A Pathway to Recovery for the El Segundo Blue Butterfly *(Euphilotes allyni)*

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The cover photo is courtesy of Travis Longcore.

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It is important to acknowledge that the UCLA campus, where our team has conducted most of our research, was originally occupied by the Tongva peoples, and that it has been built upon unceded land. Habitats for the El Segundo Blue butterfly are spread throughout the greater region of Tovaangar (the Los Angeles basin and So. Channel Islands), which was and is stewarded by the Tongva peoples.

Disclaimer

All content in this report is solely the opinion of the authors, and is not the opinion of the U.S. Fish and Wildlife Service or the University of California, Los Angeles. This report is intended only to inform future action, and is not an official assessment or plan.

Table of contents

Executive Summary

This report aims to assess the conservation status of the endangered El Segundo Blue butterfly (*Euphilotes allyni*), hereafter known as the ESB, to produce recommendations that would facilitate its recovery within the next 10 years. The ESB is endemic to coastal dune ecosystems within Los Angeles County, and entirely reliant on the health and abundance of seacliff buckwheat (*Eriogonum parvifolium*). The team has reviewed previous research, reports, and conservation work for the ESB to develop a recommended ammendment to the current recovery criteria. This update includes the creation of a fifth Recovery Unit in the Palos Verdes Peninsula to further support the species' genetic diversity. We assess the legal protections, habitat quality, and population status of each site to evaluate the ESB's progress according to these recovery criteria. Furthermore, we formulate a recommended monitoring plan and survey methodology to rectify a lack of consistent population data, particularly in smaller sites, in order to reliably determine ESB population health and trends over time. The team notably determined novel differences in emergence phenology over time and between geographic regions, further demonstrating the need for a site-specific survey schedule and sustained annual monitoring. This research has informed the creation of our 10-year Recovery Strategy for the ESB, which details the actions necessary for downlisting and delisting the species. If successful, the El Segundo Blue could become the first insect species to be delisted from the Endangered Species List due to recovery, serving as a promising precedent for conservation as a whole.

Chapter 1: Introduction

The El Segundo Blue butterfly (*Euphilotes allyni*), hereafter referred to as the ESB, is a federally endangered species endemic to a narrow strip of coastal sand dunes in Southern California. They have come to symbolize the intersection of urban development and biodiversity conservation. Once thought to be a subspecies of the square-spotted blue butterfly (*Euphilotes battoides*), genetic research has since confirmed it as its own distinct species (Dupuis et al., 2020; Rubinoff et al., 2021). These butterflies are highly specialized in their ecological needs, relying entirely on a single plant species, seacliff buckwheat (*Eriogonum parvifoloum*), for nectar, reproduction, and larval development. The ESB serves as an indicator species for dune ecosystem health, signaling the presence of native vegetation and the stability of the habitat. Rapid urbanization and the encroachment of invasive species in the Santa Monica Bay region has severely diminished the habitat of this insect. As such, conserving the ESB means preserving a broader web of life in these rare and vulnerable dune environments.

This report is part of a 2024-2025 UCLA Environmental Science senior practicum in partnership with the U.S. Fish and Wildlife Service (USFWS), aimed at creating a pathway to downlisting and eventually delisting the ESB from the Endangered Species List. Building on foundational work such as the 1998 U.S. FWS recovery plan and the 2021 five-year status review, the project synthesizes decades of monitoring, ecological data, and habitat assessments into a cohesive and actionable strategy for conservation. Objectives include evaluating current legal protections, habitat quality, and population trends across the butterfly's fragmented range, comparing its current status against the official recovery criteria, and providing a clear roadmap for conservation efforts over the next decade. The project is especially timely, given the species' increasing presence in previously unoccupied areas such as Torrance and Redondo Beach. Acknowledging these two zones is important as they provide physical evidence of the promising results that can come from a comprehensive recovery plan and well-managed restoration efforts.

The narrative driving this report is one of cautious optimism. Although the ESB's historic range has been drastically reduced from 1,200 to about 115 hectares, the species' numbers have increased tremendously since the 1980s as a result of targeted habitat restoration. Transect monitoring at sites like LAX and Ballona Wetlands has helped to further demonstrate this positive progress, but significant gaps still remain. Many occupied habitats are managed by a variety of stakeholders including cities, nonprofits, corporations, and even private individuals. Consequently, there is a noticeable lack in coordinated survey protocols. The USFWS has called for a scientifically credible monitoring plan to standardize data collection and confirm population trends across sites (U.S. Fish and Wildlife Service, 1998). This project proposes such a plan, recognizing that only populations showing statistically significant stable or upward trends over at least an eight year period can qualify for downlisting.

The layout of this report follows a structured approach to both analyze what has already been done and look toward what remains. In it, we hope to present an extensive evaluation of the past, present, and future of the ESB. The remainder of Chapter 1 will be dedicated to a synthesis of previous and ongoing conservation efforts, identifying the successes such as site recolonizations and native habitat restoration, as well as areas in need of improvement, including fragmented data collection, lack of standardized monitoring, and inconsistent site protection. Next, Chapter 2 will assess each known ESB population in detail, analyzing habitat quality, legal protections, and available population data, while confronting the challenges posed by non-uniform methodologies and poorly archived monitoring records. In Chapter 3 we hope to address these shortcomings directly, presenting a robust, standardized monitoring plan designed to unify future data collection efforts across all Recovery Units, complete with implementation timelines and cost estimates. Finally, Chapter 4 offers a 10-year recovery strategy rooted in scientific assessment and practical feasibility. It lays out a pathway to delisting grounded in updated criteria, site-specific actions, and evidence that successful recolonization is already underway. Together, these chapters reflect an all-encompassing effort, not only to assess where the species stands now, but also to chart a realistic, hopeful course forward.

Ultimately, the ESB's recovery is more than a conservation milestone—it is a potential national model for biodiversity preservation in urban areas. Achieving delisting offers tangible benefits beyond ecological success. Removal of the ESB from the federal endangered species list would ease regulatory burdens in a densely developed, high-stakes region. Millions of people live near its habitat, and its visible recovery could inspire public engagement with environmental issues in a way few species can. Achieving the delisting milestone could serve as a powerful example of successful urban conservation, instilling civic pride in the greater Los Angeles County community and reinforcing the value of long-term investment in conservation and stewardship. This report serves as both a scientific resource and a strategic blueprint for ensuring that one of California's most endangered butterflies can continue to thrive amid the concrete and coastlines of Los Angeles.

Literature Cited

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Chapter 2: Review of previous and current conservation work for the El Segundo Blue butterfly

Introduction

The 2019 ESB Recovery Plan Amendments shed significant light into the current state of the El Segundo Blue butterfly, establishing the primary threats to the ESB as habitat fragmentation from existing development while highlighting that increased recolonization of suitable habitat made the butterfly more resilient against extinction. Since the last assessment of the general ESB population, habitat restoration throughout most Recovery Units have continued in some capacity, largely led by private and nonprofit groups. This has resulted in a patchwork of differing protections for ESB habitat, particularly in terms of public access and awareness about ESB conservation. The largest ESB habitats, at the Los Angeles International Airport and El Segundo Chevron Refinery, are private and non-accessible to the public, and generally lead restoration through nonprofit or private means. This report will detail the relevance of public outreach and volunteer restoration as a means to conserve ESB habitat, building on the 2019 ESB Recovery Plan Amendments in noting the butterflies' remarkable adaptability in recolonizing habitat and expanding its range when given the opportunity.

This report additionally builds on the findings of the 2019 plan by contextualizing the genetic distinctions between the Santa Barbara and Los Angeles ESB populations while further recommending protections for the then-newly discovered Palos Verdes population of the ESB. These genetic differences will undoubtedly impact the conservation methods required to support the ESB population, and, as a result, any prospective conservation recommendations have been made with these differences in mind. This chapter will propose the removal of the Santa Barbara Recovery unit and addition of a new Palos Verdes Recovery Unit to reflect these revelations, providing a more consistent framework for conserving the Los Angeles ESB population.

Development of Recovery Plan amendments

While the genetic differences between the Santa Barbara and Los Angeles ESB populations were noted in the 2019 ESB Recovery Plan Amendments, discussion about distinguishing the two populations as separate species were put on hold, pending the publication of decisive genetic evidence. Since 2019, the genetic evidence cited by the recovery amendments has been formally published (Rubinoff et. al 2021). As a result, we have proposed to remove the Santa Barbara populations from the downlisting and delisting criteria, shifting our focus towards the Los Angeles populations instead.

Additionally, there are minor genetic differences between the Palos Verdes population and the rest of the southern sites, reflecting a degree of isolation between the two populations and the precarity of the PV population. Creating a separate Recovery Unit, therefore, allows more specific management and protection of the Palos Verdes population while replacing the now-irrelevant Santa Barbara populations. Additional proposed amendments also reflect these Recovery Unit changes.

Recommended amendments to the Recovery Criteria

The proposed amendments to the recovery criteria compared to the criteria for downlisting and delisting the El Segundo Blue from the Recovery Plan 2019 amendment are mostly unchanged, with the exception of significant modifications to the first criteria for both downlisting and delisting. The rest of the report will refer to the new criteria detailed below. Recommended additions or changes are in bold.

<u>Downlisting Recovery Criteria</u>

The El Segundo Blue butterfly can be considered for downlisting to threatened status when:

1) At least one secure population in each of the **five** Recovery Units (RUs) – Ballona, Airport, El Segundo, Torrance, **and Palos Verdes** – are permanently protected to provide redundancy and maintain representation. The Airport Dunes (Napoleon Street and Waterview Street to the north, Vista del Mar to the west, Pershing Drive to the east, and Imperial Highway to the south) located in the Airport RU contains the largest population of the butterfly and is the population most likely to survive disease, predators, parasites, and other perturbations. The Airport Dunes must be one of the protected populations.

2) Each of the **five** populations are managed to maintain coastal dune habitat dominated by local native species including coast buckwheat.

3) As determined by a scientifically credible monitoring plan, each of the **five** populations exhibits a statistically significant stable or upward trend (based on transect counts) for at least 8 years (approximately eight butterfly generations). Population management in each Recovery Unit ensures that the average discrete population growth rate (lambda) is at or above 1.0, indicating a stable or increasing population.

4) A program is initiated to inform the public about the El Segundo blue butterfly and its habitat.

Delisting Recovery Criteria

The El Segundo Blue butterfly can be considered for delisting when:

1) **Five** secure populations - in addition to the **five** that meet downlisting criteria - are protected (total of **10**). One of these additional populations must be **in the Palos Verdes Recovery Unit.** These additional populations increase viability of the species through increased redundancy and representation.

2) Each of the **10** populations is managed in perpetuity to maintain coastal dune habitat dominated by local native species including coast buckwheat. This criterion assures population resiliency and amelioration of the threat of habitat modification resulting from invasive nonnative plant species (Factor A).

3) As determined by a scientifically credible monitoring plan, each of the **10** populations exhibits a statistically significant stable or increasing trend (based on transect counts) for at least 8 years (approximately eight butterfly generations). Management in each population distribution ensures that the average discrete population growth rate (lambda) is at or above 1.0, indicating a stable or increasing (resilient) population. Lambda is not below 1.0 for more than one year prior to delisting, indicating growth rate fluctuations are natural and not due to population decline and the population is resilient. This criterion assures population resiliency and that the threat of limited range has been sufficiently ameliorated (Factor A).

Discussion

The ESB is one of several butterfly species in California facing critical conservation challenges, particularly due to its dependence on specific host plants and the ongoing loss and fragmentation of coastal dune habitat. By comparing the ESB to the Palos Verdes Blue (PVB) as well as the Mission Blue Butterfly (MBB), we gain valuable insight into the different recovery strategies being used and where the ESB could benefit from either similar or modified approaches.

The Palos Verdes Blue shares both geography and biology with the ESB. Found just south of several ESB recovery sites, the PVB is also restricted to a small, urban range and relies on very specific host plants for survival. Its near-extinction and rediscovery have made it a case study in intensive species recovery, involving captive breeding, propagation of native plants, and close monitoring of small population groups. The lessons from PVB recovery highlight that active intervention, rather than passive protection, can be critical for butterflies with extremely limited ranges. The ESB, especially in its smaller populations like those in Palos Verdes or Torrance, may need similar investments to ensure long-term survival.

In contrast, the Mission Blue Butterfly offers a different model, one where landscape-scale management and public access are central to conservation. Because the MBB lives in protected parklands, conservationists are able to use tools like controlled burns and managed grazing to support native lupine growth. Public engagement is also a major part of the recovery plan, with schools, volunteers, and visitors participating in restoration efforts and education programs. For the ESB, such approaches are harder to implement in closed-access areas like the LAX Dunes, but they present opportunities in more public-facing units like the Ballona Wetlands and the El Segundo Recovery Unit. By encouraging greater community involvement and interpretive programming in these accessible areas, the ESB recovery effort could broaden its impact and build long-term support.

These two comparisons show that a flexible, site-specific approach is likely the most effective way forward for the ESB. In some areas, the species may require more hands-on ecological and genetic management, while in others, expanding public education and outreach could increase awareness and protection. Both approaches are essential for building resilience across the butterfly's range.

Literature Cited

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Chapter 3: Assessment of El Segundo Blue butterfly sites' population status, habitat quality, and legal protections

Introduction

The following chapter individually assesses the sites of each Recovery Unit according to the status of legal protections present, its habitat condition, and the historic and current status of its ESB population. Sites that are most likely to meet the downlisting standards of the recommended recovery criteria stated within Chapter 2 qualify as **key sites**. The team has identified one key site with the greatest potential for recovery for each Recovery Unit. We have also identified five additional **supplementary sites** that are likely recovery candidates, resulting in a total of 10 sites that could meet delisting criteria in the near future. Although the supplementary sites are not in optimal condition, they are the most operable choices for guiding conservation efforts. Population data was collected from previously conducted annual surveys and reports, while habitat data was collected using a combination of satellite data and visits in person. The LAX Dunes Preserve, Ballona Wetlands, and Chevron Preserve appear to be in the best conditions across population status, habitat condition, and legal protections. They are followed closely by the Palos Verdes sites: Vicente Bluffs, Alta Vicente, and Abalone Cove, which all exhibit small populations but are sufficient in habitat condition and legal protections. Redondo Beach and Torrance Beach show larger and increasing populations, with varying habitat quality and weaker legal protections. Lastly, Dockweiler State Beach and the Malaga Bluffs fail to meet the standards of these three measurements. Table 3.1 summarizes the status of each site.

Across all sites, population monitoring remained largely inconsistent, with most sites either lacking in population data or using survey methods that were difficult to analyze or compare. Sites with sufficient population data include the Ballona Wetlands, LAX Dunes Preserve, and the Chevron Preserve, with the latter two being the only sites to also have current data (surveyed within the past two years). Furthermore, acquiring the population data proved difficult when looking for older surveys. These surveys, mostly dating before 2000 and in the early 2000s, were largely missing because they are still being digitized and archived by their respective organizations, or were unable to be recovered and sent to the team. There have also been challenges in the extent of legal protections in place at these habitats. Some sites, such as those in the Palos Verdes Nature Preserve, benefit from strong legal permits. However, most sites still lack substantial forms of protection, with several lacking any concrete legal defenses. In fact, none of the sites aside from those in the Palos Verdes Nature Preserve contained legal

language denoting the permanent protection and management of the ESB habitats. The public beaches (Dockweiler, Redondo, Torrance) lacked practical laws and third-party documents that would otherwise ensure regular maintenance and restoration. In order to downlist and/or delist the ESB, it is imperative that regular population surveying and habitat maintenance occurs in perpetuity. If completed, this would demonstrate a steady recovery of the species and success across site evaluations such as this. Recommendations improving upon all of these conditions can be found under the "10-Year Recovery Strategy" section.

Methods

Population data analyses

To assess the condition of each population, the team made requests to all relevant landowners and stakeholders for the acquisition of all possible surveys and reports pertaining to the ESB over the course of several months. Some reports were unable to be obtained, despite their verified existence, so the datasets for the LAX Dunes Preserve and Chevron Reserve sites (and likely others) are incomplete. In addition, some sites were not surveyed regularly, were not surveyed during the correct time period during some years, were unable to be surveyed for some years, or have just recently been re-colonized. However, the data acquired appears to be sufficient for an analysis of historic and current trends for most ESB populations.

Several sites were surveyed using different methods, making direct comparisons between sites' total counts or population estimates impossible. Thus, the peak counts for each year surveyed along a transect or transects were utilized as a standardized metric for population status. While not perfect, this metric proved to be the most reliable for cross-site comparisons. Peak counts were plotted for each population to determine historic size, past trends, the effect of the 2012-2016 drought on population size, and trends within recent years. Reports were then examined in detail to identify any explanations for sudden decreases or increases in population size.

Additional analyses were required for the LAX Dunes Preserve site, as the seven most recent years' surveys did not utilize transect observations. To estimate population status for years where peak counts from transect surveys were not available, we utilized adjusted values for their population estimates based on their proportional relationships to corresponding years' transect peak counts. Population estimates derived from transect surveys were divided by the average quotient (5) between (transect estimate)/(peak count). Population estimates derived from census block count surveys were divided by the average quotient (13) between (census block count estimate)/(peak count).

Habitat data collection and assessment

Data collection occurred by conducting on the ground surveys for seacliff buckwheat in various locations. The sites that were surveyed were determined by previously established habitat from reports and active native restoration efforts occurring in the area, as well as supplemented by citizen science observations from Calflora and iNaturalist. As a result, there were no sites surveyed that included no seacliff buckwheat.

Upon arriving on a given site, two individuals walked the full length or perimeter of the area, taking surveys every few meters if seacliff buckwheat was spotted. The surveys were conducted and sent through Survey123, and information including the exact location of the sighting, the density of the seacliff buckwheat spotted, the health of the seacliff buckwheat spotted, any nearvy invasive species, and any signage regarding restoration efforts was recorded in each survey. Each survey constituted a point, which was later loaded into a map on ArcGIS online. The points formed a perimeter, and polygons were constructed using the survey points as a guide. These polygons represent the area in which seacliff buckwheat is present. Each area was then color coded as either red, yellow, or green, dependent on the health and density of the seacliff buckwheat found within that polygon. While recorded, private residences that included seacliff buckwheat were excluded from the polygons.

Legal protections evaluation

First, site information was gathered using public records of ownership and authority. Then, the team reached out to previously established contacts from various conservation groups who have had experience working on these individual sites. These conservation groups were able to recommend the appropriate staff from these site authorities, who were then contacted to discuss and confirm the legal protections in place at each site.

Once the status of legal protections was established, they were evaluated based on the language found in the Amended Recovery Plan, which states that each of the populations is "managed in perpetuity to maintain coastal dune habitat dominated by local native species including coast buckwheat" (Recovery Plan for El Segundo Blue Butterfly (*Euphilotes Battoides Allyni*), 2019). Specifically, the team looked for a status of permanent protection and language that suggested continuous monitoring, surveying, and restoration, all of which are crucial to achieving the objectives outlined in the recovery plan.

Assessing existing outreach programs

Public outreach methods were evaluated based on the frequency, accessibility, and scope of engagement efforts across the five Recovery Units. We analyzed public records, restoration event calendars, social media activity, educational materials, and partnerships reported by local organizations. Additionally, we considered physical accessibility, public signage, and opportunities for community involvement as indicators of effective outreach. Emphasis was

placed on both traditional programming (e.g, tours and volunteer days) and alternative methods like digital engagement or creative community events.

Our findings show that while several organizations such as the ESB Coalition, Friends of Ballona Wetlands, and South Bay Parkland Conservancy have built consistent, volunteer driven programs, outreach remains even across the landscape. Some sites benefit from sustained public engagement while others have limited or no programming. This inconsistency weakens collective awareness of the species and reduces opportunities for widespread public stewardship. Previous work has demonstrated the value of community involvement in habitat protection but current gaps suggest that not all Recovery Units are equally supported by outreach infrastructure.

Outreach is a key component in meeting the Recovery Plan's criteria that populations be managed in perpetuity. While progress has been made in select sites the limited visibility and engagement in other units pose a challenge to meeting the conditions necessary for downlisting. The species recovery cannot be sustained solely through agency-led restoration; public support and compliance are essential for long-term resilience. Without equitable outreach across all units there is risk of re-fragmentation or habitat degradation which would undermine the species stability after delisting.

We recommend expanding standardized outreach protocols across all Recovery Units. These include: establishing clear public train boundaries and signage, integrating butterfly content into school curricula and community events and coordinating a shared public calendar through the ESB Coalition or a designated lead. We also recommend leveraging existing city and county partnerships to install permanent interpretive materials. Restoration programming should explicitly include youth and underrepresented communities as a part of a broader strategy.

The 10-Year Recovery Strategy for the ESB outlines targeted steps to meet delisting criteria, including the addition of the proposed Palos Verdes Recovery Unit. To qualify, 10 populations must be permanently protected, show stable or increasing trends over eight years, and be actively managed for native dune habitat. Key sites such as LAX Dunes, Ballona Wetlands, Chevron, Torrance Beach, and Vicente Bluffs are prioritized based on habitat quality and recovery potential. Early years focus on restoration, legal protections, and standardized monitoring, while later phases expand outreach and long-term management. By year ten, all populations should meet recovery targets, allowing for delisting and sustained species resilience.

Individual site assessments

The assessments of ESB sites below are based on thorough analyses of all gathered population data, habitat quality data, and legal information. Some assessments are incomplete due to inconsistencies in population surveying, missing reports, or a lack of response from relevant parties. To guide future actions, these assessments aim to track the progress of previous and current conservation efforts for the species and identify any notable historical changes or events. From this, the ESB will be evaluated as a whole using this report's updated recovery criteria, which includes the recommended addition of the proposed Palos Verdes Recovery Unit. Table 3.1 below summarizes these assessments. The key for these assessments is as follows:

Recovery Criterion 1 (Permanent legal protections in perpetuity)

Complete - Indicates extensive legal protections over the complete habitat property in perpetuity.

Strong - Indicates strong legal protections; however, they only cover most (but not all) of the habitat property, or the protection is not in perpetuity.

Moderate - Indicates that legal protections are present, but do not cover the habitat property completely and is also not in perpetuity.

Weak - Indicates a lack of legal protections beyond the Endangered Species Act, the California Environmental Quality Act, and the California Coastal Act. Legal protections here lack specificity.

Recovery Criterion 2 (Habitat quality and management)

High - Indicates a high density of seacliff buckwheat in good health, with minimal or no presence of invasive species nearby.

Medium - Indicates either a high density of seacliff buckwheat in poor health, or a low density of seacliff buckwheat in good health, often with the presence of some invasive species nearby.

Low - Indicates a low density of seacliff buckwheat in poor health with invasive species nearby.

Recovery Criterion 3 (Increasing or stable population)

High - Indicates a high potential for fulfilling the criterion in the near future.

Medium - Indicates that additional work must be done, but there is a high potential for fulfilling the criterion in the near future.

Low - Indicates that additional work must be done to fulfill the criterion.

Table 3.1 - Summary of legal protection, habitat quality, and population status assessments for each of the known El Segundo Blue butterfly (*Euphilotes allyni*) sites.

	Recovery criteria to be fulfilled		
Recovery Unit and site name	1. Legal protections	2. Habitat	3. Population
Ballona Recovery Unit			
Ballona Wetlands*	Strong†	Medium ‡	High†¶
Airport Recovery Unit			
LAX Dunes Preserve*	Moderate†	High‡	High†
Dockweiler State Beach**	Weak†	Low†	Low†¶
El Segundo Recovery Unit			
Chevron Preserve*	Weak†¶	High‡	High†
Redondo Beach**	Weak†	Medium†	High†¶
Torrance Recovery Unit			
Torrance Beach*	Weak†	High‡	High†¶
Malaga Bluffs**	Weak†¶	Low†	Low†¶
Palos Verdes Recovery Unit			
Vicente Bluffs Reserve*	Strong†	Medium‡	Medium†
Alta Vicente Reserve**	Strong†	High‡	Low†¶
Abalone Cove**	Strong†	Medium†	Low†¶

* Key site

** Supplementary site

† Does not fulfill updated recovery criteria

‡ Fulfills updated recovery criteria

¶ Insufficient information; assessment may be inaccurate

Ballona Recovery Unit

Figure 3.1 - Map of the Ballona Recovery Unit for the El Segundo Blue butterfly (*Euphilotes allyni*). Boundary adheres to the perimeter delineated in the 2019 U.S. Fish and Wildlife Recovery Amendment for the El Segundo Blue Butterfly. The only current site within this Recovery Unit is the Ballona Wetlands (shown in yellow). The site is in medium health.

Key site: Ballona Wetlands

As described within the draft Environmental Impact Report (EIR), prepared for September 2017 regarding the Ballona Wetlands Restoration Project, this site at a given point in time, spanned more than 2,100 acres, supporting a variety of wetland types (Ballona Wetlands Restoration Project, 2017, p. xix). As acknowledged in the 2017 EIR, the reserve became 577 acres of open space, providing approximately 153 acres of wetland habitat and 83 acres of non-wetland waters of the U.S. (Ballona Wetlands Restoration Project, 2017).

During 2012, the United States Environmental Protection Agency shared that the Ballona Reserve's wetland habitats were impaired, with the reserve being classified as one of the most

degraded amongst the wetlands within the state of California (Ballona Wetlands Restoration Project, 2017, p. ES-2). This location was chosen as an ESB key site given that it stands as the only one in the Ballona Recovery Unit (RU). It supports the recovery of endangered species, like the ESB, and has the potential to provide a broad amount of environmental benefits if restored. Hence, to improve the wetland habitat and ecological functions, the California Department of Fish and Wildlife (CDFW) has been involved in the drafting of a restoration project. There have been observations of the ESB within the Ballona saltwater marsh from 2011 to 2016 allowing for the observation of 199 butterflies in 2013 and 504 in 2015 (Ballona Wetlands Restoration Project, 2017, p. 3.4-30). With the ongoing restoration efforts from the Friends of Ballona Wetlands occurring for more than 35 years, the site is known to have primarily native coastal dune vegetation species and riparian thickets, taking up 12.6 acres of restored dunes to support eight plant communities and nine seacliff buckwheat areas in 2013 (Ballona Wetlands Restoration Project, 2017, p. 3.4-30).

Figure 3.2 - Map of the Ballona Wetlands site for the El Segundo Blue butterfly (*Euphilotes allyni*). The perimeter was developed by cross-referencing satellite imagery with data from the Results of 2021 Presence/Absence Surveys for El Segundo Blue Butterfly at the Ballona Wetlands Ecological Reserve report pertaining to field surveys of seacliff buckwheat presence in the Ballona Wetlands (Mendez, 2021).

Status of legal protections:

As shared by Richard Brody, the California Department of Fish and Wildlife (CDFW) Land Manager for the Ballona Wetlands Ecological Reserve, Ballona Wetlands is a State Ecological Reserve, by definition, a conservation area. The ESB habitat is already protected as it is within the Ecological Reserve, though not specifically by a Conservation Easement. The state owns all 600 acres of protected area, with the California Coastal Conservancy and El Segundo Blue Coalition doing restoration to support long-term persistence of the ESB species. Particularly, the ESB Coalition is doing restoration work on the ESB habitat within the wetlands.

The CDFW holds comprehensive authority over the reserve and is responsible for planning, implementing, and managing restoration as well as conservation activities. The EIR draft describes the planning of the restoration project entailing work on nearby lands and adjusting elements of the present flood infrastructure, like the Ballona Creek channel and levee system developed for the reserve (Ballona Wetlands Restoration Project, 2017). However, through a series of comment letters, there is a concern about flooding impacting the ESB dune habitat. A comment letter claims that "the dune areas that support this species would not be inundated by even an extreme 100-year flooding event" (Ballona Wetlands Restoration Project, 2019a). Consequently, with multiple mitigation measures addressed within the draft EIR, it is made clear that they are under the California Environmental Quality Act (CEQA) enforceability which requires Mitigation Monitoring and Reporting Programs (MMRP) to ensure that these measures are carried out. However, commenters have requested "Restrict[ing] public access through the sensitive dune habitat that currently hosts the Federally endangered El Segundo Blue Butterfly… The construction of a levee along Culver and adjacent to the dunes must limit disturbance and enhance connectivity to dune system and El Segundo Blue Butterfly habitat"(Ballona Wetlands Restoration Project, 2019b). The EIR acknowledges that berms and levees are crucial to have in place in order to prevent flooding and for the sake of managing sea-level rise. Particularly, it is explained that the berms adjacent to the dunes are designed to restrict disturbances and strengthen connectivity to this habitat supporting the ESB.

About this site being a restricted area, one measure (BIO-2) emphasizes the limit of disturbance, specifically on ensuring the signage of work areas and that workers be made aware of the exclusion areas, like the sensitive ESB habitats that are not open to any form of disturbance (Ballona Wetlands Restoration Project, 2017, p. 3.4-90). Additionally, within the draft EIR, post-restoration actions are addressed such as the removal of invasive plants and replanting species native to the dune. Although no conservation easement is in place, legal protections like these measures establish habitat exclusions, focusing on weed control plans that can all be classified as tools for conservation. A table of required permits and approvals can also be found in the draft EIR, consisting of construction permits similar to the California Coastal Act coastal development permit, amongst several others.

Nonetheless, what the EIR does not mention is that the dune habitat would undergo flooding if the water makes its way around the proposed berms. This flood risk would be a direct

consequence of the constructed berms, thus violating the 'permanently protected' requirement within the ESB Recovery Plan Amendment. Given the current design expectations, if berms and levees operate as planned and do not experience any ruptures, the habitat meets the 'permanently protected' objective. Yet it is critical to acknowledge that if the pipes fail or water bypasses the berms, the ESB habitat would be put at risk, hence jeopardizing the endured protection measures for delisting. Fortunately enough, the landowner's willingness to increase protections is very likely given that the California Department of Fish and Wildlife is already partaking in preservation efforts.

Habitat condition:

The Ballona Wetlands are a large protected area in Marina Del Rey and Playa Del Rey of Los Angeles County. While the entire wetlands boast a massive 600 acres, a vast majority of this area is not inhabited by seacliff buckwheat. Most of this preserve is inhabited by riparian habitats, which are inhospitable to seacliff buckwheat. That being said, a significant portion of seacliff buckwheat is present in the southwestern portion of the wetlands that the Friends of Ballona Wetlands monitors. The seacliff buckwheat in these areas is relatively new, yet healthy and well dispersed, sustaining a significant population of butterflies. Since 1994, The Friends of Ballona Wetlands have continued to expand the presence of seacliff buckwheat and actively monitor its health, ensuring this site becomes a key place for the ESB to inhabit.

Population status:

This population has recently been re-established, with the first recorded observations of ESBs at this site occurring in 2011 and follow-up confirmation of the species' presence in 2012 (Mendez, 2013). Presence/absence surveys were then conducted during the 2013 flight season by Irena Mendez, Senior Project Manager and Habitat Restoration Specialist with Psomas, at the request of Dr. Edith Read, Friends of Ballona Wetlands Board Member.

Surveys were conducted in accordance with Recovery Permits issued by USFWS, where "the surveyor covered the entire survey route at a slow pace, taking care taken [sic] to avoid harassing any butterflies present" (Mendez, 2021). Peak counts from these surveys are illustrated in Figure 3.3. The Ballona Wetlands population appears to have been in decline since 2017, decreasing from a peak count of 156 to 113 in 2019 and then to a peak count of 76 in 2021. While no explanation is provided for the decline in 2019, the 2021 report states that a lack of rain from 2020 to 2021 negatively affected many butterflies species within the site (Mendez, 2021).

