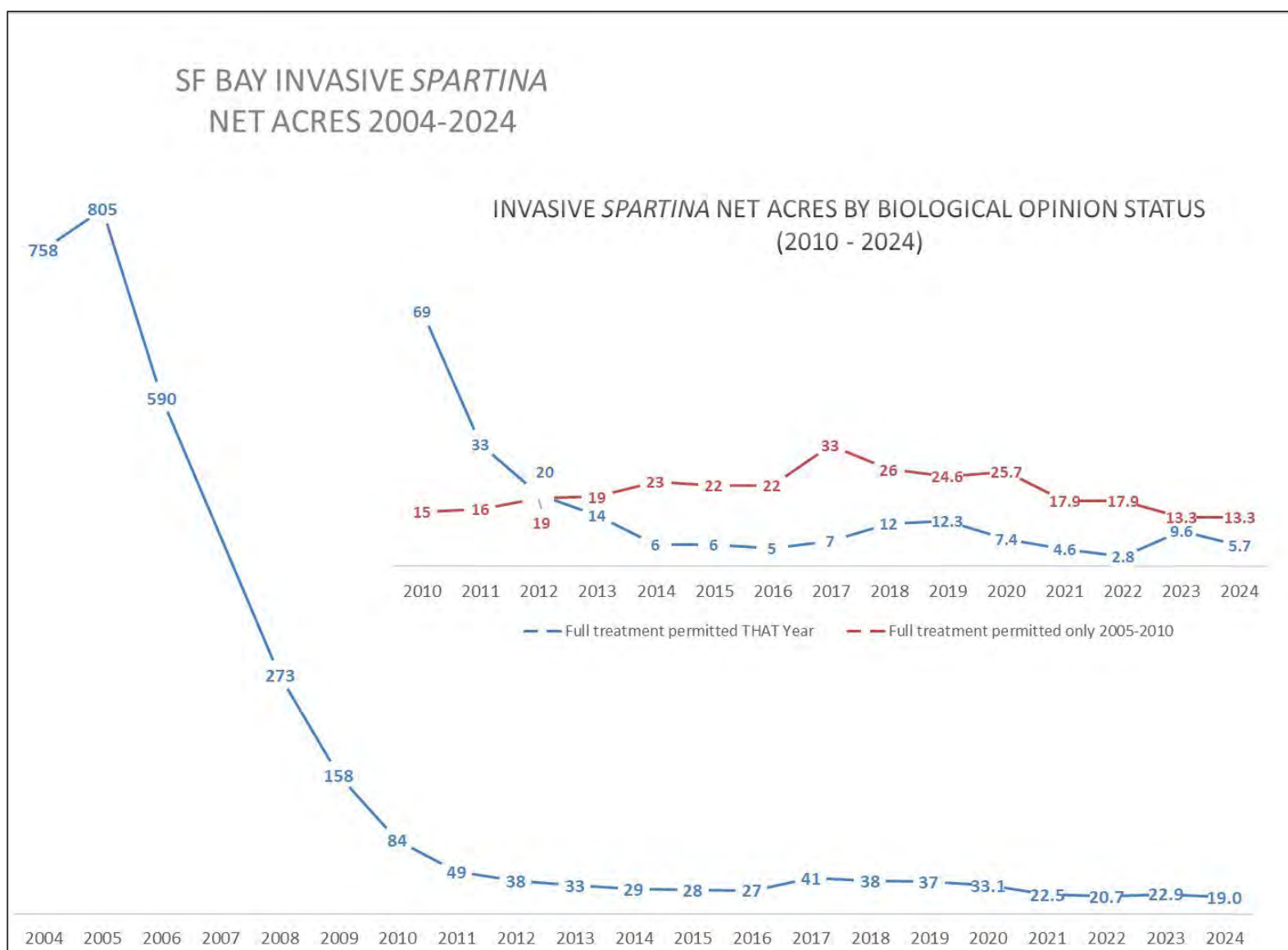


Figure 4. Bay-wide trend of invasive *Spartina* from 2004-2024 by net cover (acres) and treatment authorization since 2010.

2.2 Regional Inventory and Treatment

Section 2.1 introduced the ISP Reporting Regions as part of a discussion of estuary-wide trends of invasive *Spartina* cover and treatment. This section provides additional details presented by Reporting Region. **Table 5** provides a summary by region, and the subsequent sections provide additional details for the twelve Reporting Regions.

Table 5. Summary of 2023-2024 Invasive *Spartina* Cover by Reporting Region

Region #	Region Name	# Sub-Areas	Potential Invasive <i>Spartina</i> Habitat (ac)	Proportion of Region Where Treatment Has Not Yet Resumed (by acreage) as of 2024	Net Cover 2024 (ac)	% Bay-wide Total	Change Since 2023 (ac)	% Change Since 2023	Peak Year	Peak Amount (ac)	Change Since Peak (ac)	% Change Since Peak	% Remaining since Peak
1	Marin	32	4,150	N/A	0.008	0.0%	0.00	10.5%	2005	6.10	-6.09	-99.9%	0.1%
2	SF Peninsula	35	1,151	N/A	0.017	0.1%	-0.0057	-25.1%	2004	125.474	-125.457	-99.986%	0.014%
3	San Mateo	26	5,920	N/A	3.55	18.7%	0.90	33.8%	2004	134.8	-131.2	-97.4%	2.6%
4	Dumbarton South	26	10,351	N/A	0.63	3.3%	0.14	28.4%	2008	39.5	-38.9	-98.4%	1.6%
5	Union City	21	3,375	N/A	0.132	0.7%	-0.0265	-16.7%	2004	233.1	-232.9	-99.94%	0.06%
6	Hayward*	30	1,493	6%	7.86	41.4%	-4.23	-35.0%	2005	225.9	-218.0	-96.5%	3.5%
7	San Leandro Bay*	21	484	19%	6.77	35.6%	-0.64	-8.6%	2006	84.6	-77.8	-92.0%	8.0%
8	Bay Bridge North	13	1,705	N/A	0.027	0.1%	-0.0025	-8.7%	2009	6.49	-6.46	-99.6%	0.4%
9	Suisun	6	13,217	N/A	0.003	0.0%	0.0007	32.6%	2005	0.65	-0.64	-99.6%	0.4%
10	Vallejo	4	20,789	N/A	0.0000	0.0%	-0.0003	-100.0%	2009	0.32	-0.3	-100%	0%
11	Petaluma	4	5,696	N/A	0.0028	0.0%	0.0021	299.6%	2007	0.153	-0.150	-98.2%	1.8%
12	Outer Coast	5	3,028	N/A	0.000008	0.0%	0.000007	1233.3%	2007	0.04822	-0.0482	-99.98%	0.02%
ALL	SFB Estuary	223	71,359	99.6%	19.0	100%	-3.9	-16.9%	2005	805	-786.0	-97.6%	2.4%

* This region has at least one sub-area where treatment has not resumed since restrictions were enacted in 2011. The amount of the region in which treatment has not resumed is calculated by area in column 5.

Region 1: Marin

Marin County

Local Partners: Friends of Corte Madera Creek Watershed, San Francisco Bay National Estuarine Research Reserve, California Department of Fish & Wildlife, Marin Islands National Wildlife Refuge, Sonoma Land Trust, Multiple Private Land-owners

Acres of *Spartina* habitat surveyed by ISP: 4,001

Net coverage of invasive *Spartina* in 2024: 0.008 acres

Percentage of bay-wide total infestation: 0.04%

The Marin Region (Region 1) is composed of 32 sub-areas in Marin County extending from the Golden Gate Bridge north to the mouth of the Petaluma River. It includes several large, contiguous tracts of marsh, most notably those in the Novato Creek, Corte Madera Creek and Las Gallinas Creek Watersheds. Relative to regions in the Central and South Bays, the Marin Region never had a sizeable infestation in terms of acreage, but instead had many small infestations scattered throughout the remnant marshes and tidal channels. Four non-native *Spartina* species have been present (hybrid *S. alterniflora*, *S. densiflora*, hybrid *S. densiflora*, and *S. anglica*), the majority occurring in the Corte Madera Creek Watershed. Creekside Park (04g) on upper Corte Madera Creek is the original introduction site for both *S. densiflora* and *S. anglica* to the Estuary. The 2024 distribution and abundance of invasive *Spartina* within each sub-area are presented in **Figures 5 and 6 and Table 6**. Treatment dates and methods are included in Table 6.

The ISP inventoried 28 of 32 sub-areas in this region in both 2023 and 2024, primarily on foot but supplemented by kayak or inflatable boat on less accessible shorelines and upstream portions of the watershed. Three sub-areas with no recent infestation and low invasion pressure were not inventoried in either year: Sausalito (23k), Starkweather Park (23l), and Novato (23m) (while all three of these were thoroughly inventoried in 2022). The zone of historic infestation at China Camp (23o) was inventoried in 2023, but none of the sub-area was inventoried in 2024. All sub-areas with detections of *S. densiflora* within the last five years were surveyed at least partially for this species in the summer and winter inventory rounds in both 2023 and 2024, and sub-areas with detections of *S. densiflora* within the last eight years were also inventoried in the winter of 2024.

The ISP mapped a total of 32 m² of non-native cordgrass of four species (including two hybrid types) in the Marin Region in 2024. This reflected a 3 m² (10.5%) increase from 2023 inventory and a reduction of 6.1 acres (>99%) since peak infestation in 2005. The Marin Region infestation comprised 0.04% of the Estuary total (**Tables 5 and 6**). Two sub-areas, Larkspur Ferry Landing (04e) and Greenwood Cove (23g), had detections of hybrid *S. alterniflora* where none had been found in recent years (**Table 4**). Each had very small plants (0.001 m² and 0.005 m² respectively) that were subsequently treated. All instances of invasive *Spartina* mapped in 2023 and 2024 were treated by qualified ISP personnel.

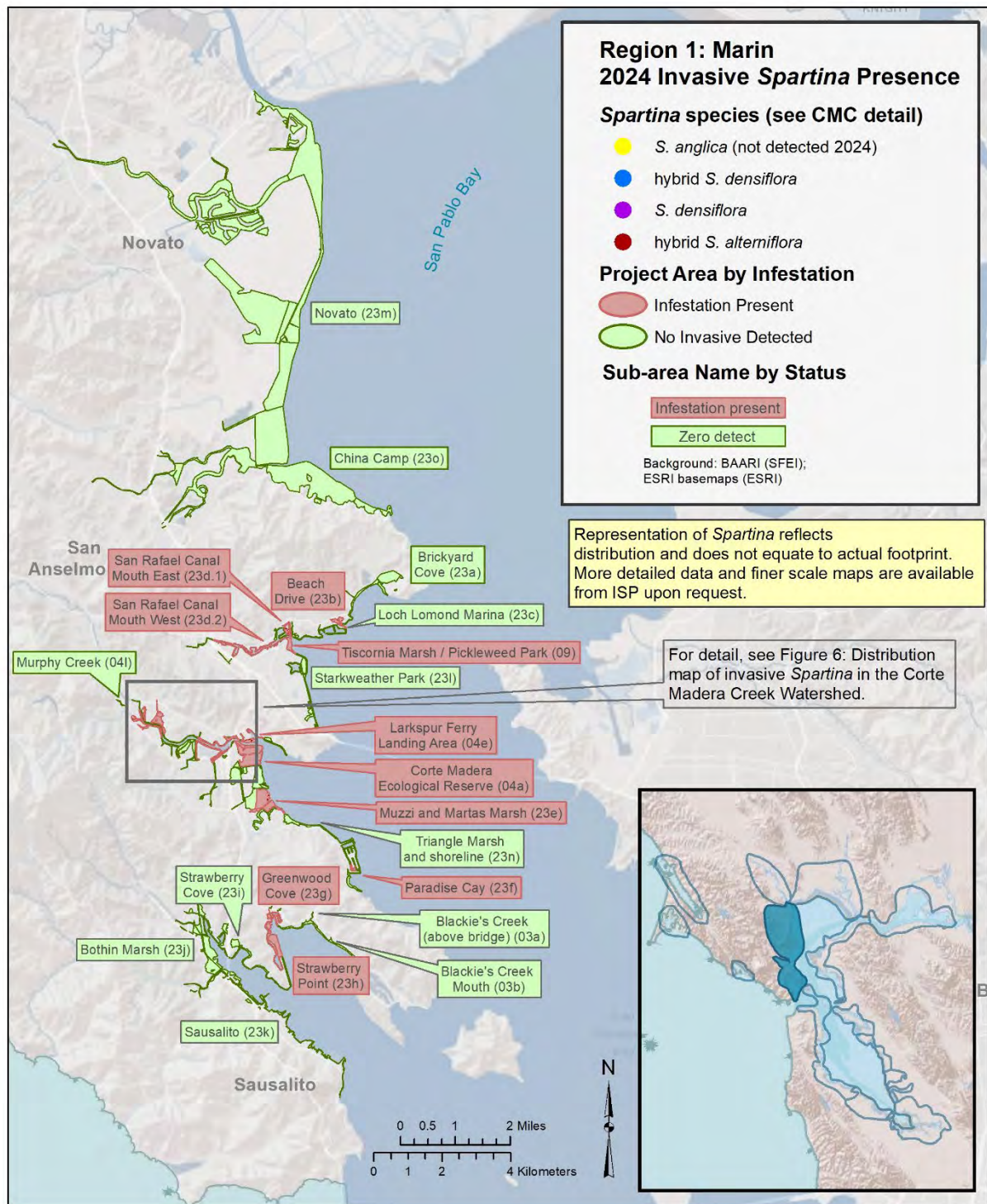


Figure 5. Distribution of invasive *Spartina* in 2024 across the 32 sub-areas of Reporting Region 1: Marin. Sub- areas with current infestation are labeled in pink, while those with no detection of invasive *Spartina* are labeled in green.

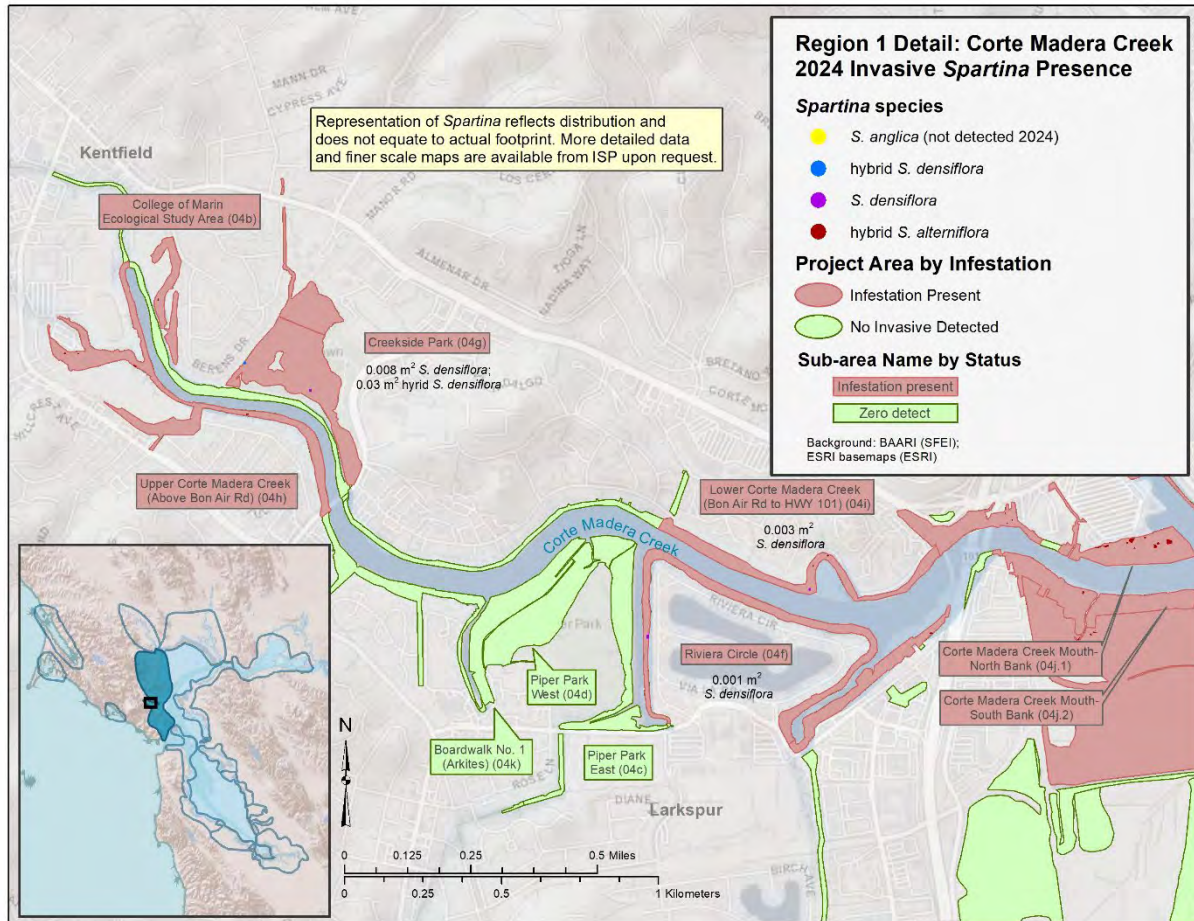


Figure 6. Distribution of invasive *Spartina* in 2024 within the Corte Madera Creek Watershed of ISP's Marin Region. Sub- areas with current infestation are labeled in pink, while those with no detection of invasive *Spartina* are labeled in green.

A total of 32 m² of hybrid *S. alterniflora* was mapped throughout 14 sub-areas of the region. Three sub-areas had infestations larger than 1 m² net cover and they accounted for 81% of the regional infestation: Corte Madera Creek Mouth – North Bank (04j.1), San Rafael Canal Mouth East (23d.1), and Muzzi & Marta's Marsh (23e). Only a relatively small number of Marin marshes have ever been heavily infested by hybrid *S. alterniflora*, but eradication efforts are complicated by the urbanized landscape of privately owned shorelines, which also support abundant *S. foliosa*. The ISP and the Friends of Corte Madera Creek Watershed have adapted inventory methods to address these areas, including shifting to ground surveys from kayak surveys conducted from the creek, which enables more thorough detection, but which requires extensive landowner coordination to gain access to private properties. All treatment for hybrid *S. alterniflora* in Region 1 has been conducted by small-scale spot applications of imazapyr by backpack sprayer in recent years.

Table 6. Summary of 2024 invasive *Spartina* mapped and treated by sub-area within Reporting Region 1: Marin.

Split Sub-Area	2024 Treatment Dates	2024 Treatment Method	2024 Net <i>Spartina</i> Coverage By Species				All Invasive <i>Spartina</i> Cover				
			anglica	densiflora x foliosa	alterniflora x foliosa	densiflora	2024 Net Area	2024 Treatment Area	Peak Year	Net Area Decline	
										Since Peak	Since 2023
REGION 1: MARIN											
03a: Blackie's Creek (above bridge)	6 years with no Invasive <i>Spartina</i> (2019-2024)		0		0	0	0	0	2005	100%	n/a
03b: Blackie's Creek Mouth	8 years with no Invasive <i>Spartina</i> (2017-2024)		0		0	0	0	0	2005	100%	n/a
04a: Corte Madera Ecological Reserve	10/25; 1/10/25	Dug, Backpack	0		0.4 m ²	0.0001 m ²	0.4 m ²	13 m ²	2005	>99%	32%
04b: College of Marin Ecological Study Area	10/16	Dug, Backpack	0		0.2 m ²	0	0.2 m ²	7 m ²	2004	>99%	Increase (0.04 m ²)
04c: Piper Park East	3 years with no Invasive <i>Spartina</i> (2022-2024)		0		0	0	0	0	2005	100%	n/a
04d: Piper Park West	3 years with no Invasive <i>Spartina</i> (2022-2024)		0		0	0	0	0	2005	100%	n/a
04e: Larkspur Ferry Landing Area	11/12	Backpack	0		0.001 m ²	0	0.001 m ²	0.1 m ²	2005	>99%	n/a
04f: Riviera Circle	1/17/25	Dug, Backpack	0		0	0.001 m ²	0.001 m ²	0.04 m ²	2005	>99%	98%
04g: Creekside Park	1/6/25; 2/20/25	Dug, Tarped, Backpack	0.03 m ²		0	0.008 m ²	0.04 m ²	0.2 m ²	2005	>99%	73%
04h: Upper Corte Madera Creek (Above Bon Air Rd)	10/16	Dug, Backpack	0		0.9 m ²	0	0.9 m ²	26 m ²	2006	>99%	Increase (0.3 m ²)
04i: Lower Corte Madera Creek (Bon Air Rd to HWY 101)	10/16; 1/20/25	Dug, Backpack	0		0.1 m ²	0.003 m ²	0.1 m ²	5 m ²	2005	>99%	89%
04j.1: Corte Madera Creek Mouth - North Bank	11/12	Dug, Backpack	0		10 m ²	0	10 m ²	247 m ²	2007	>99%	Increase (4 m ²)
04j.2: Corte Madera Creek Mouth - South Bank	10/16	Dug, Backpack	0		0.3 m ²	0	0.3 m ²	14 m ²	2007	>99%	68%
04k: Boardwalk No. 1 (Arkites)	3 years with no Invasive <i>Spartina</i> (2022-2024)		0		0	0	0	0	2006	100%	n/a
04l: Murphy Creek	4 years with no Invasive <i>Spartina</i> (2021-2024)		0		0	0	0	0	2007	100%	n/a
09: Tiscornia Marsh / Pickleweed Park	9/9	Backpack	0		0.1 m ²	0	0.1 m ²	1 m ²	2004	>99%	86%
23a: Brickyard Cove	3 years with no Invasive <i>Spartina</i> (2022-2024)		0		0	0	0	0	2008	100%	n/a
23b: Beach Drive	9/9; 10/25	Backpack	0		2 m ²	0	2 m ²	64 m ²	2006	>99%	57%
23c: Loch Lomond Marina	No Invasive <i>Spartina</i> 2024		0		0	0	0	0	2004	100%	100%
23d.1: San Rafael Canal Mouth East	9/9	Backpack	0		4 m ²	0	4 m ²	105 m ²	2007	99%	14%
23d.2: San Rafael Canal Mouth West	8/28	Backpack	0		0.2 m ²	0	0.2 m ²	7 m ²	2004	>99%	67%
23e: Muzzi and Martas Marsh	6/3; 10/25	Dug, Backpack	0		12 m ²	0.004 m ²	12 m ²	567 m ²	2007	98%	Increase (9 m ²)
23f: Paradise Cay	1/15/25	Dug	0		0	0 m ²	0 m ²	0.008 m ²	2005	>99%	87%
23g: Greenwood Cove	10/24	Backpack	0		0.005 m ²	0	0.005 m ²	0.3 m ²	2006	>99%	n/a
23h: Strawberry Point	10/24	Dug, Backpack	0		1 m ²	0 m ²	1 m ²	22 m ²	2005	>99%	29%
23i: Strawberry Cove	No Invasive <i>Spartina</i> 2024		0		0	0	0	0	2007	100%	100%
23j: Bothin Marsh	No Invasive <i>Spartina</i> 2024		0		0	0	0	0	2006	100%	100%
23k: Sausalito	10 years with no Invasive <i>Spartina</i> (2015-2024)		0		0	0	0	0	2004	100%	n/a
23l: Starkweather Park	9 years with no Invasive <i>Spartina</i> (2016-2024)		0		0	0	0	0	2006	100%	n/a
23m: Novato	9 years with no Invasive <i>Spartina</i> (2016-2024)		0		0	0	0	0	2006	100%	n/a
23n: Triangle Marsh and shoreline	6 years with no Invasive <i>Spartina</i> (2019-2024)		0		0	0	0	0	2007	100%	n/a
23o: China Camp	8 years with no Invasive <i>Spartina</i> (2017-2024)		0		0	0	0	0	2010	100%	n/a
REGION 1 TOTAL			0.03 m ²		32 m ²	0.02 m ²	32 m ²	0.3 acres	2005	>99%	11% increase (3 m ²)

Instances of *S. densiflora* in the Marin Region remain the highest in the Estuary since this region was the original introduction site and contained the vast majority of the infestation at the start of the Project. This species was detected in only one other region in both 2023 and 2024 (Region 12: Outer Coast). In 2024, seven instances of *S. densiflora* were detected in six of the 32 sub-areas where it had flourished a decade ago, and the plants found in 2023 and 2024 were consistently small young plants that were detected before having the opportunity to set seed. The ISP mapped a total of 0.02 m² net cover, which accounted for 40% of the 2024 project total. Every instance of *S. densiflora* found in 2023 and 2024 was subsequently treated by manual removal. Hybrid *S. densiflora* × *foliosa* was detected in a single sub-area in 2024 and totaled 0.03 m² of net cover. All patches of hybrid *S. densiflora* were sprayed and subsequently tarped in 2023 and 2024. Tarping involves mowing the aboveground biomass and securing thick landscape fabric to the substrate with wooden stakes, to impede photosynthesis. The Marin Region is also the only region where *S. anglica* has ever been detected. None was detected in 2024, but a single instance was detected at Creekside Park (04g) in 2023, totaling 0.05 m² net cover.

Surveys for Ridgway's rails conducted by the ISP and Point Blue Conservation Science (PBCS) have shown mixed results at sub-areas surveyed in the Marin Region. Ridgway's rail detections declined by 30%, decreasing from 71 rails detected in 2022 to 50 rails detected in 2023. However, Ridgway's rail detections increased by 16% between 2023 to 2024.

The Marin Region contains several large intact native marshes that support Ridgway's rail populations that are not expected to be impacted by the removal of the remaining non-native *Spartina*. With the abundance of native marsh, the ISP has not targeted Region 1 for significant habitat enhancement, except for nine constructed high tide refuge islands installed at the Corte Madera Ecological Reserve to provide cover for rails from predators during the highest of tides. In addition, ISP and Friends of Corte Madera Creek have planted



Figure 7. ISP biologists are finding fewer instances of *Spartina densiflora* during the twice-annual surveys. Most detections at this point are small seedlings such as this plant from January 2024, which are very challenging to find hidden amongst healthy native vegetation. All detected instances of *S. densiflora* are removed manually and disposed offsite.

Grindelia stricta for nesting substrate and cover at Creekside Park, where the previously large infestation of multiple non-native *Spartina* species had displaced many native marsh plants.

The low invasion pressure in this region and the locally abundant *S. foliosa* allowed the ISP to harvest plant material for amplification in nursery propagation beds and outplanting to other regions that do not have suitable native cordgrass propagule sources. Plants from several Marin source populations have been outplanted by the program into five regions: Region 2: San Francisco Peninsula, Region 5: Union City, Region 6: Hayward, Region 7: San Leandro Bay, and Region 10: Vallejo. The ISP currently has one propagation bed at The Watershed Nursery of genetically verified *S. foliosa* from a Marin County source population, Starkweather Park (23I).

Region 2: San Francisco Peninsula

San Francisco and San Mateo Counties

Local Partners: San Mateo County Public Works, San Mateo County Mosquito and Vector Control District, San Francisco International Airport

Acres of *Spartina* habitat surveyed by ISP: 916

Net coverage of invasive *Spartina* in 2024: 0.02 acres

Percentage of bay-wide total infestation: 0.09%

The San Francisco Peninsula Region (Region 2) extends from the Golden Gate Bridge south to the San Mateo Bridge and includes 35 sub-areas. Once very heavily infested by hybrid *S. alterniflora*, treatment has largely returned the shorelines to the pre-invasion mudflats. The three most prominent marshes in the region are found at the confluence of Colma Creek and San Bruno Creek (site 18) in South San Francisco, the shoreline of the San Francisco International Airport (SFO, 19h), and the mouth of Seal Slough (19p). The 2024 distribution and abundance of invasive *Spartina* within each sub-area are presented in **Figure 8** and **Table 7**. Treatment dates and methods are included in Table 7.

The ISP inventoried all 35 sub-areas in this region in either 2023 or 2024 on foot when the shoreline was accessible or assisted by motorized boat or kayak when shorelines were difficult for foot access. Three sub-areas were not surveyed in 2023 because no infestation had been detected for multiple years and they are under low invasion pressure: Hunters Point (12d), Yerba Buena Island (12h), and Mills Creek Mouth (19i). Five sub-areas were not inventoried in 2024 because they had no infestation detected for multiple years and are under low invasion pressure: Candlestick Park (12f), Crissy Field (12g), Navigable Slough (18b), Sierra Point (19b), and Oyster Point Marina (19d). In 2024 Seaplane Harbor (19g) was not inventoried due to lack of availability of airport security staff to escort ISP biologists.

A total of 69 m² of hybrid *S. alterniflora* was mapped and treated in 2024 across ten sub-areas. This was a reduction of 23.2 m² (25%) from 2023 infestation, and the 2024 footprint represented 0.003% of the peak 125.5-acre infestation in 2004 (**Table 7**). Two sub-areas, Yosemite Slough (12e) and Mills Creek Mouth (19i) had redetections of hybrid *S. alterniflora* where none had been found in 2023 (**Table 4**). Yosemite Slough had a single small plant (0.004 m²) that was subsequently treated. Mills Creek Mouth had two slightly larger plants (collectively 0.3 m²) that were on the mudflat at the creek outflow, and both were subsequently treated.

Multiple sub-areas in this Region were previously infested with two other types of invasive *Spartina*: *S. densiflora* and hybrid *S. densiflora*, both of which had spread from their original introduction sites in Marin (Region 1). Neither of these invasives have been detected in Region 2 for multiple years due to ISP treatment efforts.

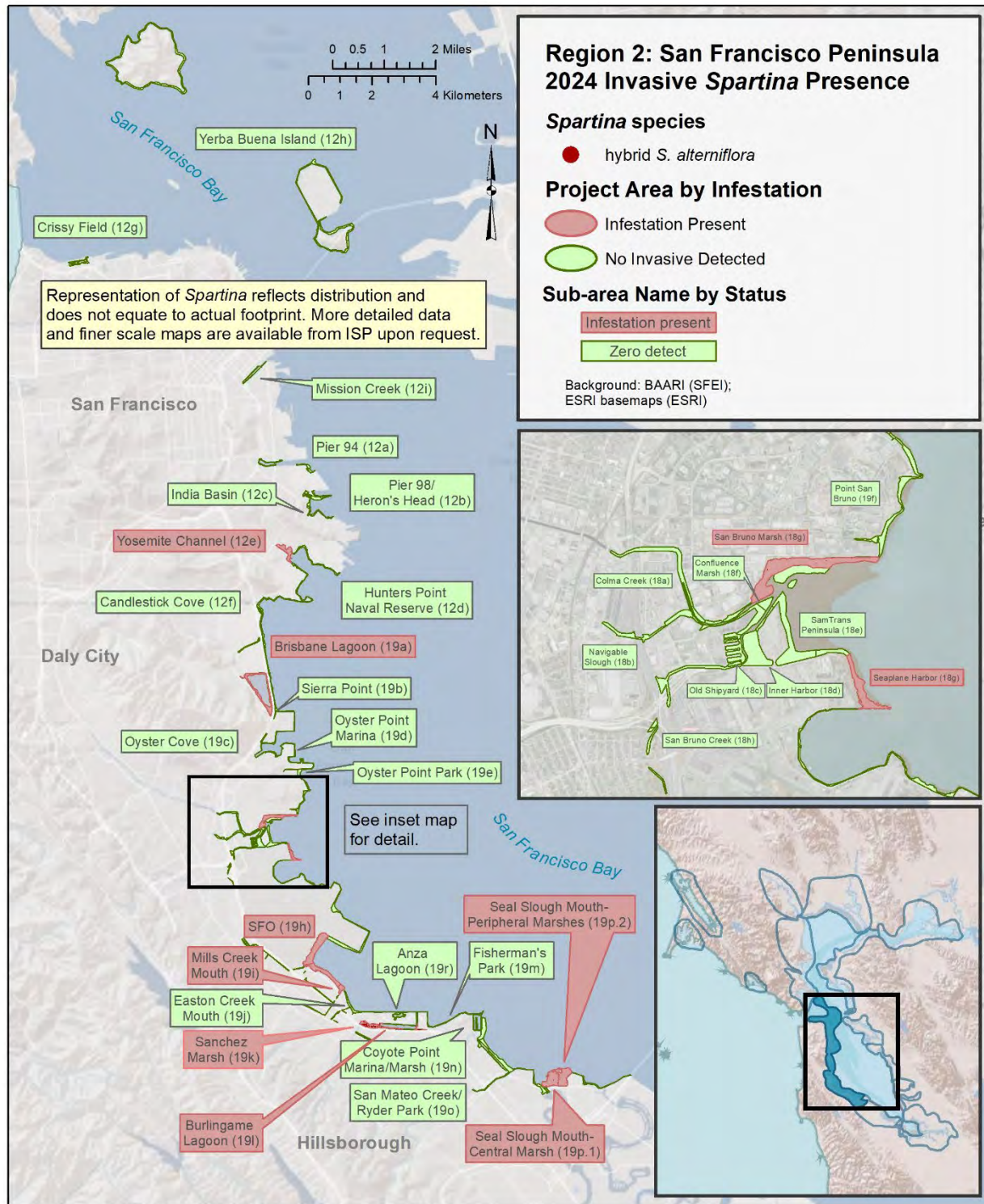


Figure 8. Distribution of invasive *Spartina* in 2022 across the 35 sub-areas of Reporting Region 2: San Francisco Peninsula. Sub-areas with current infestation are labeled in pink, while those with no detection of invasive *Spartina* are labeled in green.

Table 7. Summary of 2024 invasive *Spartina* mapped and treated by sub-area within Reporting Region 2: San Francisco Peninsula.

Split Sub-Area	2024 Treatment Dates	2024 Treatment Method	2024 Net <i>Spartina</i> Coverage By Species				All Invasive <i>Spartina</i> Cover				
			anglica	densiflora x foliosa	alterniflora x foliosa	densiflora	2024 Net Area	2024 Treatment Area	Peak Year	Net Area Decline	
										Since Peak	Since 2023
REGION 2: SAN FRANCISCO PENINSULA											
12a: Pier 94	9 years with no invasive <i>Spartina</i> (2016-2024)		0	0	0	0	0	2005	100%	n/a	
12b: Pier 98 / Heron's Head	7 years with no invasive <i>Spartina</i> (2018-2024)		0	0	0	0	0	2008	100%	n/a	
12c: India Basin	11 years with no invasive <i>Spartina</i> (2014-2024)		0	0	0	0	0	2005	100%	n/a	
12d: Hunters Point Naval Reserve	8 years with no invasive <i>Spartina</i> (2017-2024)		0	0	0	0	0	2008	100%	n/a	
12e: Yosemite Channel	11/14	Backpack	0	0.004 m ²	0	0.004 m ²	0.08 m ²	2004	>99%	n/a	
12f: Candlestick Cove	10 years with no invasive <i>Spartina</i> (2015-2024)		0	0	0	0	0	2006	100%	n/a	
12g: Crissy Field	11 years with no invasive <i>Spartina</i> (2014-2024)		0	0	0	0	0	2008	100%	n/a	
12h: Yerba Buena Island	11 years with no invasive <i>Spartina</i> (2014-2024)		0	0	0	0	0	2006	100%	n/a	
12i: Mission Creek	11 years with no invasive <i>Spartina</i> (2014-2024)		0	0	0	0	0	2009	100%	n/a	
18a: Colma Creek	7 years with no invasive <i>Spartina</i> (2018-2024)		0	0	0	0	0	2005	100%	n/a	
18b: Navigable Slough	8 years with no invasive <i>Spartina</i> (2017-2024)		0	0	0	0	0	2006	100%	n/a	
18c: Old Shipyard	6 years with no invasive <i>Spartina</i> (2019-2024)		0	0	0	0	0	2006	100%	n/a	
18d: Inner Harbor	11 years with no invasive <i>Spartina</i> (2014-2024)		0	0	0	0	0	2006	100%	n/a	
18e: Sam Trans Peninsula	No Invasive <i>Spartina</i> 2024		0	0	0	0	0	2004	100%	100%	
18f: Confluence Marsh	8 years with no invasive <i>Spartina</i> (2017-2024)		0	0	0	0	0	2004	100%	n/a	
18g: San Bruno Marsh	10/8	Backpack	0	0.7 m ²	0	0.7 m ²	15 m ²	2004	>99%	Increase (0.6 m ²)	
18h: San Bruno Creek	4 years with no invasive <i>Spartina</i> (2021-2024)		0	0	0	0	0	2006	100%	n/a	
19a: Brisbane Lagoon	8/5	Backpack	0	0.09 m ²	0	0.09 m ²	3 m ²	2006	>99%	Increase (0.06 m ²)	
19b: Sierra Point	10 years with no invasive <i>Spartina</i> (2015-2024)		0	0	0	0	0	2004	100%	n/a	
19c: Oyster Cove	10 years with no invasive <i>Spartina</i> (2015-2024)		0	0	0	0	0	2006	100%	n/a	
19d: Oyster Point Marina	10 years with no invasive <i>Spartina</i> (2015-2024)		0	0	0	0	0	2006	100%	n/a	
19e: Oyster Point Park	No Invasive <i>Spartina</i> 2024		0	0	0	0	0	2005	100%	100%	
19f: Point San Bruno	4 years with no invasive <i>Spartina</i> (2021-2024)		0	0	0	0	0	2005	100%	n/a	
19g: Seaplane Harbor	Not treated 2024		0	0.008 m ²	0	0.008 m ²	0.8 m ²	2004	>99%	0%	
19h: SFO	10/24	Backpack	0	5 m ²	0	5 m ²	199 m ²	2004	>99%	15%	
19i: Mills Creek Mouth	10/24	Backpack	0	0.3 m ²	0	0.3 m ²	22 m ²	2005	>99%	n/a	
19j: Easton Creek Mouth	2 years with no invasive <i>Spartina</i> (2023-2024)		0	0	0	0	0	2004	100%	n/a	
19k: Sanchez Marsh	10/22; 11/6	Backpack	0	56 m ²	0	56 m ²	0.3 acres	2004	99%	28%	
19l: Burlingame Lagoon	10/22; 10/25	Backpack	0	5 m ²	0	5 m ²	149 m ²	2004	>99%	29%	
19m: Fisherman's Park	13 years with no invasive <i>Spartina</i> (2012-2024)		0	0	0	0	0	2005	100%	n/a	
19n: Coyote Point Marina / Marsh	4 years with no invasive <i>Spartina</i> (2021-2024)		0	0	0	0	0	2004	100%	n/a	
19o: San Mateo Creek / Ryder Park	2 years with no invasive <i>Spartina</i> (2023-2024)		0	0	0	0	0	2006	100%	n/a	
19p.1: Seal Slough Mouth - Central Marsh	9/24; 11/8	Backpack	0	0.2 m ²	0	0.2 m ²	17 m ²	2004	>99%	Increase (0.2 m ²)	
19p.2: Seal Slough Mouth - Peripheral Marshes	9/24; 11/8	Backpack	0	1 m ²	0	1 m ²	16 m ²	2004	>99%	Increase (1 m ²)	
19r: Anza Lagoon	9 years with no invasive <i>Spartina</i> (2016-2024)		0	0	0	0	0	2004	100%	n/a	
REGION 2 TOTAL			0	69 m ²	0	69 m ²	0.4 acres	2004	>99%	25%	

Hybrid *S. alterniflora* is also now scarce or absent in most sub-areas in the San Francisco Peninsula Region, with 24 of the sub-areas having none detected in 2024. Only three sub-areas contained >1 m² of invasive *Spartina*: SFO (19h), Sanchez Marsh (19k), and Burlingame Lagoon (19l), which collectively accounted for 97% of the regional total infestation. Sanchez Marsh contained by far the largest infestation with 56 m² and 81% of the regional total. All instances of invasive *Spartina* mapped in 2023 and 2024 were subsequently treated by qualified ISP personnel.

The San Francisco Peninsula bay edge is heavily urbanized with very few opportunities to enhance habitat that could support sustainable Ridgway's rail populations. Only one Ridgway's rail was detected in the Region during surveys in 2023 and none were detected in 2024. The ISP's habitat enhancement efforts in this region have been limited to three sub-areas within the Colma Creek/San Bruno complex. ISP partnered with SFSU to reintroduce *S. foliosa* along Colma Creek (18a) and in San Bruno Marsh (18g) from 2011-13 and continued planting efforts at San Bruno Marsh and at Confluence Marsh (18f) from 2016-21. The planting effort focused on re-establishing the fringe of native *S. foliosa* that was present near the mouth of Colma Creek prior to hybrid *S. alterniflora* invasion. This fringe of native *S. foliosa* provides much needed cover for Ridgway's rails using the San Francisco Peninsula as a movement corridor.

Region 3: San Mateo

San Mateo County

Local Partners: San Mateo County Mosquito and Vector Control District, City of Redwood City, California Department of Fish & Wildlife, Don Edwards National Wildlife Refuge, South Bay Salt Pond Restoration Project

Acres of *Spartina* habitat surveyed by ISP: 5,546

Net coverage of invasive *Spartina* in 2024: 3.6 acres

Percentage of bay-wide total infestation: 18.7%

The San Mateo Region (Region 3) consists of 26 sub-areas on the western shoreline of the South Bay between the San Mateo and Dumbarton Bridges and contains many tracts within CDFW Ecological Reserves or managed by USFWS as part of Don Edwards National Wildlife Refuge (DENWR). Control of hybrid *S. alterniflora* in this region is essential to protect some large historic tracts of native marsh (Greco Island [02f, 02h]), extensive tracts of restored marsh (Bair Island [02c, 02d, 02k, 02l, 02m, 02o]), and remaining large commercial salt ponds that are slated for restoration to tidal habitat. In winter of 2023, the South Bay Salt Pond Restoration Project (Phase 2) re-connected tidal exchange for the former salt pond ‘Pond R4’, which is located between Greco Island South (02h) and Ravenswood Slough & Mouth (02i). This region was heavily impacted by hybrid *S. alterniflora* invasion, which colonized the shoreline and marshes, and quickly invaded newly breached areas undergoing restoration to tidal marsh. The 2024 distribution and abundance of invasive *Spartina* within each sub-area are presented in **Figure 10** and **Table 8**. Treatment dates and methods are included in **Table 8**. Most treatment in Region 3 must be conducted using airboats, either applying imazapyr herbicide directly from the spray rig or, for more remote areas beyond the reach of the hose, deploying personnel with backpack sprayers.

