Community Iceplant Removal at the Ballona Wetlands *(amended)*

Recipient: The Bay Foundation
Project Period: 04/05/2018 – 04/30/2022
Award Amount: $43,850.25
Matching Contributions: $13,289.64
Project Number: #8006.18.061108

Summary of Accomplishments

The Bay Foundation (TBF), in partnership with the California Department of Fish and Wildlife (CDFW) and Friends of Ballona Wetlands (FBW), worked to restore a portion of the Ballona Wetlands Ecological Reserve (Reserve) while broadening community and public involvement and stewardship. Invasive vegetation, such as iceplant, was manually removed through hand-pulling and using weeding tools during community restoration events. Since the beginning of this grant project, a cumulative total of 308 volunteers have contributed 789.5 hours and removed 59,965 lbs (or 30 tons) of invasive iceplant and other non-native species from 1.02 acres (4,128 m^2) of the restoration project area.

Revegetation, in the form of native seeding and planting container stock plants, also occurred throughout the restoration area in places that had less natural recruitment of native plant species. Approximately 250 native plants, including big saltbush (*Atriplex lentiformis*) and woolly seablite (*Suaeda taxifolia*), among others, were planted and native seed was distributed in November 2020. Ongoing scientific monitoring and maintenance occurred in accordance with the Monitoring and Implementation Plan and associated permits. Restoration events have been highlighted in partner newsletters, through online social media, via TBF's website, and through FBW. Notable lessons learned included overcoming challenges and instituting adaptive management actions relating to impacts from Covid-19, including a lack of volunteer events for a year and a half. Efforts were made to shift efforts to staff and partner events, though ongoing site maintenance was more challenging.

Project Activities

Introduction

Since October 2018, TBF, in partnership with CDFW and FBW, worked to restore a portion of the Ballona Wetlands Ecological Reserve (Reserve) while broadening community and public involvement and stewardship. Invasive vegetation, such as iceplant (*Carpobrotus edulis*), was manually removed through hand-pulling and

using weeding tools during community restoration events. The goal of this project was to remove invasive species and restore a native habitat in a degraded habitat area at the Reserve in "Area B" south of Culver Boulevard. This project was fully permitted (i.e., CDP No. 5-15-1427, CEQA exemption, CDFW PPE, CDFW Reserve access permit).

Activities

This project made significant progress in enhancing a highly degraded area of the Reserve, including engaging the community. The Coastal Development Permit (CDP No. 5-15-1427) for this project specified that community restoration events for the year should begin on or after 1 August to avoid any possible impacts to rare bird nesting (Belding's Savannah Sparrow). In the first year of grant implementation, a total of eight community restoration events were held from 1 August 2018 to 28 September 2018. In the second year, a total of six community restoration events were held from 4 October 2018 to 23 October 2019. During the third reporting year, a total of seven community restoration events were held. During the fourth reporting year, a total of two community restoration events were held on 25 August 2021 and 8 September 2021. During the final reporting period, a total of four community restoration events and one maintenance event (five total) were held from 1 October 2021 – 31 January 2022.

In all years, no community restoration events were held between 15 March 2019 and 1 August 2019 in accordance with permit requirements; however, several weeding and maintenance events with TBF staff and interns only were conducted during this period. Volunteer events and restoration progress was severely impacted by the novel coronavirus outbreak, beginning in March of 2020, requiring several no-cost extensions. However, TBF crafted Covid-19 safety protocols for intern and volunteer field work and resumed community restoration events in August of 2021, when they were deemed safe by local public health officials (e.g., Los Angeles County Department of Public Health).

In the first grant implementation year (5 April through 30 September 2018), 74 volunteers contributed 237 hours and removed 15,055 lbs (or 7.5 tons) of invasive iceplant and other species from 0.19 acres (751 m^2) of the restoration project area. In the second year (1 October 2018 through 31 October 2019), 97 volunteers contributed 278.5 hours and removed 8,455 lbs (or 4.2 tons) of invasive iceplant and other species from 0.22 acres (890.31 m^2) of the restoration project area. In the third year (1 November 2019 through 30 September 2020), 70 volunteers contributed 140 hours and removed 15,170 lbs (or 7.6 tons) of invasive iceplant and other species from 0.23 acres (930.78 m^2) of the project area.

