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History, Current Conditions, and Future Maintenance Plan for the Edgewater and Sand Dollar Habitat Preserves in Sand City, California

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Executive Summary

This report addresses habitat maintenance obligations relating to 1990s shopping center development in Sand City. It summarizes the apparent status of the obligations and the current status of the habitat itself. It includes a comprehensive updated plan for future restoration, maintenance, and monitoring, and a recommendation that the city considers the adoption of this plan. The report and associated field investigations are the work of a 5-week graduate class at CSUMB, initiated at the request of city staff.

The City of Sand City is located along the coast of northern Monterey County. Surrounding developed and urban areas are coastal sand dunes that provide dune scrub habitat to protected plants and animals such as the Smith's blue butterfly (SBB), sand gilia, and Monterey spineflower. By the time the Sand Dollar and Edgewater shopping centers were developed, dune scrub habitat was already rare and the area of relatively intact coastal dunes in Sand City had decreased by 92 percent.

The construction of Sand City's two major shopping centers 30 years ago involved impacts to fragile dune ecosystems that were to be mitigated by the perpetual maintenance of 13.6 acres of dune habitat. In 1989, a Biological Resource Management Plan (BRMP) was written in order to mitigate impacts associated with the development of the Sand Dollar Shopping Center, followed shortly after by a 1995 Habitat Conservation Plan (HCP) to mitigate impacts of the Edgewater Shopping Center. After initial restoration, Sand City became responsible for administration of what we interpret to be a perpetual obligation on the shopping center landowners to fund the maintenance of habitat at both preserves.

In the early years, mitigation was successful and well-documented, but in the most recent 20 years the intensity of habitat maintenance has waned and documentation has been relatively scarce. At Sand Dollar, Harding Lawson Associates and Native Solutions performed habitat restoration between 1990 and 1993 and 1994 and 2001, respectively. During this period, they controlled invasive plants, planted native species, performed regular maintenance, and conducted natural resource monitoring and reporting. Native Solutions continued periodic manual removal of invasive plants into 2016, funded by the shopping center owner. At Edgewater, Zander Associates performed similar

establishment maintenance and monitoring work between 1996 and 2001 and Native Solutions followed with limited maintenance between 2004 and 2008, also funded by the shopping center owner, as far as we can discern. We were unable to locate city documentation of these post-restoration maintenance activities, and it appears that formal monitoring of habitat quality has not been conducted since the initial restoration period.

In 2018/2019, the city recognized the need to better understand the current status of compliance with habitat standards at the mitigation sites and to create an updated plan for the continued restoration and maintenance of the habitat preserves. At the request of Sand City, graduate students in the Environmental Science Master's program at CSUMB were engaged through a class project to evaluate current preserve conditions and create an updated restoration and stewardship plan that will meet relevant performance criteria. We began by providing environmental context for the importance of preserving sensitive and unique coastal dune scrub habitat and associated species, and a mapping of the rarity of dune habitat in the region. We demonstrate that relatively intact examples of these dune environments are now very rare, and that the shopping center mitigation sites are two notable remaining examples of these habitats in the region. We reviewed the legal and administrative context for the two habitat preserves and explain what appear to be perpetual obligations as defined in a series of documents we've assembled; we highlighted relevant passages to facilitate a more formal analysis should one be required. We re-surveyed the original vegetation transects and mapped non-native, and invasive plants.

We found that habitat quality has declined from levels that were generally compliant at the conclusion of the initial restoration efforts in the late 1990s, to standards that are now generally non-compliant. The long-term maintenance obligation is underperforming and the remaining intact elements of dune habitat that support protected species are at risk of continued degradation. Over the past 20 years, non-native vegetation such as iceplant has increased from near zero percent to as high as 37 percent, and native vegetation cover has decreased at both preserves to below the initially established 60 percent criterion. Spring 2020 field surveys would be required in order to complete the current status update, so we strongly recommend that the city

initiates a follow-up project specifically to survey species that can only be reliably detected in spring, such as the protected Monterey spineflower and sand gilia.

We developed a restoration, stewardship, and maintenance plan to support Sand City in managing the preserves in perpetuity and be compliant with long-term goals and obligations for the preserves. The plan recommends actions that fall under four strategies listed based on priority: (1) controlling invasive plants, (2) revegetation, (3) long-term monitoring and reporting, and (4) physical maintenance needs. Within each strategy, we prioritized a series of recommended actions to be implemented for a minimum of ten-years along with initial restoration activities to address overall habitat decline from lack of stewardship. The estimated total costs to implement these restoration recommendations across both preserves and according to the strategies noted above are: (1) \$32,000 for initial invasive species control plus \$10,000/yr for annual maintenance; (2) \$43,000 for initial revegetation; (3) \$18,000/yr for long-term monitoring and reporting; (4) \$10,000/yr for physical maintenance. Our recommendations were informed and reviewed by local dune ecology and restoration experts and specify minimum qualifications by specific task so the plan could be executed in part by public works staff, interns and volunteers. There may be some potential for costs to be offset by grants, but this would likely exclude any costs that are the obligation of private entities. Successful implementation of the plan will require time, money, patience, and possibly seeking input with a restoration specialist. In doing so, Sand City could restore Sand Dollar and Edgewater preserves to compliant conditions and demonstrate responsible environmental stewardship of this important and rare habitat.

Table of Contents

Executive Summary	3
1 Introduction	10
1.1 Legal Context	12
1.1.1 Endangered Species Act of 1973	12
1.1.2 California Coastal Act of 1976	13
1.2 Summary of Legal and Financial Obligations	13
1.2.1 Sand Dollar	14
1.2.2 Edgewater (North of Playa)	16
1.3 Legal Timelines	19
1.3.1 Sand Dollar	19
1.3.2 Edgewater (North of Playa)	21
2 Coastal Dunes: Significance and Relevance to Sand City	23
2.1 Formation	23
2.1.1 Coastal Dunes in California	23
2.1.2 Rare in California	23
2.1.3 Importance of Dunes	24
2.1.4 Human Impacts on Dunes	25
2.1.5 Management of Dunes	26
2.2 Species Profiles	26
2.2.1 Animals	26
2.2.1.1 Smith's Blue Butterfly, <i>Euphilotes enoptes smithi</i>	26
2.2.1.2 Black Legless Lizard, <i>Anniella pulchra nigra</i>	29
2.2.2 Plants	32
2.2.2.1 Monterey Ceanothus, <i>Ceanothus rigidus</i>	32
2.2.2.2 Monterey Spineflower, <i>Chorizanthe pungens</i> var. <i>pungens</i>	33
2.2.2.3 Sand Gilia, <i>Gilia tenuiflora</i> ssp. <i>arenaria</i>	35

2.2.2.4 Sandmat Manzanita, <i>Arctostaphylos pumila</i>	37
2.2.2.5 Hottentot Fig (Iceplant), <i>Carpobrotus spp.</i>	39
3 Historical Biophysical Conditions	41
3.1 Effects on The Dunes of Sand City	41
3.2 Methods of Estimating Impacts of Urbanization on Dune Extent	42
3.3 Results of Historical Aerial Photograph Interpretation	43
4 Previous Establishment Period Activities	51
4.1 Sand Dollar	51
4.2 Edgewater	53
5 Current Conditions	58
5.1 Fall 2019 Site Assessment Methods	58
5.2 Sand Dollar 2019 Assessment Results	59
5.2.1 Vegetation	59
5.2.2 Inventory of Special Status Plant Species	63
5.2.3 Smith’s Blue Butterfly Habitat Value and Buckwheat Mapping	64
5.2.4 Geomorphic Conditions and Presence of Erosion	67
5.2.5 Photopoints	67
5.2.6 General Maintenance Issues	71
5.3 Edgewater 2019 Assessment Results	73
5.3.1 Vegetation	73
5.3.2 Inventory of Special Status Plant Species	77
5.3.3 Smith’s Blue Butterfly Habitat Value and Buckwheat Mapping	78
5.3.4 Geomorphic Conditions and Presence of Erosion	81
5.3.5 Photopoints	82
5.3.6 General Maintenance Issues	87
6 Potential Future Actions for Restoration & Conservation	89
6.1 Management Areas	89
6.1.1 Sand Dollar Habitat Preserve	89

6.1.2 Edgewater Habitat Preserve.....	90
6.2 Restoration, Stewardship & Maintenance Plan.....	90
6.3 Control of Invasive Plants.....	91
6.3.1 Invasive Plant Ranking	94
6.3.2 Invasive Plant Control Methods	97
6.3.2.1 Iceplant	97
6.3.3 Herbicide Application: Best Management Practices	98
6.3.3.1 Rules & Regulations	98
6.3.3.2 Measures To Minimize Impacts To Protected Species	99
6.4 Revegetation.....	106
6.4.1 Revegetation Areas	106
6.4.1.1 Sand Gilia and Monterey Spineflower.....	107
6.4.2 Measures To Minimize Impacts To Protected Species	114
6.4.3 Revegetation Methods	114
6.4.3.1 General Specifications.....	114
6.4.3.2 Protected Species Specifications.....	114
6.4.4 Seed Collection.....	116
6.4.4.1 General Specifications.....	116
6.4.4.2 Protected Species Specifications.....	116
6.5 Long-term Monitoring & Reporting	117
6.5.1 Smith’s Blue Butterfly Transects	118
6.5.1.1 Protocol (Permitted or authorized biologist required).....	118
6.5.1.2 Transect Locations.....	119
6.5.2 Vegetation Line–Intercept Transects	122
6.5.2.1 Protocol.....	122
6.5.2.2 Transect Locations.....	122
6.5.2.3 Monterey Spineflower	123
6.5.3 Sand Gilia	126

6.5.3.1 Protocol.....	126
6.5.3.2 Historic Observations and Planted Locations	126
6.5.4 Photo Monitoring.....	129
6.5.4.1 Protocol.....	129
6.5.4.2 Photo Point Locations	129
6.5.5 Reporting Requirements	132
6.6 Physical Maintenance Needs.....	133
7 Actions for Spring 2020	135
8 References	140
Appendix A.....	149
Appendix B.	151

1 Introduction

The Edgewater and Sand Dollar shopping complexes are two major retail centers in the City of Sand City and together include major retailers Costco, Marshalls, Target, Ross, and Lucky (**Figure 1.1**). The development of these shopping centers in 1989 and 1996 was approved under the conditions that segments of the rare coastal dune habitat on both sites would be conserved and managed in perpetuity (HLA 1989a; Zander Associates 1995). Construction at the two sites was approved through two different legal frameworks that led to different types of legal habitat protection. The construction of the Edgewater shopping center was determined to cause a take of federally listed endangered species, Smith's blue butterfly, leading to the necessity of an incidental take permit (ITP) which requires a habitat conservation plan (HCP) to preserve habitat under the Federal Endangered Species Act (ESA) of 1973, (Zander Associates 1995). The construction of the Sand Dollar shopping center was not determined to cause a take of any federally endangered species but did require the creation and management of a Biological Resource Management Plan (BRMP) under the Coastal Zone Management Act (CZMA) and the California Coastal Act (HLA 1989). These legal and planning documents are discussed in detail later in the legislative history section.

The main goal of this project was to perform a thorough evaluation of the historical background and current compliance of the Sand Dollar and Edgewater habitat preserves with respect to their planning documents, and to provide feasible recommendations to the City of Sand City on how to bring and keep these habitat preserves to a standard that meets the criteria established in the planning documents.

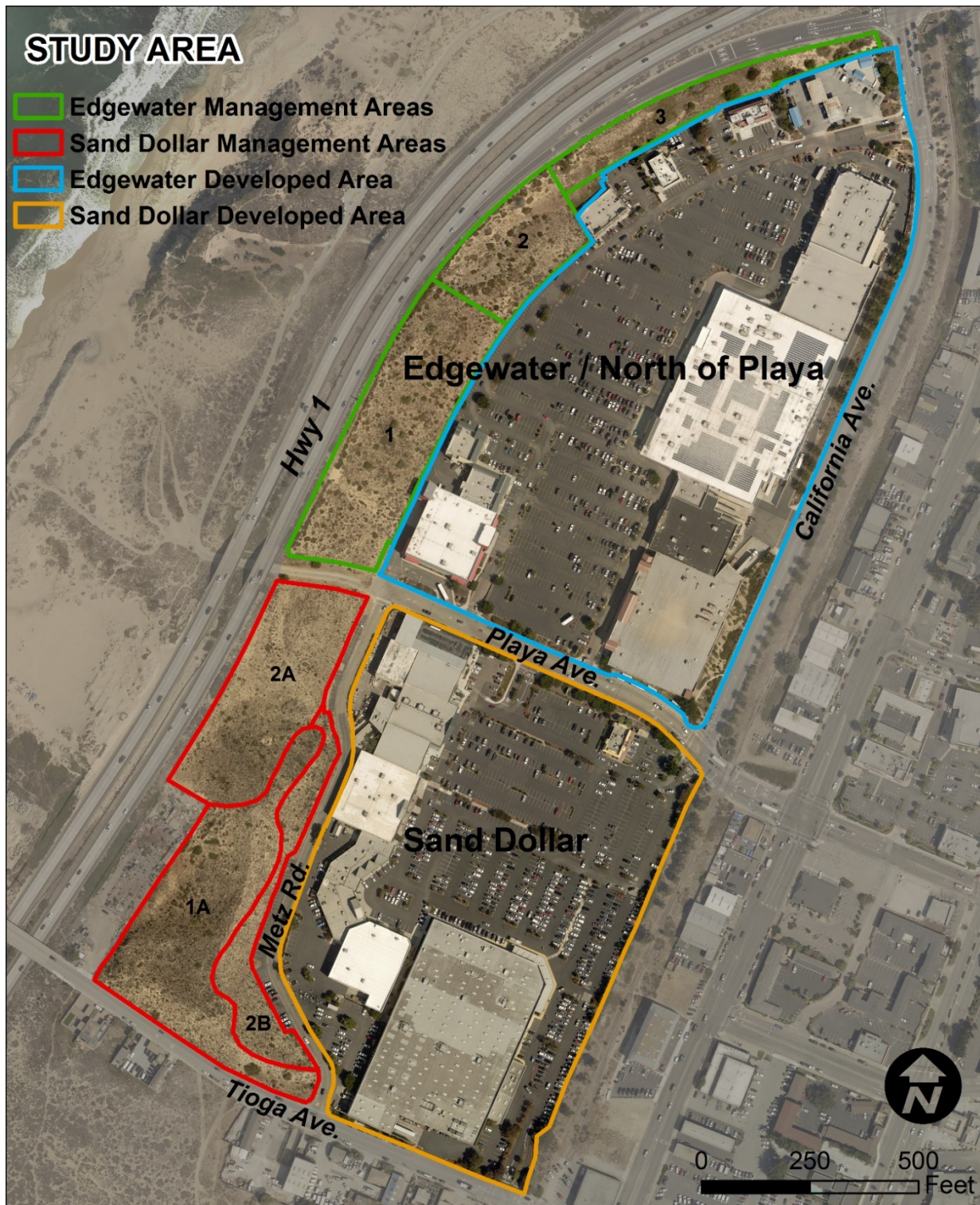


Figure 1.1. Map of the Sand Dollar and Edgewater habitat preserves and developed areas. Management Areas within each habitat preserve are labeled.

1.1 Legal Context

1.1.1 Endangered Species Act of 1973

The Federal Endangered Species Act (ESA) was signed into law in 1973 in order to protect endangered and threatened species from decline and promote their resurgence (ESA 1973). Section 10 of the ESA specifies that a habitat conservation plan must be created and accepted by the United States Fish and Wildlife Service (USFWS) for the issuance of a take permit when a private entity wishes to undertake a project that may destroy habitat of a federally endangered or threatened species. "Take" is defined by the ESA as an action that would harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect any threatened or endangered species. An Incidental Take Permit application requires an HCP that specifies:

The impact which will likely result from such taking;

1. What steps the applicant will take to minimize and mitigate such impacts, and the funding that will be available to implement such steps;
2. What alternative actions to such taking the applicant considered and the reasons why such alternatives are not being utilized; and
3. Such other measures that the Secretary may require as being necessary or appropriate for purposes of the plan

The Secretary of Commerce/Interior in charge of issuing the take permit will issue a permit if:

1. The taking will be incidental;
2. The applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking;
3. The applicant will ensure that adequate funding for the plan will be provided;
4. The taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild.

A take permit will contain terms and conditions the Secretary deems necessary or appropriate, including but not limited to, reporting requirements as the Secretary deems necessary for determining whether such terms and conditions are being complied with. If these conditions are not met, the Secretary can revoke the take permit (ESA 1973).

1.1.2 California Coastal Act of 1976

The Coastal Zone Management Act (CZMA) was signed into federal law in 1972 to protect coastal regions in the United States and to promote healthy development of the nation's coastlines (CZMA 1972). The California Coastal Act (1976) builds off the mandate of the CZMA and allows for the delegation of tasks to state and municipal entities through the creation of Local Coastal Programs (LCP) that grant certain responsibilities and authorities to municipalities. Once an LCP is approved by the California Coastal Commission the LCP has jurisdiction to manage its region according to the rules of the California Coastal Act. Under the Coastal Act, the City of Sand City LCP is required to protect "environmentally sensitive areas" defined in the CCA as: "any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which could be easily disturbed or degraded by human activities and developments" (CCA 1976). The Sand City LCP Land Use Plan states that: "Within this area (east of State Highway One), there are scattered locations which contain remnants of the fragile Coastal Strand community or ecotones between it and inland communities. These areas contain a variety of native species and some rare and endangered species, including the rare wallflower, the rare Monterey ceanothus, the rare and endangered sandmat manzanita, and the food species, buckwheat, for the rare and endangered Smith's blue butterfly. Due to the presence of rare and endangered species east of State Highway One, these areas are considered environmentally sensitive habitats, even though they have been impacted over time and are in a disturbed state" (City of Sand City 1982). Therefore, the approval process for development at the Sand Dollar site required preparation of a BRMP in accordance with the Sand City Land Use Plan.

1.2 Summary of Legal and Financial Obligations

Environmental documents prepared for the Sand Dollar and Edgewater developments each specified a short-term obligation by the developers to restore, protect and maintain habitat. Although the short-term obligations have been fulfilled, there also appears to remain a legal obligation to maintain the sites in perpetuity. The short-term and perpetual obligations to protect and maintain habitat are summarized in Section 1.2.1

and 1.2.2 below; and a full annotated timeline of all relevant documents is presented in chronological order in Section 1.3.

1.2.1 Sand Dollar

The short-term obligation of the developer to monitor and maintain habitat at the Sand Dollar habitat preserve was defined in the Sand Dollar BRMP. The BRMP required a formal agreement between the developer and Sand City as a mechanism to enforce this obligation. The section titled “Formal Agreement” on page 44 of the Sand Dollar BRMP states that:

“As a condition to issuance of any building or grading permits by Sand City for commencement of construction of the project, Monterey Sand Co. and all owners of the project site will enter into a formal agreement with Sand City and applicable regulatory agencies to ensure that the provisions of this plan are carried out. As a part of this agreement, Monterey Sand Co. and these owners will commit to participate in the city-wide HCP with respect to this project and commit the level of funding required herein for the project site to the city-wide HCP in the event the HCP establishes a different entity for management of the sensitive habitat areas on the project site.”

The provisions of the BRMP included initial restoration and protection of habitat, control of invasive weeds, and monitoring for compliance with defined performance criteria. The BRMP initially obligated the developer to monitor and maintain the restored and protected habitat for a period of five years. BRMP Addendum 1 extended this period to ten years in response to comments received from state and federal resource agencies (HLA 1989).

The BRMP established a perpetual obligation by the developer to preserve and maintain habitat at the Sand Dollar site beyond the initial maintenance and monitoring period by requiring dedication of a conservation easement, and through reference to plans for it to be included in a city-wide HCP. Page 43 of the BRMP states that:

“...in order to provide for the long-term protection of the sensitive habitat areas, Monterey Sand Co. will grant a conservation easement in perpetuity over Management Areas 1A, 2A, and 2B.” (HLA 1989)

Reference to the planned City-wide HCP is made on page 44 in the statement:

"It is anticipated that the HCP, when completed, will provide a mechanism for long-term funding for monitoring and maintenance of mitigation and management plans. The funding mechanism established under this plan will assure the long-term funding of the preservation of the sensitive habitat areas of the project site. In the event that the HCP establishes a different mechanism, Monterey Sand Co. will participate in that funding mechanism as a substitute for the mechanism established under this plan to the extent of the financial obligations set forth in this plan."

The Conservation Easement was recorded through an Offer to Dedicate, dated September 20, 1989, and the acceptance of the Offer to Dedicate, dated March 27, 2015. Section 2 of the Offer to Dedicate states that:

"...Grantor shall be responsible for all costs and expenses for maintenance, improvement, use or possession of the Sensitive Habitat Area except for costs incurred by Grantee for monitoring compliance with the terms of this offer."

The duration of this agreement is defined in Section 8 which states:

"...all of the terms, covenants, conditions, restrictions, and reservations contained in this Offer shall constitute covenants running with the land...in perpetuity"

BRMP Addendum 1 added language further clarifying the obligation of Monterey Sand Co. to administer the collection of funds from the owners of the project site, stating that:

"Monterey Sand Co. will impose upon the project site recorded covenants and restrictions which will obligate the owners of the project site to manage and maintain the sensitive habitat area in accordance with this plan. These covenants and restrictions, as part of this obligation, will require the landowners to pay the amounts necessary to cover the cost of monitoring and maintenance over time." (HLA 1989)

The funding source for perpetual maintenance of habitat is further defined in BRMP Addendum 2, which states that:

"In the event that the city-wide HCP is not in effect by 1999, funds for continued trash removal, iceplant control, and permanent fence maintenance would be provided on an annual basis through assessments imposed on the Property Owners ... The assessment will be \$2000 per year (based on 1989 dollars) and will be placed in a special account

managed by the City of Sand City specifically for maintenance of the Sensitive Habitat Area.”

It is made clear that this assessment is to continue in perpetuity by the statement:

“Funding for maintenance beyond year ten will continue indefinitely or until such time as another permanent funding mechanism is established.” (HLA 1989)

A city-wide HCP was never approved. So, the above statement appears to be the most recent guidance on the financial obligations of the shopping center owners. It appears that the shopping center owners have been acting in accordance with this guidance to some extent, as they have been paying for basic maintenance as recently as 2019 (Joey Dorrell–Canepa, personal communication, October 10, 2019).

An “Agreement for Implementation” also exists for the Sand Dollar site (cited by BRMP Addendum 2), but we did not obtain a copy of this in time for our review.

1.2.2 Edgewater (North of Playa)

The legal obligation to restore and maintain the Edgewater habitat preserve is tied to the North of Playa HCP, a city Resolution approving the HCP, an Implementation Agreement, an Operation and Easement Agreement, two conservation easements, and two grant deeds. Like the requirements stated in the Sand Dollar BRMP, the North of Playa HCP specified both short-term and perpetual obligations for preservation and maintenance of habitat. Section 3.3.11 of the HCP describes short-term obligations by stating:

“Initial funding for implementation and monitoring will be borne by the project owners through utilization of construction funds, or dedication of funds to a special account specifically established for this purpose...”

and speaks to long-term obligations by stating:

“Long-term funding for maintenance of the habitat will be provided through an annual assessment fee and deposited in an account specifically established for this purpose. The City of Sand City will be designated as the entity responsible for long-term maintenance of the habitat.” (Zander 1995)

Section 4 of the HCP provides more detail regarding perpetual obligations and makes an additional distinction between the entity responsible for funding versus administration of funds by stating:

“D.B.O. Development Company will impose upon the project site recorded covenants and restrictions which will obligate present and future owners of the property to manage and maintain the sensitive habitat area in accordance with this plan. These covenants and restrictions, as part of this obligation, will require the landowners to pay the amounts necessary to cover the cost of monitoring for five years and for maintenance of the habitat in perpetuity...A special account for these funds will be established and administered by D.B.O. Development Company until such time as the City of Sand City assumes responsibility for long-term management of the area, then administration of funds will be transferred to the City.” (Zander 1995)

The covenants and restrictions stipulated by the HCP were recorded by an Offer to Dedicate Conservation Easement for Management Areas 1 and 2 and a separate Offer to Dedicate Conservation Easement for Management Area 3, both dated June 14 and officially recorded on July 25, 1996. Language in both Offers cites the HCP Implementation Agreement signed by the developer and reiterates the framework for long-term funding by stating in Section 2:

“Grantor (D.B.O. Development Company) shall be responsible for all costs and expenses for maintenance, improvement, use or possession of the Mitigation Area except for costs incurred by Grantee for monitoring compliance with the terms of this Offer.”

However, the grantor’s rights regarding transfer of title are stated in Section 9:

“Grantor shall have the absolute right to transfer its right, title and interest in and to all or any portion of the Mitigation Area...and upon such a transfer Grantor shall be fully relieved and discharged from all of Grantor’s obligations under this Offer with respect to the land transferred.”

The Certificates of Acceptance for both Offers were signed June 17, 1996. Several days later, the title was transferred from D.B.O. Development to the City of Sand City by a Grant Deed dated June 20 and recorded on July 25, 1996. The Grant deed appears to make a clear distinction that while ownership of the parcel is transferred to the City, it

does not negate the obligations of the developer under the HCP when it states in Paragraph 2:

“Nothing in this paragraph shall be deemed to alter or affect the respective obligations of Grantor and Grantee under either the Habitat Conservation Plan or the Implementation Agreement.” (City of Sand City 1996d)

This responsibility is further acknowledged in the Operation and Easement Agreement entered into by D.B.O. development and the operators of retail venues in the shopping center, which states:

“The Habitat Area shall be maintained in accordance with the requirements of the Habitat Plan (defined in paragraph 1.25), and the Operator is authorized to collect from the Parties and forward to the City the annual payments for maintenance of Parcel A as provided in the Habitat Plan” then “Notwithstanding any contrary provisions of this Agreement, (i) the obligations under this paragraph 4.2(C) shall continue in perpetuity, unless released of record by the U.S. Fish and Wildlife Service (as to subparagraph 4.2(C)(l)j ...; and (ii) this paragraph 4.2(C) may not be amended without the prior written consent of said Service or City (respectively as to said subparagraphs).”

Based on the language in the documents summarized above, it appears that responsibility for ensuring long-term habitat maintenance lies with the land owner of the habitat preserve, which is currently the City of Sand City. However, language in the HCP and Grant Deeds makes a distinction between the City of Sand City being responsible for ensuring the maintenance of the site, and the owners of the project area, which includes the shopping center, being responsible for the costs of said maintenance. This point is reinforced by the fact that the HCP and its Implementation Agreement are the only documents in our knowledge pertaining to the Edgewater habitat preserve that are signed by USFWS, so any language in subsequent agreements between the developers and the city cannot alter the terms of the HCP or Implementation Agreement without USFWS approval.

1.3 Legal Timelines

1.3.1 Sand Dollar

The timeline of legislative and administrative history of the Sand Dollar habitat preserve is as follows:

- 1976: California Coastal Act grants cities the ability to create Local Coastal Programs (LCP), which have the authority to issue Coastal Development Permits for their own jurisdictions, provided that they have a Land Use Plan (LUP) and Coastal Implementation Plan certified by the California Coastal Commission (CCA 1976).
- 1982, December 2: Sand City LUP certified as legally adequate by the California Coastal Commission (City of Sand City 1982).
- 1988, August 12: Draft EIR for Sand Dollar shopping center published. The EIR was prepared by LSA Associates. Proposed mitigation measures consisted of reclamation of former sand mining areas, and resource management guidelines from McDonald Property Specific Plan including a dune habitat restoration program, and mitigation measures for impacts to Smith's blue butterfly, black legless lizard, coast wallflower, Monterey Bay spineflower, sandmat manzanita, Monterey ceanothus, and plant communities of central dune scrub and central maritime chaparral (LSA 1988).
- 1989, January: Responses to comments on draft EIR were released (LSA 1989).
 - Notably, USFWS Comment 1 stated that the project as initially planned would result in take of Smith's blue butterfly. The concern in Comment 1 was addressed by additional surveys for the butterfly, and the rerouting of Metz Road to avoid a patch of seacliff buckwheat.
 - USFWS Comment 2 stated that the mitigation measures were not adequate because there was no mechanism in place to insure their implementation. This comment was addressed by stating that the Sand City LUP provided that all habitat protection plans must provide funding for long term maintenance and preservation.
- 1989, February 1: BRMP for Sand City Regional Shopping Center finalized. The BRMP contained plans for the restoration, mitigation, and monitoring of the Sand

Dollar habitat reserve, specific success criteria for each management area, and obligated Monterey Sand Co. to carry out all of the provisions that it contained “...as a condition for the issuance of any building or grading permits by Sand City for commencement of the project.” (HLA 1989)

- 1989, March 7: Addendum 1 to BMRP finalized. Amended BRMP approved through Sand City Resolution number SC-8 1989. Updates included changes based on the realignment of Metz road. The BMRP was approved under authority of the Sand City LUP. No USFWS or CDFW approval was required because the project did not require a take permit for Smith’s blue butterfly (HLA 1989).
- 1989, May 15: Addendum 2 to BRMP published. This amendment specified that in the event that a city-wide HCP was not in effect by 1999, funds for invasive plant control, trash removal, and fence maintenance would be “...provided on an annual basis through assessments imposed on the property owners of that portion of the property...” and that “Funding for maintenance beyond year ten will continue indefinitely or until such time as another permanent funding mechanism is established.” (HLA 1989)
- 1989, approximate: Agreement for Implementation executed. Document not obtained by present authors.
- 1989, approximate: Mitigation Monitoring Program published. This defined the monitoring checklist for the issuance of various permits, including the final grading permit for the site (City of Sand City 1989).
- 1989, September 20: Offer to dedicate the conservation easement to the City of Sand City by Monterey Sand Company, as a precondition of the permits to begin construction. Terms contained in the offer place the responsibility on Monterey Sand Company for maintaining the habitat preserve and gives the City of Sand City legal options for compelling Monterey Sand Company to effectively manage the preserve, but are not legally binding until the acceptance of the offer (Monterey Sand Co. 1989).
- 2015, March 18: Offer to Dedicate Conservation Easement accepted by the City of Sand City, thus enacting the terms contained in the offer. (City of Sand City 2015).