The San Mateo Region underwent the most significant changes for both inventory and treatment approaches in 2023 and 2024. Staffing constraints in 2023 resulted in skipping inventory and treatment altogether at B2 North West (02c.1a) that year; it was subsequently thoroughly inventoried and treated in 2024. In 2023, a 0.3-acre increase in infestation was detected in Central Bair (02o), a restoration marsh that was breached in 2012, which brought it to its peak infestation to date of hybrid *S. alterniflora*. Adjacent to Central Bair is Pond B3 (02m), another restoration site that had been breached four years earlier in 2008. The infestation in Central Bair in 2023 inspired new inventory approaches and methods for both of these sites in 2024, resulting in ISP hiring an additional set of five seasonal staff with a dedicated airboat to specifically focus on the marshes of Bair Island (**Figure 9**; see **Section 3.4**) for more detailed discussion). Conducting full inventory in areas of B3, as opposed to coarse mapping during airboat treatment, led to the detection of significantly more hybrid *S. alterniflora* than previously realized and underscored the need to continue these increased efforts at these two marshes and their neighboring marshes in upcoming years.



Figure 9. Airboat treatment at Central Bair in 2024; the new approach (discussed above) to adapt to the increased vegetation establishment at this maturing restoration site. The airboat is returning to treat a patch of hybrid *S. alterniflora* that was detected the prior year by experienced ISP biologists conducting focused on-the-ground surveys.

Another complication to conducting inventory and treatment at Bair Island marshes in 2024 was the absence of two contracted airboats that contributed many days to these sites annually for well over a decade. SOLitude Lake Management’s secondary airboat and San Mateo County Mosquito and Vector Control District’s sole airboat both suffered mechanical breakdowns that rendered them inoperable for ostensibly the entire season. The contracted Airboat Specialists airboat, dedicated to supporting the new Bair Island crew (mentioned above), assisted greatly in providing support in the absence of these other two airboats, but the Project was still at a net loss of airboat availability for the 2024 season.

Inventory at all sub-areas was conducted primarily on foot, often with assistance from boats (e.g. kayak, whaler, Achilles inflatable boat, or airboat) for access. Twenty-five of the 26 sub-areas in the San Mateo Region were inventoried in 2024; Maple Street Channel (19s) was not visited in 2024 due to an absence of recent detections and very low invasion pressure. In 2023, the same number of sub-areas were inventoried; B2 North West (02c.1a) was intentionally

skipped due to time constraints. Both years had multiple sub-areas that were not mapped in their entirety due to constraints of time, resources, airboat, and/or staffing availability (see **Appendix IV and V** for details).

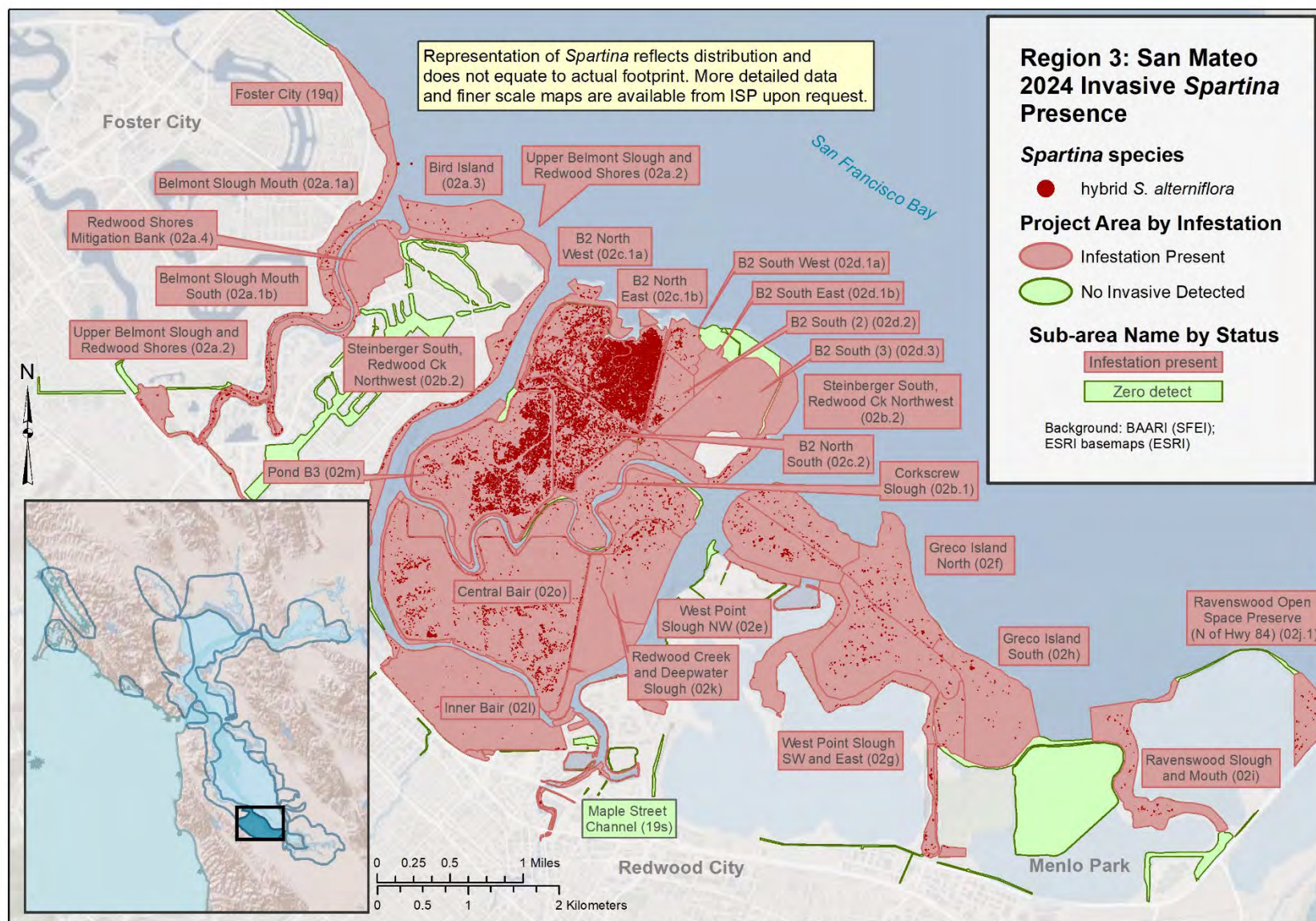


Figure 10. Distribution of invasive *Spartina* in 2024 across the 26 sub-areas of Reporting Region 3: San Mateo. Sub-areas with current infestation are labeled in pink, while those with no detection of invasive *Spartina* are labeled in green.

Table 8. Summary of 2024 invasive *Spartina* mapped and treated by sub-area within Reporting Region 3: San Mateo.

Split Sub-Area	2024 Treatment Dates	2024 Treatment Method	2024 Net <i>Spartina</i> Coverage By Species				All Invasive <i>Spartina</i> Cover				
			anglica	densiflora x foliosa	alterniflora x foliosa	densiflora	2024 Net Area	2024 Treatment Area	Peak Year	Net Area Decline	
										Since Peak	Since 2023
REGION 3: SAN MATEO											
02a.1a: Belmont Slough Mouth	9/11; 10/29; 11/7	Backpack, Airboat	0	35 m ²	0	35 m ²	946 m ²	2004	>99%	Increase (14 m ²)	
02a.1b: Belmont Slough Mouth South	9/9; 10/29; 11/7	Backpack, Airboat	0	13 m ²	0	13 m ²	364 m ²	2004	>99%	Increase (2 m ²)	
02a.2: Upper Belmont Slough and Redwood Shores	9/9-9/10; 10/23; 10/25; 11/7	Backpack, Airboat	0	91 m ²	0	91 m ²	0.7 acres	2004	>99%	32%	
02a.3: Bird Island	10/29	Backpack	0	18 m ²	0	18 m ²	563 m ²	2006	>99%	Increase (14 m ²)	
02a.4: Redwood Shores Mitigation Bank	9/11	Backpack	0	6 m ²	0	6 m ²	105 m ²	2015	56%	Increase (4 m ²)	
02b.1: Corkscrew Slough	10/8; 11/7-11/8	Backpack, Airboat	0	98 m ²	0	98 m ²	0.4 acres	2004	98%	Increase (36 m ²)	
02b.2: Steinberger Slough South, Redwood Creek Northwest	7/26; 9/27; 10/23; 11/14	Backpack, Airboat	0	176 m ²	0	176 m ²	0.8 acres	2004	>99%	Increase (62 m ²)	
02c.1a: B2 North West	8/24; 8/26; 9/7; 9/24; 10/7	Backpack, Airboat	0	885 m ²	0	885 m ²	4.2 acres	2005	98%	Increase (789 m ²)	
02c.1b: B2 North East	7/26; 8/12-8/15; 8/23; 8/26; 9/6-9/7; 9/9-9/11; 9/16; 9/20; 9/23-9/26	Backpack, Airboat	0	0.9 acres	0	0.9 acres	11.2 acres	2005	96%	38%	
02c.2: B2 North South	9/16; 9/26-9/27; 10/7-10/8; 10/10-10/11; 11/6-11/8	Backpack, Airboat	0	0.7 acres	0	0.7 acres	10.3 acres	2006	94%	Increase (0.3 acres)	
02d.1a: B2 South West	11/8	Backpack, Airboat	0	24 m ²	0	24 m ²	588 m ²	2004	>99%	Increase (20 m ²)	
02d.1b: B2 South East	11/8	Backpack, Airboat	0	0.07 m ²	0	0.07 m ²	6 m ²	2004	>99%	Increase (0.06 m ²)	
02d.2: B2 South (2)	11/6	Backpack, Airboat	0	14 m ²	0	14 m ²	313 m ²	2006	>99%	Increase (5 m ²)	
02d.3: B2 South (3)	11/8	Backpack	0	4 m ²	0	4 m ²	82 m ²	2009	>99%	38%	
02e: West Point Slough NW	10/25	Backpack, Airboat	0	9 m ²	0	9 m ²	162 m ²	2005	>99%	Increase (8 m ²)	
02f: Greco Island North	9/10; 10/22; 11/6-11/7	Backpack, Airboat	0	542 m ²	0	542 m ²	2.4 acres	2008	99%	Increase (374 m ²)	
02g: West Point Slough SW and East	9/10; 10/9; 10/25; 11/11	Backpack, Airboat	0	76 m ²	0	76 m ²	0.4 acres	2005	>99%	Increase (59 m ²)	
02h: Greco Island South	10/22	Backpack, Airboat	0	46 m ²	0	46 m ²	893 m ²	2005	>99%	24%	
02i: Ravenswood Slough and Mouth	9/25-9/26; 10/9; 11/6	Backpack	0	22 m ²	0	22 m ²	560 m ²	2004	>99%	52%	
02j.1: Ravenswood Open Space Preserve (N of Hwy 84)	9/26	Backpack	0	34 m ²	0	34 m ²	818 m ²	2006	94%	34%	
02k: Redwood Creek and Deepwater Slough	10/8; 10/23; 11/7	Backpack, Airboat	0	239 m ²	0	239 m ²	1.4 acres	2009	98%	Increase (95 m ²)	
02l: Inner Bair	10/10; 10/28; 11/12	Backpack	0	26 m ²	0	26 m ²	522 m ²	2006	99%	Increase (7 m ²)	
02m: Pond B3	8/14; 9/27; 10/3-10/4; 10/10; 10/12	Airboat	0	1.2 acres	0	1.2 acres	19.9 acres	2024	n/a	Increase (0.9 acres)	
02o: Central Bair	7/29; 8/27; 9/12-9/13; 9/26; 10/10; 10/24-10/25	Airboat	0	0.3 acres	0	0.3 acres	5.3 acres	2023	4%	4%	
19q: Foster City	6/26	Backpack	0	0.02 m ²	0	0.02 m ²	1 m ²	2004	>99%	65%	
19s: Maple Street Channel	6 years with no invasive <i>Spartina</i> (2019-2024)		0	0	0	0	0	2011	100%	n/a	
REGION 3 TOTAL			0	3.6 acres	0	3.6 acres	58.3 acres	2004	97%	Increase (0.9 acres)	

In 2024, a total of 3.6 acres of hybrid *S. alterniflora* was mapped and treated in the San Mateo Region, a 0.9-acre increase since 2023 (**Figure 10, Table 8**). Region 3 had the third largest remaining infestation in the Estuary (18.7% of total), behind Region 6: Hayward and Region 7: San Leandro Bay, where treatment of the majority of the remaining hybrid *S. alterniflora* infestation had not fully resumed since restrictions 2010. In Region 3, the bulk (92%) of the infestation was within the five sub-areas that comprise most of Middle and Outer Bair Island: B2 North West (02c.1a), B2 North East (02c.1b), B2 North South (02c.2), Pond B3 (02m), and Central Bair (02o). B2 North East had restricted treatment from 2011 to 2018 but detailed on the ground inventory and treatment across the entire sub-area did not commence until 2023. The adjacent marshes within Outer and Middle Bair were greatly impacted during the twelve years of growth and seed production by hybrid *S. alterniflora* at B2 North East despite efforts to suppress seed production at the partially restricted site.

Annual surveys for Ridgway's rails by the ISP and Don Edwards National Wildlife Refuge (DENWR) indicated an increasing trend in the region. The number of rails detected increased by 27% between 2022 and 2023 and increased by another 2.7% between 2023 and 2024. At the formerly restricted sub-area B2 North East (02c.1b), Ridgway's rail numbers have remained relatively low but increased from 3 rails detected in 2022 to 4 rails detected in 2023 and 6 rails detected in 2024. Additionally, as marsh habitats have developed at young restoration sites in the region, Ridgway's rails were detected during inventory in 2024 for the first time at both Central Bair and Inner Bair.

With abundant *S. foliosa* in most sub-areas and hybrid *S. alterniflora* persisting throughout the region, native cordgrass has not been considered for planting in this region. Habitat enhancements to date have included construction of high tide refuge islands and planting extensive *Grindelia stricta*. Both types of enhancement are intended to provide Ridgway's rails with taller vegetative cover for protection from predators. High tide refuge islands, intended to provide cover during extreme tide events, have been constructed at seven sub-areas: two along Belmont Slough (02a.1-2), one on Bird Island (02a.3), four in Corkscrew Slough (02b.1), nine within B2 North (02c.1a-b), and four in Deepwater Slough (02k). Additionally, the ISP has installed over 46,800 *Grindelia stricta* plants across nine sub-areas.

Region 4: Dumbarton South

San Mateo, Santa Clara, and Alameda Counties

Local Partners: San Mateo County Mosquito and Vector Control District, Valley Water, San José-Santa Clara Regional Wastewater Facility, Midpeninsula Regional Open Space District, Don Edwards National Wildlife Refuge, South Bay Salt Pond Restoration Project, City of Palo Alto

Acres of *Spartina* habitat surveyed by ISP: 8,392

Net coverage of invasive *Spartina* in 2024: 0.6 acres

Percentage of bay-wide total infestation: 3.3%

The Dumbarton South Region (Region 4) includes 26 sub-areas and is comprised of all tidal wetlands south of the Dumbarton Bridge. The region includes newly breached restoration sites, salt evaporator ponds that are slated for restoration to tidal marsh, large expanses of marsh protected and managed by the USFWS as part of DENWR, and fringe marsh that provides connectivity between the larger marshes. Much of this region is a focus for large-scale tidal restoration by the South Bay Salt Pond Restoration Project (SBSPRP), and control of invasive *Spartina* here is required for SBSPRP to achieve its long-term goals. SBSPRP Phase 1 tidal restorations included: Island Ponds (05i), Knapp Tract (15a.6), and Pond 17 (15a.7), all of which are located within the Coyote Creek Watershed and are consistently monitored by the ISP. SBSPRP Phase 2 began in 2021 and is expected in the next couple years to return Mountain View Ponds A1 and A2W to tidal flow. The 2024 distribution and abundance of invasive *Spartina* within each sub-area are presented in **Figure 11** and **Table 9**. Treatment dates and methods are included in Table 9.

Twenty-four of 26 sub-areas of the Dumbarton South Region were inventoried in 2024; Newark Slough West (05c.1) and Newark Slough East (05c.2) were not inventoried in 2024. In 2023, ten sub-areas were thoroughly inventoried while the remaining 16 were partially inventoried and simultaneously treated based on inventory data from the previous two years. Region 4 is particularly difficult to inventory and treat in the *Spartina* growing season following a wet winter and early spring due to its abundant brackish marsh vegetation that makes movement through the marsh by biologists exceedingly difficult. The dense brackish vegetation that flourishes after a wet winter and spring also decreases visibility of plants and the detectability of hybrid *S. alterniflora* that may be mixed in [hiding in] the taller vegetation. Of the sub-areas that were partially surveyed in 2023, seven also received partial inventory in 2024:

- SF2 (02n)—partial survey to revisit and treat any remaining plants mapped in 2023;
- Calaveras Marsh (05a.2)—shoreline was inventoried and treated; marsh interior was not surveyed;
- Dumbarton/Audubon (05b)—Eastern-most areas “Railroad-Barge Marsh” were not surveyed;
- Plummer Creek Mitigation Marsh (05h)—partial survey to revisit and treat any remaining plants mapped in 2023;

- Island Ponds (05i)—airboat access not possible in 2024 to Pond A20; intended partial survey of historic 2022 patch was not completed;
- Guadalupe Slough (15a.3)—shoreline was inventoried and treated; marsh interior was not surveyed; and
- Sunnyvale Baylands (15d)—2021 patch was surveyed and found to be absent for third year.

Hybrid *S. alterniflora* is the only species of invasive cordgrass that has been found in the Dumbarton South Region, and in 2024, ISP mapped a total of 0.63 acres, a 0.14-acre (28.4%) increase since 2023. The hybrid *S. alterniflora* infestation in the Dumbarton South Region amounted to 3.3% of the Estuary total, placing this region as the fourth most infested behind Hayward, San Leandro Bay, and San Mateo Regions respectively.

Despite its relatively low level of infestation, this region is challenging for conducting inventory and treatment work due to its size, complexity of habitats, the remote locations requiring airboat access, and the continued large-scale restoration efforts. Most of the region is fed by Coyote Creek, which provides nutrients for plants to flourish, including abundant native cordgrass. *Spartina foliosa* is widespread and robust in this region, which makes identification of the hybrid *S. alterniflora* more challenging. This is also one of the most dynamic regions within the Project Area, largely due to restoration efforts, but also because Coyote Creek is one of the only tributaries remaining in the bay that transports adequate sediment from upstream. Deposition of sediment along Coyote Creek shorelines and within recently breached former salt ponds leads to accretion and development of new tidal marsh habitats. These newly developed tidal marsh tracts are difficult to access because the substrate is still young and not fully consolidated, which makes access on foot nearly impossible. Access by airboat helps for a period, but as the marsh plain develops more vegetation, full access by airboat throughout the new marsh becomes impossible. See **Section 3.3** for more information on ISP’s methods for conducting fieldwork in these areas.

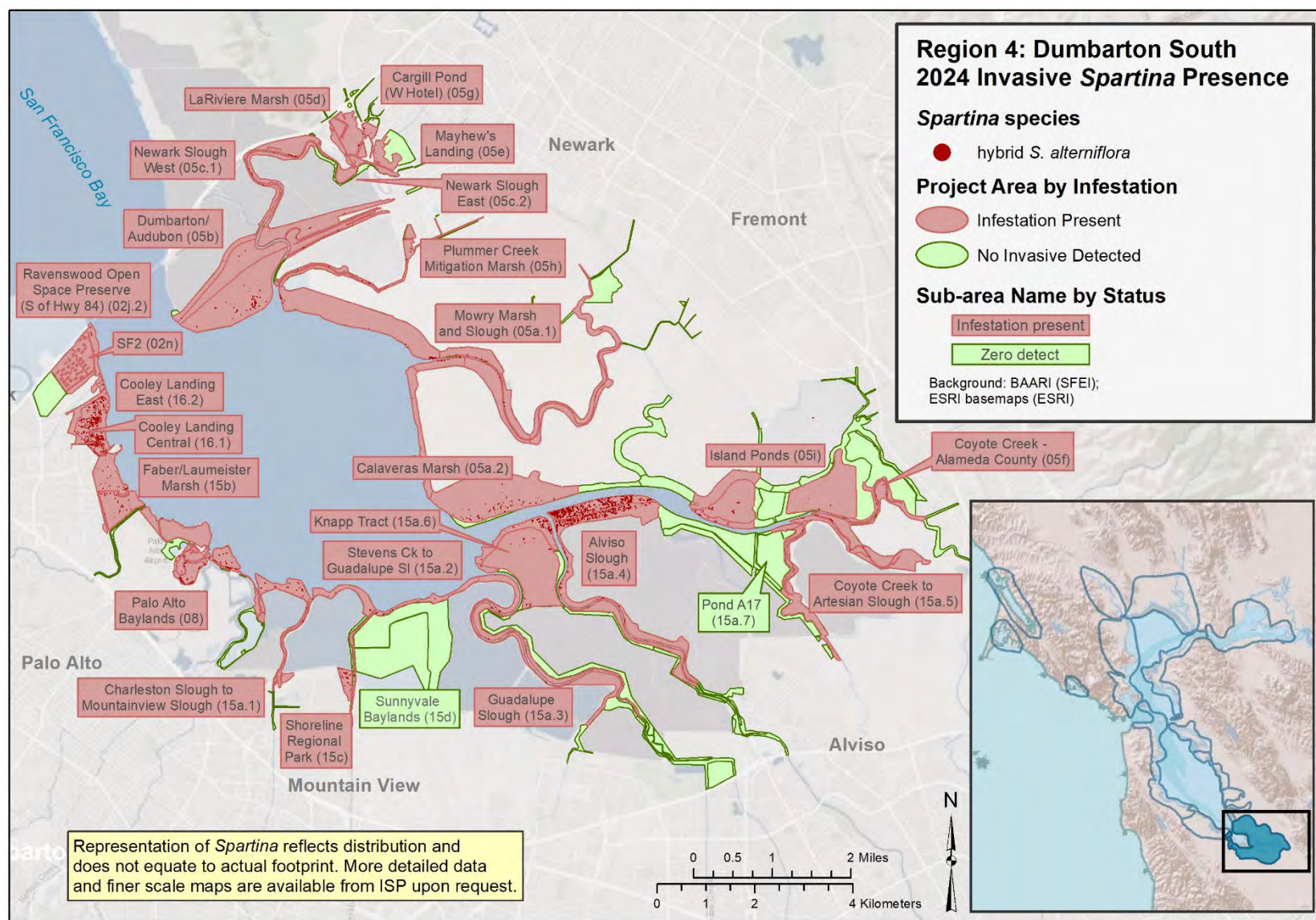


Figure 11. Distribution of invasive *Spartina* in 2024 across the 26 sub-areas of Reporting Region 4: Dumbarton South. Sub-areas with current infestation are labeled in pink, while those with no detection of invasive *Spartina* are labeled in green.

Table 9. Summary of 2024 invasive *Spartina* mapped and treated by sub-area within Reporting Region 4: Dumbarton South.

Split Sub-Area	2024 Treatment Dates	2024 Treatment Method	2024 Net <i>Spartina</i> Coverage By Species				All Invasive <i>Spartina</i> Cover				
			anglica	densiflora x foliosa	alterniflora x foliosa	densiflora	2024 Net Area	2024 Treatment Area	Peak Year	Net Area Decline	
										Since Peak	Since 2023
REGION 4: DUMBARTON SOUTH											
02j.2: Ravenswood Open Space Preserve (S of Hwy 84)	9/26	Backpack	0	11 m ²	0	11 m ²	254 m ²	2006	>99%	33%	
02n: SF2	9/26	Backpack	0	0.8 m ²	0	0.8 m ²	24 m ²	2013	38%	0%	
05a.1: Mowry Marsh and Slough	8/13; 9/10; 10/24	Backpack, Airboat	0	96 m ²	0	96 m ²	0.3 acres	2008	>99%	Increase (6 m ²)	
05a.2: Calaveras Marsh	8/9	Backpack, Airboat	0	69 m ²	0	69 m ²	0.3 acres	2007	>99%	40%	
05b: Dumbarton/Audubon	9/10; 9/23; 10/28	Backpack, Airboat	0	69 m ²	0	69 m ²	0.3 acres	2006	>99%	Increase (3 m ²)	
05c.1: Newark Slough West	Not treated 2024		0	8 m ²	0	8 m ²	283 m ²	2004	>99%	0%	
05c.2: Newark Slough East	Not treated 2024		0	0.02 m ²	0	0.02 m ²	0.7 m ²	2005	>99%	0%	
05d: LaRiviere Marsh	10/22	Backpack	0	7 m ²	0	7 m ²	163 m ²	2006	>99%	Increase (6 m ²)	
05e: Mayhew's Landing	10/21	Backpack	0	0.4 m ²	0	0.4 m ²	6 m ²	2004	>99%	Increase (0.1 m ²)	
05f: Coyote Creek - Alameda County	9/6; 9/11; 10/23	Backpack, Airboat	0	21 m ²	0	21 m ²	424 m ²	2008	87%	Increase (12 m ²)	
05g: Cargill Pond (W Hotel)	10/25	Backpack	0	5 m ²	0	5 m ²	105 m ²	2010	>99%	Increase (0.5 m ²)	
05h: Plummer Creek Mitigation Marsh	9/10; 10/24	Backpack	0	1 m ²	0	1 m ²	33 m ²	2011	>99%	Increase (0.3 m ²)	
05i: Island Ponds	9/11; 10/1; 10/23	Airboat	0	32 m ²	0	32 m ²	628 m ²	2017	81%	Increase (21 m ²)	
08: Palo Alto Baylands	9/12; 10/11; 10/23	Backpack, Airboat	0	124 m ²	0	124 m ²	0.8 acres	2009	98%	Increase (48 m ²)	
15a.1: Charleston Slough to Mountainview Slough	8/13; 10/28	Backpack	0	57 m ²	0	57 m ²	771 m ²	2004	>99%	Increase (48 m ²)	
15a.2: Stevens Ck to Guadalupe St	8/14; 10/28	Backpack	0	17 m ²	0	17 m ²	285 m ²	2008	99%	Increase (16 m ²)	
15a.3: Guadalupe Slough	9/11; 9/16	Backpack, Airboat	0	10 m ²	0	10 m ²	198 m ²	2008	>99%	Increase (1 m ²)	
15a.4: Alviso Slough	8/9; 9/11-9/13; 9/23-9/25; 10/9; 10/23; 10/28; 11/8	Backpack, Airboat	0	0.4 acres	0	0.4 acres	7.4 acres	2007	85%	Increase (462 m ²)	
15a.5: Coyote Creek to Artesian Slough	9/6; 10/1	Backpack, Airboat	0	38 m ²	0	38 m ²	739 m ²	2017	95%	53%	
15a.6: Knapp Tract	9/16	Airboat	0	39 m ²	0	39 m ²	941 m ²	2024	n/a	Increase (25 m ²)	
15a.7: Pond 17	No Invasive <i>Spartina</i> Ever Detected		0	0	0	0	0	0	n/a	n/a	
15b: Faber / Laumeister Marsh	9/24; 10/23; 11/11	Backpack	0	46 m ²	0	46 m ²	0.3 acres	2008	98%	Increase (30 m ²)	
15c: Shoreline Regional Park	10/10; 11/14	Backpack	0	43 m ²	0	43 m ²	790 m ²	2006	99%	Increase (42 m ²)	
15d: Sunnyvale Baylands	3 years with no invasive <i>Spartina</i> (2022-2024)		0	0	0	0	0	n/a	100%	n/a	
16.1: Cooley Landing Central	9/9-9/10; 9/24; 10/23	Truck, Backpack, Airboat	0	90 m ²	0	90 m ²	0.6 acres	2008	>99%	30%	
16.2: Cooley Landing East	9/9-9/10; 9/25; 10/11	Truck, Backpack, Airboat	0	334 m ²	0	334 m ²	1.6 acres	2008	>99%	7%	
REGION 4 TOTAL			0	0.6 acres	0	0.6 acres	13 acres	2008	98%	Increase (564 m ²)	

The bulk of the Region 4 infestation was found in Alviso Slough (05a.4), which includes Ogilvie Island, and comprised 67% of the Region's total. Palo Alto Baylands (08) and Cooley Landing East (16.2) are the only other sub-areas in the region that had more than 100 m² net cover of hybrid *S. alterniflora* in 2024, and when combined with Alviso Slough represented 86% of the Regional total. Knapp Tract (15a.6), a restoration marsh at the mouth of Alviso Slough, experienced an increase of 25 m² from 2023 to 2024, which brought it up to 39 m², the highest level of infestation detected there since its opening to tidal exchange in 2010.



Figure 12. Hybrid *S. alterniflora* in the Island Ponds (05i) restoration marshes can reach substantial heights enabled by high nutrient input from Coyote Creek and the San Jose Wastewater Treatment Facility and growing in competition for sunlight within dense stands of alkali bulrush (*Bolboschoenus maritimus*).

The Dumbarton South Region includes some of the highest quality Ridgway's rail habitat in the Estuary. Surveys in the region conducted by ISP, PBCS, and DENWR have shown an increase by 13.6% between 2022 to 2023 (from 198 rails to 225 rails) and by 5.8% between 2023 to 2024 (from 225 rails to 238 rails). Marshes in this region generally have abundant *S. foliosa*, however, there is opportunity to enhance available habitat cover with *G. stricta* plantings and high tide refuge islands. ISP and partners have constructed two high tide refuge islands at Cooley Landing (16.2), eight at Palo Alto Baylands (08), and six at Dumbarton/Audubon (05b), and planted over 8,400 *G. stricta* at Dumbarton/Audubon (05b).

Region 5: Union City

Alameda County

Local Partners: Alameda County Flood Control District, California Department of Fish & Wildlife, East Bay Regional Park District, Don Edwards National Wildlife Refuge, South Bay Salt Pond Restoration Project

Acres of *Spartina* habitat surveyed by ISP: 3,523

Net coverage of invasive *Spartina* in 2024: 0.1 acres

Percentage of bay-wide total infestation: 0.7%

The Union City Region (Region 5) extends along the East Bay shoreline from the San Mateo Bridge to the Dumbarton Bridge and includes 21 sub-areas. This region includes the original introduction site for *S. alterniflora* to San Francisco Bay – Pond 3 adjacent to the north bank of the Alameda Flood Control Channel (AFCC; 01f, also known as Ecology Marsh). Planted *S. alterniflora* later hybridized with native *S. foliosa* and eventually resulted in the bay-wide spread of their highly invasive progeny. Region 5 also includes many historical tidal marshes that were converted to commercial salt ponds in the early 1900s. Some of these salt ponds were part of the earliest large-scale tidal restoration activities by the South Bay Salt Pond Restoration Project (“SBSPRP” Phase 1). More de-commercialized salt ponds are included in future actions for SBSPRP Phase 2 to increase tidal marsh and wetland habitats in Region 5. The 2024 distribution and abundance of invasive *Spartina* within each sub-area are presented in **Figure 13** and **Table 10**. Treatment dates and methods are included in Table 10.

All 21 sub-areas in this region were inventoried in 2023. Two sub-areas (Upper Channel - Union City Blvd to I-880 [01d] and Upstream of 20 Tide Gates [13g]) were not inventoried in 2024 after multiple years of no detected infestation and low invasion pressure. One sub-area, Pond 10 (13i) in Eden Landing Ecological Reserve, was partially inventoried in both years. Pond 10 was opened to tidal flow during tidal marsh restoration actions between 2005-2008 as part of South Bay Salt Pond Restoration Project (Phase 1), and a portion was hydrologically connected to Mount Eden Creek (13j), which is fully tidal. The larger portion of Pond 10 that was not inventoried in either year is managed as a wet pond for waterfowl and no longer provides likely habitat for *Spartina*.

In 2024, a total of 0.13 acres of hybrid *S. alterniflora* was detected, which constituted 0.7% of the bay wide infestation and a 16.7% reduction from 2023 regional infestation. Of the region total, 94% was found within three sub-areas, all of which are former salt ponds restored to tidal flow since 2006: Eden Landing-North Creek Marsh (13k), Eden Landing-Mt Eden Creek Marsh (13l), and Eden Landing-Ponds E8A, E9, and E8X (13m). Each of these three marshes experienced increases of greater than 400% between 2022 and 2023, and then moderate to strong (7-62%) reductions in infestation between 2023 and 2024.

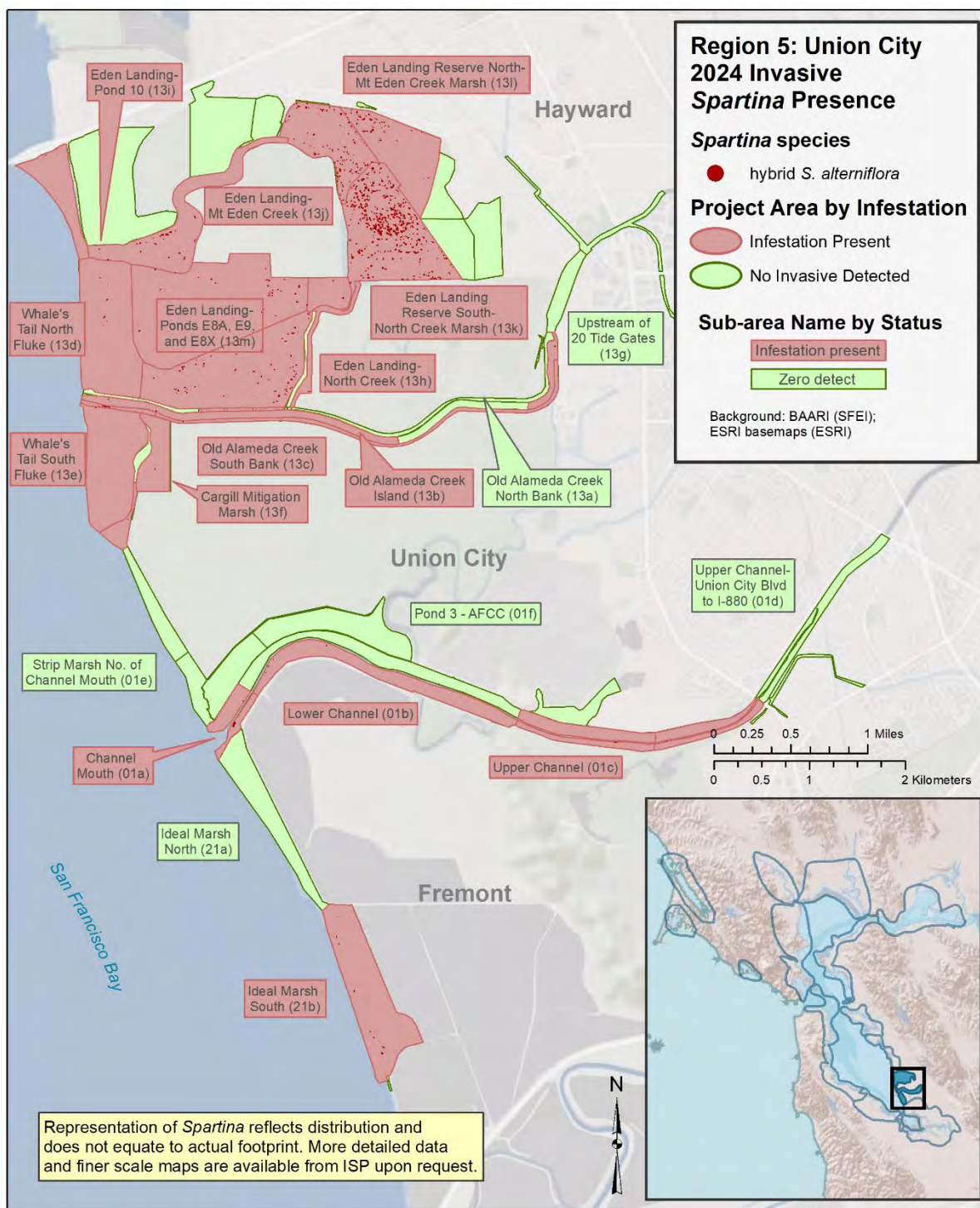


Figure 13. Distribution of invasive *Spartina* in 2024 across the 21 sub-areas of Reporting Region 5: Union City. Sub- areas with current infestation are labeled in pink, while those with no detection of invasive *Spartina* are labeled in green.

Table 10. Summary of 2024 invasive *Spartina* mapped and treated by sub-area within Reporting Region 5: Union City.

Split Sub-Area	2024 Treatment Dates	2024 Treatment Method	2024 Net <i>Spartina</i> Coverage By Species				All Invasive <i>Spartina</i> Cover				
			anglica	densiflora x foliosa	alterniflora x foliosa	densiflora	2024 Net Area	2024 Treatment Area	Peak Year	Net Area Decline	
										Since Peak	Since 2023
REGION 5: UNION CITY											
01a: Channel Mouth	10/7	Backpack	0	5 m ²	0	5 m ²	200 m ²	2004	>99%	Increase (4 m ²)	
01b: Lower Channel	10/7	Backpack	0	0.6 m ²	0	0.6 m ²	27 m ²	2004	>99%	Increase (0.4 m ²)	
01c: Upper Channel	10/7	Backpack	0	2 m ²	0	2 m ²	51 m ²	2004	>99%	Increase (2 m ²)	
01d: Upper Channel - Union City Blvd to I-880	4 years with no invasive <i>Spartina</i> (2021-2024)		0	0	0	0	0	2005	100%	n/a	
01e: Strip Marsh No. of Channel Mouth	9 years with no invasive <i>Spartina</i> (2017-2024)		0	0	0	0	0	2004	100%	n/a	
01f: Pond 3 - AFCC	No Invasive <i>Spartina</i> 2024		0	0	0	0	0	2005	100%	100%	
13a: Old Alameda Creek North Bank	8/27	Backpack	0	0.002 m ²	0	0.002 m ²	0.2 m ²	2005	>99%	96%	
13b: Old Alameda Creek Island	10/25	Backpack	0	2 m ²	0	2 m ²	77 m ²	2005	>99%	Increase (1 m ²)	
13c: Old Alameda Creek South Bank	10/9	Backpack	0	2 m ²	0	2 m ²	68 m ²	2005	>99%	43%	
13d: Whale's Tail North Fluke	10/7; 10/21	Backpack	0	0.5 m ²	0	0.5 m ²	23 m ²	2005	>99%	69%	
13e: Whale's Tail South Fluke	10/9	Backpack	0	0.9 m ²	0	0.9 m ²	26 m ²	2005	>99%	Increase (0.3 m ²)	
13f: Cargill Mitigation Marsh	10/9	Backpack	0	0.2 m ²	0	0.2 m ²	9 m ²	2004	>99%	Increase (0.05 m ²)	
13g: Upstream of 20 Tide Gates	4 years with no invasive <i>Spartina</i> (2021-2024)		0	0	0	0	0	2005	100%	n/a	
13h: Eden Landing - North Creek	8/27	Backpack	0	1 m ²	0	1 m ²	52 m ²	2007	>99%	Increase (0.2 m ²)	
13i: Eden Landing - Pond 10	10/7	Backpack	0	0.06 m ²	0	0.06 m ²	3 m ²	2008	>99%	50%	
13j: Eden Landing - Mt Eden Creek	9/25; 10/21	Backpack	0	14 m ²	0	14 m ²	429 m ²	2009	98%	Increase (11 m ²)	
13k: Eden Landing Reserve South - North Creek Marsh	8/26; 8/28; 10/8-10/9	Backpack	0	335 m ²	0	335 m ²	2.3 acres	2009	22%	7%	
13l: Eden Landing Reserve North - Mt Eden Creek Marsh	9/25; 10/8-10/9; 11/6	Backpack	0	129 m ²	0	129 m ²	0.5 acres	2010	21%	11%	
13m: Eden Landing - Ponds E8A, E9, and E8X	8/27; 8/28; 10/25	Backpack, Airboat	0	38 m ²	0	38 m ²	0.3 acres	2023	62%	62%	
21a: Ideal Marsh North	No invasive <i>Spartina</i> 2024		0	0	0	0	0	2005	100%	100%	
21b: Ideal Marsh South	10/7	Backpack	0	3 m ²	0	3 m ²	60 m ²	2006	>99%	86%	
REGION 5 TOTAL			0	533 m ²	0	533 m ²	3.4 acres	2004	>99%	17%	

The restored marshes of Eden Landing Ecological Reserve (ELER) are still developing and have experienced fluctuating levels of hybrid *S. alterniflora* as they continue to fill in with native vegetation, including abundant *S. foliosa*. Many of these restored marshes were opened to tidal flow between 2006 and 2008 when hybrid *S. alterniflora* was still widespread in central East Bay, since estuary-wide treatment by ISP had just begun in 2005. Many of the former salt ponds were quickly colonized by the hybrid cordgrass, changing the course for their intended restoration to native salt marsh. Years of focused treatment in Region 5 by the ISP from 2005 to 2011 had dropped these infestations to very low levels. However, when treatment restrictions were instated in the nearby Cogswell Complex (Region 6: Hayward) in 2012, the influx of seed and propagules by increasing hybrid *S. alterniflora* overwhelmed the sparsely vegetated mudflats of these sub-areas and infestations rebounded. Full treatment of the entire Cogswell Complex resumed in 2023, and invasion pressure on these former ponds is expected to be greatly reduced in future years.

Biologists at ISP and DENWR detected 48 Ridgway's rails in 2023 and 55 Ridgway's rails in 2024 during annual surveys in the Union City Region. Notably, twenty-two (22) Ridgway's rails were detected at North Creek Marsh, where ISP has significantly invested in re-introducing native *S. foliosa* to the sub-area.