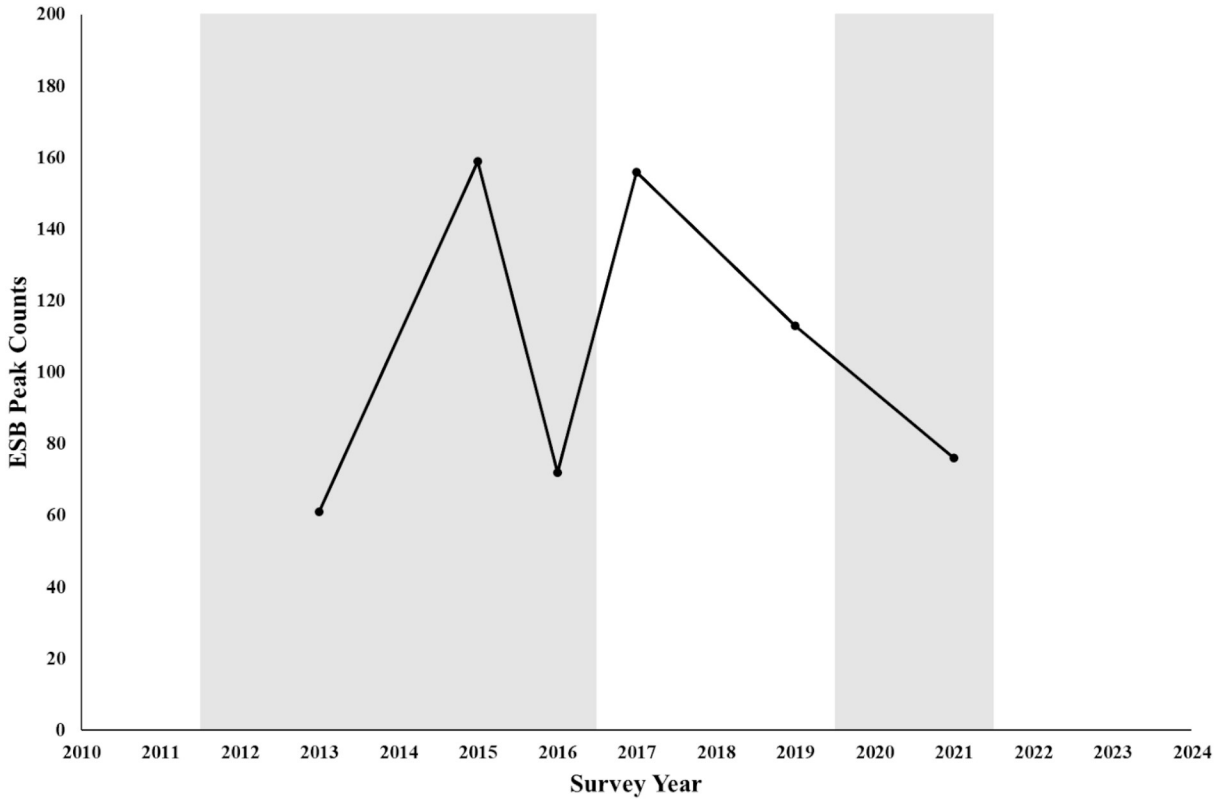

Figure 3.3 - Peak counts of weekly El Segundo Blue Butterfly (*Euphilotes allyni*) surveys at the Ballona Wetlands site. Surveys were conducted along a predetermined transect route during the estimated peak of the species' flight season. Intervals shaded in gray indicate historic periods of drought, as determined by the California Department of Water Resources.

The Ballona Wetlands currently supports a population with numbers in the middle range, relative to other sites. The highest peak count was recorded in 2015, with 156 individuals observed during one day, and the lowest peak count was recorded in 2013, with 61 individuals observed during one day. Since the dataset begins in 2013, we are unable to determine the effect of the 2011-2017 drought on this population. Although, as previously mentioned, a drought between 2020 and 2021 was stated to negatively affect the ESB at this site (Mendez, 2021). This report also mentioned that seacliff buckwheat seemed to withstand the lack of precipitation better than invasive plant species, likely due to ongoing restoration efforts targeted against invasives. This anecdote suggests that seacliff buckwheat, and subsequently the ESB, may tolerate short-term droughts if properly established in restored areas. Continued restoration and management have allowed for the reestablishment and subsequent population growth of the species within the site. Though this is the only site currently within the Ballona RU, its sizable population and previous population spikes show a high probability of achieving recovery criteria as a key site.

Recovery Criterion 3 for downlisting and delisting of the species requires populations to show a "statistically significant stable or upward trend (based on transect counts) for at least 8 years". As a key site, the Ballona Wetlands appears to host the population that is most likely to meet this criteria within the Ballona Recovery Unit. However, not enough data is available to determine a statistically significant trend over the past eight years. Surveys have only been conducted every other year since 2017, and the team did not receive any surveys conducted after 2021. Thus, the population growth rate (lambda) cannot be consecutively calculated for this period (see Figure 3.4). As such, this site does not meet recovery criteria with respect to population stability. Going forward, conducting consistent, annual surveys would allow for the consecutive calculation of lambda to track population growth.

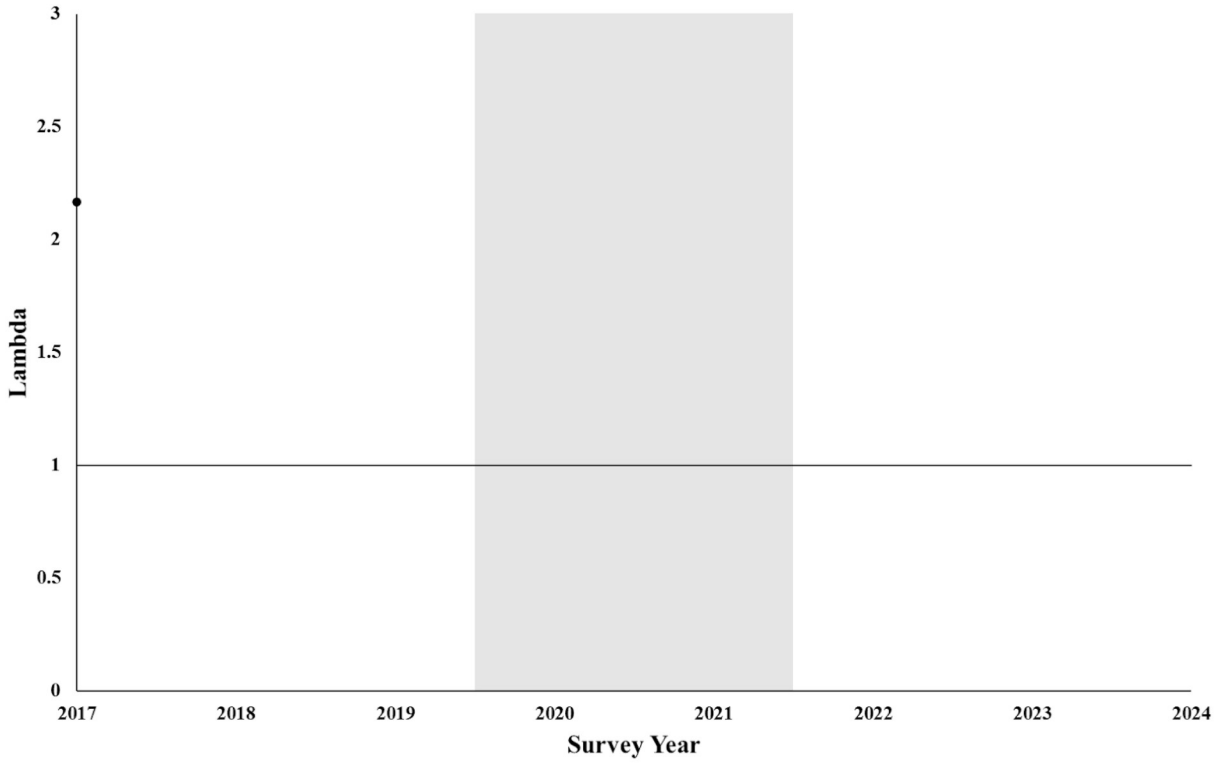

Figure 3.4 - Population growth rate (lambda) of the El Segundo Blue Butterfly (*Euphilotes allyni*) at the Ballona Wetlands site over the past eight years (2017-2024). Surveys were conducted along a predetermined transect route during the estimated peak of the species' flight season. Intervals shaded in gray indicate historic periods of drought, as determined by the California Department of Water Resources.

Airport Recovery Unit

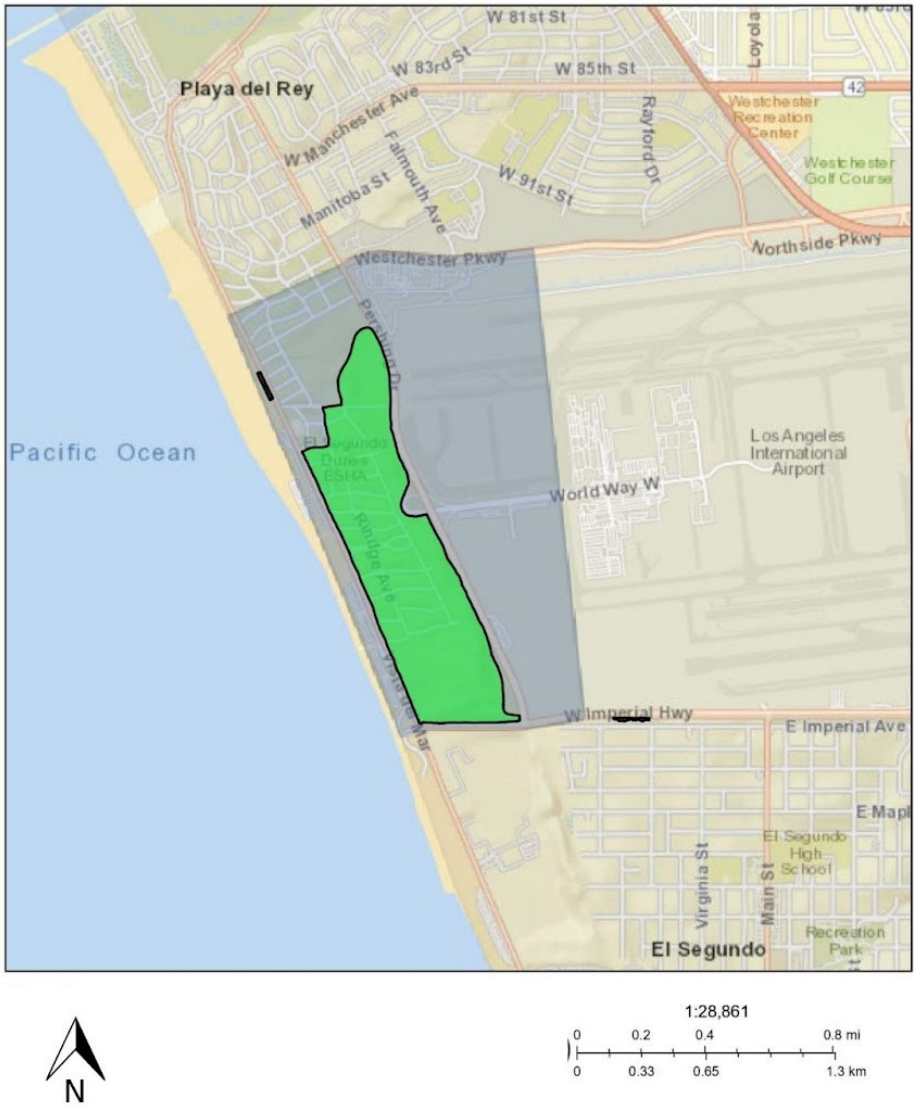

Figure 3.5 - Map of the Airport Recovery Unit for the El Segundo Blue butterfly (*Euphilotes allyni*). Boundary adheres to the perimeter delineated in the 2019 U.S. Fish and Wildlife Recovery Amendment for the El Segundo Blue Butterfly. Sites included in this Recovery Unit are the LAX Dunes Preserve (shown in green) and the Dockweiler State Beach (shown in yellow). Sites in this unit range from medium-high health.

Key site: LAX Dunes Preserve

As the proposed sentinel site, the LAX Dunes Preserve is crucial for the downlisting and delisting of the ESB. As a natural wildlife preserve, the airport dunes have provided the most extensive and consistent survey data of all the sites. Because of its location at the Los Angeles International Airport, the success of ESB restoration thus far and in the future serves as an inspiration for ecological resurgence in a highly urbanized area.

Figure 3.6 - Map of the LAX Dunes Preserve site for the El Segundo Blue butterfly (*Euphilotes allyni*). Boundaries adhere to the perimeter delineated in the El Segundo Blue Butterfly Habitat Restoration Area 2023 Annual Monitoring Report by the Los Angeles World Airports (Psomas, 2023).

Status of legal protections:

As the proposed sentinel site and home to the largest ESB population, the protection at this site holds particular importance. The LAX dunes have been deemed an "Ecologically Important Area" according to the city's conservation plan (Los Angeles Airport/El Segundo Dunes Specific Plan, 1992). Los Angeles County names the dunes as a Significant Ecological Area, and the California Coastal Commission has determined all 307 acres of the dune habitat to be an Environmentally Sensitive Habitat Area (ESHA) (Rich, 2003).

Under the authority of the City of Los Angeles/Los Angeles World Airports, the LAX Dunes Preserve is subject to two city ordinances: Ordinance No. 167,940 and Ordinance No. 169,767, with the latter being an amendment to the former. Ordinance No. 167,940, known as the Los Angeles Airport/El Segundo Dunes Specific Plan, outlines the protection of the southern 203 acres, notably omitting the northern 104 acres which were proposed for golf/recreational use (Los Angeles Airport/El Segundo Dunes Specific Plan, 1992). The second ordinance, Ordinance No. 169,767, amends that no development aside from nature preserve use shall be allowed on the southern acres (Los Angeles Airport/El Segundo Dunes Specific Plan, 1994). Like the first ordinance, this continues to restrict conservation to the southern acres. Previous reports and surveys have mainly focused on these southern acres, but some restoration has occurred in the northern acres.

Currently, because the northern 104 acres outlined in the Specific Plan are excluded from conservation, legal protection has been deemed insufficient according to the amended recovery plan. Furthermore, city ordinances are less stringent and easier to appeal compared to state or federal laws. Since the Specific Plan can be changed by a majority vote in the Los Angeles City Council at any time, this does not constitute permanent protection. The amended recovery plan in 2019 pointed out the "lack of permanent conservation and long-term assurances" here, and the Specific Plan has not been altered since (Recovery Plan for El Segundo Blue Butterfly (*Euphilotes battoides allyni*), 2019). Lastly, the California Coastal Commission states that "the 302 acre dune habitat is still connected and functions as a contiguous habitat" (Rich, 2003). Unless the habitat is treated as such, conservation efforts cannot be thorough in protecting the species.

Habitat condition:

Urban development throughout the 20th century, including construction of the Chevron Refinery, residential communities, and public infrastructure such as the Hyperion Wastewater Treatment Plant has led to severe habitat fragmentation and degradation, causing a decline in ESB populations, including the population of ESB found at the LAX Dunes. Despite this, the largest remaining population persists within a 203-acre area at the western edge of Los Angeles International Airport (LAX), known as the El Segundo Blue Butterfly Habitat Restoration Area. Prior to this, it was a part of the Surfridge neighborhood, though this land was vacated between 1965 and 1974 due to LAX's expansion efforts. Upon establishment of the ecological

significance of the site, it was designated as a protected habitat in 1982 and expanded in 1992 following comprehensive biological assessments conducted by LAWA.

Restoration efforts, carried out by the California Coastal Commission, included three major revegetation phases: 1987, 1990, and 1992. This resulted in the reestablishment of 120 acres of native dune vegetation. The LAX Dunes Preserve is a key site due to the high density and overall health of seacliff buckwheat in the area. The revegetation program was incredibly successful in removing invasive species, resulting in higher quality seacliff buckwheat and higher ESB numbers. In recent years, the Bay Foundation has been responsible for the bulk of the maintenance and seacliff buckwheat planting on the site.

Population status:

The LAX Dunes Preserve has been continually regarded as the largest site for the ESB, both in site area and population size. Surveys had been conducted along a 2,160m historical transect since 1977, though only data as far back as 1984 were made available to us. In 1996, the site began conducting census block counts, surveying each block of habitat once during the estimated peak of the flight season. This method was conducted in tandem with the historic transect surveys, attempting to capture a now larger area due to successful habitat restoration (Arnold, 2009). While these two methods are not directly comparable (as seen by their differing proportional magnitudes during some years), similar trends occur. In addition, seasonal population estimates utilizing counts from both methods were then calculated for each year utilizing the Holmes and Arnold method (Holmes & Arnold, 2015). Peak counts from the historic transect, total historic transect counts, total block census counts, and the seasonal population estimates are visualized in Figure 3.7. After 2018, population estimates could only be calculated every other year.

In 2020, the historic transect method was replaced by transect grid surveys, where 18 selected 50-meter cells were surveyed utilizing three north-south transects each. Six cells from each of the three geographic stratum (north, mid, south) were selected. The combined transect length of 2,250m in this method is comparable to the size of the 2,160m historic transect. Though this method is stated to “improve overall ESBB population estimates and reduce instances when ESBB transect counts are too low to reliably model” (Psomas, 2023), the population estimates produced are neither directly nor indirectly comparable with peak counts or seasonal estimates, as the methods have not overlapped for any of the years. To retain continuity across sites, counts from this transect grid survey method are not visualized.

As is evident in Figure 3.8, the LAX Dunes Preserve appears to support the largest ESB population relative to other sites. Droughts have negatively affected this population during at least two periods. In 2007, all three of the available population metrics recorded a sharp decline. From 2012 to around 2020, a period marked by a substantial and intense drought, this population saw its steepest decline. Conversely, habitat restoration efforts have produced immensely successful population increases over time. From the mid-1990s to 2012, the LAX population had

shown enormous total growth, and following intensive restoration efforts during and after the 2012-2016 drought, ESB numbers have once again been on the rise. As it stands, the LAX population shows the most obvious relationships between drought and habitat restoration, and it provides a high emphasis on the importance of long-term restoration and management in the face of now-unpredictable Southern California precipitation patterns.

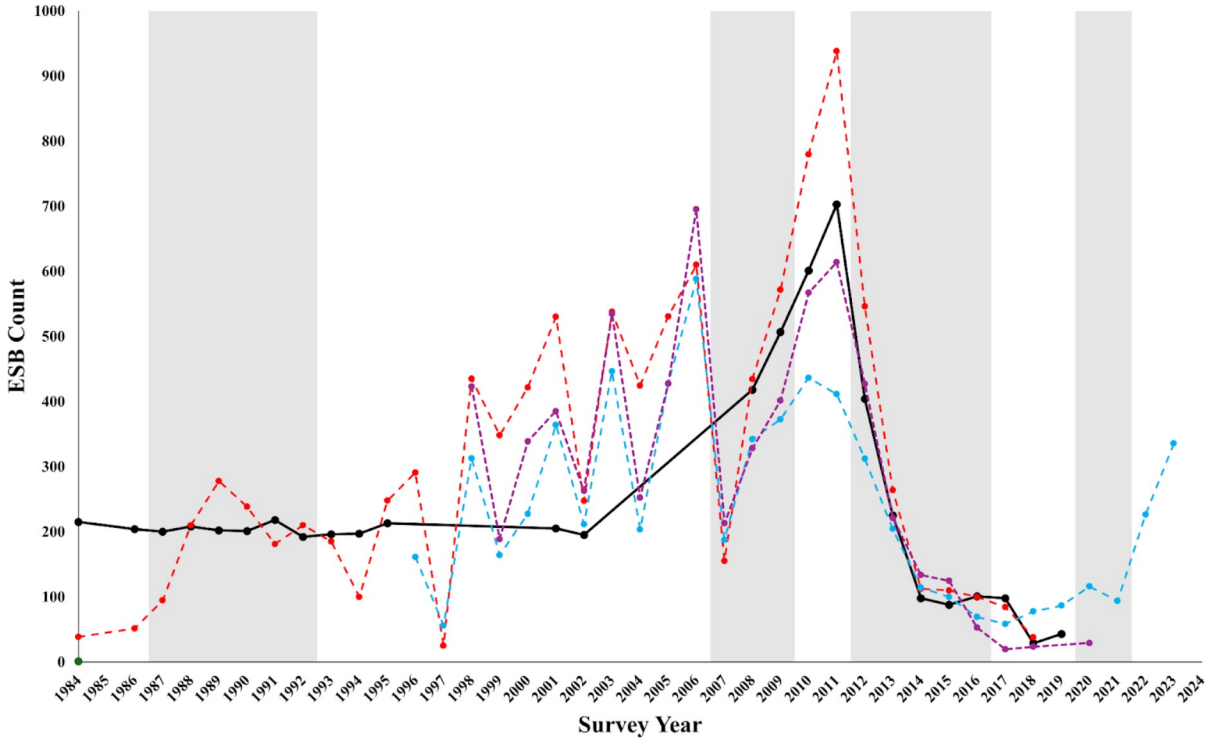

Figure 3.7 - Four population metrics for the El Segundo Blue Butterfly (*Euphilotes allyni*) at the LAX Airport Preserve site. Transect surveys were conducted along a historic transect route during the estimated peak of the species' flight season; peak counts for these surveys are shown by the solid black line. Total counts for these surveys have been adjusted (divided by 5 for visual comparison) and are show by the dashed red line. Total counts from census block counts have been adjusted (divided by 13 for visual comparison) and are shown by the dashed blue line. Population estimates from transect and block counts have been adjusted (divided by 201 for visual comparison) and are shown by the dashed purple line. Intervals shaded in gray indicate historic periods of drought, as determined by the California Department of Water Resources.

Each of the four methods produces counts of significantly differing magnitudes, making direct visual comparison between all four difficult. Following our usage of peak counts throughout these assessments, we have utilized the historic transect peak counts as the primary reference point. For easy visualization, total transect counts have been adjusted, using the average ratio of 5:1 total count to peak count. Total block census counts have also been adjusted,

using the average ratio of 13:1 total count to peak count. Finally, we took the average between the minimum and maximum population estimates for each year, and adjusted them using the average ratio of 201:1 estimate to peak count.

For easy comparison with other sites, Figure 3.8 displays LAX historic transect peak counts separately. The highest peak count was recorded right before the drought in 2011, with 703 individuals observed during one day, and the lowest peak count was recorded directly after the drought in 2018, with 29 individuals. Survey reports from before 1984, 1985, from1996 to 2001, and from 2003 to 2007 were unavailable to the team. The historic transect was no longer utilized after 2019, though there is a slight increase during that year. This increase follows increasing trends shown by the other three population metrics in Figure 3.7.

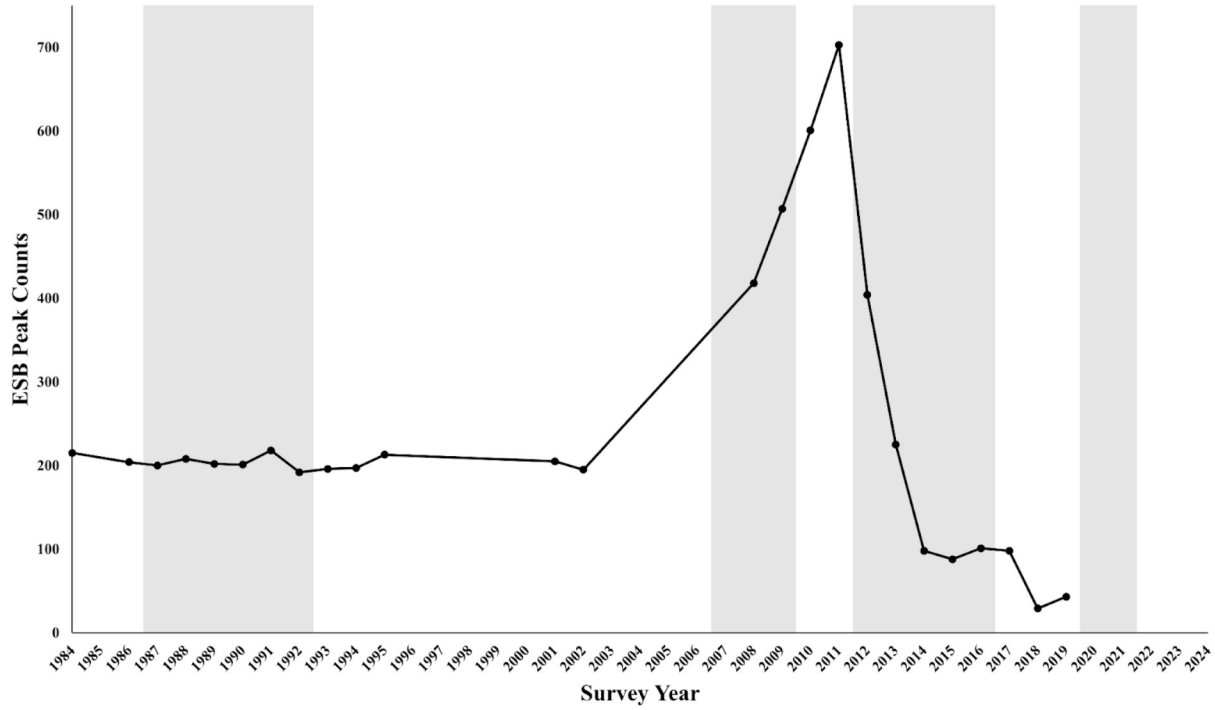

Figure 3.8 - Peak counts of weekly El Segundo Blue Butterfly (*Euphilotes allyni*) transect surveys at the LAX Airport Preserve site. Surveys were conducted along a historic transect route during the estimated peak of the species' flight season. Intervals shaded in gray indicate historic periods of drought, as determined by the California Department of Water Resources.

Recovery Criterion 3 for downlisting and delisting of the species requires populations to show a "statistically significant stable or upward trend (based on transect counts) for at least 8 years". As a key site, the LAX Dunes Preserve appears to host the population that is most likely to meet this criterion within the Airport Recovery Unit. However, not enough data is available to determine a statistically significant trend over the past eight years utilizing any of the available methods. The population growth rate (lambda) cannot be consecutively calculated for this period

using transect peak counts or population estimates due to the cessation of this survey method (see Figure 3.9). While block count census survey data was made available to us for seven of the eight years, lambda was below 1.0 for two of these years, indicating a population decline during those periods. In addition, these data do not meet the criteria of "based on transect counts", rendering these lambda values invalid. Therefore, this site does not meet recovery criteria with respect to population stability. Going forward, conducting consistent, annual transect surveys would allow for the consecutive calculation of lambda to track population growth.

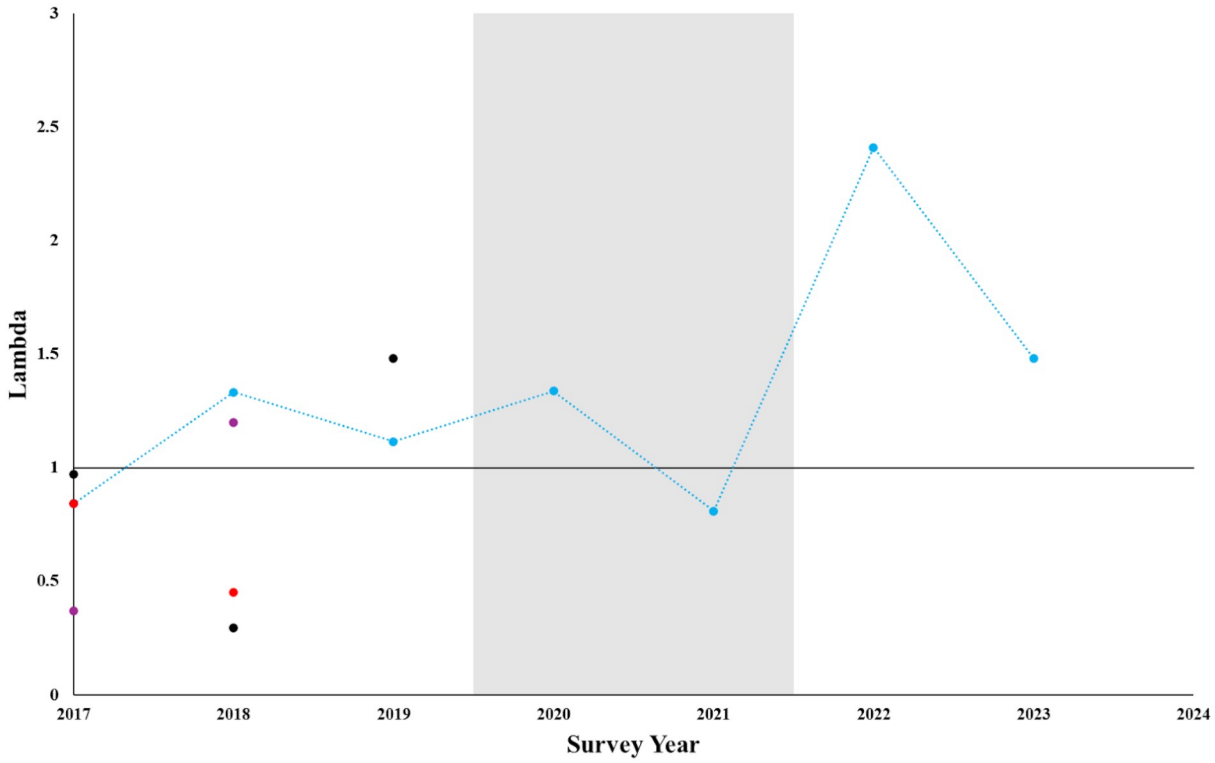

Figure 3.9 - Population growth rate (lambda) of the El Segundo Blue Butterfly (*Euphilotes allyni*) at the LAX Airport Preserve site over the past eight years (2017-2024). Lambda values calculated from the peak counts of surveys conducted along a historic transect route are shown in black. Lambda values calculated from transect total counts are shown in red. Lambda values calculated from derived from block count total counts are shown in blue. Lambda values calculated from seasonal estimates are shown in purple. Intervals shaded in gray indicate historic periods of drought, as determined by the California Department of Water Resources.

Dockweiler State Beach

Figure 3.10 - Map of the Dockweiler State Beach site for the El Segundo Blue butterfly (*Euphilotes allyni*). Boundaries developed by field assessment of extant seacliff buckwheat presence in May, 2025.

Status of legal protections:

The legal authority at Dockweiler State Beach is slightly complicated. While California State Parks owns the beach, it is currently operated and maintained by LACDBH. This sets Dockweiler State Beach apart from the sites at Redondo Beach and Torrance Beach, whose ownership was transferred to the county department completely in 1995.

Historically, before urban development in Los Angeles, the dunes at Dockweiler Beach once extended into the LAX Dunes. Because of its proximity to the LAX Dunes Preserve, the restoration of this site is likely to prove beneficial for the species. Any permits associated with restoration go through the aforementioned Los Angeles Living Shoreline Project. In 2021, this project set out to obtain a Coastal Development Permit, Right of Entry Permit, and a scientific collecting permit in order to carry out scientific monitoring and restoration. While the goals of this project are not specifically focused on the ESB, emphasis on native vegetation and shoreline resilience through the foredune habitat includes planting the seacliff buckwheat (The Bay Foundation, 2021). This project is also CEQA (California Environmental Quality Act) exempt because the project is unlikely to have a significant effect on the environment and thus does not require the review process. The Bay Foundation was able to provide an update to the project with a report in 2024 showing an increase in native plant cover since 2021, and they hope to continue making steady progress in restoring the dunes.

While The Bay Foundation and other organizations continue to do restoration work, there are no permanent legal protections in place. This is most likely because no critical habitat was ever designated here by USFWS. The only protections that exist are under the Endangered Species Act, CEQA, and the California Coastal Act. In practice, these penalties only ensure that future projects must be considered for potential impact on the environment. Because of the lack of permanent and extensive legal documents, aside from those under the ESA preventing harm to the species, protection at this site has been deemed insufficient.

Habitat condition:

Dockweiler State Beach retains a relatively unhealthy and not well-dispersed seacliff buckwheat population. While scattered throughout some of the bluffs, most of this site is overrun with iceplant and other invasives. Only a 0.58 acres of this large site contains a notable number of seacliff buckwheat.

The most notable conservation work currently being implemented is the Los Angeles Living Shoreline Project, a collaborative project to restore beach bluffs in Los Angeles by The Bay Foundation, Los Angeles County Department of Beaches and Harbors (LACDBH), the California Coastal Commission, the City of Los Angeles, and the California Department of Parks and Recreation. However, the condition has severely declined in recent years, because despite the heavy emphasis on restoration, a limited amount of maintenance has been conducted to keep the native restored areas healthy and uninvaded.

Population status:

Dockweiler State Beach was only surveyed for two years. The survey in 2008 was conducted by Ken Osborne, Ann Dalkey, and Rick Rogers each day using transects. In 2009, zero ESBs were observed. Not enough data has been collected to assess the population or make any comments regarding population trends within the past eight years. The highest numerical count was recorded as 31 on July 13th, 2008. Since lambda cannot be calculated for the past eight years, the site does not meet recovery criteria with respect to population stability. Going forward, conducting consistent, annual surveys would provide more detailed and accurate tracking of population changes.