1.3.2 Edgewater (North of Playa)

The timeline of legislative history of the Edgewater habitat preserve is as follows:

- 1995, June 21: Draft EIR for North of Playa Redevelopment Project published, prepared by LSA associates. This EIR notably listed loss of habitat and individuals of Smith's blue butterfly, black legless lizard, coast horned lizard, Monterey Bay gilia, sandmat manzanita, Monterey spineflower, Monterey ceanothus, and Michael's rein orchid (LSA 1995).
- 1995, August: A Habitat Conservation Plan (HCP) for Smith's blue butterfly and the other species of special concern was prepared by Zander Associates. This HCP specifies both short-term and long-term obligations of the owners of the shopping center to provide funding for habitat maintenance. (Zander 1995).
- 1995: The HCP for the North of Playa project site was approved by the Sand City Council, in resolution SC 95-49 (City of Sand City 1995).
- 1995, October 16: North of Playa HCP revised and approved by USFWS.
- 1996, April 26: The Implementation Agreement for the North of Playa HCP was entered between the City of Sand City, D.B.O. Development no. 25, and the USFWS. This agreement appears to place responsibility for funding maintenance of the habitat preserve on D.B.O. Development (City of Sand City 1996a).
- 1996, July 25: Conservation easements for Edgewater habitat preserve, which include Management areas 1, 2, and 3, are offered to the city, and recorded by the county recorder (City of Sand City 1996b; City of Sand City 1996b).
- 1996, July 25: Fee title for Parcel A conveyed to Sand City (City of Sand City 1996d).
- 1996, July 25: Operation and Easement Agreement entered between D.B.O. development and operators of retail properties in Edgewater shopping center. (City of Sand City 1996e)
- 1997, May: Management Area 3 is conveyed to the City of Sand City through a lot line adjustment. Previously, Management Area 3 fell in a private parcel that contained both the Management Area and retail properties. (authorized by council May 6 recorded May 15) (City of Sand City 1997a; DBO 1997).
- 1997, July 1: The City Council of Sand City accepted the completion of the habitat restoration services by Zander Associates by resolution SC 97-6. These services

included the initial habitat restoration services at the Edgewater site, totaling \$110,563 (City of Sand City 1997b).

- 2004–2008: Habitat maintenance performed at Edgewater site by Native Solutions was invoiced to Sand City but reimbursed by the owner of the shopping center (Joey Dorrell–Canepa, personal communication, October 10, 2019).
- 2019, April 26: Sand City internal memorandum states that the city is the owner of both parcels that make up the Edgewater habitat preserve, and that tax documents show that the assessment described in the HCP is not currently being collected (City of Sand City 2019).

2 Coastal Dunes: Significance and Relevance to Sand City

2.1 Formation

Dunes form where an abundant supply of dry sand can be transported, such as in coastal areas (Wiedemann and Pickart 2004). Coastal dunes are dynamic habitats characterized by fluid sand structures that are shaped over time by the ocean through wave action and tides, and by wind that blows and transports the sand (Cooper 1967). On the U.S. west coast sand is transported in southward longshore currents, and dunes occur where the shore is positioned to receive more sand because the coastline jogs westward and is oriented in the effective wind direction (Cooper 1967).

2.1.1 Coastal Dunes in California

The California coastline supports patches of coastal dunes that extend north to the Oregon border and as far south as San Diego and range in size from 2.5 acres to over 40 square miles (Cooper 1967, Wiedemann and Pickart 2004). Dunes formed here during the Pleistocene Epoch are referred to as “Pre-Flandrian” dunes, and they are mostly stabilized with a defined soil profile (Cooper 1967). Dunes formed following the last ice age are known as “Flandrian” or “post-Flandrian” and are often superposed over the Pre-Flandrian sheet (Cooper 1967). These active dune systems extend to the beach and have relatively little vegetation; they are younger than the older, inner and more established Pre-Flandrian dunes (Cooper 1967).

Because these natural ecosystems are located on the temperate coast, a most desirable location for cities, tourism and recreation, coastal dune habitat throughout the state has been severely reduced and impacted both directly and indirectly by humans (Pickart and Barbour 2007; Alpert 2016).

2.1.2 Rare in California

Coastal dunes have declined as a result of residential and commercial development, agriculture, off-road vehicle use, sand mining, and introduction or encroachment of exotic species (Pickart and Sawyer 1998; Pickart and Barbour 2007; Alpert 2016). Five of the thirteen major dune localities described by Barbour and Johnson (1988) lie south of

San Francisco and most have been heavily built or planted over; one of these is the well-known, large coastal dune belt of Monterey Bay (Cooper 1967).

The Monterey Bay Dunes Complex has been noted as one of two examples of “extensive coastal dune complexes that are relatively rare in California” (California Geology, as cited in Monterey Bay Dunes 1991). While this complex could be considered one unit, there are notable distinctions therein that influence biological composition and distribution in the greater dune area. Cooper (1967) described the composition of this 105 square mile complex: 94% is made up of older Pre-Flandrian dunes which are characterized by shrub plant communities and observed inland (e.g. former Fort Ord); the narrow strip of dunes next to the coast are more recently formed Flandrian dunes which have been stabilized and are no longer experiencing major building but are still active with the movement of loose sand; the most recent dunes occupy a limited extent of “mere fringe” along the nearshore zone of the coast. It is the narrow strip of nearshore Flandrian dunes that most immediately pertain to the evaluation of coastal dune habitat in this report.

2.1.3 Importance of Dunes

Coastal dunes provide many ecosystem services (Barbier et al. 2011): coastal protection, erosion control, water catchment and purification, maintenance of wildlife, carbon sequestration, tourism, recreation, education, and research (Alpert 2016). Additionally, dune areas provide a place for groundwater recharge and serve as an important source of freshwater retention that can act as a buffer against saltwater intrusion (Martinez et al. 2003).

Coastal dunes serve as habitat for plants and animals with unique adaptations for living on the dunes. Many of the species found here are classified as state and/or federally threatened or endangered species and are limited in their range (Monterey Bay Dunes Coalition 1991; Pickart and Barbour 2007; Alpert 2016). The biodiverse plant and animal life that have adapted to survive—and thrive—here have done so because they have developed characteristics that enable them to change with the changing landscape (Pickart and Barbour 2007; Alpert 2016).

Native plants with unique adaptations aid in the formation of coastal dune structures and habitat. Most native plants in dunes are prostrate herbs with creeping stems and

long fleshy taproots, and hairy leaves that are grayish in color (Pickart and Barbour 2007). Plants are generally widely spaced and have adapted to wind, salt, sun, drought and sandblasting that characterize the coastal dune environment (Pickart and Barbour 2007). Native dune vegetation does not provide a rich supply of food for animals, yet these special habitats support a diversity of species, including small arthropods and reptiles (Pickart and Barbour 2007).

The uniqueness of coastal dunes is further demonstrated in the distinctive natural communities supported here (Pickart and Barbour 2007; Alpert 2016). The northern foredune community is limited in distribution throughout California and considered very threatened (Sawyer and Keeler-Wolf 1995). A *foredune* is a vegetated ridge parallel to the beach and above the high tide line (Alpert 2016). The more stabilized, vegetated backdunes support central dune scrub (G2 S2.2) communities, designated critical habitat (USFWS 2008) for Monterey spineflower (*Chorizanthe pungens* var. *pungens*). The Sand Dollar and Edgewater habitat preserves are Flandrian central dune scrub of the Monterey Bay Dune Complex with native plant species characteristic of the Central Dune Scrub community described by Holland (1986). Additionally, the vegetation community here is more recently referred to as *Lupinus chamissonis*-*Ericameria ericoides* Shrubland Alliance described by Sawyer et al. (2009). Because these natural ecosystems are located on the coast and compete with human interests, coastal dune habitat throughout the state has been severely reduced and impacted both directly and indirectly by humans as noted above.

2.1.4 Human Impacts on Dunes

When dunes are artificially stabilized by non-native, invasive plants, roads, physical structures, and/or restructuring they are limited in their capacity to function naturally and support the species that occur here (Martinez et al. 2003; Pickart and Barbour 2007). Human altering of dunes makes these landscapes especially vulnerable to colonization by plants that do not naturally occur or thrive here, such as iceplant and non-native grasses, and that outcompete smaller annuals that are part of this habitat (Pickart and Barbour 2007). By compromising the natural processes that influence dune habitat, humans have had a detrimental effect on the health and function of coastal dune ecosystems and the species that depend on it for their survival.

2.1.5 Management of Dunes

Restoration of coastal dune scrub communities is challenging but increasing efforts since the 1990s have provided useful techniques for managing these sensitive ecosystems (Pickart and Barbour 2007). Removing non-native invasive plants, such as iceplant, are high priority (Pickart and Sawyer 1998; Pickart and Barbour 2007) because these plants seem to present the most immediate threat to coastal dune habitat (Alpert 2016). Efforts to eradicate these non-native invasive species include hand pulling and digging as well as heavy equipment to uproot and bury plants (Alpert 2016). Another method is to spray iceplant with herbicide such as glyphosate (DiTomaso et al. 2013). Protecting and stewarding remnant dune habitat and ecosystem function is essential to the long-term persistence of these habitats and the native species that survive here.

2.2 Species Profiles

With unattributed reproduction from North of Playa HCP (Zander Associates 1995), along with adaptations and updated content for this report.

2.2.1 Animals

2.2.1.1 Smith's Blue Butterfly, *Euphilotes enoptes smithi*

Protection Status

The Smith's Blue butterfly (SBB) is a federally protected species (CDFW 2019a) and has been since the time of the BRMP (Harding Lawson Associates 1989) and HCP (Zander Associates 1995) (**Table 2.1**). The California Department of Fish and Wildlife does not allow for the listing of insects (CDFW 2019b).

Table 2.1 . Historic and current U.S. Federal listing status for Smith's blue butterfly.

Listing status	At time of project approvals in 1990s	Current (2019)
State endangered	-	-
State threatened	-	-
State species of special concern	-	-
Federal endangered	BRMP/HCP	X
Federal threatened	-	-
Federal proposed for listing	-	-

Natural History

The Smith's blue butterfly is a small lycaenid butterfly, which, as an adult has a one-inch wingspan. Larvae are slug-shaped and vary from cream to pale yellow or rose in color, changing with the color of the buckwheat flowerheads on which they are feeding (USFWS 1984).

The larvae (caterpillar form) feed on two species of buckwheat: the seacliff buckwheat *Eriogonum parvifolium*, generally used in the southern portion of the SBB range, and the coast buckwheat, *Eriogonum latifolium*, generally used in the northern portion of SBB range. Both species of buckwheat are utilized by populations of Smith's blue butterfly within Sand City.

The entire lifespan of the SBB occurs within a few hundred yards of the buckwheat plant where females lay eggs on the flower heads, and both adults and larvae feed on the flowers. Because of SBB's dual dependency on the flowers of its buckwheat food plants, it is more susceptible to habitat degradation. Although it is more extinction prone because of its total dependence upon the flowers of buckwheats, conservation efforts are greatly simplified because resource managers only need worry about two plant species rather than several plants to maintain this endangered butterfly.

The larvae pupate sometime between August and November, and then overwinter in the leaf litter at the base of the plants. As with any other lycaenids, Smith's blue butterfly larvae may have a mutualistic interaction with ants during later developmental stages (Arnold 1983).

The Smith's blue butterfly is a weakly flying species; therefore, long distance dispersal is believed to occur only rarely. Arnold reported common dispersal of distances of up to a few hundred yards at Fort Ord and at the Marina State Beach (1983 and 1986). Flight usually occurs within one or two meters above the ground. Observations of extended flight of more than a few minutes for an individual butterfly are rare.

Distribution and Habitats

With unattributed reproduction from Arnold et al. (2006), along with adaptations and updated content for this report.

Smith's blue butterfly is found along the coastal dunes of Monterey County north from Marina Dunes, south to Point Gorda. More inland populations are found in Carmel Valley. The distribution and habitats of Smith's Blue have not changed since the inception of the North of Playa HCP. Between Monterey and southern Santa Cruz County, SBB is found on coastal sand dunes in association with coast buckwheat. From the southern portion of Fort Ord to Monterey, there are several sand dune-inhabiting populations that occur in association with seacliff buckwheat.

Throughout most of its range, the primary threat to the butterfly is urbanization. The limited distribution and poor quality of host plants in Sand City has resulted in a locally limited distribution of SBB.

Adult Smith's blue butterflies can find basic requirements (mating, nectaring, egg-laying) within a very small area (less than three acres). In locations where host plants are abundant, the local densities of Smith's blue butterflies may vary from year to year, and may shift spatially over a period of years, at least partially in response to declining buckwheat quality (Arnold 1986).

Since the Smith's blue butterfly spends the majority of its time in short flight within patches of buckwheat, any area of non-habitat, such as active mining areas, large blow-outs on sand dunes, or extensive dense patches of vegetation which do not contain buckwheat (such as iceplant), will act as barriers to dispersal. Where visual continuity of habitat does not exist, as with areas of urban development or planting of shrubs or trees,

the barrier is likely to be significant. Some dispersal may be passive, by the wind, but the typical response of adults under high wind conditions is to avoid flight altogether.

Presence in Sand Dollar and Edgewater Habitat Preserves

At the Sand Dollar Preserve five years of surveys for the Smith's Blue Butterfly showed a variable but substantial population, ranging from 700–5000 individuals (TRA 1998).

At Edgewater it was noted in the HCP (Zander Associates 1995) that a small population of Smith's blue butterflies had periodically existed at the portion of the site that was developed into the shopping center. A survey conducted over a seven-week period for the 1999 Monitoring Report identified 309 adults (Zander Associates 1995), some of which may have been duplicates due to the transects being walked two times per visit. The population had declined 33% since 1997, which is not unusual for Smith's Blue butterflies (Arnold 1999). It was anticipated that the population would increase with increasing buckwheat plants maturing and producing more flowers, and no change in habitat management was recommended.

2.2.1.2 Black Legless Lizard, *Anniella pulchra nigra*

Protection Status

At the time of the Sand Dollar and Edgewater shopping center developments the black legless lizard was proposed for listing at the federal level (Harding Lawson Associates 1989; Zander Associates 1995) (**Table 2.2**). At the time of drafting the BRMP for Sand Dollar (Harding Lawson Associates 1989) the species was a state species of special concern, which is still its current status (CDFW 2019a).

Table 2.2. Historic and current State of California and U.S. Federal listing status for the legless lizard.

Listing status	At time of project approvals in 1990s	Current (2019)
State endangered	-	-
State threatened	-	-
State species of special concern	BRMP	X
Federal endangered	-	-
Federal threatened	-	-
Federal proposed for listing	BRMP/HCP	-

Natural History

A. pulchra was formerly split into two subspecies: *Aniella pulchra pulchra*—Silvery Legless Lizard and *Aniella pulchra nigra*—Black Legless Lizard). Most herpetologists and state agencies no longer recognize the two subspecies as they are considered melanistic morphs (CDFA 2019a).

Black legless lizards burrow in sand and leaf litter beneath plants that grow on the dunes. They feed on insects and other invertebrates that occur in the sand. At least a few plants need to be present as food for insects that, in turn, serve as food for the black legless lizards. They are live-bearing and 1–4 young (usually 2) are born in the fall between September and November (Miller 1944; Kuhn et. al. 2005). Young and adults spend most of the time underground but may rest just under the surface of the sand or leaf litter layer.

The activity of legless lizards is controlled by temperature. The optimum temperature is from 15° C to 25° C. Below 13 degrees Celsius the lizards are inactive, although they can stand a temperature as low as 4 degrees Celsius. The lizards bask in the warm sand during the day. They are active and feed in the afternoon and evening.

Distribution and Habitats

The black legless lizard is only known to exist from the Monterey Peninsula and the southern part of Monterey Bay (Stebbins 1966; Kuhn et. al. 2005). Its historic range extended along the coastal sand dunes from the Salinas River to the Carmel River.

Human activity has disrupted the continuous distribution of the black legless lizard and the lizard has experienced a severe reduction in the area where it formerly occurred.

Black legless lizards live in several habitats in sand dunes from areas immediately above high tide, the crest of sand dunes, and the edge of the hind dunes (TRA 1987; Kuhnz et. al. 2005). They are most abundant in dune habitats where native vegetation is present (Stebbins 1966; Kuhnz et. al. 2005). Although legless lizards have also been found along the edges of iceplant mats within dune ecosystems, the iceplant mat community is not considered suitable habitat for legless lizards (Papenfuss and Harris 1990; Kuhnz et. al. 2005). The dense root structure of iceplant and lack of leaf litter and duff produced by the species appear to provide poor burrowing conditions for legless lizards.

Habitat destruction and modification are the primary threats to the black legless lizard. Extensive urban and agricultural development in the Monterey Bay region has eliminated many areas of black legless lizard habitat. Degradation or removal of native vegetation by urban or agricultural development, recreational activities, and introduction of non-native species such as iceplant has made habitat conditions unsuitable for the black legless lizard in many areas (Bury 1985; Kuhnz et. al. 2005). Activities that compact soils, such as trail construction or off-road vehicle use, also degrade black legless lizard habitat (Bury 1985; Kuhnz et. al. 2005). Because black legless lizards travel underground, dispersal capabilities for the species are limited. Movement barriers include rivers, hard or rocky soils, roads or trails, and cultivated fields (Bury 1985; Kuhnz et. al. 2005). Habitat modifications in the Monterey Bay region have isolated many legless lizard populations. Isolated populations are highly susceptible to extirpation from catastrophic events and genetic erosion resulting from excessive inbreeding (Bury 1985; Kuhnz et. al. 2005).

Presence in Sand Dollar and Edgewater Habitat Preserves

Habitat for black legless lizards was known to occur on and adjacent to the project site at Edgewater. Habitat on-site had been degraded by the presence of iceplant, compacted substrate as a result of the previous mining activity, and the dumping of rubble and debris. Black legless lizards were observed in three locations on the project site before development occurred, including within the proposed mitigation area (Zander Associates

1995). In 1996 340 lizards were captured at the site and cared for in captivity. In June 1998 162 of those lizards were reintroduced into the Preserve, and the rest were released there in 1999.

At Sand Dollar there are no written requirements for establishment or monitoring of black legless lizards. They were documented in Management Area 1 during a city-wide survey in 1987, and we are not aware of any additional documented surveys of the species at Sand Dollar has happened since then. There was suitable habitat observed for the species at the Habitat Preserve (Dorrell–Canepa 2000).

2.2.2 Plants

2.2.2.1 Monterey Ceanothus, *Ceanothus rigidus*

Protection Status

Monterey Ceanothus was proposed for listing at the federal level during both the BRMP and the HCP (Harding Lawson Associates 1989; Zander Associates 1995) (Table 2.3). At the time of drafting the BRMP for Sand Dollar (Harding Lawson Associates 1989) the species was a state species of special concern. The California Rare Plant Rank for the species is 4.2 and it is considered to have a limited distribution and be “fairly endangered” in the state (CNPS 2019).

Table 2.3. Historic and current State of California and U.S. Federal listing status for Monterey ceanothus.

Listing status	At time of project approvals in 1990s	Current (2019)
State endangered	-	-
State threatened	-	-
State species of special concern	BRMP	-
Federal endangered	-	-
Federal threatened	-	-
Federal proposed for listing	BRMP/HCP	-

Natural History

This species is a medium-sized evergreen shrub with pale to bright blue flowers and is a member of the buckthorn family. The leaves are small, dark green and leathery.

Distribution and Habitats

Monterey ceanothus occurs on pre-Flandrian dunes and flats within central maritime chaparral and closed-cone coniferous forests in the southern Monterey Bay region (Wilken and Burge 2016; Griffin 1978). This species only occurs in the vicinity of Monterey Bay with the largest population known from former Fort Ord (U.S. Army Corps of Engineers 1992). Plant species associated with Monterey ceanothus include sandmat manzanita (*Arctostaphylos pumila*), beach sagewort (*Artemisia pycnocephala*), ripgut brome (*Bromus diandrus*), cropleaf ceanothus (*Ceanothus divergens*), beach mock heather (*Ericameria ericoides*), and deer weed (*Lotus scoparius*) (Zoger and Pavlik 1987a). Removal of central maritime chaparral habitat for development is the primary threat to this species.

Presence in Sand Dollar and Edgewater Habitat Preserves

According to the Habitat Management Plan (Harding Lawson Associates 1989) for the Sand Dollar Habitat Preserve, survival of Monterey ceanothus is not to fall below 35% after initial planting (Harding-Lawson Associates 1989).

Monterey ceanothus was not monitored at Edgewater, but plantings were installed in 1996.

2.2.2.2 Monterey Spineflower, *Chorizanthe pungens* var. *pungens*

Protection Status

Monterey spineflower is a federally threatened species (USFWS 2019a) and has been since the time of the HCP (Zander Associates 1995) (Table 2.4). The California Rare Plant Rank for the species is 1B.2 and it is considered rare, threatened or endangered in the state (CNPS 2019).

Table 2.4. Historic and current State of California and U.S. Federal listing status for Monterey spineflower.

Listing status	At time of project approvals in 1990s	Current (2019)
State endangered	-	-
State threatened	-	-
State species of special concern	-	-
Federal endangered	-	-
Federal threatened	HCP	X
Federal proposed for listing	-	-

Natural History

Monterey spineflower is a small, prostrate annual in the buckwheat family. It occurs scattered on sandy soils within coastal dune, coastal scrub grassland, maritime chaparral, and oak woodland communities along and adjacent to the coast of southern Santa Cruz and northern Monterey Counties and inland to the coastal plain of Salinas Valley.

The U.S. Fish and Wildlife Service updated the Recovery Plan (USFWS 2019b) for Monterey spineflower relevant to its occurrence in coastal dune habitat, noting it may be considered for delisting when:

- Beach–dune occurrences on State Park and private lands throughout its current range from Santa Cruz to the Monterey Peninsula are covered under a permanent protection plan.
- Populations in the protected areas are stable or increasing over a 15–year period, which will include wet and drought years. These criteria ensure that the underlying causes of decline are addressed.

Distribution and Habitats

Monterey spineflower has a wide habitat range and tends to occur on bare sandy patches with sparse vegetation cover. The species often colonizes recently disturbed sandy soils. Within grassland communities, the plant occurs along roadsides, in firebreaks, and other disturbed sites. In oak woodland, chaparral, and scrub communities, the plants occur in sandy openings between shrubs. In dense chaparral or scrub vegetation, Monterey

spineflower typically is restricted to roadsides and firebreaks through these communities. The species is threatened by residential development, agricultural land conversion, recreational use, sand mining, dune stabilization and introduction of non-native species.

Presence in Sand Dollar and Edgewater Habitat Preserves

Protection of Monterey spineflower is not required by the BRMP for Sand Dollar, but efforts were made to enhance the presence the species at the Habitat Preserve. Monterey spineflower population fluctuated yearly in number and location but was substantially larger in 1999 than when the Preserve was established (Dorrell–Canepa 2000).

Monterey spineflower was observed and documented at the Edgewater mitigation site in 1995, and approximately 1,200 plants were present in one of the areas that was later developed into the shopping center. The North of Playa HCP notes improvements would be made to the overall habitat for the species with implementation of the habitat restoration measures described in the HCP (Zander Associates 1995). By 1999 Monterey spineflower were continuing to colonize the site and were increasing in number in some survey areas, but overall, they had decreased about 3% since the baseline survey in 1997.

2.2.2.3 Sand Gilia, *Gilia tenuiflora ssp. arenaria*

Protection Status

Sand gilia has been under different classifications of a state and federally listings since the drafting of the BRMP and HCP (Harding Lawson Associates 1989; Zander Associates 1995) (Table 2.5). The species is currently listed as threatened in California (CDFA 2019c) and federally endangered (USFWS 2019c). The California Rare Plant Rank for the species is 1B.2 and it is considered rare, threatened or endangered in the state (CNPS 2019).

Table 2.5. Historic and current State of California and U.S. Federal listing status for sand gilia.

Listing status	At time of project	
	approvals in 1990s	Current (2019)
State endangered	-	-
State threatened	HCP	X
State species of special concern	BRMP	-
Federal endangered	HCP	X
Federal threatened	-	-
Federal proposed for listing	BRMP	-

Natural History

Sand gilia, is a state listed threatened species and a federally listed endangered species. It was listed by both the federal and state governments because of its small number of known populations, limited distribution, and potential harm to its populations from development. The gilia is a small, erect annual plant of the Phlox family. Recreational uses, such as off-road vehicles, hiking, and horseback riding, as well as the introduction of iceplant and European beach grass for dune stabilization, threaten sand gilia populations and habitat.

Distribution and Habitats

Sand gilia is limited to the Monterey Bay region (USFWS 2019). It is found in scattered populations in coastal dune scrub and maritime chaparral communities from Moss Landing to the Monterey Peninsula. There is a large population of sand gilia on the former Fort Ord (U.S. Army Corps of Engineers 1992).

Sand gilia prefer sandy soils in open, yet wind-sheltered areas (Dorrell-Canepa 1994; Hayes 2015). The low average rainfall (10–15 inches) and foggy conditions around the Monterey Bay area provide sufficient moisture for gilia to survive. Gilia are most often found in level areas or on shallow slopes (up to 45 degrees) but may also occur on the cut banks of sandy drainages. In steep areas, gilia seed often washes to the bottom of the slope and germinates there. On sand dunes, gilia seem to prefer northern, western, and eastern slopes to southern slopes, which are the hottest and driest in the dunes. Gilia often thrive in slight depressions. These depressions may have higher soil moisture and dead vegetative matter, providing a slight increase in nutrients in otherwise nutrient

poor soils. Found in the mid to hind dunes (coastal scrub) and in open pockets of maritime chaparral, gilia can tolerate a small amount of sand burial (probably < 1 cm). Gilia prefer stabilized sands and do not thrive in excessively windy areas. Previous physical disturbance to the sand seems to encourage germination in some areas, and healthy gilia populations may be found along old paths, in old vehicle tracks, or in areas where trenching has occurred.

Gilia prefer areas with little plant competition, and are associated with native species including spineflower, seacliff and coast buckwheats, mock heather, silver beach lupine (*Lupinus chamissonis*) and California poppy (*Eschscholzia californica*). Associated plant density rarely exceeds 30% cover in dune areas surrounding the gilia populations. Gilia is a self-pollinating species, but insect pollination by the bee fly has been observed in the related (non-endangered) subspecies, *Gilia tenuiflora* ssp. *tenuiflora* (Dorrell-Canepa 1994; Hayes 2015).

Presence in Sand Dollar and Edgewater Habitat Preserves

Before development of the North of Playa shopping center there were colonies of sand gilia with 10 to 700 individuals across locations of the site (Zander Associates 1995). It was estimated that the mitigation area could support up to 5,000 plants of sand gilia (Dorrell 1995). In 1999 the sand gilia population at the Edgewater Habitat Preserve was doing well and percent aerial cover had not decreased substantially from baseline conditions (Zander Associates 1999).

Since the HCP was instated in 1995 (Zander Associates 1995) the species listing has been reviewed and the current listing still stands. After sand gilia was listed as an endangered species there were several large populations discovered in the interior of former Fort Ord (U.S. Army Corps of Engineers 1992). It is generally assumed there is some genetic difference between the coastal and inland species, and effective USFWS policy is that the coastal occurrences must be protected in their own right.

2.2.2.4 Sandmat Manzanita, *Arctostaphylos pumila*

Protection Status

Sandmat manzanita was a state species of special concern at the time of the Sand Dollar development (Harding Lawson Associates 1989) and was proposed for federal listing during the time of project approvals for both shopping centers (Harding Lawson Associates 1989; Zander Associates 1995) (Table 2.6). The California Rare Plant Rank for the species is 1B.2 and it is considered rare, threatened or endangered in the state (CNPS 2019).

Table 2.6. Historic and current State of California and U.S. Federal listing status for sand gilia (CDFA 2019c).

Listing status	At time of project	
	approvals in 1990s	Current (2019)
State endangered	-	-
State threatened	-	-
State species of special concern	BRMP	-
Federal endangered	-	-
Federal threatened	-	-
Federal proposed for listing	BRMP/HCP	-

Natural History

This plant is a mat- to mound-like evergreen shrub in the heath family, generally growing less than 5 feet tall. Sandmat manzanita grows on pre-Flandrian dunes in central maritime chaparral communities, only around Monterey Bay (Griffin 1978). It blooms from February to May.

Distribution and Habitats

Sandmat manzanita is well adapted to shifting sand habitat forming large circular mats and mounds. It appears to be an early to middle successional species in maritime chaparral following bum events or ground disturbance, eventually yielding to taller chamise and shaggy-barked manzanita in older stands. It is typically associated with cropleaf ceanothus, Monterey ceanothus, deer weed, heliotrope (*Heliotropum curassavicum*), and beach mock heather (Zoger and Pavlik 1987a). Sandmat manzanita prefers windy open areas close to the ocean's sandy soils. Reproduction occurs by seed and layering. The greatest threat to sandmat manzanita, other than development, is crowding out by noxious weeds and taller species within the maritime chaparral community.

Presence in Sand Dollar and Edgewater Habitat Preserves

At Edgewater average percent cover of for sandmat manzanita increased 0.5% since the baseline survey. There was a recommendation to install plantings adjacent to the fence line and curb for the parking lot at the Habitat Preserve (Zander Associates 1999).

At the Sand Dollar Habitat Preserve sandmat manzanita percent survival decreased from 1994 to 1999 from 56% to 32%. According to the BRMP (Harding Lawson Associates 1989) survival of sandmat manzanita is not to fall below 35% after initial planting (Harding–Lawson Associates, Addendum 1 1989). It was recommended that 10% of funding be allocated for replanting of species including sandmat manzanita in deficient areas.

2.2.2.5 Hottentot Fig (Iceplant), *Carpobrotus spp.*

Protection Status

Iceplant has no history of or current protection status for the State of California or Federal listings because it is a non–native, invasive plant.

Natural History

Iceplant is a mat–forming succulent native to South Africa that was introduced to California in the early 1900s for stabilizing land near railroads and was later used by Caltrans to prevent erosion near roads and highways (CDFW 2019d). This is a highly invasive plant primarily in coastal habitats in many parts of the world. It outcompetes native flora by smothering and causing changes to soil pH and nutrient regimes (D'Antonio 1990; D'Antonio and Mahall 1991).