The objective of the ISP Restoration Program in this region is to establish rail habitat cover where control efforts have removed or precluded hybrid *S. alterniflora*. To date, the program has installed more than 258,000 plantings across fourteen sub-areas along the Alameda Flood Control Channel (01a, 01b, 01c, 01f) and within the Eden Landing Ecological Reserve (13b, 13d, 13e, 13f, 13h, 13j, 13k, 13l, 13m, 21b). ISP's recently planted *S. foliosa* has established and expanded extensively in this region, now covering acres of tidal wetlands at appropriate elevations, especially in the former salt ponds. The amount of *S. foliosa* present in the region resulting from plantings is orders of magnitude greater than the amount of remaining hybrid *S. alterniflora*. The Ridgway's rails now present at Eden Landing-North Creek Marsh (13k) are largely reliant on the established *S. foliosa* that expanded from ISP plantings there. Habitat enhancements in this region have also included planting multiple native species in the marsh-upland transition zone at Cargill Mitigation Marsh (13f).

Region 6: Hayward

Alameda County

Local Partners: East Bay Regional Park District, City of Hayward, City of San Leandro, Oakland Airport, Alameda County Flood Control District, Metropolitan Golf Links

Acres of *Spartina* habitat surveyed by ISP: 1,639

Net coverage of invasive *Spartina* in 2024: 7.9 acres

Percentage of bay-wide total infestation: 41.4%

The Hayward Region (Region 6) extends from the San Mateo Bridge to Oakland Airport on the east side of the San Francisco Bay. The region is heavily urbanized and consists of 30 sub-areas clustered around three relatively young but sizeable restoration marsh complexes: Robert's Landing, Oro Loma, and Cogswell Marsh. Cogswell Marsh (20m-o) is the oldest and was restored to tidal exchange in 1980. The 2024 distribution and abundance of invasive *Spartina* within each sub-area are presented in **Figure 15** and **Table 11**.

This region contains multiple sub-areas where treatment was suspended in 2011 to maintain habitat for local Ridgway's rail populations in a carefully phased approach to hybrid *S. alterniflora* removal. By 2024, full treatment had resumed in all but one sub-area, North Marsh (20f) in Roberts Landing, where treatment is expected to resume in 2025. Full treatment resumed in 2023 at two sub-areas, Cogswell Marsh B Main (20n.3) and Citation Marsh Central (20d.2b). During the time treatment restrictions were in place in this region, hybrid *S. alterniflora* expanded, annually re-infested adjacent marshes that were on the brink of local eradication, and dispersed seed on the tides to the wider Estuary.

All 30 sub-areas in the Hayward Region were inventoried on foot in 2023, and 29 sub-areas were inventoried on foot in 2024. Inventory was conducted by grids at North Marsh in 2023 and not at all in 2024. Inventory at the two sub-areas where treatment had not occurred since 2011 but resumed in 2023 (Cogswell Marsh B Main and Citation Marsh Central) was conducted by grids in 2023 to loosely inform broad-scale treatment. Both sub-areas were inventoried more thoroughly in 2024 to document the efficacy of the first year of treatment and to inform more specific treatment necessitated by the reductions of the monocultures to a more scattered distribution within the marsh.

A total of 7.9 acres of non-native cordgrass, all hybrid *S. alterniflora*, was detected in 2024 (**Figure 15**), 6.9 acres (87% of regional total; 36% estuary total) of which was in North Marsh where treatment had not yet resumed. This accounted for 41.4% of the Estuary total, making Region 6 the most heavily infested region, largely due to the treatment restrictions instated in 2011. In 2024, major reductions were observed in Region 6, especially within the two sub-areas where treatment resumed in 2023: the infestation was reduced by 94% at Cogswell Marsh B Main and by 85% at Citation Marsh Central after their first year of full treatment (Cogswell B Main had received a seed suppression treatment for several years prior). Collectively, they accounted for a 4.25-acre reduction in hybrid *S. alterniflora* in 2024, which contributed heavily to the estuary-wide reduction of 3.9 acres while increases were detected elsewhere in the bay (See Region 3). See **Section 3.1** for more information on resuming phased treatment at the formerly restricted sub-areas.



Figure 14. Initiation of full treatment at Cogswell B Main (20n.3) in 2023, utilizing an Intelli-Spray system that enables applicators to haul up to 850ft of hose from a truck staged on an adjacent levee. This equipment was not available in the early years of the project and greatly enhances efficiency in treating large stands of hybrid *S. alterniflora*. This has facilitated substantial reductions of the infestation reported above for 2023-2024.

All 30 sub-areas in this region contained hybrid *S. alterniflora* in both 2023 and 2024, and though annual treatment has kept infestation levels low in many sub-areas, their proximity to sub-areas where treatment has not resumed makes local eradication impossible due to the wave of hybrid *S. alterniflora* propagules that flood these sub-areas each year. Annual inventory and treatment remain necessary to ensure that these marshes and mudflats do not devolve into hybrid *S. alterniflora* meadows and further impact the Estuary with increased propagules.

The number of California Ridgway's rail detected in the Hayward Region has remained stable during this timeframe. ISP biologists detected 151 Ridgway's rails in 2023 and 152 Ridgway's rails in 2024.

The large amount of hybrid *S. alterniflora* remaining in this region has delayed the reintroduction of *S. foliosa* at sub-areas with treatment restrictions. The ISP Restoration Program has cautiously tested planting *S. foliosa* at sub-areas with relatively less invasion pressure near restricted treatment sub-areas with the goal of enhancing suitable habitat prior to resuming control efforts in the future. Sub-areas that have undergone some level of *S. foliosa* planting include Oro Loma Marsh-East (07a), H.A.R.D. Marsh (20s), Triangle Marsh (20w), and Cogswell Marsh A (20m). Habitat enhancements have also included planting over 49,200 marshplain *Grindelia stricta*, (sometimes paired with *Distichlis spicata*), across sixteen sub-areas. Habitat enhancements that

provide cover during high tides, especially during extreme high tides (king tides) include 13 high tide refuge islands installed in Cogswell Marsh B South (20n.2), Cogswell Marsh B Main (20n.3), Cogswell Marsh C (20o), and Bunker Marsh (20g) as well as over 15,600 marsh-upland transition zone plantings on existing large higher elevation islands at Cogswell (20m, 20n.1, 20n.3, 20o), Citation Marsh (20d.2a, 20d.2b), and the transition zone along the east side of Bunker Marsh (20g).

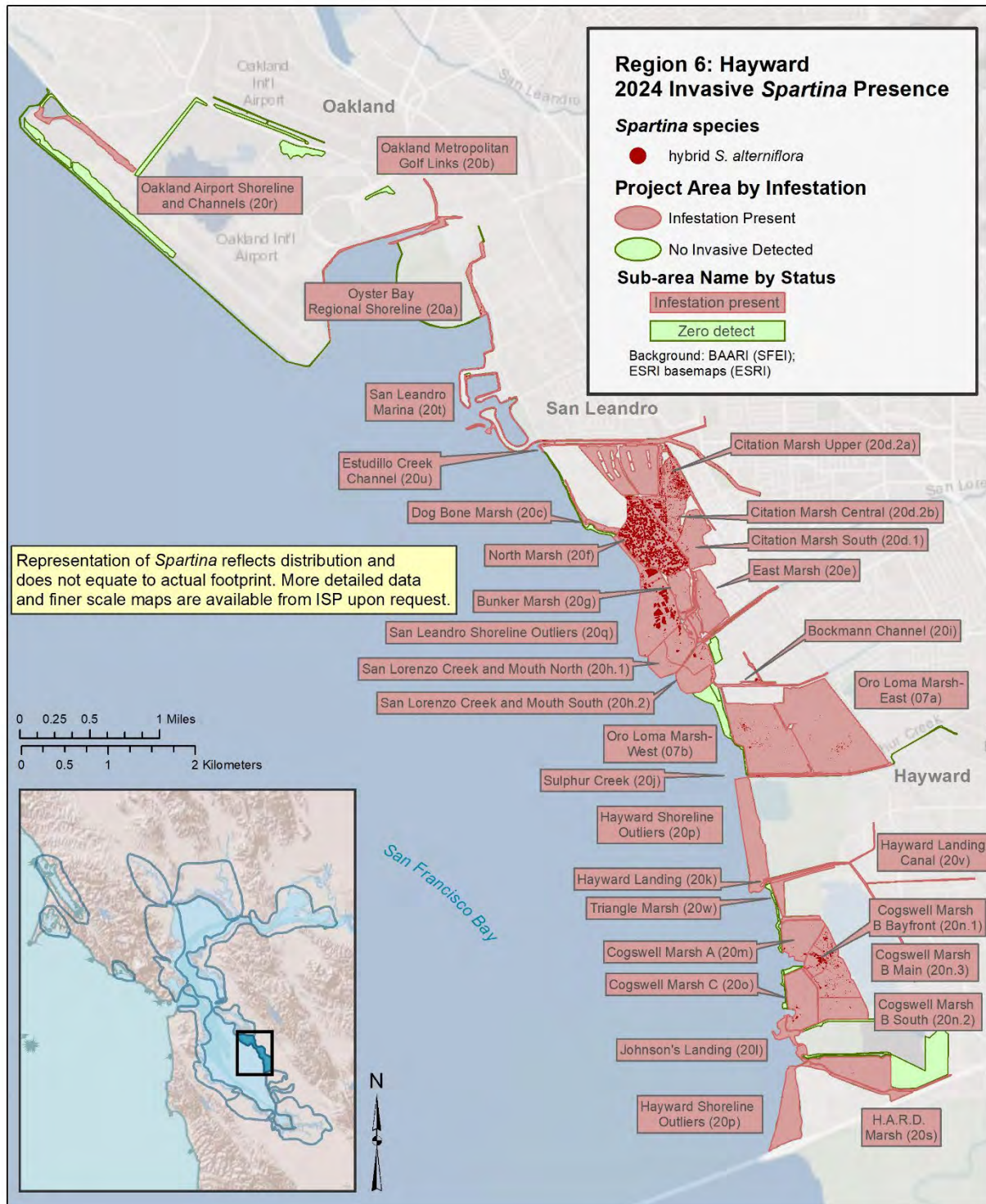


Figure 15. Distribution of invasive *Spartina* in 2024 across the 30 sub-areas of Reporting Region 6: Hayward. Sub- areas with current infestation are labeled in pink, while those with no detection of invasive *Spartina* are labeled in green.

Table 11. Summary of 2024 invasive *Spartina* mapped and treated by sub-area within Reporting Region 6: Hayward.

Split Sub-Area	2024 Treatment Dates	2024 Treatment Method	2024 Net <i>Spartina</i> Coverage By Species				All Invasive <i>Spartina</i> Cover				
			anglica	densiflora x foliosa	alterniflora x foliosa	densiflora	2024 Net Area	2024 Treat-ment Area	Peak Year	Net Area Decline	
										Since Peak	Since 2023
REGION 6: HAYWARD											
07a: Oro Loma Marsh - East	7/30-7/31; 9/23	Backpack	0	49 m ²	0	49 m ²	985 m ²	2008	>99%	Increase (1 m ²)	
07b: Oro Loma Marsh - West	7/30-7/31	Backpack	0	106 m ²	0	106 m ²	0.3 acres	2005	>99%	Increase (53 m ²)	
20a: Oyster Bay Regional Shoreline	7/25; 9/30	Backpack	0	9 m ²	0	9 m ²	133 m ²	2004	>99%	22%	
20b: Oakland Metropolitan Golf Links	7/25	Backpack	0	2 m ²	0	2 m ²	41 m ²	2009	>99%	Increase (1 m ²)	
20c: Dog Bone Marsh	8/29	Backpack	0	2 m ²	0	2 m ²	37 m ²	2006	>99%	90%	
20d.1: Citation Marsh South	8/14; 8/15; 8/29	Truck, Backpack	0	20 m ²	0	20 m ²	302 m ²	2004	>99%	74%	
20d.2a: Citation Marsh Upper	8/12-8/14; 8/21-8/22; 8/29	Truck, Backpack	0	344 m ²	0	344 m ²	1.2 acres	2006	99%	29%	
20d.2b: Citation Marsh Central	8/12-8/14; 8/22-8/23; 8/29	Truck, Backpack	0	0.6 acres	0	0.6 acres	3.9 acres	2006	91%	85%	
20e: East Marsh	8/15	Backpack	0	4 m ²	0	4 m ²	98 m ²	2006	>99%	33%	
20f: North Marsh	Not treated 2024		0	6.9 acres	0	6.9 acres	59.6 acres	2006	62%	No change detected	
20g: Bunker Marsh	8/15	Truck, Backpack	0	9 m ²	0	9 m ²	226 m ²	2004	>99%	77%	
20h.1: San Lorenzo Creek and Mouth North	8/9	Backpack	0	0.7 m ²	0	0.7 m ²	18 m ²	2004	>99%	Increase (0.6 m ²)	
20h.2: San Lorenzo Creek and Mouth South	8/7; 8/9	Backpack	0	59 m ²	0	59 m ²	0.4 acres	2004	>99%	32%	
20i: Bockmann Channel	7/26	Backpack	0	14 m ²	0	14 m ²	162 m ²	2004	>99%	Increase (7 m ²)	
20j: Sulphur Creek	7/26; 7/31	Backpack	0	2 m ²	0	2 m ²	11 m ²	2004	98%	Increase (0.5 m ²)	
20k: Hayward Landing	7/26	Backpack	0	0.3 m ²	0	0.3 m ²	10 m ²	2004	>99%	Increase (0.3 m ²)	
20l: Johnson's Landing	7/26	Backpack	0	0.08 m ²	0	0.08 m ²	3 m ²	2005	>99%	56%	
20m: Cogswell Marsh A	9/6	Backpack	0	13 m ²	0	13 m ²	76 m ²	2005	>99%	Increase (10 m ²)	
20n.1: Cogswell Marsh B Bayfront	8/26-8/27	Truck, Backpack	0	71 m ²	0	71 m ²	456 m ²	2005	>99%	Increase (5 m ²)	
20n.2: Cogswell Marsh B South	8/29	Backpack	0	8 m ²	0	8 m ²	123 m ²	2005	>99%	74%	
20n.3: Cogswell Marsh B Main	8/26-8/28	Truck, Backpack	0	182 m ²	0	182 m ²	0.7 acres	2005	>99%	94%	
20o: Cogswell Marsh C	9/6	Backpack	0	28 m ²	0	28 m ²	324 m ²	2005	>99%	28%	
20p: Hayward Shoreline Outliers	7/26	Backpack	0	0.2 m ²	0	0.2 m ²	2 m ²	2008	>99%	Increase (0.2 m ²)	
20q: San Leandro Shoreline Outliers	6/26; 8/7	Backpack	0	408 m ²	0	408 m ²	724 m ²	2006	92%	Increase (394 m ²)	
20r: Oakland Airport Shoreline and Channels	7/25; 11/7	Backpack	0	2 m ²	0	2 m ²	42 m ²	2006	>99%	Increase (0.7 m ²)	
20s: H.A.R.D. Marsh	8/29	Backpack	0	3 m ²	0	3 m ²	95 m ²	2006	98%	26%	
20t: San Leandro Marina	7/25; 8/6	Backpack	0	5 m ²	0	5 m ²	110 m ²	2009	86%	Increase (1 m ²)	
20u: Estudillo Creek Channel	6/17	Truck, Backpack	0	57 m ²	0	57 m ²	692 m ²	2010	93%	72%	
20v: Hayward Landing Canal	7/26	Backpack	0	9 m ²	0	9 m ²	103 m ²	2006	>99%	Increase (8 m ²)	
20w: Triangle Marsh	7/26	Backpack	0	2 m ²	0	2 m ²	48 m ²	2007	83%	25%	
REGION 6 TOTAL			0	7.9 acres	0	7.9 acres	67.4 acres	2005	96%	35%	

Note: Treatment at North Marsh (20f) will not resume until 2025 and inventory was conducted by grid with extrapolation in 2023. Inventory data reported for 2024 reflects those of 2023.

Region 7: San Leandro Bay

Alameda County

Local Partners: City of Alameda, Oakland International Airport, Port of Oakland, Alameda County Flood Control District, East Bay Regional Park District, U.S. Coast Guard

Acres of *Spartina* habitat surveyed by ISP: 435

Net coverage of invasive *Spartina* in 2024: 6.8 acres

Percentage of bay-wide total infestation: 35.6%

The San Leandro Bay Region (Region 7) is an especially urbanized portion of the East Bay that extends north from the Oakland Airport to the Bay Bridge. Its 21 sub-areas consist of long, thin tidal areas along rip-rap shorelines and open mudflats, punctuated by fragmented areas of marsh habitat. The 2024 distribution and abundance of invasive *Spartina* within each sub-area are presented in **Figure 16** and **Table 12**. Treatment dates and methods are included in **Table 12**.

This region contains three sub-areas where treatment had not been conducted since 2010 to maintain habitat for local Ridgway's rail populations in a carefully phased approach to hybrid *S. alterniflora* removal: Arrowhead Marsh East (17c.2), MLK New Marsh (17h), and Fan Marsh Main (17j.2). Treatment resumed at Fan Marsh Main in 2023 while treatment at Arrowhead Marsh East and MLK New Marsh are expected to resume in 2027. A new sub-area was established in this region in 2023, Doolittle Drive Mitigation Marsh (17n), which is directly connected to MLK New Marsh (see **Section 3.5** for more information).

All 21 sub-areas in this region were mapped on foot or by boat in 2023, and 19 sub-areas were inventoried in 2024. Arrowhead Marsh East and MLK New Marsh were inventoried by grid in 2023 and, in the absence of treatment, not inventoried in 2024; 2023 data have been carried over and reported in 2024 for summary. Fan Marsh Main was also inventoried by grid in 2023, but then thoroughly inventoried in 2024 to document the efficacy of the first year of treatment and to inform more specific treatment as the infestation was reduced from a monoculture to a more scattered distribution. Coast Guard Island (17g) was only partially mapped by boat in 2024 due to security access issues.

Hybrid *S. alterniflora* was the only non-native cordgrass species found in Region 7 in 2024 with a total of 6.8 acres, which represented 35.6% of the Estuary-total and reflected a 0.6-acre decrease (8%) from 2023 levels. Most of the regional infestation (6.6 acres; 97%) remained in Arrowhead Marsh East, MLK New Marsh, and the neighboring Arrowhead Marsh West that annually gets re-infested from the absence of treatment at the restricted sites. Treatment at Fan Marsh Main that resumed in 2023 yielded a 91% reduction between 2023 and 2024 (see **Section 3.1** for more information on resuming phased treatment at formerly restricted sub-areas).

The number of Ridgway's rail detected during surveys was stable in 2023 (85 rails) and 2024 (82 rails). The high degree of hybrid *S. alterniflora* infestation in San Leandro Bay marshes has supported a local high-density Ridgway's rail population for the past two decades, and the lack of

appropriate native plant structure in these fragmented urban marshes makes the rails here dependent upon hybrid *S. alterniflora* for cover.

Opportunities for rail habitat enhancement in this region are limited by treatment restrictions at all main marshes. The presence of uncontrolled hybrid *S. alterniflora* significantly increases the risk of *S. foliosa* plantings becoming infested, exacerbating the problem and requiring subsequent treatment. As a result, the ISP Restoration Program has so far limited efforts to enhance habitat in this region. To date, more than 3,400 *Grindelia* plantings were installed at the key marshes. *Spartina foliosa* has been planted at Elsie Roemer (17a) with caution due to the high risk of re-infestation, and a small amount of annual spot treatment is required at this sub-area to suppress nascent hybrid *S. alterniflora* that has spread from neighboring San Leandro Bay. Additionally, a total of five high tide refuge islands were constructed in 2012-13 within Arrowhead Marsh West (17c.1) and MLK New Marsh (17h) to provide potential protective cover for rails during extreme high tides when they are most exposed to predators.

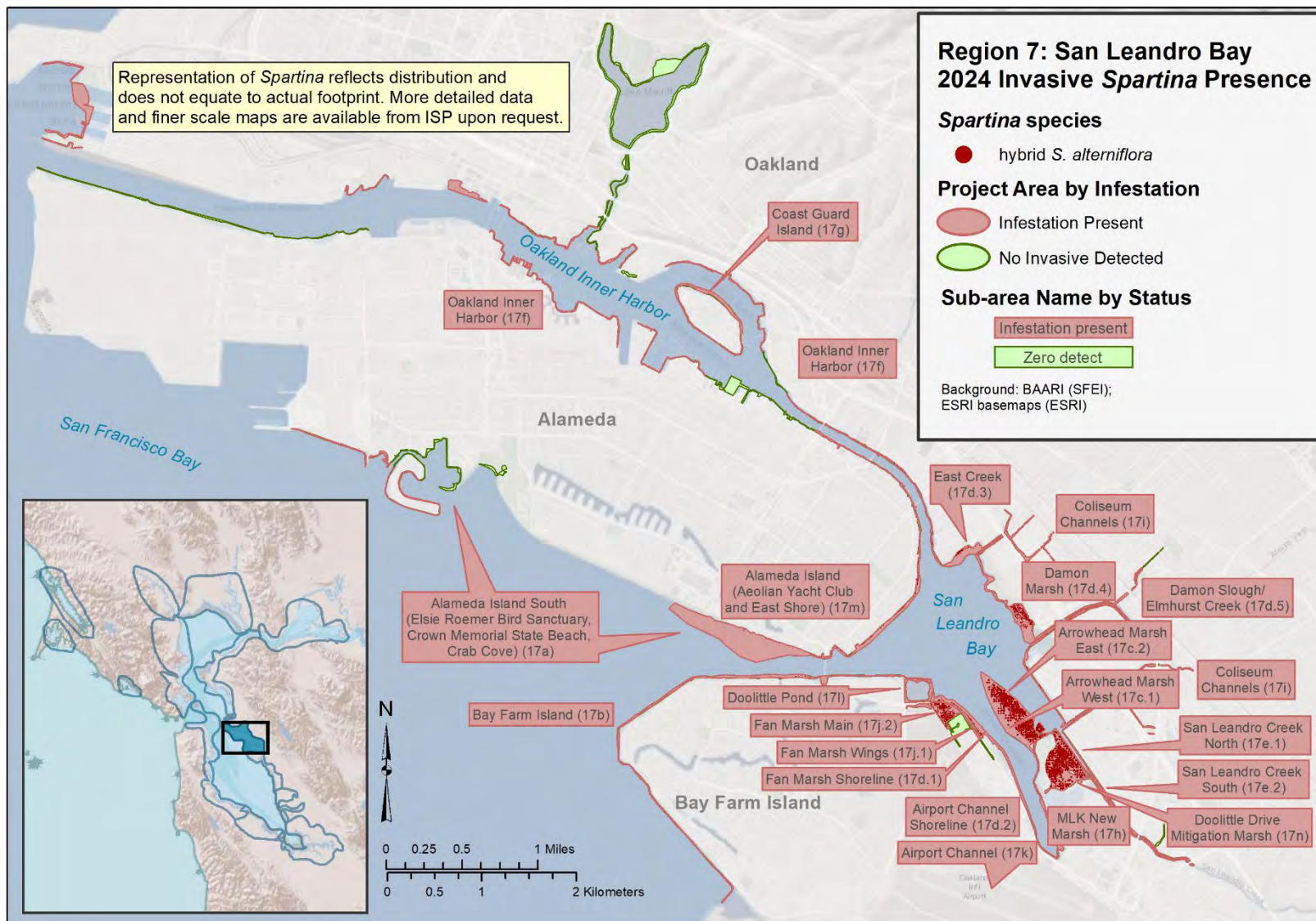


Figure 16. Distribution of invasive *Spartina* in 2024 across the 21 sub-areas of Reporting Region 7: San Leandro Bay. Sub-areas with current infestation are labeled in pink, while those with no detection of invasive *Spartina* are labeled in green.

Table 12. Summary of 2024 invasive *Spartina* mapped and treated by sub-area within Reporting Region 7: San Leandro Bay.

Split Sub-Area	2024 Treatment Dates	2024 Treatment Method	2024 Net <i>Spartina</i> Coverage By Species				All Invasive <i>Spartina</i> Cover				
			anglica	densiflora x foliosa	alterniflora x foliosa	densiflora	2024 Net Area	2024 Treatment Area	Peak Year	Net Area Decline	
										Since Peak	Since 2023
REGION 7: SAN LEANDRO BAY											
17a: Alameda Island South (Elsie Roemer Bird Sanctuary, Crown Memorial State Beach, Crab Cove)	7/10; 10/8	Backpack	0	7 m ²	0	7 m ²	202 m ²	2006	>99%	Increase (3 m ²)	
17b: Bay Farm Island	7/12	Backpack	0	8 m ²	0	8 m ²	85 m ²	2005	>99%	Increase (6 m ²)	
17c.1: Arrowhead Marsh West	8/12-8/13; 8/29; 9/20	Backpack, Airboat	0	766 m ²	0	766 m ²	3.6 acres	2005	98%	Increase (60 m ²)	
17c.2: Arrowhead Marsh East	Not treated 2024		0	3.6 acres	0	3.6 acres	19.9 acres	2006	78%	No change detected	
17d.1: Fan Marsh Shoreline	7/12	Airboat	0	16 m ²	0	16 m ²	237 m ²	2004	>99%	Increase (8 m ²)	
17d.2: Airport Channel Shoreline	7/12; 7/29	Backpack	0	15 m ²	0	15 m ²	185 m ²	2005	>99%	3%	
17d.3: East Creek	7/29-7/30	Backpack	0	50 m ²	0	50 m ²	320 m ²	2004	>99%	Increase (34 m ²)	
17d.4: Damon Marsh	7/25	Truck, Backpack	0	205 m ²	0	205 m ²	0.7 acres	2006	>99%	Increase (178 m ²)	
17d.5: Damon Slough / Elmhurst Creek	7/29	Backpack	0	5 m ²	0	5 m ²	157 m ²	2005	>99%	Increase (0.4 m ²)	
17e.1: San Leandro Creek North	7/29	Backpack	0	1 m ²	0	1 m ²	40 m ²	2005	>99%	Increase (1 m ²)	
17e.2: San Leandro Creek South	7/29	Backpack	0	9 m ²	0	9 m ²	193 m ²	2005	>99%	Increase (5 m ²)	
17f: Oakland Inner Harbor	7/1; 7/10; 12/5	Backpack	0	11 m ²	0	11 m ²	152 m ²	2007	>99%	Increase (8 m ²)	
17g: Coast Guard Island	7/1	Backpack	0	0.2 m ²	0	0.2 m ²	10 m ²	2007	>99%	Increase (0.2 m ²)	
17h: MLK New Marsh	Not treated 2024		0	2.9 acres	0	2.9 acres	22.2 acres	2006	61%	No change detected	
17i: Coliseum Channels	7/9; 9/20	Backpack	0	25 m ²	0	25 m ²	497 m ²	2005	>99%	Increase (8 m ²)	
17j.1: Fan Marsh Wings	7/12	Backpack	0	3 m ²	0	3 m ²	34 m ²	2005	>99%	Increase (0.2 m ²)	
17j.2: Fan Marsh Main	8/22-8/23; 9/6; 10/7	Truck, Backpack	0	286 m ²	0	286 m ²	2.2 acres	2006	99%	91%	
17k: Airport Channel	7/29	Backpack, Airboat	0	2 m ²	0	2 m ²	35 m ²	2005	>99%	Increase (2 m ²)	
17l: Doolittle Pond	7/12	Backpack	0	2 m ²	0	2 m ²	30 m ²	2004	>99%	Increase (1 m ²)	
17m: Alameda Island (Aeolian Yacht Club and East Shore)	10/8; 11/19	Backpack	0	24 m ²	0	24 m ²	749 m ²	2006	>99%	Increase (14 m ²)	
17n: Doolittle Drive Mitigation Marsh	Not treated 2024		0	0.3 m ²	0	0.3 m ²	15 m ²	2023	0% increase (0 m ²)	No change detected	
REGION 7 TOTAL			0	6.8 acres	0	6.8 acres	49.4 acres	2006	92%	9%	

Note: Treatment at Arrowhead Marsh East (17c.2) and MLK New Marsh (17h) is not expected until 2027. Inventory was conducted in 2023 by grid, and inventory data reported for 2024 reflect those of 2023.

Region 8: Bay Bridge North

Alameda and Contra Costa Counties

Local Partners: Alameda County Flood Control District, City of Richmond, California State Parks, East Bay Regional Park District, Chevron, Richmond Rod & Gun Club

Acres of *Spartina* habitat surveyed by ISP: 1,696

Net coverage of invasive *Spartina* in 2024: 0.03 acres

Percentage of bay-wide total infestation: 0.14%

The Bay Bridge North Region (Region 8) is composed of 13 sub-areas including all East Bay shoreline marshes north of the Bay Bridge and southwest of the Carquinez Strait. This region is typified by riprap shorelines and fragmented marshes with little to no room for habitat expansion due to urban development right down to their upland edge. The exceptions are intact historic Whittell Marsh (10a) and Giant Marsh (10c), and the large and partially brackish Wildcat Marsh (22a) and San Pablo Marsh (22b). The 2024 distribution and abundance of invasive *Spartina* within each sub- area are presented in **Figure 17** and **Table 13**. Treatment dates and methods are included in **Table 13**.

ISP surveyed all 13 sub-areas in 2023 and 12 sub-areas in 2024: Hofmann Marsh (22e) was not inventoried in 2024 due to lack of recent infestation and low invasion pressure. Portions of Wildcat Marsh (22a) and Richmond/Albany/Pinole Shoreline (22f) were not surveyed in either year due to low invasion pressure. All inventory was completed on foot, except for the shorelines and ponds adjacent to Wildcat Marsh, which were surveyed with airboat assistance for the first time in 2023 and again in 2024.

In 2024, a total of 0.03 acres of invasive cordgrass (all hybrid *S. alterniflora*) was found in Region 8, which represented 0.14% of the Estuary total. Four sub-areas in Region 8 contained greater than 10 m² of hybrid *S. alterniflora*: Emeryville Crescent West (06b), Wildcat Marsh (22a), San Pablo East (22b.1), and Breuner Marsh-Rheem Creek (22d), which collectively comprised 87% of the regional total. Wildcat Marsh was the only sub-area with greater than 20 m² (49 m²) and experienced a 38% reduction between 2023 and 2024 due to treatment. Much of the infestation at Wildcat Marsh is in a secluded cove (“Castro Cove”) adjacent to the Chevron Richmond Refinery, within a pocket marsh that was opened to tidal flow in 2012 when a construction coffer dam was removed. In the subsequent years of sediment accretion and marsh plant colonization, hybrid *S. alterniflora* patches established and have been verified by genetic sampling. These patches are at low tidal elevation and enter senescence early in the season, sometimes before ISP can access them and conduct effective treatment. This area was prioritized for early detection and treatment in 2023 and 2024 and will continue to be in future years.

Two sub-areas, Southern Marsh (10d) and Stege Marsh (22b) had detections of hybrid *S. alterniflora* where none had been found in 2023 (**Table 4**). Southern Marsh had a new occurrence totaling 0.8 m² that was genetically verified as hybrid *S. alterniflora* and subsequently treated. Stege Marsh had a recurrence in a historic footprint totaling 0.8 m² that was also genetically verified as hybrid *S. alterniflora* and subsequently treated.

Spartina densiflora was continuously present in this region since its discovery here in 2004 through 2014, during which time it was first treated with herbicide and then manually removed in later years from four sub-areas: Whittell Marsh (10a), Southern Marsh (10b), Giant Marsh (10c), and Richmond/Albany/Pinole Shoreline (22f). No *S. densiflora* had been detected in the region between 2014 and 2018, when a single plant was found and manually removed from Whittell Marsh. Consistent inventory monitoring for *S. densiflora* has been conducted for more than five years in Region 8 and none has been detected in this region since 2018. Monitoring efforts for *S. densiflora* will be reduced in 2025 but not yet discontinued.

Surveys for Ridgway's rails in the Bay Bridge North Region have been conducted by a coalition of survey organizations including ISP, PBCS, and EBRPD. Collectively, results from these surveys have shown a decrease in the number of rails detected. Ridgway's rail detections declined by 15% between 2022 and 2023 (from 54 rails in 2022 to 46 rails in 2023) and by 17% between 2023 and 2024 (from 46 rails in 2023 to 38 rails in 2024). Most of this region is highly urbanized, riprap shoreline or steep upland edge with few opportunities for tidal marsh habitat enhancement. The two largest marshes in this region, Wildcat Marsh (22a) and San Pablo Marsh (22b), have high quality habitat and extensive *S. foliosa* and *G. stricta* throughout (and little invasive *Spartina* treatment), however these marshes have had the greatest decline in rail detections. Stege and Meeker Marshes (22d) in Richmond continue to support one of the densest populations of Ridgway's rails in the Estuary, with 20 Ridgway's rails detected in 2023 and 21 Ridgway's rails detected in 2024.

Consequently, to date the ISP Restoration Program has not planned any habitat enhancements in this region, except to support the Giant Marsh Living Shorelines Project by conducting inventory and treatment of hybrid *S. alterniflora* in this region. The Living Shorelines Project tested plantings of cordgrass in areas where the marsh is substantially eroding due to wave energy, both in combination with artificial oyster reef elements and plantings alone.

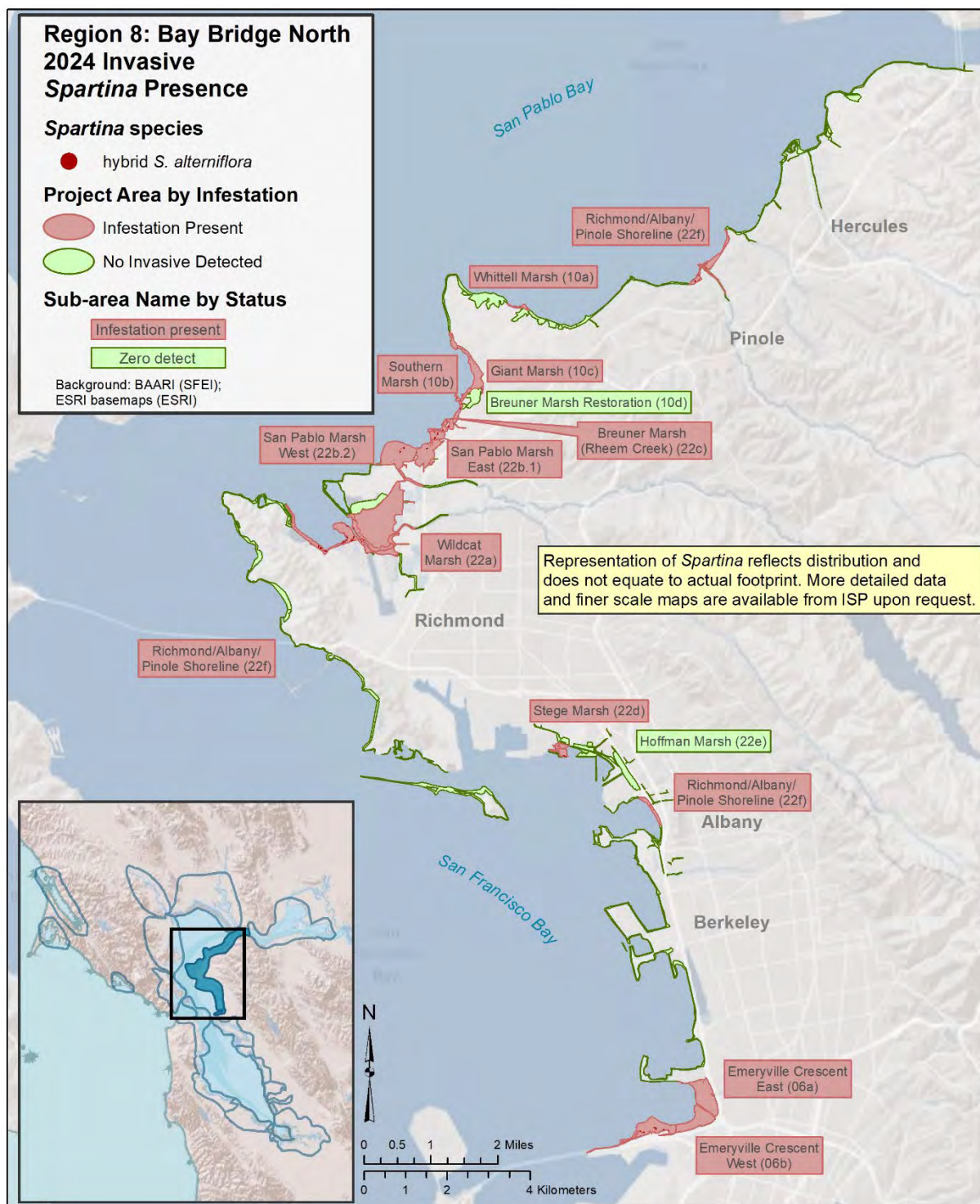


Figure 17. Distribution of invasive *Spartina* in 2024 across the 13 sub-areas of Reporting Region 8: Bay Bridge North. Sub-areas with current infestation are labeled in pink, while those with no detection of invasive *Spartina* are labeled in green.

Table 13. Summary of 2024 invasive *Spartina* mapped and treated by sub-area within Reporting Region 8: Bay Bridge North.

Split Sub-Area	2024 Treatment Dates	2024 Treatment Method	2024 Net <i>Spartina</i> Coverage By Species				All Invasive <i>Spartina</i> Cover				
			anglica	densiflora x foliosa	alterniflora x foliosa	densiflora	2024 Net Area	2024 Treatment Area	Peak Year	Net Area Decline	
										Since Peak	Since 2023
REGION 8: BAY BRIDGE NORTH											
06a: Emeryville Crescent East	8/15	Backpack	0	4 m ²	0	4 m ²	38 m ²	2005	>99%	Increase (3 m ²)	
06b: Emeryville Crescent West	8/15; 10/24	Backpack	0	16 m ²	0	16 m ²	354 m ²	2004	>99%	Increase (10 m ²)	
10a: Whittell Marsh	11/14	Backpack	0	0.03 m ²	0	0.03 m ²	2 m ²	2005	>99%	87%	
10b: Southern Marsh	11/14	Backpack	0	0.8 m ²	0	0.8 m ²	21 m ²	2010	>99%	n/a	
10c: Giant Marsh	11/14	Backpack	0	0.6 m ²	0	0.6 m ²	14 m ²	2005	>99%	Increase (0.05 m ²)	
10d: Breuner Marsh Restoration	2 years with no Invasive <i>Spartina</i> (2023-2024)		0	0	0	0	0	2016	100%	n/a	
22a: Wildcat Marsh	9/9; 9/20	Backpack, Airboat	0	49 m ²	0	49 m ²	0.3 acres	2010	96%	38%	
22b.1: San Pablo Marsh East	9/9; 9/30	Backpack, Airboat	0	10 m ²	0	10 m ²	255 m ²	2009	>99%	Increase (6 m ²)	
22b.2: San Pablo Marsh West	9/9; 9/17; 9/20; 11/5	Backpack, Airboat	0	8 m ²	0	8 m ²	125 m ²	2006	>99%	Increase (2 m ²)	
22c: Breuner Marsh (Rheem Creek)	9/30	Backpack	0	12 m ²	0	12 m ²	321 m ²	2009	>99%	Increase (0.2 m ²)	
22d: Stege Marsh	11/12	Backpack	0	0.8 m ²	0	0.8 m ²	39 m ²	2009	>99%	n/a	
22e: Hoffman Marsh	3 years with no Invasive <i>Spartina</i> (2022-2024)		0	0	0	0	0	2004	100%	n/a	
22f: Richmond / Albany / Pinole Shoreline	10/14; 10/24	Backpack	0	6 m ²	0	6 m ²	175 m ²	2004	>99%	41%	
REGION 8 TOTAL			0	107 m ²	0	107 m ²	0.6 acres	2009	>99%	9%	

Region 9: Suisun

Contra Costa and Solano Counties

Local Partners: California State Parks, Solano Resource Conservation District, Greenleaf Mitigation, Military Ocean Terminal at Concord

Acres of *Spartina* habitat surveyed by ISP: 5,709

Net coverage of invasive *Spartina* in 2024: 0.003 acres

Percentage of bay-wide total infestation: 0.01%

The Suisun Region (Region 9) is bounded on the west by the Carquinez Strait and extends east approximately to Antioch, where the salinity level transitions from brackish to freshwater within the San Joaquin-Sacramento Delta. The Suisun Region consists of six sub-areas including Southampton Marsh (11) in the Carquinez Strait and five others east of the Benicia Bridge in Suisun Bay. An infestation by hybrid *S. alterniflora* was discovered on Point Buckler in 2016, resulting in the extension of this Region to the east to incorporate most of Suisun Bay. High winds across the long fetch of this open bay generate substantial waves, frequently making boat operation very challenging in large portions of this region, and unsafe conditions often force ISP to postpone work. The 2024 distribution and abundance of invasive *Spartina* within each sub-area are presented in **Figure 18** and **Table 14**. Treatment dates and methods are included in **Table 14**.

In 2023, all five existing sub-areas in the Suisun Region were thoroughly inventoried, and in 2024 all were inventoried again in 2024 with the addition of the newly created Martinez (27e) sub-area. Southampton Marsh (11) was partially inventoried in 2024 by revisiting and simultaneously treating recent years' patches of hybrid *S. alterniflora*. Most marshes of Region 9 were inventoried by whaler with foot crew support when possible: Point Buckler (27a), MOTCO Islands (27b), Honker Bay (27c), and MOTCO Mainland (27d). The new Martinez sub-area (27e) primarily includes Pacheco Marsh, a young marsh that was restored to tidal action in 2021. In 2024, an outside contractor discovered an established hybrid *S. alterniflora* patch while conducting a site assessment. ISP biologists then conducted a thorough foot survey of Pacheco Marsh, but the much older and more extensive marshlands adjacent to Pacheco will need to be further inventoried in 2025.

The extensive side channels and back sloughs of MOTCO Islands and Honker Bay have never been fully inventoried due to difficult access, solid walls of tall brackish vegetation, and the sheer amount of ground to cover; each year new areas are explored and assessed, frequently resulting in new detections of isolated hybrid *S. alterniflora* patches. The long rocky shoreline of the Carquinez Strait provides minimal opportunity for *Spartina* establishment, and it is surveyed only every few years so that resources can be focused elsewhere where there is more invasion pressure. This stretch was partially surveyed by kayak in 2023, and the remainder was most recently surveyed by whaler in 2020 and/or 2022.