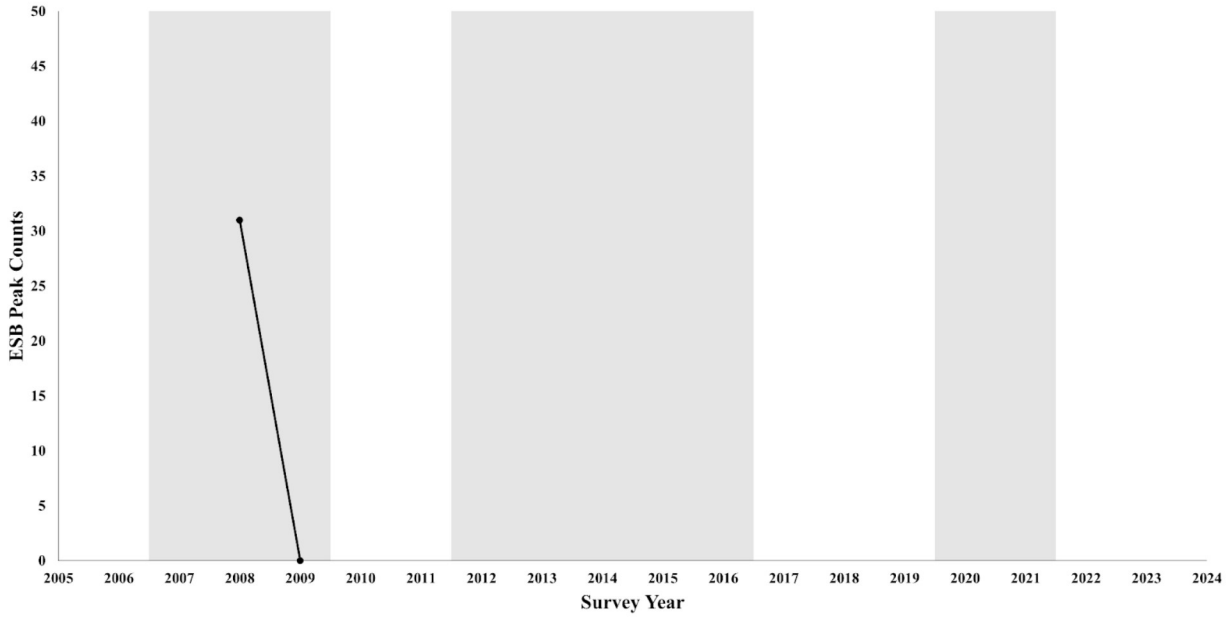

Figure 3.11 - Peak counts of weekly El Segundo Blue Butterfly (*Euphilotes allyni*) transect surveys at the Dockweiler Beach site. Surveys were conducted along a predetermined transect route during the estimated peak of the species' flight season. Intervals shaded in gray indicate historic periods of drought, as determined by the California Department of Water Resources.

El Segundo Recovery Unit

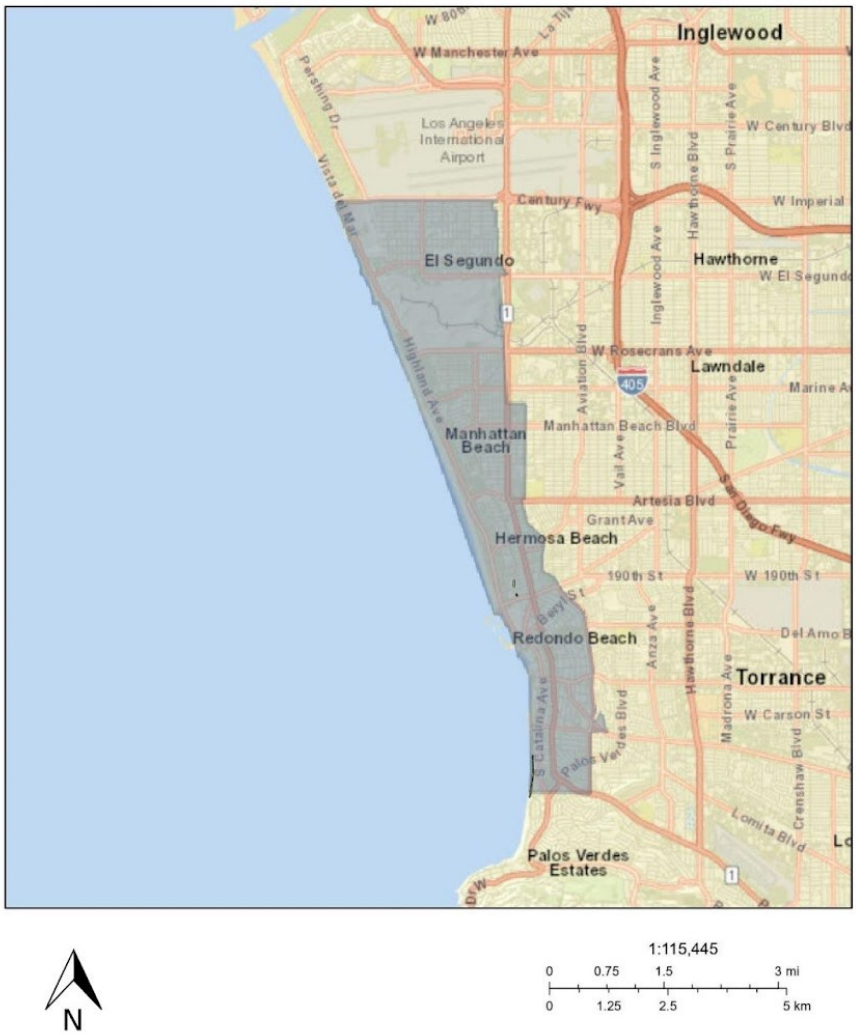

Figure 3.12 - Map of the El Segundo Recovery Unit for the El Segundo Blue butterfly (*Euphilotes allyni*). Boundary adheres to the perimeter delineated in the 2019 U.S. Fish and Wildlife Recovery Amendment for the El Segundo Blue Butterfly. Sites included in this Recovery Unit are the Chevron Preserve and Redondo Beach. Sites in this unit are in medium health.

Key site: Chevron Preserve

Figure 3.13 - Map of Dockweiler State Beach Recovery Site. Boundaries delineated from 2023 Report of El Segundo Blue Population Monitoring and Habitat Management Activities (Arnold, 2023) and corroborated with a site visit in May, 2025.

Status of legal protections:

The Chevron El Segundo Refinery is owned and operated by the Chevron Corporation. Despite continuous outreach efforts, the communications team was unable to establish a clear point of contact for the site or receive complete responses from the landowner. Given that the information was deemed a very sensitive issue, it was not released to us. Monica W. Davis of the El Segundo Blue Butterfly Conservancy (ESBBC) noted that the community relations position has undergone significant changes over the past year and their current contact appears to be unresponsive towards external emails. Though our inquiries were forwarded to him, a response was not guaranteed.

Habitat condition:

The Chevron Preserve is home to a significant amount of seacliff buckwheat, due to the seacliff buckwheat planting efforts from 1981 after the ESB was originally discovered on its land. According to Chevron, the preserve is actively maintained with transplanted seacliff buckwheat to support the butterfly, with more than 15,000 seacliff buckwheat plants grown and transplanted on these lands (Protecting Nature, n.d.). The habitat is privately owned by Chevron, and as such, proper external assessments of the seacliff buckwheat health and density could not be holistically made. However, our evaluation from the perimeter of the property detected the presence of seacliff buckwheat, and paired with reports of the ESB population on this property, we can assume the seacliff buckwheat habitat to be of medium to -high quality.

Population status:

The team could only acquire surveys as far back as 2000, though the report for that year states that surveys have been conducted since 1977 (Arnold, 2001). This report in 2000 by Richard Arnold, addressed to Chevron, Products Company, is the first available recorded observation of this population. Surveys have been conducted utilizing three transect routes that were previously established in 1977. Similar to the LAX Dunes Preserve site, they calculate a seasonal estimate utilizing a trapezoidal numerical integration method, which incorporates transect and block count date. After 2015, however, the seasonal estimate is calculated using the Holmes & Arnold (2015) method. These estimates are visualized alongside peak counts in Figure 3.14. Each of the three methods produces counts of significantly differing magnitudes, making direct visual comparison between all three difficult. Following our usage of peak counts throughout these assessments, we have utilized the transect peak counts as the primary reference point. For easy visualization, population estimates calculated from a trapezoidal numerical integration method have been adjusted, using the average ratio of 40:1 estimate to peak count. Holmes & Arnold (2015) population estimates have also been adjusted, using the average ratio of 6:1 estimate to peak count.

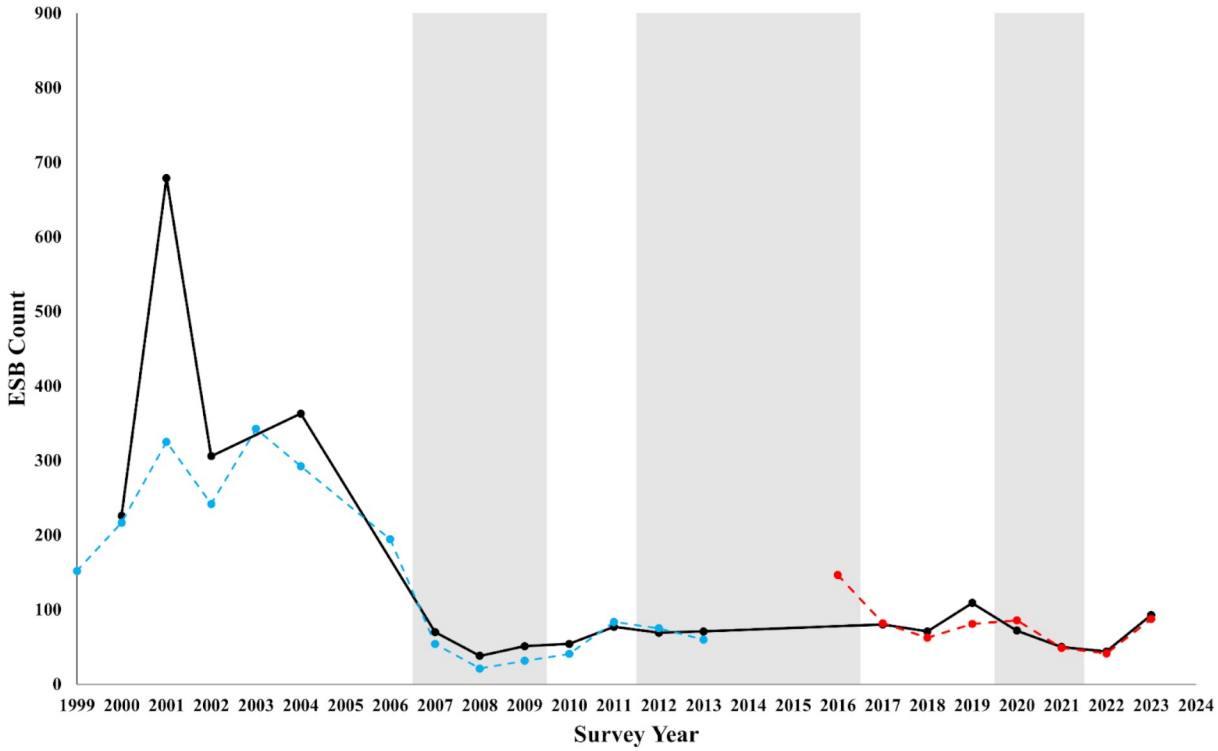

Figure 3.14 - Three population metrics for the El Segundo Blue Butterfly (*Euphilotes allyni*) at the LAX Airport Preserve site. Transect surveys were conducted along a historic transect route during the estimated peak of the species' flight season; peak counts for these surveys are shown by the solid black line. Population estimates calculated from a trapezoidal numerical integration method have been adjusted (divided by 40 for visual comparison) and are show by the dashed blue line. Populations estimates calculated from the Holmes & Arnold (2015) method have been adjusted (divided by 6 for visual comparison) and are shown by the dashed red line. Intervals shaded in gray indicate historic periods of drought, as determined by the California Department of Water Resources.

As is evident in Figure 3.15, the Chevron Preserve appears to support the second largest ESB population relative to other sites. Droughts have negatively affected this population over the course of the past two decades, shown by lower peak counts and population estimates since 2004. The highest peak count was recorded in 2001, with 679 individuals observed during one day, and the lowest peak count was recorded in 2008, with 38 individuals. It appears that the Chevron populations have decreased since the beginning of the century, but have stabilized at this lower count. A possible explanation for this could be that the recorded number of mature seacliff buckwheat individuals dropped from 372 in 2006 to 95 in 2007. This sudden decline in matches with the decrease in ESB counts. Although the 2005 and 2006 ESB population data are unavailable, the 2007 report states that the ESB population estimate for that year (2,114 to 2,207 individuals) was 73% less than 2006 (7,609 to 7,944 individuals). This report also states that the

"record low seasonal rainfall (15% of normal precipitation) is likely responsible for the substantial losses of seacliff buckwheat plant and flowerhead numbers, as well as the increased numbers and proportions of senescent plants" (Arnold, 2007). Seacliff buckwheat was continually planted during the subsequent years, and its numbers rose to 2,984 mature individuals in 2023. The ESB populations, however, have not yet recovered to their previous numbers, as seen in Figure 3.15. Another decline was recorded between 2019 and 2022, but in 2023, the population estimate rose 212% from 2022. The peak recorded count in 2023 was 93 individuals, and the estimated population size was 526. Overall, the population seems to be on the rise since 2022, despite experiencing several losses due to continued losses of seacliff buckwheat plants and lower numbers of flowerheads over the past two decades.

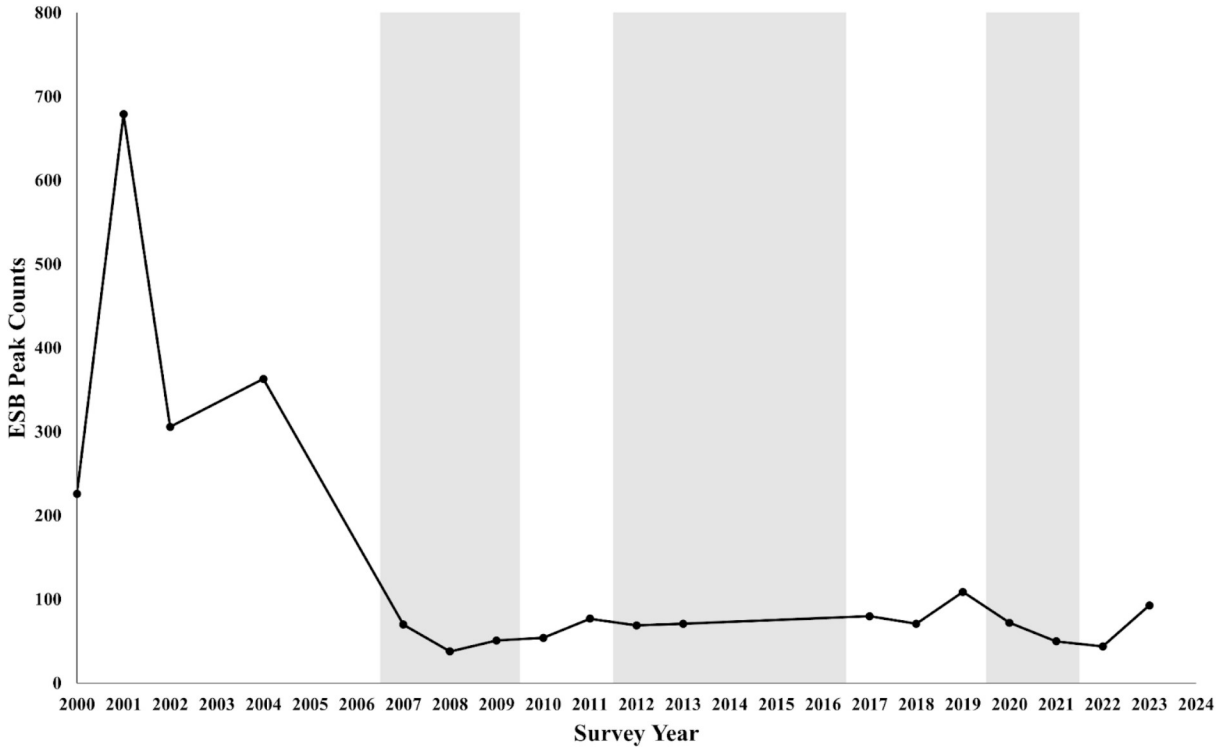

Figure 3.15 - Peak counts of weekly El Segundo Blue Butterfly (*Euphilotes allyni*) transect surveys at the Chevron Preserve site. Surveys were conducted along three predetermined transect routes during the estimated peak of the species' flight season. Intervals shaded in gray indicate historic periods of drought, as determined by the California Department of Water Resources.

Recovery Criterion 3 for downlisting and delisting of the species requires populations to show a "statistically significant stable or upward trend (based on transect counts) for at least 8 years". As a key site, the Chevron Preserve appears to host the population that is most likely to meet this criteria within the El Segundo Recovery Unit. However, not enough data is available to determine a statistically significant trend over the past eight years. The population growth rate

(lambda) cannot be calculated for 2024, as the 2024 report was unavailable to us (see Figure 3.16). Excluding these unknowns, lambda is below 1.0 for four of the six years from peak counts and below 1.0 for four of the seven years from population estimates, indicating population declines during those periods. Therefore, this site does not meet recovery criteria with respect to population stability. Going forward, continued habitat restoration and management is recommended to allow populations to increase naturally.

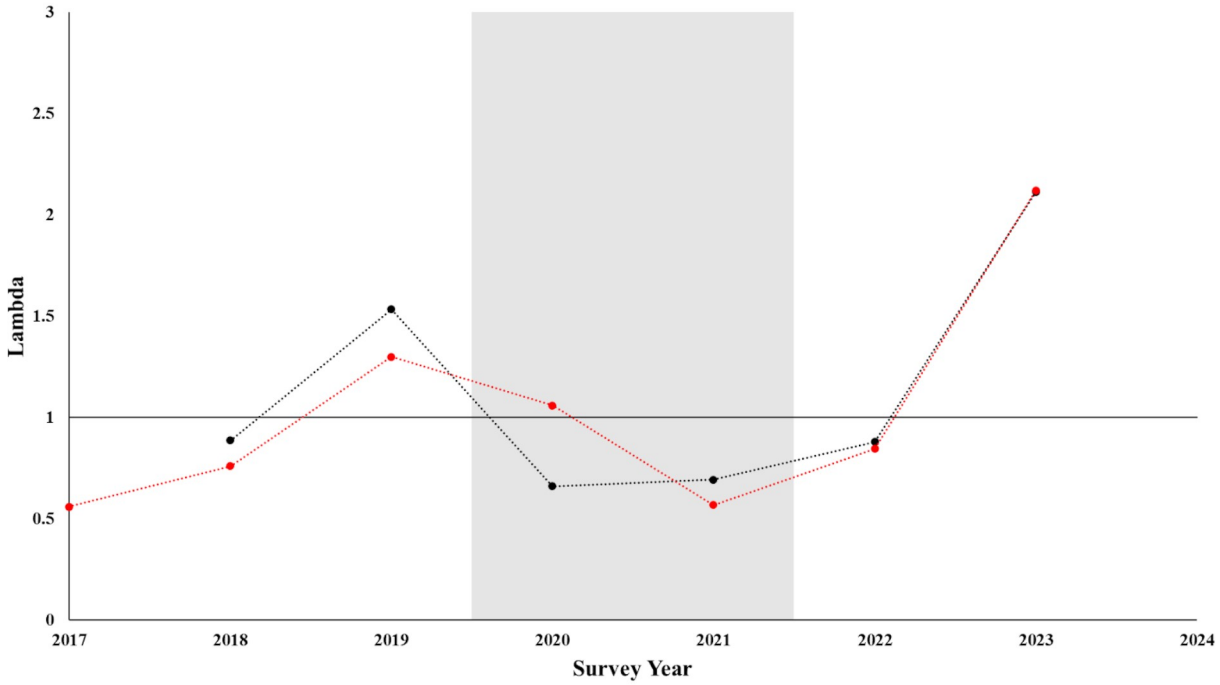

Figure 3.16 - Population growth rate (lambda) of the El Segundo Blue Butterfly (*Euphilotes allyni*) at the Chevron Preserve site over the past eight years (2017-2024). Lambda values calculated from the peak counts of surveys conducted along transect routes are shown in black. Lambda values calculated from Homles & Arnold (2015) population estimates are shown in red. Intervals shaded in gray indicate historic periods of drought, as determined by the California Department of Water Resources.

Redondo Beach

Figure 3.17 - Map of the Redondo Beach site for the El Segundo Blue butterfly (*Euphilotes allyni*). Boundaries delineated from the 2024 Survey Report for El Segundo Blue Butterfly Habitat (Dalkey, 2024), corroborated with a site visit in May, 2025. Habitat quality remains average, approximately 25% seacliff buckwheat (*Eriogonum parvifolim*) and 75% other flora.

Status of legal protections:

LACDBH both owns and operates this property. Currently, there are no permanent legal protections in place at this property. Any existing permits have come about through the Beach Bluffs Restoration Project, where they continue to plant native vegetation and reinforce the health of the beach bluffs. As a public beach, any restoration work has to be evaluated for its impact on public beach activities. Therefore, the only permits that exist are California Coastal Commission permits applied for by organizations such as South Bay Park Land Conservancy. Yet, the public nature of the beach calls for more protection. Because the beach is public, pedestrians looking for a shortcut have caused deep gullies in the slope, eroding the dunes and damaging the habitat (Longcore & Dalkey, 2005). Because of the lack of legal documents, aside from those under the ESA preventing harm to the species, protection at this site has been deemed insufficient.

Habitat condition:

The Redondo Beach portion of the El Segundo Recovery Unit remains small, with, nearly three-quarters of an acre.; however, it is an active recovery site and contains high-quality, densely dispersed seacliff buckwheat. Because the habitat residesWhile residing on a bluff, it does exist on an incline; however, but it is not nearly as steep as some of the other areas in the Palos Verdes Peninsula. The entirety of the Redondo Beach recovery area is surrounded by sidewalks, but the vegetation yet is protected from foot traffic by a fence. Iceplant and other invasive plant species remain present; however, they have been and continue to be are actively being removed from the specified recovery area.

The largest restoration project to take place at Redondo Beach comes as part of the Beach Bluffs Restoration Project, which aimed to restore the coastal bluffs from the Malaga Bluffs to Ballona Creek, along the Santa Monica Bay shoreline. The beginnings of this project started back in 2001 as the Redondo Beach Bluffs Restoration Project, and now works with the cities of Redondo and Torrance, LACDBH, Santa Monica Bay Restoration Commission, California Department of Fish and Game, and USFWS.

Under this project, there have been several restoration efforts at the Redondo Beach bluffs over the years. In 2003, three acres were revegetated with native plants. Notably, this effort removed a significant amount of invasive ice plant (*Carpobrotus edulis*), a plant that continues to pose a threat to the ESB. Subsequently, the ESB was observed in 2007, where they continue to be observed. While the revegetation effort largely increased native plant cover (8% to 23%), the remaining invasive plants continued to spread (Dalkey, 2019). As a result, the Los Angeles Conservation Corps received a USFWS Service Grant (17B0482-18I0218) in 2017 to remove more invasive species, plant native species, and monitor the recovery of the ESB, which covered monitoring in the years 2018, 2019, and 2022.

Population status:

The first recorded observation of this population occurred in 2007 as a part of an investigative survey by Ken H. Osborne, identifying 144 ESBs. Official surveys began in 2008 utilizing a site-specific point observation method (Osborne, 2010) to avoid erosion and damage to vegetation. Peak counts from these surveys are illustrated in Figure 3.18. Lambda cannot be calculated due to several gaps between surveyed years and inaccuracies in data collection.

Excluding 2008, all years surveyed have consisted of only one survey date. The peak count for 2008 may be inaccurate, as the survey began near the peak of the flight season, and the first day's count was labeled only as "Many". Additionally, the observed peak for 2008 occurred on June 22nd, and the 2022 report states that the peak should occur on June 16th, the only day surveyed for that year. Thus, the counts for 2009, 2018, and 2019, which were recorded early to mid-July and have produced significantly lower counts, are likely to be inaccurate. This may explain the apparent drop in population size. In addition, the peak counts of 156 ESBs in 2008 and 116 ESBs in 2022 may suggest that the Redondo population could have experienced a slight decline. However, this is purely conjecture, and additional, yearly surveys must be conducted during the actual peak of the Redondo population flight season before its condition can be determined. As lambda cannot be calculated for the past eight years, the site does not meet recovery criteria with respect to population stability. Going forward, conducting consistent, annual surveys would provide more detailed and accurate tracking of population changes.

If actual peak counts are between 100 and 200 as previously recorded, the Redondo Beach site appears to host one of the larger ESB populations. Its close proximity to Torrance Beach likely allows for genetic flow between the two sites and greater overall resilience. As such, the site appears to be in the best condition within this Recovery Unit, with a high probability of achieving recovery criteria as a supplementary key site.

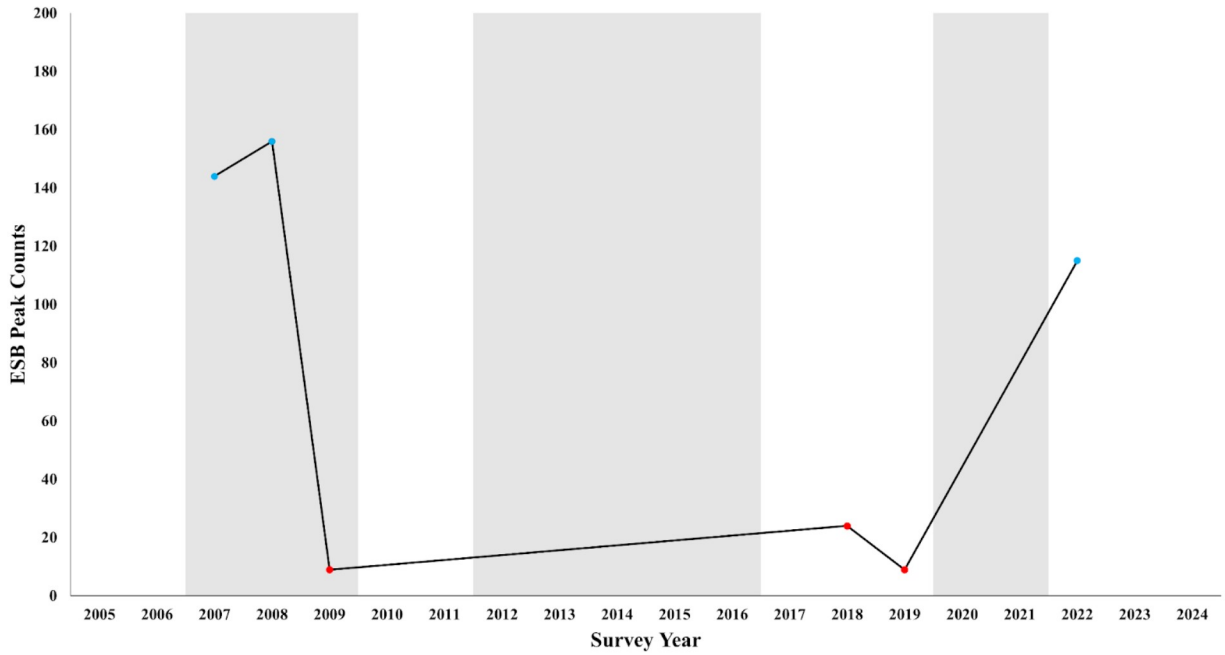

Figure 3.18 - Peak counts of weekly El Segundo Blue Butterfly (*Euphilotes allyni*) surveys at the Redondo Beach site. Point count surveys were conducted during the estimated peak of the species' flight season. Surveys conducted in June are indicated by points in blue, while surveys conducted in July are indicated by points in red. Intervals shaded in gray indicate historic periods of drought, as determined by the California Department of Water Resources.

Recovery Criterion 3 for downlisting and delisting of the species requires populations to show a "statistically significant stable or upward trend (based on transect counts) for at least 8 years". As a supplementary site, Redondo Beach appears to host a population that is very likely to meet this criteria within the near future. However, not enough data is available to determine a statistically significant trend over the past eight years. Surveys had only been conducted during 2018, 2019, and 2022 (or they otherwise were not received by the team) during this time. Thus, the population growth rate (lambda) cannot be consecutively calculated for this period (see Figure 3.19). As such, this site does not meet recovery criteria with respect to population stability. Going forward, conducting consistent, annual surveys during the site's estimated flight season peak would allow for the consecutive calculation of lambda to track population growth.

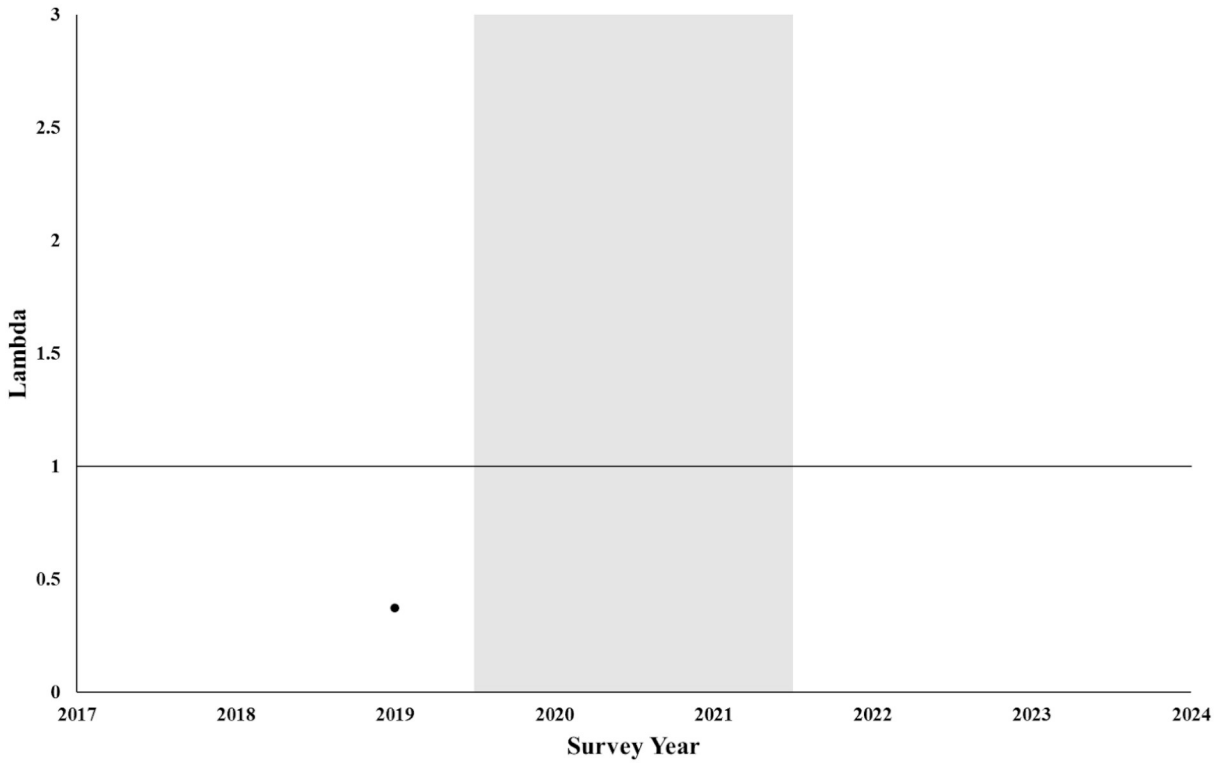

Figure 3.19 - Population growth rate (lambda) of the El Segundo Blue Butterfly (*Euphilotes allyni*) at the Redondo Beach site over the past eight years (2017-2024). Point count observation surveys were conducted during the estimated peak of the species' flight season. Intervals shaded in gray indicate historic periods of drought, as determined by the California Department of Water Resources.