In the fourth year (1 October 2020 through 30 September 2021) two public events were held after LA County Department of Public Health started allowing volunteer events in July 2021. However, during these two events and as part of staff, partner, and internship student maintenance days, 5,050 lbs (or 2.53 tons) of invasive iceplant and other species were removed from site. In one event in December 2020, over 4,200 lbs of iceplant was removed, leveraging a partnership with the Los Angeles Conservation Corps, an organization that helps underserved youth develop in the workforce. New acres for year four included 0.09 acres (364 m^2) within the project area.

In the final reporting period (1 October 2021 – 31 January 2022), 62 volunteers contributed 124 hours and removed 16,235 lbs (or 8.12 tons) of invasive iceplant and other species from 0.29 acres (1174 m^2) of the restoration project area. Though Covid-19 severely impacted the ability to bring volunteers to the site for a long time in LA County, once the events were allowed again, substantial progress was made. Enthusiastic community members and visitors were excited to get back out for field work and contribute to the project again. Since the beginning of this grant project, a cumulative total of 308 volunteers have contributed 789.5 hours and removed 59,965 lbs (or 30 tons) of invasive iceplant and other non-native species from 1.02 acres (4,128 m^2) of the restoration project area.

Revegetation, in the form of native seeding and planting container stock plants, also occurred throughout the restoration area in places that had less natural recruitment of native plant species. During the fourth reporting year, approximately 250 native plants, including big saltbush (*Atriplex lentiformis*) and woolly seablite (*Suaeda taxifolia*), among others, were planted and native seed was distributed in November 2020. Efforts were made to target species that were likely to have higher survivorship and to increase native plant species richness throughout the restoration area. Throughout the entire restoration area (NFWF area and adjacent restoration area), over 1,400 native plants were installed.

Table 1 summarizes event dates, activities, targeted species, volunteer statistics, and weight removed. 'Weight removed' was calculated by averaging the bag weight across 10 bags for each species and then extrapolating up to a total number of bags per event. Additionally, several 'site cleanup' events were conducted to move several large piles of iceplant detritus to the green waste dumpster and off the project area and frequent staff maintenance days occurred. Supplemental watering was conducted once in November and once in December of 2020 due to the lack of rain and drought conditions during the wet season after the seeding and container stock were planted.

Ongoing scientific monitoring also occurred in accordance with the Monitoring and Implementation Plan and associated permits. Restoration event tracking data, wildlife checklists, and project area monitoring occurred during restoration events, in addition to summarizing targeted invasive species locations as part of the event. Lastly, this project was supported by supplemental funding for the restoration of an additional 0.75 acres in the immediate project area as part of the same permits. For the whole project site, a Year 5 Annual Report was released in July 2021: https://cms.santamonicabay.org/wp-content/uploads/2021/08/BWER_Ballona_Iceplant_Removal_Yr5_Report_FINAL_7-30-21.pdf. The Year 5 Report contains additional information for the whole permitted area and can be considered as supplemental information, though this summary report is specific to the NFWF restoration area statistics.

Table 1. Summary of restoration event activities, volunteers, and removed invasive species weights from October 2018 to January 2022. "Comm. Rest." = Community Restoration. * Does not include TBF staff and partner events.