In 2024, ISP detected and treated a total of 11 m² of hybrid *S. alterniflora*, which accounted for 0.01% of the Estuary total and reflected an increase of 3 m² over 2023 amounts. This increase was driven almost entirely by the discovery of a new 4 m² clone along the MOTCO Mainland shoreline. All instances of invasive *Spartina* detected in the Suisun Region were treated in 2023 and 2024.

The Suisun Region's extensive brackish and freshwater marshes have a very low density of Ridgway's rails, and the nominal infestation by and treatment of invasive cordgrass is not anticipated to have any impact on rail populations. Very few organizations conduct rail surveys in this region and data are sparse, but OEI conducted surveys for the Military Ocean Terminal Concord (MOTCO) at several offshore islands (including portions of ISP sub-area 27b) in 2023 and 2024, and no Ridgway's rails were detected. As such, the ISP Restoration Program has not implemented habitat enhancements within this region.

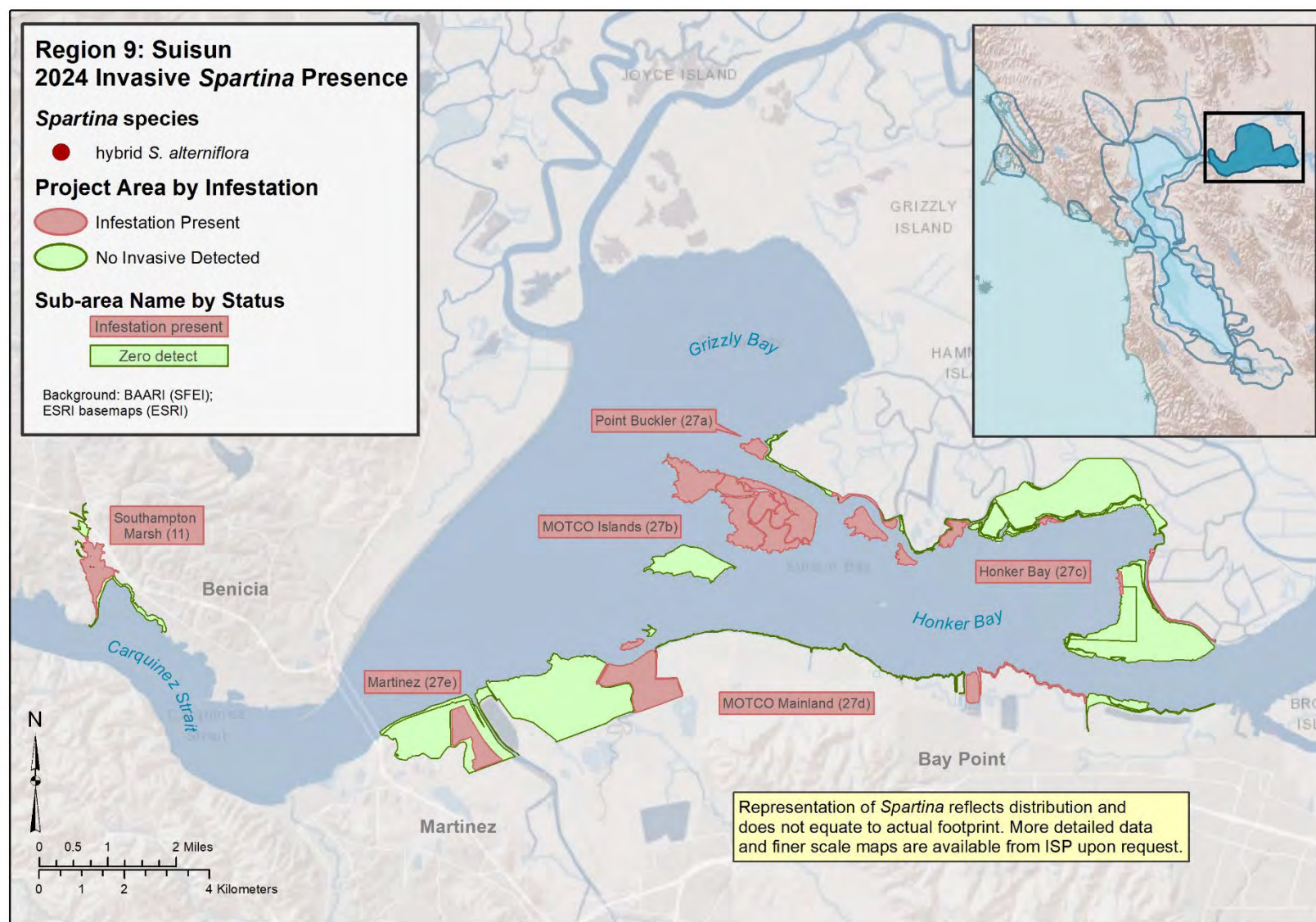


Figure 18. Distribution of invasive *Spartina* in 2024 in the six sub-areas of Reporting Region 9: Suisun. Sub-areas with current infestation are labeled in pink, while those with no detection of invasive *Spartina* are labeled in green.

Table 14. Summary of 2024 invasive *Spartina* mapped and treated by sub-area within Reporting Region 9: Suisun.

Split Sub-Area	2024 Treatment Dates	2024 Treatment Method	2024 Net <i>Spartina</i> Coverage By Species				All Invasive <i>Spartina</i> Cover				
			<i>anglica</i>	<i>densiflora</i> x <i>foliosa</i>	<i>alterniflora</i> x <i>foliosa</i>	<i>densiflora</i>	2024 Net Area	2024 Treatment Area	Peak Year	Net Area Decline	
										Since Peak	Since 2023
REGION 9: SUISUN											
11: Southampton Marsh	9/6	Backpack	0	1 m ²	0	1 m ²	37 m ²	2005	>99%	60%	
27a: Point Buckler	7/10	Backpack	0	0.008 m ²	0	0.008 m ²	0.7 m ²	2016	>99%	92%	
27b: MOTCO Islands	7/10; 7/11	Backpack	0	2 m ²	0	2 m ²	60 m ²	2017	>99%	Increase (1 m ²)	
27c: Honker Bay	6/11; 6/25; 7/11; 8/9	Backpack	0	2 m ²	0	2 m ²	85 m ²	2022	94%	55%	
27d: MOTCO Mainland	6/11; 7/10; 8/5; 11/4	Backpack	0	5 m ²	0	5 m ²	105 m ²	2020	69%	Increase (5 m ²)	
27e: Martinez	11/4	Backpack	0	0.5 m ²	0	0.5 m ²	14 m ²	2024	n/a	n/a	
REGION 9 TOTAL			0	11 m ²	0	11 m ²	302 m ²	2005	>99%	Increase (3 m ²)	

Region 10: Vallejo

Solano, Napa, and Sonoma Counties

Local Partners: San Pablo Bay National Wildlife Refuge, Solano Land Trust, Sonoma Land Trust, California Department of Food & Agriculture

Acres of *Spartina* habitat surveyed by ISP: 21,794

Net coverage of invasive *Spartina* in 2024: None detected

Percentage of bay-wide total infestation: 0

The Vallejo Region (Region 10) is comprised of four sub-areas and covers the northern portion of San Pablo Bay, bounded by the mouth of the Petaluma River to the west and the City of Vallejo to the east, and extending eight miles inland to the north. Due to the region's large size and limited invasion pressure over much of its extent, it is not surveyed entirely each year, and methods vary depending on resources. The 2024 distribution and abundance of invasive *Spartina* within each sub-area are presented in **Figure 19** and **Table 15**. Treatment dates and methods are included in **Table 15**.

In 2024, San Pablo Bay NWR/Mare Island (26b) and Sonoma Creek (26c) were partially surveyed by revisiting the historic infestation zones. White Slough/Napa River (26a) was partially surveyed by whaler in 2023 and not at all in 2024. Sonoma Baylands (26d) was inventoried in neither 2023 nor 2024 but was surveyed thoroughly by airboat in 2022. All sub-areas and portions of sub-areas that were skipped in either year experience very low invasion pressure and have no known or recent invasive *Spartina* presence.

No invasive *Spartina* was found in this entire region in 2024, the first time this milestone had been reached since inventory began in 2005. In 2024, several plants in the historic infestation zone were suspected to be hybrid *S. alterniflora* and were genetically sampled before being treated. Results from all plants came back as native *S. foliosa*, and this area will continue to be closely monitored over the next few years to ensure that the historic infestation does not return.

The San Pablo Bay NWR and Mare Island sub-area has also historically contained both *S. densiflora* and hybrid *S. densiflora*, though neither have been detected here since 2018. Consistent inventory monitoring continued through 2024 because *S. densiflora* seed can remain viable for an estimated five years. However, with six years of inventory conducted with no detections, efforts will be reduced in future years.

Annual rail surveys by PBCS and San Pablo Bay NWR showed an increase in the number of Ridgway's rails detected between 2022 and 2023 (from 63 rails to 79 rails) and a decline between 2023 to 2024 (from 79 rails to 58 rails). There is extensive *S. foliosa* throughout the Region that has quickly colonized and established in various tidal restoration projects, expanding the potential habitat. The ISP Restoration Program has planted *S. foliosa* on 59 constructed islands and other elevated features located within the Sears Point-Dickson Unit restoration project in the Sonoma Baylands (26d) sub-area of San Pablo Bay NWR. These interior features within the restoration site were planted to facilitate rapid vegetation establishment to help reduce erosion observed by project partners SFSU, San Francisco Bay NERR, SPBNWR, and Sonoma Land Trust. The ISP Restoration

Program has collected *S. foliosa* plant material from several of the fringe marsh areas along the Napa River for amplification in propagation beds at a nursery. Propagated *S. foliosa* from this region has been outplanted in four other Regions: Region 2: San Francisco Peninsula, Region 5: Union City, Region 6: Hayward, and Region 7: San Leandro Bay.

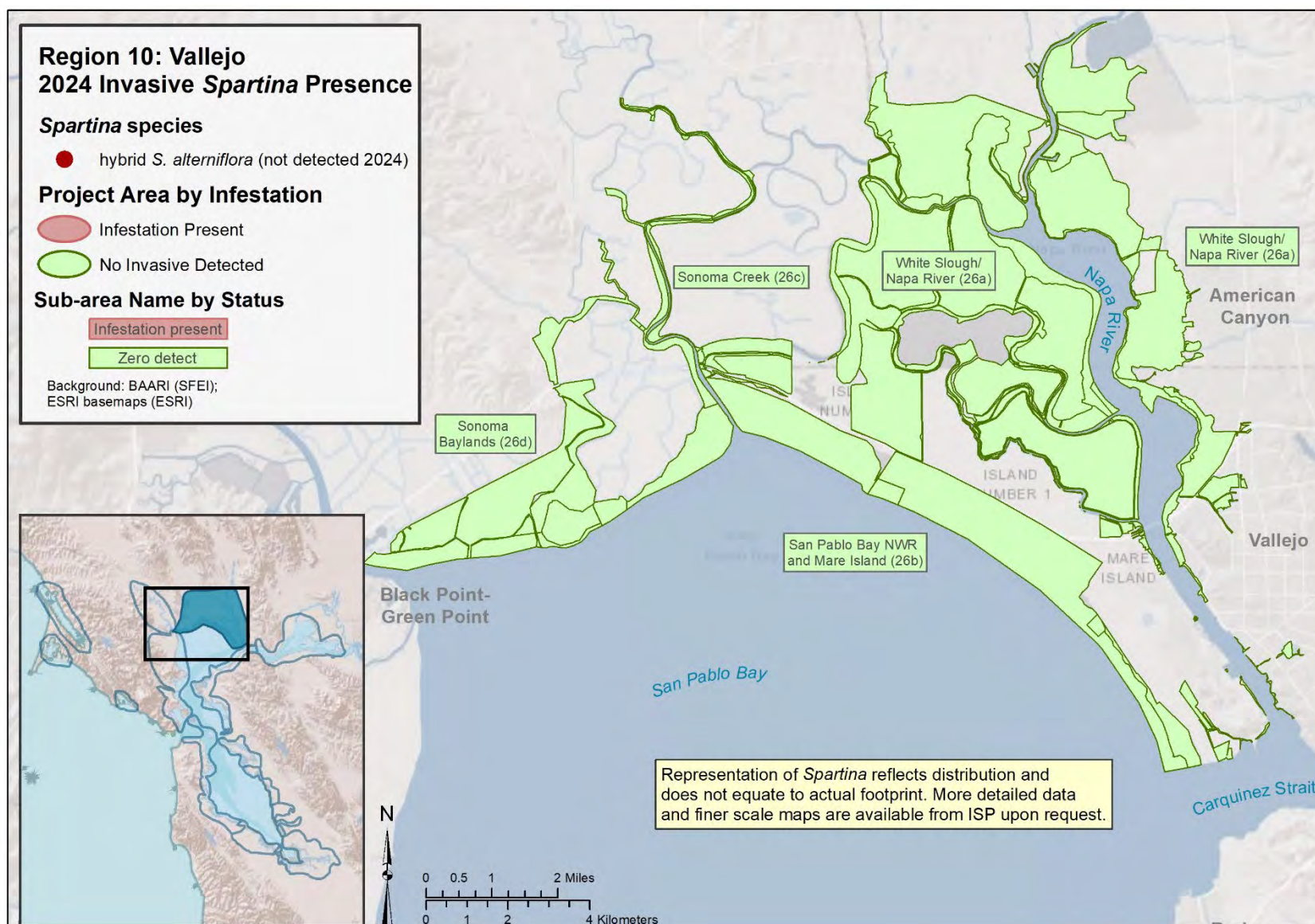


Figure 19. Distribution of invasive *Spartina* in 2024 across the four sub-areas of Reporting Region 10: Vallejo. Sub-areas with current infestation are labeled in pink, while those with no detection of invasive *Spartina* are labeled in green.

Table 15. Summary of 2024 invasive *Spartina* mapped and treated by sub-area within Reporting Region 10: Vallejo.

Split Sub-Area	2024 Treatment Dates	2024 Treatment Method	2024 Net <i>Spartina</i> Coverage By Species				All Invasive <i>Spartina</i> Cover				
			anglica	densiflora x foliosa	alterniflora x foliosa	densiflora	2024 Net Area	2024 Treatment Area	Peak Year	Net Area Decline	
										Since Peak	Since 2023
REGION 10: VALLEJO											
26a: White Slough / Napa River	14 years with no invasive <i>Spartina</i> (2011-2024)		0	0	0	0	0	2008	100%	n/a	
26b: San Pablo Bay NWR and Mare Island	No invasive <i>Spartina</i> 2024		0	0	0	0	0	2009	100%	100%	
26c: Sonoma Creek	No invasive <i>Spartina</i> 2024		0	0	0	0	0	2010	100%	100%	
26d: Sonoma Baylands	14 years with no invasive <i>Spartina</i> (2011-2024)		0	0	0	0	0	2008	100%	n/a	
REGION 10 TOTAL			0	0	0	0	0	2009	100%	100%	

Region 11: Petaluma

Marin and Sonoma Counties

Local Partners: California State Parks, California Department of Food and Agriculture, Sonoma Land Trust

Acres of *Spartina* habitat surveyed by ISP: 5,622

Net coverage of invasive *Spartina* in 2024: 0.003 acres

Percentage of bay-wide total infestation: 0.01%

The Petaluma Region (Region 11) is composed of four sub-areas and includes the wetlands lining the tidal portions of the Petaluma River and its tributaries in Marin and Sonoma Counties, from downtown Petaluma to the river's mouth in northwestern San Pablo Bay. The historic infestation of hybrid *S. alterniflora* in this region peaked in 2007 at 0.15 acres and has been fairly localized to the upper reaches of the Petaluma River. It is suspected that hybrid *S. alterniflora* was introduced here by propagules transported via uncleaned dredge or construction equipment, rather than natural tidal propagule distribution, due to the absence of any steppingstone infestations for the length of the lower Petaluma River to San Pablo Bay. The 2024 distribution and abundance of invasive *Spartina* within each sub-area are presented in **Figure 20** and **Table 16**. Treatment dates and methods are included in **Table 16**.

Two of this Region's sub-areas, Upper Petaluma-Upstream of Grey's Field (24a) and Petaluma Marsh (23c), were inventoried in both 2023 and 2024. Grey's Field (24b) and Lower Petaluma River-Below San Antonio Creek (24d) were inventoried in neither year due to lack of infestation, low invasion pressure, and both sub-areas being thoroughly inventoried in 2022. The primary infestation has been within Upper Petaluma-Upstream of Grey's Field, which was surveyed thoroughly on foot with whaler assistance in both years, as was Petaluma Marsh.

The 2024 inventory of this region yielded 11 m² of hybrid *S. alterniflora* and no other non-native cordgrass species. This represented an increase of 8 m² (300%) from 2023 levels, 80% of which was within 24a (Upper Petaluma River-Upstream of Grey's Field). No invasive *Spartina* of any species has ever been found in the lower portions of the Petaluma River or adjacent bay shoreline.

The remaining infestation in the Petaluma Region exists within the narrow shoreline of upstream Petaluma River, while most rails in the region are detected further downstream within Lower Petaluma River-Downstream of San Antonio Creek (24d). Surveys for Ridgway's rails within Region 11 are conducted by PBCS, which have shown an increase in Ridgway's rails detected in the Petaluma Region during surveys in 2023 (218 rails) and 2024 (255 Ridgway's rails).

No ISP habitat enhancements have been implemented in Region 11 because the northern reaches of the Petaluma River have abundant *S. foliosa* and *G. stricta* throughout the extensive tidal marsh habitat. ISP's Restoration Program has collected *S. foliosa* from Port Sonoma Marina at the mouth of the Petaluma River for amplification in nursery propagation beds. Native cordgrass collected from this region has been planted into five Reporting Regions: Region 2: San Francisco Peninsula, Region 5: Union City, Region 6: Hayward, Region 7: San Leandro Bay, and Region 10: Vallejo.

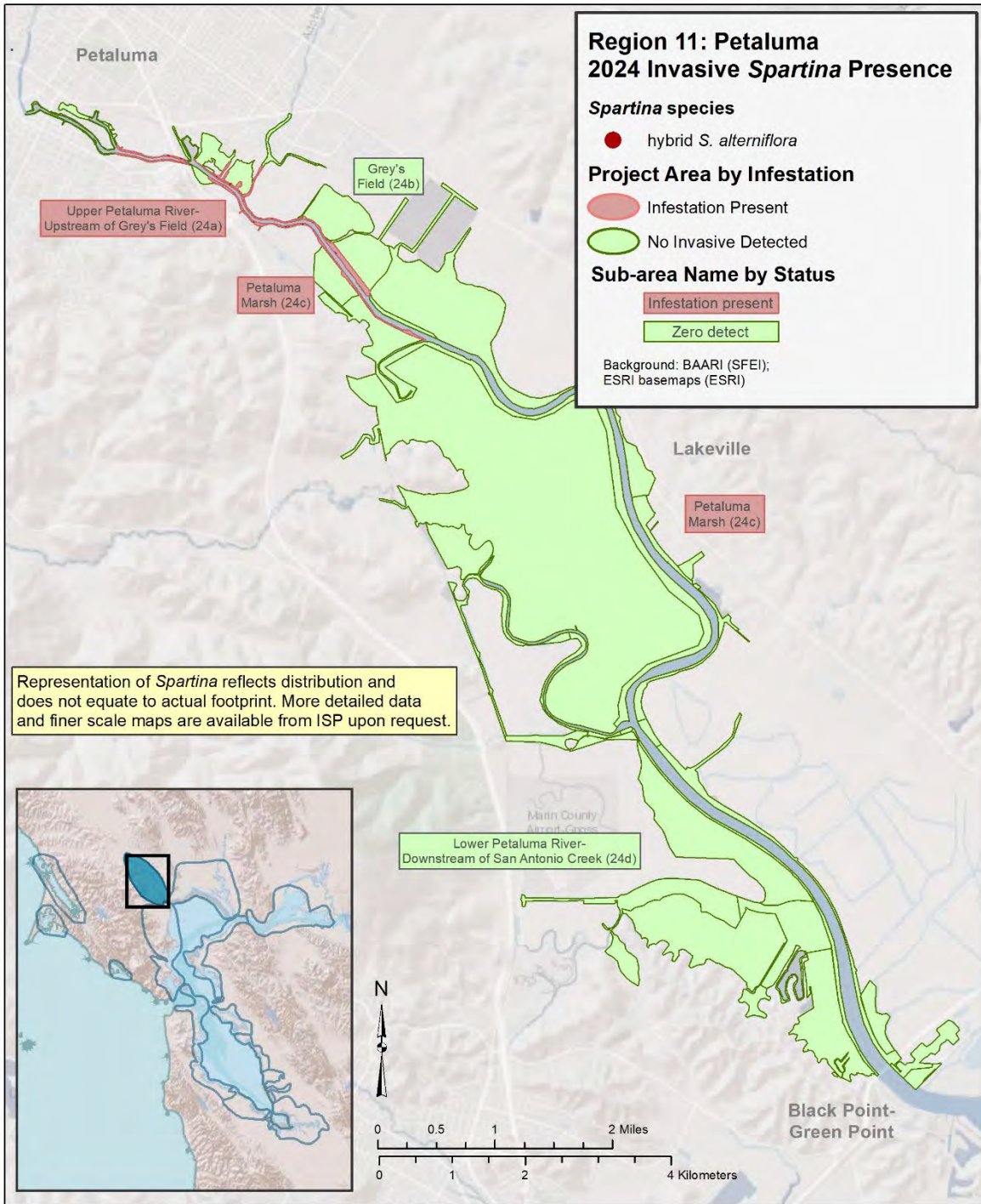


Figure 20. Distribution of invasive *Spartina* in 2024 across the four sub-areas of Reporting Region 11: Petaluma. Sub-areas with current infestation are labeled in pink, while those with no detection of invasive *Spartina* are labeled in green.

Table 16. Summary of 2024 invasive *Spartina* mapped and treated by sub-area within Reporting Region 11: Petaluma.

Split Sub-Area	2024 Treatment Dates	2024 Treatment Method	2024 Net <i>Spartina</i> Coverage By Species				All Invasive <i>Spartina</i> Cover				
			anglica	densiflora x foliosa	alterniflora x foliosa	densiflora	2024 Net Area	2024 Treat-ment Area	Peak Year	Net Area Decline	
										Since Peak	Since 2023
REGION 11: PETALUMA											
24a: Upper Petaluma River - Upstream of Grey's Field	9/23; 11/12	Backpack, Airboat	0	9.6 m ²	0	9.6 m ²	240 m ²	2007	98%	Increase (6.8 m ²)	
24b: Grey's Field	4 years with no invasive <i>Spartina</i> (2021-2024)		0	0	0	0	0	2024	n/a	n/a	
24c: Petaluma Marsh	9/23; 11/12	Backpack, Airboat	0	1.7 m ²	0	1.7 m ²	37 m ²	2010	94%	Increase (1.67 m ²)	
24d: Lower Petaluma River - Downstream of San Antonio Creek	No Invasive <i>Spartina</i> Ever Detected		0	0	0	0	0	n/a	n/a	n/a	
REGION 11 TOTAL			0	11.3 m ²	0	11 m ²	277 m ²	2007	98%	Increase (8.4 m ²)	

Region 12: Outer Coast

Marin County

Local Partners: National Park Service, Marin County Parks, Hog Island Oyster Company

Acres of *Spartina* habitat surveyed by ISP: 2,992

Net coverage of invasive *Spartina* in 2024: <0.00001 acres

Percentage of bay-wide total infestation: <0.00005%

The Outer Coast Region (Region 12) includes the geographically isolated tidal portions of watersheds on the western side of Marin County. This region is composed of remote coastal estuaries and bays, most within Point Reyes National Seashore, several of which were colonized by hybrid *S. alterniflora* in the early 2000s. The 2024 distribution and abundance of invasive *Spartina* within each sub-area are presented in **Figure 21** and **Table 17**. Treatment dates and methods are included in **Table 17**.

In 2024, Bolinas Lagoon North (25d) and Bolinas Lagoon South (25e) were thoroughly inventoried on foot, and Bolinas Lagoon North was also partially inventoried in 2023. Tom's Point/Tomales (25a) was partially inventoried in zones of historic *S. densiflora* infestation in both years. Limantour Estero (25d) and Drakes Estero (25c) were inventoried in neither year; they were thoroughly inventoried in 2021 by kayak and have no infestation and very low invasion pressure.

Spartina densiflora is the only species of invasive *Spartina* that remains in the Outer Coast Region and it is limited to two small, fragmented marshes, Tom's Point Marsh and Hog Island Oyster Company, within the Tom's Point/Tomales sub-area. Hybrid *S. alterniflora* was present in Bolinas Lagoon North until 2018 but has not been detected since. No invasive *Spartina* has been found in Limantour Estero and Drakes Estero for more than a decade.

Spartina densiflora persisted at Tom's Point Marsh in 2024 with a single seedling totaling 0.03 m², which was subsequently removed manually. None was found at Hog Island Oyster Company, which most recently had two small plants in 2022, both of which were manually removed at the time of detection. With virtually no re-invasion potential since these sites are far removed from other infestations, it is simply a matter of time until the *S. densiflora* seed bank has been exhausted and local eradication achieved.

Ridgway's rails do not occur in the region, as their observed geographic range is limited to the tidal marshes of the San Francisco Estuary, except for occasional fall and winter observations along the Outer Coast. No ISP habitat enhancements have been implemented in this region to date.

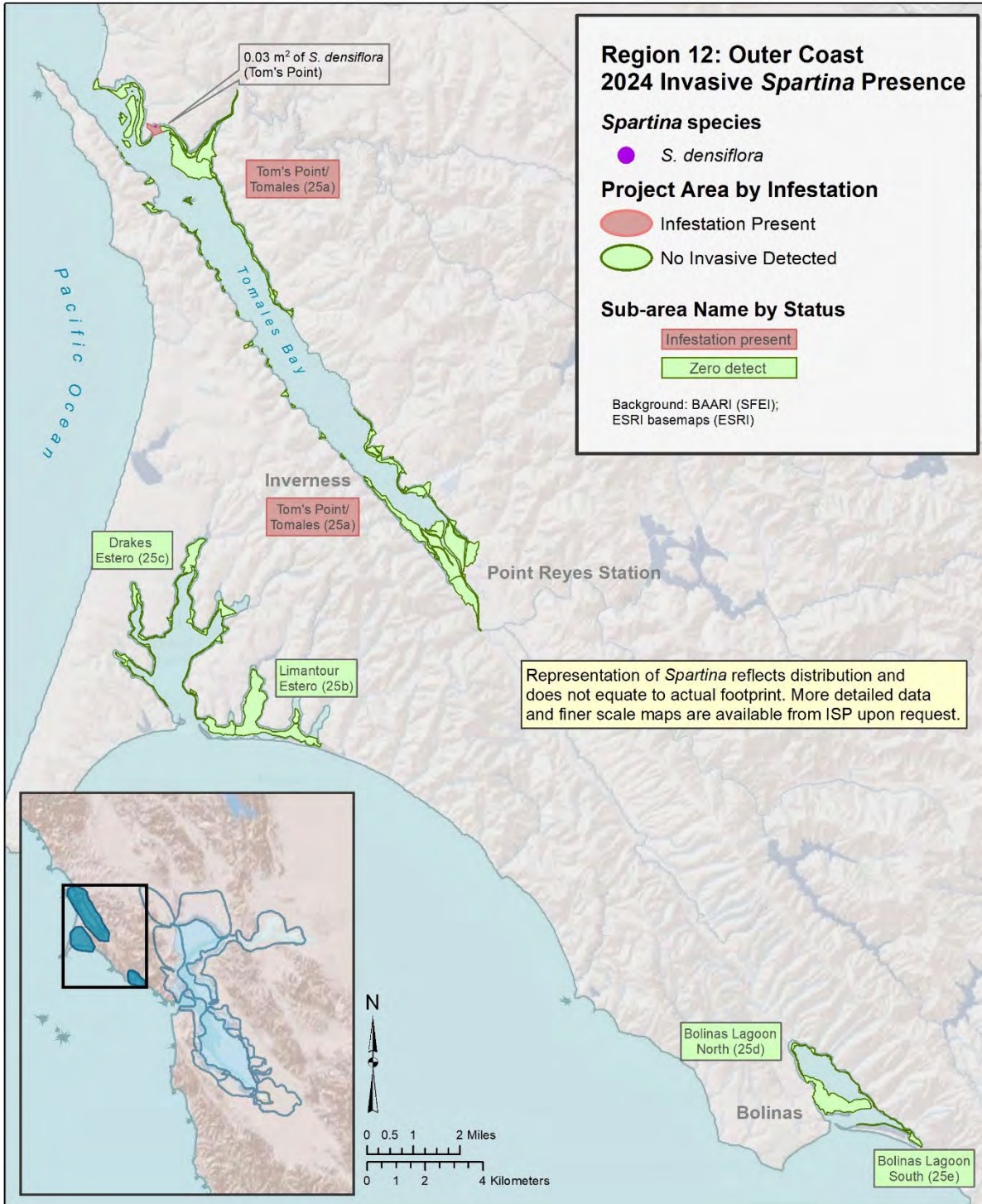


Figure 21. Distribution of invasive *Spartina* in 2024 across the five sub-areas of Reporting Region 12: Outer Coast. Sub-areas with current infestation are labeled in pink, while those with no detection of invasive *Spartina* are labeled in green.

Table 17. Summary of 2024 invasive *Spartina* mapped and treated by sub-area within Reporting Region 12: Outer Coast.

Split Sub-Area	2024 Treatment Dates	2024 Treatment Method	2024 Net <i>Spartina</i> Coverage By Species				All Invasive <i>Spartina</i> Cover				
			anglica	densiflora x foliosa	alterniflora x foliosa	densiflora	2024 Net Area	2024 Treatment Area	Peak Year	Net Area Decline	
										Since Peak	Since 2023
REGION 12: OUTER COAST											
25a: Tom's Point, Tomales	6/11	Dug	0	0	0.03 m ²	0.03 m ²	0.03 m ²	2010	>99%	Increase (0.03 m ²)	
25b: Limantour Estero	13 years with no invasive <i>Spartina</i> (2012-2024)		0	0	0	0	0	2010	100%	n/a	
25c: Drakes Estero	12 years with no invasive <i>Spartina</i> (2013-2024)		0	0	0	0	0	2007	100%	n/a	
25d: Bolinas Lagoon, North	6 years with no invasive <i>Spartina</i> (2019-2024)		0	0	0	0	0	2012	100%	n/a	
25e: Bolinas Lagoon, South	12 years with no invasive <i>Spartina</i> (2013-2024)		0	0	0	0	0	2004	100%	n/a	
REGION 12 TOTAL			0	0	0.03 m ²	0.03 m ²	0.03 m ²	2007	>99%	Increase (0.03 m ²)	

3. SPECIAL TOPICS

3.1 Phase 2 Implementation for Resuming Treatment at Previously Restricted Sites

The ISP's 2023-2033 Biological Opinion from USFWS encompassed the Phase 2 Site-Specific Plans for Resuming Treatment at Restricted Sites ("Phase 2 Plan"). The Phase 2 Plan was built on the strategies and approaches encapsulated in the Phase 1 Plan that was approved by USFWS in the ISP's 2018-2022 Biological Opinion and subsequently implemented by the ISP partners. The Phase 2 Plan outlines the first steps for resuming treatment of hybrid *Spartina alterniflora* at the final six (6) sub-areas where treatment had been restricted since 2011. From 2018-2022, Phase 1 resumed full treatment at nine ISP sub-areas [B2 North East (2c.1b), Damon Marsh (17d.4), Fan Marsh Wings (17j.1), Citation Marsh Upper (20d.2a), Bunker Marsh (20g), San Lorenzo Creek & Mouth North (20h.1), Cogswell Marsh B Bayfront (20n.1), Cogswell Marsh B South (20n.2), and Cogswell Marsh C (20o)], while Cogswell Marsh B Main (20n.3) received aerial seed suppression treatment until full treatment could be initiated during Phase 2 (**Figure 22**).

The Phase 2 treatment approaches followed Site-specific Integrated Vegetation Management (IVM) plans utilized by ISP partners at Phase 1 sites since 2018 to eliminate some of the last remaining monocultures of hybrid *S. alterniflora* within the Estuary, while minimizing negative impacts to Ridgway's rail and other wildlife. Over the 2023-2024 ISP Treatment Seasons, Phase 2 resumed full treatment at three sub-areas: Fan Marsh Main (17j.2), Citation Marsh Central (20d.2b), and Cogswell Marsh B Main (20n.3). Cogswell B Main (**Figure 23**) was a part of Phase 1 where aerial seed suppression (sub-lethal treatment) was allowed, which kept the hybrid *S. alterniflora* from overwhelming all the available tidal habitat at that site. Fan Marsh Main and Citation Marsh Central had not received any *Spartina* treatment since 2010, aside from treatment of three-meter buffers around restoration enhancements that had been installed by the ISP (*Grindelia stricta* plantings or constructed high tide refuge islands). The treatment hiatus of more than a decade at Fan Marsh Main (**Figure 24**) and Citation Marsh Central resulted in expansion of hybrid *S. alterniflora* into monocultures that dominated most of the available tidal habitat, both of which were larger than the initial infestation present when the ISP began treatment in 2005.



Figure 22. Distribution map of ISP Sub-areas in Phase 1 and Phase 2 of resuming treatment plan after restrictions were put in place in 2011.

After the first year of Phase 2 implementation in 2023, ISP inventory mapping in 2024 revealed hybrid *S. alterniflora* reductions that surpassed expectations: the infestation dropped by 85% at Citation Marsh Central (20d.2b), 94% at Cogswell Marsh B Main (20n.3), and 91% at Fan Marsh Main (17j.2). A portion of western Citation Central remained untreated until 2024 due to wet conditions and undriveable levee roads, so the 85% site-wide reduction reported above was likely above 90% across the majority of the marsh where treatment had been initiated in 2023. All three of these sites were fully treated during the optimal growing season in 2024, hopefully leading to further substantial reductions in hybrid *S. alterniflora* cover.



Figure 23. Treatment of hybrid *S. alterniflora* on the mudflat at the Phase 1 site Cogswell B Bayfront (20n.2). Phase 2 treatment began at the adjacent Cogswell B Main (20n.3) in 2023, which will greatly reduce the invasion pressure on this mudflat from the annual flood of hybrid seed dispersed by its neighbor.

The ISP continued to see good progress at Phase 1 sites throughout 2023-2024 as well. Annual treatment at *most* Phase 1 sites required relatively minimal resources due to the

reductions of >95% that had been achieved at all but two of these sites. The three Phase 1 sites within Cogswell Marsh had all been reduced by 99% from 2018 levels; Cogswell B South went from 0.6 acres (6.6 acres treatment area) down to just 7.7 m² (123 m² treatment area) scattered across the site, such a small amount it could be treated by a single backpack. And despite an average hybrid *Spartina* reduction of 98.6% across these Cogswell Marshes, they still harbored numerous Ridgway's rail as of 2025, even after allowing for the lag effect of several years before native plant cover and rail populations reach their new equilibrium.

Treatment of Citation Marsh Upper (20d.2a) required relatively substantial resources due to the higher rainfall generating heavy 2023 seed production (and subsequent 2024 recruitment) from the contiguous Phase 2 site Citation Marsh Central (20d.2b), where treatment had only just begun in 2023 for the first time since 2011. In addition, the most complex Phase 1 site, Bair Island's B2 Northeast (02c.1b), required very substantial treatment resources despite experiencing substantial reductions in hybrid *S. alterniflora* cover from earlier and more thorough 2023 treatment coverage of the site. B2 Northeast is the largest and most complex marsh on the Phase 1 list and is in a remote location on Bair Island Ecological Reserve. Its complexity derives from an extensive natural channel network, native *S. foliosa*, and other high-quality habitat features. After three seasons of helicopter broadcast treatment at B2 Northeast, the ISP pivoted to ground-based treatment by airboat and backpack in 2022. By 2024, these intensive efforts had finally yielded reductions similar to the smaller and less complex Phase 1 sites.

Defining "Area"*

The ISP uses the terms "net area" and "treatment area" to define the extent of non-native *Spartina*.

Net area refers to the size of the infestation if the space between stems were subtracted from the overall footprint of the plant or clump of plants. Net area is the metric typically used in botanical surveys.

Treatment area describes the area that will be directly affected by treatment. Treatment area is a separate measurement used for planning, and it is generally five to ten times greater than the net area of a given instance of invasive *Spartina*.

Reports in this Special Topics section sometimes use the concept of treatment area to better relay issues encountered while planning and implementing treatment.

*This definition box, first shown on page 3, is reproduced here for convenience in understanding terms.

The average reduction in hybrid *S. alterniflora* across all Phase 1 sites reached 90.4% by the time of 2024 inventory and before subsequent treatment that season, totaling 9.3 acres (137.2 acres treatment area) of hybrid *Spartina* and its propagules removed from the Estuary over the course of seven treatment seasons. Including Phase 2 sites, which had only received a single year of treatment by the time of 2024 mapping, the average reduction across all Phase 1 & 2 sites was 89%. **Table 18** summarizes the infestation status and removal progress at each Phase 1 & 2 site where treatment has been initiated as of 2024 and lists the marsh restoration enhancements installed to benefit Ridgway's rail and ease the transition to a native marsh plant assemblage.



Figure 24. Initiating full treatment at Fan Marsh in 2023. In the absence of treatment during the 12-year hiatus, the infestation of hybrid *S. alterniflora* rebounded to pre-ISP levels, completely engulfing the all available tidal marsh habitat at this site.

The phased plans also include installation of marsh enhancements within and near the Phase 1 & 2 sites to restore important Ridgway's rail habitat features that were extirpated by the hybrid *Spartina* invasion and subsequent treatment. These enhancements have most often included planting *Grindelia stricta* along channel banks and higher tidal elevations of the marsh and *S. foliosa* in the lower tidal elevations. Stands of *Grindelia* provide vertical structure and high tide refugia for Ridgway's rail, salt marsh harvest mice, and other wildlife; native *S. foliosa* provides cover while rails are foraging through channels. During Phase 1 implementation, the ISP also began planting the upland transition zones (UTZs) adjacent to the treated areas in Cogswell Marsh and Roberts Landing. In Cogswell, these planting areas

are on upland islands surrounded by the tidal marsh where treatment has been conducted, while at Roberts Landing (both Citation and Bunker Marshes) UTZ enhancements have been at the upland perimeter of the sites. The ISP's 2023-2024 suite of UTZ plant species relies heavily on rhizomatous perennials that can form dense cover quickly and resist being overwhelmed by invasive weeds still present in the adjacent upland and surrounding landscape. These include *Ambrosia psilostachya*, *Baccharis glutinosa*, *Baccharis pilularis*, *Elymus triticoides*, and *Euthamia occidentalis*.

Unfortunately, most of the San Leandro Bay marshes are not good candidates for ISP's standard marsh enhancements. Their low tidal elevations and limited channel development will not allow for substantial *Grindelia stricta* planting, and the highly fragmented urbanized landscape does not contain significant upland transition zone adjacent to the marsh. Damon Marsh had some channel bank and marsh scarp opportunities where the ISP has recently installed *Grindelia stricta*. The ISP does not expect to plant native *S. foliosa* in San Leandro Bay until the hybrid *S. alterniflora* infestation is reduced to a level that re-hybridization events would be minimal.

In 2025, ISP Phase 2 implementation is scheduled to resume treatment at North Marsh (20f), the last of the previously restricted sites in the Roberts Landing marsh complex. This will be one of the largest ground-based undertakings of ISP's Treatment Program. Resuming treatment at North Marsh will reduce the heavy propagule pressure that this sub-area has imposed annually on proximal tidal marshes, mudflats, and shoreline where successful treatment has already been implemented. North Marsh contains a hybrid *S. alterniflora* monoculture of 6.9 acres and a treatment area of approximately 60 acres, many times larger than when treatment was restricted in 2011, which will require a substantial investment of labor and equipment mobilization to reinitiate treatment in 2025.

The 2023-2033 Biological Opinion also permitted the ISP to resume treatment in 2027 at the final two sub-areas that were restricted from treatment in 2011, (Arrowhead Marsh East [17c.2] and MLK New Marsh [17h]), pending annual evaluations of California Ridgway's rail population numbers and associated feedback loops.

Table 18. ISP activities at the Phase Sites from 2018 to 2024.