Torrance Recovery Unit

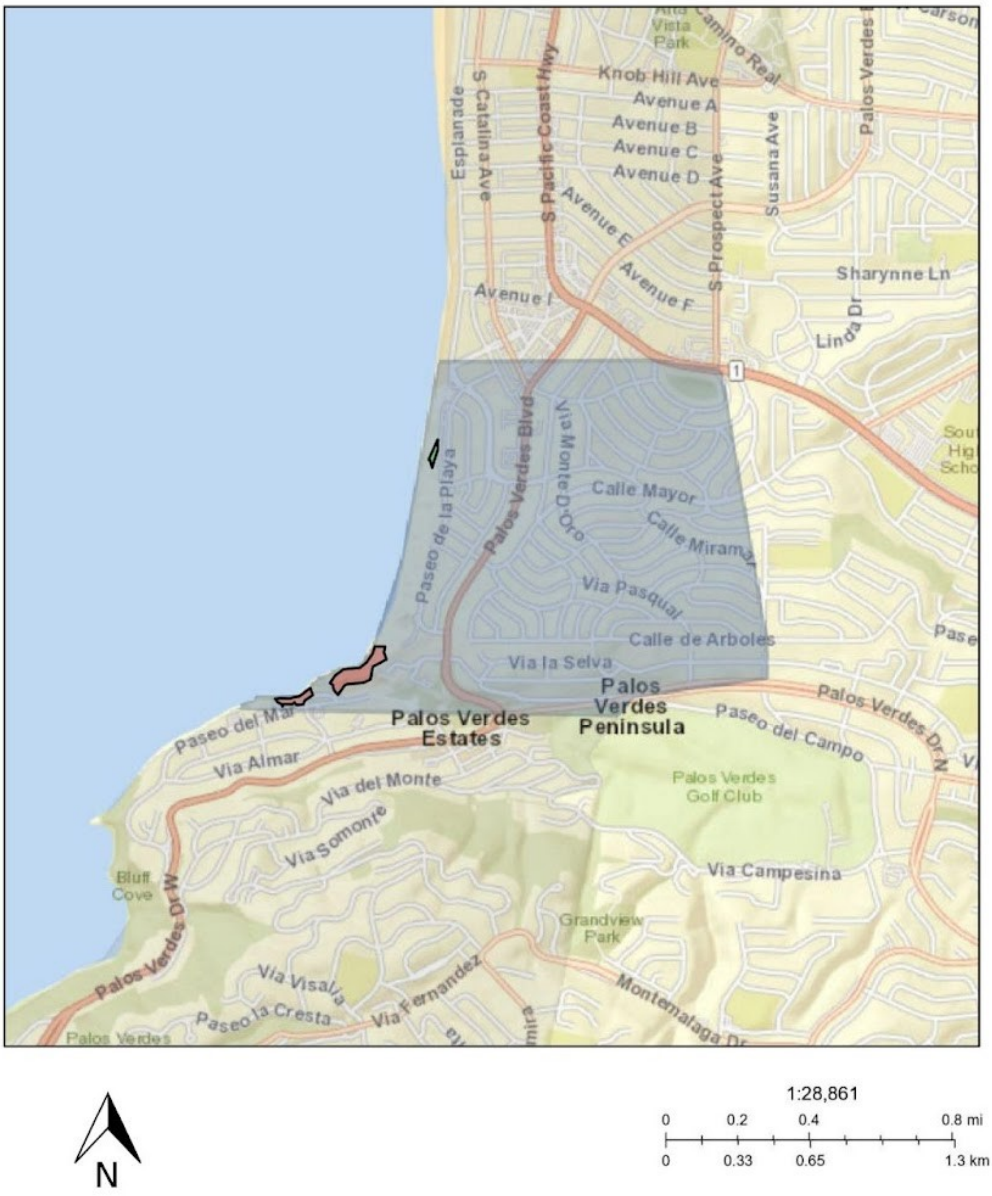

Figure 3.20 - Map of the Torrance Recovery Unit for the El Segundo Blue butterfly (*Euphilotes allyni*). Boundary adheres to the perimeter delineated in the 2019 U.S. Fish and Wildlife Recovery Amendment for the El Segundo Blue Butterfly. Sites included in this Recovery Unit are Torrance Beach and the Malaga Bluffs. Sites in this unit range from low to medium health.

Key site: Torrance Beach

Figure 3.21 - Map of the Torrance Beach site for the El Segundo Blue butterfly (*Euphilotes allyni*). Boundaries delineated from the 2024 Survey Report for El Segundo Blue Butterfly Habitat (Dalkey, 2024), corroborated with a site visit in May, 2025. Habitat quality remains high, approximately 75% seacliff buckwheat (*Eriogonum parvifolium*) and 25% other flora species.

Status of legal protections:

Because of its proximity to Redondo Beach, restoration projects, surveys, and reports often examine these sites in conjunction for efficiency (Longcore & Dalkey, 2005). Therefore, similar to Redondo Beach, Torrance Beach lacks substantial legal protection. The Beach Bluffs Restoration Project mentioned previously also covers Torrance Beach, so current permits only exist as a result of coastal development permits. Because of the lack of legal documents, aside from those under the ESA preventing harm to the species, protection at this site has been deemed insufficient.

Habitat condition:

The Torrance portion of the El Segundo Recovery Unit is directly adjacent to the Redondo Beach site and is being restored and maintained by the same organizations. While the area is smaller than the Redondo recovery area, the seacliff buckwheat presence remains healthier and denser. Additionally, there is very little iceplant present due to the sidewalks and fences separating the area from the massive amount of ice plant that covers the adjacent areas., This allows seacliff buckwheat to thrive alongside a number of other native species as part of ongoing recovery projects.

The ESB population at Torrance Beach was found around the same time as its discovery at Redondo Beach, both of which had been revegetated in previous years.

Population status:

The first recorded observation of this population occurred in 1998 as a part of a survey conducted by Richard Arnold and Oakley Shields in an effort to identify new ESB populations. A follow-up investigative survey was then conducted in 2007 by Ken H. Osborne, identifying 94 ESBs. Official surveys began in 2008 utilizing a site-specific point observation method (Osborne, 2010) to avoid erosion and damage to vegetation. Peak counts from these surveys are illustrated in Figure 3.22.

Excluding 2008, all years surveyed have only consisted of one survey date. Additionally, the observed peak for 2008 occurred on June 22nd, and the 2022 report states that the peak should occur on June 16th, the only day surveyed for that year. Thus, the counts for 2009, 2018, and 2019, which were recorded early to mid-July and have produced significantly lower counts, are likely to be inaccurate. This may explain the apparent drop in population size. In addition, the peak counts of 206 ESBs in 2008 and 239 ESBs in 2022 are relatively similar in magnitude, which may suggest that the Torrance population could be stable. However, this is purely conjecture, and further surveys must be conducted before its condition can be determined.

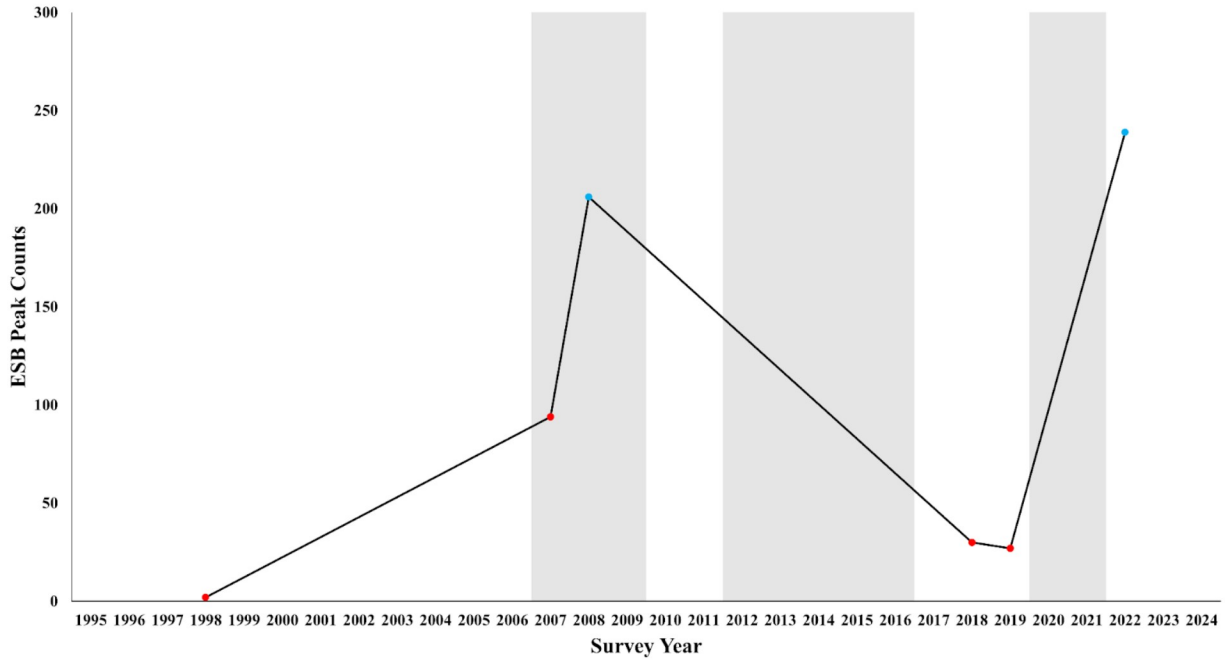

Figure 3.22 - Peak counts of weekly El Segundo Blue Butterfly (*Euphilotes allyni*) surveys at the Torrance Beach site. Point count surveys were conducted during the estimated peak of the species' flight season. Surveys conducted in June are indicated by points in blue, while surveys conducted in July are indicated by points in red. Intervals shaded in gray indicate historic periods of drought, as determined by the California Department of Water Resources.

If actual peak counts are between 200 and 300, as previously recorded, the Torrance Beach site appears to host one of the larger ESB populations. This is impressive given its relatively small area, although it is less surprising due to its close proximity with the Redondo Beach site. This proximity likely allows for genetic flow between the two sites and greater overall resilience. As such, the site appears to be in the best condition within this Recovery Unit, with a high probability of achieving recovery criteria as a key site.

Recovery Criterion 3 for downlisting and delisting of the species requires populations to show a "statistically significant stable or upward trend (based on transect counts) for at least 8 years". As a key site, Torrance Beach appears to host the population that is most likely to meet this criteria within the Torrance Recovery Unit. However, not enough data is available to determine a statistically significant trend over the past eight years. Surveys had only been conducted during 2018, 2019, and 2022 (or they otherwise were not received by the team) during this time. Thus, the population growth rate (lambda) cannot be consecutively calculated for this period (see Figure 3.23). As such, this site does not meet recovery criteria with respect to population stability. Going forward, conducting consistent, annual surveys during the site's

estimated flight season peak would allow for the consecutive calculation of lambda to track population growth.

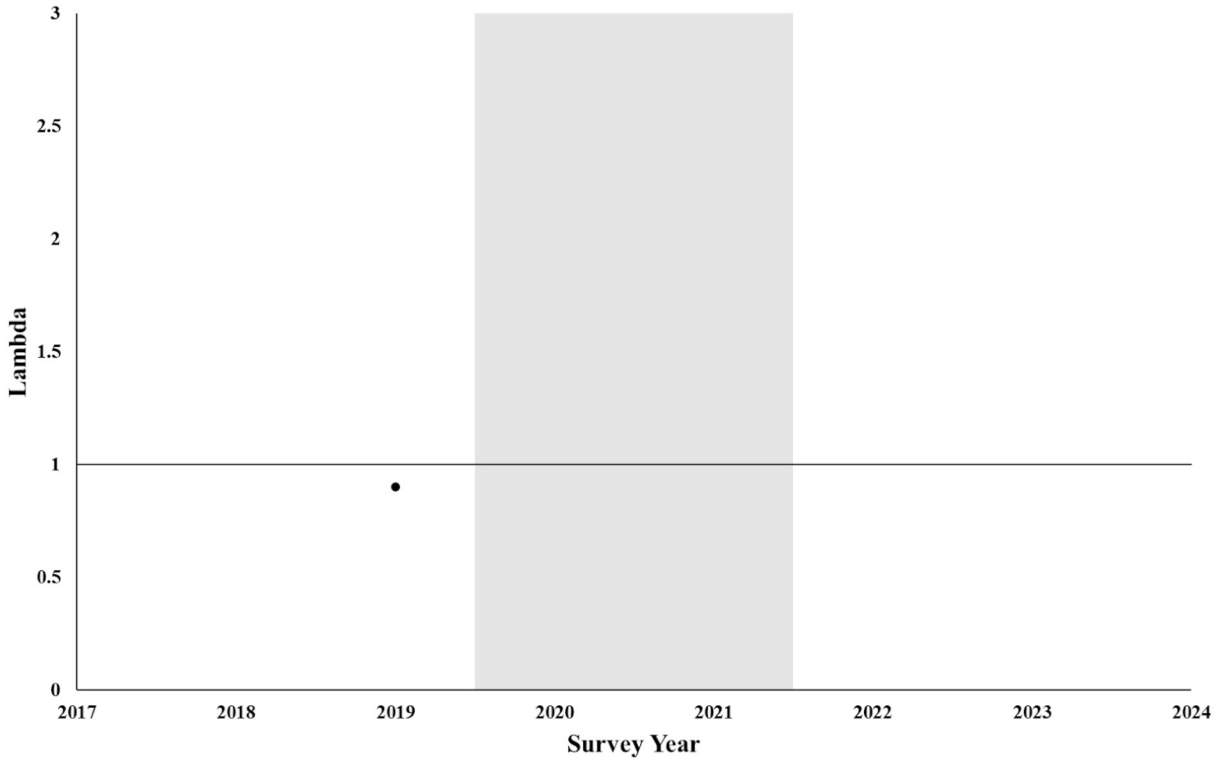

Figure 3.23 - Population growth rate (lambda) of the El Segundo Blue Butterfly (*Euphilotes allyni*) at the Torrance Beach site over the past eight years (2017-2024). Point count observation surveys were conducted during the estimated peak of the species' flight season. Intervals shaded in gray indicate historic periods of drought, as determined by the California Department of Water Resources.

Malaga Bluffs

Figure 3.24 - Map of the Malaga Bluffs site for the El Segundo Blue butterfly (*Euphilotes allyni*). Boundaries delineated by site visits in May, 2025 and corroborated with satellite imagery data from ArcGIS Pro. Seacliff buckwheat (*Eriogonum parvifolium*) presence remained sparse.

Status of legal protections:

While restoration work and minimal surveying have occurred at this site, establishing legal protections for the ESB has proven difficult because most of these properties are privately owned and residential. According to a survey at the Malaga Bluffs conducted in 2001, landowners of the observed sites (29 properties) were contacted to establish willingness, with 21 properties granting surveying permission (Longcore & George, 2001).

Because these properties are private, restoration and surveying can only occur with landowner cooperation. The strict nature of the California Coastal Act (Section 30240) specifies the ban of any disruptive uses of ESHAs permanently, which may make landowners reluctant to commit. Because of the lack of conservation easements over these properties currently, aside from those under the ESA preventing harm to the species, protection at this site has been deemed insufficient.

Habitat condition:

Malaga Cove marks the end of the El Segundo Recovery Unit and the beginning of the proposed Palos Verdes Recovery Unit. In this transitional bluff zone, the cliffs become steeper than the northern sites, yet still remain as viable habitat for seacliff buckwheat. Within Malaga Cove, however, there lacks a strong recovery program, and thus, the presence of seacliff buckwheat remains low in density and health. While seacliff buckwheat is present, there is still work to be done to ensure that this transitional zone from Torrance to Palos Verdes remains healthy to support a strong ESB population.

Population status:

The Malaga Bluffs have been surveyed sporadically over the years, likely due to the fact that much of its cliffs habitat is either on or adjacent to private property. The first recorded observation of this population occurred in 1998 as a part of a survey conducted by Richard Arnold and Oakley Shields in an effort to identify new ESB populations. The survey was conducted on July 12th, recording a total of four individuals. It was later surveyed at near-weekly intervals starting July 12th in 2001 to produce a total of 126 ESBs, though no peak count could be extracted. Surveys in 2008 and 2009 were also conducted late June to mid-July, producing peak counts of two for each year, which were fairly low compared to the 2001 total. However, in 2020 and 2021, surveys began earlier, producing peak counts on July 5th and 6th respectively. A transect was established using the Pollard-Yates method during the 2021 survey.

The general size of the population is difficult to estimate, but the two most recent surveys suggest that the population is in the low to middle range, with respect to other sites, and is increasing. The highest peak count of 29 ESBs was observed during 2021, following the second-highest peak count of eight in 2020. This population increase follows a successful habitat restoration project that concluded in 2020. Due to a lack of surveys, it is unclear how drought may have affected the population.

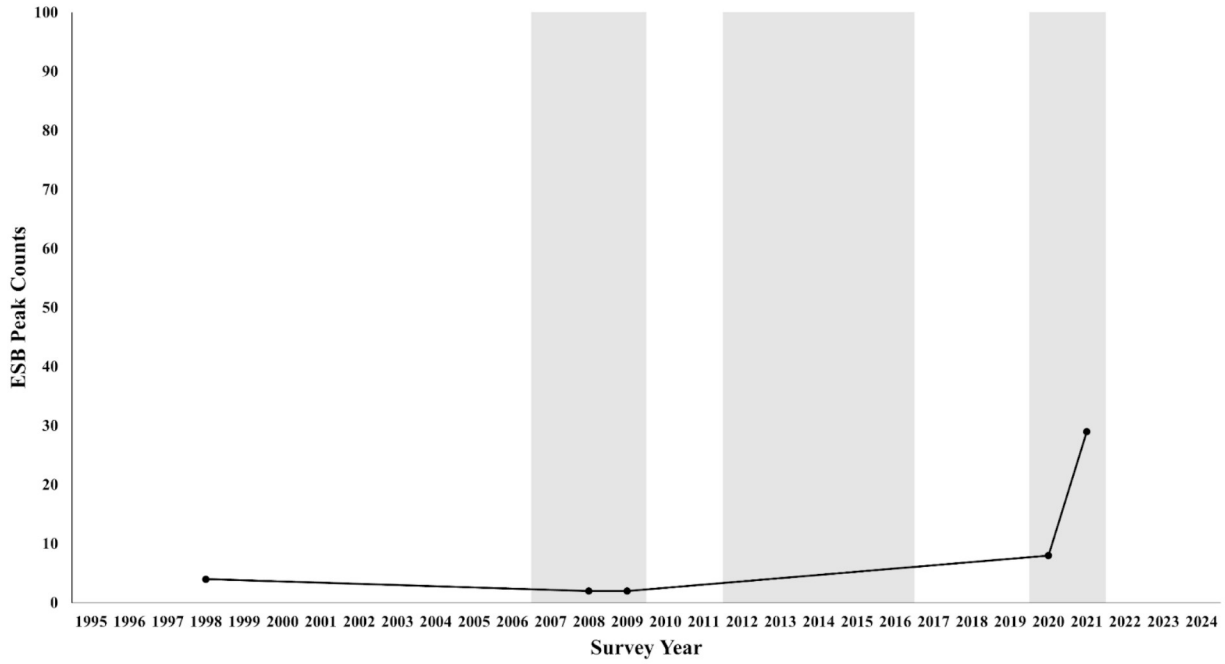

Figure 3.25 - Peak counts of El Segundo Blue Butterfly (*Euphilotes allyni*) surveys at the Malaga Bluffs site. Surveys were conducted mid-June to mid-July. Intervals shaded in gray indicate historic periods of drought, as determined by the California Department of Water Resources.

Recovery Criterion 3 for downlisting and delisting of the species requires populations to show a "statistically significant stable or upward trend (based on transect counts) for at least 8 years". The most recent data suggest a population increase, however, the site has not been surveyed since 2021. Not enough data is available to determine a statistically significant trend over the past eight years. Thus, the population growth rate (lambda) cannot be consecutively calculated for this period (see Figure 3.26). As such, this site does not meet recovery criteria with respect to population stability. Going forward, conducting consistent, annual surveys during the estimated peak of the population's flight season would allow for the consecutive calculation of lambda to track population growth.

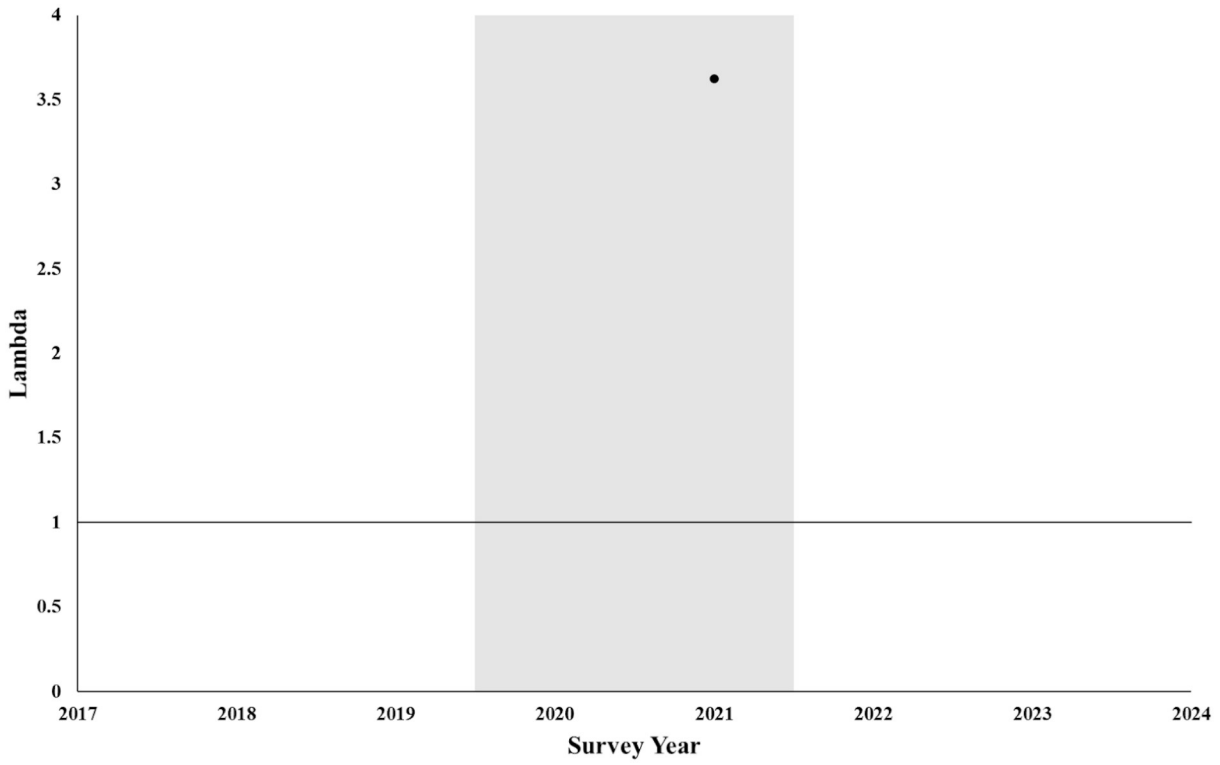

Figure 3.26 - Population growth rate (lambda) of the El Segundo Blue Butterfly (*Euphilotes allyni*) at the Malaga Bluffs site over the past eight years (2017-2024). Intervals shaded in gray indicate historic periods of drought, as determined by the California Department of Water Resources.

Proposed Palos Verdes Recovery Unit

Figure 3.27 - Map of the proposed Palos Verdes Recovery Unit for the El Segundo Blue butterfly (*Euphilotes allyni*). Boundaries were corroborated with a site visit in May, 2025. Seacliff buckwheat (*Eriogonum parvifolim*) presence was found in medium-high amounts across the Recovery Unit. Sites in this unit range from medium-high health.

The proposed Palos Verdes Recovery Unit includes the four sites discussed in this report: Point Vicente/Vicente Bluffs, Abalone Cove, Alta Vicente, and Pelican Cove. The proposed protections present at the Palos Verdes properties are the strongest of all the sites presented in this report, due to the protection of a Natural Communities Conservation Plan (NCCP) in conjunction with a Habitat Conservation Plan (HCP), both of which have allowed the use of conservation easements. It was agreed in 2019 that Palos Verdes Peninsula Conservancy (PVPLC) manages the habitats within the Preserve on behalf of and with support from the City of Rancho Palos Verdes (landowner), with Wildlife Agencies (as third-party beneficiaries)

implementing NCCP/HCP conservation easements. It should be noted, however, that most of these proposed conservation easements have not been implemented yet. In 2019, the City Council adopted a resolution to enact the NCCP/HCP. In the hearing for this adoption, the City stated: "The City has made a commitment in the NCCP/HCP to manage NCCP/HCP Nature Preserve lands in perpetuity for the protection of the covered species and their habitats and has committed to fund management of the lands in a minimum amount of $1.5 Million annually during the permit term" (*Rancho Palos Verdes Public Hearing for NCCP/HCP Adoption*, 2019).

The NCCP/HCP Preserve covers 1402.4 acres of the Palos Verdes property, which includes Vicente Bluffs, Abalone Cove, Upper and Lower Point Vicente, Pelican Cove, Alta Vicente. An additional site, Lunada Canyon, has had ESB sightings in the past, however it has not been analyzed in this report due to lack of data and a lack of a significant ESB presence.

Protection at both the state and federal level in the form of these permits have allowed PVPLC to enact conservation easements over existing public and private property that would be "monitored and managed in perpetuity for the benefit of 10 covered species," species of which the ESB is included (*Rancho Palos Verdes Public Hearing for NCCP/HCP Adoption*, 2019, pp. 39). The plan states that a qualified biologist will survey occupied and potential ESB habitat under the plan area during peak flight period (June 20-August 20) every three years. Both PVPLC and the City of Rancho Palos Verdes are required to "enhance/restore a minimum of 5 acres per year within the Preserve," with special emphasis on areas that have moderate to high potential for success by enhancing habitat patch size and linkage (*Final NCCP and HCP for Rancho Palos Verdes*, 2019, pp. 52).

Notably, as of this report, the California Department of Fish and Wildlife (CDFW) have not yet issued a NCCP despite the city's resolution to do so, and the City of Rancho Palos Verdes is still in the process of acquiring this permit. Because of this, there remain steps of the plan that are intended to be completed post permit issuance. The NCCP is a crucial part of this plan because it requires conservation actions to *improve* the overall condition of a species, applied at a regional scale to promote long-term recovery. On the other hand, the HCP only requires the avoidance of a net adverse impact on species. Therefore, the downlisting criteria of the ESB cannot be reasonably met until the NCCP is issued. Once the permits are issued, conservation easements will formally protect the Preserve within 90 days of issuance. As of now, more than half of the preserved properties have conservation easements recorded.

The City of Rancho Palos Verdes is highly committed to conservation. They continue working with CDFW to acquire the NCCP necessary to complete the plan's implementation steps.

Key site: Vicente Bluffs

Figure 3.28 - Map of Vicente Bluffs Preserve site for the El Segundo Blue butterfly (*Euphilotes allyni*). Boundaries outlined in the Survey Report for the El Segundo Blue Butterfly (*Euphilotes battoides allyni*) in the Palos Verdes Nature Preserve 2024 (Parker & Sarabia, 2024), and corroborated with site visits to the Southern portion in May 2025. Seacliff buckwheat presence remains extremely healthy with plenty of native habitat nearby.

Status of legal protections:

See above. The Vicente Bluffs Reserve is one of the 12 Preserves, which includes Pelican Cove and Lower Point Vicente (City of Rancho Palos Verdes, 2019, p.55).

Habitat condition:

Vicente Bluffs contains a bulk of the seacliff buckwheat habitat in Palos Verdes, including Lower Point Vicente, the Fishing Access property, Pelican Cove, and the habitat areas in the Oceanfront Estates Open Space. Two sites at Pelican Cove established previously were considered an extension of Vicente Bluffs in surveys from 2019 onward (Dalkey, 2016). The coastline below this area also includes Point Vicente and Terranea Resort. Lower Point Vicente and Oceanfront Estates Open Space have seacliff buckwheat of medium density and medium health quality. Seacliff buckwheat quality seems to improve moving down this coastline, with the healthiest seacliff buckwheat concentrated around Terranea Resort. All of the land here is public, Some of this area has been manually restored, such as the patch of native habitat in front of the Point Vicente Cultural Center. While some areas have invasive black mustard plants (*Brassica nigra)* near the seacliff buckwheat, their presence seems to have a limited effect on its health or prevalence.

Population status:

The first recorded observations of this population occurred in 2006 by Gordon Pratt during a non-protocol survey, conducted to determine their presence or absence along the Palos Verdes Peninsula (Pratt, 2006). Due to the site's geography and seacliff buckwheat distribution, surveys were conducted using Pollard transects only for the years 2006, 2010, 2022, and 2024, whereas all other surveys were conducted using point observations. Peak counts from these surveys are illustrated in Figure 3.29. Although lambda cannot be calculated due to several gaps between these surveys, it appears that the Vicente Bluffs population has been increasing since 2014. However, the most recent survey shows a decrease from a count of 30 in 2022 to a count of 18 in 2024. The total number of observed individuals was also lower, with 61 recorded in 2022 and 28 in 2024. The reason for this decline is unclear, though the report states that three of the five survey days exhibited cloudy weather, which could have interfered with ESB activity (Parker & Sarabia, 2024). It is important to note that from 2019 onwards, transects within Pelican Cove have been regarded as a part of the Vicente Bluffs site. As such, all counts have been included in the Vicente Bluffs Preserve site data. The Pelican Cove area was first surveyed in the non-protocol survey of 2006, resulting in a peak count of 13 ESBs. Since then, however, counts have not exceeded one individual. The reason for this is unclear, although in 2016, the ongoing drought was cited to have negatively impacted the seacliff buckwheat distribution and recruitment in the area, and the plant's numbers remained low in the following years (Dalkey, 2016).

While the population is smaller than its more northern counterparts, the Vicente Bluffs has been regarded as retaining "the best ESB habitat" and containing "the highest number of

ESB" in the Palos Verdes Peninsula (Parker & Sarabia, 2024). The highest peak count was recorded in 2022 with 30 individuals observed during one day, and the lowest peak count was recorded in 2009 with 3 individuals during one day. Despite the 2011-2017 drought, this population has shown an increase in its numbers over the past decade. While a significant loss of seacliff buckwheat was reported in 2014 due to the drought, efforts to irrigate and restore the host plant afterwards proved successful (Dalkey, 2014). Continued habitat restoration and management have shown significant, positive impacts on this population, aiding its resilience during the drought and allowing for impressive population growth. As such, the site appears to be in the best condition within this Recovery Unit, with a high probability of achieving recovery criteria as a key site.

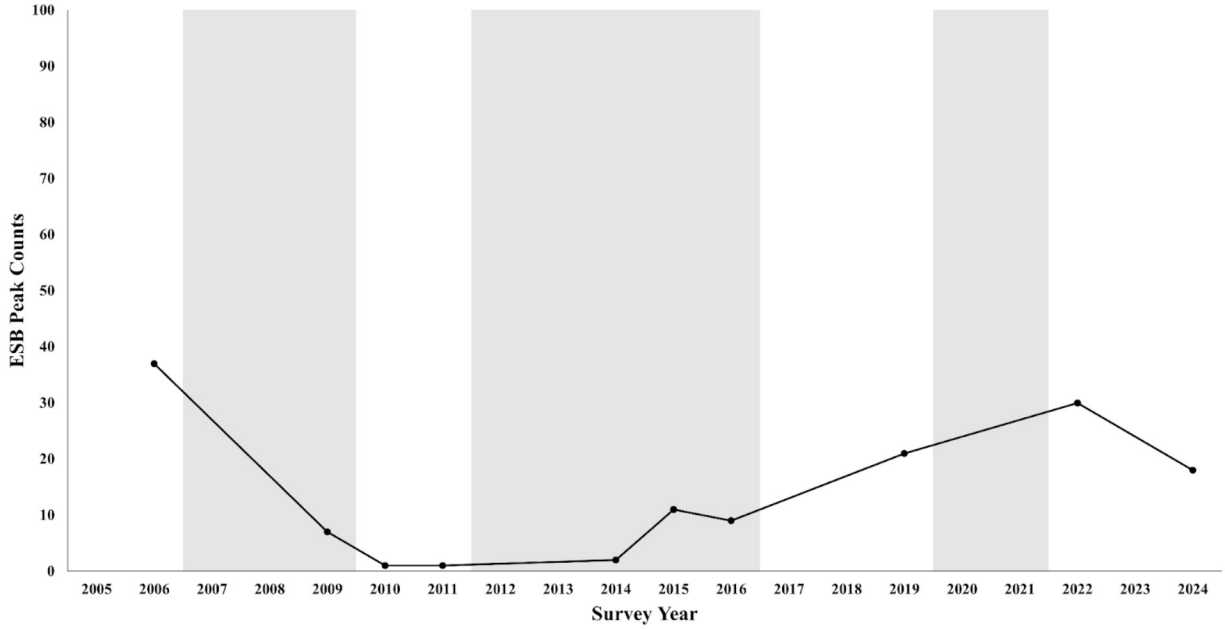

Figure 3.29 - Peak counts of El Segundo Blue butterfly (*Euphilotes allyni*) surveys at the Vicente Bluffs Reserve site. Surveys were conducted during the estimated peak of the species' flight season. Intervals shaded in gray indicate historic periods of drought, as determined by the California Department of Water Resources.