Iceplant is a self–pollinating plant with individual branches that can grow more than three feet in a year. Ungerminated seeds remain viable in the soil for at least two years (D'Antonio 1990b) and the plant readily roots where the nodes contact soil (D'Antonio 1990a). The plant grows like a vine, crawling over plants and fences and cascading down walls or other more permanent hard surfaces. It can form thick mats almost two feet deep, and once established it has a high vegetative reproductive rate (D'Antonio and Mahall 1991; D'Antonio 1993). Iceplant is resilient to herbivory and competition and can

decrease species diversity and hinder natural processes in dunes by preventing sand movement.

Distribution and Habitats

Iceplant is abundant in coastal ecosystems on the west coast of California from Eureka in the North and south through San Diego where its range extends into Baja California, Mexico. It is frost-intolerant and thus restricted to temperate climates and elevations below 500 ft. It has spread beyond intentional planting for landscape and land stabilizing purposes and has invaded foredune, dune scrub, coastal bluff scrub, coastal prairie, and most recently maritime chaparral communities.

Presence in Sand Dollar and Edgewater Habitat Preserves

Iceplant did not have a dominating presence at Sand Dollar at the time of the BRMP, but eradication was a component of the plan and efforts were diligently made to remove the invasive species. Average percent cover across all surveyed transects didn't change much between 1995–1999 surveys (0.1 to 0.2) (Dorrell–Canepa 2000).

Iceplant covered 85–90% of the area at the time of the Edgewater HCP (Dorrell 1995a). It was used as a bank stabilizer along Highway 1 adjacent to the site and aggressively spread throughout the preserve. There was a recommendation to completely eradicate iceplant from the Edgewater habitat preserve (Zander Associates 1995).

3 Historical Biophysical Conditions

This Chapter explains how the Edgewater and Sand Dollar habitat areas are some of the largest portions of the few remaining relatively natural areas in Sand City, which has experienced widespread habitat damage due to sand mining and land development.

3.1 Effects on The Dunes of Sand City

Sand City is located in a coastal dune zone but is largely urbanized (City of Sand City 1982). The development of Sand City has led to natural dune habitat diminishing as populations and industries increased. Sand City's dune habitat has been affected by industrial, residential, and public areas (City of Sand City 1982), but because Sand City is mainly a town for businesses, industry has had the most impact on the coast dune scrub habitat.

The two industries that had a considerable impact on Sand City were the sand mining companies: Monterey Sand Company and Lone Star Industries (MBNMS 1992). The Monterey Sand Company removed approximately 150,000 cubic yards of sand annually after 1978 (MBNMS 1992). The Lone Star mining plant removed between 50,000 to 100,000 cubic yards before 1987 (MBNMS 1992). Sand mining continued until approximately 1990, when the California Coastal Commission and the United States Army Corps of Engineers ordered a cease of mining because of erosion concerns and permitting issues (Thornton et al. 2006).

Dune habitat was not only used for sand mining, but also for landfill (City of Sand City 1999; MPRPD 2019). During the Great Depression, at least 28 acres of dune habitat in Sand City were used as an area for burning wood and debris from housing materials (MPRPD 2019). The burning area was later converted into a landfill site because of public aesthetics after World War II and became the Eolian Dunes Preserve in the late 1990s (City of Sand City 1999; MPRPD 2019). Some of the landfill within the preserve was sorted, disposed of, and the remaining landfill is covered with sand. As a result, the preserve is largely man made, resulting in loose active sand and local erosion (MPRPD 2019).

The dunes of Sand City are characterized as part of one of the largest dune belts on the California coast, but have been disturbed from human stressors (City of Sand City 1999). As such, visitors of Sand City have been known to use dune habitat as a pathway to reach popular beach areas (City of Sand City 1999). To compensate for anthropogenic erosion, non-native plant species such as iceplant have historically been used to help stabilize the dunes in these areas (National Park Service 2015), but these invasive plants have encroached on the native plant habitat.

Currently, the relatively intact native dune habitat in Sand City is less than 10 percent of its historical extent. Much of the local dune habitat is disturbed to some degree, mostly from the effects of sand mining, and what relatively intact dune habitat remains is dominated by invasive species with relatively few native plants appearing within the invasive species' extents.

3.2 Methods of Estimating Impacts of Urbanization on Dune Extent

To better understand the regional importance of the Edgewater and Sand Dollar habitat preserves, we quantified the total area of relatively natural dune habitat in Sand City through an analysis of seven decades of aerial photography.

We acquired historical aerial photographs using the United States Geological Survey's *EarthExplorer*, University of California Santa Cruz's aerial photo library, and University of California Santa Barbara's *FrameFinder*. The aerial photographs were from 1941, 1956, 1961, 1964, 1976, 1978, 1988, and 2001. In the geospatial program ArcMap (v.10.6.1), the images were georeferenced (i.e., aligned and overlaid onto a base map and given a coordinate system) and converted into updated files.

We estimated relatively natural dune areas by initially assuming that the whole city was a single relatively natural area, and then excising from that area any structures, roads, railways, pavement, dumps, mines, or otherwise excavated areas – as could be discerned from the aerial photos. We also excised recent blowouts of loose sand upon which little original vegetation remained. We did not add restored areas back into the balance because the extent of these is not well documented on a city-wide scale; but future work should account for them.

3.3 Results of Historical Aerial Photograph Interpretation

We estimated that development, sand mining, and public use of coast dune scrub habitat in Sand City have diminished its current extent to approximately 18 acres (**Figure 3.1**). The 18 acres of remaining coastal dune habitat exist as small isolated patches of what was once present in the future Sand City. Future field validation could refine the accuracy of this estimate.

The coast dune scrub extent of the future Sand City in 1941 was once 207 acres (**Figure 3.2**) but has diminished over the last seventy years. Impacts to dune habitat are visible in the 1941 photo, but the parcel of land that would later become Sand City had little urbanization. In the 1950s, the population of Monterey County increased by approximately 120,000 from 1940 (US Census 1990), thus more buildings appeared in the future city limits of Sand City (**Figure 3.3**). The urbanization in 1956 was mostly appearing on the outskirts of the future city limits, with a few buildings appearing within the middle of the dunes (**Figure 3.3**). A substantial increase in disturbance to the coast dune scrub habitat can be seen in the 1956 aerial photo.

Sand City was incorporated in 1960, beginning the expanse of urban areas within the city limits. In 1961, small patches of urban areas appeared (**Figure 3.4**), but no large urbanization events could be seen in a comparison with a photo from 1956. When comparing the 1956 and 1961 photographs, a large increase in dune habitat removal is apparent.

In the 1970s, Highway 1 would be established in the Monterey Bay area, resulting in some dune habitat being removed (excavated) to be used as fill for the highway. To keep the fill from eroding into urban areas and the freeway, iceplant was planted to stabilize the newly filled areas (National Park Service 2015), which can be seen in an aerial photo (**Figure 3.5**). In the northern city limits, more buildings appeared near the future Edgewater shopping center site, removing a considerable portion of dune habitat (**Figure 3.5**).

The extent of urbanization did not increase notably by 1988. Buildings, likely businesses, appeared toward the city limits, but the dune habitat removed in this time was an isolated area toward the south of Sand City (**Figure 3.6**). By the early 2000s, most

of the dune habitat impacts had already occurred (Figure 3.7). A large portion of dunes along the boundaries of Sand City were removed where the Edgewater and Sand Dollar shopping centers would appear in the 1990s. Little development has occurred in Sand City after 2001.



Figure 3.1. The extent of dune habitat in 2016. Current physical conditions do not differ greatly in 2019.

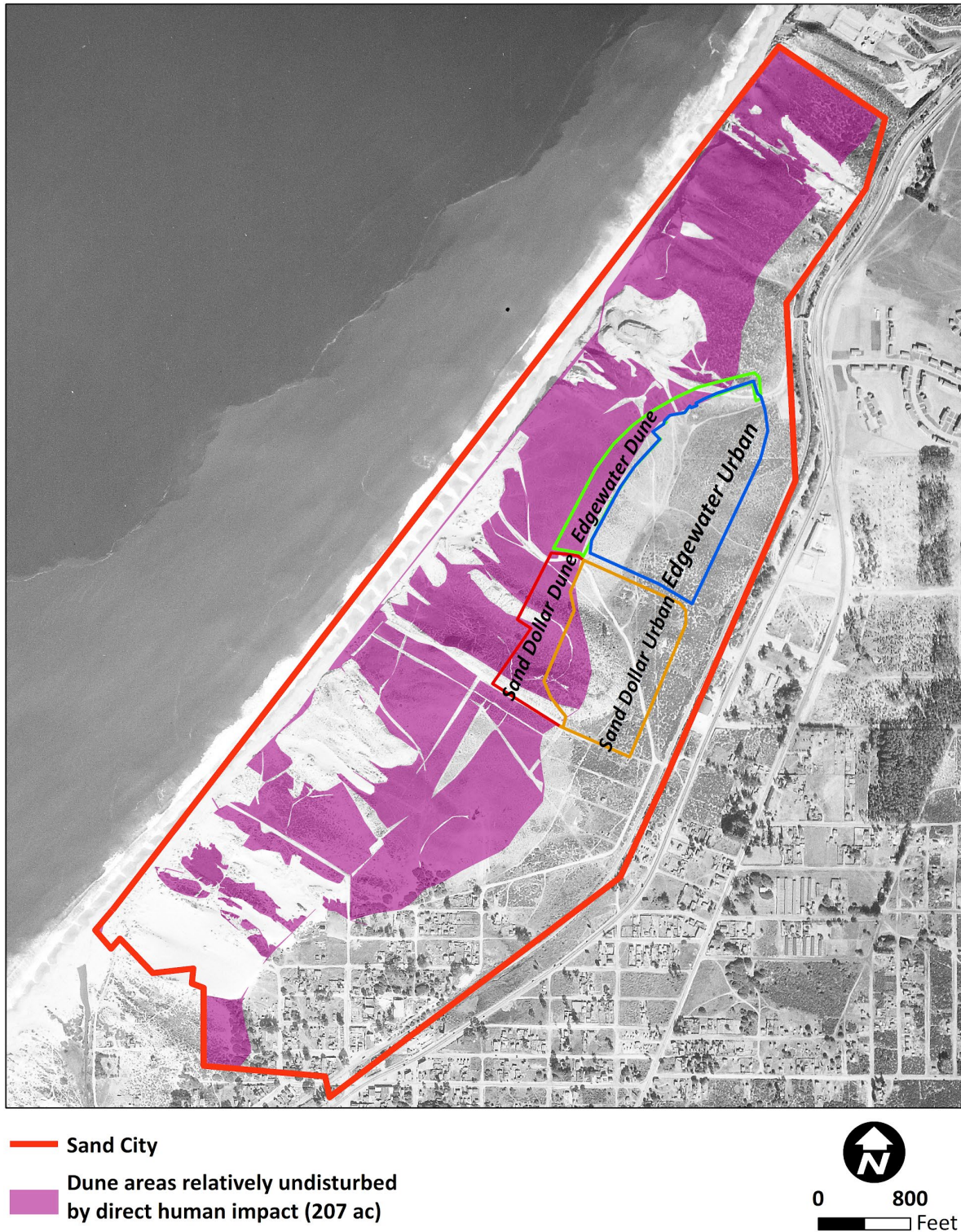


Figure 3.2. The extent of dune habitat in 1941.

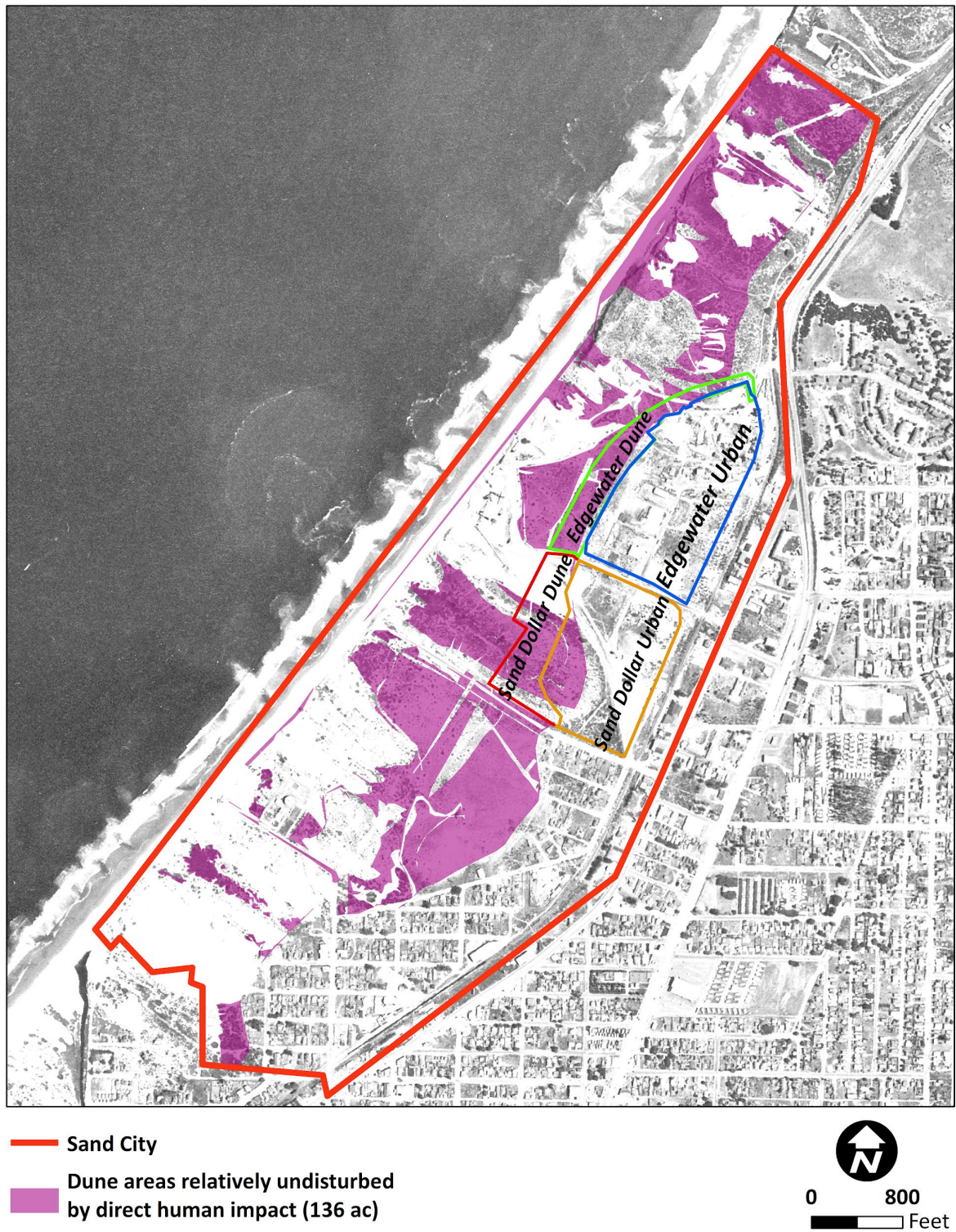


Figure 3.3. Extent of dune habitat in 1956. Note the increase in disturbance.

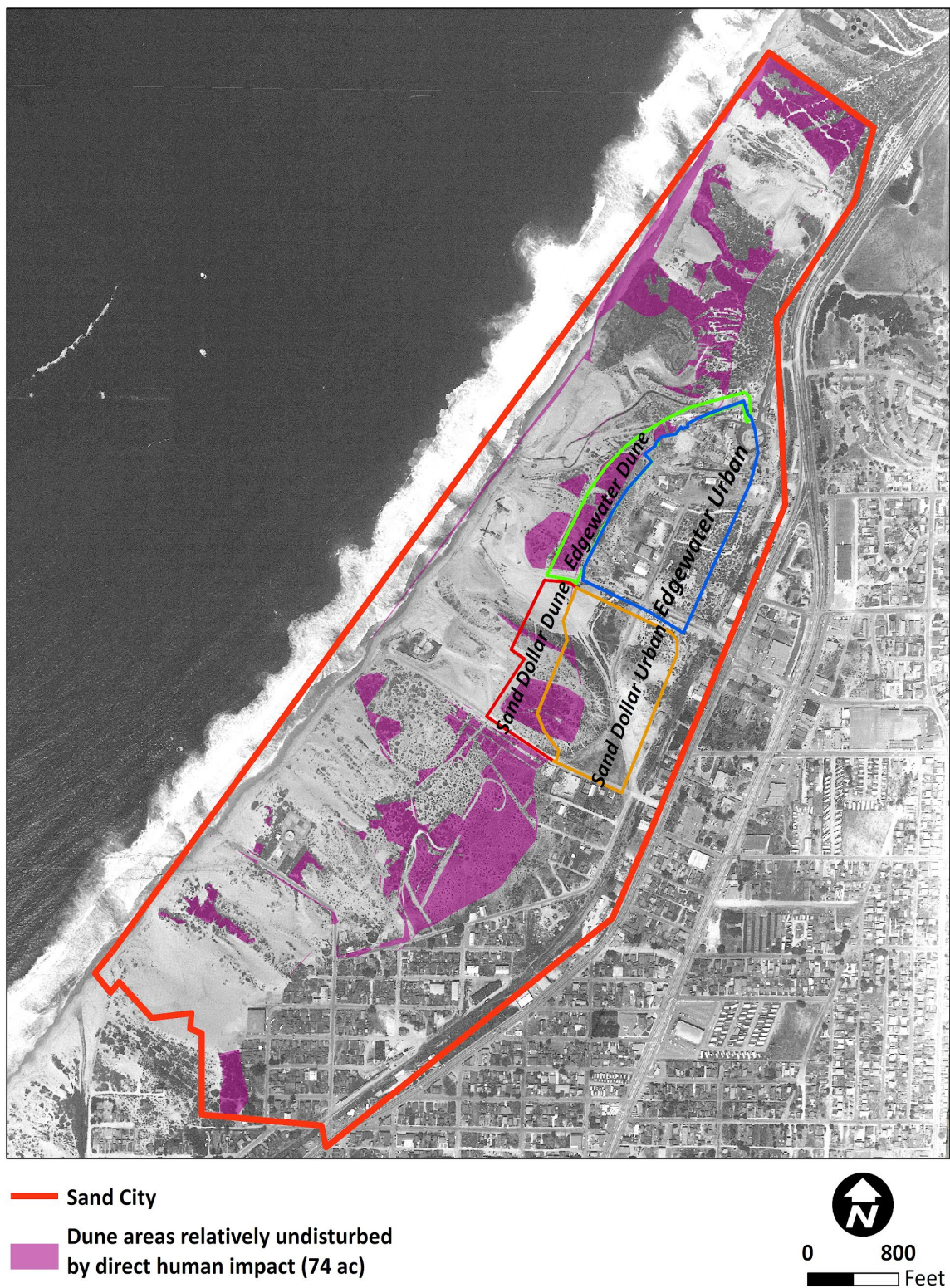


Figure 3.4. Extent of dune habitat in 1961.



Figure 3.5. The extent of dune habitat in Sand City in 1976, shortly after Highway 1 was established.



Figure 3.6. Extent of dune habitat in 1988.



Figure 3.7. Extent of dune habitat in 2001.

4 Previous Establishment Period Activities

Establishment period maintenance, monitoring and reporting activities are key requirements of habitat restoration projects and are designed to ensure restoration goals are being achieved. Specific maintenance monitoring and reporting periods were required for both the Sand Dollar and Edgewater sites in the BRMP (HLA 1989) and HCP (Zander Associates 1995), respectively. Available records of establishment period activities completed at each site are summarized below. It should be noted that at both the Sand Dollar and Edgewater habitat preserves, a portion of the initial plant installation and stabilization work extended into the establishment maintenance and monitoring period. Historical monitoring results and data from the 2019 fall assessment are provided in Section 5.

4.1 Sand Dollar

At the 7.6-acre Sand Dollar habitat preserve, the requirement defined in Addendum 1 of the BRMP was to perform ten years of establishment maintenance and monitoring (HLA 1989). This period extended from initial seed collection, propagation, planting and seeding work performed in Autumn 1990 and Winter 1991 through 2001. During this ten-year period, regular maintenance, monitoring and reporting activities were performed by HLA (1992, 1993) and Native Solutions/Joey Dorrell-Canepa (1994 – 2001). Between 2001 and 2016, Native solutions also performed minor maintenance activities in the habitat preserve including manual control of invasive annual grasses, iceplant and trash removal. Performance requirements during the ten-year period were achieved as a result of the maintenance and monitoring activities that were conducted. The details of those activities are summarized below. Monitoring results and compliance with performance criteria are addressed in Section 5.

Invasive Plant Control

- 1992–1993: Hand pulling, cutting and removal of ripgut brome; hand removal and treatment of iceplant with Roundup. (HLA 1992, 1993)
- 1994 –2001: Bi-monthly weed control, including removal of ripgut brome, iceplant, slender-leaved iceplant, horseweed and sow thistle. (JDC 2000, JDC 2019)

- 1999 – 2016: Periodic manual removal of ripgut brome, iceplant and narrow-leaved iceplant throughout the habitat preserve. (JDC 2019)

Revegetation

- 1992 (March): Continued installation of native plant material specified by the BRMP (2,815 propagules). (HLA 1992)
- 1992 (September): Monterey spineflower seed broadcast in Management Area 2A in front of interpretive center viewing platform. (HLA 1992)
- 1992 (December): Approximately 1,130 sand gilia planted in Management Areas 1A, 2A and 3B. (HLA 1992)
- 1993 (December): Installation of four Monterey ceanothus and 25 sandmat manzanita in Management Area 2A. Installation of 21 Monterey ceanothus and 21 sandmat manzanita in Management Area 1B. 12,049 propagules installed over duration of project as of 1993. (HLA 1993)
- 1999 (January): Supplemental planting of native plant material (1,200 plants). (JDC 2000)
- 2000 (January): Supplemental planting of 25 Monterey ceanothus. (JDC 2000)

Erosion Control/Dune Stabilization

- 1992: Vertical straw mulch installed to stabilize a tongue of sand along Highway 1. Installation of snow fencing and signage upwind of the area to control sand movement. (HLA 1992)

Site Maintenance

- 1992: Periodic trash removal. (HLA 1992)
- 1993: Periodic trash removal. (HLA 1993)
- 1994 – 2001: Bi-monthly trash removal. (JDC 2000, 2019)
- 1999 – 2016: Periodic trash removal. (JDC 2019)

Vegetation Monitoring

- 1991: Vegetation cover monitoring performed. Dates unknown. (HLA 1992)

- 1992 (April) Vegetation cover and count of naturally occurring sand gilia in Management Area 1A.^(HLA 1993)
- 1993 (March) Vegetation cover and count of naturally occurring sand gilia in Management Area 1A, survival count and crown diameter measurement of Monterey ceanothus and sandmat manzanita.^(HLA 1993)
- 1994 – 2001: Vegetation cover monitoring; survival and canopy spread of Monterey ceanothus and sandmat manzanita; and sand gilia counts performed. Dates unknown.^(JDC 2000, 2019)

Smith's Blue Butterfly Surveys

- 1991, 1993, 1994, 1996, 1997, 1998: Surveys performed during the SBB flight season.^(JDC 2000)

4.2 Edgewater

At the 4.6-acre Edgewater habitat preserve, the requirement was to perform five years of establishment maintenance and monitoring (Zander Associates 1995). The establishment period for Areas 1 and 2 extended from completion of initial restoration in 1996 until 2001 and 1997 until 2001, respectively. Performance requirements during the five-year period were achieved in both areas as a result of the maintenance and monitoring activities that were conducted. The details of those activities are summarized below. Monitoring results and compliance with performance criteria are addressed in Section 5.

Invasive Plant Control

- 1996 (February–March, October–November): Treatment of iceplant with Roundup resulting in dramatic reduction of living iceplant cover. Dead iceplant thatch left in place for erosion control and mulch for native plant seedlings.^(ZA 1998)
- 1996 (December): Hand removal and Roundup treatment of ripgut brome.^(ZA 1998)
- 1997 (January–February): Follow-up treatment of iceplant with Roundup.^(ZA 1999a)
- 1997 (January – April): Hand removal and Roundup treatment of ripgut brome.^(ZA 1999a)

- 1998 (Spring): Roundup treatment of iceplant patches and seedlings. Hand removal of yellow sour clover (*Melilotus indica*), redstem filaree (*Erodium cicutarium*) and bur clover (*Medicago polymorpha*). (ZA 1999a)
- 1999 (May): Roundup treatment of iceplant with a focus on the northern portion of Area 1 and slopes near Highway 1 within Area 2. (ZA 1999b)
- 1999 (Spring): Hand removal of ripgut brome. (ZA 1999b)
- 2000 (February – October): Hand removal of ripgut brome. Removed weeds were bagged and disposed of properly. (ZA 2001)
- 2001 (May, October): Hand removal of ripgut brome. Removed weeds were bagged and disposed of properly. Patches of ripgut brome and iceplant were sprayed in October. (ZA 2002)
- 2004 – 2008: Periodic weed control. (JDC 2019)

Revegetation

- 1996 (April): Installation of 2,460 propagules. (ZA 1998)
- 1996 (February): Installation of 6,019 propagules. Installation of 1,836 propagules combined of seacliff buckwheat and coast buckwheat. (ZA 1998)
- 1997 (March–April): Installation of 485 propagules of Monterey spineflower and 103 propagules of sand gilia in Management Area 1 (sand gilia planting area SG1). (ZA 1999a)
- 1997 (Winter): Installation of 420 propagules of sandmat manzanita. Broadcast seeded 20 pounds of coast buckwheat, 20 pounds of seacliff buckwheat, 5 pounds of sand verbena, 10 pounds of beach sagewort and 5 pounds of mock heather. (ZA 1999a)
- 1998: Additional broadcast seeding (quantity and species unknown) near the parking lot in Management Area 1 and 2. (ZA 1999a)
- 1998 (Spring): Installation of 400 propagules of sand gilia in Management Area 1 (sand gilia planting areas SG2, 3, 4, 5). (ZA 1999a)
- 2000 (March): Installation of 220 sandmat manzanita and 197 of other native species along the fence line adjacent to the parking area. (ZA 2001)

Erosion Control/Dune Stabilization

- 1997 (January–February): Performed straw plugging on recontoured slopes in Management Areas 2 and 3 for erosion control. Straw bundles were buried to a depth of 12 inches every 1 to 2 feet along slopes. (ZA 1998)

Site Maintenance

- 1996 (Winter–Summer): Provide supplemental water to seedlings. (ZA 1998)
- 1997 (Winter–Summer): Provide supplemental water to seedlings. Taper amount of water and discontinued watering by end of July 1997. Trash removal throughout site. (ZA 1998)
- 1998: Periodic trash removal throughout site. (ZA 1999a)
- 1999: Periodic trash removal throughout site. Gopher and ground squirrel impacts noted. (ZA 1999b)
- 2000: Periodic trash removal. (ZA 2001)
- 2001: Fences and signage reported in good condition. (ZA 2002)
- 2004 – 2008: Periodic trash removal throughout site. (JDC 2019)

Vegetation Monitoring

- 1996 (May): Area 1 baseline cover monitoring. (ZA 1998)
- 1997: Year 1 cover monitoring in Area 1 and baseline cover monitoring in Area 2. (ZA 1998)
- 1998: Year 2 cover monitoring in Area 1 and Year 1 cover monitoring in Area 2. Cover sampling in sand gilia plots. (ZA 1999a)
- 1999 (May): Year 3 cover monitoring in Area 1 and Year 2 cover monitoring in Area 2. (ZA 1999b)
- 1999 (June): Cover sampling in sand gilia plots. (ZA 1999b)
- 2000 (April): Year 4 cover monitoring in Area 1 and Year 3 cover monitoring in Area 2. Cover sampling in sand gilia plots. (ZA 2001)
- 2001 (April): Year 5 cover monitoring in Area 1 and Year 4 cover monitoring in Area 2. Cover sampling in sand gilia plots. (ZA 2002)

Smith's Blue Butterfly Surveys

- 1997, 1998, 1999, 2000, 2001: Surveys performed during the SBB flight season.^(ZA 1998, 1999a, 1999b, 2001, 2002)

Legless Lizard Releases and Surveys

- 1998: 347 legless lizards salvaged from the site prior to construction being held in captivity and planned for reintroduction.^(ZA 1999a)
- 1998 (June): 162 legless lizards reintroduced to the site.^(ZA 1999a)
- 1999 (January, February, May, September, October): Post-release surveys under coverboard sites detected six lizards and 14 instances of lizard tracks.^(ZA 1999b)
- 1999 (June): 161 legless lizards reintroduced to the site.^(ZA 1999b)
- 2000 (April): Visual scanning and light hand raking for legless lizards under coverboards along vegetation monitoring transects. No lizards were found.^(ZA 2001)
- 2001 (April): Visual scanning and searching for legless lizards under coverboards along vegetation transect. No lizards were found. ^(ZA 2002)

Footnotes:

HLA 1992	HLA. 1992. Spring 1992 monitoring report, habitat preserve, Sand Dollar Shopping Center (Phase I), Sand City, California.
HLA 1993	HLA. 1993. Spring 1992 monitoring report, habitat preserve, Sand Dollar Shopping Center (Phase I), Sand City, California.
JDC 2000	Dorrell-Canepa J. 2000. 1999 monitoring report, habitat preserve, Sand Dollar Shopping Center, Sand City, California.
JDC 2019	Dorrell-Canepa J. 2019. Personal communication.
ZA 1998	Zander Associates. 1998. 1997 monitoring report, North of Playa habitat restoration, Sand City, California, pursuant to the Habitat conservation plan for the federally-endangered Smith's blue butterfly and other species of special concern on the North of Playa project site, USFWS Permit Number PRT-808240.
ZA 1999a	Zander Associates. 1999a. 1998 monitoring report, North of Playa habitat restoration, Sand City, California, pursuant to the Habitat conservation plan for the federally-endangered Smith's blue butterfly and other species of special concern on the North of Playa project site, USFWS Permit Number PRT-808240.
ZA 1999b	Zander Associates. 1999b. 1999 monitoring report, North of Playa habitat restoration, Sand City, California, pursuant to the Habitat conservation plan for the federally-endangered Smith's blue butterfly and other species of special concern on the North of Playa project site, USFWS Permit Number PRT-808240.
ZA 2001	Zander Associates. 2001. 2000 monitoring report, North of Playa habitat restoration, Sand City, California, pursuant to the Habitat conservation plan for the federally-endangered Smith's blue butterfly and other species of special concern on the North of Playa project site, USFWS Permit Number PRT-808240.