Sub-Area Code	Sub-Area Name	Estimated Potential Invasive and Native <i>Spartina</i> Habitat Within Sub-Area	Hybrid <i>Spartina alterniflora</i> Net Area (ac)			Initiation of Phase I or II Full Treatment	Restoration Enhancement Activities Site
			2018	2024	% reduction 2018-2024		
02c.1b	Bair Island B2 North East	134 acres	2.50	0.87	65%	2018	- Installed three artificial floating islands in 2012 and removed in fall 2013 (USGS). - Constructed eight high tide refuge islands planted with <i>Grindelia stricta</i>, one in winter 2011-12, two in winter 2012-13, and five in winter 2020-21. - Installed over 1,800 <i>Grindelia stricta</i> on channel edges.
17d.4	Damon Marsh	12 acres	0.65	0.05	92%	2018	- <i>Grindelia stricta</i>, <i>Baccharis</i> spp., and other upland transition zone species installed along edge of marsh (Save the Bay) in 2011 and 2012. - Installed over 1,200 <i>Grindelia stricta</i> along channel edges to date.
17j.1	Fan Marsh Wings	11.6 acres	0.06	0.001	98.6%	2018	- No opportunity for enhancements at this fragmented pocket marsh surrounded by urban hardscape.
17j.2	Fan Marsh Main*	10 acres	1.13	0.07	94%	2023	N/A
20d.2a	Citation Marsh Upper	33 acres	3.71	0.08	97.7%	2020	- Installed over 4,600 <i>Grindelia stricta</i> along channels and over 6,100 marsh-upland transition zone plants to date.
20d.2b	Citation Marsh Central*	37 acres	2.35	0.63	73%	2023	
20g	Bunker Marsh	34 acres	1.51	0.002	99.9%	2019	- Installed over 2,000 <i>Grindelia stricta</i> along channels/berm edges and over 2,700 marsh-upland transition zone plants to date. - Installed two high tide refuge islands planted with <i>Grindelia stricta</i> and <i>Distichlis spicata</i> in winter 2013-14. - Installed two high tide refuge islands planted with <i>Grindelia stricta</i> in winter 2013-14.
20h.1	San Lorenzo Creek & Mouth North	6.7 acres	0.01	0.0002	97.6%	2018	- Installed 400 <i>Grindelia stricta</i> and <i>Distichlis spicata</i> along channel in winter 2012-13
20n.1	Cogswell Marsh B Bayfront	16.8 acres	0.54	0.02	96.7%	2019	- Installed over 11,200 <i>Grindelia stricta</i>, <i>Triglochin maritima</i>, and <i>Distichlis spicata</i> along channels and island edges and over 4,200 marsh-upland transition zone plants to date - Installed three artificial floating islands and constructed a total of six high tide refuge islands planted with <i>Grindelia stricta</i> and <i>Distichlis spicata</i> in winters 2013-14 (3) and 2020-21 (3) - Predator control actions
20n.2	Cogswell Marsh B South	34 acres	0.60	0.002	99.7%	2018	
20n.3	Cogswell Marsh B Main*	55 acres	3.06	0.04	98.5%	2023	
20o	Cogswell Marsh C	52 acres	0.80	0.01	99.1%	2018	- Installed over 15,000 <i>Grindelia stricta</i>, <i>Triglochin maritima</i>, <i>Distichlis spicata</i> and marsh-upland transition zone plants - Three high tide refuge islands planted with <i>Grindelia stricta</i> were constructed in winter 2013-14 & two in winter 2020-21 - Predator control actions

* asterisk by site name denotes Phase 2

3.2 Influence of Rainfall Levels on *Spartina* Management

ISP planning for the 2023 season considered climatic fluctuations of above average rainfall through winter and spring following the cumulative effects of years of extreme drought that were discussed in previous ISP Monitoring and Treatment Reports (Rohmer & Kerr 2019, Rohmer & Kerr 2023). The impacts of drought on *Spartina*, both native and invasive, were first seen in 2016-2017 after banner rainfall counteracted years of drought, and when ISP biologists detected the first ever increase in hybrid *S. alterniflora* since bay-wide treatment began in 2005. After 2017, rainfall declined, leading again to multiple years of increasingly severe drought until the winter of 2022 through spring of 2023. Inventory in 2023 documented an increase in estuary-wide infestation for only the second time in ISP history since full treatment began in 2005 (albeit at much lower levels than in 2017), which appears strongly correlated with the multi-year dry and wet climatic cycles experienced in the Bay Area at the same time.

The harsh, saline conditions of the tidal marsh require special adaptations for plants to survive and thrive. Brackish rhizomatous monocots like bulrush (*Bolboschoenus*, *Schoenoplectus*) flourish with increased freshwater input from rainfall, as does the more saline *Spartina* (both native and invasive alike). Under the stress of drought years, bulrush tends to retreat to its perennial root structures underground and only produce aboveground biomass once substantial freshwater flushing from rainfall returns. In exceptionally wet years following periods of extreme drought (e.g. 2017 and 2023), bulrushes can rebound vigorously and produce tall, dense stands even in areas where they produced little to no aboveground biomass during the drought cycle. These dense bulrushes are physically (and mentally) challenging for biologists to move through and make it nearly impossible to detect all the invasive cordgrass potentially hidden within the stands. For this reason, ISP managers deprioritized inventory within extensive bulrush stands in 2023 out of concern for biologists' health and safety; those areas were then re-prioritized for inventory in 2024.

Rhizomes of salt marsh plants like native *S. foliosa* and the invasive hybrid *S. alterniflora* may lay dormant for years as well, and ISP inventory data appears to indicate this mechanism being used by hybrid *Spartina* to withstand drought stress in the intertidal zone. At numerous marshes in 2017, ISP biologists mapped hybrid *S. alterniflora* of substantial size that had not been detected since 2015 (or even 2014 in some cases) but within the same footprint. Undetected/untreated hybrids scattered throughout the native *S. foliosa* matrix appeared to have festered over the course of the drought years, likely dispersing seeds which then contributed to the big recruitment event observed after the record rainfall of 2017. These hybrids likely pollen-swamped adjacent native stands, generating hybrid seed that may take several seasons to mature into a clone detectable by an ISP biologist during inventory.

Drought stress may also have manifested as stunted hybrid *S. alterniflora* plants with smaller traits (e.g. height, leaf width, leaf length, inflorescence length, etc.) that thwarted detection by biologists, since hybrid *S. alterniflora* morphologies are normally expected to be larger in

various ways, potentially causing misidentification of the compromised plants as *S. foliosa*. This idea of *Spartina* dormancy led ISP biologists in 2023 to refer to a longer history (i.e. displaying more years of inventory data on their GPS tablets) when surveying a previously infested site to ensure focused inventory around historic and possibly re-emerged patches.

Another impact that a wet winter/spring can have on *Spartina* growth is the length and timing of the growing season. As observed in both 2017 and 2023, drought-stressed plants that experienced relief from heavy rainfall seemed to jumpstart their growing season earlier than in the previous drought years, as if in a race to produce viable seed before the water disappears again. This effectively truncated the ISP's treatment season for those years since the ISP's Biological Opinion dictates that treatment cannot begin until after August 12 in most complex marshes out of concern for breeding Ridgway's rails, yet many of the plants completed their growing season and began senescing earlier in the wet years. Once hybrid *S. alterniflora* has entered early senescence, it will no longer translocate the imazapyr herbicide down to the rhizomes, which renders herbicidal application ineffective. As a result, the ISP tried in 2023 to prioritize earlier treatment in areas where early senescence had been observed in 2017, but there are already many limitations on the Treatment Program already so that adjustment was accomplished with varying success.

However, early senescence was observed to be highly variable within and across marshes, so it was difficult to predict which sub-areas or portions of them would begin to die back first, knowledge that could have allowed for better prioritization of treatment at certain sub-areas ahead of others. Instead of reducing or eliminating those early-senescent plants through treatment, it is likely that they increased the footprint of their rhizomes, the density of the clones, and amount of viable seed produced, much of which that could expand the infestation at that site or disperse on the tides to another location. There's also only so much adjustment that can be made to manage *portions* of marshes differently than an overall site; with limited budgets and expensive airboat access to remote sites, we often can only afford to visit a given area once for treatment each season.

On the other hand, the heavy rains may have benefitted the inventory effort by supporting early establishment and rapid growth of hybrid *S. alterniflora* seedlings (and possibly dormant rhizomes), such that the plants within the *S. foliosa* matrix were more readily apparent during inventory and in perfect condition for effective treatment with herbicide. Treatment of actively growing plants from the hybrid "bounce" resulted in big reductions in the infestations in 2018 and 2024. It is important to note that these high-quality habitat marshes have abundant native *S. foliosa* that continued to provide the ecosystem functions and values (including those for Ridgway's rail), since only a very small percentage of the overall cordgrass at these sites was treated.

California's climate seems to be increasingly polarizing with droughts getting drier and longer and wet seasons being more punctuated and wetter. As the ISP moves forward with inventory and treatment of hybrid *S. alterniflora*, biologists must continue to consider the climatic

conditions of the season to inform field practices. Similarly, restoration practitioners and land managers should also consider the “bounce” potential for hybrid *S. alterniflora* presence in response to wet winters and springs following years of drought.

3.3 Large Scale Restoration and the South Bay Salt Pond Restoration Project

Tidal marsh restoration in the San Francisco Estuary has proceeded at a rapid pace over the past 20 years, trying to recover some portion of the extensive tidal marsh habitat lost to human development over two centuries. The South Bay Salt Pond Restoration Project (SBSRP; www.southbayrestoration.org) restored greater than 3,300 acres of tidal marsh since it was initiated in 2003, and there are plans to restore 4,000-10,000 more acres in the coming decades (USFWS/CDFG 2017). The San Francisco Bay Joint Venture (SFBJV; <https://sfbayjv.org>) restored greater than 11,000 acres of tidal marsh between 2001 and 2022 and has a goal to restore an additional 76,000 acres of tidal marsh and mudflat (SFBJV 2022). ISP's work plays a key role in the ultimate success of landscape-scale restoration by protecting these vulnerable sites from hybrid *S. alterniflora* invasion and allowing them time to develop a resilient native plant assemblage that provides high-quality wildlife habitat and ecosystem functions.

Tidal marsh restoration near hybrid *S. alterniflora* infestations has added thousands of acres to the ISP's Project Area. *Spartina foliosa* is a foundational species and is typically the first native species to colonize a restoration site once it has been breached and sediment has accreted to suitable levels to support cordgrass. However, hybrid *S. alterniflora* can establish at lower elevations than *S. foliosa*, can produce a greater quantity of seed, and frequently colonizes young restoration sites first when they are near existing infestations. Thus, hybrid *S. alterniflora* is often easy to detect when a newly breached tidal site is first developing vegetation. However, as other vegetation fills in, it becomes more difficult to detect nascent patches of invasive *Spartina* growing amongst extensive stands of the native. To further complicate matters, a hybrid *S. alterniflora* plant may take multiple growing seasons to display morphological traits that are distinct from *S. foliosa*, especially if it is the product of backcrossing with the native species.

In the experience of the ISP in recent years, there are three general phases of vegetation development as it relates to the work of managing hybrid *S. alterniflora*:

1. Initially, there is a scattered colonization by *Spartina* and/or pickleweed across the site. The high visibility of the colonizing plants allows for relatively thorough detection. Typically, a survey requires airboat access but a low number of experienced biologists.
2. After the initial stage, vegetation becomes more widespread, but a large amount of open space remains between established patches. The density of the vegetation begins to obscure visibility and can hinder detection of hybrid *S. alterniflora*, and airboats can no longer reach all areas. Walking surveys become necessary for thorough detection in portions of the marsh. The time and level of effort required to adequately monitor developing restoration sites for hybrid *S. alterniflora* increases substantially as the marsh progresses through the first and second phases.

3. In the later stage, the restoration matures into continuous vegetation across most of the site as individual established patches merge and new colonizers continue to arrive. *Spartina* in various stages of growth across the site presents major detection challenges, and instances of cryptic hybrid *S. alterniflora* may proliferate undetected for several seasons. Hybrid *S. alterniflora* may pollen swamp surrounding native cordgrass and greatly increase the amount of hybrid propagules. Although walking surveys are necessary to conduct thorough inventory, navigation on foot is not feasible across the entire site (especially at high tide) due to channel complexity and remaining stretches of soft substrate, and only an airboat can reach the edges of the marsh on a low or moderate tide. The requisite survey effort ramps up even more once the marsh reaches later phases of maturation.

By the second stage of maturation, airboats can facilitate faster surveys and utilize fewer biologists than standard inventory, but this approach provides a lower level of scrutiny compared to walking surveys, at a point in marsh maturation when the highest scrutiny may be necessary to prevent or contain an infestation. In a mature native marsh, one or a few morphologies of *S. foliosa* will typically become dominant, and the subtle differences exhibited by an invading hybrid *S. alterniflora* are more readily noticeable to a trained biologist. At younger restoration sites, however, competition has not yet sorted out which morphologies of *S. foliosa* proliferate, making it more difficult to quickly determine which of the many forms present are *S. foliosa* and which are hybrid *S. alterniflora*. During these transitional times of early marsh development, there is a tradeoff between the efficiency of covering the ground quickly by airboat and conducting inventory on foot for a more thorough and time-consuming survey.

The ISP continually adjusts monitoring methodologies to allow an appropriate level of scrutiny for surveying these maturing marshes, and more ground-based inventory inevitably becomes required in areas that previously had low demands on inventory time and effort. Maturing restored marsh with increased demands on inventory resources are now spread across thousands of acres of newly developing marsh, such that it is challenging for the limited number of qualified personnel to conduct annual *Spartina* surveys with the desired level of scrutiny.

In recent years, four large tidal marsh restoration sites have reached a level of maturation that required a shift in monitoring methods to perform effective *Spartina* inventory. These four sub-areas are: Knapp Tract (15a.6), Central Bair (02o), Island Ponds (05i), and Ponds E8A, E9, and E8X (13m) (**Figure 25**). The ISP is continually experimenting with new surveying strategies at these four sub-areas, striving for methods that will achieve the best level of scrutiny in a cost-effective manner, working within logistical constraints such as the limited number of appropriate tides during the growing season that will allow biologists to access the sites.

Knapp Tract (15a.6, aka Pond A6) was breached in 2010 and encompasses 375 acres. Over the past couple years, a large proportion of Knapp Tract has developed continuous vegetative

cover. In 2024, the annual airboat inventory and treatment day utilized three biologists as spotters to increase the potential for hybrid detection. Throughout the day when tides were low enough for the marsh plain to be walkable, two biologists were deployed for walking surveys while the third biologist used the airboat to access un-walkable areas and check previously treated patches for regrowth. Results from 2024 inventory and genetic sampling yielded an increase of 25 m² (180%) over 2023 levels, which had increased 12 m² (533%) over 2022 levels. Results from genetic sampling later revealed five additional hybrid *S. alterniflora* plants that were not treated during the inventory day. However, results were received so late in the season that most plants were entering senescence by that point, rendering treatment ineffective; these plants will be prioritized for treatment in 2025.

Central Bair (02o) was breached in 2013 and encompasses 672 acres. While the sub-area still has some large unvegetated areas, much of it is now continuously vegetated. This site is adjacent to some large remaining infestations of hybrid *S. alterniflora*, including the previously restricted B2 North East (02c.1b), and hybrid propagules began establishing in Central Bair shortly after breaching due to these proximate propagule sources. Until 2022, the ISP was utilizing a single biologist over the course of two or three days aboard an airboat to conduct simultaneous inventory and treatment. Since then, this survey effort has increased to multiple days with two surveyors on the boat and multiple biologists on foot with the airboat providing access. This allowed for higher scrutiny of the increasing level of vegetation while conducting treatment of the infestation that had developed. Increased efforts in 2023 detected an increase of 0.3 acres (1,300%) over 2022 levels, largely driven by the wet early season conditions and the large amount of previously unvegetated area. In 2024, a new approach to inventory was undertaken, using an airboat to deploy senior ISP biologists to more densely vegetated and walkable nodes around the site to conduct a more thorough survey. Inventory in 2024 detected virtually no change (4% decrease) in the overall infestation level from 2023, which reflected effective control of the hybrid *S. alterniflora* treated the previous year, countered with identification of hybrid *S. alterniflora* instances that had not yet been found prior to this heightened level of inventory efforts.

The **Island Ponds (05i)** is a complex of three sites (A19, A20 and A21) that were breached in 2006 and encompass a total of 489 acres. Vegetation colonized earliest at A21, which reached the third phase of development described above over five years ago. A20 reached that stage several years ago, and still has some small unvegetated areas, whereas A19 has extensive unvegetated mudplain remaining throughout its north half. A21 and A20 receive full walking surveys with airboat assistance during very specific tide windows to allow for safe access to the site at a water level that is conducive to biologists moving across the majority of the site. Until 2022, A19 was inventoried in a single day by a single biologist onboard an airboat. Since then, this survey effort has increased to include six biologists and shifted to much more inventory on foot in the continuously vegetated areas. Inventory in 2023 detected an increase of 6 m² (103%) over 2022 levels, and 2024 inventory revealed a further increase of 21 m² (186%) over 2023 levels.

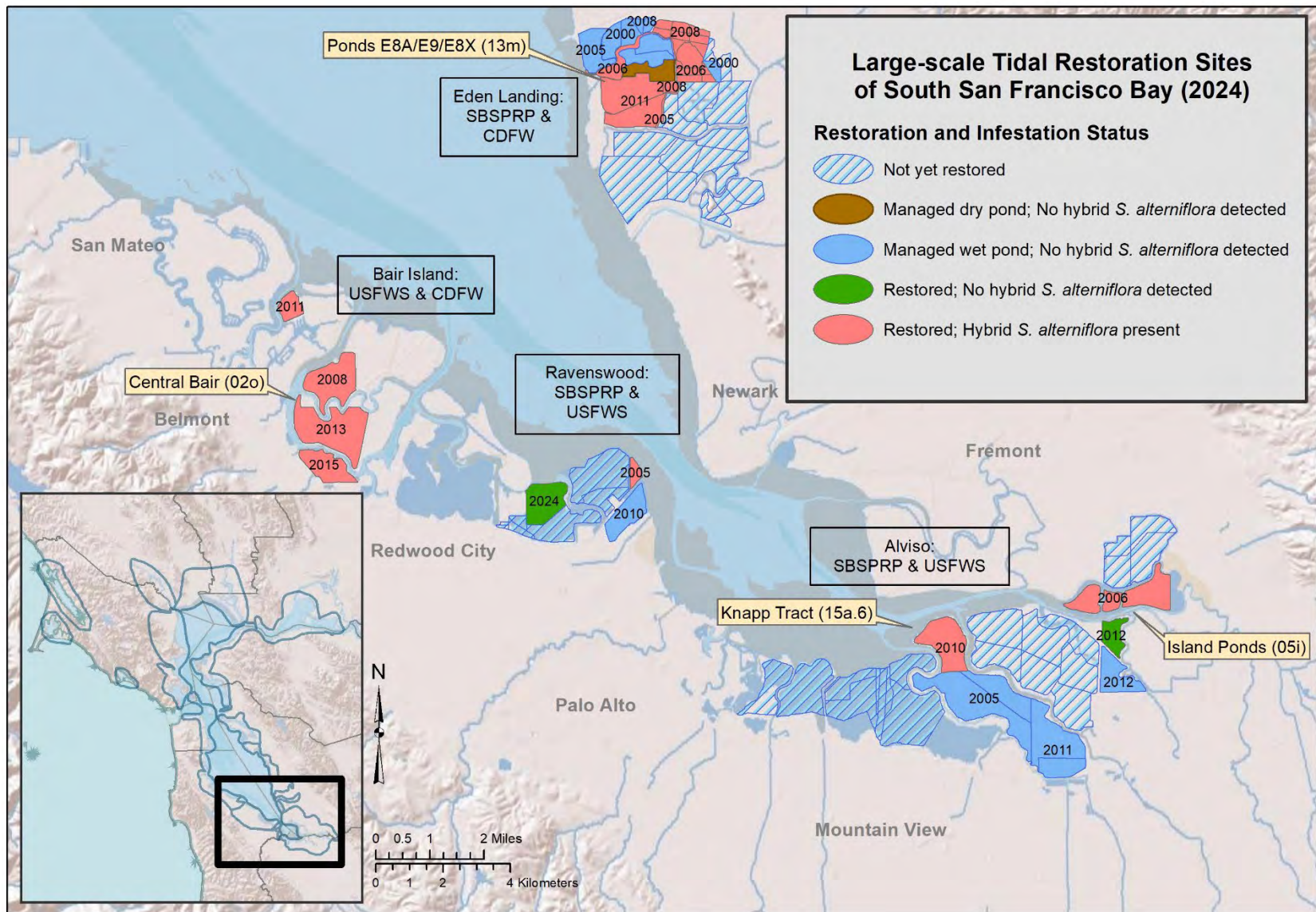


Figure 25. Distribution map of large scale restoration marshes of South San Francisco Bay

The Eden Landing complex of **Ponds E8A, E9, and E8X (13m)** was breached in 2011 and encompasses 666 acres. These three adjoining former salt ponds are varied in their vegetation development and access challenges. Pond E8X is the smallest pond and can be fully walked for inventory, but both E9 and E8A require access by airboat. Access at Pond E9 requires an airboat and a specific tide that must be high enough to allow for boat movement across the mudplain, but low enough to not impede thorough inventory and treatment. For several years, inventory and simultaneous treatment was conducted at Pond E9 in a single day by two biologists onboard the airboat. Since 2022, the amount of inventory conducted on foot increased dramatically to provide higher scrutiny where the vegetation has become continuous. ISP will be increasing the number of airboat-assisted inventory days here in 2025, including those to provide access for strictly walking surveys. Inventory in 2023 detected an increase of 6 m² (103%) over 2022 levels, and 2024 inventory revealed a reduction of 63 m² (62%) from 2023 levels.

Two other restoration sites will require increased inventory in upcoming years: Pond A17 (15a.7) and Inner Bair Restoration Marsh (02I). Pond A17 was tidally restored in 2012 and, despite its proximity to infested marshlands, has remained largely as mudplain with little colonization by bulrush and native *Spartina*. In 2024, ISP biologists observed a large increase in establishment of *S. foliosa*, showing this restoration site's trajectory to becoming a more vegetated marsh. This sub-area will be more closely monitored to detect potential colonization by hybrid *S. alterniflora* and prevent its establishment. A portion of Inner Bair Restoration Marsh has been historically tidal and has been monitored and treated throughout Project history. In 2015, an additional 215 adjacent acres were restored to tidal exchange, which were quickly colonized by both native *S. foliosa* and hybrid *S. alterniflora*.

Pond R4 in Region 3: San Mateo, was restored by SBSPRP to tidal exchange in 2023. It is situated between Greco Island South (02h) and Ravenswood Slough (02i), both of which have current but greatly reduced infestations, so this new restoration site will require regular inventory and potential treatment to ensure that it develops into a marsh with native vegetation that might otherwise be overrun by hybrid *S. alterniflora*.

Prevention is the best form of invasive species management. In the context of the ISP, prevention is accomplished on two fronts: through treatment of known infestations to minimize or eliminate propagule dispersal to other sites, and early detection of new infestations to treat them before they can escalate to greater impact. The ISP strives to support tidal restoration efforts and protect these vulnerable new restoration sites. However, as they become more vegetated, new restoration sites require an ever-increasing level of time and effort to prevent and control infestation by hybrid *S. alterniflora*.

3.4 Enhanced Inventory and Treatment Effort at Bair Island Marshes

In 2024, the ISP began a short-term increase in resources devoted to thorough inventory and treatment to help gain better control over the hybrid *S. alterniflora* infestations in several areas of Bair Island Ecological Reserve. This increase was focused primarily on three ISP sub-areas: B2 North East (02c.1b, a Phase 1 site described in detail in **Section 3.1**), the adjacent B2 North South (02c.2), and the restoration marsh Pond B3 (02m). To fully inventory and treat the hybrid *Spartina* infestations within these three sites in the narrow tidal and growing season windows available, while balancing *Spartina* management work around the rest of the Estuary, has proven beyond the capacity of the equipment (airboats) available within San Francisco Bay Area and the normal staffing levels of the ISP.

The intention at the outset of the pilot was to begin a three-year enhanced effort in 2024 with an additional out-of-town airboat contractor and additional seasonal support staff and subsequently ramp up to double the level of resources in 2025 and 2026 if the pilot went well. The main goal of the plan was to have a dedicated, semi-independent team working at the largest hybrid *Spartina* infestations remaining in the Estuary outside of the Phased sites. This team could thereby complete inventory and treatment in these marshes as early as possible to reduce pollen swamping of the adjacent native *S. foliosa*, which is abundant at all these high-quality sites and grows alongside hybrid *Spartina*. Earlier treatment could reduce hybrid seed production from the native stands, eliminate hybrid plants before they could produce seed as well, and allow ISP to complete the work before autumn senescence ends the opportunity for effective treatment with a systemic herbicide.

To accomplish this goal the ISP hired an out-of-state contractor, Airboat Specialists from Louisiana, to mobilize an airboat and experienced pilot to the Bay Area, and hired five additional Seasonal Technicians. This new Seasonal Technician position did not require the same level of work experience sought for ISP's standard five Seasonal Biologists hired each season since 2009. The Seasonal Technicians' primary task involved treatment, being deployed from the dedicated airboat platform with backpack sprayers, after conducting coarse inventory for hybrid *S. alterniflora* at these Bair Island sites using prior years' data as guidance. These marshes were selected because they are very time-consuming to inventory and treat and contain morphologically distinct hybrid *S. alterniflora* that can be identified with much less experience. This then frees ISP's more experienced biologists to conduct inventory at other portions of the Estuary that require greater identification skills and expertise. At least one experienced and USFWS-approved rail biologist was always present with the Seasonal Technician crew in a supervisory role, and to ensure that conservation measures for Ridgway's rail were upheld. The technicians were hired for a ten-week period including two weeks of intensive training with senior biologists.

The pilot year of the Seasonal Technician crew was very successful, and the extra airboat and seasonal staff substantially increased the ground covered during the prime growing season. Treatment took longer than anticipated at B2 North East, which led to incomplete treatment at B2 North South due to limited tide windows for treatment. However, the Seasonal Technician crew was able to work at some sites with alternate tidal constraints, which included treatment at Ogilvie Island along Coyote Creek, and completing a couple weeks of inventory and treatment at Pond B3. The availability of additional equipment and staff from the Seasonal Technician crew allowed the ISP to conduct the first thorough inventory of portions of B3 in over a decade, covering about 60% of the area in 2024.

In 2025, the ISP will double the Seasonal Technician crew to include ten Seasonal Technicians and two contracted airboats and pilots from Airboat Specialists. Some early season treatment will also be conducted on the hybrid *Spartina* that was mapped in 2024 but wasn't able to be treated before senescence. Having the inventory from the previous year already conducted during the prime season for detection will allow for early-season treatment before the plants have matured enough to be morphologically distinct, functionally increasing the length of the treatment season.

3.5 New Infestations and Sub-Areas Added in 2023-2024

ISP defines a “new infestation” as a newly discovered instance of invasive *Spartina* greater than one kilometer from any historic location. A new “sub-area” within a previously existing site may also be created; in most cases, this would be associated with an area that was breached and returned to tidal action that subsequently became infested. A new “site” needs to be added if it is completely outside of previously codified treatment or inventory areas. Two new treatment sub-areas were created in 2023-2024: Doolittle Drive Mitigation Marsh (17n) in San Leandro Bay, and Martinez (27e) directly east of the Benicia Bridge just east of the Town of Martinez.

In 2023, Doolittle Drive Mitigation Marsh was added to the San Leandro Bay Complex (Site 17) in Region 7 (**Figure 26**) as a new restoration marsh. This one-acre expansion to MLK New Marsh (17h) was created in autumn 2022 by EBRPD as mitigation for construction work completed at the boat ramp along Doolittle Drive. By 2023, it had already been colonized by hybrid *S. alterniflora* from the conjoined MLK New Marsh where treatment has not occurred since 2010. No treatment will be conducted at Doolittle Drive Mitigation Marsh until treatment resumes at MLK New Marsh.

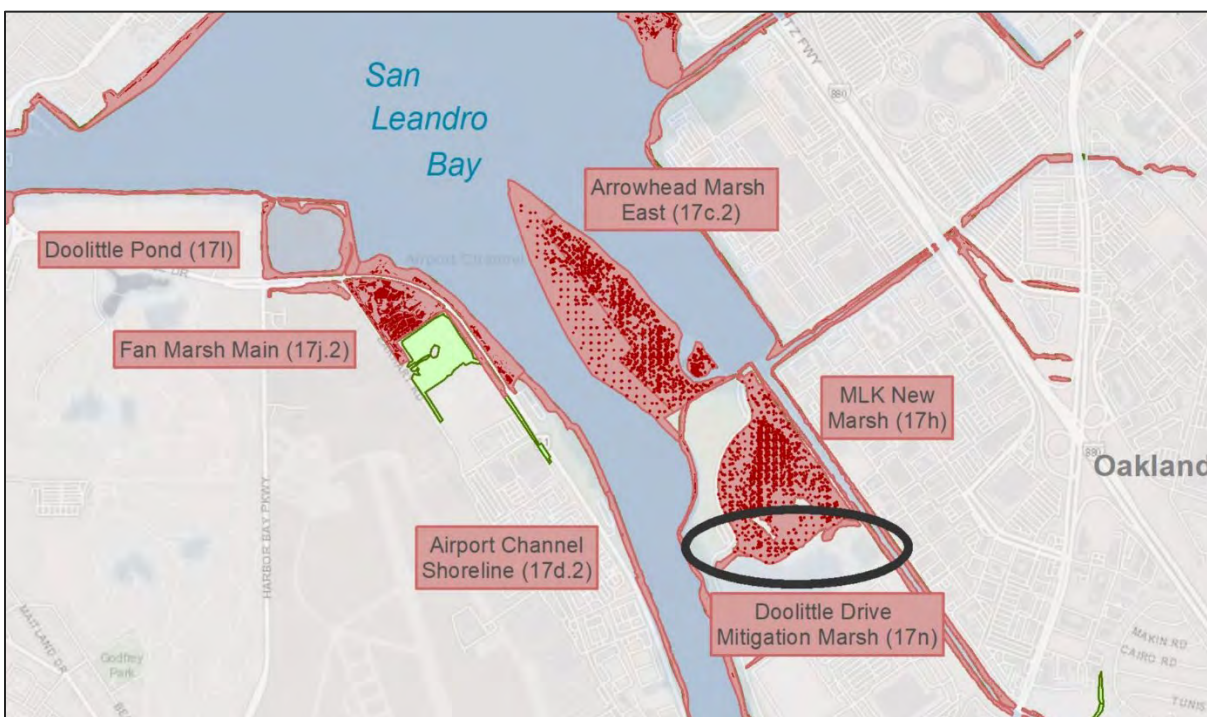
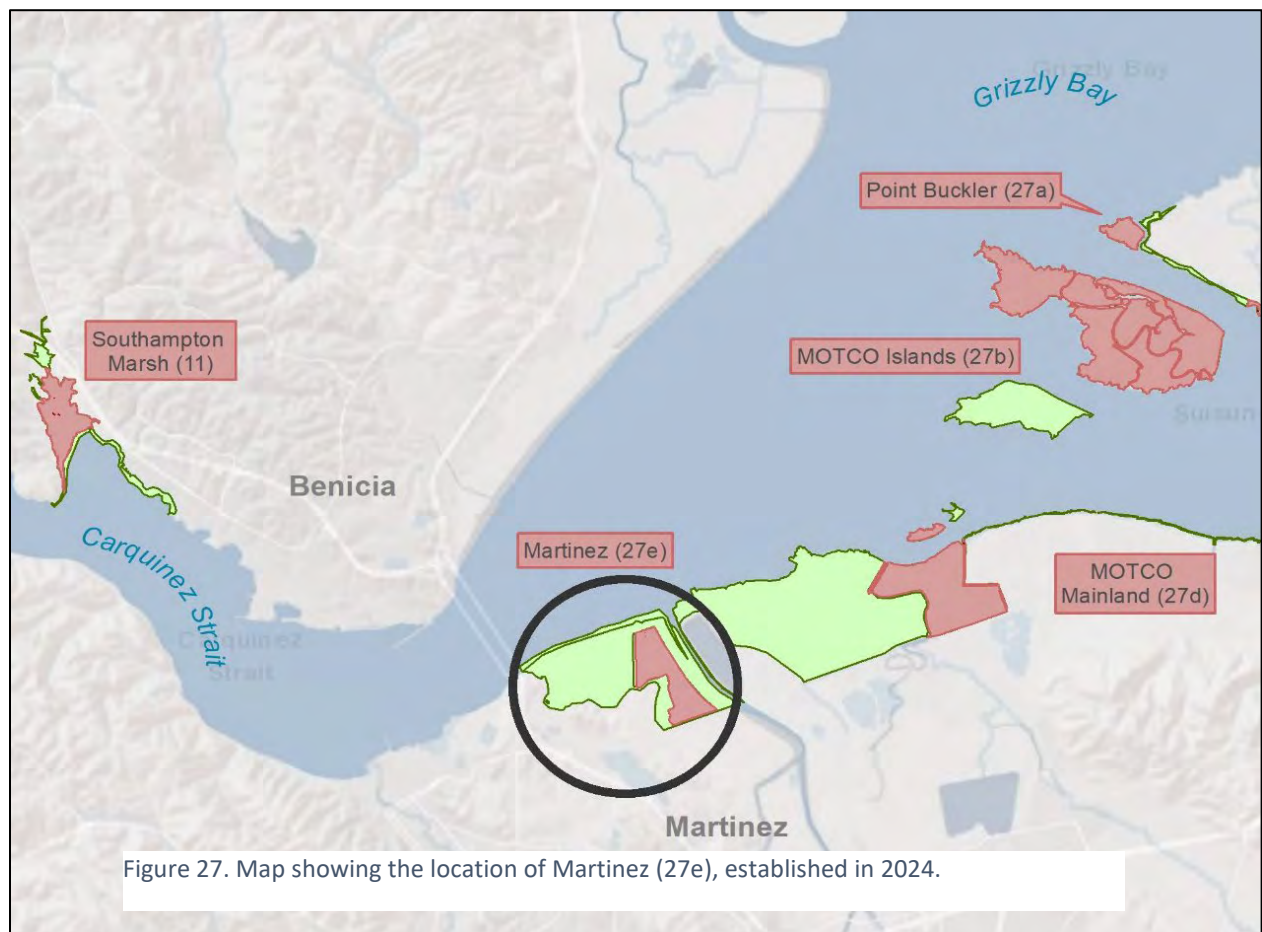


Figure 26. Map showing the location of Doolittle Drive Mitigation Marsh (15d), established in 2023.

In 2024, the Martinez sub-area (27e) was added to the Suisun Region (Region 9) adjacent to the existing MOTCO Mainland (27d) sub-area (**Figure 27**). This sub-area includes the Pacheco Restoration Marsh that was breached in 2021. In 2024, a patch of *Spartina* suspected to be hybrid *S. alterniflora* was discovered by an outside consultant who was assessing the success of the restoration efforts. After genetic results confirmed that the patch was indeed hybrid *S. alterniflora*, ISP biologists did a full inventory of the site and found one other instance of hybrid *S. alterniflora* and multiple patches of establishing native *S. foliosa*. The two invasives patches were then treated by ISP staff. Pacheco Restoration Marsh is surrounded by a much larger expanse of mature tidal marsh, and ISP will need to increase inventory efforts here in 2025.



4. CONSIDERATIONS FOR 2025

Main considerations leading into the 2025 *Spartina* Monitoring and Treatment field season are:

- 1) A substantial amount of treatment effort at North Marsh (20f) in Roberts Landing where treatment will begin in 2025 for the first time since being restricted in 2011 (**Section 3.1**):
- 2) Continuation of and increased Seasonal Technician crew effort at Bair Island (**Section 3.2**); and
- 3) Increased and more focused inventory (and potential treatment) time for the recently restored marshes highlighted in **Section 3.3**.

Resuming treatment at North Marsh after a 14-year hiatus will be one of the largest ground-based efforts in the history of the ISP. Many of the large monocultures present at the start of the project were first treated by aerial application to achieve some reductions before ground-based work began. However, North Marsh has PG&E powerlines running down the center, and is adjacent to a residential community, so treatment will be conducted from ground-based platforms. Current ISP partners have treatment technologies that were not available at the start of the Project. Two treatment partners have Intelli-Spray® hose reel system, with lightweight, narrow-gauge hoses that allow for the applicators to treat hybrid *Spartina* up to 850 feet from a truck with a water tank staged on a levee or adjacent upland area. The trucks with tandem hose systems allow applicators to cover more ground treating a monoculture like North Marsh each day. This is a big benefit with the few tide windows available during the active growing season and after ISP's Biological Opinion entry date of August 12 for treatment at Ridgway's rail sites. This treatment method has been successfully deployed at other Phase 1 and 2 sites, which supported applicators to achieve rapid reductions in hybrid *S. alterniflora*.

Doubling the Seasonal Technician crew to include ten technicians and two dedicated airboats and captains will substantially increase the inventory and treatment they can accomplish as compared to that completed during the 2024 season. This substantial labor and equipment infusion is expected to bolster the thorough management effort at B2 North East (02c.1b), B2 North South (02c.2), Pond B3 (02m), and likely Central Bair (02o). Other sub-areas within the Bair/Greco complex, and even down at Ogilvie Island/Coyote Creek, are likely to utilize the larger seasonal crew, depending on how the 2025 season progresses.

More time will be scheduled to complete inventory at the new restoration marshes, including the new sub-area Martinez (27e) where expansive marshes surrounding Pacheco Restoration Marsh will need to be assessed for habitat availability and inventoried on some level for hybrid *S. alterniflora*. Similarly, Pond R4 that was breached in 2023 will require inventory to ensure that it does not get colonized by and then overrun with hybrid *S. alterniflora* from its infested neighbors. The more developed restoration marshes highlighted in **Section 3.3** will almost undoubtedly require more time for inventory as their vegetated marshland functionally increases in both size and complexity. In all of these, it is hoped that while inventory time will

increase, treatment time will decrease as the Project continues to remove invasive propagules from the system.

A final consideration for the season is not directly tied to fieldwork expected for the 2025 season, but to preparation for the future. Treatment is intended to resume in 2027 at Arrowhead Marsh East (17c.2) and MLK New Marsh (17h), the final two sub-areas in which treatment has been restricted since 2011. There are many factors affecting successful treatment in these marshes, including endangered species on a local and bay-wide scale, temporary changes to marsh access and recreation for the community, and long-term management goals.

Moving forward with treatment in North Marsh, increased treatment focus at the largest infestations on Bair Island and employing more specific and focused inventory efforts at the developing young marshes are some of the approaches the ISP is implementing in 2025. . On the horizon is a new chapter for the Project once treatment is phased-in for the final monocultures that were previously restricted, and full bay-wide treatment of all known infestations can be conducted annually, invasion pressures around the rest of the Estuary should subside. This should result in a reduction of new infestations, decreased establishment of hybrid *S. alterniflora* in young restoration marshes, significantly less invasion threat to Central East Bay sites where hybrid *S. alterniflora* has been held at bay for over a decade, and the opportunity to remove the worst threats from invasive *Spartina* from San Francisco Estuary.

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ISP Target Species Descriptions

There are one native and four non-native species of cordgrass in the San Francisco Estuary. The native species, Pacific cordgrass (*Spartina foliosa*), is avoided during treatment and is conserved by controlling the invasive species that can displace or genetically assimilate it. Key aspects of the cordgrass species found in the Estuary are contrasted below. All species and hybrids are perennial, salt-tolerant grasses that spread both sexually and asexually. The roles these species play in their native habitats give ecologists an indication of their potential to alter the salt marsh ecosystem of San Francisco Bay.

NATIVE: PACIFIC CORDGRASS (*SPARTINA FOLIOSA*)

California's only native cordgrass, *S. foliosa*, grows in a narrow range of the tidal spectrum due to its relatively short stature and intolerance for drought. *Spartina foliosa* is a vital component of the salt marsh plant community, occurring at the lowest intertidal elevation of any native macrophyte. This lower tidal marsh zone occurs at the upper elevation of the mudflat and along channel banks and benches. Native cordgrass is also found scattered throughout the next zone in the elevational gradient, the middle tidal marsh zone, or pickleweed (*Salicornia virginica*) marsh plain. *Spartina foliosa*'s slender leafy shoots seldom exceed five feet in height including seed heads, with most shoots ranging from approximately one to three feet tall. Cordgrass height correlates with its tolerance of submersion, and as such *S. foliosa* can occupy only a limited range in the lower and middle tidal marsh zones (Cain and Harvey 1983). Its leaves and stems wither in fall and are shed in winter, as the clones die back to the mud substrate.



Spartina foliosa is particularly valued as habitat for the endangered California Ridgway's rail (*Rallus obsoletus obsoletus*), which spends most of its time foraging for food within, or close to, the protective canopy of cordgrass. California Ridgway's rails can move within *S. foliosa* stands, and they spend most of their time under cover of the cordgrass foliar canopy, usually selecting prey items such as benthic and aquatic invertebrates inhabiting the cordgrass stands and their edges. The benthic invertebrate community found in the substrate at the base of *S. foliosa* is also an important food source to a variety of other consumers including both resident and migratory shorebirds.

While it was widely recognized that hybrid *S. alterniflora* (discussed next) could potentially threaten the existence of native *S. foliosa*, control of the hybrids began sufficiently early that *S. foliosa* still anchors thousands of acres of tidal marsh throughout the Estuary. Most of the North Bay was relatively unimpacted by hybrid *S. alterniflora*, and more than 99% of the cordgrass in the remnant marshes throughout the Estuary is still intact *S. foliosa*. However, *S. foliosa* was assimilated into the hybrid swarm, and even locally extirpated, in some of the largest infestations around South San Francisco Bay, including the Alameda Flood Control Channel (Site 1) and Eden Landing (Site 13). These sites are the focus of an extensive reintroduction effort by the Conservancy that began in 2010, to establish stands of *S. foliosa* that will begin to disperse seeds throughout these sites, leveraging the investment in direct planting.

ATLANTIC SMOOTH CORDGRASS (*SPARTINA ALTERNIFLORA*) AND ITS HYBRIDS

Atlantic smooth cordgrass is unique among the world's cordgrass species in terms of its growth potential and ecological breadth. *Spartina alterniflora* is genetically very similar to *S. foliosa*, but the two species have significant differences. *S. alterniflora* is more robust than *S. foliosa* in size, growth rate, pollen and seed production, culm (stem) density, and ecological tolerances (Smart and Barko 1978; Boyer, Callaway et al. 2000). The San Francisco Estuary population of *S. alterniflora* was introduced from seed collected in Maryland in the early-1970s to aid in a dredge spoils stabilization and marsh restoration experiment (Faber 2000). Genetic similarity to *S. foliosa* allowed multiple hybridization and eventual backcrossing events that produced the “hybrid swarm” that has posed the most widespread and intrusive threat to the Estuary (Daehler and Strong 1997). Pollen production, higher fertility, greater tolerance for both inundation and drought, and increased timeframe for flowering make these hybrids a prominent threat to native cordgrass through out-competition, pollen swamping, and hybrid assimilation (Rhymer and Simberloff 1996; Ayres, Garcia-Rossi et al. 1999; Anttila, King et al. 2000; Levin, Neira et al. 2006).



Hybrid *S. alterniflora* was well established and widely distributed in the Central and South Bay at the start of the ISP Control Program, but has been reduced by >97% bay-wide, down to 19 net acres¹ since its peak of 805 net acres in 2005.