Recovery Criterion 3 for downlisting and delisting of the species requires populations to show a "statistically significant stable or upward trend (based on transect counts) for at least 8 years". As a key site, the Vicente Bluffs appears to host the population that is most likely to meet this criteria within the proposed Palos Verdes Recovery Unit. However, not enough data is available to determine a statistically significant trend over the past eight years. The population growth rate (lambda) cannot be calculated due to a lack of consecutive surveys. Therefore, this site does not meet recovery criteria with respect to population stability. Going forward, conducting consistent, annual surveys would provide more detailed and accurate tracking of population changes.

Alta Vicente

Figure 3.30 - Map of the Alta Vicente Preserve site for the El Segundo Blue butterfly (*Euphilotes allyni*). Boundaries are outlined in the Survey Report for the El Segundo Blue Butterfly (*Euphilotes battoides allyni*) in the Palos Verdes Nature Preserve 2024 (Parker & Sarabia, 2024).

Status of legal protections:

See above. The Alta Vicente Reserve, one of the 12 Preserves, includes Upper Point Vicente. Existing agricultural uses are allowed to continue operation here (5.5 acres) as long as City approval continues and all agricultural practices follow the NCCP/HCP, but no other agricultural activities are allowed (City of Rancho Palos Verdes, 2019, p.104). The NCCP/HCP has allowed for a restoration project that has been ongoing since 2008 (Vona, 2007).

Habitat condition:

The Alta Vicente habitat has a healthy abundance and relatively high density of seacliff buckwheat. This public habitat is above and adjacent to the Vicente Bluffs section, allowing for habitat connectivity between two very healthy sections. Limited invasive species were spotted in these habitats. This site is quite large and makes up a large portion of the Palos Verdes ESB habitats. Under the NCCP/HCP implemented by the City of Rancho Palos Verdes, Alta Vicente is also part of an ongoing restoration project started in 2008 (Vona, 2007).

Population status:

A cursory survey was conducted at this site in 2014, and the first recorded observation of this population occurred in 2015 by Ann Dalkey. Over time, additional locations within the site have been surveyed. Due to the site's geography and seacliff buckwheat distribution, surveys were conducted using Pollard transects only during the years 2022 and 2024, whereas all other surveys were conducted using point observations. Peak counts from these surveys are illustrated in Figure 3.31. Although lambda cannot be calculated due to several gaps between these surveys, it appears that the Alta Vicente population has relatively low and unstable numbers. The most recent survey shows a decrease from a count of 3 in 2022 to a count of 0 in 2024. The reason for this decline is unclear, despite "abundant *E. parvifolium* that has been established in the last decade" (Parker & Sarabia, 2024).

This population has shown consistently low numbers of ESB. The highest peak count was recorded in 2022 with three individuals observed during one day, with a total of four ESBs for that year. Excluding zeros, the lowest peak count was recorded in 2015 and 2019 with one individual observed during one day, for a total of one ESB for each year. No ESBs were observed during 2014, 2016, and 2024. Due to low counts and a lack of long-term survey data, we cannot determine the effect of the 2011-2017 drought on this population. While the site has had continual habitat restoration and management, ESB populations have remained relatively low and unstable. Unlike the other survey locations within the RU, transects at Alta Vicente are inland and not adjacent to any cliffs or shoreline. It is also separated from the larger Vicente Bluffs site by a four-lane road, which may potentially inhibit the species' ability to establish a strong population within Alta Vicente. Additionally, the timing of these low counts coincide with low counts for Abalone Cove during 2014 to 2019 and 2024, where no ESBs were observed. Further research is needed to determine the cause of these low ESB numbers. However, as stated within the most recent report, Alta Vicente has "potential for further maintenance and

enhancement in the coming years" (Parker & Sarabia, 2024). Continued restoration and management to support the site's habitat and enhance site connectivity may lead to more stable ESB establishment in the future.

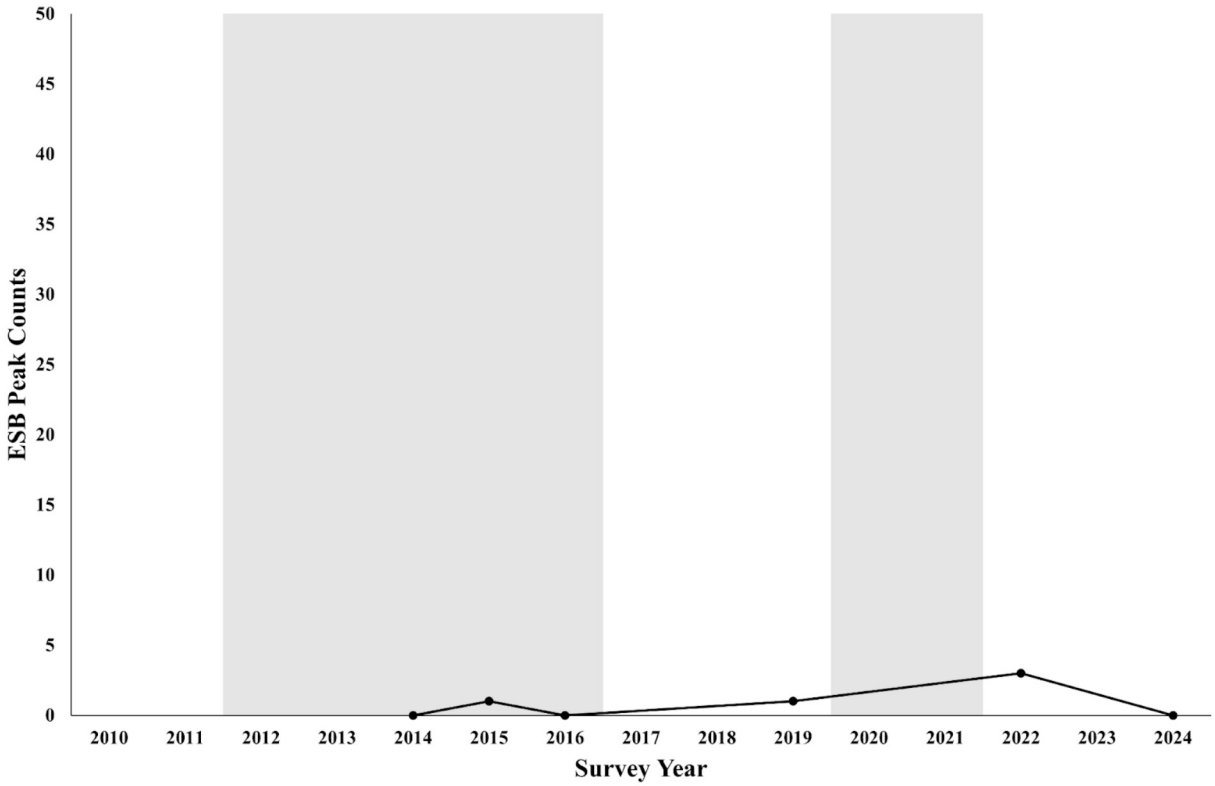

Figure 3.31 - Peak counts of El Segundo Blue butterfly (*Euphilotes allyni*) surveys at the Alta Vicente Reserve site. Surveys were conducted during the estimated peak of the species' flight season. Intervals shaded in gray indicate historic periods of drought, as determined by the California Department of Water Resources.

Recovery Criterion 3 for downlisting and delisting of the species requires populations to show a "statistically significant stable or upward trend (based on transect counts) for at least 8 years". However, not enough data is available for Alta Vicente to determine a statistically significant trend over the past eight years. The population growth rate (lambda) cannot be calculated due to a lack of consecutive surveys. Therefore, this site does not meet recovery criteria with respect to population stability. Going forward, conducting consistent, annual surveys would provide more detailed and accurate tracking of population changes.

Abalone Cove

Figure 3.32 - Map of the Alta Vicente Preserve site for the El Segundo Blue butterfly (*Euphilotes allyni*). Boundaries are outlined in the Survey Report for the El Segundo Blue Butterfly (*Euphilotes battoides allyni*) in the Palos Verdes Nature Preserve 2024 (Parker & Sarabia, 2024), and were corroborated with a site visit in May, 2025. Seacliff buckwheat (*Eriogonum parvifolim*) presence was primarily focused in the site's northern corner.

Status of legal protections:

See above. Abalone Cove is part of the Abalone Cove Reserve, one of the 12 reserves that make up the Preserve, and includes portions of the State Ecological Reserve Area. The property was previously owned by the Redevelopment Agency (RDA), but transferred to the County of Los Angeles in 1988 (City of Rancho Palos Verdes, 2019, p.60).

Habitat condition:

Abalone Cove covers the tail end of ESB habitat in the Palos Verdes section, marking it the southernmost point of the butterfly's range. Abalone Cove itself is a restoration preserve but the quality and density of seacliff buckwheat is not as strong as other areas such as Redondo and Lunada Bay. While active restoration efforts continue, personal site observations show that much of the protected bluffs are vacant of seacliff buckwheat and areas that do contain seacliff buckwheat lack in health. The size of this site is quite large, as is the case for the majority of the proposed Palos Verdes Recovery Unit. As such, the potential for further expansion of seacliff buckwheat presence remains strong.

Population status:

The site was first surveyed in 2009 by Ann Dalkey, and the first recorded observation of this population occurred in 2022. Over time, observation locations have changed and additional locations within the site have been surveyed. Due to the site's geography and seacliff buckwheat distribution, surveys were conducted using Pollard transects only during the years 2006, 2010, 2022, and 2024, whereas all other surveys were conducted using point observations. Peak counts from these surveys are illustrated in Figure 3.33. It appears that the Abalone Cove population increased sharply in 2022 before falling back to zero recorded ESBs in 2024, though the reason for this decline is unclear.

This population has shown potential for quick and sizable growth, with the spike from zero observed in 2019 to a peak of 16 observed in 2022. The 2022 survey showed the highest and only peak count, as the species has not been observed in any other surveys. Due to low counts and a lack of long-term survey data, we cannot directly determine the effect of the 2011-2017 drought on this population. However, drought was shown to have affected the site's abundance of seacliff buckwheat (Dalkey, 2014). Habitat restoration and management have led to a greater abundance of seacliff buckwheat and the site's subsequent population spike in 2022. As stated in the most recent report, "with the continued success of restoration efforts, the [Abalone Cove] ESB population has a good probability of success" (Parker & Sarabia, 2024).

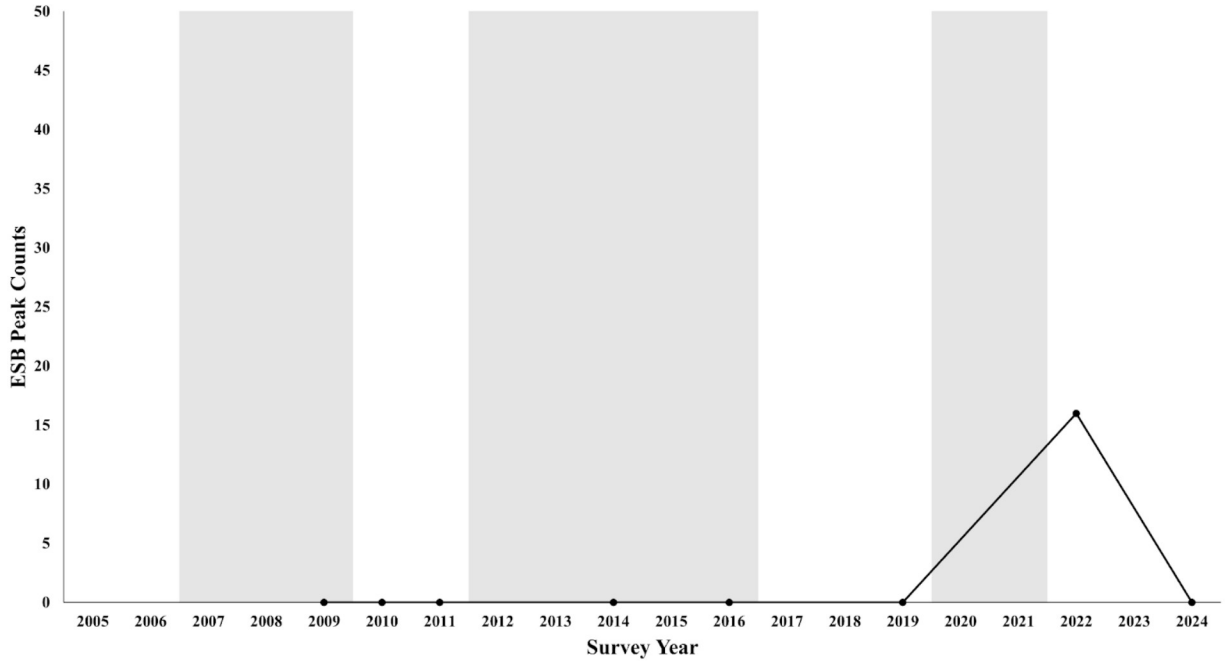

Figure 3.33 - Peak counts of El Segundo Blue butterfly (*Euphilotes allyni*) surveys at the Abalone Cove site. Surveys were conducted during the estimated peak of the species' flight season. Intervals shaded in gray indicate historic periods of drought, as determined by the California Department of Water Resources.

Recovery Criterion 3 for downlisting and delisting of the species requires populations to show a "statistically significant stable or upward trend (based on transect counts) for at least 8 years". However, not enough data is available for Abalone Cove to determine a statistically significant trend over the past eight years. The population growth rate (lambda) cannot be calculated due to a lack of consecutive surveys. Therefore, this site does not meet recovery criteria with respect to population stability. Going forward, conducting consistent, annual surveys would provide more detailed and accurate tracking of population changes.

Assessment of existing community education and involvement programs

Public outreach efforts related to the ESB span five Recovery Units throughout the South Bay region. These efforts are supported by a network of nonprofits, agency partners, and community groups that offer habitat restoration events, educational resources, and volunteer opportunities. Among the most active organizations are the ESB Coalition, The Bay Foundation, Friends of Ballona Wetlands, South Bay Parkland Conservancy, Urban Wildlands Group and the Palos Verdes Peninsula Land Conservancy. Together, their outreach activities are key to promoting stewardship and increasing public awareness about the sensitive coastal dune ecosystems where the ESB resides.

Within the Ballona Recovery Unit, the key site is the Ballona Wetlands. The Friends of Ballona Wetlands host regular nature tours, monthly volunteer events, and environmental education programs that link ESB conservation with broader wetland health. These events are well-attended and show how volunteer involvement can successfully reduce restoration costs while fostering a sense of local responsibility for conservation. However, opportunities remain to expand youth engagement by building curriculum-aligned programming for schools and increasing the availability of educational signage, including materials for self-guided learning.

The Airport Recovery Unit, anchored by the LAX Dune Preserve, contains the largest contiguous habitat for the ESB. Restoration work here is led by The Bay Foundation in partnership with Los Angeles World Airports (LAWA), and public volunteer events are held roughly once a month. However, public access is generally restricted, and outreach is limited to occasional signage inside the airport and guided events. While public access is generally restricted, LAWA has invested in impressive educational displays within the airport that highlight the unique habitat and species. Expanding educational engagement through more frequent guided tours, improved digital storytelling, and trail infrastructure that prevents off-trail walking and habitat disturbance. Consequently, the profile of this site would help generate public pressure to secure stronger, long-term protections.

The El Segundo Recovery Unit, centered around the Chevron Preserve, has observed consistent restoration and monitoring efforts supported by Chevron, which voluntarily set aside the property and has continuously funded ecological work. While public access is minimal due to private ownership, the ESB Coalition includes this site in its regional materials, and Chevron maintains a public-facing website showcasing their habitat conservation efforts. Partnering with Chevron and local stakeholders to host occasional community restoration events or youth science programming could broaden public awareness. Installing signage in nearby accessible areas may also help inform the public about the sites ecological value.

The Torrance Recovery Unit features the key site of Torrance Beach, which has suitable coastal habitat, but currently lacks structured outreach or restoration programs specific to the ESB. Given that the beach attracts heavy foot traffic, the risk of unintentional habitat disturbance is high. Potential improvements include launching local education campaigns, organizing dune restoration events, and placing clear signage at beach access points to explain the importance of preserving ESB habitat. Partnering with local schools and community groups could also build capacity for long-term involvement.

The proposed Palos Verdes Recovery Unit contains several key sites, including Point Vicente/Vicente Bluffs, Abalone Cove, Alta Vicente, and Pelican Cove. Outreach in this unit is particularly robust, led by groups such as the Palos Verdes Peninsula Land and Conservancy, South Bay Parkland Conservancy and Urban Wildlands Group. These organizations host seasonal ESB walks, habitat restoration events, and provide educational content through blogs, videos, and public programs. Public access is generally good, and existing trail networks present opportunities for effective signage and engagement. Increasing the frequency of public events and formalizing protections through local ordinances or conservation easements could help preserve these habitats amid development pressures. Tracking public participation and monitoring habitat quality would also help evaluate the impact of outreach programs more effectively.

Across all Recovery Units, it is clear that volunteer-based programming is a cost-effective and powerful tool for supporting restoration. However, outreach remains fragmented, and many opportunities exist to enhance coordination. Creating a centralized website or outreach hub could unify calendars, educational materials, and volunteer sign-ups to make engagement more accessible. More robust integration with schools and youth groups would help embed ESB conservation into long-term community learning. Lastly, increasing the visibility of the butterfly through storytelling, signage, and public events would raise awareness and build resistance to development that threatens habitat while more permanent protections are being secured.

Recovery evaluation of the El Segundo Blue butterfly

Utilizing our updated recovery criteria, we have evaluated the current condition of the El Segundo Blue butterfly (*Euphilotes allyni*) species as a whole. This evaluation will inform future actions and planning by the U.S. FWS regarding the conservation and recovery of the species.

Downlisting (updated criteria):

Criterion 1: At least one secure population in each of the five Recovery Units (RUs) – Ballona, Airport, El Segundo, Torrance, and Palos Verdes – are permanently protected to provide redundancy and maintain representation. The Airport Dunes (Napoleon Street and Waterview Street to the north, Vista del Mar to the west, Pershing Drive to the east, and Imperial Highway to the south) located in the Airport RU contains the largest population of the butterfly and is the population most likely to survive disease, predators, parasites, and other perturbations. The Airport Dunes must be one of the protected populations.

Ballona Recovery Unit: UNFULFILLED

Ballona Wetlands

The Ballona Wetlands is owned by the state of California and is under conservation management through the California Department of Fish and Wildlife (CDFW). The CDFW, alongside the Coastal Conservancy and ESB Coalition, have worked towards restoration efforts. The draft Environmental Impact Report updates the design of the flood infrastructure to cause minimal habitat disturbance (Ballona Wetlands Restoration Project, 2017). Despite other restrictions put into place to allow for public access, mitigation measures were set to create exclusion zones, for further protection of the ESB species. However, the 2017 EIR fails to directly address the potential long-term flooding impacts of the ESB habitat and potential berm or levee failures, thus raising concern.

Though the EIR claims protection against serious flood events, concerns regarding berm or levee failures persist. Hence, in order for the Ballona Wetlands to fall under the ‘permanently protected’ standard, it must address potential flood concerns.

Airport Recovery Unit: UNFULFILLED

LAX Dunes Preserve

The LAX Dunes Preserve is a site governed by two ordinances and of major importance for conservation. On the southern portion, 203 acres are protected by these ordinances, while 104 acres on the northern portion are excluded from the plan. Despite restoration efforts, the omission of the 104 acres reveals a lack of legal protection, thus not meeting the standards

outlined within the Recovery Plan. Furthermore, the lack of permanence in city ordinances also prevent this site from reaching recovery criteria standards.

El Segundo Recovery Unit: UNKNOWN

Chevron Preserve

The team was unable to establish contact and obtain information from Chevron Corporation regarding Chevron Preserve concerning legal protection.

Torrance Recovery Unit: UNFULFILLED

Torrance Beach

Torrance Beach is determined to have minimal legal protection. Despite the implementation of protections under the Endangered Species Act (ESA), there are no long-term enforceable safeguards in place that would deem the site's protection as sufficient.

Proposed Palos Verdes Recovery Unit: UNFULFILLED

Vicente Bluffs

The sites within the proposed Palos Verdes Recovery Unit are deemed to have strong protections. With a Habitat Conservation Plan (HCP) and a Natural Communities Conservation Plan (NCCP) in progress, it is likely that conservation easements will be enacted over every site in the near future, which would allow for permanent protection of the ESB habitats in this RU.

Criterion 2: Each of the five populations are managed to maintain coastal dune habitat dominated by local native species including seacliff buckwheat.

Ballona Recovery Unit: FULFILLED

Ballona Wetlands

This unit includes the population at the dunes in the Ballona Wetlands area, which is managed and maintained by Friends of Ballona Wetlands. Friends of Ballona Wetlands holds regular events with volunteers restoring native habitat throughout the area, including the dunes. Part of the native revegetation that occurs on the dunes is the planting of seacliff buckwheat, which is conducive to supporting the ESB population found at this area.

Airport Recovery Unit: FULFILLED

LAX Dunes Preserve

The site is managed by LAWA, who also holds regular restoration efforts through both public projects involving volunteers and internal projects. The LAX Dunes boasts the largest habitat area for the ESB with over 200 acres specifically designated as their ESB Preserve. As a result, because the coastal dune habitat is being maintained properly to have native species including seacliff buckwheat, this unit and its associated population meets the habitat requirements.

El Segundo Recovery Unit: FULFILLED

Chevron Preserve

The site is a piece of land owned and maintained by Chevron. This property has been planting seacliff buckwheat specifically for the ESB since 1981, and the numbers have shown increases in ESB populations over the years. Since Chevron has shown to be actively maintaining the ESB habitat, this site fulfills the requirements.

Torrance Recovery Unit: FULFILLED

Torrance Beach

The site's restoration has been managed by The Urban Wildlands Group and the South Bay Parkland Conservancy, both of whom prioritize the planting of native vegetation with the ESB habitat in mind. This is shown in the signage present at the site, informing visitors of the native flora and fauna in the area. Both organizations have also hosted volunteer events for restoration, and the area is actively being maintained as a result, allowing it to meet the requirements.

Proposed Palos Verdes Recovery Unit: FULFILLED

Vicente Bluffs

This site is managed by the Palos Verdes Peninsula Parkland Conservancy, which restores areas around the Palos Verdes Peninsula. Vicente Bluffs Reserve hosts a population of ESB due to the presence of seacliff buckwheat. The restoration in this area is supported by a California Coastal Conservancy grant and has created a coastal bluff scrub habitat that is being actively maintained. As such, this site is conducive to the survival of ESB populations and meets the requirements.

Criterion 3: As determined by a scientifically credible monitoring plan, each of the five populations exhibit a statistically significant stable or upward trend (based on transect counts) for at least 8 years (approximately eight butterfly generations). Population management in each Recovery Unit ensures that the average discrete population growth rate (lambda) is at or above 1.0, indicating a stable or increasing population.

Ballona Recovery Unit: UNFULFILLED

Ballona Wetlands

As a key site, the Ballona Wetlands appears to host the population that is most likely to meet this criteria within the Ballona Recovery Unit. Based on peak counts from transect surveys, not enough data is available to determine a statistically significant trend over the past eight years. The population growth rate (lambda) cannot be consecutively calculated for this period due to gaps between survey years (see Figure 3.4). Therefore, this site does not meet downlisting criteria with respect to population stability. Going forward, conducting consistent, annual surveys would allow for the consecutive calculation of lambda to track population growth.

Airport Recovery Unit: UNFULFILLED

LAX Dunes Preserve

As a key site, the LAX Dunes Preserve appears to host the population that is most likely to meet this criteria within the Airport Recovery Unit. Based on peak counts and population estimates from transect surveys, not enough data is available to determine a statistically significant trend over the past eight years. The population growth rate (lambda) cannot be consecutively calculated for this period using these methods due the cessation of the transect survey method (see Figure 3.9). While block count census survey data was made available to us for seven of the eight years, lambda was below 1.0 for two of these years, indicating a population decline during those periods. In addition, these data do not meet the criteria of "based on transect counts". Therefore, this site does not meet downlisting criteria with respect to population stability. Going forward, conducting consistent, annual transect surveys would allow for the consecutive calculation of lambda to track population growth.

El Segundo Recovery Unit: UNFULFILLED

Chevron Preserve

As a key site, the Chevron Preserve appears to host the population that is most likely to meet this criteria within the El Segundo Recovery Unit. Based on peak counts from transect surveys, not enough data is available to determine a statistically significant trend over the past eight years. The population growth rate (lambda) cannot be calculated for 2017 or 2024, as data from 2016 and 2024 was unavailable to us (see Figure 3.16). Excluding these unknowns, lambda

is below 1.0 for four of the six years, indicating population declines during those periods. Therefore, this site does not meet downlisting criteria with respect to population stability. Going forward, continued habitat restoration and management is recommended to allow populations to increase naturally.

Torrance Recovery Unit: UNFULFILLED

Torrance Beach

As a key site, Torrance Beach appears to host the population that is most likely to meet this criteria within the Torrance Recovery Unit. Based on peak counts from transect surveys, not enough data is available to determine a statistically significant trend over the past eight years. The population growth rate (lambda) cannot be consecutively calculated for this period due to gaps between survey years (see Figure 3.23). Therefore, this site does not meet downlisting criteria with respect to population stability. Going forward, conducting consistent, annual surveys during the site's estimated flight season peak would allow for the consecutive calculation of lambda to track population growth.

Proposed Palos Verdes Recovery Unit: UNFULFILLED

Vicente Bluffs Reserve

As a key site, the Vicente Bluffs Reserve appears to host the population that is most likely to meet this criteria within the proposed Palos Verdes Recovery Unit. Based on peak counts from transect surveys, not enough data is available to determine a statistically significant trend over the past eight years. The population growth rate (lambda) cannot be consecutively calculated for this period due to gaps between survey years. Therefore, this site does not meet downlisting criteria with respect to population stability. Going forward, conducting consistent, annual surveys during the site's estimated flight season peak would allow for the consecutive calculation of lambda to track population growth.

Criterion 4: A program is initiated to inform the public about the El Segundo Blue butterfly and its habitat.

A range of public education and community engagement programs currently exist across multiple Recovery Units, fulfilling the Recovery Plan's requirements to inform the public about the ESB and its habitat. Organizations such as the ESB Coalition, Friends of Ballona Wetlands, South Bay Parkland Conservancy (SBPC), and The Bay Foundation offer accessible programming through restoration events, volunteer opportunities, student engagement, and digital outreach. Notably, SBPC's Junior Urban Naturalist Program and seasonal ESBB walks

offer hands-on educational experiences tied to tentative habitat restoration. The Bay Foundation maintains online presence with newsletter and project updates, while Friends of Ballona Wetlands provide habitat tours and school programs.

However, outreach varies across sites. The Palos Verdes Peninsula (PVP) currently lacks consistent education and volunteer programming, despite having the potential to support a large viable population. GIS data collected during this project also revealed that interpretive signage is inconsistently distributed across sites; while areas like Ballona and Torrance include habitat and species information others like Dockwieler and Alta Vicente have little or no signage to educate visitors. These findings were compiled through site visits, interviews with partner organizations, event calendars, and GIS-based signage assessments.

While a program to inform the public is indeed active and diverse, meeting the letter of the Recovery Plan is not yet standardized or evenly implemented across all Recovery Units. To strengthen public education ahead of potential delisting, we recommend the expansion of signage, the introduction of school-aligned curriculum at under-engaged sites, and a centralized platform for public involvement. Despite these gaps, the presence of multiple active outreach efforts confirms that this downlisting criterion is currently fulfilled.

Delisting (updated criteria):

Criterion 1: Five secure populations - in addition to the five that meet downlisting criteria - are protected (total of 10). One of these additional populations must be in the Palos Verdes Recovery Unit. These additional populations increase viability of the species through increased redundancy and representation.

Ballona Recovery Unit: UNFULFILLED

Ballona Wetlands: UNFULFILLED

Though the EIR claims protection against serious flood events, concerns regarding berm or levee failures persist. Hence, in order for the Ballona Wetlands to fall under the ‘permanently protected’ standard, it must address potential flood concerns. See downlisting criteria evaluation for more information.

There is currently no additional site within the Ballona Recovery Unit that hosts the ESB. Active restoration is underway at Ballona Creek under the Ballona Creek Revitalization Project, which may support species expansion to create another secure population within the Ballona RU.

Airport Recovery Unit: UNFULFILLED

LAX Dunes Preserve: UNFULFILLED

Despite restoration efforts, the omission of the 104 acres reveals a lack of legal protection, thus not meeting the standards outlined within the Recovery Plan. Furthermore, the lack of permanence in city ordinances also prevent this site from reaching recovery criteria standards. See downlisting criteria evaluation for more information.

Dockweiler State Beach: UNFULFILLED

A potential supplementary site within the Airport RU would be Dockweiler State Beach, which has historically hosted the ESB, though this site is not currently sufficiently protected in a legal manner. Existing protections are held under CEQA, ESA, and the California Coastal Act under the authority of LACDBH. To be considered protected, this site would require a third-party conservation easement or other legal document of that calibre.

El Segundo Recovery Unit: UNFULFILLED

Chevron Preserve: UNFULFILLED

The team was unable to establish contact and obtain information from Chevron Corporation regarding Chevron Preserve concerning legal protection.

Redondo Beach: UNFULFILLED

An additional population would be the population at Redondo Beach, where active restoration efforts have allowed for a healthy ESB habitat and an existing ESB population. Despite this, as a public beach, Redondo Beach has the same minimal legal protections as Dockweiler Beach. The only extant protections are under CEQA, ESA, and the California Coastal Act under the authority of LACDBH. To be considered protected, this site would require a third-party conservation easement or other legal document of that calibre.

Torrance Recovery Unit: UNFULFILLED

Torrance Beach: UNFULFILLED

Torrance Beach is determined to have minimal legal protection. Despite the implementation of protections under the Endangered Species Act (ESA), there are no long-term enforceable safeguards in place that would deem the site's protection as sufficient.

Malaga Bluffs: UNFULFILLED

The supplementary site for the Torrance RU is the Malaga Bluffs, which consists of private properties. To ensure protection at this site would require a third-party conservation easement or other legal document of that calibre.

Proposed Palos Verdes Recovery Unit: UNFULFILLED

The sites within the proposed Palos Verdes Recovery Unit (Vicente Bluffs, Alta Vicente, and Abalone Cove) are deemed to have strong protections. They are managed by Palos Verdes Land Conservancy on behalf of the City of Rancho Palos Verdes under an adopted NCCP/HCP. While the HCP has been implemented and conservation easements have been enacted on several preserves, CDFW has yet to issue the NCCP. Once the NCCP has been issued, protection can be deemed sufficient at these supplementary sites.

Criterion 2: Each of the 10 populations is managed in perpetuity to maintain coastal dune habitat dominated by local native species including seacliff buckwheat. This criterion assures population resiliency and amelioration of the threat of habitat modification resulting from invasive nonnative plant species (Factor A).

Ballona Recovery Unit: FULFILLED

Ballona Wetlands: FULFILLED

While the site itself retains high potential for seacliff buckwheat presence expansion, the site as a whole is maintained to prioritize the presence of native species, including seacliff buckwheat. While the current efforts on expanding seacliff buckwheat presence remain minimal and satisfactory at best, the coastal dune habitat remains managed in perpetuity.

Airport Recovery Unit: UNFULFILLED

LAX Dunes Preserve: FULFILLED

The site is managed by LAWA, who also holds regular restoration efforts through both public projects involving volunteers and internal projects. The LAX Dunes boasts the largest habitat area for the ESB with over 200 acres specifically designated as their ESB Preserve. As a result, because the coastal dune habitat is being maintained properly to have native species including seacliff buckwheat, this unit and its associated population meets the habitat requirements.

Dockweiler State Beach: UNFULFILLED

Despite the presence of seacliff buckwheat at Dockweiler State Beach, this site is unfulfilled in this criteria. The seacliff buckwheat is present only in one specific area along the coast of this location, and even in that small section, iceplant can be spotted peaking through and surrounding the seacliff buckwheat. Tangentially, the seacliff buckwheat appears to be in rather poor health, indicating the presence of invasive species as well as the lack of habitat restoration

creating an environment where the habitat is still dominated by nonnative invasive species and is at an inadequate level of habitat resiliency.