ZA 2002

Zander Associates. 2002. 2001 monitoring report, North of Playa habitat restoration, Sand City, California, pursuant to the Habitat conservation plan for the federally-endangered Smith's blue butterfly and other species of special concern on the North of Playa project site, USFWS Permit Number PRT-808240.

5 Current Conditions

The primary long-term goal of compensatory mitigation for both the Edgewater and Sand Dollar projects is to create a self-sustaining coastal dune scrub community capable of supporting habitat for the protected species of concern. Approximately 18 to 19 years have passed since the conclusion of the required establishment maintenance, monitoring and reporting periods at the Sand Dollar and Edgewater habitat preserves. Although short-term obligations defined in environmental documents may have been met, the compliance status of long-term goals for the habitat preserves was not known at the outset of our work. In the following sections, we provide an update of current habitat conditions and compliance status at both sites through a combination of a records review, qualitative site observations and quantitative field surveys.

5.1 Fall 2019 Site Assessment Methods

We performed field surveys at the Sand Dollar and Edgewater habitat preserves during October 2019. Survey locations and methods were designed to replicate the methods used by biologists and documented in previous monitoring reports for both sites. Due to seasonal and time constraints, our surveys were not able to capture all possible site conditions and are preliminary. Chapter 7 outlines specific monitoring that should be done in Spring 2020 to complete the assessment of current (2019/2020) conditions. Fall 2019 field surveys included the following:

- We searched for and found rebar monuments that were originally placed in the 1990's to mark the endpoints of vegetation transects. All but two original rebar monuments were found.
- We performed vegetation transect sampling using the line intercept method; analyzed data to calculate absolute percent native and non-native cover.
- We mapped invasive perennial weed species using GPS and GIS, including but not limited to narrow-leaved iceplant, Hottentot fig (iceplant), Ngaio tree, Australian tea tree and *Acacia* species.
- We completed a GPS and GIS inventory of special status perennial plant species including sandmat manzanita and Monterey ceanothus. Annual species with

spring/early summer bloom periods, including sand gilia and Monterey spineflower could not be surveyed due to the fall timing of the work.

- We assessed SBB habitat value via GPS mapping of seacliff buckwheat and coast buckwheat occurrences.
- We identified geomorphic, soil, or erosional features that may influence vegetation and habitat.
- We collected current site photographs at the previously established locations and angles (photopoints).
- We mapped locations needing general site maintenance, including fencing, signage, trash cans, areas of refuse or homeless encampment(s).

Findings of fall 2019 survey work for each site are provided below.

5.2 Sand Dollar 2019 Assessment Results

5.2.1 Vegetation

The Sand Dollar preserve is vegetated with native plant species characteristic of the Central Dune Scrub community described by Holland (1986) and *Lupinus chamissonis*–*Ericameria ericoides* Shrubland Alliance described by Sawyer et al. (2009). Back dune areas along the eastern edge of the preserve are dominated by woody shrubs, including mock heather, beach blue lupine and seacliff buckwheat. Coast buckwheat, beach sagewort, branching phacelia and pink sand verbena are also found along dune ridges and in openings between the shrubs. On the windward, western dune faces, areas of open sand are more common and dominant native plants are beach sagewort, deerweed, and beach bur.

The most common invasive perennial weeds found were iceplant and narrow-leaved iceplant. Iceplant occurs in numerous patches throughout the site, especially in Management Areas 2A and 1A (**Figure 5.1**). Iceplant occurrences vary in size from seedlings to patches 10 to 15 feet across. However, no large, monotypic areas of iceplant were observed. We also observed substantial areas occupied by invasive non-native annual grasses. These could not be identified with certainty, but appeared to be dominated by ripgut brome, a common invasive annual grass in dune habitats that was a focus of weed control efforts during the establishment period (Dorrell–Canepa 2000).

Narrow-leaved iceplant, which is not mat-forming, occurs as scattered individuals and small groupings throughout the site. At the time of the surveys, narrow-leaved iceplant was at the end of its flowering cycle and contained numerous fruits and seeds. A list of native and non-native plant species observed during the Fall 2019 surveys is provided as **Appendix A**.

Historic and fall 2019 vegetation cover sampling results from eight permanent transects (**Table 5.1, Figure 5.2**) illustrate a trend of improving habitat qualities between initial restoration and the end of the establishment period followed by a reversion to more degraded conditions by 2019. Over the course of the establishment period, native cover increased from a baseline of 20.4 percent in 1991 to a high of 78 percent in 1998, achieving the final performance criterion of 60 percent native cover set by the BRMP. Perennial non-native plants, primarily iceplant and narrow-leaved iceplant, were maintained at low cover levels during the establishment period as a result of regular control. In contrast, the fall 2019 sampling results show that the minimal management since 2000 has resulted in a decrease of native plant cover by more than half and an increase in perennial non-native cover from 0.3 percent to 11.4 percent (**Table 5.1**). The current perennial native plant cover was measured at 25.2 percent. Based on previous monitoring data from Sand Dollar, cover of annual species detected during spring surveys could add an additional five percent to the current cover value. However, even with the addition of native annual species, the current native cover value would fall well below the performance criterion of 60 percent native cover. Although the BRMP did not define a performance criterion for maximum allowable non-native cover, the increasing percentage of invasive plants is a direct threat to the native plant community as a whole and the habitat values for protected species.

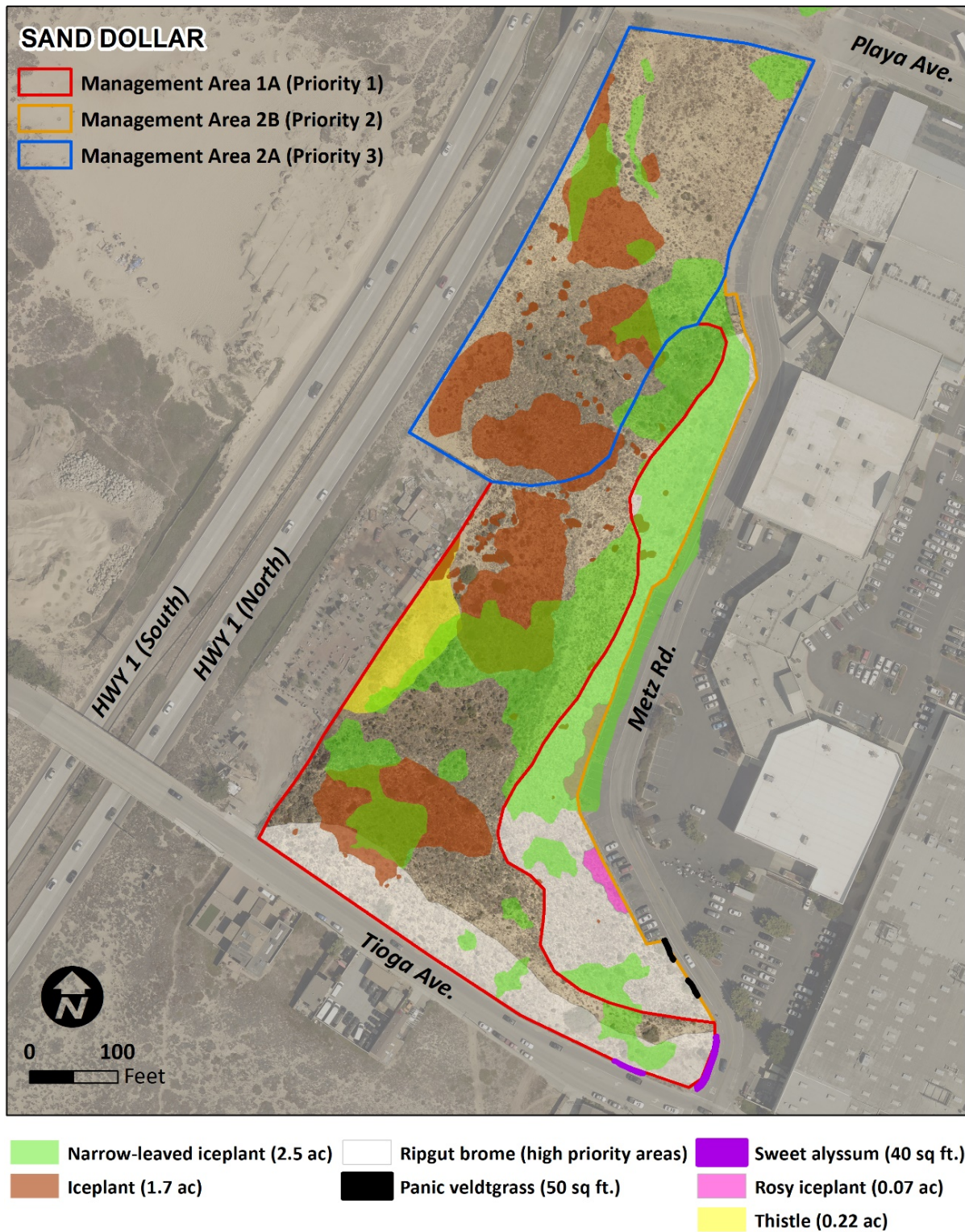


Figure 5.1. Fall 2019 distribution of invasive weeds at the Sand Dollar habitat preserve.

Table 5.1. Historical and fall 2019 vegetation cover sampling results at the Sand Dollar habitat preserve shown as absolute average percent cover

Category	1991	1992	1993	1994	1995	1996	1997	1998	1999	2019	Performance Criterion ¹
	T1 – T8										
	Planting		Establishment Maintenance								
Native Plants (Annual & Perennial)	20.4	44.7	32.0	31.0	47.0	59.0	52.0	78.0	65.0	--	60.0
Non-Native Plants (Annual & Perennial)	8.0	15.1	13.0	12.0	22.0	33.0	11.0	31.0	31.0	--	--
Native Plants (Perennial)	--	39.1	28.3	30.8	43.6	55.1	51.2	76.1	65.9	25.2 ^p	--
Non-Native Plants (Perennial)	--	0.3	0.1	0.0	0.2	0.2	0.4	0.2	0.4	11.4 ^p	--
Seacliff buckwheat & coast buckwheat	--	1.1	1.9	3.6	5.4	6.8	9.0	10.7	7.6	6.7	
Iceplant	--	0.1	0.0	0.0	0.1	0.1	0.2	0.1	0.2	8.7	--
Narrow-leaved iceplant	--	--	0.0	0.0	0.1	0.3	0.1	0.2	0.2	2.7	--

Notes:

^p: 2019 data collected on October 10 & 14, 2019; excludes annual species

Historical data from Dorrell-Canepa (2000), Harding Lawson Associates (1992)

¹: Harding Lawson Associates (1989)

Values in **boldface** type below performance criterion

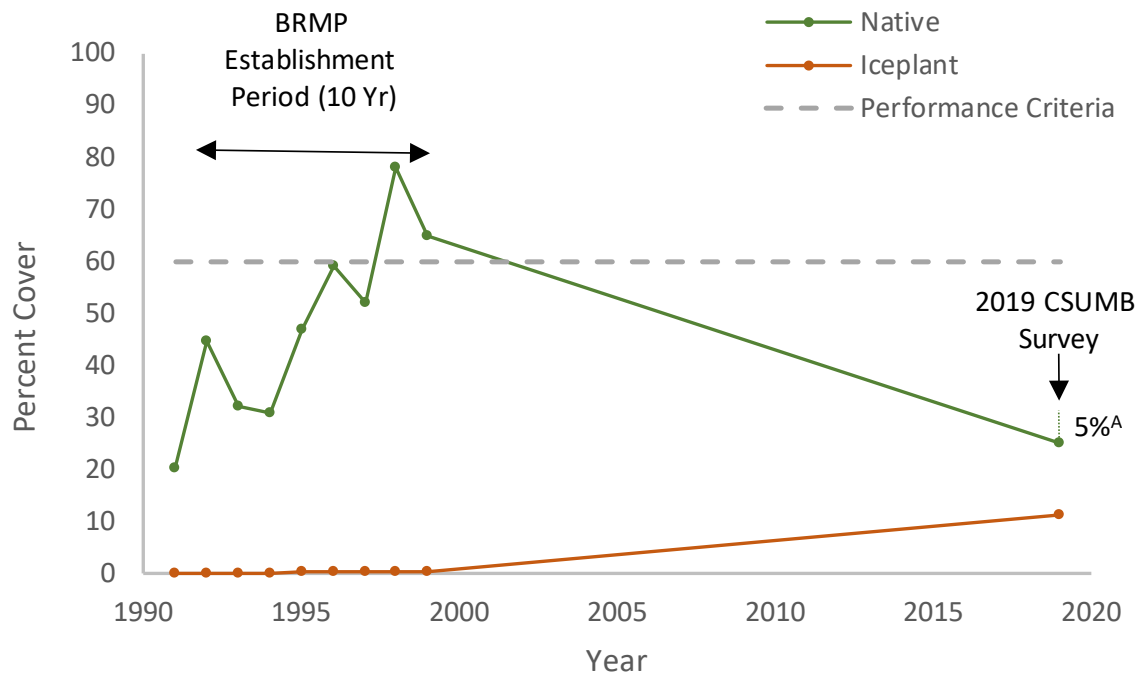


Figure 5.2. Historical and fall 2019 percent cover data at Sand Dollar habitat preserve (^A represents potential increase of current cover value due to annual native species).

5.2.2 Inventory of Special Status Plant Species

During fall 2019 vegetation surveys at the Sand Dollar habitat preserve, we searched the site on foot and mapped special status plants with GPS. Due to the fall timing of the surveys, we were only able to identify and map the perennial species sandmat manzanita and Monterey ceanothus. Both of these woody shrubs were planted during initial restoration work to mitigate for development impacts. We found a total of 16 sandmat manzanita and 13 Monterey ceanothus individuals (**Figure 5.3**). The 2019 census of these two species indicates a decline in survival for both species and a survival rate for sandmat manzanita that falls below the performance criterion of 35 percent survival.

The fall 2019 survey could not detect the presence of sand gilia or Monterey spineflower, which are only reliably detectable and identifiable during the spring and early summer. However, suitable conditions for both species occur at the site and what appeared to be Monterey spineflower seed from last season was observed on the ground in Management Area 1A. Initial development did not impact sand gilia or Monterey spineflower and therefore performance criteria for these species was not provided (Harding Lawson

Associates 1989a). However, annual counts of sand gilia were performed at three separate colonies within Management Area 1A during the establishment period (Dorrell–Canepa 2000). During our fall 2019 survey, we also identified several senesced individuals of what appeared to be Coast wallflower (*Erysimum ammophilum*), a California Native Plant Society (CNPS) 1B.2 listed species. This annual species can only be identified with certainty during its bloom period between late winter and early summer. **Table 5.2** summarizes historical sand gilia count data and **Table 5.3** summarizes historical and fall 2019 survival data and performance criteria for sandmat manzanita and Monterey ceanothus.

Table 5.2. Historical sand gilia count data from three natural occurrences in Area 1A at Sand Dollar habitat preserve.

Species	1991	1992	1993	1994	1995	1996	1997	1998	1999	2019	Performance Criterion
Sand gilia	60	96	322	180	435	2	0	360	0	--	--

Table 5.3. Historical and fall 2019 percent survival results for Monterey ceanothus and sandmat manzanita at the Sand Dollar habitat preserve.

Species	1989–1992	1994	1995	1996	1997	1998	1999	2019	Performance Criterion ¹
	Initial Planting	Establishment			Maintenance				
Monterey ceanothus	--	--	69	69	66	62	55	45	35
Sandmat manzanita	--	56	48	48	48	36	32	21	

Notes

¹: Harding Lawson Associates (1989)

4 Monterey ceanothus planted in 1989

25 Monterey ceanothus planted in 1992

75 Sandmat manzanita planted in 1992

Values in **boldface** type below performance criteria

5.2.3 Smith’s Blue Butterfly Habitat Value and Buckwheat Mapping

We assessed the current habitat conditions for SBB at the Sand Dollar habitat preserve by mapping its two host plants, seacliff buckwheat and dune buckwheat in Management Areas 1A, 2A and 2B using GPS. We found approximately 1.9 acres occupied by seacliff buckwheat and 1.5 acres occupied by coast buckwheat for a total of 45 percent of the preserve with buckwheat presence (**Figure 5.3**). SBB utilize mature and robust buckwheat plants that are typically at least three to five years old and occur in patches (Harding

Lawson Associates 1989b). Although percent cover of the two buckwheat species utilized by SBB has declined slightly since 1999, the fall 2019 survey found that it remains a prevalent native plant species throughout the site and still provides suitable habitat for SBB.

Permanent transects for assessing abundance of SBB at the preserve were surveyed by Dr. Richard Arnold of Entomological Consulting Services during the establishment period (Table 5.4). Quantitative SBB survey data has not been collected since 1999, but SBB are assumed to utilize the site due to the quality of the habitat and have been observed in flight nearly every year since 1999 (Dr. Richard Arnold, personal communication, October 8, 2019).

Table 5.4. Historical Smith’s blue butterfly survey results, Sand Dollar habitat preserve

Year	Number of Adults	Survey Dates	Surveyor
1992	299	July 12 – August 29	Entomological Consulting Services ¹
1993	651	June 21 – August 12	Entomological Consulting Services ¹
1994	942	--	Thomas Reid Associates
1995	--	--	--
1996	1,702	June 5 – August 20	Thomas Reid Associates
1997	2,769	June 25 – August 22	Thomas Reid Associates
1998	771	June 17 – August 14	Thomas Reid Associates
1999	--	--	--

Notes

¹: Dr. Richard Arnold

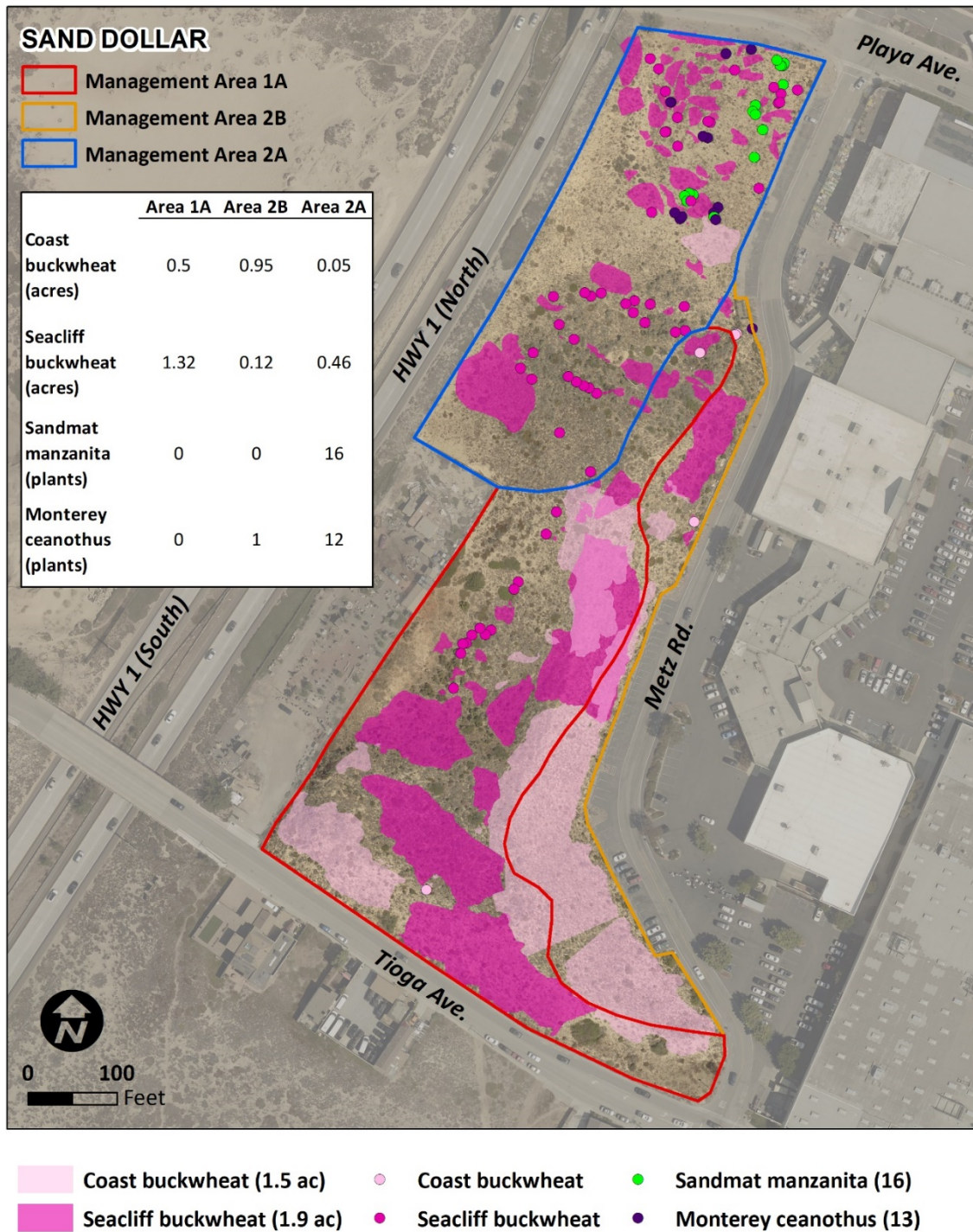


Figure 5.3. Fall 2019 distribution of buckwheat, sandmat manzanita and Monterey ceanothus at the Sand Dollar habitat preserve.

5.2.4 Geomorphic Conditions and Presence of Erosion

During Fall 2019 surveys, we qualitatively assessed the Sand Dollar habitat preserve for geomorphic and/or erosion features that could possibly affect habitat value and/or special status species. The topography at the Sand Dollar preserve appears to remain as described in previous monitoring reports and land cover is similar to historical aerial imagery dating to 1999. The site consists of a series of high dune ridges comprised of well-sorted eolian sands that are well-vegetated and stable. Analysis of 2018 LiDAR data indicates that dune slopes at the Sand Dollar preserve range from nearly flat to 38 degrees with an average slope of 15 degrees.

We did not observe any evidence of blowouts, migrating dunes or erosion caused by concentrated runoff. Soil conditions in approximately the northern half of Management Area 2A remain as described in the 1999 Monitoring Report (Dorrell–Canepa 2000). Soils in this area are sandy, but were historically impacted by grading and development; contain foreign aggregate material and are more compacted than the natural dunes. As a result, native plant cover in this area remains poor relative to the rest of the site.

5.2.5 Photopoints

During fall 2019 fieldwork, we visited permanent photo-monitoring stations at the Sand Dollar habitat preserve and took current site photographs. The 2019 photographs were taken at approximately the same angle as the historical photographs to provide a visual record of habitat changes between 1999 and 2019. Photopoint locations are shown on Figure 6.9.

Photopoint 1A1

1999



2019



Photopoint 1A2

1999



2019



Photopoint 2A1

1999



2019



Photopoint 2A2

1999



2019



Photopoint 2A3

1999



2019



Photopoint 2B1

1999



2019



Photopoint 2B2

1999



2019



5.2.6 General Maintenance Issues

We mapped areas at the Sand Dollar habitat preserve where general maintenance on site infrastructure is needed and/or observations of accumulated trash or evidence of homeless encampments (Figure 5.4 and 5.5). We observed minor areas of trash and fencing in need of repair. Two small homeless encampments were noted. The interpretive sign at the viewing platform is missing.



Figure 5.4. Maintenance needs at Sand Dollar and Edgewater habitat preserves. Sand Dollar: (1) replace Habitat preserve sign, (2) repair 15 feet of fence, (3), repair 20 feet of fence, (4), repair 56 feet of fence. See Figure 5.5 for locations.



Figure 5.5. Locations of general maintenance issues in the Sand Dollar habitat preserve.

5.3 Edgewater 2019 Assessment Results

5.3.1 Vegetation

Similar to the Sand Dollar habitat preserve, Management Areas 1 and 2 at the Edgewater preserve are vegetated with native plant species characteristic of Central Dune Scrub as described by Holland (1986) and *Lupinus chamissonis*–*Ericameria ericoides* Shrubland Alliance described by Sawyer et al. (2009). The Edgewater Preserve is generally an east-facing slope and lacks the variation in aspect and topography found at Sand Dollar. As a result, the composition of vegetation is fairly uniform, although woody shrubs are more prevalent towards the northern end of the site in Management Area 2. Dominant native plants in Area 1 are California coffeeberry, deerweed, beach sagewort, seacliff buckwheat, mock heather and poison oak. Coyote brush, California croton, beach blue lupine and coast buckwheat are also found throughout Area 1. In Area 2, woody shrubs including coyote brush, mock heather and seacliff buckwheat are the most prevalent native species while California sagebrush, California buckwheat, beach sagewort, California croton and lizardtail occur in more limited areas. Management Area 3, which does not have a monitoring requirement defined in the HCP (Zander Associates 1995) and was not sampled for vegetation cover during fall 2019 surveys, is primarily vegetated with iceplant, *Acacia* species and other non-native plants including non-native annual grasses.

The most common invasive weeds encountered during fall 2019 surveys at the Edgewater preserve were iceplant and narrow-leaved iceplant. Qualitative and vegetation transect data show that in both Areas 1 and 2, mats of iceplant are common, are often five to ten feet across or more and in some areas have merged into patches over 30 feet across (**Figure 5.6**). Narrow-leaved iceplant was found in Area 1 at similar cover values to the Sand Dollar preserve, but was not common in Area 2. However, Area 2 is invaded with weeds and contains patches of iceplant, one large patch of tocalote (*Centaurea* sp.) thistle, and several types of invasive woody shrubs and trees including Sydney golden wattle (*Acacia longifolia*), Australian tea tree (*Leptospermum laevigatum*) and Ngaio tree (*Myoporum laetum*). A list of native and non-native plant species observed during the Fall 2019 surveys is provided as **Appendix A**.

Historical and fall 2019 monitoring results from the six permanent transects at the Edgewater habitat preserve reveal similar patterns of vegetation cover improvement and decline as the Sand Dollar habitat preserve. Habitat conditions were improved by initial restoration and the first several years of establishment period work but have suffered dramatic declines since 2001. Restoration at Edgewater occurred in phases, with initial restoration occurring at Management Area 1 in 1996 and at Management Area 2 in 1997 (**Table 5.5**). Cover of iceplant was high during these initial years, but was removed during site contouring and restoration. Native plant cover was also increased as a result of initial restoration and establishment period maintenance. Minimal to no management since approximately 2001 has resulted in a re-invasion of iceplant and other invasive weeds noted during the fall 2019 survey. Over that period of time, iceplant coverage increased from zero percent to over 37 percent in Area 1 and from zero percent to 25 percent in Area 2. Native plant cover in Area 1 has decreased more than in Area 2, perhaps due to the greater degree of iceplant invasion in Area 1. Although the spring survey could potentially detect an additional five percent cover of native annual species, the current native plant cover in both areas would still fall short of the 60 percent cover criterion set by the HCP (Zander Associates 1995).



Figure 5.6 Fall 2019 distribution of invasive weeds at the Edgewater habitat preserve.

Table 5.5 Historical and fall 2019 vegetation cover sampling results at the Edgewater habitat preserve shown as absolute average percent cover.

Category	1996 ¹	1997	1998	1999	2000	2001	2019 ^p	Performance Criteria ³
	T1-T3		T1-T3,T5		T1-T3,T5			
	Initial Planting	Establishment Maintenance						
Native Plants	38.5	45.8	35.0	44.3	68.0	69.4	22.1	60
Non-Native Plants	61.5	1.1	8.0	16.2	5.2	5.9	39.7	--
Monterey spineflower	1.6	4.7	6.7	7.6	7.5	5.9	--	30-50*
Seacliff buckwheat & coast buckwheat	3.7	2.3	2.0	4.6	14.5	8.1	2.9	
Sand gilia	0.0	0.3	1.2	1.1	0.1	0.1	--	--
Iceplant	56.9	1.1	1.9	0.0	0.0	0.5	37.2	--
Narrow-leaved iceplant	--	--	--	--	--	--	2.5	--

Management Area 2

Category	Management Area 2							Performance Criteria ³
	1996	1997 ²	1998	1999	2000	2001	2019 ^p	
		T1-T4	T1-T5	T1-T6	T1-T6			
		Initial Planting	Establishment Maintenance					
Native Plants	--	9.7	12.0	31.6	66.6	53.2	24.5	60
Non-Native Plants	--	11.2	24.7	17.7	14.6	27.8	28.3	--
Monterey spineflower	--	3.3	0.2	0.2	11.9	2.9	--	30-50*
Seacliff buckwheat & coast buckwheat	--	0.7	1.8	4.8	15.8	27.8	4.8	--
Sand gilia	--	0.0	0.2	0.1	0.0	0.6	--	--
Iceplant	--	8.0	0.5	0.0	0.0	0.6	25.0	--
Narrow-leaved iceplant	--	--	--	--	--	--	0.1	--

Notes:

^P: 2019 data collected on October 10 & 14, 2019; excludes annual species

Historical data from Zander Associates (1997-2002)

¹: Area 1 baseline data

²: Area 2 baseline data

³: Zander Associates (1995)

*: Performance criteria in original planting plots. Plot locations not shown in HCP.