When stands of *S. foliosa* are displaced by hybrid *S. alterniflora*, not only does the biomass of the benthic invertebrates decline by more than 70%, the benthic community also shifts from surface feeders to belowground feeders that are inaccessible to foraging birds (Levin et. al. 2006).

¹ The ISP uses the terms “net area” and “treatment area” to define the extent of non-native *Spartina*. *Net area* refers to the size of the infestation if the space between stems were subtracted from the overall footprint of the plant or clump of plants. Net area is the metric typically used in botanical surveys. *Treatment area* describes the area that will be directly affected by treatment. Treatment area is a separate measurement used for planning, and it is general 5 to 7 times greater than the net area of given instance of invasive *Spartina*.

CHILEAN CORDGRASS (*SPARTINA DENSIFLORA*) AND ITS HYBRID WITH PACIFIC CORDGRASS (*S. FOLIOSA*)

Chilean cordgrass (also called dense-flowered cordgrass) is a distinctive cordgrass species native to South America that grows as a bunchgrass in the middle marsh plain, eventually forming tussocks and meadows (Spicher and Josselyn 1985; Kittelson and Boyd 1997). *Spartina densiflora* was introduced to California in Humboldt Bay by dry ship ballast containing propagules from South American ports that traded lumber (Spicher and Josselyn 1985). Thought for most of the 20th century to be a form of Pacific cordgrass, *S. densiflora* was deliberately transplanted to a salt marsh restoration project at Creekside Park (4g) along Corte Madera Creek in Marin County in the 1970s. Within the salt marshes fringing Corte Madera Creek, it became a locally-dominant component of the middle and high salt marsh vegetation, displacing even robust pickleweed.



While the bulk of the *S. densiflora* invasion has been contained within Marin around the Corte Madera Creek watershed, other populations have been detected and largely eliminated in Redwood City (19s), Point Pinole Regional Shoreline (Site 10), Burlingame (19k & 19l), Tom's Point (25a) in Tomales Bay, and the shoreline of San Pablo Bay National Wildlife Refuge (26b). Most of the novel population establishments appear to have been the result of active planting by anonymous parties. When established in close proximity to *S. foliosa*, *S. densiflora* has produced infertile hybrids with the native cordgrass that spread solely via vegetative growth (Ayres, Zaremba et al. 2008).

By 2016, the population of *S. densiflora* had been reduced to 24 m² Estuary-wide, and 12.5 m² of the hybrid between *S. foliosa* and *S. densiflora* remained; both are reductions of more than 95% since the peak years for each. These successful reductions have been achieved through dedicated implementation of an adaptive Integrated Vegetation Management (IVM) strategy that includes multiple treatment methods. Because of the unique biology of this form of *Spartina*, any single-tool approach would have been ineffective. The efficacy of herbicide treatment (using imazapyr) varies widely between large plants and small plants, as well as between pioneering individuals and established stands. The seed bank viability of *S. densiflora* is estimated at 3 to 5 years (as compared to 1 to 1.5 years for *S. alterniflora*), which increases the time required for full eradication, even after an infestation is effectively reduced to just a few individuals. With these additional challenges, it is fortunate that *S. densiflora* appears to be somewhat limited in its ability to disperse around the San Francisco Bay ecosystem, and that the infestation has never approached the scale of hybrid *S. alterniflora*, which both consistently responds well to imazapyr treatment and has shorter seed viability.

ENGLISH CORDGRASS (*SPARTINA ANGLICA*)

English cordgrass is an aggressive invader of mudflats and salt marshes in Britain, New Zealand, Australia, and the Pacific Northwest, and thrives in cool temperate climates. It originated in Britain as a fertile hybrid derived from introduced Atlantic smooth cordgrass and common cordgrass (*S. maritima*). It was introduced to the San Francisco Estuary at Creekside Park (4g) along Corte Madera Creek in Marin

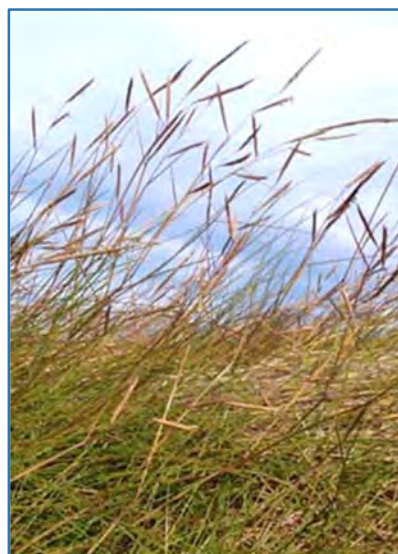
County, along with Chilean cordgrass (*S. densiflora*), in 1976. Unlike Atlantic smooth cordgrass and Chilean cordgrass, this species failed to disperse from its point of introduction to expand the infestation beyond Creekside Park. It may be at or near its southern climatic limit on the Pacific Coast in the Estuary.

Spartina anglica is nearly eradicated from San Francisco Bay, and it is not known to occur in any other location in California. The ISP mapped just 0.05 m² of *S. anglica* in 2023 and none was detected in 2024. There are several factors that contributed to this infestation lingering longer than might be expected given its relatively small size and presence at only a single ISP site. *Spartina anglica* flowers and sets seed in early summer, slightly later than *S. densiflora* but far ahead of hybrid *S. alterniflora*. This phenology did not allow for treatment ahead of seed dispersal prior to 2008, when ISP was first permitted to enter the sites before California clapper rail breeding season ends on September 1. In addition, there were several other years where either delayed permits (2011 and 2012 Biological Opinions) or political concerns (delays with Marin County finalizing its revised IPM Policy in 2009) caused the implementing ISP partner, Friends of Corte Madera Creek Watershed, to miss the optimal treatment window for that year. Finally, the remaining *S. anglica* at Creekside Park is often found growing as a short understory to the native *S. foliosa* that lines the main channel, which limited the full detection of the target plants, and the desire to preserve as much of the native cordgrass as possible further complicated the matter.



SALT-MEADOW CORDGRASS (*SPARTINA PATENS*)

In its native range on the Atlantic coast, salt-meadow cordgrass is naturally restricted to the well-drained high salt marsh and relatively moist sandy depressions at or above tidal influence. However, in the San Francisco Estuary, it has thrived along channel banks and on the pickleweed plain. *Spartina patens* arrived in the Estuary by the early 1960s in Southampton Marsh (Site 11; Benicia State Recreation Area), as evidenced by a sample present in the California Academy of Science's collection from circa 1962. At the initiation of treatment by ISP and the California Department of Parks and Recreation (State Parks), 0.65 net acre of salt-meadow cordgrass was present in large, discrete patches at Southampton Marsh. In 2014, the net cover was only 75 m², and treatment was reinitiated after three years of hiatus due to complications related to the presence of three special status species. In 2016 a total of 35 m² of net cover was mapped by ISP biologists.



Spartina patens has spread into an area of Southampton Marsh that supports a population of an endangered annual hemi-parasitic plant, soft bird's-beak (*Chloropyron molle* ssp. *molle*, formerly *Cordylanthus mollis* ssp. *mollis*). The treatment approach initially approved and used in this area of the marsh was to treat the *S. patens* stands with herbicide in the late fall, after the soft bird's beak had produced seed and senesced, so that the treatment would not negatively affect the soft

bird's beak population. However, *S. patens* itself flowers in May at that location, and by the time herbicide was applied in October, the *S. patens* plants had also already produced seed and begun senescing. When a plant is senescent it is no longer able to uptake and translocate the herbicide, processes that are necessary to kill the plant. It soon was clear that no additional headway was being made toward eradication of *S. patens*.

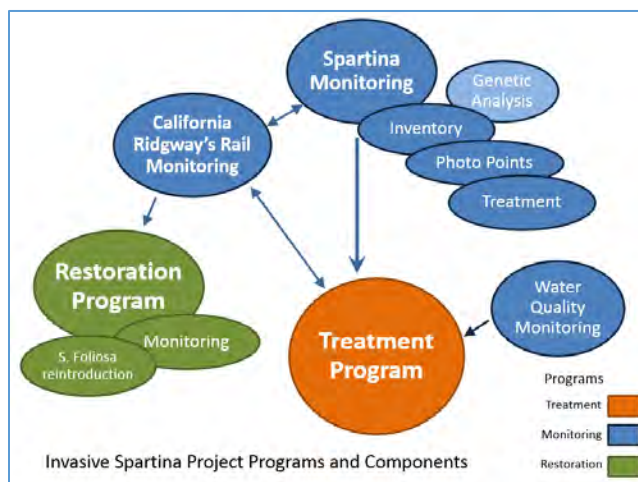
In 2011, the ISP worked with rare plant researcher Brenda Grewell (USDA-ARS) and State Parks to develop a new eradication plan to address the shortcomings of the earlier plan. The new plan permits limited, temporary impacts to *C. molle* ssp. *molle* so that the *S. patens* can be treated effectively, and may include collecting and banking seed from the hemi-parasite to sow once *S. patens* has been eradicated and native host plants reestablished.

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Invasive *Spartina* Project Programs

The ISP is comprised of three broad programs—treatment, monitoring, and restoration, which coordinate closely to achieve the ISP goals. Monitoring is comprised of several programs including *Spartina* inventory monitoring, treatment monitoring, California Ridgway's (formerly "clapper") rail monitoring, and water quality monitoring. Important tools within the monitoring programs are genetic sampling and analysis of *Spartina*, and photo point monitoring. The many programs work together to assure and document an effective regional treatment effort, while protecting water quality, wildlife, and the ecosystem structure. The status of each of the program areas is provided below.



TREATMENT PROGRAM

The Treatment Program coordinates a multitude of contractors, agencies, landowners, and staff to plan and conduct annual treatment of the various non-native *Spartina* species found throughout the Estuary. Pilot efforts to test herbicide methods and coordination mechanisms began in 2004, when the total known footprint of non-native *Spartina* was at that time 758 acres. In 2005, the ISP partners began coordinated, Estuary-wide treatment. Treatment initially focused on large infestations and areas where partners were most ready to begin work, and expanded to include the total of sites in 2006 and 2007. Aerial broadcast treatment by helicopter at several of the large hybrid *Spartina* monocultures of the central and south bay soon effectively reversed the spread of hybrid *Spartina* and established control over the infestations. Once continuous meadows of hybrid *Spartina* at sites like Alameda Flood Control Channel (Site 1), Eden Landing Ecological Reserve (Site 13) in Union City, and Seal Slough (19p) in San Mateo, were reduced to a patchy distribution of plants across each site, the herbicide methods were shifted away from broadcast spray to use of amphibious tracked vehicles on the mudflats and marsh plain, and hauling hose from trucks staged on surrounding levees to accessible marshes. Smaller infestations were treated by applicators with backpack sprayers walking through the marsh, as well as by manual removal of isolated seedlings. *Spartina densiflora*, a species that grows in a bunchgrass form and doesn't spread significantly by rhizome, was effectively controlled by a strategic combination of herbicide application and digging (see Chilean Cordgrass description in Appendix 1).

After several years of regionally coordinated control work, the character of the infestations had changed. Very large meadows of non-native *Spartina* were rare, replaced by sparse infestations spread over larger areas that were more difficult to locate and access. New outlier populations were being discovered in more remote areas of the Estuary. By 2008, the ISP began to experiment with utilizing airboats on the open mud to allow treatment during low tide, thus maximizing herbicide dry time. The airboats were also used to deploy personnel with backpacks onto the marsh plain of islands and other sites

that were inaccessible by land. By 2009, this approach was employed for treatment throughout Don Edwards San Francisco Bay National Wildlife Refuge (DENWR), and by 2012 there were as many as four airboats on a given day working on hybrid *Spartina* treatment around the Estuary. While the use of airboats in this way is essential for accessing difficult areas at this stage, the vast majority of herbicide treatment is conducted by trained personnel walking through the marsh with backpack herbicide sprayers.

Similarly, there have been shifts in methodology for *S. densiflora* treatment. By 2012, all sites were using manual removal as the primary technique, with only two sites still requiring an early season application of herbicide to stop seed production until digging could be implemented after California Ridgway's rail breeding season. Mowing was also an important technique used early on in combination with other treatment methods at sites with meadows of *S. densiflora*, but the reductions achieved through the successful implementation of the adaptive IPM strategies allowed Friends of Corte Madera Creek to discontinue mowing in 2012. Control methods used in 2024 are listed by sub-area in each of the Reporting Region tables in the accompanying report.

MONITORING PROGRAM

Inventory Monitoring

The ISP began Estuary-wide inventory monitoring of invasive *Spartina* in 2000, with annual monitoring of all known infestation sites beginning in 2004. The original geographic scope of inventory monitoring was limited to the bayward side of most major highways (Hogle 2008). Since 2006, all potential invasive *Spartina* habitat identified within the San Francisco Estuary and tidal tributaries, Bolinas Lagoon, Point Reyes National Seashore, and Tomales Bay has been surveyed by ISP biologists or its partners. This includes annual surveys over 50,000 acres of tidal marsh and mudflat throughout the Estuary and Outer Coast areas. The inventory area is shown in Section 2.1 of the 2014 Monitoring and Treatment Report. While the area inventoried covers some large remnant marshes as well as many fringe marshes, it also includes miles of flood control channels and many small fragmented marshes, channels and drainage ditches in a matrix of highly urbanized land use.

Inventory monitoring is conducted for two purposes: to track change in the extent and net cover of the infestation over time for analyzing and reporting, and to locate and map patches of invasive *Spartina* to inform management and coordination of Treatment Program operations. The ISP typically completes inventory of sites prior to treatment (generally from May through October) to allow for the most efficient use of time and personnel during limited treatment windows. Minimizing time in the marsh during treatment also serves to minimize potential disturbance to marsh plants and animals. Data is collected using global positioning system (GPS) and managed using a Geographic Information System (GIS).

Since 2008, all monitoring has been conducted on the ground or by helicopter for select large and remote sites where large patches of infestation persist. Ground mapping is done mostly on foot, but also by kayak and motorized boats when surveying islands, extensive shorelines, and lengthy waterways. 2012 was the last year that ISP conducted monitoring by helicopter due to its inherent decrease in precision as compared to ground mapping. As of 2013, all sites previously monitored by helicopter have been reduced to a lower status of infestation level and warrant more detailed ground mapping.

Genetic Sampling and Analysis

Genetic analysis is a necessary tool for all of the ISP programs. *Spartina* leaf samples are collected and genetically analyzed to distinguish plants with native vs. non-native ancestry. Staff collect leaf samples

from *S. foliosa* and hybrid *S. alterniflora* to verify identification of select plants, guide treatment practices, and keep an eye on new or changing plant morphologies. A genetic sampling plan is developed internally each season to address questions posed by the Treatment and Restoration programs and assure efficient use of limited laboratory resources. Samples are shipped to a commercial laboratory for extraction, and then sent to the UCLA Human Genomics Laboratory, where they are analyzed using Simple Sequence Repeats (SSRs; aka “microsatellites”) and scored. The laboratory used fifteen SSR loci during the 2018 monitoring season. The ISP analyzes the data from UCLA using the software package Structure (Pritchard Lab, Stanford University) to determine, for every sampled plant, the likelihood of it being descended from *S. alterniflora* ancestry. The ISP incorporates these results into the program’s GIS layers for further analysis and for reference in the field during future treatment and inventory events. Over 6,500 plants have been collected and analyzed in this manner since 2010, allowing the identification and treatment of many otherwise morphologically indistinct hybrid *S. alterniflora* plants throughout the Estuary.

More information regarding the genetic sampling program is available in the Monitoring Program Quality Assurance Document (http://www.spartina.org/project_documents/QAD_2009_Update_All.pdf) and the ISP *Spartina* Monitoring Program Approach report referenced above.

Photo Point Monitoring

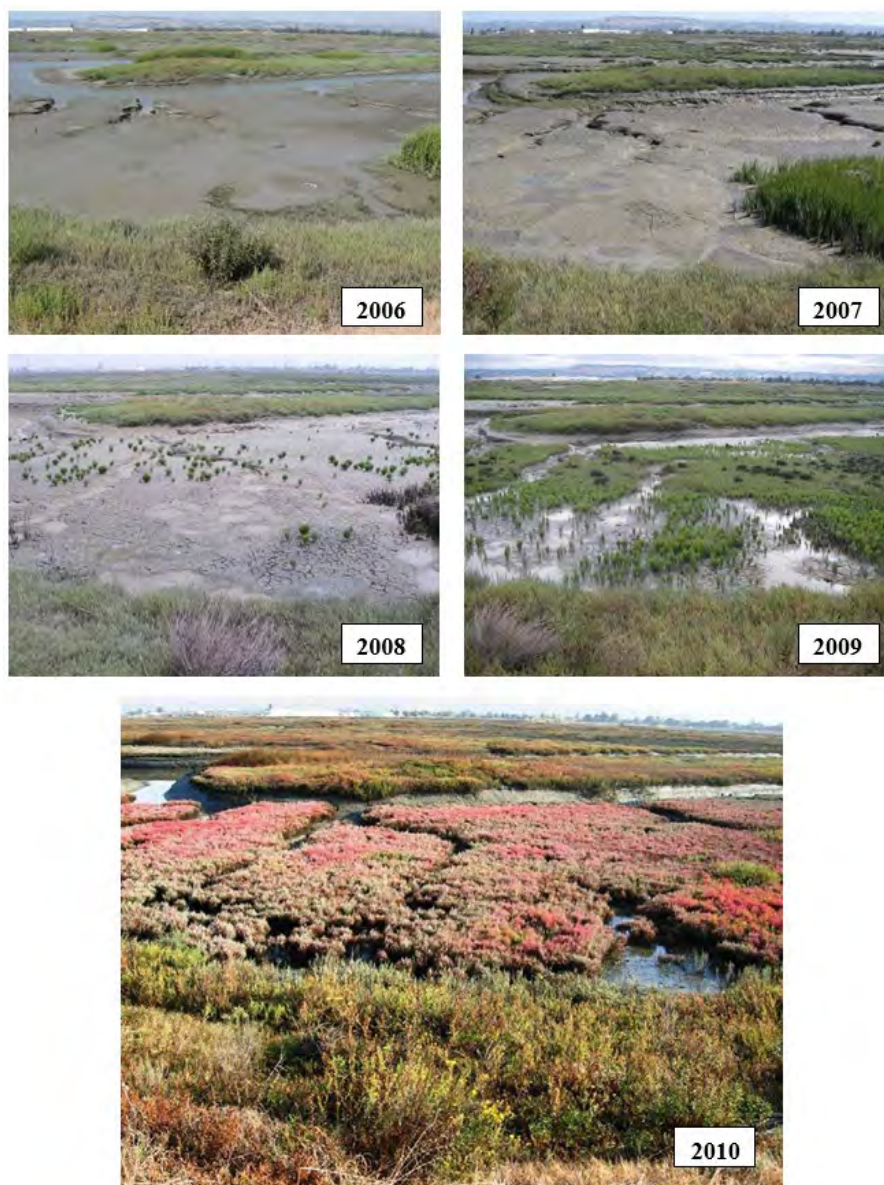
Another tool used by the Treatment and Monitoring Programs is photo point monitoring. The ISP established and has maintained 93 permanent locations within 51 sub-areas from which staff take consistent photos twice annually to qualitatively monitor marsh changes between seasons and years. Photo points are used to inform the extent of the next treatment effort and to visually document the changes in vegetation occurring at the sites. Visible changes often include rapid disappearance of large areas of non-native *Spartina* within one to three seasons of treatment, passive (and frequently rapid) establishment of native vegetation, and expansion or “rebounding” of hybrid *Spartina* populations when treatment is missed or restricted for one or more seasons.

The intra- and inter-annual visual comparisons of marsh composition are useful to the ISP for monitoring treatment efficacy and for presenting local trends to outside parties. These photos are especially useful to illustrate different marsh trajectories when comparing sites with continuous full treatment with those where treatment was absent or incomplete, as has happened since 2011 in 11 sub-areas a result of permit restrictions. An example of photo point data is provided on the **next page**. Also, all ISP Photo Point photos are available on the web, through Google Maps and Picasa Web Albums, at <http://maps.google.com/maps/ms?ie=UTF8&hl=en&msa=0&msid=212795091225976478689.00049ce382daadf691d97&t=h&z=10>.

Treatment Monitoring

The ISP began monitoring all treatment events in 2009. Treatment monitoring involves pairing ISP personnel with the agency or private contractor treatment crews to accomplish the following important objectives: (1) assure protection of California Ridgway’s rails and other sensitive species during treatment activities; (2) enhance conservation of native *S. foliosa* that may be present by delimiting it in no-treatment areas for the crew; (3) substantially improve the ability for crews to locate and target plants for treatment by leading them to less obvious plants requiring treatment; and (4) document completed

treatment in real time at the patch level. As previously mapped *Spartina* locations are revisited, ISP staff update the map features using GPS data loggers to reflect the day's treatment action (e.g. "treated," "not treated," "sub-optimally treated" etc.). This data is uploaded daily to the ISP's ArcGIS geodatabase for use in the field the next day. Accompanying treatment crews also allows ISP staff to identify, mapping, and concurrently record treatment of patches of invasive *Spartina* that had not been detected during initial inventory monitoring. Treatment monitoring is perhaps the most important of the ISP's new programmatic initiatives, allowing ISP partners to gain ground on the remaining substantial infestations in the West Bay, and greatly accelerating the rate at which eradication may be achieved at all sites.



An example of photo point monitoring data showing habitat transition over several years.

Since the timing of inventory and treatment overlap from mid-July through November, the ISP hires additional seasonal staff to conduct treatment monitoring at suitable sites – that is, at sites where native *Spartina* is not present, where hybrid *Spartina* has been recently mapped by more experienced staff, or where native and hybrid morphologies are sufficiently distinct to allow the interns to make consistently correct determinations. More experienced biologists are thus reserved to inventory and monitor treatment at more complex sites.

California Ridgway's Rail Monitoring

Implementation of *Spartina* control measures requires annual breeding season surveys of the endangered California Ridgway's rail (*Rallus obsoletus obsoletus*) in marshes affected by the invasion and management of non-native *Spartina*. Annual breeding season surveys provide a standardized measure of Ridgway's rail presence and distribution in marshes throughout the Estuary. This information guides the

ISP in the planning, permitting, and implementation of treatment strategies and helps to minimize the impacts of *Spartina* control on rail populations. Results from California Ridgway's rail surveys help determine the time of year in which ISP monitoring staff and treatment contractors will enter a site so as to not disturb birds present during their breeding season, and are used by USFWS and others for making decisions regarding the ISP program.

Water Quality Monitoring

The application of herbicide for *Spartina* control is covered under the Statewide General National Pollutant Discharge Elimination System (NPDES) Permit for Application of Aquatic Pesticides for Aquatic Weed Control in Waters of the United States (General Permit No. CAG990005; www.swrcb.ca.gov/water_issues/programs/npdes/docs/aquatic/permit.pdf). To obtain coverage under this permit, each grantee or other ISP partner that will be applying herbicide must submit a Notice of Intent (NOI) to comply with the terms of the General Permit and an annual fee to the Regional Water Quality Control Board (RWQCB). The permit requires preparation of an Aquatic Pesticide Application Plan (APAP) that includes a Water Quality Monitoring Plan (WQMP), which must be updated annually as needed. The ISP arranged with the State Water Resources Control Board and the San Francisco Bay RWQCB to allow the ISP to prepare and implement a programmatic APAP and WQMP on behalf of the ISP partners who submitted NOIs. The ISP prepared a programmatic APAP in 2006 and updated it in 2015, which is available on the ISP website at http://www.spartina.org/documents/2015_ISP_APAP_wAppendices.pdf.

As with many substances, there are no State or Federal numeric water quality objectives or limits established for imazapyr herbicide; therefore, concentrations are compared to tested toxicity and effects levels found in the literature. In 2013, concentrations of imazapyr herbicide measured immediately following treatment events were two to four orders of magnitude below those reported in the literature as a concern to humans or the animals that inhabit the tidal marsh ecosystem. Imazapyr is not persistent in the aquatic environment because it is rapidly degraded by sunlight; thus, as expected, the one-week post-treatment samples with any residual herbicide detected showed a mean reduction of 91.4% of the treatment event levels. Details regarding sampling and analysis methods and the monitoring results are provided in the [2017 Water Quality Monitoring Report](#) (Kerr 2013).

The ISP commissioned a focused review of imazapyr herbicide in 2005, prior to adopting it into the Treatment Program. The review, *The use of Imazapyr Herbicide to Control Invasive Cordgrass (Spartina spp.) in the San Francisco Estuary: Water Quality, Biological Resources, and Human Health and Safety* (Leson & Associates 2005), is on the ISP website at www.spartina.org/project_documents. The Conservancy's findings under CEQA may be found at www.spartina.org/2005Addendum.htm.

RESTORATION PROGRAM

The Restoration Program was initiated in 2011 to rapidly establish habitat features to benefit California Ridgway's rails in areas where recent removal of non-native *Spartina* has caused decreases in Ridgway's rail habitat. The plan for the program is contained in the [California Clapper Rail Habitat Enhancement, Restoration and Monitoring Plan](#) (Olofson Environmental, Inc. 2012). As part of the plan, the Conservancy and other regional ISP partners are employing several habitat enhancement methods including construction of high tide refuge islands, deployment of artificial floating nesting islands, and extensive revegetation, focusing on native tidal marsh plant species that provide foraging, breeding, and high tide refuge cover.

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2023 Regional Tables

Split Sub-Area	2023 Treatment Dates	2023 Treatment Method	2023 Net <i>Spartina</i> Coverage By Species				All Invasive <i>Spartina</i> Cover				
			anglica	densiflora x foliosa	alterniflora x foliosa	densiflora	2023 Net Area	2023 Treat-ment Area	Peak Year	Net Area Decline	
										Since Peak	Since 2022
REGION 1: MARIN											
03a: Blackie's Creek (above bridge)	5 years with no Invasive <i>Spartina</i> (2019-2023)		0	0	0	0	0	2005	100%	n/a	
03b: Blackie's Creek Mouth	7 years with no Invasive <i>Spartina</i> (2017-2023)		0	0	0	0	0	2005	100%	n/a	
04a: Corte Madera Ecological Reserve	9/25; 1/17/24	Dug, Backpack	0	0.5 m ²	0.002 m ²	0.5 m ²	43 m ²	2005	>99%	21%	
04b: College of Marin Ecological Study Area	Not treated 2023		0	0.2 m ²	0	0.2 m ²	6 m ²	2004	>99%	n/a	
04c: Piper Park East	No Invasive <i>Spartina</i> 2023		0	0	0	0	0	2005	100%	100%	
04d: Piper Park West	2 years with no Invasive <i>Spartina</i> (2022-2023)		0	0	0	0	0	2005	100%	n/a	
04e: Larkspur Ferry Landing Area	2 years with no Invasive <i>Spartina</i> (2022-2023)		0	0	0	0	0	2005	100%	100%	
04f: Riviera Circle	6/13; 1/15/24	Dug, Mowed, Backpack	0	0	0.07 m ²	0.07 m ²	1 m ²	2005	>99%	n/a	
04g: Creekside Park	6/5; 7/25; 9/12; 12/15; 1/4/24	Dug, Tarped, Backpack	0.05 m ²		0	0.02 m ²	0.1 m ²	4 m ²	2005	>99%	17%
			0.07 m ²								
04h: Upper Corte Madera Creek (Above Bon Air Rd)	6/6; 10/16; 1/5/24	Dug, Backpack	0	0.6 m ²	0.001 m ²	0.6 m ²	17 m ²	2006	>99%	Increase (0.5 m ²)	
04i: Lower Corte Madera Creek (Bon Air Rd to HWY 101)	6/6; 10/16	Dug, Backpack	0	1 m ²	0.01 m ²	1 m ²	35 m ²	2005	>99%	Increase (0.4 m ²)	
04j.1: Corte Madera Creek Mouth - North Bank	10/30	Dug, Backpack	0	6 m ²	0	6 m ²	222 m ²	2007	>99%	48%	
04j.2: Corte Madera Creek Mouth - South Bank	10/12; 10/16; 10/30	Dug, Backpack	0	0.8 m ²	0	0.8 m ²	28 m ²	2007	>99%	21%	
04k: Boardwalk No. 1 (Arkites)	2 years with no Invasive <i>Spartina</i> (2022-2023)		0	0	0	0	0	2006	100%	n/a	
04l: Murphy Creek	3 years with no Invasive <i>Spartina</i> (2021-2023)		0	0	0	0	0	2007	100%	n/a	
09: Tiscornia Marsh / Pickleweed Park	8/21	Backpack	0	1 m ²	0	1 m ²	44 m ²	2004	>99%	87%	
23a: Brickyard Cove	2 years with no invasive <i>Spartina</i> (2022-2023)		0	0	0	0	0	2008	100%	n/a	
23b: Beach Drive	8/21	Backpack	0	5 m ²	0	5 m ²	116 m ²	2006	>99%	Increase (5 m ²)	
23c: Loch Lomond Marina	10/12	Backpack	0	0.1 m ²	0	0.1 m ²	11 m ²	2004	>99%	81%	
23d.1: San Rafael Canal Mouth East	8/21	Backpack	0	5 m ²	0	5 m ²	168 m ²	2007	98%	Increase (4 m ²)	
23d.2: San Rafael Canal Mouth West	8/21; 9/8; 10/12	Backpack	0	0.5 m ²	0	0.5 m ²	16 m ²	2004	>99%	Increase (0.5 m ²)	
23e: Muzzi and Martas Marsh	6/15; 9/25; 10/3; 1/25/24	Dug, Backpack	0	4 m ²	0.1 m ²	4 m ²	163 m ²	2007	>99%	38%	
23f: Paradise Cay	1/5/24	Dug	0	0	0.001 m ²	0.001 m ²	0.008 m ²	2005	>99%	100%	
23g: Greenwood Cove	2 years with no invasive <i>Spartina</i> (2022-2023)		0	0	0	0	0	2006	100%	n/a	
23h: Strawberry Point	10/9; 10/18	Dug	0	2 m ²	0.001 m ²	2 m ²	38 m ²	2005	>99%	Increase (1 m ²)	
23i: Strawberry Cove	8/21	Backpack	0	2 m ²	0	2 m ²	23 m ²	2007	>99%	Increase (2 m ²)	
23j: Bothin Marsh	9/12	Backpack	0	0.3 m ²	0	0.3 m ²	9 m ²	2006	>99%	Increase (0.2 m ²)	
23k: Sausalito	9 years with no invasive <i>Spartina</i> (2015-2023)		0	0	0	0	0	2004	100%	n/a	
23l: Starkweather Park	8 years with no invasive <i>Spartina</i> (2016-2023)		0	0	0	0	0	2006	100%	n/a	
23m: Novato	8 years with no invasive <i>Spartina</i> (2016-2023)		0	0	0	0	0	2006	100%	n/a	
23n: Triangle Marsh and shoreline	5 years with no invasive <i>Spartina</i> (2019-2023)		0	0	0	0	0	2007	100%	n/a	
23o: China Camp	7 years with no invasive <i>Spartina</i> (2017-2023)		0	0	0	0	0	2010	100%	n/a	
REGION 1 TOTAL			0.05 m ²		28 m ²	0.2 m ²	29 m ²	945 m ²	2005	>99%	10%
			0.07 m ²								

2023 Regional Tables

Split Sub-Area	2023 Treatment Dates	2023 Treatment Method	2023 Net <i>Spartina</i> Coverage By Species				All Invasive <i>Spartina</i> Cover				
			anglica	densiflora x foliosa	alterniflora x foliosa	densiflora	2023 Net Area	2023 Treat-ment Area	Peak Year	Net Area Decline	
										Since Peak	Since 2022
REGION 2: SAN FRANCISCO PENINSULA											
12a: Pier 94	8 years with no invasive <i>Spartina</i> (2016-2023)		0	0	0	0	0	2005	100%	n/a	
12b: Pier 98 / Heron's Head	6 years with no Invasive <i>Spartina</i> (2018-2023)		0	0	0	0	0	2008	100%	n/a	
12c: India Basin	10 years with no invasive <i>Spartina</i> (2014-2023)		0	0	0	0	0	2005	100%	n/a	
12d: Hunters Point Naval Reserve	7 years with no Invasive <i>Spartina</i> (2017-2023)		0	0	0	0	0	2008	100%	n/a	
12e: Yosemite Channel	No Invasive <i>Spartina</i> 2023		0	0	0	0	0	2004	100%	100%	
12f: Candlestick Cove	9 years with no invasive <i>Spartina</i> (2015-2023)		0	0	0	0	0	2006	100%	n/a	
12g: Crissy Field	10 years with no invasive <i>Spartina</i> (2014-2023)		0	0	0	0	0	2008	100%	n/a	
12h: Yerba Buena Island	10 years with no invasive <i>Spartina</i> (2014-2023)		0	0	0	0	0	2006	100%	n/a	
12i: Mission Creek	10 years with no invasive <i>Spartina</i> (2014-2023)		0	0	0	0	0	2009	100%	n/a	
18a: Colma Creek	6 years with no invasive <i>Spartina</i> (2018-2023)		0	0	0	0	0	2005	100%	n/a	
18b: Navigable Slough	7 years with no invasive <i>Spartina</i> (2017-2023)		0	0	0	0	0	2006	100%	n/a	
18c: Old Shipyard	5 years with no invasive <i>Spartina</i> (2019-2023)		0	0	0	0	0	2006	100%	n/a	
18d: Inner Harbor	10 years with no invasive <i>Spartina</i> (2014-2023)		0	0	0	0	0	2006	100%	n/a	
18e: Sam Trans Peninsula	9/28	Backpack	0	0.6 m ²	0	0.6 m ²	1 m ²	2004	>99%	n/a	
18f: Confluence Marsh	7 years with no invasive <i>Spartina</i> (2017-2023)		0	0	0	0	0	2004	100%	n/a	
18g: San Bruno Marsh	9/28	Backpack	0	0.09 m ²	0	0.09 m ²	2 m ²	2004	>99%	n/a	
18h: San Bruno Creek	3 years with no invasive <i>Spartina</i> (2021-2023)		0	0	0	0	0	2006	100%	n/a	
19a: Brisbane Lagoon	9/28	Backpack	0	0.04 m ²	0	0.04 m ²	3 m ²	2006	>99%	n/a	
19b: Sierra Point	9 years with no invasive <i>Spartina</i> (2015-2023)		0	0	0	0	0	2004	100%	n/a	
19c: Oyster Cove	9 years with no invasive <i>Spartina</i> (2015-2023)		0	0	0	0	0	2006	100%	n/a	
19d: Oyster Point Marina	9 years with no invasive <i>Spartina</i> (2015-2023)		0	0	0	0	0	2006	100%	n/a	
19e: Oyster Point Park	9/28	Backpack	0	0.1 m ²	0	0.1 m ²	2 m ²	2005	>99%	46%	
19f: Point San Bruno	3 years with no invasive <i>Spartina</i> (2021-2023)		0	0	0	0	0	2005	100%	n/a	
19g: Seaplane Harbor	10/5	Backpack	0	0.008 m ²	0	0.008 m ²	0.8 m ²	2004	>99%	n/a	
19h: SFO	8/23; 9/28; 10/5	Backpack	0	6 m ²	0	6 m ²	247 m ²	2004	>99%	Increase (4 m ²)	
19i: Mills Creek Mouth	3 years with no invasive <i>Spartina</i> (2021-2023)		0	0	0	0	0	2005	100%	n/a	
19j: Easton Creek Mouth	No Invasive <i>Spartina</i> 2023		0	0	0	0	0	2004	100%	100%	
19k: Sanchez Marsh	9/8; 10/17	Backpack	0	78 m ²	0	78 m ²	0.5 acres	2004	99%	Increase (65 m ²)	
19l: Burlingame Lagoon	9/8	Backpack	0	8 m ²	0	8 m ²	261 m ²	2004	>99%	Increase (7 m ²)	
19m: Fisherman's Park	12 years with no invasive <i>Spartina</i> (2012-2023)		0	0	0	0	0	2005	100%	n/a	
19n: Coyote Point Marina / Marsh	3 years with no invasive <i>Spartina</i> (2021-2023)		0	0	0	0	0	2004	100%	n/a	
19o: San Mateo Creek / Ryder Park	No Invasive <i>Spartina</i> 2023		0	0	0	0	0	2006	100%	100%	
19p.1: Seal Slough Mouth - Central Marsh	10/2	Backpack	0	0.03 m ²	0	0.03 m ²	3 m ²	2004	>99%	Increase (0.02 m ²)	
19p.2: Seal Slough Mouth - Peripheral Marshes	10/2	Backpack	0	0.02 m ²	0	0.02 m ²	2 m ²	2004	>99%	63%	
19r: Anza Lagoon	8 years with no invasive <i>Spartina</i> (2016-2023)		0	0	0	0	0	2004	100%	n/a	
REGION 2 TOTAL			0	93 m ²	0	93 m ²	0.7 acres	2004	>99%	Increase (76 m ²)	

2023 Regional Tables

Split Sub-Area	2023 Treatment Dates	2023 Treatment Method	2023 Net <i>Spartina</i> Coverage By Species				All Invasive <i>Spartina</i> Cover				
			anglica	densiflora x foliosa	alterniflora x foliosa	densiflora	2023 Net Area	2023 Treat-ment Area	Peak Year	Net Area Decline	
										Since Peak	Since 2022
REGION 3: SAN MATEO											
02a.1a: Belmont Slough Mouth	9/25-9/26	Backpack, Airboat	0		21 m ²	0	21 m ²	552 m ²	2004	>99%	Increase (13 m ²)
02a.1b: Belmont Slough Mouth South	9/25-9/26	Backpack, Airboat	0		11 m ²	0	11 m ²	563 m ²	2004	>99%	Increase (8 m ²)
02a.2: Upper Belmont Slough and Redwood Shores	8/17; 8/28; 9/1; 9/19; 9/22; 9/25; 10/10	Backpack, Airboat	0		135 m ²	0	135 m ²	1.1 acres	2004	>99%	Increase (97 m ²)
02a.3: Bird Island	9/22; 9/26	Backpack	0		4 m ²	0	4 m ²	183 m ²	2006	>99%	56%
02a.4: Redwood Shores Mitigation Bank	8/17; 9/25	Backpack	0		2 m ²	0	2 m ²	108 m ²	2015	87%	Increase (0.9 m ²)
02b.1: Corkscrew Slough	10/6; 10/19; 10/21; 11/9	Backpack, Airboat	0		62 m ²	0	62 m ²	0.3 acres	2004	99%	Increase (35 m ²)
02b.2: Steinberger Slough South, Redwood Creek Northwest	7/27; 9/27; 10/10; 10/21; 11/9	Backpack, Airboat	0		114 m ²	0	114 m ²	0.8 acres	2004	>99%	Increase (72 m ²)
02c.1a: B2 North West	Not treated 2023		0		98 m ²	0	98 m ²	0.8 acres	2005	>99%	No change detected
02c.1b: B2 North East	8/7; 8/24-8/25; 9/5-9/6; 10/4; 10/6; 10/20-10/21; 11/3; 11/7; 11/20	Backpack, Airboat	0		1.4 acres	0	1.4 acres	21.5 acres	2005	94%	3%
02c.2: B2 North South	8/21-8/23; 9/5-9/6; 10/4; 11/3; 11/7; 11/20	Backpack, Airboat	0		0.4 acres	0	0.4 acres	8.9 acres	2006	96%	Increase (905 m ²)
02d.1a: B2 South West	11/20	Backpack, Airboat	0		4 m ²	0	4 m ²	190 m ²	2004	>99%	Increase (2 m ²)
02d.1b: B2 South East	11/20	Backpack, Airboat	0		0.01 m ²	0	0.01 m ²	2 m ²	2004	>99%	87%
02d.2: B2 South (2)	11/20	Backpack, Airboat	0		9 m ²	0	9 m ²	196 m ²	2006	>99%	Increase (5 m ²)
02d.3: B2 South (3)	11/20	Backpack	0		7 m ²	0	7 m ²	175 m ²	2009	>99%	Increase (5 m ²)
02e: West Point Slough NW	11/20	Backpack, Airboat	0		1 m ²	0	1 m ²	43 m ²	2005	>99%	Increase (0.2 m ²)
02f: Greco Island North	11/2; 11/9; 11/20	Backpack, Airboat	0		168 m ²	0	168 m ²	0.8 acres	2008	>99%	Increase (59 m ²)
02g: West Point Slough SW and East	8/4; 10/4; 10/10	Backpack, Airboat	0		17 m ²	0	17 m ²	349 m ²	2005	>99%	Increase (15 m ²)
02h: Greco Island South	11/2	Backpack, Airboat	0		60 m ²	0	60 m ²	0.3 acres	2005	>99%	Increase (52 m ²)
02i: Ravenswood Slough and Mouth	9/11; 9/18; 10/4	Backpack	0		46 m ²	0	46 m ²	0.3 acres	2004	>99%	Increase (44 m ²)
02j.1: Ravenswood Open Space Preserve (N of Hwy 84)	9/11; 9/18; 10/4	Backpack	0		51 m ²	0	51 m ²	742 m ²	2006	91%	Increase (34 m ²)
02k: Redwood Creek and Deepwater Slough	8/4; 10/10; 10/19; 10/23; 11/9	Backpack, Airboat	0		143 m ²	0	143 m ²	1.1 acres	2009	99%	Increase (39 m ²)
02l: Inner Bair	10/4; 10/10; 10/17	Backpack	0		19 m ²	0	19 m ²	421 m ²	2006	>99%	Increase (16 m ²)
02m: Pond B3	7/28; 8/9; 9/8; 10/7; 10/9; 10/23; 11/7	Airboat	0		0.3 acres	0	0.3 acres	2.6 acres	2014	20%	13%
02o: Central Bair	7/26-7/27; 8/9; 9/11; 10/24; 11/8	Airboat	0		0.3 acres	0	0.3 acres	3.9 acres	2023	n/a	Increase (0.28 acres)
19q: Foster City	9/25	Backpack	0		0.04 m ²	0	0.04 m ²	2 m ²	2004	>99%	Increase (0.04 m ²)
19s: Maple Street Channel	5 years with no invasive <i>Spartina</i> (2019-2023)		0		0	0	0	0	2011	100%	n/a
REGION 3 TOTAL			0		2.6 acres	0	2.6 acres	43.4 acres	2004	98%	Increase (0.5 acres)