El Segundo Recovery Unit: UNFULFILLED

Chevron Preserve: FULFILLED

The site is a piece of land owned and maintained by Chevron. This property has been planting seacliff buckwheat specifically for the ESB since 1981, and the numbers have shown increases in ESB populations over the years. Since Chevron has shown to be actively maintaining the ESB habitat, this site fulfills the requirements.

Redondo Beach: UNFULFILLED

While the Redondo Beach site exhibits an abundance of seacliff buckwheat habitat, the seacliff buckwheat itself is of medium-low quality and is surrounded by a large amount of iceplant. The site has the potential to fulfill the criteria with just a bit more maintenance, planting more seacliff buckwheat to increase its abundance and removing invasive species nearby to increase the health of the plant and the nativity of the coastal dune habitat. As of now, however, the criteria for this site remains unfulfilled.

Torrance Recovery Unit: UNFULFILLED

Torrance Beach: FULFILLED

The site's restoration has been managed by The Urban Wildlands Group and the South Bay Parkland Conservancy, both of whom prioritize the planting of native vegetation with the ESB habitat in mind. This is shown in the signage present at the site, informing visitors of the native flora and fauna in the area. Both organizations have also hosted volunteer events for restoration, and the area is actively being maintained as a result, allowing it to meet the requirements.

Malaga Bluffs: UNFULFILLED

While the seacliff buckwheat at this site is currently widespread, the health of the seacliff buckwheat is definitely poor and the abundance could be higher. The site has potential if it was further maintained, and its environment is especially conducive to a positive seacliff buckwheat habitat for the ESB. Until then, this site's criteria remains

Proposed Palos Verdes Recovery Unit: UNFULFILLED

Vicente Bluffs Reserve: FULFILLED

This site is managed by the Palos Verdes Peninsula Parkland Conservancy, which restores areas around the Palos Verdes Peninsula. Vicente Bluffs Reserve hosts a population of ESB due

to the presence of seacliff buckwheat. The restoration in this area is supported by a California Coastal Conservancy grant and has created a coastal bluff scrub habitat that is being actively maintained. As such, this site is conducive to the survival of ESB populations and meets the requirements.

Alta Vicente Reserve: FULFILLED

Alta Vicente Reserve sports a high amount of seacliff buckwheat, which is supplemented by the entire native habitat restoration found on the premises. The habitat is regularly maintained and the land is under conservation easement, allowing it to be maintained in perpetuity. Thus

Abalone Cove: UNFULFILLED

Seacliff buckwheat is present in this site only in a small portion of land restored by the Palos Verdes Peninsula Land Conservancy at the top of the cliffs. The rest of this flat area above the cliffs remains a critical area that requires significant restoration and maintenance efforts to establish healthy seacliff buckwheat habitat in this recovery site.

Criterion 3: As determined by a scientifically credible monitoring plan, each of the 10 populations exhibits a statistically significant stable or increasing trend (based on transect counts) for at least 8 years (approximately eight butterfly generations). Management in each population distribution ensures that the average discrete population growth rate (lambda) is at or above 1.0, indicating a stable or increasing (resilient) population. Lambda is not below 1.0 for more than one year prior to delisting, indicating growth rate fluctuations are natural and not due to population decline and the population is resilient. This criterion assures population resiliency and that the threat of limited range has been sufficiently ameliorated (Factor A).

Currently, no ESB sites demonstrate a statistically significant stable or increasing population trend. However, six sites show great promise for meeting this criterion in the near future, if the habitat is properly maintained. The remaining four sites listed are also likely to meet this criterion, but may require additional surveying or habitat restoration and management. These evaluations are based on our site assessments, which provide additional, relevant information and graphs.

Ballona Recovery Unit: UNFULFILLED

Ballona Wetlands: UNFULFILLED

This site does not meet delisting criteria with respect to population stability. Going forward, conducting consistent, annual surveys would allow for the consecutive calculation of lambda to track population growth.

Airport Recovery Unit: UNFULFILLED

LAX Dunes Preserve: UNFULFILLED

This site does not meet delisting criteria with respect to population stability. Going forward, conducting consistent, annual transect surveys would allow for the consecutive calculation of lambda to track population growth. See downlisting criteria evaluation for more information.

Dockweiler State Beach: UNFULFILLED

The last population survey was conducted in 2009, where no ESBs were found. However, this survey began 25 days later than when the previous survey of 2008 began, which recorded a peak count of 31 ESBs. As such, we suspect that the ESB may remain at this site, especially considering its proximity to the LAX Dunes Preserve. Due to a lack of recent surveys, this site does not meet delisting criteria with respect to population stability. Going forward, conducting consistent, annual transect surveys during the site's estimate flight season peak would allow for the consecutive calculation of lambda to track population growth. See downlisting criteria evaluation for more information.

El Segundo Recovery Unit: UNFULFILLED

Chevron Preserve: UNFULFILLED

This site does not meet delisting criteria with respect to population stability. Going forward, continued habitat restoration and management is recommended to allow populations to increase naturally. See downlisting criteria evaluation for more information.

Torrance Recovery Unit: UNFULFILLED

Redondo Beach: UNFULFILLED

The last population survey was conducted in 2022, with a peak count of 115 ESBs. Considering the site's presumedly sustained medium-range population over the past decade, the population shows promise. However, due to gaps between surveys, lambda cannot be calculated over the past eight years (see Figure 3.19). Thus, this site does not meet delisting criteria with respect to population stability. Going forward, conducting consistent, annual transect surveys during the site's estimate flight season peak would allow for the consecutive calculation of lambda to track population growth.

Torrance Beach: UNFULFILLED

This site does not meet delisting criteria with respect to population stability. Going forward, conducting consistent, annual surveys during the site's estimated flight season peak

would allow for the consecutive calculation of lambda to track population growth. See downlisting criteria evaluation for more information.

Malaga Bluffs: UNFULFILLED

The last population survey was conducted in 2021, with a peak count of 29 ESBs, which increased by 21 from the previous year's survey conducted on the same day. Considering the site's known history of resilience over the decades (T. Longcore, personal communication, June 4, 2025), the population shows promise. However, due to gaps between surveys, lambda cannot be calculated over the past eight years (see Figure 3.26). Thus, this site does not meet delisting criteria with respect to population stability. Going forward, conducting consistent, annual transect surveys during the site's estimated flight season peak would allow for the consecutive calculation of lambda to track population growth.

Proposed Palos Verdes Recovery Unit: UNFULFILLED

Vicente Bluffs Reserve: UNFULFILLED

This site does not meet delisting criteria with respect to population stability. Going forward, conducting consistent, annual surveys during the site's estimated flight season peak would allow for the consecutive calculation of lambda to track population growth. See downlisting criteria evaluation for more information.

Alta Vicente Reserve: UNFULFILLED

The last population survey was conducted in 2024, with zero ESBs recorded. While there seems to be some difficulty with establishing a prominent ESB population at the site, its proximity to the Vicente Bluffs Reserve and continued habitat management shows promise for eventual establishment. However, due to gaps between surveys, lambda cannot be calculated over the past eight years. Thus, this site does not meet delisting criteria with respect to population stability. Going forward, conducting consistent, annual transect surveys during the site's estimated flight season peak would allow for the consecutive calculation of lambda to track population growth.

Abalone Cove: UNFULFILLED

The last population survey was conducted in 2024, with zero ESBs recorded, although the previous survey in 2022 produced a peak count of 16. Considering its population growth in 2022 and its proximity to the Vicente Bluffs Reserve, the population shows promise. However, due to gaps between surveys, lambda cannot be calculated over the past eight years. Thus, this site does not meet delisting criteria with respect to population stability. Going forward, conducting consistent, annual transect surveys during the site's estimated flight season peak would allow for the consecutive calculation of lambda to track population growth.

Discussion

Individual assessments of each ESB population and an evaluation of the species as a whole show that, while the species has not fully met downlisting or delisting recovery criteria, significant progress has been made in recent years. Over the past few decades, greater protections for its habitat and large-scale restoration projects have been established. This has led to successful population growth and reestablishment across its historic range.

While previously thought to be sedentary, its recent colonization of Ballona Wetlands, Redondo Beach, Torrance Beach, and various sites within the Palos Verdes Peninsula have shown the species' prominent capability to reestablish itself within restored fragments of its extant habitat. However, the successful recovery of the ESB is directly tied to the quality of its habitat. The spread of invasive plants and extended periods of drought significantly threaten the abundance and propagation of seacliff buckwheat, the host plant of the ESB. Invasive flora have proven to be a continual threat to seacliff buckwheat numbers at multiple ESB sites, exhibiting the need for consistent habitat management (Mattoni et al., 2001). However, ongoing restoration efforts have successfully enabled ESB establishment at new sites, such as Redondo Beach and Torrance Beach. While it is difficult to entirely remove the threat posed by invasive plants, sustained habitat management can keep them at bay, and allow coastal dune ecosystems to recover and thrive.

Drought, on the other hand, is difficult to combat and has historically devastated ESB populations. Most notably, the 2012-2016 drought decreased peak counts by 96% (703 in 2011 to 29 in 2018) at the LAX Dunes Preserve, the largest of the ESB populations. However, due to intensive seacliff buckwheat restoration efforts, the most recent estimates show that the population has steadily recovered to around half of its highest previous records. In multiple cases across the species' range, sustained planting, irrigation, and management of seacliff buckwheat has resulted in encouraging levels of population growth and establishment at new sites. While drought is expected to become a more frequent and intense occurrence across Southern California, with its multi-year diapause providing natural resistance, and its continual ability to bounce back from steep population declines, the ESB has proven to be remarkably resilient when aided by habitat restoration and management (Minckley et al., 2013; Vicente-Serrano et al., 2022) .

However, currently, very few sites meet any recovery criteria. Criterion 1 presents the biggest challenge, as its fulfillment relies upon cooperation between several parties and careful legal negotiations. While several sites partially meet the necessary protections, continued communication with site landowners is required to achieve protection in perpetuity without the existence of any "loopholes". While not all existing legal documentation was released to the team, we have compiled the available legal information in as much detail as possible. Each site

has its own recommendations for action, which shall be discussed in the 10-year Recovery Strategy.

The fulfillment of Criterion 2 appears to require a relatively less complex process. Most sites are already under restoration, however, management efforts must stay consistent. Without continual management, previous restoration progress can be destroyed by the spread of invasive species. Restoration goals must be specialized for each site based on historic plant community composition, emphasizing a dominance of native vegetation and appropriate abundance of seacliff buckwheat. Recommendations for these goals shall be discussed in the 10-year Recovery Strategy.

As population growth is directly tied to habitat management and restoration, the successful fulfillment of Criterion 2 will likely give way to the fulfillment of Criterion 3 for all sites. In order to track population changes, however, all ESB sites must be monitored consistently and effectively. Missing reports, gaps in survey years, varying survey methodologies, and phenological differences have produced discontinuous or inaccurate data for all sites. Without a standardized monitoring method, population tracking becomes difficult or even unreliable. Additionally, the species' sensitivity to annual weather conditions, short flight season, and Poisson population curve renders poorly-timed surveys unusable for determining that year's population size. Thus, it is essential to immediately implement a standardized methodology that is sensitive to yearly climate, to account for changes in emergence timing, and specialized for each site, to account for differences in emergence timing between sites. Based on thorough research of historic population data, the team has produced such a method to optimize future population tracking. While Criterion 3 depends on increasing or stable populations, lambda calculation of the past eight years is not even possible for any site due to gaps in survey years or changing methodology. Utilizing this standardized method across all sites each year, lambda can be calculated in the future. The actual values of lambda and the fulfillment of this criterion will then rely on successful recovery efforts for the ESB.

Much work has been done to fulfill Criterion 4, which has ultimately contributed to the greater success of the ESB and increased public awareness of the species, its story, and its habitat. There are multiple areas for improvement, however. By continuing to educate and involve the public (especially in the more southern sites), the ESB could become better protected from pedestrians and development, restoration programs could see an increase in volunteer presence which would reduce costs and augment habitat quality, and the species itself could become a more prominent symbol of the wildlife conservation in Los Angeles County.

Overall, the ESB shows significant promise for delistment. While there is much work to be done in regards to conserving its habitat, the species itself has demonstrated a remarkable capacity for recovery. The future success of the ESB then relies upon the combined efforts of all relevant parties, a strong commitment to conservation efforts, and a sustained human interest in its survival. To guide future actions and optimize the use of time and financial resources, the

team has created a Monitoring Plan and a 10-year Recovery Strategy, which outline the necessary steps to achieve expedited delistment.

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Chapter 4: Development of a standardized monitoring plan and methodology for the El Segundo Blue butterfly

Introduction

The long-term monitoring of the El Segundo Blue butterfly (*Euphilotes allyni*), hereafter referred to as the ESB, is crucial to assessing the stability and growth of each of its populations. While sites such as the Airport and El Segundo Recovery Units have historically monitored ESB population dynamics consistently, discrepancies in monitoring methodology in larger sites and lack of reliable data in smaller ones have presented challenges to any comprehensive assessment of ESB population health. Establishing a consistent monitoring plan across all sites is a prerequisite for procuring the necessary population data for downlisting the ESB, as it allows cross-site data comparison as well as precise analyses of any population changes. This is particularly important in smaller Recovery Units without a historical monitoring regime due to critical gaps in population data; accurate evaluations of sites such as Torrance, Redondo Beach, or Palos Verdes are difficult due to a lack of information. Total expenditures for yearly surveying throughout the peak flight season are expected to be around $7,750 annually across all existing non-monitored sites, representing a significantly lower expense than existing monitoring regimes at LAWA and the El Segundo Chevron Refinery due to the lower time and range commitment per site. On balance, due to the significant ecological importance of consistent monitoring across all ESB Recovery Units, as well as the relatively modest recurring cost of annual surveys, executing our proposed monitoring plan is of paramount importance to the reliable documentation of ESB recovery.

Background Research

Review of existing monitoring methodologies

The existing research on butterfly monitoring and abundance estimation has evolved significantly in recent decades which is important for endangered species like the ESB. Multiple studies stress that traditional count-based methods, though widely used, often fail to account for variable detectability which can be a serious limitation to consider when monitoring sparse or elusive populations. Occupancy-based approaches can offer more statistically sound alternatives for species like the Karner blue butterfly (Bried et al., 2011), which shares several traits with the ESB, including fragmented habitats and low population densities. Current research underscores the importance of paying close attention to the nuances involved in collecting data on butterfly

populations. Butterfly abundance estimates derived from simple count indices were often unreliable unless corrected for detectability, which fluctuated with habitat type, weather, and observer bias. The consensus across the literature was that detectability measures such as those used in distance sampling should be incorporated somehow to improve the reliability of population trends. By tracking the evolution of butterfly monitoring methods over time, it is now generally understood that method choice is often dictated by historical precedent and logistical convenience, rather than scientific rigor (Kral et al. 2018). Overall, the plethora of reports that exist today advocate for more statistically grounded approaches. Such methods can better accommodate the butterfly's short adult lifespans, patchy habitats, and low population densities. Staying informed and actively engaging with emerging research can enhance the accuracy of trend detection and strengthen conservation strategies for butterflies, and more specifically the ESB.

Statistical comparison of methodologies

For statistical analyses, we utilized JMP®, Version 18.2.0. SAS Institute Inc., Cary, NC, 1989–2025. The team identified three suitable metrics for tracking ESB population trends over time. First, the Pollard Index, which had been utilized in several previous ESB reports and is a standard method for butterfly sampling as a whole (Taron & Ries, 2015). Second, a peak count from each year's survey, recorded during the estimated peak of the ESB flight season. Third, a population estimate produced by INCA, a program utilized to analyze transect count data, provided that a sufficient number of days were surveyed throughout the full flight season. These methods were selected based on their direct reference to survey observations, as other means of estimating population size may be less reliable or subject to uncertainty. These three metrics were evaluated using multivariate correlation tests conducted in JMP Version 18.2.0 to determine their accuracy, using the three largest ESB population datasets available; six years from Ballona Wetlands, 24 years from the LAX Dunes Preserve, and 15 years from the Chevron Preserve. Comparisons utilizing other sites were not possible due to inconsistencies, such as low or infrequent survey years, a low number of surveyed days, and overall lower ESB counts. The goal of the analysis was to identify which methods, if any, demonstrated similar trends over time despite their differing magnitudes. If significant correlations were observed among the metrics, their relative reliability could be affirmed, thereby supporting the selection of its corresponding survey methodology.

For the Ballona Wetlands dataset, only the Pollard Index and peak count metrics showed a statistically significant correlation (see Table 4.1). The LAX Dunes Preserve dataset showed a statistically significant high correlation for all combinations of the three metrics (see Table 4.2). The Chevron Preserve dataset also showed a statistically significant high correlation for all combinations of the three metrics (see Table 4.3). Considering the fact that the Ballona Wetlands dataset included only six datapoints for each metric, it is unsurprising that it produced weaker or insignificant correlations. It is worth noting that the Pollard Index and peak count metrics

showed a statistically significant correlation greater than 0.90 for each site, including Ballona Wetlands. However, considering the two larger datasets demonstrated statistically significant high correlations for all combinations, it is safe to assume that all three remain viable metrics for tracking population trends. As such, financial feasibility should become the deciding factor when choosing which metric to use.

Table 4.1 - Descriptive statistics and correlations for El Segundo Blue butterfly (*Euphilotes allyni*) population metrics based on transect survey data at the Ballona Wetlands

Population metric	n	M	SD	1	2	3
1. Pollard Index	6	360.83	111.29	–	0.6916**	**0.9537***
2. INCA-estimated N	6	539.67	200.41	0.6916**	–	0.6499***
3. Peak count	6	106.17	43.45	**0.9537***	0.6499***	–

* p = .0032.
** p = .1280.
*** p = .1624.

Table 4.2 - Descriptive statistics and correlations for El Segundo Blue butterfly (*Euphilotes allyni*) population metrics based on transect survey data at the LAX Dunes Preserve

Population metric	n	M	SD	1	2	3
1. Pollard Index	24	1097.33	958.85	–	**0.9383***	**0.9088***
2. INCA-estimated N	24	1857.38	1815.3	**0.9383***	–	**0.8643***
3. Peak count	24	265.83	184.77	**0.9088***	**0.8643***	–

* p < .0001.

Table 4.3 - Descriptive statistics and correlations for El Segundo Blue butterfly (*Euphilotes allyni*) population metrics based on transect survey data at the Chevron Preserve

Population metric	n	M	SD	1	2	3
1. Pollard Index	15	327.80	269.95	–	**0.9711***	**0.9500***
2. INCA-estimated N	15	633.067	775.11	**0.9711***	–	**0.9804***
3. Peak count	15	87.47	78.47	**0.9500***	**0.9804***	–

* p < .0001.

Budget considerations

Table 4.4 lists the total estimated costs of surveying each site per year, with 5 weeks of weekly Pollard-Yates surveys per flight season. We have concluded that this method may be the most financially feasible, considering that it requires fewer surveys to produce a reliable peak count as opposed to other methods or estimates that require monitoring of the entire flight season. The costs listed take into account surveying hours and the time it takes to write a report. We assume a cost of $125/hour for a permitted biologist, and the relative costs are based on a surveying time of around 0.80 hours per acre of habitat. Costs were rounded up to the nearest hour, but several of these sites are small enough to be surveyed in under an hour.

Table 4.4 - Time and cost estimates for surveys of the El Segundo Blue butterfly (*Euphilotes allyni*) by site.

Site name	Survey time (hours)	Writing time (hours)	Total time (hours)	Total cost
Ballona Wetlands	5	2	7	$875
Dockweiler State Beach	5	2	7	$875
Redondo Beach	5	2	7	$875
Torrance Beach	5	2	7	$875
Malaga Bluffs	5	2	7	$875
Vicente Bluffs	12	2	14	$1,750
Alta Vicente	17	2	19	$2,375
Abalone Cove	24	2	26	$3,250

Note: All of the times and costs listed are estimates based on information from field biologists and conservation organizations. Costs will vary depending on the biologist and location. The LAX Dunes Preserve and the Chevron Preserve pay for their own surveys and are therefore not included.

Phenological comparisons across and between populations

Differences in emergence between sites

Contrary to sites on the northern end of the ESB's range, the 2022 report for the Redondo Beach and Torrance Beach site claimed that the populations' flight season peak would occur on June 16th, whereas data from the Ballona Wetlands, LAX Dunes Preserve, and Chevron Preserve sites suggested the peak to be mid-July. For these Redondo Beach and Torrance Beach sites, data from surveys conducted during mid-June produced significantly higher peak counts of ESBs than surveys conducted only in July by a difference of over 100 individuals. These differences are visualized in Figure 4.1. While population fluctuations could be the cause, we have determined that this is unlikely. For example, the peak count for 2008 at Redondo Beach occurred on day 174 with 156 individuals observed, and only one observation was conducted the following year, occurring on day 205 with 9 individuals observed. This coincides with a count of 16 individuals on day 203 in 2008, demonstrating that this supposed decline is more likely a result of late surveying. For these two sites, only 2008 consisted of surveys conducted over multiple days, while the following years consisted of only a single survey day. While this makes it difficult to produce detailed information regarding the emergence timing of these populations, it is clear that the observed peak count discrepancies is a result of an earlier peak flight season.

For the following statistical analyses, we utilized JMP®, Version 18.2.0. SAS Institute Inc., Cary, NC, 1989–2025. For all peak counts at Torrance Beach (excluding a peak of two in 1998), a bivariate fit test suggests that peak count decreases with increasing day of year ($N = 4$, $R^2 = 0.91$, $p = .0486$). This suggests that for Redondo Beach and Torrance Beach, the peak of the ESB flight season takes place around mid-June.

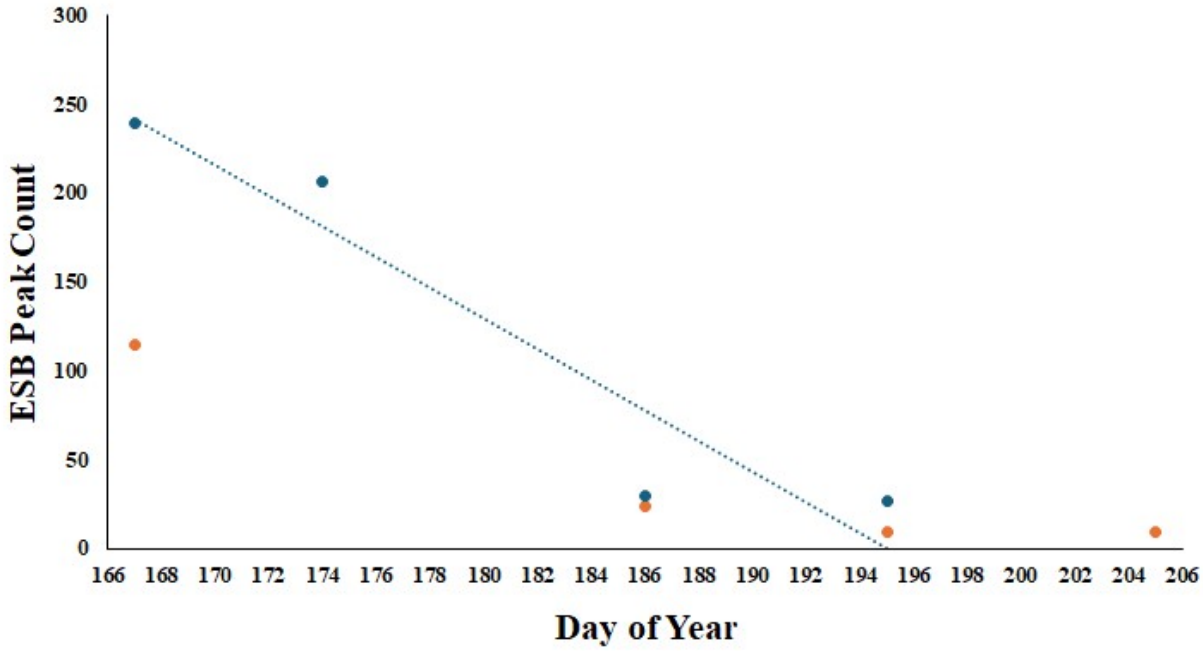

Figure 4.1 - Comparison of days of peak observance for the El Segundo Blue butterfly (*Euphilotes allyni*) at Redondo Beach and Torrance Beach from the years 2008 to 2022. Orange points represent the peak count of an annual point observation survey for the species at Redondo Beach. Blue points represent the peak count of an annual point observation survey for the species at Torrance Beach. For Torrance Beach, peak count decreases with increasing surveyed day of year ($N = 4$, $R^2 = 0.91$, $p = .0486$).

This conclusion is further supported by surveys from the proposed Palos Verdes Recovery Unit sites. Gaps in these datasets and overall low population counts makes an estimation of the peak day unreliable, so instead, we have just taken the average. For this region, the average day of peak counts falls on day 177 (June 26th, non-leap year). This average was calculated using seven of the 33 available surveys, disregarding any potential outliers from surveys that either consisted of less than 10 individuals observed, too few survey days, or clearly began too late into the flight season (as shown by first observations greater than 5).

To visually compare all sites' average emergence timing, we disregarded any potential outlier peak counts from surveys that either consisted of less than 10 individuals observed, too few survey days (with the exception of Redondo Beach and Torrance Beach), or clearly began too late into the flight season (as shown by first observations greater than 5). A boxplot of all peak observance days for these locations is shown in Figure 4.2. As some of the sites exhibited changes in emergence over time, a boxplot of all peak observance days for these locations within the past 15 years is shown in Figure 4.3. Since the Recovery Unit boundaries may group together sites that are far apart, sites have been grouped by geographic region for this analysis. The only difference between this categorization and the Recovery Unit boundaries is that Redondo Beach has been categorized as a part of the Torrance region and not the El Segundo region.

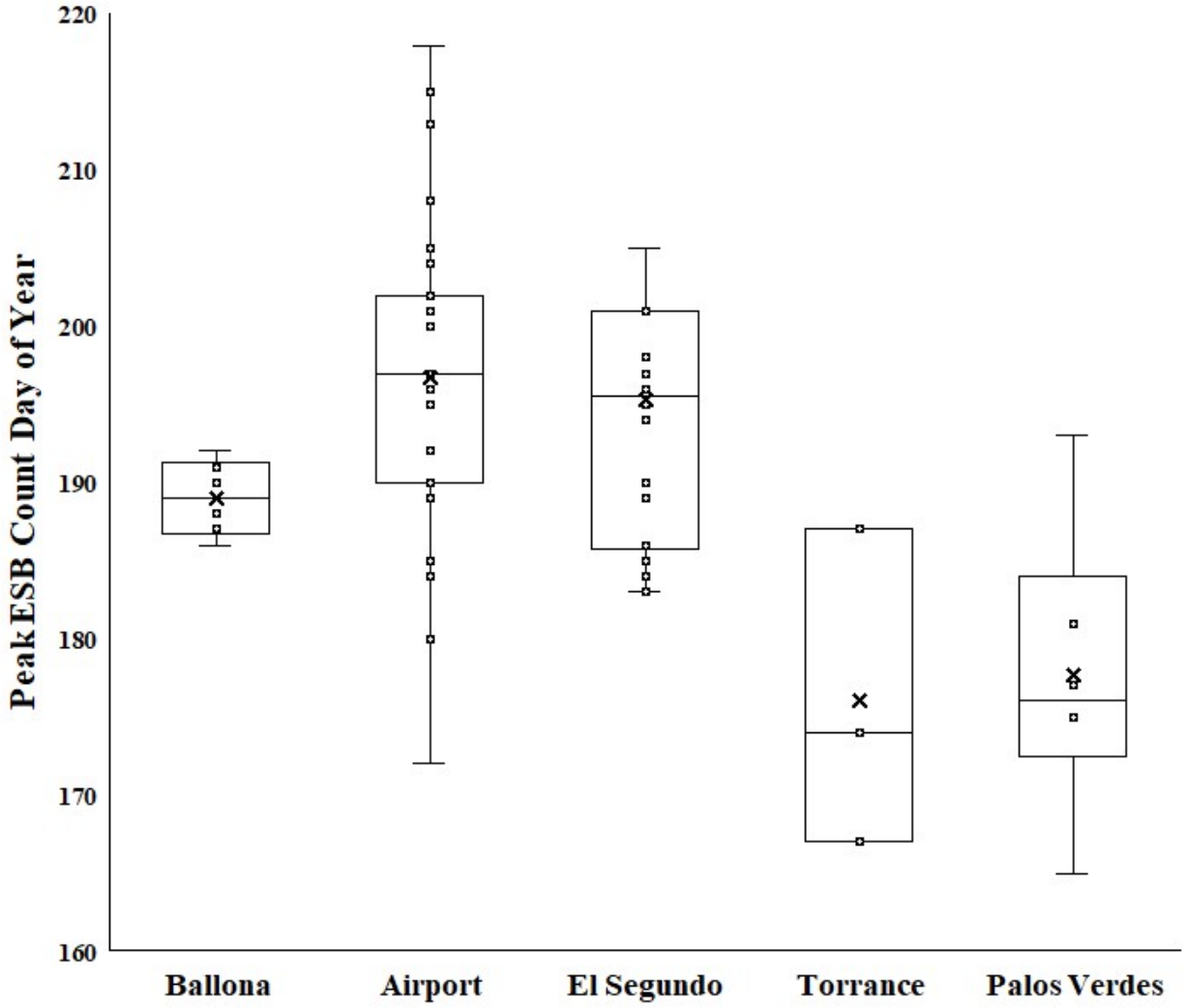

Figure 4.2 - Comparison of days of peak observance from 1984 to 2024 of the El Segundo Blue butterfly (*Euphilotes allyni*) by Recovery Unit. Sites are grouped by geographic region. The Ballona region includes the Ballona Wetlands site. The Airport region includes the LAX Dunes Preserve and Dockweiler State Beach. The El Segundo region includes the Chevron Preserve. The Torrance region includes Redondo Beach, Torrance Beach and Malaga Bluffs. The Palos Verdes region includes Vicente Bluffs Preserve, Alta Vicente Preserve, and Abalone Cove.

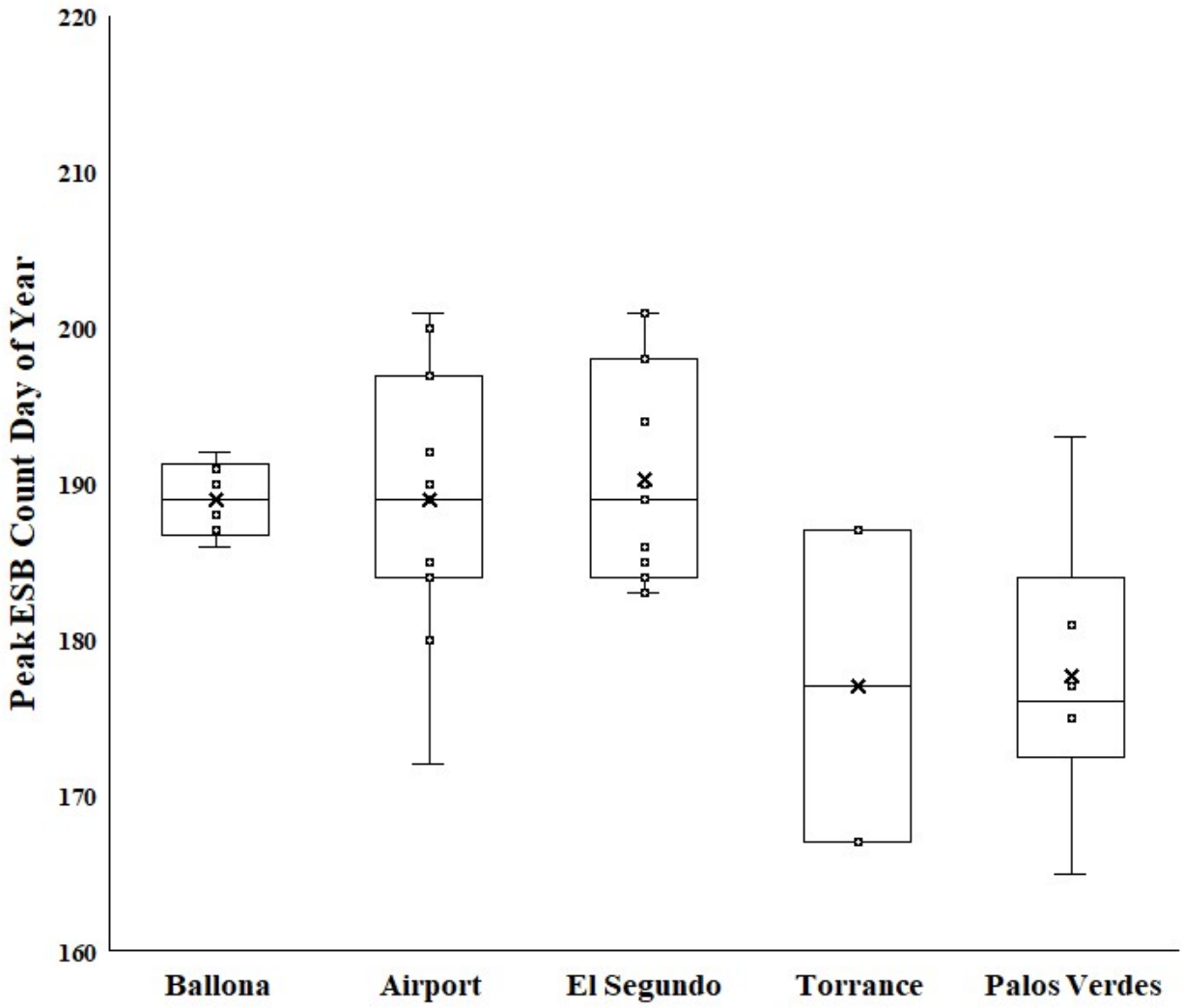

Figure 4.3 - Comparison of days of peak observance from 2010 to 2024 of the El Segundo Blue butterfly (*Euphilotes allyni*) by Recovery Unit. Sites are grouped by geographic region. The Ballona region includes the Ballona Wetlands site. The Airport region includes the LAX Dunes Preserve and Dockweiler State Beach. The El Segundo region includes the Chevron Preserv. The Torrance region includes Redondo Beach, Torrance Beach and Malaga Bluffs. The Palos Verdes region includes Vicente Bluffs Preserve, Alta Vicente Preserve, and Abalone Cove.