Values in **boldface** type below performance criteria

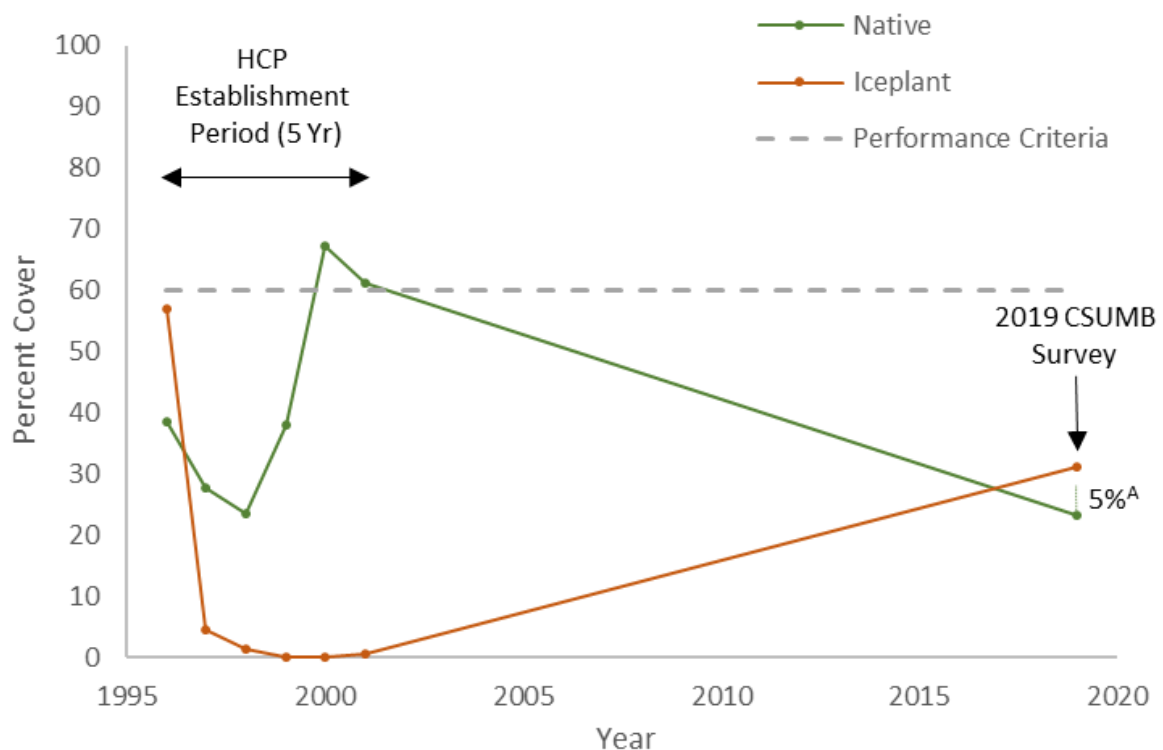


Figure 5.7. Historical and fall 2019 percent cover data (perennial and annual species) at Edgewater habitat preserve shown as an average of Areas 1 and 2 (^ represents potential increase of current cover value due to annual native species).

5.3.2 Inventory of Special Status Plant Species

Development at the Edgewater project site resulted in take of protected plant species that included sand gilia, Monterey spineflower, sandmat manzanita and Monterey ceanothus. Therefore, the HCP required compensatory mitigation for each species and established a performance criterion for cover of sand gilia within initial planting plots. The HCP indicates a cover performance criterion for Monterey spineflower of 30–50 percent, but does not indicate the location of initial planting/seeding areas. The HCP does not include performance criteria for sandmat manzanita or Monterey ceanothus. In 1997, 420 sandmat manzanita propagules were planted in the mitigation areas. Initial Monterey ceanothus propagation attempts failed due to a hybridization issue and it is not clear if this species was planted. Along with planting, the HCP required conveyance of funds equaling ten percent (\$1,500) of the annual funding generated by the development to California Department of Fish and Game once a year as mitigation for

impacts to both sandmat manzanita and Monterey ceanothus (Zander and Associates 1995).

During fall 2019 surveys, we could not survey for Monterey spineflower or sand gilia due to their spring and early summer flowering periods. However, we did observe what appeared to be Monterey spineflower seed from last season on the ground in Management Area 1. We searched for sandmat manzanita and Monterey ceanothus and mapped plant occurrences using the same GPS methods as the Sand Dollar preserve. We found zero Monterey ceanothus and 23 sandmat manzanita plants (**Figure 5.8**). Historical results of sand gilia monitoring are provided in **Table 5.6** and historical and current results of sandmat manzanita are provided in **Table 5.7**.

Table 5.6. Historical sand gilia monitoring results of average absolute percent cover at the Edgewater habitat preserve, planting areas SG 1–5.

Species	1997	1998	1999	2000	2001	2019	Performance Criterion ¹
	Initial Planting		Establishment Period				
Sand gilia	--	--	21	30	45	--	30–50

Notes

¹: Zander Associates (1995)

Values in **boldface** type below performance criteria

Table 5.7. Historical and fall 2019 percent survival results for Monterey ceanothus and sandmat manzanita at the Edgewater habitat preserve.

Species	1997	1998	1999	2000	2001	2019	Performance Criterion ¹
	Initial Planting	Establishment Period					
Monterey ceanothus	Status of planting unknown					0	--
Sandmat manzanita	--	--	--	---	---	5	

Notes

¹: No performance criteria listed, Zander Associates (1995)

420 sandmat manzanita planted in 1997

5.3.3 Smith's Blue Butterfly Habitat Value and Buckwheat Mapping

We assessed the current habitat conditions for SBB by GPS mapping of its two host plants, seaciff buckwheat and dune buckwheat in Management Areas 1 and 2. California buckwheat (*Eriogonum fasciculatum*) was also found and mapped in the western portion of Area 2. This species of buckwheat is not listed as a host plant for SBB (USFWS 1984).. We found approximately 1.4 acres occupied by seaciff buckwheat and 0.19 acre

occupied by coast buckwheat for a total of 35 percent of Areas 1 and 2 with buckwheat presence (**Figure 5.8**). The area occupied by buckwheat at Edgewater is ten percent less than Sand Dollar but suitable habitat for SBB is present due to the distribution of buckwheat across most of the site and the presence of mature buckwheat plants. Minimal or no management activities since the end of the establishment period may have caused a slight decline of buckwheat coverage in Area 1 and no change in Area 2. Like the percent cover of native plant species, the observed decline of buckwheat cover in Area 1 may be due to higher coverage of iceplant.

Three permanent transects for assessing abundance of SBB at the habitat preserve were surveyed during the SBB flight season. Surveys were performed by Dr. Richard Arnold of Entomological Consulting Services during establishment period years 1997–2001 (**Table 5.8**). Similar to the Sand Dollar habitat preserve, SBB are assumed to currently utilize the site due to the quality of the habitat and have been observed in flight nearly every year since 1999 (Dr. Richard Arnold, personal observations and communication, October 8, 2019).

Table 5.8. Historical Smith’s blue butterfly survey results, Edgewater Habitat Preserve.

Year	Transect Count			Total Number of Adults	Survey Dates	Surveyor
	1	2	3			
1997	125	297	36	458	June 14 – July 26	Entomological Consulting Services ¹
1998	29	60	8	98	June 23 – August 17	Entomological Consulting Services ¹
1999	134	142	33	309	June 30 – August 17	Entomological Consulting Services ¹
2000	--	--	--	548	June 11 – August 20	Entomological Consulting Services ¹
2001	--	--	--	760	June 8 – August 24	Entomological Consulting Services ¹

Notes

¹: Dr. Richard Arnold

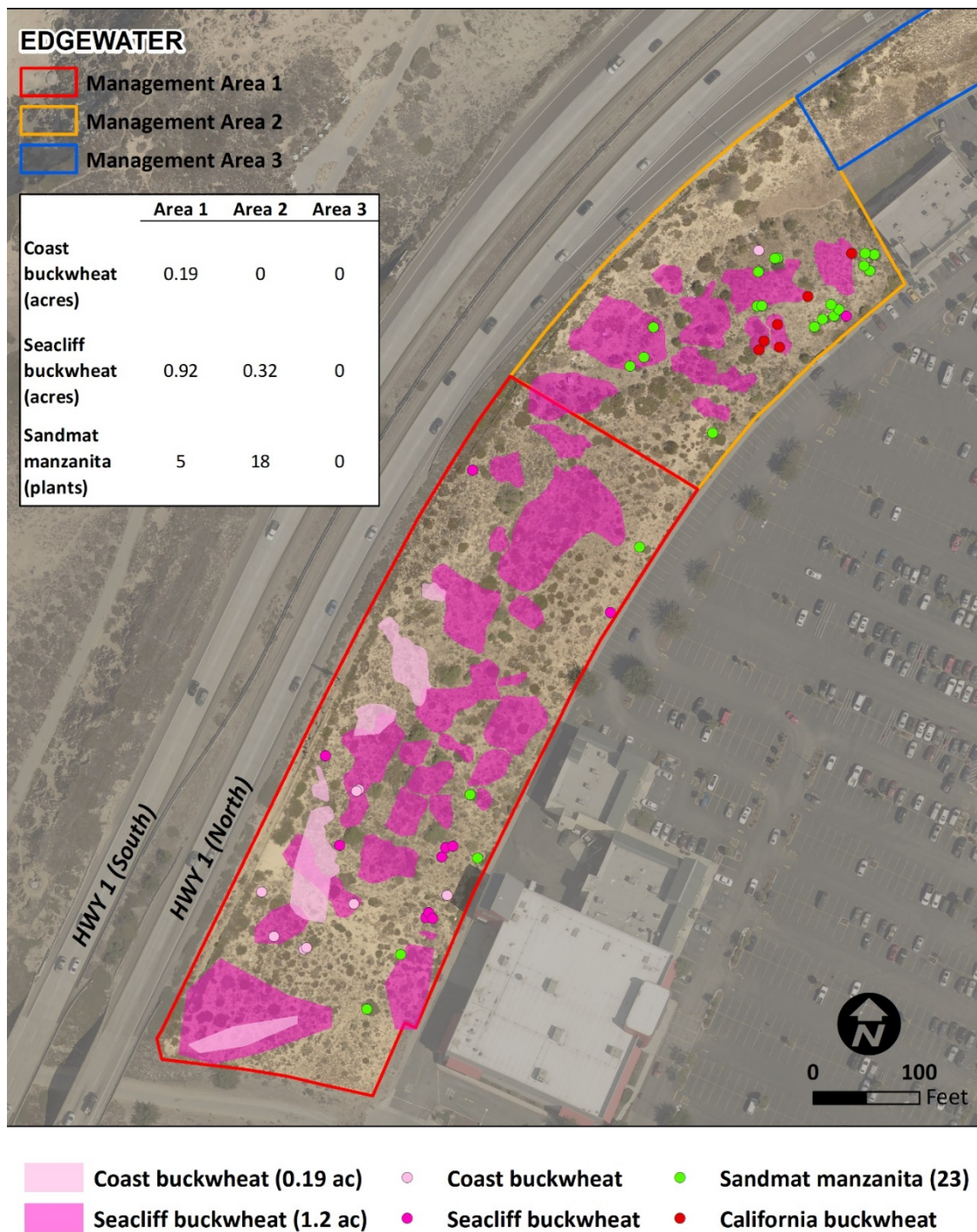


Figure 5.8. Fall 2019 distribution of buckwheat and sandmat manzanita at the Edgewater habitat preserve.

5.3.4 Geomorphic Conditions and Presence of Erosion

During Fall 2019 surveys, we qualitatively assessed the habitat preserve for geomorphic and/or erosion features that could possibly affect habitat value and/or special status species. In general, topography in all three Management Areas remains as described and depicted in previous monitoring reports. The preserve is a relatively uniform and slightly undulating slope extending from Highway 1 down to the parking lot elevation in the Edgewater shopping center and lacks the large dune features found at the Sand Dollar habitat preserve. Analysis of 2018 LiDAR data indicates that dune slopes at the Edgewater preserve range from nearly flat to a maximum slope of 35 degrees, with an average slope of 16 degrees. The steepest slopes are in Management Area 2 and 3.

Evidence of erosion caused by runoff was observed in the southern portion of Management Area 1. A gully has formed in the sand near the top of the slope and appears to have been caused by stormwater runoff exiting the paved highway surface (**Figure 5.9 and 5.10**). A review of aerial imagery reveals that this feature first appeared between August 2013 and April 2015. When it initially formed, a tongue of sand up to 60-feet-wide was deposited down the length of the slope. Since that time, vegetation has re-colonized the disturbed area and exposed sand is present only near the property line where active gullying occurs. The gully and sand deposits do not overlap with any of the original sand gilia planting areas, but could possibly have affected gilia plants outside of the original planting areas or buried sand gilia seed.



Figure 5.9. View of active gully near Highway 1 in Management Area 1.



Figure 5.10. Tail of active gully shown in Figure 5.9.

5.3.5 Photopoints

During fall 2019 fieldwork, we visited permanent photo-monitoring stations at the Edgewater habitat preserve and took current site photographs. The 2019 photographs were taken at approximately the same angle as the historical photographs to provide a visual record of habitat changes between 1999 and 2019. The expansion of iceplant detected by fall 2019 vegetation transect sampling is readily apparent in most of the photographs provided below. Photopoint locations are shown on Figure 6.10.

Photopoint 1
1999



2019



Photopoint 2
1999



2019



Photopoint 3
1999



2019



Photopoint 4
1999



2019



Photopoint 5

1999



2019



Photopoint 6

1999



2019



Photopoint 7

1999



2019



Photopoint 8

1999



2019



5.3.6 General Maintenance Issues

We mapped areas where general maintenance on site infrastructure is needed and/or observations of accumulated trash or evidence of homeless encampments (**Figure 5.11 and 5.12**). The Edgewater habitat preserve is more impacted by trash accumulation and homeless use than the Sand Dollar habitat preserve. Homeless use is most prevalent near Highway 1 in the vicinity of the tunnel entrance door and trash appears to accumulate along the fence that runs along the edge of the parking lot. During fall 2019 surveys, we noted approximately 111 linear feet of fence in need of replacement along the recreation trail at the south end of Management Area 1. The damaged section of fence was subsequently repaired by the City during October 2019.



Figure 5.11. Edgewater: (1) trash along the fence line from Playa Avenue to Starbucks, (2) trash build up behind large native shrubs, (3) trash build up behind the Clothes & Shoes donation bins, (4) homeless encampments. See Figure 5.12 for locations.



Figure 5.12. Locations of general maintenance issues in the Edgewater habitat preserve.

6 Potential Future Actions for Restoration & Conservation

This Chapter prescribes potential future actions for restoration, stewardship, and maintenance of the Sand Dollar and the Edgewater habitat preserves. In writing a management plan, we consulted the following: (1) Sand Dollar Biological Resource Management Plan (BRMP) (Harding Lawson Associates 1989) and 1995 Edgewater Habitat Conservation Plan (HCP) (Zander Associates 1995), (2) recommendations found in previous monitoring reports for Sand Dollar (Harding Lawson Associates 1992, 1993; Dorrell–Canepa 2000) and Edgewater (Zander Associates 1997, 1998, 1999), (3) current preserve conditions as described in **Chapter 6**, and (4) input from local experts in dunes restoration: Amy Palkovic, Environmental Scientist with California State Parks, Suzanne Worcester, Professor and Chair, Department of Applied Environmental Science, and Joey Dorrell–Canepa, Native Solutions. We first describe how the preserves should be managed based on Management Areas shown in **Chapter 5** maps. Then, we recommend what specific actions should occur in these areas.

6.1 Management Areas

6.1.1 Sand Dollar Habitat Preserve

The initial restoration of Sand Dollar was prioritized by Management Area 1A, 2A, and 2B. Management Area 1A had existing dune scrub and was therefore a priority to maintain. Areas 2A and 2B were vegetated but more disturbed. Between Areas 2A and 2B the former was higher priority because it was more vegetated than the latter.

Based on current conditions at Sand Dollar, we recommend that Sand City restore Sand Dollar in the following order of priority: Management Areas 1A, 2B, 2A. Areas 1A and 2B have more continuous buckwheat habitat, native plant cover and diversity than Area 2A. Between Areas 1A and 2B, Area 1A is higher priority because of the previously documented presence of sand gilia (Dorrell–Canepa 1990). Area 2A has compacted soil conditions that are unfavorable for establishment and survivorship of native plants. Historical aerial photographs suggest that these soil conditions could be a relic of sand mining operations (**Chapter 3**). Therefore, Area 2A is the lowest priority for restoration.

6.1.2 Edgewater Habitat Preserve

The initial restoration of Edgewater prioritized Management Area 1 followed by 2 and 3. While not explicitly stated, we can infer from the management goals that Area 1 likely had more existing coastal dune scrub and SBB habitat than Area 2, and Area 1 and 2 had more native vegetation to maintain and protect compared to Area 3. At the time, Area 3 needed significantly more work, so it was reconstructed, stabilized, and hydromulched (Zander Associates 1995).

Based on current conditions, we recommend that Sand City restore Edgewater based on the original order of priority. This recommendation is supported by Dr. Suzanne Worcester (personal communication, October 16, 2019). Management Area 1 and 2 have higher native plant and buckwheat cover. Area 1 needs more non-native plant control work in order to create conditions that would favor more native plant and buckwheat cover. Furthermore, Area 1 is where previous sand gilia planting occurred during initial restoration. Detection of sand gilia by spring 2020 surveys in Area 1 would provide added support for a high restoration priority. Management Area 3 is the lowest priority. The area is covered with iceplant, non-native trees and annual grasses. There is no SBB habitat and the open, sandy soils preferred by sand gilia and Monterey spineflower.

6.2 Restoration, Stewardship & Maintenance Plan

We developed a prioritized list of strategies and actions to support Sand City in maintaining its legal obligations to manage the preserves, meet performance criteria outlined in the HCP and BRMP, and protect coastal dune habitat and protected species. These recommended actions fall under four strategies based on highest need: 1) controlling invasive plants, 2) revegetation, 3) long-term monitoring and reporting, and 4) physical maintenance needs (**Table 6.1**). We recommend the City work with a restoration specialist to develop an annual implementation program for these recommendations. This recommendation is consistent with Zander Associates, 2002 Edgewater Monitoring Report.

Strategies and recommended actions described hereafter may change and reprioritize overtime. Adaptive management practices will provide the basis for long-term stewardship of the preserves and are important to the implementation of these recommended actions (Arnold 2015; Hameister 2006; Arnold et al. 2006). Adaptive management will allow adjustments to be made to how the preserves are managed. For

example, if new occurrences of sand gilia are found, priorities for controlling invasive plants might be altered to incorporate this new information. Fulfilling the recommended strategies and actions as part of an adaptive and flexible management plan will support Sand City in managing the Sand Dollar and Edgewater habitat preserves in perpetuity.

6.3 Control of Invasive Plants

Invasive plants such as iceplant are present at both preserves, most notably at Edgewater where it covers approximately 67 percent of Management Areas 1 and 2 combined. Iceplant is an aggressive colonizer that has outcompeted buckwheat and other native species. The objective of controlling invasive plants such as iceplant is to expand the cover of native plant species and enhance habitat values for the Smith's blue butterfly, sand gilia, and Monterey spineflower (Harding Lawson Associates 1989; Zander Associates 1995). This will help to achieve the following performance criteria and goals described in the Sand Dollar BRMP and Edgewater HCP:

1. Remove non-native plants.
2. Achieve 60% native plant cover and provide habitat for Smith's blue butterfly, sand gilia (30–50% cover of planted areas), and Monterey spineflower (30–50% cover).
3. Use of the area by a "stable" population of SBB (a function of healthy buckwheat habitat).

In Section 6.3, we describe invasive plant species that should be controlled (6.3.1) and how to do so effectively and safely (6.3.2). After, we provide recommendations on Best Management Practices for using herbicides (6.1.3) and measures to minimize impacts to protected species when conducting restoration work (6.3.4).

Table 6.1. An overview of four strategies to restore, steward, and maintain the Sand Dollar and the Edgewater habitat preserves which Sand City will manage in perpetuity. Recommended actions are based on exiting site conditions and performance criteria described in the Sand Dollar Biological Resource Management Plan and Edgewater Habitat Conservation Plan. Recommended strategies and actions are to be implemented based on Management Area which is prioritized based on highest habitat and resource value as of October 2019. Sand Dollar: Area 1A, 2B, 2A. Edgewater: Area 1, 2, 3. See Appendix B for detailed estimated cost breakdown.

Priority & Strategy	Relevant performance criteria	Recommended activities	Frequency & time investment	Estimated cost
1. Control invasive plants	<ol style="list-style-type: none"> 1. Remove non-native plants. 2. Achieve 60% native plant cover and provide habitat for Smith's blue butterfly, sand gilia (30–50% cover of planted areas), and Monterey spineflower (30–50% cover). 3. Use of the area by a "stable" population of Smith's blue butterfly (a function of healthy buckwheat habitat). 	<p>Details in Section 6.3</p> <p>Control 10 species of non-native, invasive plants in order of priority: narrow-leaved iceplant, iceplant, ripgut brome, panic veldtgrass, Acacia, tea tree, Ngaio tree, rosy iceplant, thistles, sweet alyssum.</p>	<p>Frequency of treatments in a calendar year will vary depending on the species controlled. Follow-up treatment will occur yearly for at least 10 years after start of this new restoration phase.</p>	<p>Initial Phase Year 1: \$32,100</p> <p>Follow-up Years 2–4 \$12,700/year</p> <p>Follow-up Years 2 – 10: \$8,500/year</p>
2. Revegetation	<ol style="list-style-type: none"> 1. Achieve 60% native plant cover and provide habitat for Smith's blue butterfly, sand gilia (30–50% cover of planted areas), and Monterey spineflower (30–50% cover). 2. Mitigate for loss of sandmat manzanita and Monterey ceanothus during initial development of shopping centers by planting more plants. 3. Use of area by a "stable" population of Smith's blue butterfly (a function of healthy buckwheat habitat). 	<p>Details in Section 6.4</p> <p>Outplant seacliff buckwheat, coast buckwheat, sandmat manzanita, Monterey ceanothus, beach sagewort, other coastal dune species where appropriate in 12 plantings areas.</p>	<p>Every year until revegetation goals have been met. Infill with more seedlings as needed.</p>	<p>Initial planting of 12 planting areas: \$43,206</p>

Priority & Strategy	Relevant performance criteria	Recommended activities	Frequency & time investment	Estimated cost
3. Long-term monitoring and reporting	<ol style="list-style-type: none"> 1. Monitoring of habitat values. 2. Achieve 60% native plant cover and provide habitat for Smith's blue butterfly, sand gilia (30–50% cover of planted areas), and Monterey spineflower (30–50% cover). 3. Use of area by a "stable" population of Smith's blue butterfly (a function of healthy buckwheat habitat). 	<p>Details in Section 6.5</p> <p>Monitoring Smith's blue butterfly, vegetation transects, sand gilia, and photo points. Results should be written in a report and made available to the public and interested agencies.</p>	<p>Every year for the first five years after the start of this new restoration phase (consistent with original BRMP and HCP recommendations), then reduce frequency to every other year or every 2–5 years depending on the dataset.</p>	<p>Yearly: \$17,640 (Smith's blue butterfly, vegetation transects, sand gilia).</p>
4. Physical maintenance needs	<ol style="list-style-type: none"> 1. Maintain habitat values. 2. Permanent protection. 	<p>Details in Section 6.6</p> <p>Repair and replace fences and signs; clean up trash and homeless encampments. Work with adjacent stores to prevent trash and debris from blowing into the preserve.</p>	<p>Every year; repair and replacement as needed. New interpretive signs could be installed.</p>	<p>Annual cost to pick-up trash/litter: \$7,056 (once a month at both preserves).</p> <p>Fence repair: \$2,460 labor and materials (as needed).</p>

Notes:

We recommend the City work with a restoration specialist to develop an annual implementation program for these recommendations. The City should also work with a restoration specialist when using herbicide to control invasive plants (Zander Associates 2002).

6.3.1 Invasive Plant Ranking

Based on a fall 2019 survey of non-native and invasive vegetation, we recommend controlling 10 species which are currently listed by the California Invasive Plant Council as species that threaten California's natural areas and more specifically, are concerns in coastal dunes (**Table 6.2**). These 10 plants were prioritized based on a score derived from two criteria described below (WCS 2017):

1. Cal-IPC threat rating and score (high=4, moderate=3, limited=2, watch=1).
 - High: These species have severe ecological impacts.
 - Moderate: These species have substantial and apparent – but generally not severe – ecological impacts.
 - Limited: These species are invasive, but their ecological impacts are minor on a statewide level.
 - Watch: These species have been assessed as posing a high risk of becoming invasive in the future in California.
2. Presence in protected species habitat (buckwheat, sand gilia, and Monterey spineflower). Based on maps showing locations of native and non-native plants, some invasive species are immediate threats because they occur in protected species habitat.
 - Immediate threat = 3
 - Moderate threat = 2
 - None of the above but species is still a concern = 1

Table 6.2. 10 species of non-native, invasive plants that need to be controlled in Sand Dollar and Edgewater habitat preserves. Definitions to California Invasive Plant Species Council (Cal-IPC) ratings are provided at the end of the table (Cal-IPC 2019). Narrow-leaved iceplant was ranked higher than iceplant because it is a concern in the local dune context and immediate control was advised by Suzanne Worcester and Joey Dorrell-Canepa. Rosy iceplant does not have a Cal-IPC rating but it ranks higher because of its immediate presence in buckwheat habitat and rate of spread.

Priority	Species	Problem
1	Narrow-leaved iceplant Cal-IPC score: 1 Threat: 3	<ul style="list-style-type: none"> Cal-IPC rating: Limited (Cal-IPC 2019). Controlling narrow-leaved iceplant is a high priority at both preserves (Worcester, personal communication, October 16, 2019). Based on Suzanne's personal observation, narrow-leaved iceplant has increased in abundance rapidly in the past ~5-10 years. Little was present about 10 years ago (personal communication, November 3, 2019). Potential to impact foredune and dune scrub communities (Wiedemann and Pickart 2004). It can become locally abundant and crowd out native plants, especially in dune habitats (Cal-IPC 2019).
2	Iceplant Cal-IPC score: 4 Threat: 3	<ul style="list-style-type: none"> Cal-IPC rating: High (Cal-IPC 2019). Iceplant displaces native dune species and large infestations can change the ecology of dunes (DiTomaso et al. 2013). Controlling iceplant is a high priority in protecting Smith's blue butterflies (USFWS 1984).

Priority	Species	Problem
3	Ripgut brome Cal-IPC score: 3 Threat: 3	<ul style="list-style-type: none"> Cal-IPC rating: Moderate (Cal-IPC, 2019). Ripgut brome is a high priority at both preserves, especially at Sand Dollar where it occurs in dense patches on the dunes facing Tioga Avenue (Worcester, personal communication, October 16, 2019). It is likely a major competitor to sand gilia and Monterey spineflower (Worcester, personal communication, November 3, 2019).
4	Panic veldtgrass Cal-IPC score: 3 Threat: 1	<ul style="list-style-type: none"> Cal-IPC rating: Moderate (Cal-IPC 2019). Can form dense stands in coastal dunes and reduce native plant diversity, leading to a dramatic effect on native plant composition (DiTomaso et al. 2013).
5	Acacias, Tea trees, Ngaio tree Cal-IPC score: 2 (Tea tree: 1) Threat: 2	<ul style="list-style-type: none"> Cal-IPC rating: Moderate (Acacias), Watch (Tea trees), Moderate (Ngaio tree) (Cal-IPC 2019). Acacias are an invader known for intercepting light and suppressing germination and sprouting of native, low stature species (Rascher et al. 2009). Tea trees are used as an ornamental tree in coastal dunes. In Western Australia, the species quickly spread into coastal ecosystems, creating dense thickets. It is a noxious weed in South Africa (Randall and Lloyd 2003) Ngaio tree may crowd out native plants, growing to form dense stands (Cal-IPC 2019).
6	Rosy iceplant Cal-IPC score: NA Threat: 2	<ul style="list-style-type: none"> Cal-IPC: no rating Need to remove rosy iceplant where it occurs at Sand Dollar habitat preserve. It has spread rapidly in the last 5 years. Based on its rate of spread, controlling rosy iceplant is important even though it doesn't seem to spread elsewhere in the area (Worcester, personal communication, November 3, 2019).
7	Thistles Cal-IPC score: 3 Threat: 1	<ul style="list-style-type: none"> <i>Might be tocalote thistle. Need ID in the spring.</i> Dense stands can displace native plants (DiTomaso et al. 2013). Exotic thistles are controlled locally where there is Smith's blue butterfly habitat (Arnold et al. 2006; Hameister 2006).
8	Sweet alyssum Cal-IPC score: 1 Threat: 1	<ul style="list-style-type: none"> Cal-IPC rating: Limited (Cal-IPC 2019). A common ornamental plant that can invade disturbed coastal dunes and can crowd out native plants in some habitats (Cal-IPC 2019).

6.3.2 Invasive Plant Control Methods

Successful control and management of invasive plants is based on use of effective control methods applied at optimal times of year and frequencies. We provide commonly used and effective control techniques as recommended by California Invasive Plant Council, University of California Statewide Integrated Pest Management Program, and local experts (**Table 6.3**).

We recommend non-chemical techniques as much as possible. For treatment methods to be effective, invasive species should be controlled in the spring during growth (i.e. bloom period) but before they can set seed. In spring, plants are also easier to spot and identify. Spring is also when protected annual plants bloom (e.g. sand gilia) therefore, treatment methods and timing should be mindful of protected species and be adapted to minimize impacts (**Table 6.4**). The following Section, particularly 6.1.3.2 describes additional minimization and avoidance measures.

6.3.2.1 Iceplant

Iceplant is the most abundant invasive plant at the preserves and while it is threatening native plants and habitat, it also is helping to stabilize the dunes. Therefore, a strategic approach is needed to eradicate iceplant while maintaining slope stability. We recommend controlling iceplant in small patches or strips overtime in order to maintain slope stability temporarily, especially in areas with a lot of iceplant (Suzanne Worcester, personal communication, October 16, 2019). We also recommend leaving iceplant mulch to stabilize slopes and for planting seedlings into during the revegetation phase (**Section 6.4**). Below are more specific recommendations on iceplant control and what to do with the mulch.

- 1) Edgewater Management Areas 1 and 2 have a significant amount of iceplant. Do not treat iceplant all at once. Treat a few patches every year for planting the following year. This will help retain some slope stability during restoration (Suzanne Worcester, personal communication, October 16, 2019).
- 2) Edgewater Management Area 3 is covered in iceplant. Iceplant should be eradicated over time but leave a 10–15 ft. strip of iceplant mat above the retaining wall to buffer against erosion until native plants establish (Suzanne Worcester,

personal communication, October 16, 2019). Dead iceplant will be left in place as mulch and to facilitate the stabilization of the slopes (Zander Associates 1995).

- 3) Large quantities of iceplant mulch should be removed because it will increase the amount of organic matter in the sandy soil (i.e. decaying iceplant and litter) which can promote invasive by other weed species such as annual grasses that otherwise would not be able to inhabit dune soils (DiTomaso et al. 2013; Joey Dorrell–Canepa, personal communication, October 30, 2019). On fragile and steep slopes, leave the iceplant because more damage will occur if removed (Joey Dorrell–Canepa, personal communication, October 30, 2019).
- 4) Remove or rake away a bit of the mulch before planting if the mulch is thick in order to expose bare soil/sand (Suzanne Worcester, personal communication, October 16, 2019).
- 5) Allow iceplant to decay for about 14 months then plant directly into iceplant mulch. The mulch helps to keep some weed species (including iceplant) down (Amy Palkovic, personal communication, October 14, 2019).