2023 Regional Tables

Split Sub-Area	2023 Treatment Dates	2023 Treatment Method	2023 Net <i>Spartina</i> Coverage By Species				All Invasive <i>Spartina</i> Cover				
			anglica	densiflora x foliosa	alterniflora x foliosa	densiflora	2023 Net Area	2023 Treat-ment Area	Peak Year	Net Area Decline	
										Since Peak	Since 2022
REGION 4: DUMBARTON SOUTH											
02j.2: Ravenswood Open Space Preserve (S of Hwy 84)	8/31; 9/11; 9/18; 10/4	Backpack	0		16 m²	0	16 m²	457 m²	2006	>99%	Increase (10 m²)
02n: SF2	Not treated 2023		0		0.8 m²	0	0.8 m²	18 m²	2013	38%	n/a
05a.1: Mowry Marsh and Slough	9/21; 10/16; 11/2	Backpack, Airboat	0		91 m²	0	91 m²	0.5 acres	2008	>99%	Increase (66 m²)
05a.2: Calaveras Marsh	8/8; 10/5	Backpack, Airboat	0		115 m²	0	115 m²	0.4 acres	2007	>99%	Increase (62 m²)
05b: Dumbarton/Audubon	8/25; 9/21; 9/28; 10/4; 10/18; 11/2; 11/9	Backpack, Airboat	0		67 m²	0	67 m²	0.4 acres	2006	>99%	Increase (12 m²)
05c.1: Newark Slough West	8/25	Backpack, Airboat	0		8 m²	0	8 m²	283 m²	2004	>99%	15%
05c.2: Newark Slough East	8/25	Backpack, Airboat	0		0.02 m²	0	0.02 m²	0.7 m²	2005	>99%	99%
05d: LaRiviere Marsh	8/25	Backpack	0		0.9 m²	0	0.9 m²	55 m²	2006	>99%	4%
05e: Mayhew's Landing	8/7; 8/25	Backpack	0		0.3 m²	0	0.3 m²	2 m²	2004	>99%	Increase (0.2 m²)
05f: Coyote Creek - Alameda County	10/18	Backpack, Airboat	0		10 m²	0	10 m²	255 m²	2008	94%	Increase (3 m²)
05g: Cargill Pond (W Hotel)	8/7; 8/25	Backpack	0		4 m²	0	4 m²	224 m²	2010	>99%	Increase (1 m²)
05h: Plummer Creek Mitigation Marsh	10/18	Backpack	0		0.6 m²	0	0.6 m²	28 m²	2011	>99%	63%
05i: Island Ponds	9/23; 10/31	Airboat	0		11 m²	0	11 m²	168 m²	2017	93%	Increase (6 m²)
08: Palo Alto Baylands	9/7; 10/3; 10/4	Backpack, Airboat	0		76 m²	0	76 m²	0.4 acres	2009	98%	Increase (55 m²)
15a.1: Charleston Slough to Mountainview Slough	8/8; 8/17	Backpack	0		10 m²	0	10 m²	128 m²	2004	>99%	Increase (3 m²)
15a.2: Stevens Ck to Guadalupe Sl	8/7-8/8	Backpack	0		0.2 m²	0	0.2 m²	16 m²	2008	>99%	92%
15a.3: Guadalupe Slough	10/5	Backpack, Airboat	0		9 m²	0	9 m²	414 m²	2008	>99%	71%
15a.4: Alviso Slough	9/21; 9/22-9/23; 10/5; 10/6; 10/20; 11/1; 12/6	Backpack, Airboat	0		970 m²	0	970 m²	4.1 acres	2007	90%	Increase (615 m²)
15a.5: Coyote Creek to Artesian Slough	10/18	Backpack, Airboat	0		81 m²	0	81 m²	0.4 acres	2017	90%	Increase (56 m²)
15a.6: Knapp Tract	9/26	Airboat	0		14 m²	0	14 m²	181 m²	2017	35%	Increase (12 m²)
15a.7: Pond 17	No Invasive <i>Spartina</i> Ever Detected		0		0	0	0	0	n/a	n/a	n/a
15b: Faber / Laumeister Marsh	8/22	Backpack	0		17 m²	0	17 m²	636 m²	2008	>99%	49%
15c: Shoreline Regional Park	8/7	Backpack	0		1 m²	0	1 m²	82 m²	2006	>99%	78%
15d: Sunnyvale Baylands	2 years with no invasive <i>Spartina</i> (2022-2023)		0		0	0	0	0	2021	100%	n/a
16.1: Cooley Landing Central	9/6-9/7; 10/5; 10/20	Truck, Backpack, Airboat	0		128 m²	0	128 m²	1.1 acres	2008	>99%	Increase (104 m²)
16.2: Cooley Landing East	8/31; 9/5-9/7; 10/5	Truck, Backpack, Airboat	0		359 m²	0	359 m²	2.1 acres	2008	99%	Increase (223 m²)
REGION 4 TOTAL			0		0.5 acres	0	0.5 acres	10 acres	2008	99%	Increase (0.3 acres)

2023 Regional Tables

Split Sub-Area	2023 Treatment Dates	2023 Treatment Method	2023 Net <i>Spartina</i> Coverage By Species				All Invasive <i>Spartina</i> Cover				
			anglica	densiflora x foliosa	alterniflora x foliosa	densiflora	2023 Net Area	2023 Treat-ment Area	Peak Year	Net Area Decline	
										Since Peak	Since 2022
REGION 5: UNION CITY											
01a: Channel Mouth	10/3	Backpack	0		1 m ²	0	1 m ²	62 m ²	2004	>99%	63%
01b: Lower Channel	10/3	Backpack	0		0.2 m ²	0	0.2 m ²	12 m ²	2004	>99%	95%
01c: Upper Channel	10/3	Backpack	0		0.2 m ²	0	0.2 m ²	5 m ²	2004	>99%	n/a
01d: Upper Channel - Union City Blvd to I-880	3 years with no invasive <i>Spartina</i> (2021-2023)		0		0	0	0	0	2005	100%	n/a
01e: Strip Marsh No. of Channel Mouth	8 years with no invasive <i>Spartina</i> (2017-2023)		0		0	0	0	0	2004	100%	n/a
01f: Pond 3 - AFCC	11/7	Backpack	0		0.002 m ²	0	0.002 m ²	0.1 m ²	2005	>99%	n/a
13a: Old Alameda Creek North Bank	8/24	Backpack	0		0.05 m ²	0	0.05 m ²	3 m ²	2005	>99%	n/a
13b: Old Alameda Creek Island	9/11	Backpack	0		0.5 m ²	0	0.5 m ²	12 m ²	2005	>99%	Increase (0.4 m ²)
13c: Old Alameda Creek South Bank	9/22; 10/5	Backpack	0		3 m ²	0	3 m ²	84 m ²	2005	>99%	Increase (1 m ²)
13d: Whale's Tail North Fluke	8/24; 9/6; 10/10	Backpack	0		2 m ²	0	2 m ²	32 m ²	2005	>99%	Increase (1 m ²)
13e: Whale's Tail South Fluke	10/5	Backpack	0		0.6 m ²	0	0.6 m ²	21 m ²	2005	>99%	Increase (0.5 m ²)
13f: Cargill Mitigation Marsh	10/5	Backpack	0		0.2 m ²	0	0.2 m ²	10 m ²	2004	>99%	Increase (0.1 m ²)
13g: Upstream of 20 Tide Gates	3 years with no invasive <i>Spartina</i> (2021-2023)		0		0	0	0	0	2005	100%	n/a
13h: Eden Landing - North Creek	9/21; 9/22	Backpack	0		0.8 m ²	0	0.8 m ²	26 m ²	2007	>99%	Increase (0.8 m ²)
13i: Eden Landing - Pond 10	9/6	Backpack	0		0.1 m ²	0	0.1 m ²	11 m ²	2008	>99%	Increase (0.1 m ²)
13j: Eden Landing - Mt Eden Creek	8/24; 9/5	Backpack	0		3 m ²	0	3 m ²	116 m ²	2009	>99%	Increase (0.2 m ²)
13k: Eden Landing Reserve South - North Creek Marsh	9/7; 9/11; 9/21-9/22; 9/25; 10/18	Backpack	0		361 m ²	0	361 m ²	2 acres	2009	16%	Increase (305 m ²)
13l: Eden Landing Reserve North - Mt Eden Creek Marsh	9/5-9/7	Backpack	0		146 m ²	0	146 m ²	0.9 acres	2010	11%	Increase (119 m ²)
13m: Eden Landing - Ponds E8A, E9, and E8X	8/10; 8/24; 9/11; 10/10	Backpack, Airboat	0		102 m ²	0	102 m ²	0.5 acres	2023	n/a	Increase (91 m ²)
21a: Ideal Marsh North	10/3	Backpack	0		0.1 m ²	0	0.1 m ²	8 m ²	2005	>99%	Increase (0.1 m ²)
21b: Ideal Marsh South	10/3	Backpack	0		20 m ²	0	20 m ²	133 m ²	2006	>99%	Increase (20 m ²)
REGION 5 TOTAL			0		640 m ²	0	640 m ²	3.6 acres	2004	>99%	Increase (532 m ²)

2023 Regional Tables

Split Sub-Area	2023 Treatment Dates	2023 Treatment Method	2023 Net <i>Spartina</i> Coverage By Species				All Invasive <i>Spartina</i> Cover				
			anglica	densiflora x foliosa	alterniflora x foliosa	densiflora	2023 Net Area	2023 Treat-ment Area	Peak Year	Net Area Decline	
										Since Peak	Since 2022
REGION 6: HAYWARD											
07a: Oro Loma Marsh - East	7/27-7/28; 9/18	Backpack	0	48 m ²	0	48 m ²	1011 m ²	2008	>99%	Increase (42 m ²)	
07b: Oro Loma Marsh - West	7/24; 7/27-7/28	Backpack	0	53 m ²	0	53 m ²	727 m ²	2005	>99%	Increase (7 m ²)	
20a: Oyster Bay Regional Shoreline	7/24; 10/18	Backpack	0	11 m ²	0	11 m ²	220 m ²	2004	>99%	Increase (11 m ²)	
20b: Oakland Metropolitan Golf Links	7/24	Backpack	0	0.9 m ²	0	0.9 m ²	27 m ²	2009	>99%	n/a	
20c: Dog Bone Marsh	10/18	Backpack	0	23 m ²	0	23 m ²	181 m ²	2006	>99%	Increase (22 m ²)	
20d.1: Citation Marsh South	10/19; 10/23-10/24	Truck, Backpack	0	76 m ²	0	76 m ²	0.3 acres	2004	98%	Increase (43 m ²)	
20d.2a: Citation Marsh Upper	8/16-8/18; 11/3; 11/7; 11/20; 12/4	Truck, Backpack	0	484 m ²	0	484 m ²	1.7 acres	2006	98%	Increase (262 m ²)	
20d.2b: Citation Marsh Central	8/17-8/18; 8/31-9/1; 9/18-9/19; 9/22; 10/4; 10/5; 11/1-11/3; 11/7	Truck, Backpack	0	4.2 acres	0	4.2 acres	26.9 acres	2006	39%	Increase (1.5 acres)	
20e: East Marsh	10/25	Backpack	0	7 m ²	0	7 m ²	170 m ²	2006	>99%	Increase (3 m ²)	
20f: North Marsh	Not treated 2023		0	6.9 acres	0	6.9 acres	59.6 acres	2006	62%	No change detected	
20g: Bunker Marsh	10/19; 10/23-10/25	Truck, Backpack	0	38 m ²	0	38 m ²	656 m ²	2004	>99%	Increase (20 m ²)	
20h.1: San Lorenzo Creek and Mouth North	10/23; 10/25	Backpack	0	0.08 m ²	0	0.08 m ²	3 m ²	2004	>99%	93%	
20h.2: San Lorenzo Creek and Mouth South	6/12-6/13; 10/23	Backpack	0	87 m ²	0	87 m ²	512 m ²	2004	>99%	16%	
20i: Bockmann Channel	7/24	Backpack	0	7 m ²	0	7 m ²	242 m ²	2004	>99%	Increase (6 m ²)	
20j: Sulphur Creek	7/28	Backpack	0	1 m ²	0	1 m ²	25 m ²	2004	98%	Increase (0.7 m ²)	
20k: Hayward Landing	7/24; 10/9	Backpack	0	0.03 m ²	0	0.03 m ²	1 m ²	2004	>99%	87%	
20l: Johnson's Landing	7/24	Backpack	0	0.2 m ²	0	0.2 m ²	8 m ²	2005	>99%	Increase (0.2 m ²)	
20m: Cogswell Marsh A	10/9	Backpack	0	3 m ²	0	3 m ²	123 m ²	2005	>99%	86%	
20n.1: Cogswell Marsh B Bayfront	9/7-9/8; 9/18; 10/3; 10/9	Truck, Backpack	0	66 m ²	0	66 m ²	0.4 acres	2005	>99%	47%	
20n.2: Cogswell Marsh B South	9/27; 9/29	Backpack	0	30 m ²	0	30 m ²	462 m ²	2005	>99%	46%	
20n.3: Cogswell Marsh B Main	8/21-8/24; 9/7-9/8; 9/18; 9/29; 10/3; 10/19	Truck, Backpack	0	0.7 acres	0	0.7 acres	9.7 acres	2005	98%	2%	
20o: Cogswell Marsh C	9/29; 10/9	Backpack	0	40 m ²	0	40 m ²	728 m ²	2005	>99%	35%	
20p: Hayward Shoreline Outliers	7/24	Backpack	0	0.05 m ²	0	0.05 m ²	5 m ²	2008	>99%	99%	
20q: San Leandro Shoreline Outliers	6/12; 10/18; 10/23-10/24	Backpack	0	14 m ²	0	14 m ²	34 m ²	2006	>99%	Increase (7 m ²)	
20r: Oakland Airport Shoreline and Channels	9/5	Backpack	0	0.9 m ²	0	0.9 m ²	39 m ²	2006	>99%	20%	
20s: H.A.R.D. Marsh	9/19; 10/9	Backpack	0	5 m ²	0	5 m ²	96 m ²	2006	98%	Increase (4 m ²)	
20t: San Leandro Marina	7/25; 8/3; 9/5	Backpack	0	4 m ²	0	4 m ²	46 m ²	2009	89%	Increase (4 m ²)	
20u: Estudillo Creek Channel	6/26; 7/5; 7/25	Truck, Backpack	0	204 m ²	0	204 m ²	0.6 acres	2010	74%	Increase (173 m ²)	
20v: Hayward Landing Canal	7/24	Backpack	0	1 m ²	0	1 m ²	25 m ²	2006	>99%	Increase (0.2 m ²)	
20w: Triangle Marsh	7/24; 10/9	Backpack	0	3 m ²	0	3 m ²	82 m ²	2007	77%	Increase (0.2 m ²)	
REGION 6 TOTAL			0	12.1 acres	0	12.1 acres	100.6 acres	2005	94%	Increase (1.6 acres)	

2023 Regional Tables

Split Sub-Area	2023 Treatment Dates	2023 Treatment Method	2023 Net <i>Spartina</i> Coverage By Species				All Invasive <i>Spartina</i> Cover				
			anglica	densiflora x foliosa	alterniflora x foliosa	densiflora	2023 Net Area	2023 Treat-ment Area	Peak Year	Net Area Decline	
										Since Peak	Since 2022
REGION 7: SAN LEANDRO BAY											
17a: Alameda Island South (Elsie Roemer Bird Sanctuary, Crown Memorial State Beach, Crab Cove)	10/2	Backpack	0	3 m ²	0	3 m ²	176 m ²	2006	>99%	Increase (3 m ²)	
17b: Bay Farm Island	6/22	Backpack	0	2 m ²	0	2 m ²	77 m ²	2005	>99%	Increase (1 m ²)	
17c.1: Arrowhead Marsh West	7/26; 8/14-8/15	Backpack, Airboat	0	706 m ²	0	706 m ²	2.6 acres	2005	98%	Increase (13 m ²)	
17c.2: Arrowhead Marsh East	Not treated 2023		0	3.6 acres	0	3.6 acres	19.9 acres	2006	78%	Increase (0.3 acres)	
17d.1: Fan Marsh Shoreline	7/26	Airboat	0	9 m ²	0	9 m ²	307 m ²	2004	>99%	Increase (4 m ²)	
17d.2: Airport Channel Shoreline	7/26; 8/15	Backpack	0	16 m ²	0	16 m ²	346 m ²	2005	>99%	1%	
17d.3: East Creek	7/26; 8/3	Backpack	0	16 m ²	0	16 m ²	132 m ²	2004	>99%	2%	
17d.4: Damon Marsh	7/24	Truck, Backpack	0	27 m ²	0	27 m ²	584 m ²	2006	>99%	52%	
17d.5: Damon Slough / Elmhurst Creek	7/24; 7/26; 8/3	Backpack	0	5 m ²	0	5 m ²	146 m ²	2005	>99%	81%	
17e.1: San Leandro Creek North	7/26	Backpack	0	0.3 m ²	0	0.3 m ²	11 m ²	2005	>99%	Increase (0.2 m ²)	
17e.2: San Leandro Creek South	7/26	Backpack	0	3 m ²	0	3 m ²	85 m ²	2005	>99%	62%	
17f: Oakland Inner Harbor	6/28; 7/24	Backpack	0	3 m ²	0	3 m ²	98 m ²	2007	>99%	56%	
17g: Coast Guard Island	6/28	Backpack	0	0.03 m ²	0	0.03 m ²	2 m ²	2007	>99%	n/a	
17h: MLK New Marsh	Not treated 2023		0	2.9 acres	0	2.9 acres	22.2 acres	2006	61%	18%	
17i: Coliseum Channels	6/29; 10/25	Backpack	0	17 m ²	0	17 m ²	356 m ²	2005	>99%	27%	
17j.1: Fan Marsh Wings	6/22	Backpack	0	3 m ²	0	3 m ²	80 m ²	2005	>99%	12%	
17j.2: Fan Marsh Main	9/1; 9/21; 11/7; 11/21; 12/4	Truck, Backpack	0	0.8 acres	0	0.8 acres	8.2 acres	2006	89%	4%	
17k: Airport Channel	7/26	Backpack, Airboat	0	0.6 m ²	0	0.6 m ²	20 m ²	2005	>99%	Increase (0.2 m ²)	
17l: Doolittle Pond	6/22	Backpack	0	0.8 m ²	0	0.8 m ²	20 m ²	2004	>99%	Increase (0.4 m ²)	
17m: Alameda Island (Aeolian Yacht Club and East Shore)	6/28; 7/25	Backpack	0	10 m ²	0	10 m ²	115 m ²	2006	>99%	17%	
17n: Doolittle Drive Mitigation Marsh	Not treated 2023		0	0.3 m ²	0	0.3 m ²	15 m ²	2023	n/a	n/a	
REGION 7 TOTAL			0	7.4 acres	0	7.4 acres	53.6 acres	2006	91%	5%	

2023 Regional Tables

Split Sub-Area	2023 Treatment Dates	2023 Treatment Method	2023 Net <i>Spartina</i> Coverage By Species				All Invasive <i>Spartina</i> Cover				
			anglica	densiflora x foliosa	alterniflora x foliosa	densiflora	2023 Net Area	2023 Treat-ment Area	Peak Year	Net Area Decline	
										Since Peak	Since 2022
REGION 8: BAY BRIDGE NORTH											
06a: Emeryville Crescent East	9/27; 10/11	Backpack	0	0.6 m ²	0	0.6 m ²	27 m ²	2005	>99%	85%	
06b: Emeryville Crescent West	9/27	Backpack	0	6 m ²	0	6 m ²	205 m ²	2004	>99%	40%	
10a: Whittell Marsh	9/15	Backpack	0	0.2 m ²	0	0.2 m ²	1 m ²	2005	>99%	92%	
10b: Southern Marsh	3 years with no Invasive <i>Spartina</i> (2021-2023)		0	0	0	0	0	2010	100%	n/a	
10c: Giant Marsh	10/3	Backpack	0	0.6 m ²	0	0.6 m ²	4 m ²	2005	>99%	80%	
10d: Breuner Marsh Restoration	No invasive <i>Spartina</i> 2023		0	0	0	0	0	2016	100%	100%	
22a: Wildcat Marsh	9/5; 10/3; 10/24	Backpack, Airboat	0	78 m ²	0	78 m ²	0.6 acres	2010	94%	Increase (53 m ²)	
22b.1: San Pablo Marsh East	9/5; 10/13	Backpack, Airboat	0	4 m ²	0	4 m ²	178 m ²	2009	>99%	3%	
22b.2: San Pablo Marsh West	10/11; 10/13; 11/7	Backpack, Airboat	0	6 m ²	0	6 m ²	182 m ²	2006	>99%	38%	
22c: Breuner Marsh (Rheem Creek)	9/5; 10/3	Backpack	0	12 m ²	0	12 m ²	390 m ²	2009	>99%	Increase (7 m ²)	
22d: Stege Marsh	No invasive <i>Spartina</i> 2023		0	0	0	0	0	2009	100%	100%	
22e: Hoffman Marsh	2 years with no invasive <i>Spartina</i> (2022-2023)		0	0	0	0	0	2004	100%	n/a	
22f: Richmond / Albany / Pinole Shoreline	9/19; 9/27	Backpack	0	10 m ²	0	10 m ²	311 m ²	2004	>99%	Increase (6 m ²)	
REGION 8 TOTAL			0	118 m ²	0	118 m ²	0.9 acres	2009	>99%	Increase (50 m ²)	

Split Sub-Area	2023 Treatment Dates	2023 Treatment Method	2023 Net <i>Spartina</i> Coverage By Species				All Invasive <i>Spartina</i> Cover				
			anglica	densiflora x foliosa	alterniflora x foliosa	densiflora	2023 Net Area	2023 Treat-ment Area	Peak Year	Net Area Decline	
										Since Peak	Since 2022
REGION 9: SUISUN											
11: Southampton Marsh	9/1; 9/29	Backpack	0		3 m ²	0	3 m ²	62 m ²	2005	>99%	Increase (1 m ²)
27a: Point Buckler	7/25	Backpack	0		0.09 m ²	0	0.09 m ²	7 m ²	2016	>99%	Increase (0.08 m ²)
27b: MOTCO Islands	7/25; 8/9; 10/16	Backpack	0		1 m ²	0	1 m ²	29 m ²	2017	>99%	51%
27c: Honker Bay	7/20; 8/8-8/9; 10/16	Backpack	0		4 m ²	0	4 m ²	74 m ²	2022	86%	86%
27d: MOTCO Mainland	6/21; 6/23	Backpack	0		0.1 m ²	0	0.1 m ²	9 m ²	2020	>99%	93%
REGION 9 TOTAL			0		8 m ²	0	8 m ²	181 m ²	2005	>99%	75%

2023 Regional Tables

Split Sub-Area	2023 Treatment Dates	2023 Treatment Method	2023 Net <i>Spartina</i> Coverage By Species				All Invasive <i>Spartina</i> Cover				
			anglica	densiflora x foliosa	alterniflora x foliosa	densiflora	2023 Net Area	2023 Treat-ment Area	Peak Year	Net Area Decline	
										Since Peak	Since 2022
REGION 10: VALLEJO											
26a: White Slough / Napa River	13 years with no invasive <i>Spartina</i> (2011-2023)		0	0	0	0	0	2008	100%	n/a	
26b: San Pablo Bay NWR and Mare Island	6/28	Backpack	0	0.6 m ²	0	0.6 m ²	10 m ²	2009	>99%	70%	
26c: Sonoma Creek	6/28	Backpack	0	0.5 m ²	0	0.5 m ²	6 m ²	2010	>99%	Increase (0.5 m ²)	
26d: Sonoma Baylands	13 years with no invasive <i>Spartina</i> (2011-2023)		0	0	0	0	0	2008	100%	n/a	
REGION 10 TOTAL			0	1 m ²	0	1 m ²	16 m ²	2009	>99%	43%	

Split Sub-Area	2023 Treatment Dates	2023 Treatment Method	2023 Net <i>Spartina</i> Coverage By Species				All Invasive <i>Spartina</i> Cover				
			anglica	densiflora x foliosa	alterniflora x foliosa	densiflora	2023 Net Area	2023 Treat-ment Area	Peak Year	Net Area Decline	
										Since Peak	Since 2022
REGION 11: PETALUMA											
24a: Upper Petaluma River - Upstream of Grey's Field	9/6; 10/16	Backpack, Airboat	0		3 m ²	0	3 m ²	105 m ²	2007	>99%	3%
24b: Grey's Field	3 years with no invasive <i>Spartina</i> (2021-2023)		0		0	0	0	0	2009	100%	n/a
24c: Petaluma Marsh	9/6	Backpack, Airboat	0		0.001 m ²	0	0.001 m ²	0.1 m ²	2010	>99%	99.9%
24d: Lower Petaluma River - Downstream of San Antonio Creek	No Invasive <i>Spartina</i> Ever Detected		0		0	0	0	0	n/a	n/a	n/a
REGION 11 TOTAL			0		3 m ²	0	3 m ²	105 m ²	2007	>99%	29%

Split Sub-Area	2023 Treatment Dates	2023 Treatment Method	2023 Net <i>Spartina</i> Coverage By Species				All Invasive <i>Spartina</i> Cover				
			anglica	densiflora x foliosa	alterniflora x foliosa	densiflora	2023 Net Area	2023 Treat-ment Area	Peak Year	Net Area Decline	
										Since Peak	Since 2022
REGION 12: OUTER COAST											
25a: Tom's Point, Tomales	2/2/24	Dug	0	0	0.002 m ²	0.002 m ²	0.03 m ²	2010	>99%	79%	
25b: Limantour Estero	12 years with no invasive <i>Spartina</i> (2012-2023)		0	0	0	0	0	2010	100%	n/a	
25c: Drakes Estero	11 years with no invasive <i>Spartina</i> (2013-2023)		0	0	0	0	0	2007	100%	n/a	
25d: Bolinas Lagoon, North	5 years with no invasive <i>Spartina</i> (2019-2023)		0	0	0	0	0	2012	100%	n/a	
25e: Bolinas Lagoon, South	11 years with no invasive <i>Spartina</i> (2013-2023)		0	0	0	0	0	2004	100%	n/a	
REGION 12 TOTAL			0	0	0.002 m ²	0.002 m ²	0.03 m ²	2007	>99%	79%	

2023 Post-season Inventory Plan Update

2023 Plan for *Spartina* Inventory Monitoring

Below is a complete list of ISP sub-areas, organized by Reporting Region, showing the level of inventory intended at each during the 2023 *Spartina* Inventory Monitoring Season. This list was finalized in August 2023 as the Inventory Plan for the season; it was then updated at the end of season to reflect deviations from the August Plan. FOR UPDATE--Colors on the list indicate where inventory was completed at a level that deviated from the Plan: "Complete" (green) inventory where none or partial was planned; "Partial" (blue) inventory where none or complete was planned; "None" (orange) where no inventory was completed as planned in 2023.

12/8/2023

Sub-area	REGION 1: MARIN	2023 Planned Inventory Coverage	2023 Completed Inventory Coverage	2023 Completed Inventory Approach	Inventory Boundary Detail (where needed) and Notes
03a	Blackie's Creek (above bridge)	Complete	Complete	Thorough Inventory	
03b	Blackie's Creek Mouth	Complete	Complete	Thorough Inventory	
04a	Corte Madera Ecological Reserve	Partial	Partial	Historics Only (hybrid); Thorough Inventory (densi)	Thorough survey 2022
04b	College of Marin Ecological Study Area	Complete	Complete	Thorough Inventory	Very little infestation pressure; complete during densi
04c	Piper Park East	Complete	Complete (more)	Coarse Mapping (hybrid); Thorough Inventory (densi)	Added coarse inventory for hybrid 2023
04d	Piper Park West	Complete	Complete (more)	Coarse Mapping (hybrid); Thorough Inventory (densi)	Added coarse inventory for hybrid 2023
04e	Larkspur Ferry Landing Area	Complete	Complete	Thorough Inventory	
04f	Riviera Circle	Complete	Complete	Thorough Inventory	
04g	Creekside Park	Complete	Complete	Thorough Inventory	
04h	Upper Corte Madera Creek (Above Bon Air Rd)	Complete	Complete	Thorough Inventory	
04i	Lower Corte Madera Creek (Bon Air Rd to HWY 101)	Complete	Complete	Thorough Inventory	
04j.1	Corte Madera Creek Mouth - North Bank	Complete	Complete	Thorough Inventory	
04j.2	Corte Madera Creek Mouth - South Bank	Complete	Complete	Thorough Inventory	
04k	Boardwalk No. 1 (Arkites)	Complete	Complete (more)	Coarse Mapping (hybrid); Thorough Inventory (densi)	Added kayak survey for hybrid 2023
04l	Murphy Creek	Complete	Complete	Densi only	Very little infestation pressure; completed during densi
09	Tiscornia Marsh / Pickleweed Park	Complete	Complete	Thorough Inventory	Completed early for early treatment
23a	Brickyard Cove	Partial	Complete	Thorough Inventory	Knight Drive Complete Northern Marsh Scanned from all sides. Sup-optimal habitat Bayfront Shoreline Complete
23b	Beach Drive	Complete	Complete	Thorough Inventory	
23c	Loch Lomond Marina	Complete	Complete	Thorough Inventory	Completed early for early treatment
23d.1	San Rafael Canal Mouth East	Complete	Complete	Thorough Inventory	Completed in prime growing season
23d.2	San Rafael Canal Mouth West	Complete	Complete	Thorough Inventory	Completed in prime growing season
23e	Muzzi and Martas Marsh	Complete	Complete	Thorough Inventory	Completed in prime growing season
23f	Paradise Cay	Partial	Partial	Historics Only (hybrid); Thorough Inventory (densi)	
23g	Greenwood Cove	Complete	Complete	Thorough Inventory	
23h	Strawberry Point	Complete	Complete	Thorough Inventory	
23i	Strawberry Cove	Complete	Complete	Thorough Inventory	
23j	Bothin Marsh	Partial	Partial	Historic Zone Only	Northern Marsh Sections Complete Southern Marsh None. Thorough survey 2020
23k	Sausalito	None	None	n/a	Thorough survey 2022
23l	Starkweather Park	None	None	n/a	Thorough survey 2022
23m	Novato	None	None	n/a	Gallinas Creek Watershed thoroughly surveyed on foot 2016; 2020 foot+kayak. None 2021-22 Novato Shoreline-North None. Surveyed by CDFA airboat 2018, 2020-22 Novato Shoreline - South and McInnis None. Surveyed by CDFA airboat 2018, 2020-22
23n	Triangle Marsh and shoreline	Complete	Complete	Thorough Inventory	
23o	China Camp	Partial	Partial	Historic Zone only	Thorough survey 2021
n/a	Hamilton Wetlands	None	None	n/a	Complete if CDFA airboat available. Surveyed by CDFA airboat 2018, 2020-2022
n/a	Fort Baker	None	None	n/a	Surveyed 2022
n/a	Tiburon	Complete	None	None	Surveyed 2017 by whaler
n/a	Bel Marin Keys	None	None	n/a	Thorough survey 2022
n/a	East Marin Island	None	None	n/a	Surveyed 2021 by whaler
n/a	Point San Pedro	Complete	Partial	Thorough Inventory	Northern Shoreline walked and scanned Southern Shoreline None. Surveyed 2017 by whaler
n/a	Point San Quentin	Complete	None	None	Not surveyed since 2011; suboptimal habitat
Sub-area	REGION 2: SAN FRANCISCO PENINSULA	2023 Planned Inventory Coverage	2023 Completed Inventory Coverage	2023 Completed Inventory Approach	Inventory Boundary Detail (where needed) and Notes
12a	Pier 94	Complete	Complete	Thorough Inventory	
12b	Pier 98 / Heron's Head	Complete	Complete	Thorough Inventory	
12c	India Basin	Complete	Complete	Thorough Inventory	
12d	Hunters Point Naval Reserve	None	None	None	Western embayment (historical zone) scanned with binoculars from across cove 2022
12e	Yosemite Channel	Partial	Partial	Historics Only	Thorough survey 2022. Simultaneous inventory and treatment
12f	Candlestick Cove	Complete	Complete	Thorough Inventory	
12g	Crissy Field	Complete	Complete	Thorough Inventory	Crissy Field Zero Detect since 2015 Quartermaster Reach Added 2021; never infested Angel Island <i>Spartina</i> never detected; suboptimal habitat Yerba Buena Island Zero Detect since 2011
12h	Yerba Buena Island	None	None	None	
12i	Mission Creek	Complete	Complete	Thorough Inventory	
18a	Colma Creek	Complete	Complete	Thorough Inventory	
18b	Navigable Slough	Complete	Complete	Thorough Inventory	
18c	Old Shipyard	Complete	Complete	Thorough Inventory	
18d	Inner Harbor	Complete	Complete	Thorough Inventory	
18e	Sam Trans Peninsula	Complete	Complete	Thorough Inventory	
18f	Confluence Marsh	Complete	Complete	Thorough Inventory	
18g	San Bruno Marsh	Complete	Complete	Thorough Inventory	
18h	San Bruno Creek	Complete	Complete	Thorough Inventory	
19a	Brisbane Lagoon	Complete	Complete	Thorough Inventory	
19b	Sierra Point	Complete	Complete	Thorough Inventory	
19c	Oyster Cove	Complete	Complete	Thorough Inventory	
19d	Oyster Point Marina	Complete	Complete	Thorough Inventory	
19e	Oyster Point Park	Complete	Complete	Thorough Inventory	
19f	Point San Bruno	Complete	Complete	Thorough Inventory	
19g	Seaplane Harbor	Partial	Complete	Thorough Inventory	Not completely inventoried 2021-22. Simultaneous inventory and treatment 2023.

2023 Post-season Inventory Plan Update

19h	SFO	Partial	Complete	Thorough Inventory	Simultaneous inventory and treatment
19i	Mills Creek Mouth	None	None	None	Thorough survey 2022. No infestation since 2020.
19j	Easton Creek Mouth	Partial	Partial	Historics Only	Thorough survey 2022. Simultaneous inventory and treatment
19k	Sanchez Marsh	Complete	Complete	Thorough Inventory	
19l	Burlingame Lagoon	Complete	Complete	Thorough Inventory	
19m	Fisherman's Park	Complete	Complete	Thorough Inventory	
19n	Coyote Point Marina / Marsh	Complete	Complete	Thorough Inventory	
19o	San Mateo Creek / Ryder Park	Complete	Complete	Thorough Inventory	
19p	Seal Slough Mouth - Central Marsh	Partial	Partial	Historics Only	Thorough survey 2022. Simultaneous inventory and treatment
19p	Seal Slough Mouth - Peripheral Marshes	Partial	Partial	Historics Only	Thorough survey 2022. Simultaneous inventory and treatment
19r	Anza Lagoon	Complete	Complete	Thorough Inventory	
Sub-area	REGION 3: SAN MATEO	2023 Planned Inventory Coverage	2023 Completed Inventory Coverage	2023 Completed Inventory Approach	Inventory Boundary Detail (where needed) and Notes
02a.1a	Belmont Slough Mouth	Complete	Complete	Thorough Inventory	Not fully inventoried 2022
02a.1b	Belmont Slough Mouth South	Complete	Complete	Thorough Inventory	Not fully inventoried 2022
02a.2	Upper Belmont Slough and Redwood Shores	Partial	Partial	Thorough Inventory; Historics Only	Interior shorelines Scan Billboard Historics only. Thorough survey 2022. Simultaneous inventory and treatment Upper Slough Complete
02a.3	Bird Island	Complete	Complete	Thorough Inventory	Not fully inventoried 2022
02a.4	Redwood Shores Mitigation Bank	Complete	Complete	Thorough Inventory	
02b.1	Corkscrew Slough	Complete	Complete	Thorough Inventory	
02b.2	Steinberger Slough South, Redwood Creek Northwest	Complete	Partial	Thorough Inventory	Steinberger Slough Eastern shoreline incomplete Upper Redwood Creek Complete Redwood Creek Mouth Bayfront incomplete
02c.1a	B2 North Quadrant West	None	None	n/a	Thoroughly inventoried in 2022
02c.1b	B2 North Quadrant East	Complete	Complete	Coarse Mapping	First time mapping 100% point/line/poly (not grid)
02c.2	B2 North Quadrant South	Complete	Complete	Coarse Mapping	
02d.1a	B2 South Quadrant West	Complete	Complete	Thorough Inventory	Not inventoried or treated 2022
02d.1b	B2 South Quadrant East	Complete	Complete	Thorough Inventory	Not inventoried or treated 2022
02d.2	B2 South Quadrant (2)	Complete	Complete	Thorough Inventory	Not inventoried or treated 2022
02d.3	B2 South Quadrant (3)	Complete	Complete	Thorough Inventory	Not inventoried or treated 2022
02e	West Point Slough NW	Complete	Complete	Thorough Inventory	
02f	Greco Island North	Partial	Partial (different than planned)	Thorough Inventory	Central Strip around boardwalk Mostly incomplete Bayfront Mostly complete Bayou Mostly complete
02g	West Point Slough SW and East	Partial	Partial	Thorough Inventory; Historics Only	Westpoint Slough Complete Bedwell Bayfront Park Historics only. Thorough survey 2022. Simultaneous inventory and treatment
02h	Greco Island South	Complete	Complete	Thorough Inventory	
02i	Ravenswood Slough and Mouth	Complete	Complete	Thorough Inventory	
02j.1	Ravenswood Open Space Preserve (N of Hwy 92)	Complete	Complete	Thorough Inventory	
02k	Redwood Creek and Deepwater Slough	Complete	Complete	Thorough Inventory	
02l	Inner Bair	Complete	Complete	Thorough Inventory	
02m	Pond B3	Complete	Complete	Coarse Mapping	Surveyed with SOLitude airboat during treatment
02o	Central Bair	Complete	Complete	Coarse Mapping	Surveyed with SMC/SOLitude airboats during treatment
19q	Foster City	Complete	Complete	Thorough Inventory	
19s	Maple Street Channel	None	Complete	Thorough Inventory	Densi dig in June; no <i>Spartina</i> present
Sub-area	REGION 4: DUMBARTON SOUTH	2023 Planned Inventory Coverage	2023 Completed Inventory Coverage	2023 Completed Inventory Approach	Inventory Boundary Detail (where needed) and Notes
02j.2	Ravenswood Open Space Preserve (S of Hwy 92)	Complete	Complete	Thorough Inventory	
02n	SF2	Complete	Complete	Thorough Inventory	Interior scan from levees Perimeter on foot
05a.1	Mowry Marsh and Slough	Complete	Complete	Thorough Inventory	Not inventoried or treated 2022
05a.2	Calaveras Marsh	Partial	Complete	Thorough Inventory	Fringe early season inventory during treatment
05b	Dumbarton/Audubon	Complete; Partial	Complete; Partial	Thorough Inventory; Historics Only	Dumbarton Complete Audubon Complete Railroad Historics only. Simultaneous inventory and treatment Barge Historics only. Simultaneous inventory and treatment
05c.1	Newark Slough West	Partial	Partial	Historics Only	Thorough survey 2022. Simultaneous inventory and treatment
05c.2	Newark Slough East	Partial	Partial	Historics Only	Thorough survey 2022. Simultaneous inventory and treatment
05d	LaRiviere Marsh	Partial	Partial	Historics Only	Thorough survey 2022. Simultaneous inventory and treatment
05e	Mayhew's Landing	Partial	Partial	Historics Only	Thorough survey 2022. Simultaneous inventory and treatment
05f	Coyote Creek - Alameda County	Complete	Complete	Thorough Inventory	w/airboat
05g	Cargill Pond (W Hotel)	Partial	Partial	Historics Only	Thorough survey 2022. Simultaneous inventory and treatment
05h	Plummer Creek Mitigation Marsh	Partial	Partial	Historics Only	Thorough survey 2022. Simultaneous inventory and treatment
05i	Island Ponds	Complete; Partial	Complete; Partial	Thorough Inventory; Historics Only	A19 Simultaneous inventory and treatment. Completed with airboat and walking at higher tide; Late in season A20 Historic clone only. Thorough survey 2022. A21 Historic zones only; Prime growing season
08	Palo Alto Baylands	Complete; Partial	Complete; Partial	Thorough Inventory; Historics Only	Baylands Complete Harbor Complete Harriet Mundy Historics only. Thorough survey 2022. Simultaneous inventory and treatment
15a.1	Charleston Slough to Mountainview Slough	Partial	Partial	Historics Only	Thorough survey 2022. Simultaneous inventory and treatment
15a.2	Stevens Ck to Guadalupe Slough	Partial	Partial	Historics Only	Thorough survey 2022. Simultaneous inventory and treatment
15a.3	Guadalupe Slough	Partial	Partial	Historics Only	Thorough survey 2022. Simultaneous inventory and treatment
15a.4	Alviso Slough	Complete; Partial	Complete; Partial	Coarse Mapping; Historics Only	Mouth Complete Ogilvie Complete Upper Slough Historics Only. Thorough survey 2022. Simultaneous inventory and treatment
15a.5	Coyote Creek to Artesian Slough	Complete	Complete	Thorough Inventory	w/airboat
15a.6	Knapp Tract	Complete	Complete	Thorough Inventory	Complete at 8' tide w/airboat
15a.7	Pond A17	Complete	Complete	Thorough Inventory	Complete at >6' tide w/airboat
15b	Faber / Laumeister Marsh	Partial	Partial	Historics Only	Thorough survey 2022. Simultaneous inventory and treatment
15c	Shoreline Regional Park	Partial	Partial	Historics Only	Thorough survey 2022. Simultaneous inventory and treatment