Earlier emergence over time across sites

When examining changes in emergence timing, days of first observation often seemed to be less reliable. Surveys often began after the start of the flight season, as shown by their relatively higher counts, and as such, were not included in the analyzes if the counts were greater than 5. We instead examined changes in days of peak observation, which were more easily captured by surveys and provided a greater amount of data points for analysis. We disregarded any potential outlier peak counts from surveys that either consisted of less than 10 individuals observed, too few survey days (with the exception of Redondo Beach and Torrance Beach), or

clearly began too late into the flight season (as shown by first observations greater than 5). Changes in peak days over time for each Recovery Unit have been visualized in Figure 4.4. A significant decreasing trend over time was found for the Ballona ($N = 6$, $R^2 = 0.84$, $p = 0.0101$), Airport ($N = 27$, $R^2 = 0.56$, $p < .0001$), and El Segundo ($N = 18$, $R^2 = 0.55$, $p = 0.0004$) Recovery Units. The Torrance and proposed Palos Verdes Recovery Units each have a sample size of 6 and show no significant trend. The same geographic grouping as above been used here, where Redondo Beach has been categorized as a part of the Torrance region and not the El Segundo region.

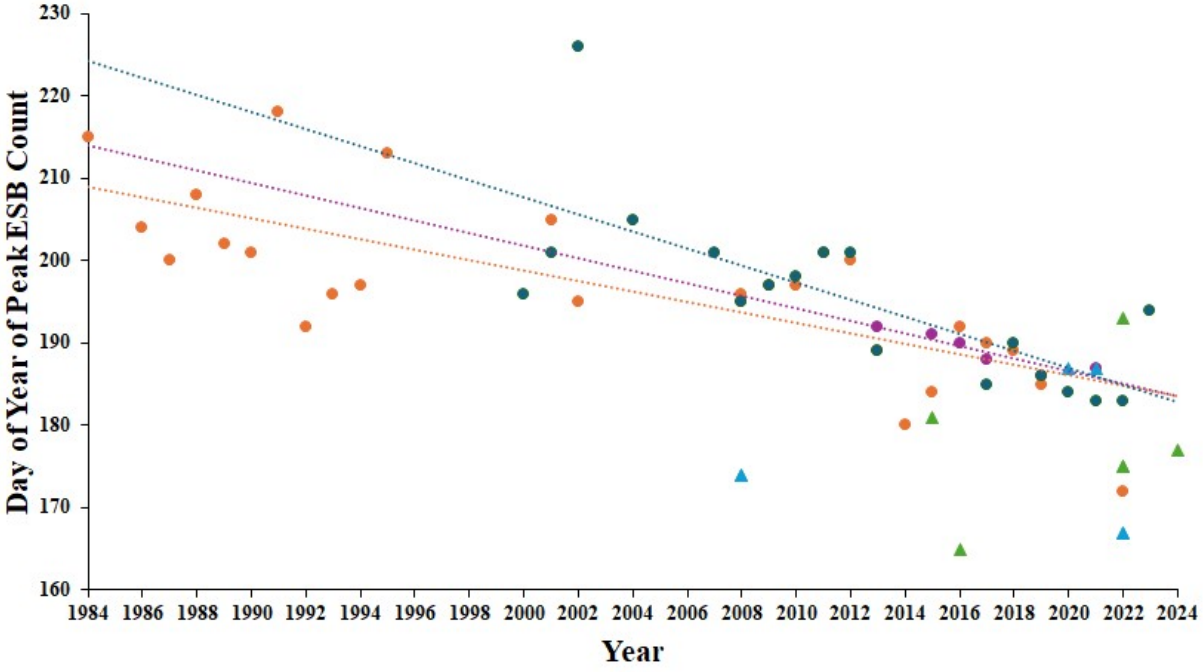

Figure 4.4 - Comparison of days of peak observance of the El Segundo Blue butterfly (*Euphilotes allyni*) by Recovery Unit. The Ballona Recovery Unit (purple), containing the Ballona Wetlands site, shows a decreasing trend over time ($N = 6$, $R^2 = 0.84$, $p = 0.0101$). The Airport Recovery Unit (orange), containing the LAX Dunes Preserve and Dockweiler State Beach sites, shows a decreasing trend over time ($N = 27$, $R^2 = 0.56$, $p < .0001$). The El Segundo Recovery Unit (dark blue), containing the Chevron Preserve site, shows a decreasing trend over time ($N = 18$, $R^2 = 0.55$, $p = .0004$). The Torrance Recovery Unit (light blue) contains the Redondo Beach, Torrance Beach, and Malaga Bluffs sites. The proposed Palos Verdes Recovery Unit (light green) contains the Vicente Bluffs, Alta Vicente, Abalone Cove sites.

It is important to note that consistent survey data is only available for the Ballona Wetlands, LAX Dunes Preserve, and Chevron Preserve populations, with long-term data available only for the latter two sites. As such, a strong visualization of the changes in peak observation timing is possible for these populations. For other sites, however, this data is

scattered throughout the years and is often less reliable due to their relatively low populations and fewer survey days per year, which opens the possibility for observers to miss potential ESB sightings.

Generalized linear model analysis

For a more through analysis, each site was assigned a latitudinal value (Appendix A) representing the approximate center of the site. We then disregarded any potential outlier peak counts from surveys that either consisted of less than 10 individuals observed, too few survey days (with the exception of Redondo Beach and Torrance Beach), or clearly began too late into the flight season (as shown by first observations greater than 5).

Utilizing JMP®, Version 18.2.0, we constructed a generalized linear model (GLM) with a Normal probability distribution and Identity link function ($g(\mu) = \mu$) to determine the relationship between year, latitude, and day of peak observation. The model did not fit the data very well, shown by the goodness-of-fit statistics and significant overdispersion (Deviance/df = 64.67, Pearson Chi-Square/df = 64.67, overdispersion = 61.77, $p < .0001$). However, the whole model was shown to be significant ($p < .0001$), and when compared to a model utilizing only the effect of year (AICc = 489.66) or only the effect of latitude (AICc = 504.61), the model ultilizing both year and latitude effects (AICc = 475.05) is preferred. We found that, assuming a linear response, latitude was a significant predictor of the day of peak observation (B = 66.83, SE = 15.26, $\chi^2(64) = 16.87$, $p < .0001$). As latitude increased, the day of peak observation increased, showing that the flight season peak for the southern sites is earlier than in the northern sites. Additionally, we found that, assuming a linear response, year was a significant predictor of the day of peak observation (B = -0.61, SE = 0.095, $\chi^2(64) = 31.83$, $p < .0001$). As year increased, the day of peak observation decreased, showing that the ESB flight season peak day is occurring earlier in more recent years. Thus, these results suggest that earlier occurrences of flight season peaks are likely affected by changes over time and differences specific to site locations.

We believe that differences in local climate account for the differences in flight season peak days, though further research is needed to determine the specifics. However, our analysis has made it clear that a specialized monitoring schedule is required to accurately capture the peak of the local ESB flight season. We also believe that climate change, and the subsequent earlier onset of summer, accounts for the earlier occurrences of flight season peaks over the past few decades. Other studies have shown that butterfly species that emerge in the summer are experiencing earlier emergences (Kearney et al., 2010). Further research is needed to prove whether this is the case for the ESB, but it is likely. Thus, a monitoring plan that is flexible and sensitive to yearly conditions through the usage of a sentinel site would produce the most accurate peak day estimations.

Population Monitoring Plan and Schedule

To support accurate and coordinated butterfly monitoring across multiple sites, the LAX dunes are designated as the sentinel site for the ESB. LAX currently estimates ESB first emergence based on their own monitoring of seacliff buckwheat (*Eriogonum parvifolium*) blooms each May. Continuing the use of this method, which has been shown to produce an accurate estimation, they will estimate when to begin surveying. LAX has been chosen as a sentinel site because it hosts the largest population of ESBs, and its larger habitat size makes it less vulnerable to environmental changes compared to smaller sites. Early observations at LAX provide a reliable indicator of when butterfly emergence is likely to occur across the region, and the usage of this sentinel site allows for greater sensitivity to potential climatic conditions, which may change each year. LAX will alert all sites once they first observe an ESB, triggering the start of each sites' formal monitoring schedule (Table 4.6), which has been formulated to be site-specific to account for slight variations in emergence across locations utilizing our generalized linear model. This coordinated approach ensures that surveys capture the peak flight window at each location, which may differ between years depending climatic conditions. By standardizing survey timing relative to ESB emergence at the LAX Dunes Preserve, we can make meaningful comparisons of population trends across all monitoring areas while minimizing the risk of missing critical data.

Upon documented first emergence at LAX, all sites except for ones in the Torrance Recovery Unit and the proposed Palos Verdes Peninsula Recovery Unit are to wait 17 days, and then conduct five consecutive weekly Pollard-Yates transect walks (Pollard & Yates, 1993) to capture the day of peak flight. Due to an average peak observation of butterflies at 38 days after initial sighting at the LAX site, this waiting period allows a 5-week survey to accurately capture the peak sighting on the third week of surveying.

To determine a monitoring plan around LAX as a sentinel site, we incorporated transect data from the LAX, Ballona, and Chevron sites to find the average date of initial observance at LAX, as well as the mean peak flight dates across each site. LAX initial observances range significantly, centering around the mean initial observance date of day 154 (June 2) in years where comparisons between the three sites are possible, with a slight bias towards earlier emergences in more recent years.

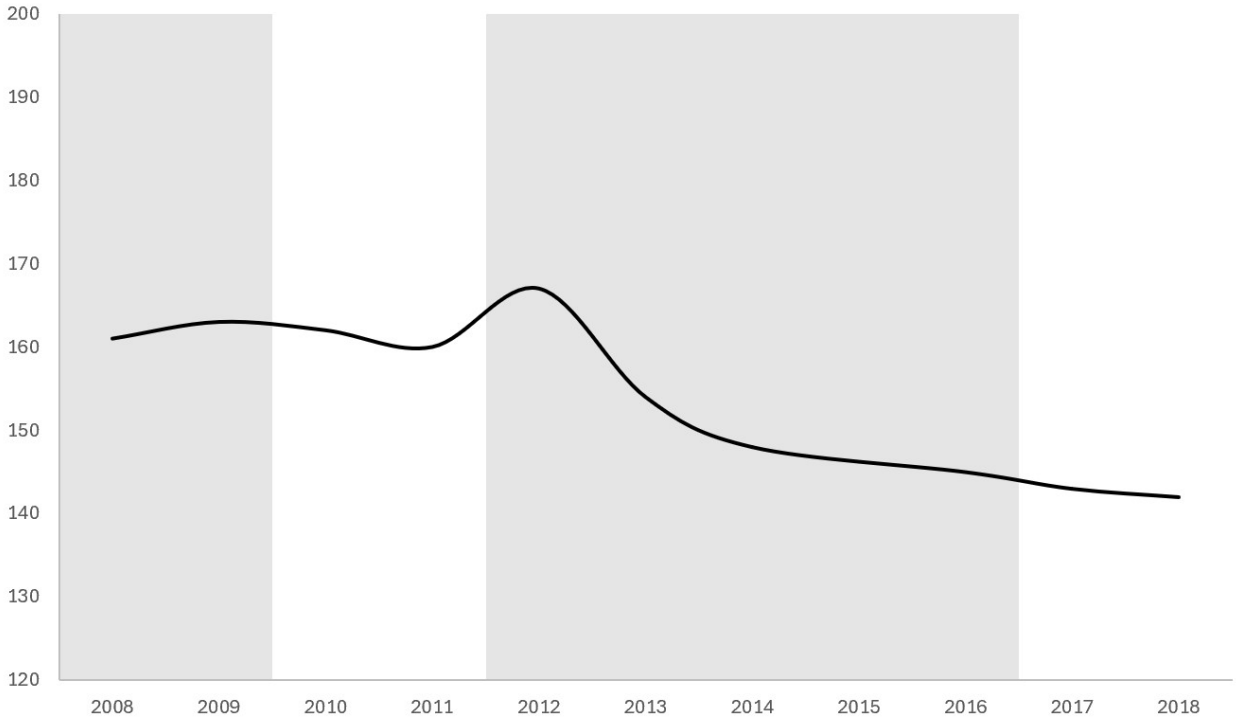

Figure 4.5 - First observed emergence at LAX, 2008-2018. Initial emergence (line) has trended earlier over time as well. This suggests a level of internal consistency between initial and peak emergence that allows the Sentinel Site model to remain consistent despite changing climatic conditions. Gray bars denote drought years, which may impact butterfly emergence phenology.

Table 4.6 - Recommended survey schedule for all known sites of the El Segundo Blue butterfly (*Euphilotes allyni*) demonstrating the estimated day of peak count (for 2024) and the recommended days for five weekly surveys based on the first observation at the LAX Dunes Preserve Sentinel Site.

Site Name (North to South)	Estimated day of peak count (day of year)	Av. days between first and peak observation	Day of survey (days after first sentinel observation on day 160)				
			First survey	Second survey	Third survey	Fourth survey	Final survey
Ballona Wetlands	187	27	17	24	31	38	45
LAX Dunes Preserve	185	25	17	24	31	38	45
Dockweiler State Beach*	186	26	17	24	31	38	45
Chevron Preserve	184	24	17	24	31	38	45
Redondo Beach*	177	17	1	8	15	22	29
Torrance Beach*	177	17	1	8	15	22	29
Malaga Bluffs*	176	16	1	8	15	22	29
Vicente Bluffs Reserve*	172	12	1	8	15	22	29
Alta Vicente Reserve*	172	12	1	8	15	22	29
Abalone Cove*	172	12	1	8	15	22	29

Note: Column two signifies the day of year when the generalized linear model indicates that a site's peak of the *E. allyni* flight season will occur. Columns four through eight indicate the recommended days for each of the five surveys; these values indicate the number of days after the first *E. allyni* sighting at the sentinel site (LAX Dunes Preserve). The historic average day of first observance for LAX (Day 160) is used as the day of first emergence in this schedule, although the expected day of first observance is likely to be earlier.

Peak flight season was documented both through yearly observed days of peak count in these three sites, as well as an analysis of the μ (peak emergence) value of each population curve produced by INCA. On average, ESB peak emergence precedes expected peak flight by around 7 days, so INCA data is then adjusted by 7 days to better fit expected and observed peak count. A chart of the average distance between peak flight, both observed and simulated (INCA $\mu + 7$), and the day of first observance at the LAX Dunes Preserve for each site is shown in Table 4.7.

Table 4.7 - Comparison of both the observed and modelled number of days between an initial ESB sighting at the Airport Recovery Unit (LAX) and other northern sites.

Site name	Avg (Obs.)	Avg (INCA μ + 7)
LAX Dunes Preserve	41	40
Chevron Preserve	38	39
Ballona Wetlands	31	33
Agg.	38	39

Detailed breakdowns of time between LAX emergence and the peak flight date from each site are listed below, in Table 4.8.

Table 4.8 - Detailed breakdown of observed and modelled number of days between initial and peak ESB sightings in the Northern Sites, observed and INCA μ + 7.

Year	LAX (Obs.)	LAX (INCA)	Chevron (Obs.)	Chevron (INCA)	Ballona (Obs.)	Ballona (INCA)
2008	39	37	38	40	N/A	N/A
2009	34	40	37	39	N/A	N/A
2010	35	37	36	39	N/A	N/A
2011	43	40	43	40	N/A	N/A
2012	33	33	34	38	N/A	N/A
2013	37	38	37	35	37	39
2014	37	32	N/A	N/A	N/A	N/A
2016	28	29	N/A	N/A	23	23
2017	38	37	40	36	31	35
2018	33	33	37	33	N/A	N/A

While the day of peak count for the ESB has shown a trend of occurring earlier in the year, this has not significantly affected the time between emergence and peak flight (Figure 4.6). Due to the internal consistency between initial and peak sightings, it is still feasible to use a standard monitoring methodology using the LAX site as a sentinel site for the Northern Sites, as sites should be expected to follow a consistent trend.

Figure 4.6 - Distance between initial and peak flight observations, 2008-2018. LAX (Blue), Chevron (Green), and Ballona (Yellow) share similar times between initial and peak flight observations. Observed data (Circle) and adjusted INCA data (Diamond) show similar trends as well.

Aside from a potential outlier year in 2016, the time between initial emergence at LAX and peak flight season at other sites is remarkably consistent. As such, we recommend a 5-week surveying period trying to capture the peak count on week 3. The weighted mean peak flight day across all three surveyed sites is 38 days after emergence at LAX, which means to capture the peak count at week 3, sites should start surveying 17 days after emergence.

Northern sites should be assessed 2–4 weeks before flight season for host plant distribution changes. Flight season for the ESB typically occurs from mid-June through mid-August (Mattoni et al., 2001). The ESB life cycle is entirely dependent on seacliff buckwheat as the species' host plant, as the butterflies emerge in sync with the blooming of the seacliff buckwheat. If transects no longer align with seacliff buckwheat patches due to habitat shifts, realignment should occur prior to the survey window using updated GIS maps. If

unanticipated changes are noticed after monitoring begins, the survey may pause for no more than 7 days to remap transects and resume without compromising the flight season data.

For the Torrance and proposed Palos Verdes Recovery Units, earlier peak flight and a lack of consistent monitoring data make assigning a specific survey schedule based on the LAX Sentinel Site difficult. As a result, there is only reliable data for the northern sites in establishing Sentinel Site timing. To supplement this, we have utilized the estimated values produced by our GLM for the peak flight season day for these southern sites (all sites south of the Chevron Preserve). When reliable estimates for expected initial emergence, peak flight season, and mean days between initial emergence and peak flight can be quantified corroborated with data from the northern sites, the schedule may be modified. Until that is possible, the Torrance and proposed Palos Verdes Recovery Units should begin their survey schedule immediately after the LAX Sentinel Site reports their first ESB observation, lasting at least 5 weeks until a peak count is observed, followed by two additional survey weeks.

Standardized Population Monitoring Methodology

To ensure reliable monitoring of the ESB and alignment with the 1998 USFWS Recovery Plan, implementing standardized Pollard-Yates transect walks (Pollard & Yates, 1993) across all occupied and potential habitats remains a critical strategy. These habitats include the LAX, El Segundo, Ballona, and Torrance Recovery Units, as well as the proposed Palos Verdes Peninsula. Pollard-Yates transects are widely regarded for producing consistent, repeatable data. This is crucial for detecting trends in adult butterfly abundance and assessing whether recovery criteria are being met or not. Additionally, a key principle in this methodology is the establishment of "exhaustive transects." Essentially, this means that survey lines must be strategically placed to capture all major patches of suitable habitat, especially areas where seacliff buckwheat is actively blooming. Since this native plant is the sole larval host for the ESB, its distribution determines where butterflies are most likely to be found. To meet this standard, each transect should intersect at least 60% of these seacliff buckwheat patches, or as much as possible depending on habitat constraints. Quantitative standards further refine what constitutes adequate coverage. Transects should be 100 meters in length, adjusted as site dimensions see fit, and spaced at least 30 meters apart to avoid double-counting. Spacing can be closer in small or fragmented habitats. The number of transects per site is calibrated to habitat size and seacliff buckwheat density as follows:

- **1–2 acres**: 2–3 transects
- **3–5 acres**: 4–5 transects
- **5–10 acres**: 6–10 transects
- **Over 10 acres**: 10 or more transects, depending on habitat complexity

In denser habitats, fewer longer transects may suffice, whereas in fragmented or sparse areas, a greater number of shorter transects ensures no key patches are missed.

To maintain annual consistency and uphold the precision and accuracy of data collection, all transects must be GPS-mapped following a pre-flight season habitat assessment. This evaluation considers the distribution and condition of seacliff buckwheat, habitat changes, flowering phenology, and access or safety concerns. If significant shifts in seacliff buckwheat distributions are observed 2–4 weeks prior to the estimated start of the flight season, realignment of transects should occur using updated GIS maps. Surveys may be paused for up to 7 days if unexpected changes are noticed after monitoring begins, allowing time for necessary adjustments without compromising data quality.

This outlined methodology establishes a robust and adaptive tool for monitoring the ESB population. It allows comparisons across sites and years, helps track progress toward recovery, and supports the safe collection of scientifically meaningful data without disturbing this sensitive species.

Discussion

In order to best track the successes of conservation efforts and the overall progress of each population, a standardized monitoring methodology and a specialized schedule is essential. All aspects of the monitoring plan have been created to address specific issues found in previous surveys or reports. Overall flight season peaks are occurring earlier nearly every year, coinciding with earlier summers. The usage of a sentinel site in this plan ensures that the monitoring schedules can accommodate any climatic changes per year that result in an altered flight season, as these changes will presumably affect the LAX population, and therefore shift all schedules accordingly. In addition, it has become clear that emergence phenology varies between sites, with the more southern sites seeming to reach their peak up to a month earlier than the northern sites. Using existing data, site-specific schedules have been formulated to best capture the observed peaks for their respective sites. While gaps in the available data have produced some uncertainty, the five week observation interval allows for two weeks before and after the estimated peak, which provides some a buffer in case the actual peak does not fall on the third week for a given year.

If future observations show that the actual peak is consistently different from our estimate, the schedules may be adjusted accordingly. Based on current data however, this strategy seems to be the most accurate option. It is aimed at capturing peak counts for all populations without excessive cost, making it manageable even for the smallest sites. If funding allows in the future, capturing the entire flight season for each site may become a better option, as this would produce more detailed data and allow for the calculation of a population estimate. However, this does not currently seem to be viable, seeing as funds are limited and there is a greater financial need for habitat restoration and management. For butterfly species, overall

trends seem to be easier and more reasonable to track than estimated population size, given their high mobility and relatively short lifespans. Ultimately, the downlisting and delisting criteria require that populations must show a stable or increasing trend for eight years. Peak counts have shown to be accurate in tracking these population trends, thus, the utilization of this metric is perfectly suitable for the purpose of meeting criteria.

Because several of these sites are extremely small in area, it may be possible that permitted biologists from various conservation organizations are willing to donate their time and provide these surveys "pro bono". In addition, many sites are close in proximity and have been surveyed together and combined into single reports. These sites include: Redondo Beach and Torrance Beach (El Segundo RU and Torrance RU) and Vicente Bluffs, Alta Vicente, and Abalone Cove (Proposed Palos Verdes RU). Funds for this effort may be found largely in federal and state grants. Other sources may include public agencies, non-profit organizations, consulting firms, and donations.

However the Plan may be implemented, it is certain that all sites must be surveyed annually in a consistent manner. Outside of the Chevron Preserve, not one site can fulfill Criterion 3 in the Recovery Plan due to gaps in survey years or the usage of inconsistent methodology. Successful recovery is directly reliant upon identifying what actions work and what areas could be improved. By filling these knowledge gaps, the ESB can be accurately monitored over time, which will inform future conservation efforts and accelerate the species' recovery progress.

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Chapter 5: Creation of a 10-Year Recovery Strategy to achieve delisting of the El Segundo Blue butterfly

Introduction

Delisting the El Segundo Blue butterfly (*Euphilotes allyni*) can be done with a carefully crafted monitoring plan; utilizing the information provided in the recovery plan, the surveys of the populations at various areas, and habitat assessments, we have constructed a recovery strategy in order to facilitate the recovery over the next 10 years. Past data and assessments are promising; previous habitats, when restored, have been established to be recolonized. The U.S. Fish and Wildlife Service in the 2008 ESB five-year review, documented recolonization at multiple sites post-restoration, indicating a pivotal point in recovery efforts for the butterfly. Dune habitats at Dockweiler, Redondo, and Torrance beaches, which were historical sites, were restored with critical native vegetation (most notably, seacliff buckwheat), and subsequent surveys found a significant recolonization of the ESB, indicating previous successes in restored areas. It was concluded that if restored habitat is within at least a mile of occupied habitat, the ESB is likely to naturally recolonize, displaying how restoration and maintenance efforts can create key habitats crucial for downlisting and delisting of the species. Many current sites have maintained their populations over the years, and properly maintained and restored areas have had positive results. Overall, a combination of habitat restoration and maintenance, standardized population monitoring, and proper outreach are necessary. Outlined below are the necessary habitat conditions, monitoring efforts, and education that must be accomplished over the next ten years in order to optimally downlist and eventually delist the species. This is based on both updated information, as well as the guidelines outlined in the original 1998 Recovery Plan and its 2019 amendments. A budget estimate was also developed in order to accomplish this, and was optimized to be as cost efficient based on the requirements.

10-year Recovery Strategy

Utilizing the proposed updated recovery criteria, which includes the addition of the proposed Palos Verdes Recovery Unit, the team has developed various recommendations to guide future actions and optimize the use of time and financial resources. This 10-year Recovery Strategy outlines the necessary steps to facilitate ESB recovery and delistment. In accordance with the updated criteria, at least 10 sites must fulfill the protection, habitat quality, and population stability requirements to achieve species delistment.

Currently, the species is present at a total of 10 distinct sites, each varying in protection status, land area, habitat quality, and population size. While these are currently the only known sites, the ESB's ability to establish itself at new locations has made it clear that new sites can be colonized or discovered. Thus, while this strategy pertains to the locations listed, if any future sites are determined to be of higher recovery potential, similar assessments can be conducted and the strategy can be updated. All sites are listed within their respective Recovery Units. To aid in the prioritization of conservation efforts, the team has labeled certain sites with respect to their overall condition. **Key sites** refer to a single site within a Recovery Unit with the greatest recovery potential and progress, based on the combined status of legal protections, land area, habitat quality, and ESB population size. **Supplementary sites** refer to sites within a Recovery Unit with relatively lower recovery potential or progress, while still being considered viable locations for the ESB.

Recommended updated recovery criteria:

Downlisting Recovery Criteria

The El Segundo Blue butterfly can be considered for downlisting to threatened status when:

1) At least one secure population in each of the five Recovery Units (RUs) – Ballona, Airport, El Segundo, Torrance, and Palos Verdes – are permanently protected to provide redundancy and maintain representation. The Airport Dunes (Napoleon Street and Waterview Street to the north, Vista del Mar to the west, Pershing Drive to the east, and Imperial Highway to the south) located in the Airport RU contains the largest population of the butterfly and is the population most likely to survive disease, predators, parasites, and other perturbations. The Airport Dunes must be one of the protected populations.

2) Each of the five populations are managed to maintain coastal dune habitat dominated by local native species including coast buckwheat.

3) As determined by a scientifically credible monitoring plan, each of the five populations exhibits a statistically significant stable or upward trend (based on transect counts) for at least 8 years (approximately eight butterfly generations). Population management in each Recovery Unit ensures that the average discrete population growth rate (lambda) is at or above 1.0, indicating a stable or increasing population.

4) A program is initiated to inform the public about the El Segundo Blue butterfly and its habitat.

Delisting Recovery Criteria

The El Segundo Blue butterfly can be considered for delisting when:

1) Five secure populations - in addition to the five that meet downlisting criteria - are protected (total of 10). One of these additional populations must be in the Palos Verdes Recovery Unit. These additional populations increase viability of the species through increased redundancy and representation.

2) Each of the 10 populations is managed in perpetuity to maintain coastal dune habitat dominated by local native species including coast buckwheat. This criterion assures population resiliency and amelioration of the threat of habitat modification resulting from invasive nonnative plant species (Factor A).

3) As determined by a scientifically credible monitoring plan, each of the 10 populations exhibit a statistically significant stable or increasing trend (based on transect counts) for at least 8 years (approximately eight butterfly generations). Management in each population distribution ensures that the average discrete population growth rate (lambda) is at or above 1.0, indicating a stable or increasing (resilient) population. Lambda is not below 1.0 for more than one year prior to delisting, indicating growth rate fluctuations are natural and not due to population decline and the population is resilient. This criterion assures population resiliency and that the threat of limited range has been sufficiently ameliorated (Factor A).

Population monitoring

Population monitoring is the most important first step in any recovery plan for a particular species because it provides the baseline data needed to understand its current status. From there, researchers can move forward with determining what the proper methodology is for accomplishing what they have determined is necessary for recovery. Without knowing how many individuals exist, where they are located, how their numbers are changing over time, or what threats they face, it is virtually impossible to make informed conservation decisions. Successful monitoring allows for the reliable tracking of population trends, identification of crucial sites, detections of threats or issues, the efficient establishment of recovery goals, and the accurate evaluation of recovery progress. Overall, population monitoring acts as both a diagnostic tool and a feedback loop, which ensures that any recovery efforts that are adopted are both evidence-based and adaptable.

Habitat restoration

The importance of habitat restoration for the ESB has long been recognized as essential to the species' survival. The 1998 Recovery Plan clearly states: “Without an active restoration

and management program, the long term persistence of the native dune ecosystem necessary to support the El Segundo blue butterfly is unlikely." This underscores how critical it is to not only protect but actively rebuild the butterfly's fragile coastal habitat. The unique coastal dune habitat, in particular, is threatened by both public and private development, and as such, the need for intentional restoration is apparent. In particular, the restoration of native habitats with an emphasis on replanting seacliff buckwheat is essential to inviting the presence of the ESB.

Habitat restoration has typically been taken care of by non-profit organizations in the respective Recovery Units, with the exception of Chevron. The company has utilized internal operations to restore its land for the ESB. Nonetheless, non-profits and many of their volunteer programs and initiatives are necessary for restoring and maintaining ESB habitat. The general restoration process entails assessing the vegetative distribution of a site, removing aggressive invasives, re-integrating native species and seacliff buckwheat, and ensuring their survival. Maintenance, which follows restoration, is an equally important element that requires long-term upkeeping of vegetation and reintroduction of plants after weather events, blight, or failure of a restoration attempt. Due to the varying nature of the health, density, and composition of the seacliff buckwheat and coastal dune habitats at each site, each site can be classified as requiring further restoration or requiring maintenance of the habitat. We recommend that sites set restoration goals that are specific to their historical, natural plant communities. While these goals may differ in exact proportions of certain plant species, we suggest the goal of 0% iceplant coverage, due to its aggressive, invasive nature. Plant cover should be dominated by native species, with an emphasis on seacliff buckwheat distribution.

Sites requiring further restoration

Ballona Wetlands

While the Friends of Ballona Wetlands have undertaken and continue to restore the wetlands, significant portions of the wetlands just above the riparian habitat remain highly viable areas for expanding the seacliff buckwheat presence. The current distribution of seacliff buckwheat is limited to the Southwesternmost portion of the wetlands. This area alone, as well as areas near the pond further inland, has the potential for significant restoration.

Dockweiler State Beach

Dockweiler has been restored multiple times, even in recent years; however, the current presence of seacliff buckwheat remains minimal. Removal of invasives, especially ice plant, and reintegration of seacliff buckwheat are necessary for this site to become viable again. Expanding the current range of seacliff buckwheat presence to the rest of the coastal dune habitat could also mark Dockweiler as one of the most significant and most viable sites north of Palos Verdes.