6.3.3 Herbicide Application: Best Management Practices

6.3.3.1 Rules & Regulations

To use herbicides safely and effectively while managing non–native, invasive plant populations in sensitive habitat areas, the following Best Management Practices, rules, and regulations should be followed (Jose Guzman, Biologist, Monterey County Agricultural Commissioner’s Office, personal communication, October 23, 2019).

- Visit the California Department of Pesticide Regulation (CDPR) and the Monterey County Agriculture Commissioner’s Office (County Ag Commissioner) websites for more information on herbicide information, personal protective equipment, and best management practices.
- Applications and applicators must adhere to the Product Label.
- Staff must be trained on safe and proper application of herbicides.
- If work is outsourced to a contractor, the business needs to have a current business license.

- All work must have a field supervisor with a current Qualified Applicators Certificate (QAC) or Qualified Applicators License (QAL). Workers can apply non-restricted herbicides without an individual QAC or QAL only when supervised by a certified foreperson.
- If work includes treatment with restricted use herbicides, contact the County Ag Commissioner's Office for additional guidance requirements for individual applicator QAC or QAL.
- A non-production permit (i.e. Operator ID #) will need to be obtained before working with herbicides.
- Submit a monthly herbicide use report to the Ag Commissioner's Office documenting use of herbicides with an EPA registration number.

6.3.3.2 Measures To Minimize Impacts To Protected Species

Protected plant and animal species occur at Sand Dollar and Edgewater habitat preserves. In order to minimize impacts to these species during restoration work, the following measures should be followed (Amy Palkovic, personal communication, October 14, 2019). Invasive species control should be performed during a time of year that maximizes effectiveness but also minimizes impacts to protected species (**Table 6.4**).

Smith's Blue Butterfly

- Work crews and volunteers will be trained on identifying buckwheat and procedures for working around buckwheat, which they may encounter when working in the preserves. This is important for anyone working on the site in mid-June through September during the butterfly flight season. Everyone should know what buckwheat looks like, where to expect it, how to work around the plants, or to avoid the plants completely.
- Work will be planned for late fall/early winter and will not occur during SBB adult flight season (mid-June – early September).
- Ingress and egress routes will be identified and communicated to work crews and volunteers before work commences in order to minimize trampling of buckwheat and other sensitive plants.

- Do not walk through or step on buckwheat or around the plant's dripline (Dorrell–Canepa, personal communication, October 10, 2019).
- Iceplant and other non–native plants within 5 feet of buckwheat plants will be hand–pulled to protect plants and avoid any impacts to SBB pupae lying dormant under buckwheat litter during the fall/winter season (Hameister 2006).
- Herbicide application will not occur if winds are ≥ 10 mph to reduce the risk of herbicide drift and non–target impacts.
- Fueling power tools and mixing or pouring of herbicide will not occur within 100 feet of buckwheat and other sensitive plants. When possible, fueling will occur over a drip bin.

Sand Gilia and Monterey Spineflower

- Work crews and volunteers will be trained on identifying sand gilia and Monterey spineflower, which they may encounter when working in the preserves. This is important for anyone working on the site in mid–March through mid–June. Everyone should know what the two plants look like, where to expect it, how to work around the plants, or to avoid the plants completely (Suzanne Worcester, personal communication, November 3, 2019).
- Iceplant and other non–native plants within 5 feet of sand gilia and Monterey spineflower will be hand–pulled.
- Ripgut brome should be carefully hand–pulled around these plants.
- Plants may be flagged to alert workers.
- Do not walk through or step on sensitive plants.
- Herbicide application will not occur if winds are ≥ 10 mph to reduce the risk of herbicide drift and non–target impacts.
- Fueling power tools and mixing or pouring of herbicide will not occur within 100 feet of buckwheat and other sensitive plants. When possible, fueling will occur over a drip bin.

Black Legless Lizard

- Workers, especially all herbicide applicators, should know what the lizard looks like, its life history, and habitat preferences.
- Legless lizards are often found around the roots of plants.
- If found during any of the activities below, legless lizards should be unharmed.

- All work involving significant soil disturbance and excavation should have a designated biomonitor to perform pre-construction surveys and construction monitoring for the black legless lizard. If operating any equipment (e.g. Bobcat), have a biomonitor walk in front of the equipment with a rake to expose and then relocate lizards. Excavation should be done iteratively, raking then pausing to allow the biomonitor time to check for lizards.
- For planting with trowels or small hand tools, use hands to carefully rake the area about to be dug to ward off any lizards.
- For planting with large shovels or tools to break the ground, use hands to carefully rake the area about to be dug to ward off any lizards.
- Iceplant removal by hand can bring up black legless lizards and they should be relocated as necessary. Assign a designated biomonitor to watch for lizards.
- Spot and foliar herbicide applications to treat iceplant should not cause soil disturbance. Do not use herbicides that are harmful to lizards (read complete herbicide Product Labels and Safety Data Sheets).
- Refuel power tools and equipment away from lizard habitat and over a drip bin.

Birds

The recognized bird and raptor nesting season starts January 15 and ends September 15. Tree removal activities should not occur at this time. If it does, surveys for nesting birds and raptors covered by the California Fish and Game Code and Migratory Bird Treaty Act shall be conducted by a qualified biologist before and during tree removal activities.

Table 6.3. Recommendations for controlling 10 species of non-native, invasive plants in Sand Dollar (SD) and Edgewater (EW) habitat preserves. Mechanical = hand pulling/removal. Prioritize control also by Management Area (Sand Dollar: 1A, 2B, 2A; Edgewater: 1, 2, 3). Estimated cost provided by Burleson Consulting Inc. Follow-up cost estimate is based on 5 workdays per year and the cost for Years 2–10 encompasses all species unless otherwise noted. Initial and follow-up estimates for Acacias, Tea trees, and Ngaio tree excludes Edgewater Management Area 3 which should be assessed by an arborist. See Appendix B for cost breakdown.

Priority	Species	Area where mapped with GPS ¹	Estimated cost	Control recommendations & notes
1	Narrow-leaved iceplant ^E	EW = 1.1 acres SD = 2.5 acres	Initial Phase Year 1: \$8,000 Follow-up Years 2–10: Folded into \$8,500 annual costs	<u>Chemical</u> : Foliar spray with 1.5% concentration of Glyphosate with 1% surfactant (Amy Palkovic, personal communication, October 14, 2019). <u>Mechanical</u> : Small plants can be dug or pulled out. <u>Notes</u> : Control at least three times per year – once in the start, middle, and end of the growing season (Amy Palkovic, personal communication, October 14, 2019).
2	Iceplant ^E	EW = 1.9 acres SD = 1.7 acres	Initial Phase Year 1: \$8,000 Follow-up Years 2–10: Folded into \$8,500 annual costs	<u>Chemical</u> : Foliar spray with 1.5% to 2% concentration of Glyphosate with 1% surfactant (DiTomaso et al. 2013). <u>Mechanical</u> : Pull plants by the roots. Because the plant can grow roots and shoots from any node, all plant material and stem fragments must be removed from contact with the soil to prevent resprouting. Iceplant should be piled with roots and stems piled facing up at the sun to prevent resprouts (DiTomaso et al. 2013). <u>Notes</u> : Treating iceplant once per year is enough. If treating iceplant in preparation for planting, re-treat the area at least one more time within the year before planting (Amy Palkovic, personal communication, October 14, 2019).

Priority	Species	Area where mapped with GPS ¹	Estimated cost	Control recommendations & notes
3	Ripgut brome ^{DR}	SD, EW	Initial Phase Year 1: \$8,000 Follow-up Years 2–10: Folded into \$8,500 annual costs	<p><u>Chemical:</u> Foliar spray with 1% concentration of Glyphosate after the grasses have appeared (post-emergence) but before the seeds get a chance to develop or mature (DiTomaso et al. 2013).</p> <p><u>Manual:</u> Individual plants or small patches can be pulled by hand, hoed in early spring before seeds are ripe, or the seed heads can be cut or scythed before ripening to reduce seed production. (DiTomaso et al. 2013). Carefully hand pull around sand gilia and Monterey spineflower to avoid destroying delicate plants (Suzanne Worcester, personal communication, November 3, 2019).</p> <p><u>Notes:</u> Be persistent and treat ripgut brome more than once during the growing season because new grass will keep coming up throughout the rainy season. Apply herbicide early so that the grass will die before setting seed (Amy Palkovic, personal communication, October 14, 2019). May take 5–10 years of management (Dorrell-Canepa, personal communication, October 30, 2019).</p>
4	Panic veldtgrass ^E	SD = 50 sq. ft.	Recommend doing with Public Works Crew	<p><u>Chemical:</u> 1% to 1.5% Glyphosate to foliar spray or 1% to 2% concentration to spot spray (DiTomaso et al. 2013).</p> <p><u>Manual:</u> The best time to remove is after the plants have bolted but before they produce seed. Systematic surveys and repeated removal should be conducted every month if possible. All buried parts must be removed to prevent resprouting (DiTomaso et al. 2013).</p>
5	Acacias, Tea trees, Ngaio tree ^E	EW 1 Acacia tree 10 Tea trees 1 Ngaio tree	Initial Phase Year 1: \$6,400 Follow-up Years 2–4: \$4,200	<p><u>Chemical:</u> Excellent control when using 50% Glyphosate cut/stump treatment (Ngaio tree) (DiTomaso et al. 2013). Trees can be treated using the cut stump treatment with Glyphosate per label instructions (UC-IPM, 2017).</p> <p><u>Manual:</u> Small trees (i.e. seedlings) can be hand-pulled or dug out (Acacias) (Nomad Ecology 2014; DiTomaso and Kyser 2017).</p>

Priority	Species	Area where mapped with GPS ¹	Estimated cost	Control recommendations & notes
6	Rosy iceplant ^E	SD = 0.07 ac	Initial Phase Year 1: \$400 Follow-up Years 2–10: Folded into \$8,500 annual costs	Control techniques for <i>Carpobrotus edulis</i> , another invasive species in the same family (Aizoaceae) with similar growth form, would likely be effective.
7	Thistles (may be tocalote, need spring ID to confirm)	EW = 0.03 acres SD = 0.22 acres	Initial Phase Year 1: \$800 Years 2–10: Folded into \$8,500 annual costs	<u>Chemical</u> : Foliar spray: 1.5% to 2% Glyphosate. Spot Treatment: 1% to 2% concentration Glyphosate (DiTomaso et al. 2013). <u>Manual</u> : Plants could be hand-pulled then bagged. It is important to detach all above-ground stem material and removing the roots. Leaving even a 2-inch piece of the stem can result in the plant regenerating. Systematic surveys and repeated removal should be conducted every 2 to 4 weeks throughout the growing season. Two to four years of removal should reduce or eliminate an infestation (DiTomaso et al. 2013).
8	Sweet alyssum ^E	SD = 40 sq. ft.	Recommend doing with Public Works Crew	<u>Chemical</u> : Foliar spray with Glyphosate per label instructions (DiTomaso et al. 2013). <u>Manual</u> : Good control (80–95%) hand pulling (DiTomaso et al. 2013).

Notes:

^E: Eradicate, a management goal that seeks to completely remove all infestations in an area.

^{DR}: Density reduction, a management goal that seeks to maintain a certain low density of plants in a population without hopes of full eradication, but enough to maintain a species or ecological processes.

¹: Edgewater area based on Management Area 1 and 2. Iceplant area based on all three Management Areas.

Contact Burleson Consultants Inc. directly for a detailed cost estimate.

Table 6.4. Treatment timing and frequency for controlling 10 invasive, non-native plant species in Sand Dollar and Edgewater habitat preserves. The goal is to control invasive plants and minimize impacts to protect plants and animals. This could be achieved by maximizing mechanical control (i.e. hand pulling/removal) and reducing herbicide use, especially during the spring and summer coinciding with the bloom and active period for protected plants and animals (red).

	winter			spring			summer			fall		winter			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Smith's blue butterfly						flight period/mating									
Sand gilia ^A				bloom											
Monterey spineflower			bloom												
In order of priority:															
Narrow-leaved iceplant ¹					H					H	H				
Iceplant ²	H/M	H/M											H/M	H/M	H/M
Ripgut brome ³			H	M	M	M	M								
Panic veldtgrass			M	M	M	M									
Acacia ⁴												H	H	H	
Tea tree ⁴												H		H	H
Ngaio tree ⁴												H		H	H
Thistles ⁵				H/M	H/M	H/M	H/M	H/M							
Rosy iceplant				M	M	M	M								
Sweet alyssum	M	M	M	M	M	M	M	M	M	M	M	M	M		

Notes:

Green = bloom/growth period

H = Herbicide; M = Mechanical (i.e. hand pulling/removal)

^A: Sand gilia blooms in April and barely makes it to June. In spring 2019, bloom started in late March (Suzanne Worcester, personal communication, November 3, 2019).

¹: At least three times per year – once in the start, middle, and end of growing season. Wait until after sand gilia but before Smith's blue flight season (sometime in start of June).

²: Treating iceplant once per year is enough. If treating iceplant in preparation for planting, retreat the area at least one more time within the year before planting.

³: Need to be persistent and treat the area (ripgut brome) more than once during the growing season because new grass will keep coming up throughout the rainy season.

⁴: Do not cut trees between the combined bird and raptor nesting season from January 15 – September 15.

⁵: Thistle is not in or near Smith's blue butterfly or sensitive plant habitat so could be herbicided in spring.

6.4 Revegetation

During the initial restoration of Edgewater habitat preserve, approximately 24,00 native dune seedlings, 10,000 buckwheat, 500 sandmat manzanita, and 500 Monterey ceanothus were outplanted in Management Areas 1 and 2 (Zander Associates 1995). A similar planting palette was used at the Sand Dollar preserve. While some areas have remained more native plant-dominated certain areas saw a reduction in native plant cover. Therefore, in addition to controlling invasive weeds, outplanting with native plants at Sand Dollar and Edgewater habitat preserves is necessary. This will achieve the following performance criteria and goals described in the Sand Dollar BRMP and Edgewater HCP:

1. Achieve 60% native plant cover and provide habitat for Smith's blue butterfly, sand gilia (30–50% cover of planted areas), and Monterey spineflower (30–50% cover).
2. Mitigate for loss of sandmat manzanita and Monterey ceanothus during initial development of shopping centers by planting more plants.
3. Use of area by a "stable" population of Smith's blue butterfly (a function of healthy buckwheat habitat).

In Section 6.4, we describe the planting areas (6.4.1) and discuss how to balance revegetation while maintaining open space (bare sand) for sand gilia and Monterey spineflower. Beginning in Section 6.4.2, we provide recommendations on ways to minimize harm to protected species when planting, planting techniques to optimize survivorship (6.4.3), and seed collection (6.4.4).

6.4.1 Revegetation Areas

We recommend planting in 12 areas after controlling invasive plants in order to revegetate the landscape. We prioritized areas that would become largely unvegetated after iceplant is controlled and in these areas, buckwheat would be planted for Smith's blue butterflies (Suzanne Worcester, personal communication, October 16, 2019). We also prescribe outplanting of sandmat manzanita and Monterey ceanothus to mitigate for the initial loss of plants during development of the shopping centers. There are three plantings areas at Sand Dollar (**Figure 6.1**) and nine at Edgewater (**Figure 6.2**). For each

area, we provide the revegetation prescription and cost estimate (**Table 6.5**). Planting areas are listed based on priority in **Table 6.6**. In creating revegetation prescriptions, we considered the following variables:

- Performance criteria and goals.
- Previous planting palette (i.e. seedling mix) described in the BRMP and HCP.
- Size of planting area (acres).
- Approximate area of iceplant that will be treated and open for planting after about 14 months (available planting area).
- Approximate area of native plants already established in the planting area (unavailable planting area).
- Adjusted based on the need to revegetate while retaining open, sandy soils between plants (e.g. clusters of buckwheat) for sand gilia and Monterey spineflower.
- Adjusted to account for field desiccation and seedling mortality.

The recommended plant numbers are estimates and there may be more plants that can fit in the planting area. Extra plants should be planted outside of the immediate planting area perimeter. On the contrary, the estimates may be under, therefore more plants may be needed in subsequent years for infill. Also, depending on survivorship, more plants may be needed to replace dead seedlings.

6.4.1.1 Sand Gilia and Monterey Spineflower

Sand gilia (specifically coastal sand gilia, *Gilia tenuiflora ssp. arenaria*) and Monterey spineflower can be maintained or re-established by creating open space (bare sand) and direct seeding, or planting seedlings depending on the species. We recommend not planting in some of the iceplant mulch piles to create some areas of open space that sand gilia and Monterey spineflower prefer (Suzanne Worcester, personal communication, October 16, 2019). High vegetation cover in a restored area can be to the detriment of sand gilia and Monterey spineflower (Suzanne Worcester, personal communication, November 3, 2019). We do not recommend revegetating elsewhere beyond these 12 planting areas however, this recommendation should be evaluated on an annual basis with a restoration specialist.

Revegetation of sand gilia and Monterey spineflower may be needed. However, given that this work was based on fall field conditions, we could not assess the current presence and distribution of sand gilia and Monterey spineflower. A springtime survey of both plants will help determine if historic naturally occurring populations and planted areas will need to be augmented by direct seeding or planting, as well as existing open sandy areas that are not already occupied by these plants (Suzanne Worcester, personal communication, November 3, 2019). Do this survey in next spring 2020 and over a series of springs because abundance of this species is highly variable. If necessary, a planting plan for sand gilia and Monterey spineflower should be developed with a restoration specialist. See **Section 6.4.3.2** for seed collection and planting technique recommendations.

Table 6.5. Estimated plant costs provided by Return of the Natives, a staff-managed and student/community-assisted native plant nursery based out of CSUMB.

Scientific name	Common name	Spacing ¹	Pot Size	Cost per plant ²	
<i>Arctostaphylos pumila</i>	sandmat manzanita	10 feet	Gallon	\$	8.00
<i>Abronia latifolia</i>	Yellow sand verbena	2–4 feet	Cone	\$	1.50
<i>Abronia umbellata</i>	Pink sand verbena	2–4 feet	Cone	\$	1.50
<i>Ambrosia chamissonia</i>	Beach bur	2–4 feet	Cone	\$	1.50
<i>Artemisia pycnocephala</i>	beach sagewort	4–6 feet	D40	\$	3.50
<i>Camissoniopsis chiranthifolia</i>	Beach evening primrose	2–4 feet	Cone	\$	1.50
<i>Ceanothus rigidus</i>	Monterey ceanothus	10 feet	Gallon	\$	8.00
<i>Corethrogyne californica</i>	Beach aster	2–4 feet	Cone	\$	1.50
<i>Ericameria ericoides</i>	Mock heather	6 feet	Cone	\$	1.50
<i>Eriogonum parvifolium</i>	seacliff buckwheat	4–6 feet	Cone	\$	1.50
<i>Eriophyllum staechadifolium</i>	Lizardtail	6 feet	Cone	\$	1.50
<i>Lupinus chamissonis</i>	Beach blue lupine	6 feet	Cone	\$	1.50

Notes:

¹: Spacing recommended by Suzanne Worcester (personal communication, November 3, 2019)

²: Subject to change



Figure 6.1. Recommended planting areas at the Sand Dollar habitat preserve for buckwheat, sandmat manzanita, and Monterey ceanothus. Other native species include beach sagewort. Areas that will have no vegetation after iceplant is controlled are higher priority. These areas should be planted exclusively with buckwheat.

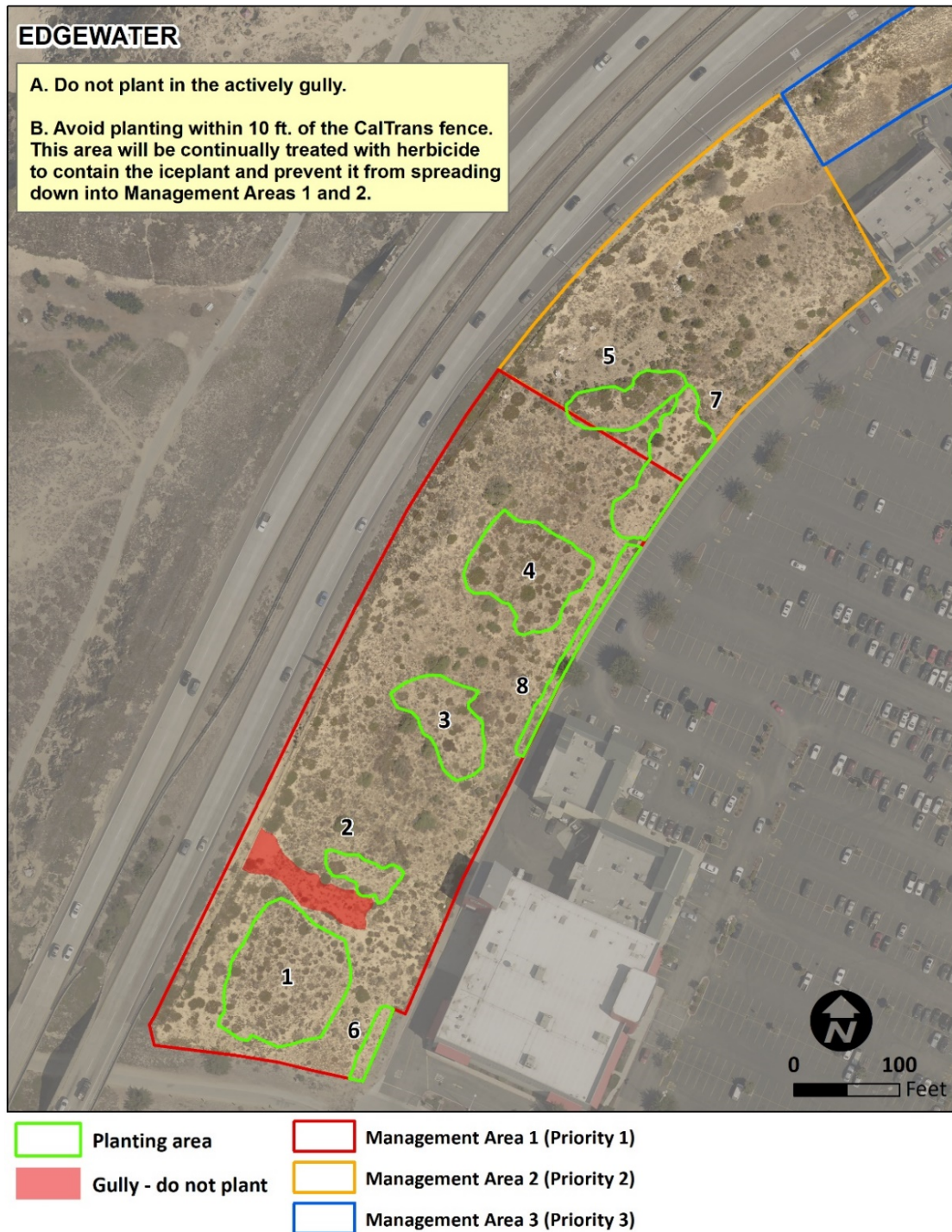


Figure 6.2. Recommended planting areas at the Edgewater habitat preserve for buckwheat, sandmat manzanita, and Monterey ceanothus. Note that the entire Area 3 is a recommended planting area which is currently covered in iceplant. Prioritize revegetation by Management Area: 1, 2, 3. Areas that will have no vegetation after iceplant is controlled are higher priority. These areas should be planted exclusively with buckwheat.

Table 6.6. Twelve areas should be revegetated after controlling invasive plants. In creating revegetation prescriptions, we considered performance criteria and previous planting palette (i.e. seedling mix) described in the Sand Dollar Biological Resource Management Plan and Edgewater Habitat Conservation Plan. Planting areas are prioritized by Management Area (Sand Dollar: 1A, 2B, 2A; Edgewater: 1, 2, 3). Areas that will have no vegetation after iceplant is controlled are higher priority. These areas should be planted with buckwheat. Estimated plant cost provided by Return of the Natives. Estimated labor provided by Burleson Consulting Inc.

Priority	# seedlings	Estimated cost ¹	Objective	Notes
Sand Dollar Habitat Preserve (Estimated total cost: \$1,974, Estimated labor cost:\$720, Estimated plant cost: \$1,254, Total # plants: 466)				
1	Seacliff buckwheat (98)	Labor: \$720 for Areas 1, 2, 3 Plants: \$147	Enhance Smith's blue butterfly host plant habitat.	Fragile and steep slope. Plant buckwheat after controlling iceplant, allowing the iceplant to decay for about 14 months. Plant directly into iceplant mulch. The mulch helps to keep some weed species (including iceplant) down (Amy Palkovic, personal communication, October 14, 2019).
2	Seacliff buckwheat (98) Monterey ceanothus (35) Sandmat manzanita (35)	Labor: \$720 for Areas 1, 2, 3 Plants: \$707	Enhance Smith's blue butterfly host plant habitat, establish more rare shrubs.	Plant Seacliff buckwheat to expand Smith's blue butterfly habitat. Plant sandmat manzanita and Monterey ceanothus in flatter areas (Zander Associates 1995; Harding Lawson Associates 1989).
3	Seacliff buckwheat (150) Beach sagewort (50)	Labor: \$720 for Areas 1, 2, 3 Plants: \$400	Enhance Smith's blue butterfly host plant habitat, establish more native vegetation.	Plant beach sagewort which is a hardier dune species with a high outplanting survivorship (Worcester, personal communication). Establish seacliff buckwheat in order to create a more continuous buckwheat habitat patch through Management Area 2A.

Priority	# seedlings	Estimated cost ¹	Objective	Notes
Edgewater Habitat Preserve (Estimated total cost: \$41,232, Estimated labor cost: \$21,000, Estimated plant cost: \$18,710, Total # plants: 11,728)				
1	Seacliff buckwheat (196)			
2	Seacliff buckwheat (49)			
3	Seacliff buckwheat (49)	Areas 1 through 5 Labor: \$720 Plants: \$882	Enhance Smith's blue butterfly host plant habitat.	Plant buckwheat after controlling iceplant, allowing the iceplant to decay for about 14 months. Plant directly into iceplant mulch. The mulch helps to keep some weed species (including iceplant) down (Amy Palkovic, personal communication, October 14, 2019).
4	Seacliff buckwheat (196)			Area 5: Fragile and steep slope. Leave more of the iceplant mulch and plant directly into the mulch.
5	Seacliff buckwheat (98)			
6	Sandmat manzanita (10)			
7	Sandmat manzanita (10) Monterey ceanothus (25)	Areas 6, 7, 8 Labor: \$120 Plants: \$640	Establish more sandmat manzanita. Reattempt to establish Monterey ceanothus.	Plant sandmat manzanita and/or Monterey ceanothus after controlling non-native, invasive weeds. Focus on flatter areas or low spots and along the fence line (Amy Palkovic and Suzanne Worcester, personal communication; Zander Associates 1995; Harding Lawson Associates 1989).
8	Sandmat manzanita (10) Monterey ceanothus (25)			

Priority	# seedlings	Estimated cost ¹	Objective	Notes
9	Yellow sand verbena (900)	Labor: \$20,160 Plants: \$18,710	Completely remove iceplant and other non-native, invasive weeds and revegetate with natives.	Management Area 3 is the primary planting area. The entire slope is covered in iceplant, non-native trees, and non-native annual grasses. Iceplant will be treated throughout. Planting palette follows the seedling mix described in the Edgewater HCP (Lawson Associates 1995). Sand City was responsible for revegetation according to the HCP using the same seedling mix applied in Management Areas 1 and 2.
	Pink sand verbena (480)			
	Beach bur (600)			
	Beach evening primrose (2400)			
	Beach aster (1200)			
	Lizardtail (450)			
	Mock heather (300)			
	Beach blue lupine (60)			
	Beach sagewort (1000)			
	Seacliff buckwheat (3750)			
	Total = 11,140			

Notes:

¹: Cost does not include slope stabilization materials (e.g. straw wattles and jute) that may be needed to prepare or stabilize planting areas.

²: If sand gilia (specifically) is needed, Burleson Consulting Inc. has experience growing sand gilia in pots. Native seedlings could be grown by Return of the Natives and sand gilia by Burleson (Suzanne Worcester, personal communication, November 3, 2019).

Contact Burleson Consultants Inc. and/or Return of the Natives directly for a detailed cost estimate.

6.4.2 Measures To Minimize Impacts To Protected Species

Protected plant and animal species occur at Sand Dollar and Edgewater habitat preserves. In order to minimize impacts on these species during restoration work, please review measures provided in **Section 6.3.3.2**.

6.4.3 Revegetation Methods

Follow the guidelines and recommendations below to maximize the survivorship of outplanted seedlings. Many of these guidelines are found in the Edgewater HCP unless otherwise noted.

6.4.3.1 General Specifications

1. Remove/rake away a bit of the mulch before planting if the mulch is thick (Suzanne Worcester, personal communication, October 16, 2019).
2. Start planting in November and December, or after the first rains of the winter season. Planting typically occurs from December 1 – March 1 (Arnold et al. 2015).
3. Plant seedlings in 6” deep holes spaced on evenly across the planting area per guidance in **Table 6.5**. Plants should be planted within a small basin that will catch rainwater during the first wet season after planting (Arnold et al. 2015).
4. If sand is dry, seedlings should be watered to saturation immediately after planting to ensure root contact.
5. Water by hand immediately following planting and periodically through the establishment period (typically 3 years) if rainfall is erratic.
6. Supplemental planting may occur during the same planting window in subsequent years to achieve performance criteria and goals.

6.4.3.2 Protected Species Specifications

Buckwheat

1. Plant buckwheat after controlling iceplant, allowing the iceplant to decay for about 14 months. Plant directly into iceplant mulch. The mulch helps to keep some weed species (including iceplant) down (Amy Palkovic, personal communication, October 14, 2019).
2. Plant in groups of 10 arranged in a circle (Arnold et al. 2015).

3. Plant seedlings in clusters to provide good SBB while retaining some open sandy soils interspersed in between buckwheat patches. (Amy Palkovic, personal communication, October 14, 2019).
4. If buckwheat is planted during the rainy season, and it is not a very dry winter, the buckwheat should grow without any supplemental watering. During drought periods, winter watering may be needed to keep survivorship up (Amy Palkovic, personal communication, October 14, 2019).