Event Date	Event Type	# Volunteers or Participants*	# Volunteer Hours*	Targeted Invasive Species	Weight Removed (lbs)
8/1/2018	Restoration	8	32	*Euphorbia terracina*	50
8/8/2018	Restoration	7	28	*Euphorbia terracina, Carpobrotus edulis*	25
8/29/2018	Restoration	3	9	*Carpobrotus edulis*	2,240
9/19/2018	Restoration	15	45	*Carpobrotus edulis*	3,850
9/22/2018	Restoration	36	108	*Carpobrotus edulis*	8,400
9/25/2018	Site Cleanup	N/A	N/A	*Carpobrotus edulis*	N/A
9/27/2018	Restoration	1	3	*Carpobrotus edulis*	490
9/28/2018	Site Cleanup	4	12	*Carpobrotus edulis*	N/A
10/4/2018	Comm. Rest.	3	9	*Carpobrotus edulis*	1,750
10/24/2018	Comm. Rest.	11	33	*Euphorbia terracina, Raphanus sativus*	3,620
11/14/2018	Comm. Rest.	15	45	*Carpobrotus edulis*	1,110
2/8/2019	LA Conservation Corps	8	48	*Raphanus sativus*	N/A
3/13/2019	Restoration	9	27	*Melitotus indicus, Bromus diandrus*	135
4/26/2019	Site Check / Restoration	1	3	*Melitotus indicus, Bromus diandrus, Raphanus sativus*	300
6/11/2019	Site Check / Restoration	3	9	*Ricinus communis, Raphanus sativus, Euphorbia terracina*	30
6/12/2019	Monitoring / Restoration	3	9	*Rincinus communis, Euphorbia terracina*	15
6/21/2019	Monitoring /	10	30	*Ricinus communis,*	330

Event Date	Event Type	# Volunteers or Participants*	# Volunteer Hours*	Targeted Invasive Species	Weight Removed (lbs)
	Restoration			*Raphanus sativus*	
7/24/2019	Monitoring / Restoration	5	7.5	*Euphorbia terracina, Raphanus sativus, Ricinus communis*	45
9/14/2019	Comm. Rest.	5	10	*Carpobrotus edulis, Melilotus indicus, Brassica spp., Avena fatua, Bromus diandrus, Raphanus sativus*	700
10/9/2019	Comm. Rest.	5	10	*Melilotus indicus, Brassica spp., Avena fatua, Bromus diandrus, Raphanus sativus*	120
10/23/2019	Comm. Rest.	19	38	*Melilotus indicus, Brassica spp., Avena fatua, Bromus diandrus, Raphanus sativus, Euphorbia terracina*	300
11/13/2019	Comm. Rest.	26	52	*Carpobrotus edulis*	2,730
12/11/2019	Comm. Rest.	3	6	*Carpobrotus edulis*	2,310
01/08/2020	Comm. Rest.	2	4	*Carpobrotus edulis*	420
01/15/2020	Comm. Rest.	6	12	*Carpobrotus edulis*	2,030
01/29/2020	Comm. Rest.	13	26	*Carpobrotus edulis*	2,835
02/13/2020	Comm. Rest.	5	10	*Carpobrotus edulis*	1,470
02/19/2020	Comm. Rest.	13	26	*Carpobrotus edulis*	3,150
06/05/2020	Site Check / Restoration	2	4	Variety of invasives	225
12/14/2020	LACC Iceplant	0 (partner participation	0	*Carpobrotus edulis*	4,200

Event Date	Event Type	# Volunteers or Participants*	# Volunteer Hours*	Targeted Invasive Species	Weight Removed (lbs)
	Removal	)			
08/25/2021	Maintenance Event	0 (partner participation)	0	*Carpobrotus edulis, Melilotus indicus, Avena fatua, others*	100
09/08/2021	Comm. Rest.	5	10	*Carpobrotus edulis, Melilotus indicus, Avena fatua, others*	750
10/13/21	Comm. Rest.	8	16	*Carpobrotus edulis, Atriplex semibacata*	2,750
10/22/21	Maintenance Event	0 (partner participation)	0	*Carpobrotus edulis*	500
10/30/21	Comm. Rest.	22	44	*Carpobrotus edulis*	4,900
11/10/21	Comm. Rest.	13	26	*Carpobrotus edulis*	2,065
11/13/21	Comm. Rest.	19	38	*Carpobrotus edulis*	6,020
Totals	**----**	**308**	**789.5**	**---**	**59,965**