2023 Post-season Inventory Plan Update

15d	Sunnyvale Baylands	Partial	Partial	Historics Only	AB1:AB2 Historic A2-A3 None. Thorough survey 2022.
16.1	Cooley Landing Central	Complete	Complete	Thorough Inventory	
16.2	Cooley Landing East	Complete	Complete	Coarse Mapping	
n/a	Ponds A5, A7, A8, A8S	None	None	n/a	Perimeter walked 2021; no tidal action since 2015
Sub-area	REGION 5: UNION CITY	2023 Planned Inventory Coverage	2023 Completed Inventory Coverage	2023 Completed Inventory Approach	Inventory Boundary Detail (where needed) and Notes
01a	Channel Mouth	Complete	Complete	Thorough Inventory	
01b	Lower Channel	Complete	Complete	Thorough Inventory	Not inventoried or treated 2022
01c	Upper Channel	Complete	Complete	Thorough Inventory	Not inventoried or treated 2022
01d	Upper Channel - Union City Blvd to I-880	Complete	Complete	Thorough Inventory	Not inventoried or treated 2022
01e	Strip Marsh No. of Channel Mouth	Complete	Complete	Thorough Inventory	
01f	Pond 3 - AFCC	Complete	Complete	Thorough Inventory	Not inventoried or treated 2022
13a	Old Alameda Creek North Bank	Complete	Complete	Thorough Inventory	Not completely inventoried or treated 2022
13b	Old Alameda Creek Island	Complete	Complete	Thorough Inventory	Not completely inventoried or treated 2022
13c	Old Alameda Creek South Bank	Complete	Complete	Thorough Inventory	Not completely inventoried or treated 2022
13d	Whale's Tail North Fluke	Complete	Complete	Thorough Inventory	
13e	Whale's Tail South Fluke	Complete	Complete	Thorough Inventory	
13f	Cargill Mitigation Marsh	Complete	Complete	Thorough Inventory	
13g	Upstream of 20 Tide Gates	Complete	Complete	Thorough Inventory	Not inventoried or treated 2022
13h	Eden Landing - North Creek	Complete	Complete	Thorough Inventory	
13i	Eden Landing - Pond 10	Partial	Partial	Historics Only	Southern Portion Complete inventory where now hydrologically connected to Mt Eden Creek
13j	Eden Landing - Mt Eden Creek	Complete	Complete	Thorough Inventory	Main Pond Scan from southern and western levees
13k	Eden Landing Reserve South - North Creek Marsh	Complete	Complete	Thorough Inventory	
13l	Eden Landing Reserve North - Mt Eden Creek Marsh	Complete	Complete	Thorough Inventory	
13m	Eden Landing - Ponds E8A, E9, and E8X	Complete	Complete	Thorough Inventory	
21a	Ideal Marsh North	Partial	Partial	Historics Only	Historics only. Thorough survey 2022. Simultaneous inventory and treatment
21b	Ideal Marsh South	Partial	Partial	Historics Only	Historics only. Thorough survey 2022. Simultaneous inventory and treatment
Sub-area	REGION 6: HAYWARD	2023 Planned Inventory Coverage	2023 Completed Inventory Coverage	2023 Completed Inventory Approach	Inventory Boundary Detail (where needed) and Notes
07a	Oro Loma Marsh - East	Complete	Complete	Thorough Inventory	R2 in reveg zone
07b	Oro Loma Marsh - West	Complete	Complete	Coarse Mapping	
20a	Oyster Bay Regional Shoreline	Complete	Complete	Thorough Inventory	
20b	Oakland Metropolitan Golf Links	Complete	Complete	Thorough Inventory	
20c	Dog Bone Marsh	Complete	Complete	Coarse Mapping	
20d.1	Citation Marsh South	Complete	Complete	Coarse Mapping	
20d.2a	Citation Marsh Upper	Complete	Complete	Coarse Mapping	
20d.2b	Citation Marsh Central	Complete	Complete	Grids	Informed first year of resumed treatment as part of Phase 2
20e	East Marsh	Complete	Complete	Coarse Mapping	
20f	North Marsh	Complete	Partial	Grids	Assessed partially by grid and extrapolated (vegetation too dense to walk through)
20g	Bunker Marsh	Complete	Complete	Coarse Mapping	
20h.1	San Lorenzo Creek and Mouth North	Complete	Complete	Coarse Mapping	
20h.2	San Lorenzo Creek and Mouth South	Complete	Complete	Coarse Mapping	
20i	Bockmann Channel	Complete	Complete	Thorough Inventory	
20j	Sulphur Creek	Complete	Complete	Thorough Inventory	
20k	Hayward Landing	Complete	Complete	Thorough Inventory	
20l	Johnson's Landing	Complete	Complete	Thorough Inventory	
20m	Cogswell Marsh A	Complete	Complete	Thorough Inventory	
20n.1	Cogswell Marsh B Bayfront	Complete	Complete	Coarse Mapping	
20n.2	Cogswell Marsh B South	Complete	Complete	Coarse Mapping	
20n.3	Cogswell Marsh B Main	Complete	Complete	Grids	Informed first year of resumed lethal (not seed suppression) treatment as part of Phase 2
20o	Cogswell Marsh C	Complete	Complete	Coarse Mapping	
20p	Hayward Shoreline Outliers	Complete	Complete	Coarse Mapping	
20q	San Leandro Shoreline Outliers	Complete	Complete	Coarse Mapping	
20r	Oakland Airport Shoreline and Channels	Complete	Partial	Historics Only	Simultaneous inventory and treatment
20s	H.A.R.D. Marsh	Complete	Complete	Thorough Inventory	
20t	San Leandro Marina	Complete	Complete	Thorough Inventory	
20u	Estudillo Creek Channel	Complete	Complete	Thorough Inventory	
20v	Hayward Landing Canal	Complete	Complete	Thorough Inventory	
20w	Triangle Marsh	Complete	Complete	Thorough Inventory	
Sub-area	REGION 7: SAN LEANDRO BAY	2023 Planned Inventory Coverage	2023 Completed Inventory Coverage	2023 Completed Inventory Approach	Inventory Boundary Detail (where needed) and Notes
17a	Alameda Island South (Elsie Roemer Bird Sanctuary, Crown Memorial State Beach, Crab Cove)	Complete	Complete	Thorough Inventory	Elsie Roemer: Complete inventory around foliosa plantings + R2
17b	Bay Farm Island	Complete	Complete	Coarse Mapping	
17c.1	Arrowhead Marsh West	Complete	Complete	Grids	Infestation wide spread enough to not warrant point/line/poly inventory
17c.2	Arrowhead Marsh East	Complete	Complete	Grids	
17d.1	Fan Marsh Shoreline	Complete	Complete	Coarse Mapping	
17d.2	Airport Channel	Complete	Complete	Coarse Mapping	
17d.3	East Creek	Complete	Complete	Coarse Mapping	
17d.4	Damon Marsh	Complete	Complete	Coarse Mapping	
17d.5	Damon Slough / Elmhurst Creek	Complete	Complete	Coarse Mapping	
17e.1	San Leandro Creek North	Complete	Complete	Thorough Inventory	
17e.2	San Leandro Creek South	Complete	Complete	Thorough Inventory	
17f	Oakland Inner Harbor	Complete	Complete	Thorough Inventory	
17g	Coast Guard Island	Complete	Complete	Thorough Inventory	
17h	MLK New Marsh	Complete	Complete	Grids	
17i	Coliseum Channels	Complete	Complete	Coarse Mapping	
17j.1	Fan Marsh Wings	Complete	Complete	Coarse Mapping	
17j.2	Fan Marsh Main	Complete	Complete	Grids	Informed first year of resumed treatment as part of Phase 2
17k	Airport Channel	Complete	Complete	Coarse Mapping	
17l	Doolittle Pond	Complete	Complete	Coarse Mapping	
17m	Alameda Island (Aeolian Yacht Club and East Shore)	Complete	Complete	Coarse Mapping	
Sub-area	REGION 8: BAY BRIDGE NORTH	2023 Planned Inventory Coverage	2023 Completed Inventory Coverage	2023 Completed Inventory Approach	Inventory Boundary Detail (where needed) and Notes

2023 Post-season Inventory Plan Update

06a	Emeryville Crescent East	Partial	Partial	Historics Only	Historics only. Thorough survey 2022. Simultaneous inventory and treatment
06b	Emeryville Crescent West	Complete	Complete	Thorough Inventory	
10a	Whittel Marsh	Complete	Complete	Thorough Inventory	
10b	Southern Marsh	Complete	Complete	Thorough Inventory	
10c	Giant Marsh	Complete	Complete	Thorough Inventory	
10d	Breuner Marsh Restoration	Complete	Complete	Thorough Inventory	
22a	Wildcat Marsh	Partial	Partial	Thorough Inventory	Shorelines Complete. Airboat assistance 2023
22b.1	San Pablo Marsh East	Complete	Complete	Thorough Inventory	Interior None. Historics only. Thorough survey 2022. Simultaneous inventory and treatment
22b.2	San Pablo Marsh West	Partial	Complete	Thorough Inventory	
22c	Breuner Marsh (Rheem Creek)	Complete	Complete	Thorough Inventory	
22d	Steger Marsh	Partial	Complete	Thorough Inventory	
22e	Hoffman Marsh	None	Complete	Thorough Inventory	
22f	Richmond / Albany / Pinole Shoreline	Partial	Partial	Historics Only	Pinole, Rodeo, Hercules Historics only. Crockett Shorelines None. West of Carquinez Bridge completed by whaler 2022 Brooks Island Complete during annual shorebird surveys Albany Shoreline Historics only Point San Pablo Harbor None. Thorough survey 2022. Steger Marsh Channels None. Thorough survey 2021 Point Richmond Marina None. Thorough survey 2021 Point Molate & Western Shoreline None. Thorough survey 2020 Castro Cove Historics only
n/a	Berkeley Aquatic Park	None	None	n/a	Thorough survey 2021
Sub-area	REGION 9: SUISUN	2023 Planned Inventory Coverage	2023 Completed Inventory Coverage	2023 Completed Inventory Approach	Inventory Boundary Detail (where needed) and Notes
11	Southampton Marsh	Partial	Complete	Thorough Inventory	Historics only in 2024
27a	Point Buckler	Complete	Complete	Thorough Inventory	
27b	MOTCO Islands	Complete	Complete	Thorough Inventory	
27c	Honker Bay	Complete	Complete	Thorough Inventory	Accessed Wheeler Island for first time
27d	MOTCO mainland shoreline	Complete	Complete	Thorough Inventory	
n/a	Suisun Bay Marshes	Complete	None	None	Grizzly Bay None. Not surveyed since 2017
n/a	Benicia Shoreline	None	Partial	n/a	Western Shoreline kayaked 2023. Thorough survey 2021
Sub-area	REGION 10: VALLEJO	2023 Planned Inventory Coverage	2023 Completed Inventory Coverage	2023 Completed Inventory Approach	Inventory Boundary Detail (where needed) and Notes
26a	White Slough / Napa River	None	Partial	Thorough Inventory	American Canyon None. Thorough survey 2020 Napa River Complete Napa River Mouth Complete (till Vallejo) Vallejo None. Thorough survey 2022 White Slough Complete Napa Sonoma Marshes None. Extensive survey w/CDFA airboat 2022
26b	San Pablo Bay NWR and Mare Island	Partial	Complete	Thorough Inventory	Completed on foot 2023. Completed on foot and w/CDFA airboat 2022
26c	Sonoma Creek	Partial	Partial	Historics Only	Surveyed w/CDFA airboat 2022
26d	Sonoma Baylands	None	None	n/a	Surveyed w/CDFA airboat 2022
n/a	Cullinan Ranch	None	None	n/a	Surveyed 2019 w/USFWS airboat; Assessed 2022 by CDFA airboat
Sub-area	REGION 11: PETALUMA	2023 Planned Inventory Coverage	2023 Completed Inventory Coverage	2023 Completed Inventory Approach	Inventory Boundary Detail (where needed) and Notes
24a	Upper Petaluma River - Upstream of Grey's Field	Complete	Complete	Thorough Inventory	Survey on foot with whaler support
24b	Grey's Field	Partial	None	None	Thorough survey 2022
24c	Petaluma Marsh	Partial	Partial	Historics Only	Surveyed main slough and all accessible channels w/CDFA airboat 2022
24d	Lower Petaluma River - Downstream of San Antonio Creek	None	None	n/a	Point Sonoma Marina Completed 2022 Bahia Restoration, Petaluma River Black John Slough-North, Petaluma River Black John Slough-South, Petaluma River Carl's Marsh, Rush Creek All No survey: Low Risk of Infestation >3.5 km
Sub-area	REGION 12: OUTER COAST	2023 Planned Inventory Coverage	2023 Completed Inventory Coverage	2023 Completed Inventory Approach	Inventory Boundary Detail (where needed) and Notes
25a	Tom's Point, Tomales	Complete	Complete; None	Thorough Inventory	Tom's Point surveyed for <i>S. densiflora</i> only Hog Island Oyster Farm surveyed for <i>S. densiflora</i> only Tomales Bay, Walker Creek, Giacomini, Bivalve None (rained out). Not surveyed since 2015
25b	Limantour Estero	None	None	n/a	Thorough survey 2021
25c	Drakes Estero	None	None	n/a	Thorough survey 2021
25d	Bolinas Lagoon, North	Partial	Partial	Historics only	Northern and Eastern shorelines Complete inventory Western shoreline None; no infestation history
25e	Bolinas Lagoon, South	None	None	n/a	Southern Marsh Thorough survey 2021 Housing shoreline Last completed in 2019
n/a	Bodega Bay	None	Partial	Thorough Inventory	Southwestern Shoreline Complete Remainder of Bay Not surveyed since 2010; Very low risk of infestation
n/a	Dillon Beach	None	None	n/a	Not surveyed since 2009; Very low risk of infestation

2024 Post-season Inventory Plan Update

2024 Plan for *Spartina* Inventory Monitoring Post-Season Update

Below is a complete list of ISP sub-areas, organized by Reporting Region, showing the level of inventory intended and completed at each during the 2024 *Spartina* Inventory Monitoring Season. This was finalized in June 2024 as the Inventory Plan for the season; it was then updated at the end of season to reflect deviations from the June Plan. FOR UPDATE--Colors on the list indicate where inventory was completed at a level that deviated from the Plan: "Complete" (green) inventory where none or partial was planned; "Partial" (blue) inventory where none or complete was planned; "None" (orange) where no inventory was completed where it was intended to be surveyed in 2024.

NOTE--Marshes (inventory boundaries with no ISP "Sub-area" designation) are included here because inventory monitoring is required to detect infestation where it has not yet occurred and to protect those spaces; ISP "sub-areas" are only designated once infestations are detected and require treatment.

11/13/2024

Sub-area	REGION 1: MARIN	2024 Planned Inventory Coverage	2024 Completed Inventory Coverage	2024 Completed Inventory Approach	Inventory Boundary Detail (where needed) and Notes
03a	Blackie's Creek (above bridge)	None	None	n/a	Survey twice per season for <i>S. densiflora</i>
03b	Blackie's Creek Mouth	None	None	n/a	Survey twice per season for <i>S. densiflora</i>
04a	Corte Madera Ecological Reserve	Partial	Partial	Historics Only	Thorough survey 2022
04b	College of Marin Ecological Study Area	Partial	Partial	Historics Only	Very little infestation pressure; complete during densi
04c	Piper Park East	None	None	n/a	Completed coarse inventory for hybrid 2023
04d	Piper Park West	None	None	n/a	Completed coarse inventory for hybrid 2023
04e	Larkspur Ferry Landing Area	Complete	Complete	Thorough Inventory	
04f	Riviera Circle	Complete	Partial	Scanned from opposited shorelines	No hybrid <i>S. alterniflora</i> presence for 5+ years
04g	Creekside Park	Complete	Complete	Thorough Inventory	Through inventory for hybrid <i>S. alterniflora</i> during <i>S. densiflora</i>
04h	Upper Corte Madera Creek (Above Bon Air Rd)	Partial	Partial	Historics Only	
04i	Lower Corte Madera Creek (Bon Air Rd to HWY 101)	Partial	Partial	Historics Only	Lucky Drive Thorough inventory
04j.1	Corte Madera Creek Mouth - North Bank	Complete	Complete	Thorough Inventory	
04j.2	Corte Madera Creek Mouth - South Bank	Complete	Complete	Thorough Inventory	
04k	Boardwalk No. 1 (Arkites)	None	None	None	Completed kayak survey for hybrid 2023; Survey twice per season for <i>S. densiflora</i>
04l	Murphy Creek	None	None	None	Very little infestation pressure; completed during densi
09	Tisconia Marsh / Pickleweed Park	Complete	Complete	Thorough Inventory	Completed early for early treatment
23a	Brickyard Cove	Partial	Partial	Historics Only	Knight Drive Thorough inventory Northern Marsh None; Scanned from all sides in 2023. Sup-optimal habitat Bayfront Shoreline None; Completed in 2023
23b	Beach Drive	Complete	Complete	Thorough Inventory	
23c	Loch Lomond Marina	Partial	Complete	Thorough Inventory	
23d.1	San Rafael Canal Mouth East	Complete	Complete	Thorough Inventory	
23d.2	San Rafael Canal Mouth West	Partial	Complete	Thorough Inventory	Creek Thorough survey Marin Islands Surveyed 2021 by whaler
23e	Muzzi and Martas Marsh	Complete	Partial	Historics Only	Muzzi Historics only Martas Thorough survey
23f	Paradise Cay	Partial	Partial	Historics Only	
23g	Greenwood Cove	None	Complete	Thorough Inventory	
23h	Strawberry Point	Complete	Complete	Thorough Inventory	
23i	Strawberry Cove	Complete	Complete	Thorough Inventory	
23j	Bothin Marsh	Partial	Partial	Historics Only	Northern Marsh Sections Complete Southern Marsh None. Thorough survey 2020
23k	Sausalito	None	None	None	Thorough survey 2022
23l	Starkweather Park	None	None	None	Thorough survey 2022
23m	Novato	None	None	None	Gallinas Creek Watershed thoroughly surveyed on foot 2016; 2020 foot+kayak. None 2021-22 Novato Shoreline-North None. Surveyed by CDFA airboat 2018, 2020-22 Novato Shoreline - South and McInnis None. Surveyed by CDFA airboat 2018, 2020-22
23n	Triangle Marsh and shoreline	Partial	Partial	Historics Only	
23o	China Camp	None	None	None	Thorough survey 2021; Historics in 2023
n/a	Hamilton Wetlands	Complete	None	None	CDFA Airboat not available 2024; Surveyed by CDFA airboat 2018, 2020-2022
n/a	Fort Baker	None	None	None	Thorough survey 2022
n/a	Tiburon	Complete	Complete	Thorough Inventory	Thorough survey by whaler 2024
n/a	Bel Marin Keys	None	None	None	Thorough survey 2022
n/a	Point San Pedro	Complete	None	None	Northern Shoreline walked and scanned 2023 Southern Shoreline Surveyed 2017 by whaler
n/a	Point San Quentin	Complete	None	None	Not surveyed since 2011; suboptimal habitat
	REGION 2: SAN FRANCISCO PENINSULA	2024 Planned Inventory Coverage	2024 Completed Inventory Coverage	2024 Completed Inventory Approach	Inventory Boundary Detail (where needed) and Notes
12a	Pier 94	Complete	Complete	Thorough Inventory	
12b	Pier 98 / Heron's Head	Complete	Complete	Thorough Inventory	
12c	India Basin	Complete	Complete	Thorough Inventory	
12d	Hunters Point Naval Reserve	Complete			Western embayment (historical zone) scanned with binoculars from across cove 2022
12e	Yosemite Channel	Complete	Complete	Thorough Inventory	Thorough survey 2022. Simultaneous inventory and treatment
12f	Candlestick Cove	None	None	None	Multiple years of zero-detect
12g	Crissy Field	Complete	None	None	Crissy Field Zero Detect since 2015 Quartermaster Reach Added 2021; never infested
12h	Yerba Buena Island	Complete	Complete	Thorough Inventory	Angel Island <i>Spartina</i> never detected; suboptimal habitat Yerba Buena Island Zero Detect since 2011
12i	Mission Creek	Complete	Complete	Thorough Inventory	
18a	Colma Creek	Partial	Partial	Historics Only	
18b	Navigable Slough	None	None	None	Multiple years of zero-detect
18c	Old Shipyard	Complete	Complete	Thorough Inventory	
18d	Inner Harbor	Complete	Complete	Thorough Inventory	
18e	Sam Trans Peninsula	Complete	Complete	Thorough Inventory	
18f	Confluence Marsh	Complete	Complete	Thorough Inventory	
18g	San Bruno Marsh	Complete	Complete	Thorough Inventory	
18h	San Bruno Creek	Complete	Complete	Thorough Inventory	
19a	Brisbane Lagoon	Complete	Complete	Thorough Inventory	
19b	Sierra Point	None	None	None	Multiple years of zero-detect
19c	Oyster Cove	None	Partial	Thorough Inventory	Southwestern Cove thorough inventory; Multiple years of zero-detect
19d	Oyster Point Marina	None	None	None	Multiple years of zero-detect
19e	Oyster Point Park	Complete	Complete	Thorough Inventory	
19f	Point San Bruno	Complete	Complete	Thorough Inventory	
19g	Seaplane Harbor	Partial	None	None	None; No security access 2023; Simultaneous inventory and treatment 2023.
19h	SFO	Partial	Partial	Thorough Inventory	SFO Main Marsh None; No security access 2023; Simultaneous inventory and treatment 2023. Burlingame Shoreline Thorough survey
19i	Mills Creek Mouth	Partial	Partial	Historics Only	Bayside of US-101 Thorough survey; Inland Thorough survey 2022. No infestation since 2020.

2024 Post-season Inventory Plan Update

19j	Easton Creek Mouth	Partial	Partial	Historics Only	Bayside of US-101 Thorough survey; Inland Thorough survey 2022.
19k	Sanchez Marsh	Complete	Complete	Thorough Inventory	
19l	Burlingame Lagoon	Complete	Complete	Thorough Inventory	
19m	Fisherman's Park	Complete	Complete	Thorough Inventory	
19n	Coyote Point Marina / Marsh	Complete	Complete	Thorough Inventory	
19o	San Mateo Creek / Ryder Park	Complete	Complete	Thorough Inventory	
19p	Seal Slough Mouth - Central Marsh	Partial	Complete	Thorough Inventory	Thorough survey 2022. Simultaneous inventory and treatment
19p	Seal Slough Mouth - Peripheral Marshes	Partial	Complete	Thorough Inventory	Thorough survey 2022. Simultaneous inventory and treatment
19r	Anza Lagoon	Complete	Complete	Thorough Inventory	
	REGION 3: SAN MATEO	2024 Planned Inventory Coverage	2024 Completed Inventory Coverage	2024 Completed Inventory Approach	Inventory Boundary Detail (where needed) and Notes
02a.1a	Belmont Slough Mouth	Complete	Complete	Thorough Inventory	
02a.1b	Belmont Slough Mouth South	Complete	Complete	Thorough Inventory	
02a.2	Upper Belmont Slough and Redwood Shores	Complete	Complete	Thorough Inventory	Interior shorelines Kayak Billboard Thorough survey 2022; Partial in 2023. Simultaneous inventory and treatment Upper Slough Complete
02a.3	Bird Island	Partial	Complete	Thorough Inventory	Simultaneous inventory and treatment
02a.4	Redwood Shores Mitigation Bank	Complete	Partial	Historics Only	Interior not boated/accessed 2024; scanned from shoreline
02b.1	Corkscrew Slough	Complete	Partial	Thorough Inventory	Main Marsh Complete 2024 Western three lobes Not done 2024
02b.2	Steinberger Slough South, Redwood Creek Northwest	Complete	Partial	Thorough Inventory	Steinberger Slough Eastern shoreline incomplete Upper Redwood Creek Complete Redwood Creek Mouth Bayfront incomplete
02c.1a	B2 North Quadrant West	Complete	Complete	Thorough Inventory	
02c.1b	B2 North Quadrant East	Partial (Pulse)	Complete	Thorough Inventory	
02c.2	B2 North Quadrant South	Partial (Pulse)	Complete	Thorough Inventory	
02d.1a	B2 South Quadrant West	Partial (Pulse)	Complete	Thorough Inventory	
02d.1b	B2 South Quadrant East	Partial (Pulse)	Complete	Thorough Inventory	
02d.2	B2 South Quadrant (2)	Partial (Pulse)	Complete	Thorough Inventory	
02d.3	B2 South Quadrant (3)	Partial (Pulse)	Complete	Thorough Inventory	
02e	West Point Slough NW	Partial	Complete	Thorough Inventory	
02f	Greco Island North	Complete	Partial	Thorough Inventory	Central Strip around boardwalk Complete in 2023 Bayfront Complete in 2024 Bayou Narrow strip of SE corner not complete in 2024
02g	West Point Slough SW and East	Partial	Complete	Thorough Inventory	
02h	Greco Island South	Complete	Partial	Thorough Inventory	90% of sub-area not done 2024
02i	Ravenswood Slough and Mouth	Complete	Complete	Thorough Inventory	
02j.1	Ravenswood Open Space Preserve (N of Hwy 92)	Complete	Complete	Thorough Inventory	
02k	Redwood Creek and Deepwater Slough	Complete	Complete	Thorough Inventory	
02l	Inner Bair	Complete	Complete	Thorough Inventory	
02m	Pond B3	Complete	Partial	Thorough Inventory	~40% of sub-area inventoried 2024
02o	Central Bair	Complete	Partial	Thorough Inventory	~40% of sub-area inventoried 2024
19q	Foster City	Complete	Complete	Thorough Inventory	
19s	Maple Street Channel	None	None	None	Densi dig in June; no <i>Spartina</i> present
	REGION 4: DUMBARTON SOUTH	2024 Planned Inventory Coverage	2024 Completed Inventory Coverage	2024 Completed Inventory Approach	Inventory Boundary Detail (where needed) and Notes
02j.2	Ravenswood Open Space Preserve (S of Hwy 92)	Complete	Complete	Thorough Inventory	
02n	SF2	Complete	Partial	Historics Only	Interior scan from levees Perimeter on foot
05a.1	Mowry Marsh and Slough	Partial	Partial	Historics Only	Interior Not Done 2024; Thorough inventory 2023 Shoreline Complete 2024 early season
05a.2	Calaveras Marsh	Partial	Partial	Shoreline Historics Only	Fringe early season inventory during treatment.
05b	Dumbarton/Audubon	Partial; Complete	Partial; Complete	Thorough Inventory	Dumbarton Complete Audubon Complete Railroad/Barge None 2024 Plummer Creek Complete
05c.1	Newark Slough West	Complete	None	None	Simultaneous inventory and treatment 2023
05c.2	Newark Slough East	Complete	None	None	Simultaneous inventory and treatment 2023
05d	LaRiviere Marsh	Complete	Complete	Thorough Inventory	Simultaneous inventory and treatment
05e	Mayhew's Landing	Complete	Complete	Thorough Inventory	Simultaneous inventory and treatment
05f	Coyote Creek - Alameda County	Complete	Complete	Thorough Inventory	Simultaneous inventory and treatment
05g	Cargill Pond (W Hotel)	Complete	Complete	Thorough Inventory	
05h	Plummer Creek Mitigation Marsh	Complete	Partial	Historics Only	Thorough survey 2022. Simultaneous inventory and treatment
05i	Island Ponds	Partial	Partial	Historics Only	A19 Complete 2024; Simultaneous inventory and treatment. A20 None Thorough survey 2022. A21 Historic zones only; Prime growing season
08	Palo Alto Baylands	Complete	Complete	Thorough Inventory	
15a.1	Charleston Slough to Mountainview Slough	Complete	Complete	Thorough Inventory	
15a.2	Stevens Ck to Guadalupe Slough	Complete	Complete	Thorough Inventory	
15a.3	Guadalupe Slough	Partial	Partial	Shoreline Historics Only	Slough banks Complete 2024; Thorough survey 2022. Simultaneous inventory and treatment Interior Incomplete
15a.4	Alviso Slough	Complete	Complete	Coarse Mapping	Mouth Complete Ogilvie Complete Upper Slough Complete. Historics only in 2023.
15a.5	Coyote Creek to Artesian Slough	Complete	Complete	Thorough Inventory	Simultaneous inventory and treatment
15a.6	Knapp Tract	Complete	Complete	Thorough Inventory	Complete at 8' tide w/airboat. Simultaneous inventory and treatment
15a.7	Pond A17	Complete	Complete	Thorough Inventory	Complete at >6' tide w/airboat. Simultaneous inventory and treatment
15b	Faber / Laumeister Marsh	Complete	Complete	Thorough Inventory	
15c	Shoreline Regional Park	Complete	Complete	Thorough Inventory	
15d	Sunnyvale Baylands	Partial	Partial	Historics Only	AB1:AB2 Historic A2-A3 None. Thorough survey 2022.
16.1	Cooley Landing Central	Complete	Complete	Thorough Inventory	
16.2	Cooley Landing East	Complete	Complete	Coarse Mapping	
n/a	Ponds A5, A7, A8, A8S	None	None	None	Perimeter walked 2021; no tidal action since 2015
	REGION 5: UNION CITY	2024 Planned Inventory Coverage	2024 Completed Inventory Coverage	2024 Completed Inventory Approach	Inventory Boundary Detail (where needed) and Notes
01a	Channel Mouth	Partial	Complete	Thorough Inventory	
01b	Lower Channel	Partial	Complete	Thorough Inventory	
01c	Upper Channel	Partial	Complete	Thorough Inventory	
01d	Upper Channel - Union City Blvd to I-880	Partial	None	None	
01e	Strip Marsh No. of Channel Mouth	Partial	Complete	Thorough Inventory	

2024 Post-season Inventory Plan Update

01f	Pond 3 - AFCC	Partial	Complete	Thorough Inventory	
13a	Old Alameda Creek North Bank	Partial	Complete	Thorough Inventory	
13b	Old Alameda Creek Island	Partial	Complete	Thorough Inventory	
13c	Old Alameda Creek South Bank	Partial	Complete	Thorough Inventory	
13d	Whale's Tail North Fluke	Complete	Complete	Thorough Inventory	
13e	Whale's Tail South Fluke	Complete	Complete	Thorough Inventory	Simultaneous inventory and treatment
13f	Cargill Mitigation Marsh	Complete	Complete	Thorough Inventory	Simultaneous inventory and treatment
13g	Upstream of 20 Tide Gates	Complete	None	None	
13h	Eden Landing - North Creek	Complete	Complete	Thorough Inventory	
13i	Eden Landing - Pond 10	Partial	Partial	Historics Only	Southern Portion Complete inventory where now hydrologically connected to Mt Eden Creek Main Pond None. Scanned in 2023.
13j	Eden Landing - Mt Eden Creek	Complete	Complete	Thorough Inventory	
13k	Eden Landing Reserve South - North Creek Marsh	Complete	Complete	Thorough Inventory	
13l	Eden Landing Reserve North - Mt Eden Creek Marsh	Complete	Complete	Thorough Inventory	
13m	Eden Landing - Ponds E8A, E9, and E8X	Complete	Complete	Thorough Inventory	
21a	Ideal Marsh North	Partial	Complete	Thorough Inventory	
21b	Ideal Marsh South	Partial	Complete	Thorough Inventory	
REGION 6: HAYWARD		2024 Planned Inventory Coverage	2024 Completed Inventory Coverage	2024 Completed Inventory Approach	Inventory Boundary Detail (where needed) and Notes
07a	Oro Loma Marsh - East	Complete	Complete	Thorough Inventory	Early season inventory except in reveg zone; Reveg zone later
07b	Oro Loma Marsh - West	Complete	Complete	Coarse Mapping	Early season inventory
20a	Oyster Bay Regional Shoreline	Complete	Complete	Thorough Inventory	Foli present, so inventory later in season
20b	Oakland Metropolitan Golf Links	Complete	Complete	Thorough Inventory	
20c	Dog Bone Marsh	Complete	Complete	Coarse Mapping	
20d.1	Citation Marsh South	Complete	Complete	Coarse Mapping	
20d.2a	Citation Marsh Upper	Complete	Complete	Coarse Mapping	
20d.2b	Citation Marsh Central	Complete	Complete	Coarse Mapping	
20e	East Marsh	Complete	Complete	Coarse Mapping	
20f	North Marsh	None	None	None	Treatment restricted until 2025
20g	Bunker Marsh	Complete	Complete	Coarse Mapping	
20h.1	San Lorenzo Creek and Mouth North	Complete	Complete	Coarse Mapping	
20h.2	San Lorenzo Creek and Mouth South	Complete	Complete	Coarse Mapping	
20i	Bockmann Channel	Complete	Complete	Thorough Inventory	Early season inventory
20j	Sulphur Creek	Complete	Complete	Thorough Inventory	Early season inventory
20k	Hayward Landing	Complete	Complete	Thorough Inventory	
20l	Johnson's Landing	Complete	Complete	Thorough Inventory	
20m	Cogswell Marsh A	Complete	Complete	Thorough Inventory	
20n.1	Cogswell Marsh B Bayfront	Complete	Complete	Coarse Mapping	
20n.2	Cogswell Marsh B South	Complete	Complete	Coarse Mapping	
20n.3	Cogswell Marsh B Main	Complete	Complete	Coarse Mapping	
20o	Cogswell Marsh C	Complete	Complete	Coarse Mapping	
20p	Hayward Shoreline Outliers	Complete	Complete	Coarse Mapping	Early season inventory
20q	San Leandro Shoreline Outliers	Complete	Complete	Coarse Mapping	
20r	Oakland Airport Shoreline and Channels	Partial	Complete	Thorough Inventory	Simultaneous inventory and treatment
20s	H.A.R.D. Marsh	Complete	Complete	Thorough Inventory	
20t	San Leandro Marina	Complete	Complete	Thorough Inventory	
20u	Estudillo Creek Channel	Complete	Complete	Thorough Inventory	
20v	Hayward Landing Canal	Complete	Complete	Thorough Inventory	Early season inventory
20w	Triangle Marsh	Complete	Complete	Thorough Inventory	
REGION 7: SAN LEANDRO BAY		2024 Planned Inventory Coverage	2024 Completed Inventory Coverage	2024 Completed Inventory Approach	Inventory Boundary Detail (where needed) and Notes
17a	Alameda Island South (Elsie Roemer Bird Sanctuary, Crown Memorial State Beach, Crab Cove)	Complete	Complete	Thorough Inventory	Elsie Roemer: Complete inventory around foliosa plantings + R2
17b	Bay Farm Island	Complete	Complete	Coarse Mapping	Early season inventory
17c.1	Arrowhead Marsh West	Complete	Complete	Grids	Infestation wide spread enough to not warrant point/line/poly inventory
17c.2	Arrowhead Marsh East	None	None	None	Treatment restricted until 2027
17d.1	Fan Marsh Shoreline	Complete	Complete	Coarse Mapping	Early season inventory
17d.2	Airport Channel	Complete	Complete	Coarse Mapping	Early season inventory
17d.3	East Creek	Complete	Complete	Coarse Mapping	Early season inventory
17d.4	Damon Marsh	Complete	Complete	Coarse Mapping	Early season inventory
17d.5	Damon Slough / Elmhurst Creek	Complete	Complete	Coarse Mapping	Early season inventory
17e.1	San Leandro Creek North	Complete	Complete	Thorough Inventory	Early season inventory
17e.2	San Leandro Creek South	Complete	Complete	Thorough Inventory	Early season inventory
17f	Oakland Inner Harbor	Complete	Complete	Thorough Inventory	Early season inventory
17g	Coast Guard Island	Complete	Partial	Thorough Inventory	Eastern Shoreline Complete 2024 North, West, South Shorelines Not done 2024; Security access issues
17h	MLK New Marsh	None	None	None	Treatment restricted until 2027
17i	Coliseum Channels	Complete	Complete	Coarse Mapping	Early season inventory
17j.1	Fan Marsh Wings	Complete	Complete	Coarse Mapping	Early season inventory
17j.2	Fan Marsh Main	Complete	Complete	Coarse Mapping	
17k	Airport Channel	Complete	Complete	Coarse Mapping	Early season inventory
17l	Doolittle Pond	Complete	Complete	Coarse Mapping	Early season inventory
17m	Alameda Island (Aeolian Yacht Club and East Shore)	Complete	Complete	Coarse Mapping	Early season inventory
17n	Doolittle Drive Mitigation Marsh	Complete	Complete	Coarse Mapping	Early season inventory
REGION 8: BAY BRIDGE NORTH		2024 Planned Inventory Coverage	2024 Completed Inventory Coverage	2024 Completed Inventory Approach	Inventory Boundary Detail (where needed) and Notes
06a	Emeryville Crescent East	Complete	Complete	Thorough Inventory	Historics only. Thorough survey 2022. Simultaneous inventory and treatment
06b	Emeryville Crescent West	Complete	Complete	Thorough Inventory	
10a	Whittell Marsh	Partial	Partial	Historics Only	Simultaneous inventory and treatment
10b	Southern Marsh	None	Partial	Historics Only	Thorough inventory 2023
10c	Giant Marsh	Partial	Complete	Thorough Inventory	Simultaneous inventory and treatment
10d	Breuner Marsh Restoration	Complete	Complete	Thorough Inventory	
22a	Wildcat Marsh	Partial	Partial	Historics Only	Shorelines Complete. Airboat assistance first time in 2023 Interior None in 2023. Historics only. Thorough survey 2022
22b.1	San Pablo Marsh East	Complete	Complete	Thorough Inventory	
22b.2	San Pablo Marsh West	Complete	Complete	Thorough Inventory	
22c	Breuner Marsh (Rheem Creek)	Complete	Complete	Thorough Inventory	
22d	Stege Marsh	Partial	Complete	Thorough Inventory	Simultaneous inventory and treatment
22e	Hoffman Marsh	None	None	None	

2024 Post-season Inventory Plan Update

22f	Richmond / Albany / Pinole Shoreline	Partial	Partial	Historics Only	Pinole, Rodeo, Hercules Historics only. Crockett Shorelines None. West of Carquinez Bridge completed by whaler 2022 Brooks Island Complete during annual shorebird surveys Emeryville to Richmond Shoreline Only shoreline north of Golden Gate Fields Point San Pablo Harbor None. Thorough survey 2022. Stege Marsh Channels None. Thorough survey 2021 Point Richmond Marina Complete Point Molate & Western Shoreline Thorough survey by whaler 2024 Castro Cove Historics only
n/a	Berkeley Aquatic Park	None	None	None	Thorough survey 2021
	REGION 9: SUISUN	2024 Planned Inventory Coverage	2024 Completed Inventory Coverage	2024 Completed Inventory Approach	Inventory Boundary Detail (where needed) and Notes
11	Southampton Marsh	Partial	Partial	Historics Only	Simultaneous inventory and treatment
27a	Point Buckler	Complete	Complete	Thorough Inventory	
27b	MOTCO Islands	Complete	Complete	Thorough Inventory	
27c	Honker Bay	Complete	Complete	Thorough Inventory	Chippis Island Assess for tidal action and restoration efforts Van Sickle Island Assess for tidal action and restoration efforts
27d	MOTCO mainland shoreline	Complete	Complete	Thorough Inventory	
n/a	Suisun Bay Marshes	Complete	None	None	Grizzly Bay None. Not surveyed since 2017
n/a	Benicia Shoreline	None	None	None	Western Shoreline kayaked 2023. Thorough survey 2021
	REGION 10: VALLEJO	2024 Planned Inventory Coverage	2024 Completed Inventory Coverage	2024 Completed Inventory Approach	Inventory Boundary Detail (where needed) and Notes
26a	White Slough / Napa River	None	None	None	American Canyon None. Thorough survey 2020 Napa River None. Surveyed 2023 by whaler Napa River Mouth None. Surveyed 2023 by whaler Vallejo None. Thorough survey 2022 White Slough None. Surveyed 2023 by kayak Napa Sonoma Marshes None. Extensive survey w/CDFA airboat 2022
26b	San Pablo Bay NWR and Mare Island	None	Partial	Historics Only	Completed on foot 2023. Completed on foot and w/CDFA airboat 2022
26c	Sonoma Creek	Partial	Partial	Historics Only	Surveyed w/CDFA airboat 2022
26d	Sonoma Baylands	None	None	None	Surveyed w/CDFA airboat 2022
n/a	Cullinan Ranch	None	None	None	Surveyed 2019 w/USFWS airboat; Assessed 2022 by CDFA airboat
	REGION 11: PETALUMA	2024 Planned Inventory Coverage	2024 Completed Inventory Coverage	2024 Completed Inventory Approach	Inventory Boundary Detail (where needed) and Notes
24a	Upper Petaluma River - Upstream of Grey's Field	Partial	Complete	Thorough Inventory	Survey on foot with whaler support. Simultaneous inventory and treatment.
24b	Grey's Field	None	None	None	Thorough survey 2022
24c	Petaluma Marsh	Partial	Partial	Historics Only	Surveyed main slough and all accessible channels w/CDFA airboat 2022
24d	Lower Petaluma River - Downstream of San Antonio Creek	None	None	None	Point Sonoma Marina Surveyed 2022 Bahia Restoration, Petaluma River Black John Slough-North, Petaluma River Black John Slough-South, Petaluma River Carl's Marsh, Rush Creek All No survey: Low Risk of Infestation >3.5 km
	REGION 12: OUTER COAST	2024 Planned Inventory Coverage	2024 Completed Inventory Coverage	2024 Completed Inventory Approach	Inventory Boundary Detail (where needed) and Notes
25a	Tom's Point, Tomales	Complete	Partial	Historics only	Tom's Point Survey for <i>S. densiflora</i> only Hog Island Oyster Farm Survey for <i>S. densiflora</i> only
25b	Limantour Estero	None	None	None	Tomales Bay, Walker Creek, Giacomini, Bivalve None; Not surveyed since 2015
25c	Drakes Estero	None	None	None	Thorough survey 2021. Low risk of infestation
25d	Bolinas Lagoon, North	Partial	Complete	Thorough Inventory	Northern and Eastern shorelines Complete inventory. Simultaneous inventory and treatment Western shoreline None; no infestation history
25e	Bolinas Lagoon, South	None	Complete	Thorough Inventory	Southern Marsh Thorough survey 2021. Simultaneous inventory and treatment Housing shoreline Last completed in 2019. Simultaneous inventory and treatment