Sand Gilia and Monterey Spineflower

1. Per Joey Dorrell–Canepa’s work with sand gilia (Dorrell–Canepa 1994), sand gilia is best established via seedlings compared to seeds.
2. Leave some of the iceplant patches unplanted to facilitate natural recruitment of native seedlings and to maintain open, sandy soils preferred by sand gilia and Monterey spineflower (Suzanne Worcester, personal communication, October 16, 2019).
3. Sand gilia and Monterey spineflower needs to be planted in bare sand. Plant in existing open sand or in iceplant mulch that has been raked with bare soil exposed underneath (Suzanne Worcester, personal communication, November 3, 2019).
4. Site Preparation: If sand movement becomes a problem due to location or restoration activities, stabilize the perimeter of the planting area with jute wattles or straw plugs placed on 1–2 foot centers.
5. Plant seedlings in November/ December after the first rains of the winter season. Plant seedlings in 6” deep holes spaced on 1 foot centers evenly across the selected planting area. If the sand is dry, water the seedlings to saturation immediately after planting to ensure root–soil contact.
6. If direct seeding Monterey spineflower, broadcast by hand at a rate of about 0.2 grams per meter squared. Rake the seeds by hand and lightly cover with sand.

Sandmat Manzanita and Monterey Ceanothus

1. Plant propagules on 10 foot centers. Focus on flatter areas or low spots (Zander Associates 1995).

6.4.4 Seed Collection

Follow the guidelines and recommendations below for proper techniques to collect native plant seeds.

6.4.4.1 General Specifications

1. All seeds and seedlings must be from local sources collected within 3 miles of the preserves to control genetic variation.
2. Collect seeds from 20% of the available seed heads and from at least 10 individual plants from each species (Arnold et al. 2015).
3. Collection of seeds should occur from late June through early October, with actual timing depending on seed maturation of the target species (Arnold et al. 2015; Zander Associates 1995).

6.4.4.2 Protected Species Specifications

Buckwheat

1. Seed and/or cutting collection of buckwheat plants from onsite plant material will occur after the Smith's blue butterfly flight season (after September 15 or as determined by a qualified biologist) for later germination and outplanting (Arnold et al. 2006).
2. Seed and cuttings will be collected from Sand Dollar and Edgewater if possible, or within 3 miles if site collection is not possible, to control genetic variation (Arnold et al. 2006).

Sand Gilia and Monterey Spineflower

1. A permit is required to collect sand gilia seed. Work with a permitted biologist to collect Sand gilia seeds and grow seedlings. Per sand gilia work conducted by Dorrell–Canepa (1994), seeds will be collected when capsules are starting to dehisce, late April through early June. Bi-weekly visits to the site by a specialist will ensure the proper timing of seed collection. Work with nursery managers who have experience growing sand gilia.
2. Seeds should come from the same habitat areas as the preserves and no further than South of Tioga.
3. Burleson Consulting Inc. has grown sand gilia.

Sandmat Manzanita and Monterey cCeanothus

1. Sandmat manzanita will be grown via cuttings.
2. Monterey ceanothus seedlings are better achieved by collecting seed (Zander Associates, 1995).

6.5 Long-term Monitoring & Reporting

The habitat and natural resources values at both Sand Dollar and Edgewater habitat preserves will be monitored using long-term monitoring protocols. We recommend that surveys occur each year for the first 5 years of this new restoration phase. A 5-year monitoring period was also a requirement of the original Sand Dollar Biological Resource Management Plan and Edgewater Habitat Conservation Plan (Harding Lawson Associates 1989; Zander Associates 1995). Afterward, monitoring may be reduced to every other year or 2–5-years depending on the dataset being collected. Monitoring and reporting these restoration activities and progress will help to document whether performance criteria and goals described in the Sand Dollar BRMP and Edgewater HCP are being met. These goals are:

1. Remove non-native plants.
2. Achieve 60% native plant cover and provide habitat for Smith's blue butterfly, sand gilia (30–50% cover of planted areas), and Monterey spineflower (30–50% cover).
3. Mitigate for loss of sandmat manzanita and Monterey ceanothus during initial development of shopping centers by planting more of these plants.
4. Use of area by a "stable" population of Smith's blue butterfly (a function of healthy buckwheat habitat).

In Section 6.5, we describe each of the monitoring protocols and locations (i.e. transects, photo points) and indicate when a permitted biologist is required. Smith's blue butterflies will be surveyed using transects (6.5.1), vegetation composition will be surveyed using line-intercept transects (6.5.2), sand gilia will be mapped and surveyed (6.5.3), and photo points will be used to document landscape-level change over time (6.5.4). Section 6.5.5 offers guidance on reporting. Cost estimates were provided by Burleson Consulting Inc.

6.5.1 Smith's Blue Butterfly Transects

6.5.1.1 Protocol (Permitted or authorized biologist required)

Estimated cost/year – \$2,520 (monitoring & reporting)

A qualified and permitted biologist should survey the site for Smith's blue butterfly (SBB) every year during its flight season in order to document presence or absence and relative abundance trends. Per the BRMP and HCP, one of the goals is to provide suitable habitat for the resident population of SBB. Transect surveys will help Sand City evaluate whether this goal is being met. Transects should be surveyed every year.

Transects at both preserves were established by Dr. Richard Arnold, Ph.D. (Entomological Consulting Services) and follow the Pollard-type transect methodology. The monitoring protocol is described below, taken from Arnold's 2001 SBB Monitoring Report at the Edgewater site prepared for Sand City.

"During the butterfly's flight season the transects were walked at approximately 4–11 day intervals (depending upon the weather), and counts of the numbers of butterflies observed along each transect were made during each visit. Butterflies observed within approximately 4–5 meters on either side of a transect were counted. As butterflies were observed, their sex and behavior (flying, nectar, bask, perch, courtship, mating, oviposit) were noted, as well as their position by transect interval). Using these tallies, an index of butterfly abundance was calculated for each transect, as well as a daily index for all transects. On days when each transect was walked only once, the index of abundance is the total number of adults of the SBB that are observed along each transect during each site visit and the daily index is the sum of the respective transect indices for a particular site. Since the transects at Edgewater were relatively short, on most days each transect was walked twice. In these cases, the index of abundance is the average of the two walks along the same transect and the daily index is the sum of the averaged indices for all three transects."

6.5.1.2 Transect Locations

We did not search for the transect locations as part of this work. The transect start and end points still need to be located and mapped. We georeferenced maps in the monitoring reports to create maps showing the approximate transect locations at Sand Dollar and Edgewater. There are five at Sand Dollar (**Figure 6.3**). Existing datasets are available for the following years: 1992, 1993, 1994, 1996, 1997, 1998 and 1999.

Table 6.7. Edgewater Smith's blue butterfly transect intervals and lengths.

Transect	Intervals								Total Length
	A-B	B-C	C-D	D-E	E-F	F-G	G-H	H-I	
1	30.6	49	40.6	30.4	30.6	26.2			207.4
2	30.4	30.7	29.3	32.2	32	29.8	20.2	26.3	230.9
3	30.8	30.7	30.6	30.7	30.4	30.6	43.7	34.3	261.8

At Edgewater, there are 3 transects, each with varying lengths (**Figure 6.4**). Transect 1 is located in the upper portion of the mitigation area, Transect 3 is located in the lower portion, and Transect 2 is situated in the mid-elevation portion. Each transect was divided into intervals (**Table 6.7**). Existing datasets for Edgewater are available for the following years: 1997, 1998, 1999, 2000 and 2001.



Figure 6.3. Sand Dollar Smith's blue butterfly transects at the Edgewater habitat preserve, established by Dr. Richard Arnold.

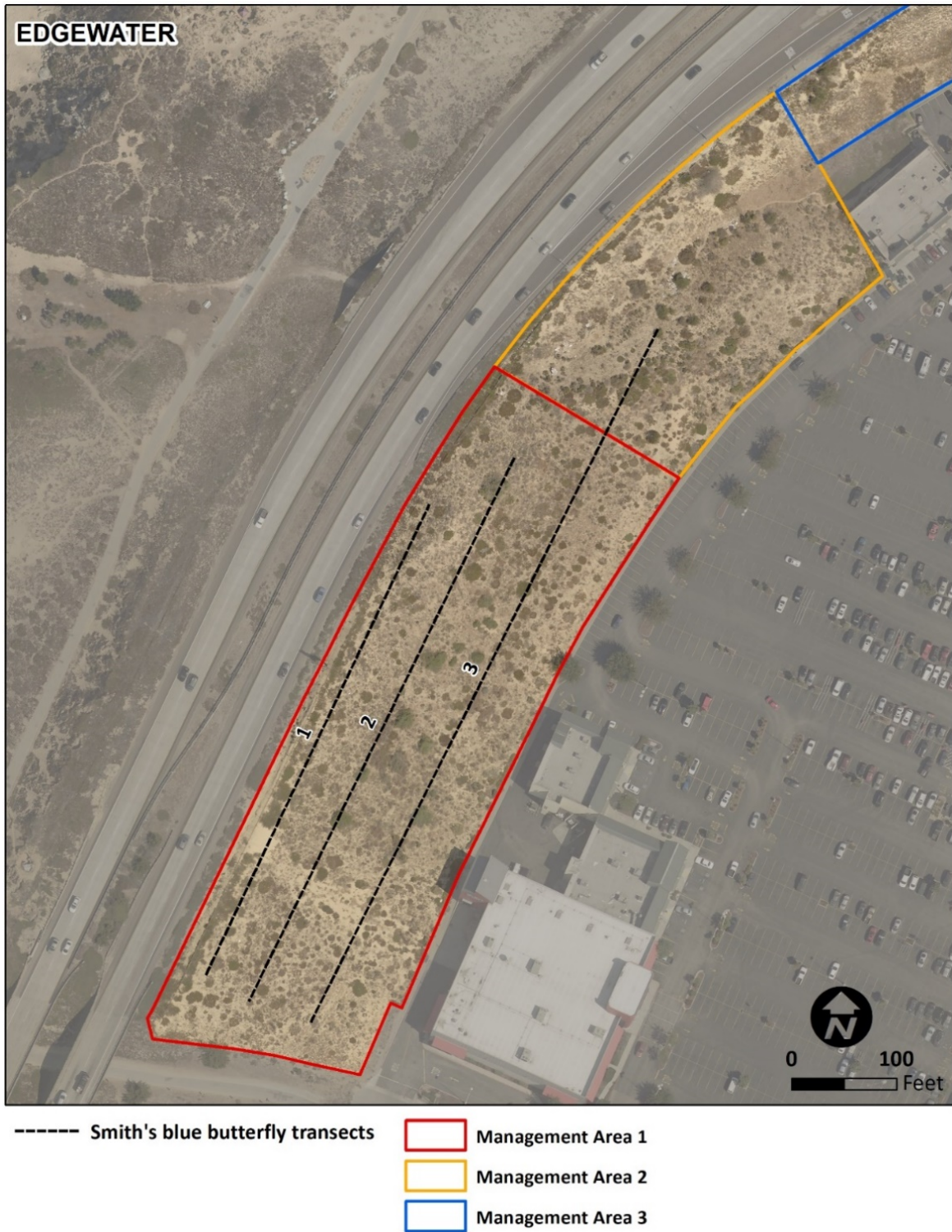


Figure 6.4. Smith's blue butterfly transects at the Edgewater habitat preserve established by Dr. Richard Arnold.

6.5.2 Vegetation Line–Intercept Transects

Estimated cost/year – \$74,400 (monitoring & reporting) | Could be done by an undergraduate or graduate student intern with relevant training and education background.

6.5.2.1 Protocol

A person familiar with dune and coastal scrub vegetation should survey line–intercept transects to assess vegetation composition over time. This will allow Sand City to track restoration progress and whether HCP and BRMP performance criteria are being met with respect to the cover of native and non–native vegetation. Transects should be surveyed every year for the first 5 years of this new restoration phase, then possibly reducing the frequency to every other year or 2–5 years.

Per original monitoring protocols, the transects should be surveyed early spring during the active growing season (see 6.5.2.3 for additional recommendations on timing). Surveyors should be careful not to step on sand gilia and Monterey spineflower and be careful not to heavily disturb fragile, loose sandy areas (Suzanne Worcester, personal communication, November 3, 2019).

Cover for each species is measured as the distance occupied by each plant along the transect tape using the line–intercept method. Percent cover is calculated by dividing the cumulative distance each species occupied along the transect by the total distance of the transect. **Plants should be identified down to species level for all plant life forms, and to subspecies for sand gilia (i.e. *Gilia tenuiflora* ssp. *arenaria* or ssp. *tenuiflora*).**

6.5.2.2 Transect Locations

All transect locations were mapped with GPS as part of this work. There are eight, 30–meter line–intercept transects at Sand Dollar (**Figure 6.5**). Existing datasets are available for the following years: 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999 and October 2019. Sand Dollar transect locations are marked with rebar.

At Edgewater, there are 6 transects, each with varying lengths (**Figure 6.6**). Existing datasets for Edgewater are available for the following years: 1992, 1993, 1999, and

October 2019. Edgewater transects are not marked with rebar but should be monumented as part of spring 2020 work.

6.5.2.3 Monterey Spineflower

If transects are done in early spring, spineflower will be too small and will not be detected (Suzanne Worcester, personal communication, November 3, 2019). Therefore, transects should be surveyed in early/mid-June to get the largest extent of spineflower when it will be most easily detected.

At Sand Dollar, the line-intercept transects are insufficient in estimating Monterey spineflower because they miss a lot of bare sand habitat such as the south-facing dunes along Tioga Ave. (Suzanne Worcester, personal communication, November 3, 2019). More transects need to be established, especially on those south-facing dunes.

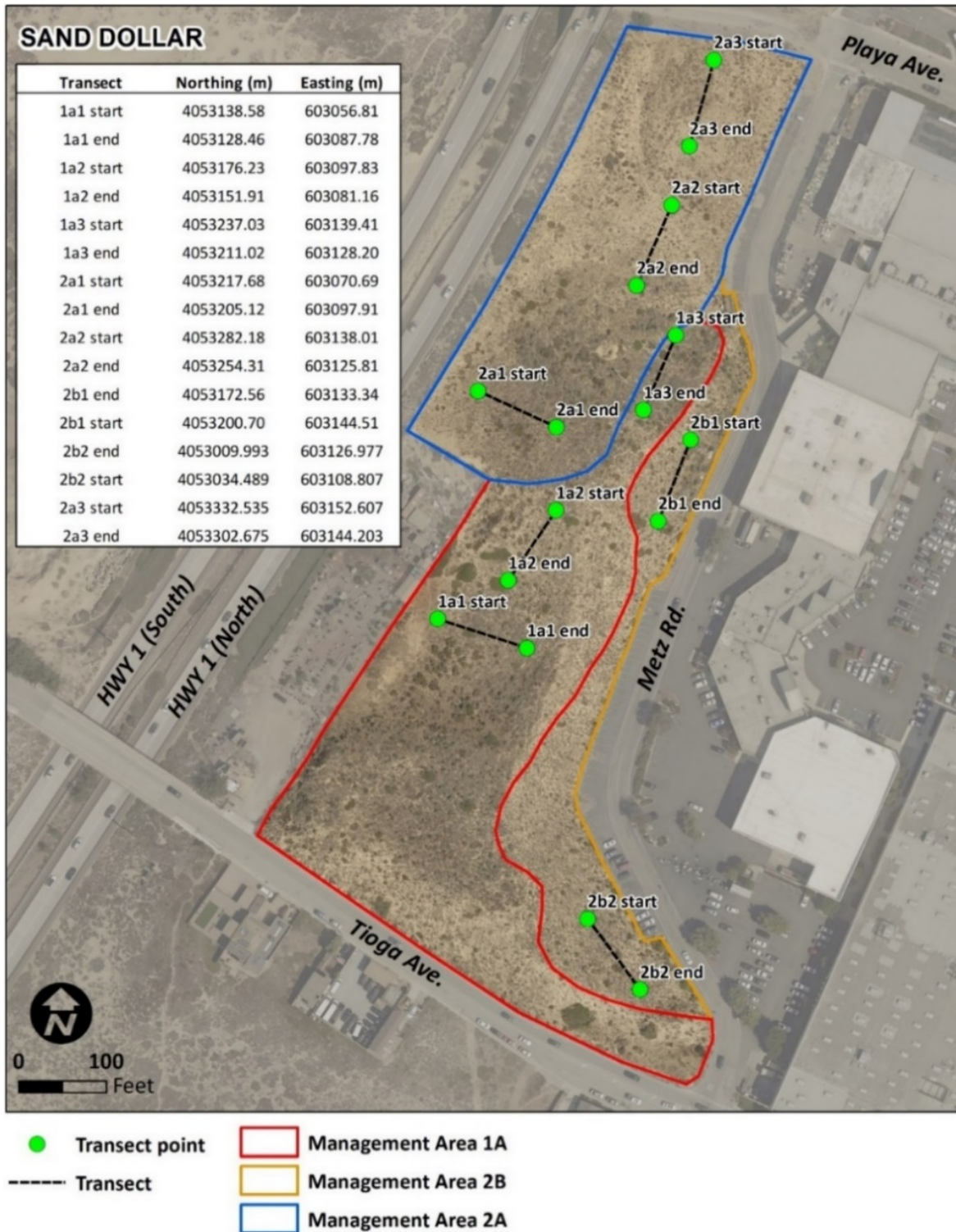


Figure 6.5. Original line-intercept vegetation transects at Sand Dollar habitat preserve.

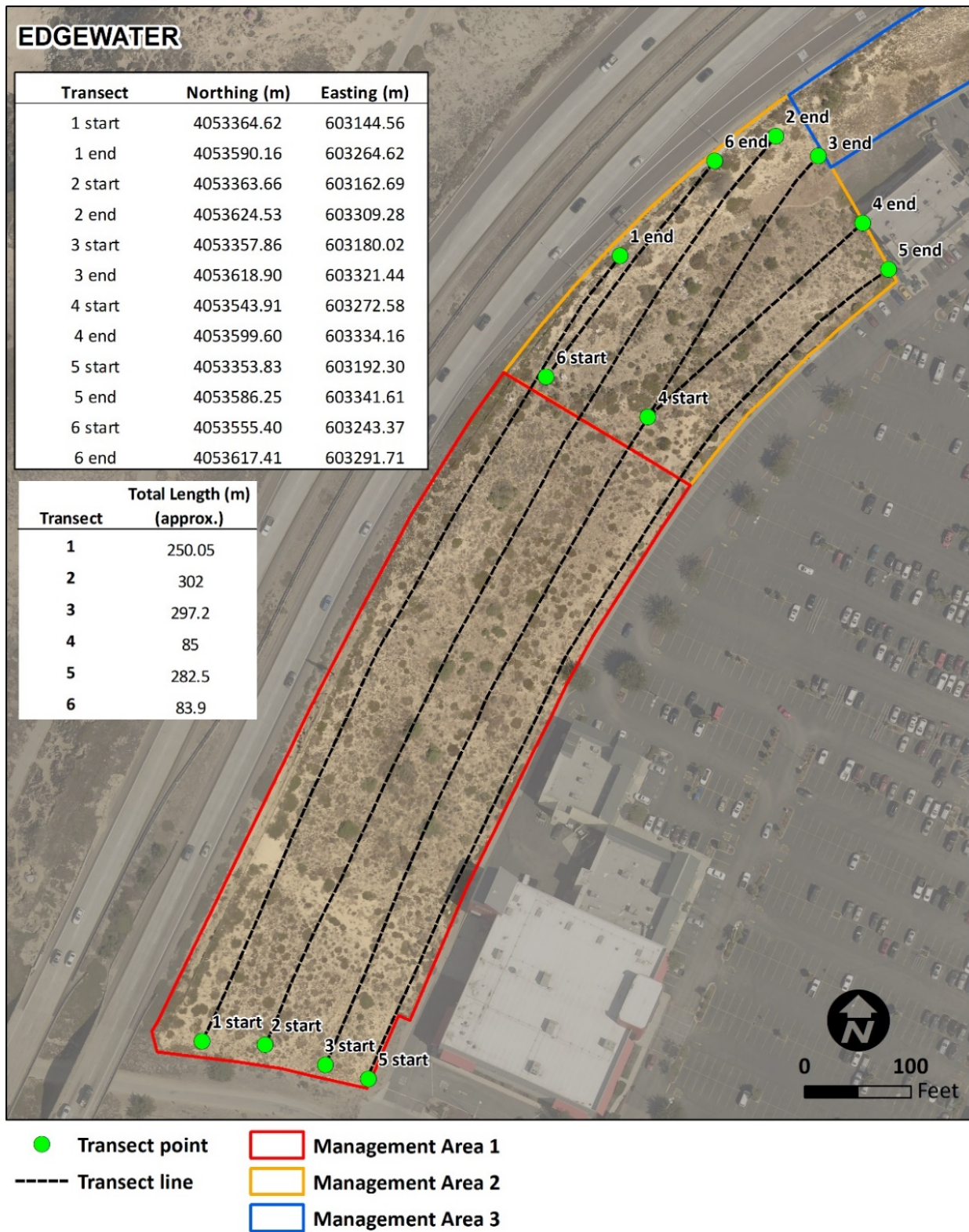


Figure 6.6. Original line-intercept vegetation transects at Edgewater habitat preserve.

6.5.3 Sand Gilia

Estimated cost/year – \$7,680 (monitoring & reporting) | Could be done by an undergraduate or graduate student intern with relevant training and education background.

6.5.3.1 Protocol

A person with verified experience identifying sand gilia should survey the entire site, starting with locations of historic observations and previously planted locations. Sand gilia should be surveyed every year starting in April. Resurveying or checking areas with sand gilia in early to mid-May may find additional plants (Suzanne Worcester, personal communication, November 3, 2019).

We recommend a spring 2020 survey for sand gilia which will include mapping and counts. There is no protocol for sand gilia monitoring, rather previous surveys simply counted the number of plants in planted locations. Gilia will be mapped as a polygon or a point. A polygon could be for clusters of 10 or more plants. Colonies could be distinguished using a separation distance of 3–5 feet. Further development of a long-term, standardized sand gilia monitoring protocol is needed.

6.5.3.2 Historic Observations and Planted Locations

During fall 2019 surveys, we could not survey for sand gilia due to its spring and early summer flowering periods. For Sand Dollar, we made a map of historic populations and planting areas based on a map provided in Dorrell–Canepa’s 2000 Monitoring Report prepared for Sand City (**Figure 6.7**). Historic counts of sand gilia at three naturally occurring colonies are available for nine years (**Table 5.2**). Data should be collected in a manner consistent with **Table 5.2**.

For Edgewater, we also made a map of planting areas based on a map provided in the Edgewater monitoring reports prepared by Zander Associates (**Figure 6.9**). Historic cover data in each planting area is available for three years (**Table 5.6**). Data should be collected in a manner consistent with **Table 5.6**.

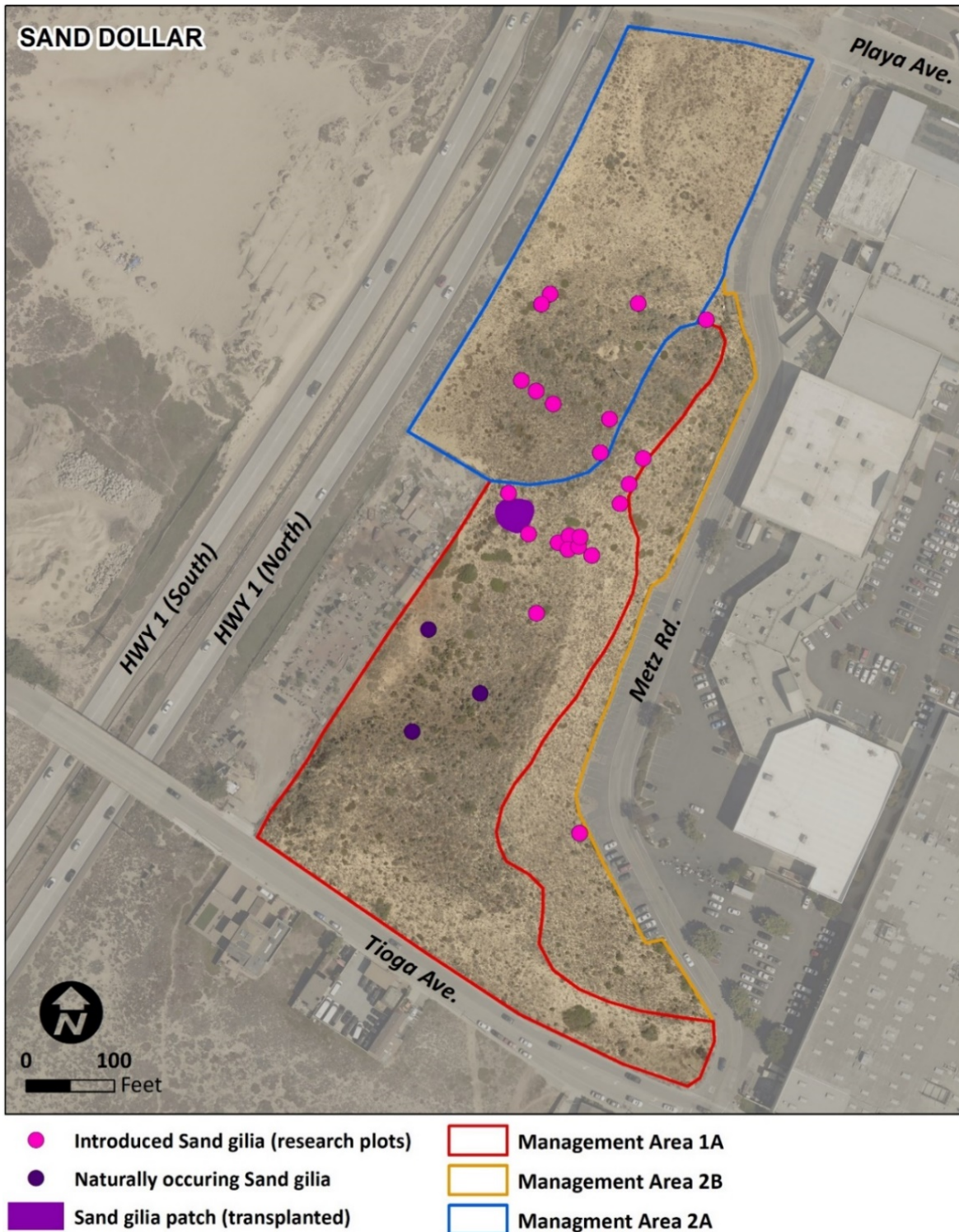


Figure 6.7. Map of Sand Dollar and sand gilia colonies and planting areas based on Dorrell–Canepa’s Monitoring Report (2000). During fall 2019 surveys we could not survey for sand gilia due to its spring and early summer flowering periods.



Figure 6.8. Map of Sand gilia planting areas in Edgewater habitat preserve based on Zander Associates Monitoring Report (1997–2002). During fall 2019 surveys, we could not survey for sand gilia due to its spring and early summer flowering periods.

6.5.4 Photo Monitoring

Could be done by an undergraduate or graduate student intern with relevant training and education background.

6.5.4.1 Protocol

To document long-term, landscape-level change at the preserves, we recommend taking photo points the first 5 years of this new restoration phase, then possibly reducing the frequency to every other year or 2–5 years. Photo points will be taken in the spring during the active growing season and capture the same extent as in baseline photos.

6.5.4.2 Photo Point Locations

At Sand Dollar, there are 13 photo points. We added an additional five photo points in October 2019 to the original set of eight points (1A1 through 2B2) because we believe these five locations capture areas of interest and vegetation not captured by the original eight (**Figure 6.9**). Existing datasets for Sand Dollar include the following years: 1992, 1993, 2000, October 2019.

At Edgewater, there are eight photo points (**Figure 6.10**). Existing datasets for Edgewater include the following years: May 1996, June 1998, May 1999, October 2019.

Suzanne Worcester (personal communication, November 3, 2019) recommends adding photo points along Tioga Ave. to document vegetation composition where it is good sand gilia and Monterey spineflower habitat on those south-facing dunes.

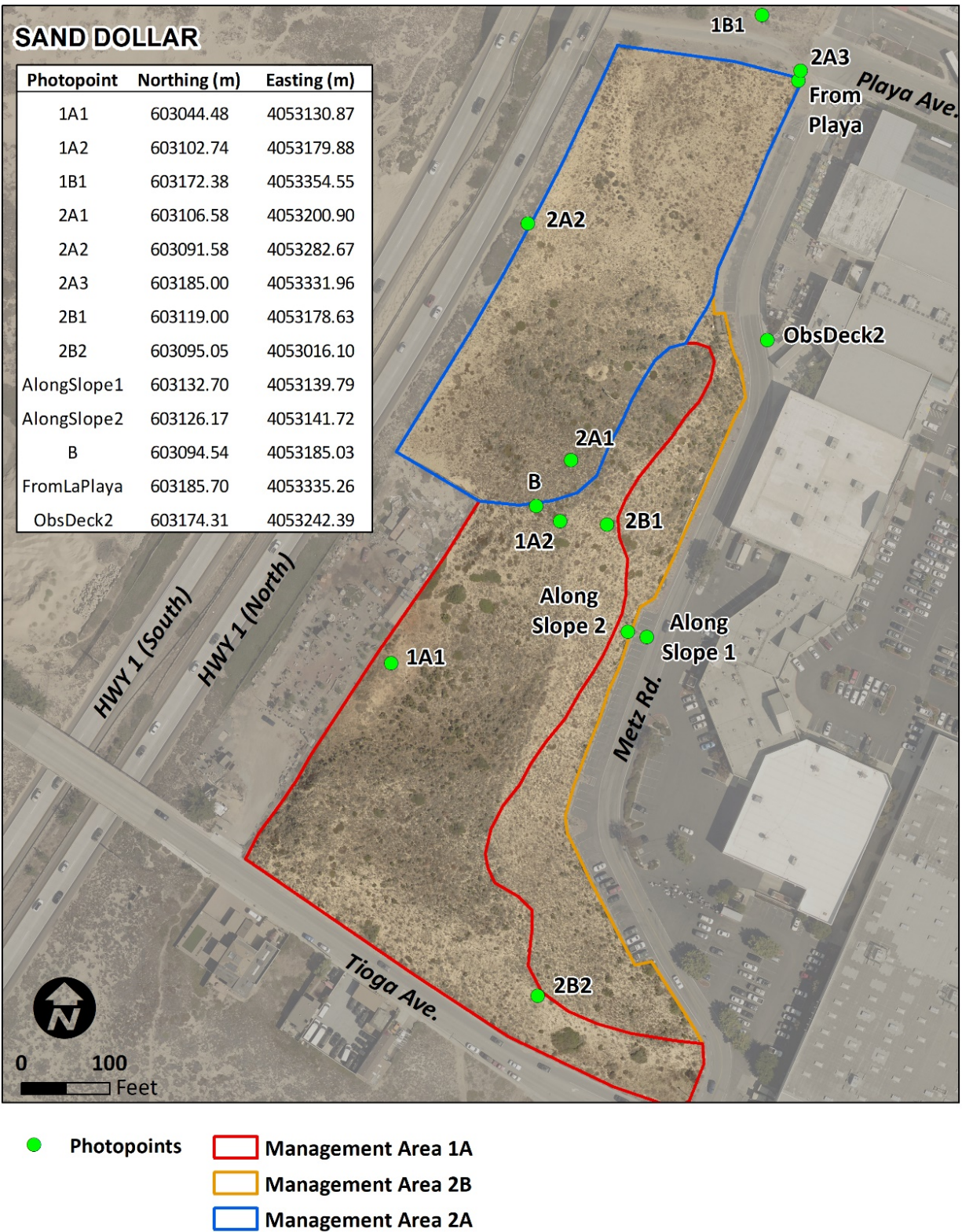


Figure 6.9. Photo points at Sand Dollar habitat preserve.