Project Outcomes

Success of the restoration project was determined using various methods. The first evaluation point was determining the effectiveness of the iceplant removal techniques by area, followed by long-term criteria based on the presence of native vegetation relative to invasive, non-native vegetation species (Table 2). Other criteria were tracked, such as presence of various wildlife. It should also be recognized that wetland vegetation communities can sometimes take many years to develop and become well-established and more complex; therefore, higher level ecosystem support by the restoration project may continue to establish over time. Lastly, another major project goal was to engage students and the community, which was incredibly successful. Several of the final quantifiable metrics were substantially higher than the target goals, even with the impacts due to Covid-19. Based on the final project evaluation, all success criteria were met successfully.

Table 2. Success criteria for the iceplant removal project, assessment method, target goal, and progress towards goal.

Success Criteria Description	Method of Evaluation	Target Goal	Progress Towards Goal
Removal of iceplant (e.g., area covered)	Mapping (GIS surveys); Plant cover surveys (transects and quadrats)	100% of iceplant within restoration area removed	*Completed* – 1.02 acres with 100% of iceplant removed
Absolute cover of invasive, non-native vegetation species (e.g., iceplant, euphorbia) to natives	Mapping (GIS surveys); Plant cover surveys (transects and quadrats)	Increase in absolute cover of native species compared to baseline; Increase in relative cover of natives compared to baseline and non-natives	*Completed* – results show increase in absolute and relative cover of native species, especially saltgrass (Figure 2)
Maintain native vegetation species richness across the site	Mapping (GIS surveys); Plant cover surveys (transects and quadrats)	Equal and/or increase in native species richness as compared to baseline assessment	*Completed* – results show maintenance of native vegetation species richness, with increases in several areas of the restoration
Use of the site by wildlife (e.g., avifauna)	Bird and wildlife presence surveys	Presence of wildlife and use of restoration area	*Completed* – monitoring suggests use of site by wildlife and birds
Public engagement	Sign-in sheets and waivers from restoration events	> 100 volunteer participants contributing more than 300 hours	*Completed* – 308 volunteer participants contributed 789.5 hours

Measurable outcomes were achieved through the assessment of the success criteria (above) over time using the described metrics, or methods, of evaluation (also above). Biological monitoring was conducted in accordance with the CDP permit monitoring plan as well as the California Estuarine Wetland Monitoring Manual. In addition to the methods described in the table above, additional monitoring information was collected such as permanent georeferenced photo point surveys over time, seedling surveys, etc. Although the project-level success criteria were met, TBF has a long-term commitment to the project site, which will include ongoing maintenance for several years. Additionally, TBF is exploring other grant opportunities to continue and expand restoration activities. Vegetation transect monitoring was conducted within the project site prior to restoration (9 August 2018), immediately following a restoration event (28 November 2018), in Spring 2019 (5 June 2019), in Fall 2019 (11 November 2019), in Spring 2020 (2 June 2020), in November 2020, in May 2021, and in November 2021.

Figure 2 shows the results from vegetation transect monitoring in the restoration area. Prior to restoration this site was identified as a mix of primarily non-native iceplant (40.7%) and native saltgrass (57.9%). Following a series of restoration events focused on removing non-native iceplant, there was a drastic improvement in native cover (88.9%) and decrease in non-native cover (1.3%). In the June 2019 survey, saltgrass continued to dominate the area (87.9%) with only a slight increase in non-native cover (2.0%) primarily composed of annual non-native vegetation. The November 2019 survey continued to exhibit high native cover (86.8%) with a decrease in non-native cover (0.0%). The June 2020 survey exhibited a small decrease in native cover (73.1%) and an increase in non-native cover (16.5%), primarily due to recruitment of non-native annual species such as *Sonchus oleraceous* which were subsequently hand-removed following the survey. Even though Covid-19 impacted the ability of the project team to have volunteers on site, during the fourth reporting year, the site continued to show a dominance of native vegetation (91.5% and 82.8%, respectively). Volunteer events resumed in August 2021, with staff and volunteers following strict COVID safety guidelines. The subsequent November 2021 survey showed continued high native cover (79.3%), with low non-native cover (1.7%), primarily consisting of annual species. Vegetation monitoring shows substantial improvement in native saltgrass cover and decline in non-native iceplant relative to baseline surveys.