Torrance Beach

The current recovered portion of the Torrance preserve remains an excellent example of successful restoration; however, the site itself is relatively small, especially when there is a massive amount of coastal dune habitat adjacent to it that remains entirely viable for restoration. Iceplant is the most vigorous invasive plant in this area and poses the greatest threat to any restoration and subsequent management project.

Sites requiring habitat maintenance

LAX Dunes Preserve

The LAX Dunes is one of the most successful implementations of ESB habitat restoration and maintenance; however, further maintenance of the seacliff buckwheat is still necessary to ensure this site remains viable. While there is little to no space for further expansion, extant seacliff buckwheat's current distribution and health will always retain room for improvement.

Redondo Beach

Redondo Beach, located directly adjacent to Torrance Beach, is significantly larger in range yet is still riddled with iceplant, and has a sparser distribution of seacliff buckwheat than the small area of the Torrance Beach site. The vast range of habitat in this coastal dune system requires long-term maintenance to ensure the iceplant fails to destroy restoration effort and seacliff buckwheat can sustain itself and expand its presence naturally.

Malaga Bluffs

The Malaga Bluffs site has a healthy natural occurence of seacliff buckwheat and other native vegetation yet still falls victim to invasives such as iceplant and mustards. Maintenance of this site would include periodic removal of these invasives to ensure the current seacliff buckwheat distribution can restore itself to natural levels and balance the coastal dune ecosystems of Palos Verdes.

Site protections

Ballona Recovery Unit

Key site: Ballona Wetlands

The Ballona Wetlands is recognized as the sole key site within the Ballona Recovery Unit (RU) for the ESB, making it a suitable candidate for recovery efforts within the unit. This designation is given not only because of its state ownership and active restoration efforts, but also for being the only location within the RU where the ESB is present and observable.

However, concerns remain regarding the site’s enduring protection. The proposed berm construction plans are meant to reduce flood risks throughout the wetland, yet Ballona Wetlands remains vulnerable to potential flooding given that failures are not taken into account. The 2017

draft Environmental Impact Report (EIR) for the Ballona Wetlands Restoration Project, fails to directly address the possibility of berm or levee failures and the negative effects they can instill on the existing ESB habitat. Thus, undermining the amended recovery plan's criteria of being 'permanently protected', which is necessary for downlisting the site.

Although the site is considered protected, a legally binding document, such as a conservation easement or some equivalent, would better ensure a 'permanently protected' wetland. Currently, the population trend data for the ESB at the Ballona Wetlands site appears to be in decline with no current data, limiting the ability to produce a complete assessment on the progress for recovery.

In order to fulfill the downlisting criteria, a significant amount of long-term monitoring data must be developed and permanent protection must be ensured through finalized and legally secure sustained protections. Future restoration design efforts and flood control plans, particularly those regarding levees and berms, must explicitly state how potential failures would be mitigated to prevent undesirable effects on the ESB habitat. In this situation, establishing contingency planning for possible berm failure scenarios would be a step towards ensuring flood resilience.

Overall, eliminating flood risks, securing long-term legal protection, demonstrating a stable increasing ESB trend, and sustaining the native habitat with the ESB's primary host plant, is crucial for meeting the downlisting objectives and having the site meet the 'permanently protected' requirement.

Airport Recovery Unit

Key site: LAX Dunes Preserve

Despite the extent of surveying and progress at the LAX Dunes Preserve, the legal protections here can be improved. As mentioned previously, the LAX dunes are protected by two city ordinances: the first protects and restores the southern 203 acres as the Dunes Habitat Preserve, and the second amends the first to state that no development shall occur on those acres. Due to the exclusion of the northern 104 acres from the Dunes Habitat Preserve as well as the impermanent nature of city ordinances, the protection at this site has been deemed insufficient. The amended recovery plan has already echoed this, stating that one of the threats to the ESB population is "The lack of permanent conservation and long-term management assurances at significant occupied areas such as the Los Angeles Airport Preserve" (Recovery Plan for El Segundo Blue Butterfly (*Euphilotes Battoides Allyni*), 2019). The Specific Plan has not been altered since.

It is important to recognize the entire dune habitat, both the northern and southern acres, as one. The California Coastal Commission has stated that the whole dune habitat is contiguous, even designating the northern acres as ESHA. Furthermore, the Commission stated that the

construction of a golf course or other recreational use would "raise serious issues of conformity of Section 30240 of the Coastal Act" (Rich, 2003). Section 30240 ensures that developments on ESHAs must be dependent on those resources, and ESHAs shall be protected against any disruption. Not only would a golf course not be dependent on the dunes' resources, they may disrupt the habitat of the endangered species that live there. Since the development proposed for the northern acres would not be allowed according to Section 30240, the Specific Plan should be amended to include the northern acres in the Dune Habitat Preserve.

To achieve delisting, it is also recommended that the legal protections follow the amended Recovery Plan's requirement that each of the populations is managed in perpetuity. While the city ordinances offer local protection and have allowed for great strides in recovering the LAX dunes, they are not permanent. City ordinances are subject to amendment or repeal by the Los Angeles City Council at any time, and an ordinance initiative petition can even be submitted by citizens that would like to amend or repeal an ordinance. Existing laws at state and federal levels such as the Endangered Species Act, California Environmental Quality Act, and the California Coastal Act prevent harm done to the species, but the Recovery Plan requires ongoing management to maintain the coastal dune habitat from invasive species. Therefore, there should be more permanent legal protections implemented in the form of conservation easements, NCCPs/HCPs, or other durable legislation.

Supplementary site: Dockweiler State Beach

Dockweiler State Beach is a site owned by the State of California and managed under the Los Angeles County Department of Beaches and Harbors (LACDBH), as well as California State Parks. This site currently lacks permanent legal protections, necessary to meet the criteria for either the downlisting or delisting of the ESB. The existing regulations, like the Endangered Species Act (ESA), the California Environmental Quality Act (CEQA), and the California Coastal Act serve as measures designed to safeguard the habitat, yet they don't ensure binding, long-term protection.

Through the Bay Foundation's work, alongside several agencies, the Los Angeles Living Shoreline Project is a representation of the conservation efforts being worked on at this site. Despite the project's efforts to plant seacliff buckwheat and improve the dune ecosystem, these actions are not sufficient to guarantee permanent protection or sustained monitoring of the ESB. Thus, this site fails to meet the downlisting standards which entail a "permanently protected" population and a "credible monitoring plan" (Recovery Plan for El Segundo Blue Butterfly (*Euphilotes Battoides Allyni*), 2019).

Upon analyzing the data and information obtained, Dockweiler State Beach showcased limited and outdated population data. Its most current transect surveys were conducted in 2008 and 2009 with no clear documentation of stable or growing ESB population trends. In order to contribute towards recovery goals, potential recommendations would be to establish habitat zones that could undergo management in a feasible manner. These locations could include those

above the high tide line, cliffs, or residential areas. While doing so, it is also necessary to consider the Public Trust Doctrine, to guarantee that access to the beach by the public is not violated.

El Segundo Recovery Unit

Key site: Chevron Preserve

The Chevron Preserve is a site located within the El Segundo Recovery Unit, serving as a crucial site for the ESB given its long-term efforts to plant seacliff buckwheat and its dense population data recorded over the years. Since the ESB's presence in 1981, the amount of seacliff buckwheat plants have increased and expanded throughout the site under Chevron's preservation efforts.

Although Chevron has supported a quantifiable ESB population, there are not sufficient legal protections in place. Hence, preventing the site from qualifying as a 'secure' population, as mentioned within the ESB Recovery Plan Amendment for both the downlisting and delisting criteria. Regulations like the Endangered Species Act (ESA), the California Coastal Act, and the California Environmental Quality Act (CEQA) have been put in place for this site, yet fail to guarantee active or permanent preservation practices. Chevron identifies as a privately owned site, and unfortunately, despite outreach, no point of contact or collaboration for conservation efforts has been established.

Given the ESB population data, there appears to be signs of a short-term comeback for the ESB, with its most recent increase being a 212% from 2022-2023 and lambda values falling below 1.0 for 'four of the past seven years' as stated within the individual site assessment. This information further proves its failure to meet the recovery plan standards of a "statistically significant stable or upward trend…" (Recovery Plan for El Segundo Blue Butterfly (*Euphilotes Battoides Allyni*), 2019). Potential recommendations for the site to meet downlisting or delisting standards, would be to establish legal long-term habitat management agreements, though keeping in mind its private ownership and possible land use restrictions.

Torrance Recovery Unit

Key site: Torrance Beach

Torrance Beach is determined as a key site within the Torrance Recovery Unit. Its proximity to Redondo Beach and its healthy coastal dune habitat make it a suitable candidate for preservation. In terms of legal protections not much is in place, thus undermining the 'secure' portion of the recovery criteria. Like many locations, Torrance Beach is under the Endangered Species Act (ESA), the California Environmental Quality Act (CEQA), and the California Coastal Act which do not command permanent management.

This site is currently benefiting from the Beach Bluffs Restoration Project, which secures limited and temporary management through permits applied for by organizations involved with the California Coastal Commission (CCC). A strong seacliff buckwheat presence and low level of ice plant disruption throughout the site calls for favorable habitat conditions, however, there has been an inconsistency in ESB monitoring which prevents it from meeting downlisting or delisting criteria. As noted within the ESB Recovery Plan, the site must have a "statistically significant stable or upward trend for at least 8 years" (Recovery Plan for El Segundo Blue Butterfly (*Euphilotes Battoides Allyni*), 2019).

Because of the Public Trust Doctrine, there may be a restriction in potential legal recommendations for improving the site's management and monitoring in regards to the ESB. For instance, it is important to recognize that measures like a conservation easement, may be difficult to implement. Consequently, establishing a standardized monitoring plan would benefit the site and allow it to improve in the direction of recovery.

<u>Supplementary site: Malaga Bluffs</u>

The Malaga Bluffs is located at the start of the proposed Palos Verdes Recovery Unit and serves as a suitable additional candidate for the delisting of the ESB. The site makes a good habitat for the ESB's host plant, seacliff buckwheat. However, the absence of a strong recovery program has resulted in the presence of seacliff buckwheat being insufficient, irregular, and unhealthy, which poses a risk for the ESB's survival moving forward.

As a privately owned site, there have been minimal observations in relation to restoration and surveying of the ESB population. The Endangered Species Act (ESA), California Environmental Quality Act (CEQA), and the California Coastal Act do not meet the needs of the recovery criteria given that despite their implementation's ability to protect a species against disturbances, they do not guarantee permanent protection in perpetuity. The Coastal Act (Section 30240) ensures permits for new development follow protection regulations which include the prohibition of disruptive land use for Environmentally Sensitive Habitat Areas (ESHAs), but offers limited management retrospectively. Considering these limitations, there is a possibility for landowners to become less willing to implement a long-term legal conservation measure as such.

Malaga Bluffs' proximity to Redondo is a decent indicator for designating it as a site for potential delisting. However, significant long-term protections must be secured and the habitat must showcase a "...statistically stable or upward trend for at least 8 years" (Recovery Plan for El Segundo Blue Butterfly (*Euphilotes Battoides Allyni*), 2019). Though it may be a challenge to convince private landowners to agree upon a conservation easement, a potential recommendation would be to incentivize the landowner through financial benefits in the form of lowered taxes for third-party conservation easements.

Proposed Palos Verdes Recovery Unit

All of the following Palos Verdes sites currently have the most extensive and sufficient legal protection when evaluated according to the amended Recovery Plan. With an NCCP/HCP in progress, there are conservation easements recorded on many properties, which implies permanent protection over the sites. The NCCP/HCP also requires regular surveying, which is essential to meeting downlisting and delisting criteria.

The issue only lies in the execution. While the HCP has been issued and many conservation easements enacted, CDFW has yet to issue the NCCP. The City of Rancho Palos Verdes has adopted the final Rancho Palos Verdes NCCP/HCP and expressed enthusiastic commitment to the plan, and are still working with CDFW to have the NCCP issued. The NCCP is essential because it encourages long-term recovery by requiring improvement of the species' overall condition.

Key site: Vicente Bluffs

See above. The Vicente Bluffs Reserve encompasses Pelican Cove and Lower Point Vicente, and it has been deemed to be the key site as the largest population of the proposed Palos Verdes Recovery Unit. An NCCP must be acquired to ensure sufficient permanent protection.

Supplementary site: Alta Vicente

See above. Given the legal protections afforded to this site as one of the 12 reserves included in the plan, Alta Vicente has the potential to be included as a supplementary site. As stated previously, surveyors at this site see a potential for "enhancement in the coming years" (Parker & Sarabia, 2024). To do so, an NCCP must be acquired to ensure sufficient permanent protection.

Supplementary site: Abalone Cove

See above. Given the legal protections afforded to this site as one of the 12 reserves included in the plan, Abalone Cove has the potential to be included as a supplementary site. At 29.46 acres, Abalone Cove has the largest habitat size of all the sites in the proposed Palos Verdes Recovery Unit and only smaller than the LAX Dunes Preserve when compared overall. As such, there may be a higher potential for recovering the population here. To do so, an NCCP must be acquired to ensure sufficient permanent protection.

Public education and involvement

Crucial public education and involvement initiatives

Public education and community engagement are crucial to the recovery of the ESB, an iconic species whose survival depends not only on protected habitats but also on sustained public

support. Across the greater Los Angeles coastal region, conservation groups, public agencies, and community coalitions have developed a variety of initiatives that connect people to the ESB through education, volunteerism, and direct action.

The El Segundo Blue Coalition (ESB Coalition) serves as a unifying platform for regional efforts, bringing together partners and offering accessible tools like DIY restoration guides, volunteer sign-up resources, and a shared calendar of events. Their collaborative model helps foster a sense of shared responsibility and raises awareness of the butterfly's endangered status.

The South Bay Parkland Conservancy (SBPC) enhances this work by focusing on long-term educational engagement. Its Junior Urban Naturalist Program (JUNP) introduces youth to ecological principles through field-based experiences, while seasonal butterfly walks and student ambassador roles offer additional pathways for hands-on learning and leadership. These programs reflect a deeper investment in nurturing the next generation of environmental stewards.

At the LAX Dunes, Los Angeles World Airports (LAWA) plays a critical role in managing one of the largest contiguous ESB habitats. Despite limited public access due to airport security, LAWA works with local partners to host regular volunteer events, where community members remove invasive species and restore native vegetation. These efforts demonstrate how even restricted sites can offer meaningful opportunities for engagement and conservation impact. Additionally, LAWA has installed educational displays within the airport terminals that inform travelers about the unique dune ecosystem and the ESB, further extending the site's outreach potential.

Friends of Ballona Wetlands connect ESB conservation to the broader story of Southern California's coastal ecosystems. Their nature tours, habitat restoration activities, and student workshops help build ecological literacy and empower participants to take action. The organization's approach to education emphasizes both place-based learning and a broader understanding of biodiversity and resilience.

Meanwhile, The Bay Foundation, in partnership with the Santa Monica Bay National Estuary Program, extends outreach through multiple digital platforms and public-facing communication tools. Project web pages, newsletters, and social media help keep the public informed, while their broader coastal resilience initiatives highlight how species recovery is interconnected with climate adaptation and land management goals.

Taken together, these diverse efforts show that effective public engagement is not one-size-fits-all. It thrives through a mix of place-based experiences, youth programming, digital outreach, and community empowerment. As habitat pressures persist, strengthening these educational strategies and expanding coordination across groups will be essential to achieving long-term recovery objectives for the ESB.

Public education plan per Recovery Unit

Ballona Recovery Unit

Key site: Ballona Wetlands

The Ballona Wetlands remain one of the largest protected areas in the list, boasting over 600 acres in total. While remaining protected, a large portion of the Wetlands is riparian habitat, constituted of many native species aside from seacliff buckwheat. The portions of the wetlands that have been actively restored remain on the southwest entrance to the wetlands, spearheaded by Friends of Ballona Wetlands. Historically, native buckwheat was introduced in the mid-1900s; however, it wasn't until the 1980s that Eriogonum parvifolum was properly introduced. Since the 2010s, active recovery efforts from Friends of Ballona Wetlands and semi-routine surveying have designated the Ballona Wetlands as a key restoration site.

While there are current restoration efforts of the habitat, full expansion and utilization of the rest of the viable wetlands remains a necessary step in a 10-year delisting plan for this site. This includes a primary expulsion of invasive plants and planting of seacliff buckwheat and other natives in replacement for the first few years. Additionally, persistent monitoring, maintenance, and restoring of all seacliff buckwheat present on this site for the following years is necessary. Fulfillment of this would ensure that the habitat of the Ballona Wetlands remains maximally utilized and viable for butterfly populations to remain.

Airport Recovery Unit

Key site: LAX Dunes Preserve

Since the inception of the Recovery Plan back in 1998, the LAX Dunes has been arguably the most important site for the ESB. The recovery plan specifically lists this location as a necessary site for downlisting and delisting criteria, meaning that this site must be managed properly in order to change the listing status of the entire species. Current restoration efforts are primarily led by the Bay Foundation, a non-profit organization.

To allow this site to properly maintain its population, standardized, routine monitoring is necessary. While monitoring does occur at this site, the methods are not standardized, making it difficult to examine changes between each season in a standardized manner. Furthermore, maintaining the seacliff buckwheat and removing any invasive plants that pop up are necessary to preserve the habitat.

Supplementary site: Dockweiler State Beach

Dockweiler State Beach is home to a fair amount of seacliff buckwheat, with recent restoration efforts being coordinated by The Bay Foundation as part of the Los Angeles Living

Shoreline project. The shoreline contains the seacliff buckwheat necessary to support ESB populations, but the area is surrounded by invasive species such as iceplant, and the seacliff buckwheat could certainly be in healthier condition.

Moving forward, more focus on removing invasive plant species will be key to supporting the existing seacliff buckwheat. This area could also benefit from full utilization of the available shoreline space, as there was a significant amount of space that did not contain seacliff buckwheat and was enabling the persistence of invasive species. Furthermore, increasing signage on these areas to emphasize the importance of the native habitats and the species associated with them can prevent unnecessary destruction of the habitat; signage appeared to be loosely correlated with health and abundance of the habitat. With concerns of human impacts on public property, this could be a simple, low-cost mitigation strategy.

El Segundo Recovery Unit

Key site: Chevron Preserve

The Chevron recovery site has remained a key element in the restoration of ESB populations over the past few decades. Since the 1950s, after receiving an alert that butterflies were present on this property due to the presence of seacliff buckwheat, Chevron closed off this 1.6 acre site with a chain link fence to protect the small yet resistant population. Today, the Chevron site remains a successful site that is regularly maintained and monitored, essential for a 10 year recovery plan.

As the Chevron recovery site remains well maintained and intact, an important element to integrate in a future recovery plan would include adhering to a standardized monitoring metric to ensure butterfly populations are assessed in a standardized, fair way. Additionally, routine removal of invasive species would prove beneficial.

Supplementary site: Redondo Beach

The Redondo Beach site has increased its seacliff buckwheat abundance through activities organized by the South Bay Parkland Conservancy and Urban Wildlands group. These activities not only allowed recolonization of previously degraded sites, but also set a precedent that future sites that were previous habitats can be recolonized sufficiently. Since 2007, ESB have been found on this site due to the restoration efforts.

Moving forward, further utilization of the space along the esplanade will be necessary to support higher butterfly populations. While a fair amount of the shoreline is made up of seacliff buckwheat, there is still the persistence of some invasive species. Specifically, it is crucial to remove the invasive species, maintain the habitat, and plant more seacliff buckwheat to increase the ESB populations on this stretch of beach.

Torrance Recovery Unit

Key site: Torrance Beach

The Torrance Recovery site has proven to be a wildly successful restoration endeavor for the ESB. While relatively small, near an acre or two in total size, this site boasts a dense and healthy population of seacliff buckwheat that has been added and monitored since the 2010s. Located directly adjacent to the Redondo Beach Esplanade site, the densest population of seacliff seacliff buckwheat has been established and is maintained by the South Bay Parkland Conservancy and Urban Wildlands group. The successes of the re-integration of seacliff buckwheat into this site has also resulted in a dramatic increase in butterfly populations, marking it one of the strongest areas for sustaining the ESB in Torrance and further south.

While the reintegration of seacliff buckwheat remains successful, this site remains threatened by the relentless presence of iceplant. Additionally, since it is located directly adjacent to a public beach, general foot traffic also poses a threat; however, this is mitigated by a fence. Future restorations efforts should include consistent removal of ice plant and other invasives, standardized and consistent monitoring of populations on a yearly basis, and potential expansion into surrounding area (removing iceplant and re-introducing seacliff buckwheat into other sections).

Proposed Palos Verdes Recovery Unit

Key site: Vicente Bluffs

The Vicente Bluffs boasts over 69 acres of viable habitat for the ESB, marking it a large and promising key site for the butterfly. Being a protected site in the Palos Verdes Peninsula, the only elements that pose as threats are foot-traffic by hikers and passers-by. Aside from this, this habitat contains a healthy spread of native species, including seacliff buckwheat.

Future restoration efforts that should be integrated to ensure this site remains viable would be increasing protections of the habitat, potentially by fencing off some areas to completely mitigate foot-traffic from disturbing the wildlife. Additionally, this site would benefit from routine monitoring.

Supplementary site: Alta Vicente

The Alta Vicente Reserve is a 55 acre area on the Palos Verdes Peninsula, around and below the City Hall, 23 acres of which are part of an active restoration project. Restoration efforts have been maintained by the Palos Verdes Peninsula Land Conservancy with the intention of supporting a variety of native species, and boast a considerable amount of seacliff buckwheat. These efforts, beginning with the planting of coastal sage scrub began in 2008, and make up public land. Plenty of seacliff buckwheat can be found on these lands, much of which is healthy and moderately dense.

To properly support ESB populations in particular, proper maintenance of the habitat (preventing introduction and growth of invasive species) is necessary. Furthermore, planting more seacliff buckwheat can be conducive to supporting a higher volume of butterflies. Finally, routine monitoring is necessary to examine the population of butterflies and how it may change over time.

Supplementary site: Abalone Cove

Abalone Cove is a 109 acre site located on the Southern portion of the Palos Verdes Peninsula. While a large site, a large portion of this site contains beach area, which is uninhabitable by seacliff buckwheat. Regardless, there is a lot of potential habitat for the ESB. The Palos Verdes Peninsula Land Conservancy has spearheaded conservation efforts; however, a large portion of the protected area has not been properly restored or maintained.

Future conservation efforts should prioritize expansion of current seacliff buckwheat populations into the Northern uninhabited areas and on the cliffside areas adjacent to the trails. Once populations of seacliff buckwheat have been established, yearly monitoring should be undertaken to track the stability of the ESB in this site.

Implementation schedule

The following is the implementation plan and schedule for the recovery of the ESB. Much of the intensive work is concentrated within the earlier years, however, this strategy has been optimized to increase the species' chances of an accelerated recovery. If its range is expanded through habitat restoration and maintained through proper management, the populations have shown incredible potential for sustained, rapid increases. Much of the work towards securing sufficient legal protections should be ongoing throughout the 10-year process, allowing for appropriate amounts of time for discussion and agreements. Below is the key for the implementation schedule:

Priority 1 - An action that is necessary for the species' long-term survival and must be taken immediately to ensure the timely fulfillment of recovery criteria.

Priority 2 - An action that is necessary for the species' long-term survival and will likely accelerate its recovery upon fulfillment.

Priority 3 - An action that is necessary for the species' recovery and long-term survival.

Abbreviation definitions:

N/A - Not applicable
Cont. - Continuous
Intermit. - Intermittent (once every three years or when deemed necessary)

Recommendation 1: Monitor populations

Priority #	Task #	Task Description	Year to Begin	Year to Complete
1	1.1	Discuss the Plan and methodology with all relevant parties (landowners, surveyors, ESB Coalition, etc.).	1	1
1	1.2	Reach an agreement and make any necessary changes to the Plan and methodology.	1	1
1	1.3	Implement the Plan and methodology.	1	Cont.
2	1.4	Survey potential sites during the local estimated flight season peak to identify new populations.	1	Intermit.
2	1.5	If necessary, update the Plan and methodology based on new data, sites, requirements, or other developments.	Cont.	N/A

Recommendation 2: Establish complete protections in perpetuity

Priority #	Task #	Task Description	Year to Begin	Year to Complete
1	2.1	Begin discussions with all relevant parties (landowners, ESB Coalition, local government, government bodies, etc.) regarding the establishment of complete protections in perpetuity for all key and supplementary sites.	1	1
1	2.2	Identify potential amibugities regarding development or any other potential threats for all key and supplementary sites.	1	2
1	2.3	Establish complete protections in perpetuity for all key sites.	Cont.	6
1	2.4	Establish complete protections in perpetuity for all supplementary sites.	Cont.	8

Recommendation 3: Restore and manage habitat

Priority #	Task #	Task Description	Year to Begin	Year to Complete
1	3.1	Identify and evaluate ESB habitat areas within all key and supplementary sites.	1	Intermit.
1	3.2	Develop restoration goals based on Strategy recommendations, and historic community composition for habitats identified in 3.1.	1	Intermit.
1	3.3	Develop restoration and management plans to achieve goals developed in 3.2.	1	Intermit.
1	3.4	Implement restoration and management plans developed in 3.3.	2	Cont.
1	3.5	Achieve and maintain restoration goals developed in 3.2 for all key sites.	Cont.	4
1	3.6	Achieve and maintain restoration goals developed in 3.2 for all supplementary sites.	Cont.	5

Recommendation 4: Educate and involve local communities

Priority #	Task #	Task Description	Year to Begin	Year to Complete
3	4.1	Install proper signage at all key and supplementary sites to educate the public about the species and to prevent trespassing on habitat areas.	1	2
3	4.2	Implement additional educational and volunteer events centered on habitat restoration in the El Segundo, Torrance, and Palos Verdes RUs.	2	Cont.

Budget estimates

Restoration and maintenance costs for bluff habitats are given below using the costs listed in the Beach Bluffs Restoration Project (Longcore & Dalkey, 2005). The estimated maintenance cost for dune habitats is based on information given by Friends of Ballona Wetlands. All cost estimates are subject to variation based on factors such as real estate value, regional labor costs, material costs, prevailing wages, and habitat type/condition. Acreage was estimated using polygons from GIS mapping, focusing only on areas where seacliff buckwheat was observed and surveys were conducted.

The LAX Dunes Preserve and the Chevron Preserve fund their own restoration and maintenance and are therefore not included below. Alta Vicente has been the focus of an ongoing restoration project since 2008, and is therefore also not included (Vona, 2007). The Vicente Bluffs site includes Pelican Cove, with 7.16 acres attributed to Vicente Bluffs and 7.99 acres attributed to Pelican Cove.

The following are our estimates for the varying types of habitat restoration work:

Maintenance cost per acre for bluff habitat: $2,000/year
Restoration and maintenance cost per acre for bluff habitat: $20,000 + $2,000/year
Maintenance cost per acre for dune habitat: $3,400

Table 5.1 - Cost estimates per site according to recommended actions for habitat, size, and habitat type.

Site name	Size (acres)	Habitat	Recommended action	Estimated costs
Ballona Wetlands	6.35	Dunes	Maintenance	$21,590/yr
Dockweiler State Beach	0.58	Bluffs	Restoration and Maintenance	$11,600 + $1,160/yr
Redondo Beach	5.21	Bluffs	Maintenance	$10,420/yr
Torrance Beach	0.51	Bluffs	Maintenance	$1,020/yr
Malaga Bluffs	5.80	Bluffs	Restoration and Maintenance	$66,600 + $6,660/yr
Vicente Bluffs	15.15	Bluffs	Maintenance	$30,300/yr
Abalone Cove	29.46	Bluffs	Restoration and Maintenance	$589,200 + $58,920/yr

Note: Restoration includes revegetation costs such as permits, reporting, invasive plant removal, labor, and materials for native plant installation. Maintenance encompasses removal of invasive plant species, general cleaning up, and replacement plantings if needed, once or twice a year.

Discussion

One of the most compelling aspects of the ESB's recovery is its demonstrated ability to recolonize restored habitats. This shows that recovery is in fact achievable when restoration efforts are targeted and nearby populations of the Blue butterflies exist. Sites like Redondo Beach and Dockweiler demonstrate that even degraded areas can become viable habitats. These successes offer hope and show that with continued restoration and management, population growth is possible.

However, legal protections still remain a major hurdle. While some sites in the proposed Palos Verdes Recovery Unit benefit from conservation easements and habitat conservation plans, others like LAX rely on temporary ordinances that could be changed or removed. Without permanent protections, even strong populations remain at risk. Securing long-term legal safeguards is essential to ensure lasting recovery.

Finally, for any restoration and monitoring program to be successful, there needs to be adequate and consistent funding. Funds for this effort may be obtained primarily through federal

and state grants. For example, USFWS provides grant funding to CDFW through the Cooperative Endangered Species Conservation Fund (Traditional Section 6), who can then administer the funds to conservation organizations. Other sources may include public agencies, non-profit organizations, consulting firms, and donations. Donations may be made in the form of an endowment to generate the income required to sustain long-term projects.

The costs listed above take the average between the cost required to break even and a billing rate for a nonprofit rate. In other words, the cost estimates provided above represent an average between the minimum required for cost recovery and a typical nonprofit billing rate. If organizations elect to contract with private firms, expenses may increase substantially. In the event that resources are limited, there are also ways to lower the required cost. For example, many nonprofit organizations rely on the work of volunteers and interns to restore and maintain these habitats. In this case, increased public outreach initiatives may enhance volunteer participation and provide financial relief.

In summary, consistent and standardized monitoring across all sites is critical. Some areas have strong data, but others lack up-to-date population trends. A unified monitoring approach will not only guide management decisions but also support funding efforts and policy protections. Together, permanent protections, reliable monitoring, and strategic restoration form the foundation needed to delist the ESB within the next 10 years.

Conclusion

Through careful analysis, review, evaluation, and recommendation, we have found the El Segundo Blue butterfly to show signs of strength and resilience amidst a changing environment—thanks to years of dedication and hard work through habitat restoration projects, sustained surveying and monitoring efforts, changing legal policies, and increased community engagement. Our report reinforces this effort by outlining a clear path for the species to meet the downlisting and delisting recovery criteria, grounded in scientific analysis and information synthesis from the wide variety of sites where the ESB is found. In this report, we first reviewed all existing public outreach programs, reports, surveys, and restoration projects. We then suggested amendments to the Recovery Plan recovery criteria, among which included a distinction between the ESB and the *Euphilotes battoides* species in Santa Barbara and the addition of a fifth Recovery Unit consisting of several sites in the Palos Verdes Peninsula. Using available data, discussion with various experts, and in-person site visits, we assessed the population trends, habitat quality, and legal protection present at each site. During this evaluation, we discovered a general trend of earlier emergence over the past decades, showing a phenological shift in the species likely due to climate patterns. We found that inconsistent surveying methods yielded inconclusive population data, and as such, we developed a standardized monitoring plan and methodology that can be applied to all sites, making it easier to compare populations across the county. From this research, we developed the 10-year Recovery

Strategy, which should lead to the downlisting and delisting of the species in the near future in the most efficient manner possible.

Overall, we found that most of the existing sites do not currently meet the recovery criteria for downlisting and delisting listed in the Recovery Plan. Despite this, we have documented promising results from previous efforts in many sites, whether it be through consistent and active restoration or extensive legal protection. By constructing recommendations using existing information and evaluating the overall progress of this species, we hope to lay the groundwork for an accelerated recovery effort going forward. If achieved, the El Segundo Blue butterfly could not only serve as a symbol of success for insect recovery, but also as an inspiration for conservation as a whole in the face of an increasingly urbanized and changing world.

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Appendix

Table 4.5 - Latitudinal values representing the approximate center of the known sites of the El Segundo Blue butterfly (*Euphilotes allyni*).

Recovery Unit and site name	Latitude	Size (acres)
Ballona Recovery Unit		
Ballona Wetlands	33.963	6.35
Airport Recovery Unit		
LAX Dunes Preserve	33.940	201.06
Dockweiler State Beach	33.946	0.58
El Segundo Recovery Unit		
Chevron Preserve	33.916	1.43
Redondo Beach	33.817	5.21
Torrance Recovery Unit		
Torrance Beach	33.813	0.51
Malaga Bluffs	33.807	5.80
Palos Verdes Recovery Unit		
Vicente Bluffs Reserve	33.745	15.15
Alta Vicente Reserve	33.744	20.61
Abalone Cove	33.741	29.46

Note: The proposed Palos Verdes Recovery unit is unofficial. All latitudinal values are approximations. Acreage has been estimated from site maps.