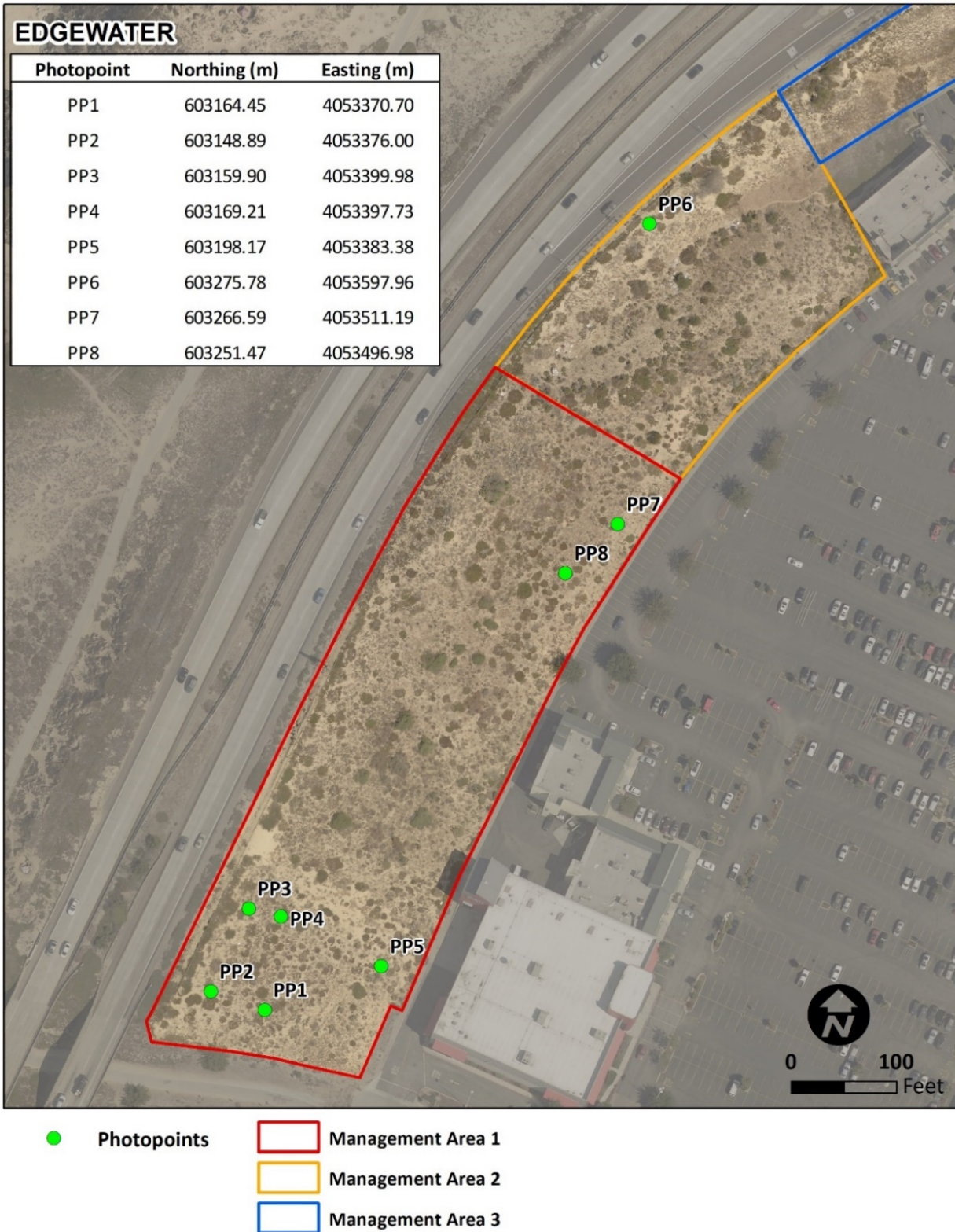


Figure 6.10. Photo points at Edgewater habitat preserve.

6.5.5 Reporting Requirements

Monitoring results and work performed (i.e. invasive plant control, revegetation) should be summarized in an annual report in order to document restoration progress and status of natural resources at the Sand Dollar and Edgewater habitat preserves. The report should include the following information and sections which are based on the monitoring reports written by Zander Associates (1997–2002), Harding Lawson Associates (1992, 1993), and Dorrell–Canepa Habitat Service (2000):

1. Management summary of the following activities if applicable: controlling invasive plants, revegetation, long-term monitoring, and addressing physical maintenance needs.
2. Describe activities and conservation strategies implemented;
 - Where was the work performed?
 - What was treated and how? What species were planted and how many?
 - Who did the work?
 - When and how much time was allocated?
 - How much money was spent?
 - Information could be presented/summarized in a table.
3. Describe monitoring work in greater detail;
 - SBB monitoring report can be its own report/addendum.
 - Provide tables and graphs that match those in Chapter 5.
 - Provide current photo point photos.
4. Explicitly discuss whether performance criteria were met each year (e.g. Zander Associates 2002, section 6.0 Discussion).
5. Provide management recommendations and work plan for the following year.
6. Discuss any changes to the recommended strategies and actions (**Chapter 6**).
7. Description of any changed or unforeseen circumstances that occurred and how they were dealt with (Arnold et al. 2015).

The monitoring report should be made available to the public and interested agencies.

6.6 Physical Maintenance Needs

Sand Dollar and Edgewater habitat preserves are surrounded by a protective fence and signs placed to deter unauthorized access. Long-term maintenance of fences and signs is important towards protecting the preserves from unauthorized access which can disturb the habitat and protected species within.

During fall 2019 work, we observed fence segments that need to be repaired or replaced, social trails, homeless encampments, and areas where trash and litter are problems. In **Table 6.8**, we describe maintenance needs that will need to be addressed to protect the dunes and maintain general aesthetics. See **Chapter 5 Figures 5.4 and 5.11** for locations of these maintenance needs and current condition.

Table 6.8. Maintenance need (fence, signage, trash, homeless encampments) at Sand Dollar and Edgewater habitat preserves. Estimated cost provided by Sand City for Public Works Crew. See Appendix B for cost breakdown.

Need	Description	Estimated cost
Sand Dollar (Total estimated cost = \$5,988, excluding cost for sign replacement and addressing homeless encampments).		
Trash	Sand Dollar is relatively less impacted by trash compared to the Edgewater site to the north. However, litter was observed where there is parking along Metz Road, particularly in the northern-most parking area closer to Playa Avenue.	\$3,528 (2 hours/month, once a month)
Homeless encampments	There are two areas with encampments.	To be estimated by Sand City
Fence & signage	<ol style="list-style-type: none"> 1. Replace the habitat preserve sign at the viewing platform. (Sign cost to be estimated by Sand City). 2. Repair approximately 15 feet of fence along the parking area. 3. Repair approximately 20 feet of fence along the parking area down by Tioga Avenue. 4. Repair approximately 56 feet of fence along the parking area along Tioga Avenue. 	\$ 2,460 (based on labor and materials cost for repairing 160 ft. of fence by Sand City on 10/24/2019).

Need	Description	Estimated cost
Edgewater (Total estimated cost = \$3,528, excluding cost for adding new signage and addressing homeless encampments).		
Trash	<ol style="list-style-type: none"> 1. Area 1: Trash along the fence line from Playa Avenue. to Starbucks. Could install more waste and recycle bins at the end of Playa Avenue. Work with retailers paralleling the fence on preventing packaging material and other trash from entering the site. 2. Area 1: Trash behind large native shrubs. Could prune the shrub (coffeeberry) but do not eliminate this or other native shrubs (coyote brush, mockheather). 3. Trash behind the Clothes & Shoes donation bins. 	<p>\$3,528 (2 hours/month, once a month)</p>
Homeless encampments	Area 2: Multiple homeless encampments. A corridor of trash is evident along a social trail starting from behind Starbucks up to the old abandoned tunnel under HWY 1. Along the way, there are multiple encampments under large non-native trees. One large encampment is established in front of the old tunnel.	To be estimated by Sand City
Fence & signage	More educational and interpretive signage could be installed in high traffic areas to inform and educate the public about dunes, restoration, and natural resources present in the preserves. A sign could be added over by Starbucks where people are regularly sitting outside, or along the bike path facing north behind HomeGoods (Suzanne Worcester, personal communication, November 3, 2019). CSUMB may be able to design the sign if Sand City would pay to build it. The sign could help educate people on the values and benefits of native plants (Worcester, personal communication, November 3, 2019).	To be estimated by Sand City (potentially in collaboration with CSUMB)

7 Actions for Spring 2020

This work was limited in scope because it was performed in five weeks during the fall when most plants were not growing, spent, died back or senesced such as spring gilia, Monterey spineflower, and many non-native invasive plants. Therefore, the results presented in **Chapter 5** and the recommendations in **Chapter 6** are subject to change depending on springtime discoveries. In spring 2020, we recommend the following specific actions be taken beginning in February in order to complete this review of the Sand Dollar and Edgewater habitat preserves (**Table 7.1**).

Table 7.1. Specific actions needed for spring 2020 to complete status update of Sand Dollar and Edgewater habitat preserves.

Month(s)	Task(s)	Specific activities	Equipment needs
February – ongoing	Hire/recruit student intern, develop a yearly management plan	<ol style="list-style-type: none"> 1. Hire an undergraduate or graduate student intern to complete the status update of Sand Dollar and Edgewater habitat preserves. Minimum skillset: background in Environmental Science, geospatially trained (GIS/GPS (ArcGIS 10.6 or higher, ArcGIS Pro), familiar with non-native and native plants in Monterey County coastal dunes, plant ID, vegetation sampling and monitoring, report writing, organized, detail-oriented, self-starter. Student should be supervised and trained by someone knowledgeable in dune restoration and ecology of dune species, particularly sand gilia, Monterey spineflower, buckwheat, and Smith's blue butterflies (Suzanne Worcester, personal communication, November 3, 2019). 2. Develop a plan to implement the Restoration, Stewardship & Maintenance Plan. Will be an on-going effort throughout the spring/summer. Consider the following: <ul style="list-style-type: none"> • Identify actions that can be performed by: 1) volunteers (e.g. removing iceplant by hand, planting native species), 2) contractors/biologists (e.g. herbicide control of iceplant, seed collection and propagation, SBB monitoring), 3) Sand City Public Works Crew (e.g. trash and litter pickup, fence repair). • Identify what and when recommended actions should occur in the next 10 years. • Create a management plan based on year and recommended action (Table 7.2). • Research potential grant and partnership opportunities to the extent that there maybe a shortfall after any funding obligations have been met by shopping center owners. 	

Month	Task	Specific activities	Equipment needs
February – March	Monitoring preparation	<ol style="list-style-type: none"> 1. Search for butterfly transects (Figures 6.3, 6.4) and map start and end coordinates. 2. Monument Edgewater vegetation transects (Figures 6.4). 3. Monument photo points (Figures 6.9, 6.10). 4. Read old monitoring reports for Sand Dollar and Edgewater habitat preserves. 5. Prepare datasheets for SBB and vegetation surveys. Refer to previous monitoring reports. 	GPS unit with sub-meter accuracy, collects points and polygons (e.g. Trimble GeoXT 6000); rebar or other type of survey marker.
April – May	Protected plant species survey: sand gilia	<ol style="list-style-type: none"> 1. Search Sand Dollar and Edgewater Preserves for sand gilia, starting at historic locations and planting areas (Figures 6.7, 6.8). 2. Map occurrences as polygons and/or points, polygons to denote clusters of 10 or more plants. Map at a level of detail consistent with Figures 5.3 and 5.8. Turn on tracks to document search area. 3. Count the number of plants in each polygon and point in order to compare with historic data and at Edgewater, also estimate cover (Tables 6.8, 6.9) 4. Develop a long-term, standardized monitoring protocol for sand gilia. 5. Create maps of sand gilia showing polygons, points, and tracks. 6. Work with someone who has access to the California Natural Diversity Database to report observed abundances to the database. 	GPS unit with sub-meter accuracy and can collect points and polygons (e.g. Trimble GeoXT 6000)
May – July	General plant survey	<ol style="list-style-type: none"> 1. Comprehensive plant survey at both preserves and update species list (Appendix A). 	
June	Vegetation transect monitoring	<ol style="list-style-type: none"> 1. Re-survey line-intercept transects. 2. Develop a storage and organization system for the transect data. 3. Analyze transect data and compare with previous years' data (Tables 5.1, 5.4). 	100 meter transect tapes (at least 2), clamps to hold down tape to rebar, pin flags

Month	Task	Specific activities	Equipment needs
June	Protected plant species survey: Monterey spineflower	<ol style="list-style-type: none"> 1. Search Sand Dollar and Edgewater Preserves for Monterey spineflower. 2. Map occurrences as polygons and/or points with a level of detail consistent with Figures 5.3 and 5.8. Turn on GPS tracks to document search area. 3. Describe polygons based on cover (high, medium low) per mapping protocol described in the 1992 USACE Flora and Fauna Baseline Study report (USACE 1992b). 4. Evaluate the need to develop a species-specific monitoring protocol for spineflower if vegetation line-intercept transects are not detailed enough to detect spineflower. 5. Establish more transects at Sand Dollar along south-facing dunes. 6. Create maps of Monterey spineflower showing polygons, points, and tracks. 	GPS unit with sub-meter accuracy and can collect points and polygons (e.g. Trimble GeoXT 6000)
June – December	Reporting	<ol style="list-style-type: none"> 1. Documented survey and monitoring work in a report. See Chapter 6, Section 6.3.5 for reporting guidelines. In this same report, there should be a clear discussion of whether BRMP and HCP expectations have been met based on fall 2019 and spring 2020 assessments. 2. All data should be entered, analyzed, and organized. 3. Create maps of Monterey spineflower and sand gilia (Figures 6.7, 6.8). Re-evaluate if Sand City is meeting performance criteria and goals to provide habitat for both plants. 4. Update vegetation cover table (Tables 5.1, 5.4). 5. Update maps of non-native invasive plants (Figures 5.1, 5.6). 6. Update preserve-wide species list (Appendix A). 7. Update SBB transect maps to show transect locations, start and end points (Figures 6.3, 6.4). 8. Update Tables 6.2, 6.3, 6.4 if needed to include additional non-native, invasive plant species not detected in October 2019 work. 9. Revise Chapter 6 as needed and collaborate with interested local experts (Amy Palkovic, Nikki Nedeff, Suzanne Worcester, Joey Dorrell-Canepa). 	

Table 7.2. An example table to illustrate a way to plan out management actions by year and who can potentially perform the work. Scenarios presented in the table are not recommendations and for illustrative purposes only.

		Who				Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
		C	I	V	PW										
Green = Can do it, Orange = Can do it but only after proper training, especially regarding herbicide use, Red = Can do it without contractor support to save money or work is not appropriate or safe for this group.															
Control Invasive Plants: H = Can apply herbicide, M = Control by mechanical (i.e. handpulling/removal) techniques only.															
Control Invasive Plants	Narrow-leaved Iceplant	H	H	M	H	Initial treatment – Edgewater	Initial treatment – Sand Dollar	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up
	Iceplant	H/M	H/M	M	H/M	Control a few patches	Control a few patches/follow-up in previous treated areas								
	Ripgut brome	H/M	H/M	M		Handpull around sand gilia and Monterey spineflower									
	Panic veldtgrass		M	M	M	Initial treatment	Follow-up to see if retreatment needed								
	Acacia	H	H		H		Initial treatment	Follow-up to see if retreatment needed							
	Tea tree	H	H		H		Initial treatment	Follow-up to see if retreatment needed							
	Ngaio tree	H	H		H		Initial treatment	Follow-up to see if retreatment needed							
	Thistles	H/M	H/M	M	H/M		Initial treatment	Follow-up to see if retreatment needed							
	Rosy Iceplant	H/M	H/M	M	H/M	Initial treatment	Follow-up to see if retreatment needed								
	Sweet alyssum		M	M	M	Initial treatment	Follow-up to see if retreatment needed								
Revegetation	Edgewater Planting Area 1						Plant	Infill with more plants if needed	Continue planning for revegetation of Sand Dollar and Edgewater habitat preserves, starting with highest priority areas. After treating iceplant, it takes about 14 months for the material to decay into mulch. Planting therefore typically starts one year after iceplant is treated.						
	Edgewater Planting Area 2						Plant	Infill with more plants if needed							
	Edgewater Planting Area 3							Plant							
S = Can play a supportive role if supervised/trained, T = Will need to be trained by a Biologist.															
Monitoring & Reporting	Smith's blue butterflies		T	S		survey	survey	survey	survey	survey	reduce to every other year				
	Sand gilia & Monterey spineflower			S		survey	survey	survey	survey	survey	survey	survey	survey	survey	survey
	Vegetation transects			S		survey	survey	survey	survey	survey	reduce to every other year or 2–5 years				
	Photopoints			S		survey	survey	survey	survey	survey	reduce to every other year or 2–5 years				
	Reporting					summarize monitoring and work performed in annual report									
Physical maintenance needs	Trash pickup					once a month/every other month									
	Fence repair					as needed									
	Homeless encampments					check & manage as needed									

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Appendix A. List of native and non-native plant species observed at the Sand Dollar and Edgewater habitat preserves, October 10 and 14, 2019.

Sand Dollar Habitat Preserve

Family	Botanical Name	Common Name	Listing Status Fed/CA/CNPS
Native Plants			
Nyctaginaceae	<i>Abronia umbellata</i>	pink sand verbena	
Fabaceae	<i>Acemisson glaber</i>	deerweed	
Asteraceae	<i>Ambrosia chamissonis</i>	beach bur	
Ericaceae	<i>Arctostaphylos pumila</i>	Sandmat manzanita	--/--/1B.2
Plumbaginaceae	<i>Armeria maritima</i>	sea thrift	
Asteraceae	<i>Artemisia californica</i>	California sagebrush	
Asteraceae	<i>Artemisia pycnocephala</i>	beach sagewort	
Asteraceae	<i>Baccharis pilularis</i>	coyote brush	
Onagraceae	<i>Camissoniopsis cheiranthifolia</i>	beach evening primrose	
Rhamnaceae	<i>Ceanothus rigidus</i>	Monterey ceanothus	--/--/1B.2
Polygonaceae	<i>Chorizanthe pungens</i> var. <i>pungens</i>	Monterey spineflower	FT/--/1B.1
Asteraceae	<i>Corethrogyne filanginifolia</i>	sand aster	
Euphorbiaceae	<i>Croton californica</i>	California croton	
Crassulaceae	<i>Dudleya caespitosa</i>	liveforever	
Poaceae	<i>Elymus pacificus</i>	Pacific wildrye	
Asteraceae	<i>Ericameria ericoides</i>	mock heather	
Asteraceae	<i>Erigeron canadensis</i>	Canada horseweed	
Polygonaceae	<i>Eriogonum latifolium</i>	coast buckwheat	
Polygonaceae	<i>Eriogonum parvifolium</i>	seacliff (dune) buckwheat	
Asteraceae	<i>Eriophyllum staechadifolium</i>	lizardtail	
Brassicaceae	<i>Erysimum ammodophilum</i>	coast wallflower	
Papaveraceae	<i>Eschscholzia californica</i> var. <i>maritima</i>	beach poppy	
Rhamnaceae	<i>Frangula californica</i>	California coffeeberry	
Asteraceae	<i>Heterotheca grandiflora</i>	telegraph weed	
Fabaceae	<i>Lupinus chamissonis</i>	beach blue lupine	
Hydrophyllaceae	<i>Phacelia ramosissima</i>	branching phacelia	
Poaceae	<i>Poa douglasii</i>	dune bluegrass	
Non-Native Plants			
Poaceae	<i>Bromus diandrus</i>	ripgut brome	
Aizoaceae	<i>Carpobrotus chilensis</i>	sea fig (iceplant)	
Aizoaceae	<i>Carpobrotus edulis</i>	hottentot fig (iceplant)	
Aizoaceae	<i>Conicosia pugioniformis</i>	narrow-leaved iceplant	
Aizoaceae	<i>Drosanthemum floribundum</i>	rosy iceplant	
Poaceae	<i>Ehrharta erecta</i>	panic veldtgrass	
Poaceae	<i>Festuca myuros</i>	rat tail fescue	
Brassicaceae	<i>Lobularia maritima</i>	sweet alyssum	
Fabaceae	<i>Medicago polymorpha</i>	bur clover	
--	Unknown	unknown thistle species	

Notes:

FT – Federal threatened

1B.1 – Plants rare, threatened, or endangered in California and elsewhere; seriously threatened in California

1B.2 – Plants rare, threatened, or endangered in California and elsewhere; fairly threatened in California

Edgewater Habitat Preserve

Family	Botanical Name	Common Name	Listing Status Fed/CA/CNPS
Native Plants			
Fabaceae	<i>Acmispon glaber</i>	deerweed	
Asteraceae	<i>Ambrosia chamissonis</i>	beach bur	
Ericaceae	<i>Arctostaphylos pumila</i>	sandmat manzanita	--/--/1B.2
Asteraceae	<i>Artemisia californica</i>	California sagebrush	
Asteraceae	<i>Artemisia pycnocephala</i>	beach sagewort	
Asteraceae	<i>Baccharis pilularis</i>	coyote brush	
Onagraceae	<i>Camissoniopsis cheiranthifolia</i>	beach evening primrose	
Polygonaceae	<i>Chorizanthe pungens</i> var. <i>pungens</i>	Monterey spineflower	
Euphorbiaceae	<i>Croton californicus</i>	California croton	
Crassulaceae	<i>Dudleya caespitosa</i>	liveforever	
Asteraceae	<i>Ericameria ericoides</i>	mock heather	
Polygonaceae	<i>Eriogonum fasciculatum</i>	California buckwheat	
Polygonaceae	<i>Eriogonum latifolium</i>	coast buckwheat	
Polygonaceae	<i>Eriogonum parvifolium</i>	seacliff (dune) buckwheat	
Asteraceae	<i>Eriophyllum staechadifolium</i>	lizardtail	
Rhamnaceae	<i>Frangula californica</i>	California coffeeberry	
Asteraceae	<i>Heterotheca grandiflora</i>	telegraph weed	
Fabaceae	<i>Lupinus chamissonis</i>	beach blue lupine	
Hydrophyllaceae	<i>Phacelia ramosissima</i>	branching phacelia	
Anacardiaceae	<i>Toxicodendron diversilobum</i>	poison oak	
Non-Native Plants			
Fabaceae	<i>Acacia longifolia</i>	Sydney golden wattle	
Poaceae	<i>Bromus diandrus</i>	ripgut brome	
Aizoaceae	<i>Carpobrotus chilensis</i>	sea fig (iceplant)	
Aizoaceae	<i>Carpobrotus edulis</i>	hottentot fig (iceplant)	
Asteraceae	<i>Centaurea</i> sp.	thistle species	
Aizoaceae	<i>Conicosia pugioniformis</i>	narrow-leaved iceplant	
Boraginaceae	<i>Echium</i> sp.	Pride of Madeira	
Myrtaceae	<i>Leptospermum laevigatum</i>	Australian tea tree	
Fabaceae	<i>Melilotus</i> sp.	sour clover	
Scrophulariaceae	<i>Myoporum laetum</i>	Ngaio tree	

Notes:

FT – Federal threatened

1B.1 – Plants rare, threatened, or endangered in California and elsewhere; seriously threatened in California

1B.2 – Plants rare, threatened, or endangered in California and elsewhere; fairly threatened in California

Appendix B. Estimated cost to implement recommended actions prescribed in the Sand Dollar and Edgewater Restoration, Stewardship, and Maintenance Plan. Cost estimates cover work at Sand Dollar Management Areas 1A, 2B, 2A and Edgewater Management Areas 1, 2, 3. Estimate cost for invasive plant control and long-term monitoring/reporting was provided by Burleson Consulting Inc. Under Revegetation, estimated plant cost was provided by Return of the Natives while estimated labor cost was provided by Burleson Consulting Inc. For a detailed cost estimate, contact Burleson Consulting and/or Return of the Natives directly.

	Species	Initial Control Costs	Follow-up Costs	Comments
		Estimated Initial Cost (Year 1)	Est. Follow-up Cost (Years 2 -10)	
Controlling Invasive Plants	Narrow-leaved iceplant	\$ 8,000.00		Follow-up cost estimated for 5 work days per year.
	Iceplant	\$ 8,000.00	\$ 8,500.00	
	Ripgut brome	\$ 8,000.00		
	Panic veldtgrass	See Note		
	Acacias			Estimates do not include trees in Edgewater Management Area 3. Follow-up: 1 day per year for 2 years to treat resprouts (Years 2-4).
	Tea trees	\$ 6,400.00	\$ 2,100.00	
	Ngaio tree			
	Rosy iceplant	\$ 400.00	Follow-up costs folded into \$8,500/year	
	Thistles	\$ 800.00		
	Sweet alyssum	See Note		
		\$ 32,100.00	NA	Year 1 (Initial)
		NA	\$ 12,700.00	Year 2 - 4 (Follow-up)
		NA	\$ 8,500.00	Year 5 - 10 (Follow-up) (minus tree work)

Notes: Panic veldtgrass and sweet alyssum can be hand removed by Public Works. All costs increased by \$500/year to cover herbicide and Personal Protective Equipment. Estimated cost to treat iceplant is based on control all in one year (i.e. one upfront cost). Iceplant should be controlled in small patches thus the cost could be spread out between multiple years. Cost to remove non-native trees in Edgewater Management Area 3 is not included. This work should be evaluated and estimated by an arborist because the trees are on a steep slope and close to structures.

Burleson Consulting Inc.	Return of the Natives	
Labor	Plants	
Plants/Day/Person	Pot size	Cost/pot
Cones = 200–300	Cones	\$ 1.50
Gallons = 100	Gallon	\$ 8.00
	D40	\$ 3.50

		Estimated cost				Comments
		Cones	Gallons	Labor (Burleson Consulting, Inc.)	Plants (Return of the Natives)	
Revegetation	Sand Dollar	Area				
		1	98	0	\$ 147.00	
		2	98	70	\$ 707.00	
	Edgewater	3	200	0	\$ 400.00	150 Cones, 50 D40
		TOTAL		\$ 720.00	\$ 1,254.00	
		1	196	0		
		2	49	0		
		3	49	0	\$ 720.00	\$ 882.00
		4	196	0		
		5	98	0		
		6	0	10		
		7	0	35	\$ 120.00	\$ 640.00
		8	0	35		
		Area 3	11,140	0	\$ 20,160.00	\$ 18,710.00
		TOTAL		\$ 21,000.00	\$ 20,232.00	10,140 Cones, 1,000 D40

Notes: Estimated cost reflects initial planting and not subsequent infill planting that may be needed. Estimated cost does not include slope stabilization materials (e.g. straw wattles and jute) that may be needed to prepare or stabilize planting areas.

Monitoring & Reporting	Permitted		# Person(s) (Y = Yes)	# Person(s) (Y = Yes)	Estimated cost per year	Comments
	Biologist	Field Tech				
	SBB	Monitoring	Y		\$ 1,800.00	2-4 acres/day monitoring sand gilia depending on number of plants present.
		Reporting	Y		\$ 720.00	
	Vegetation	Surveying	Y	Y	\$ 6,000.00	
	transects	Reporting	Y		\$ 1,440.00	
	Sand gilia	Monitoring	Y	Y	\$ 4,800.00	
		Reporting	Y		\$ 2,880.00	
	TOTAL				\$ 17,640.00	

Notes: Vegetation transects, photopoint monitoring, and sand gilia monitoring could be done by an undergraduate or graduate student intern with relevant training and education background.

Cost estimates provided by Sand City for Public Works Crew (1 Public Works Field Supervisor, 2 Maintenance Workers)

Physical Maintenance Needs	Public Works				Estimated cost	
	Rate /hr/ person	# Person(s)	Total Hours			
	Trash	\$ 49.00	3	48	\$ 7,056.00	Total annual cost (4 hours/month, once per month) at both preserves.
	Encampments	\$ 49.00	3		Tbd	To be estimated/determined by Sand City
	Fence repair	\$ 49.00	2	20	\$ 1,960.00	Labor (as needed)
					\$ 500.00	Materials (as needed)
					\$ 2,460.00	Total (Materials + Labor) (as needed basis)
	Sign replacement				Tbd	To be estimated/determined by Sand City

Notes: Fence repair – approximately 160 ft. fence – assumes reuse of 3' tall chain-link. (20 5 ft. tall posts, 10 16 ft. 2X4, 20 50 lb. sacks of post mix (Shelby Gorman, Sand City, personal communication, October 24, 2019). An interpretive sign could be created in a collaboration with CSUMB if Sand City can pay to build one (Suzanne Worcester, personal communication, November 3, 2019).