Compared to other restoration areas within the larger project footprint, this area of originally mixed iceplant and saltgrass shows higher natural recruitment of saltgrass following restoration events. The sparse non-native cover that persists within the project area is primarily concentrated along Culver Blvd. The proximity to the roadway likely makes this area more susceptible to non-native seed transport and impacts. The non-natives in the area will continue to be controlled through site maintenance. Photo point monitoring was also conducted as part of monitoring protocols and is shown in a series of photos below (Figures 4-5).

Lessons Learned

While the preliminary results of restoration efforts show substantial improvement in the increase of native saltgrass cover and volunteer recruitment was high (prior to Covid-19, the site had already exceeded volunteer engagement), the total area covered required more effort / time than expected. Due to Covid-19 restrictions in Los Angeles County, no community restoration events took place between 19 February 2020 and July 2021. Beginning in March 2020, the State of California and Los Angeles County Department of Public Health issued a “stay-at-home” order with specific restrictions on all activities. While Covid-19 prohibited volunteer engagement for a year and a half of the project, TBF staff, partners, and interns continued to conduct site maintenance within the project area and increased their efforts. TBF began hosting restoration events again in compliance with permit requirements and under the guidance of Los Angeles County safety regulations starting in August 2021, even after public engagement targets were met to maximize the footprint of iceplant removal. The loss of volunteers due to Covid was challenging, especially for invasive annual weed maintenance.

One success of the project was leveraging volunteer and partner efforts. Staff from CDFW and FBW would often participate and cross-promote volunteer events. Additionally, CDFW used herbicide to control adjacent pampas grass just outside the project area, so there would be no dispersal into the project.

Meeting project success criteria for native plant cover (and reduction of non-native species) required the least

amount of effort in areas that started with mixed native vegetation as compared to areas with monocultures of iceplant. It seems likely that these mixed areas had a stronger native seed bank and/or were able to propagate quickly through rhizome spread (e.g., saltgrass). Areas of the site with iceplant monocultures were more likely to require more intensive maintenance activities for invasive annuals. One of the maintenance strategies was to use a weed eater to cut the tops of the weeds off (such as radish and grasses) before seeds developed and became viable. This limited required effort, while controlling the seed back for subsequent years. Hand-pulling iceplant was very time- and labor-intensive (e.g., transporting the pulled plants to a green waste dumpster) as compared to other restoration strategies such as herbicide. TBF has had success in other projects with using solarization to desiccate iceplant, though it is not always popular with stakeholders who fear animal mortality (though TBF has never documented any animal mortality). In this case, the permitting agency (California Coastal Commission) preferred hand-pulling the iceplant to the other methods.

Dissemination

TBF sent a press release about the project widely on 1 September 2021 and several local news outlets reposted it. Restoration events have been highlighted in partner newsletters, through online social media, via TBF's website, and through FBW. Event notices have also been posted in other newsletters such as Sustainable Santa Monica Newsletter and Jen's List, and local newspapers such as The Argonaut and the El Segundo Scene. In addition, TBF made a substantial effort, both internally and with partners, to figure out how to better engage with inland and underserved communities. Efforts thus far have included assembling a list of various Community Based Organizations to connect with directly and tailoring events (e.g., timing, duration, etc.) to fit the need of the community group.

In addition to public notices and those efforts described above, TBF worked to disseminate information to other agencies and scientists. Frequent updates on this project were made to the Santa Monica Bay Restoration Commission Governing Board, presentations occurred at scientific conferences (e.g., Society for Ecological Restoration), and other venues opportunistically (such as to the Wetland Recovery Project and California Coastal Commission). Additional communication occurred to other NGOs (e.g., Heal the Bay, Surfrider), agencies (e.g., CDFW), and members of the public (e.g., those passing by on the adjacent pedestrian trail). For more project information and additional photos, please view the Year 5 Report, which covers the whole project area (NFWF site and adjacent restoration areas).

Project Documents

- Ballona Wetlands Restoration: Community Iceplant Removal Project Year 3 Annual Report (July 2019)
- Ballona Wetlands Restoration: Community Iceplant Removal Project Year 4 Annual Report (July 2020)
- Ballona Wetlands Restoration: Community Iceplant Removal Project Year 5 Annual Report (July 2021)

Project Photos

Figure 1: Total restoration footprint for the NFWF project area (1.02 acres).

Figure 2: Photographs of restored areas of the site dominated by native vegetation (7 July 2021).

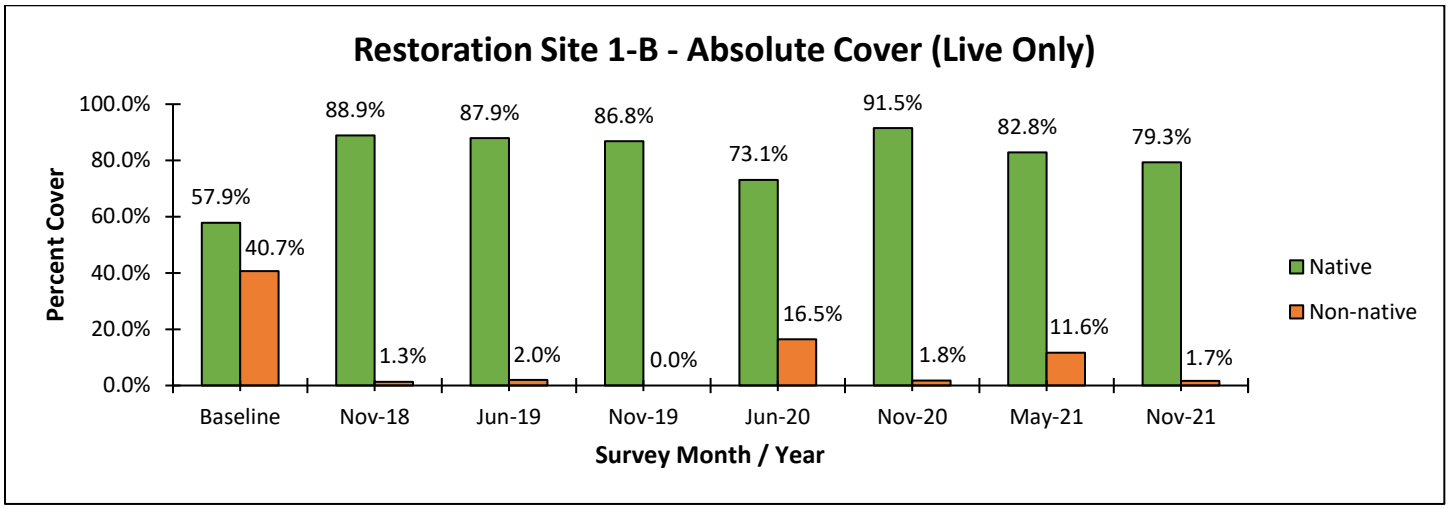

Figure 3: NFWF restoration project area vegetation transect results.

Figure 4: Photo point (Station 4a) before restoration on 20 September 2019 (top, left) and post-restoration on 31 October 2019 (top, right), 11 February 2020 (middle left), 2 June 2020 (middle, right), 28 August 2020 (bottom, left), and 9 February 2021 (bottom, right).

Figure 5. Photo point (Station 4a) before restoration on 20 September 2019 (top, left) and post-restoration on 31 October 2019 (top, right), 11 February 2020 (middle left), 2 June 2020 (middle, right), 28 August 2020 (bottom, left), and 9 February 2021 (bottom, right).