Final

TARGETED MONITORING PLAN

County of San Diego Department of Parks and Recreation

August 2024

Prepared for
Department of Parks and Recreation
County of San Diego
5500 Overland Ave, Suite 410
San Diego, CA 92123

Prepared by
Environmental Science Associates
2355 Northside Drive
Suite 100
San Diego, CA 92108

Final

TARGETED MONITORING PLAN

County of San Diego Department of Parks and Recreation

Prepared for
Department of Parks and Recreation
County of San Diego
5500 Overland Ave, Suite 410
San Diego, CA 92123

August 2024

Prepared by
Environmental Science Associates
2355 Northside Drive
Suite 100
San Diego, CA 92108

2355 Northside Drive
Suite 100
San Diego, CA 92108
619.719.4200
esassoc.com

OUR COMMITMENT TO SUSTAINABILITY | ESA helps a variety of public and private sector clients plan and prepare for climate change and emerging regulations that limit GHG emissions. ESA is a registered assessor with the California Climate Action Registry, a Climate Leader, and founding reporter for the Climate Registry. ESA is also a corporate member of the U.S. Green Building Council and the Business Council on Climate Change (BC3). Internally, ESA has adopted a Sustainability Vision and Policy Statement and a plan to reduce waste and energy within our operations. This document was produced using recycled paper.

CONTENTS

Targeted Monitoring Plan

Figures

Tables

Appendices

This page is intentionally left blank.

SECTION 1
Introduction

As a participant in the Multiple Species Conservation Program (MSCP) and the adopted South County MSCP Subarea Plan, the County of San Diego (County) is obligated to conduct biological monitoring of habitats and species covered by the MSCP to ensure that the MSCP biological conservation goals and conditions for species coverage are being met. These obligations are fulfilled through the Targeted Monitoring Plan (TMP), organized as follows.

- **Section 1** introduces the TMP and its purpose, provides a description of the geographic area covered by the plan, an overview of the regulatory and regional context, and a process overview, which describes the methods used during plan development.
- **Section 2** identifies the goals, objectives, and monitoring protocols for target resources.
- **Section 3** describes the reporting requirements and the structure for communication, coordination, and an integrated feedback loop, in which monitoring results are analyzed and then used to reevaluate the adaptive management strategy.

1.1 Purpose

The TMP's purpose is to provide detailed specifications for monitoring and adaptive management implementation within County Department of Parks and Recreation (DPR) owned and managed conserved lands (DPR parks and preserves). The TMP is an adaptive implementation plan that incorporates the site-specific monitoring strategy included in the Resource Management Plans (RMPs), focused goals and objectives for target resources, and detailed monitoring protocols. The TMP ensures consistency with the preserve-specific RMPs. RMPs include a framework for general stewardship management activities (including public access) and are incorporated into the TMP by reference. The TMP is consistent with regional priorities and includes goals, measurable objectives, and detailed protocols using best available science. The TMP is intended to achieve the management directives for species per the adopted South County MSCP Subarea Plan's Framework Management Plan. The regional framework that guides monitoring at the preserve level has been refined over time and is still evolving through a collaborative effort among the U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Wildlife (CDFW) (collectively *Wildlife Agencies*), MSCP jurisdictions, and outside experts. It is understood by all stakeholders (e.g., state and federal resource agencies, municipal and county agencies, land managers) that adaptive management is an iterative process in which lessons are learned and used to further refine priorities, goals, objectives, and monitoring methods.

The TMP was developed based on several key points that emerged from a 2012 workshop hosted by San Diego State University's (SDSU's) Institute for Ecological Monitoring and Management (IEMM) and was funded by CDFW and the San Diego Association of Governments (SANDAG) (Deutchman et al.

2012). In this workshop, an interdisciplinary group of local government staff and land managers reviewed current literature and results of regional monitoring studies and used their expertise to identify ways to improve monitoring and management within regional conservation plans in San Diego County (Deutschman et al. 2012).

The key points for the TMP (based on the above workshop guidance) are: (1) the need to connect monitoring data to management at the preserve level and the region; (2) the benefit of using conceptual models that relate stressors and threats to key species and communities for focusing monitoring and management efforts; (3) the need to improve the utility of monitoring protocols so that they can inform management actions; (4) the need to prioritize funding for monitoring and management; and (5) the need to develop, test, and refine monitoring protocols as an ongoing process. Consistent with the workshop guidance, the TMP has expanded over time as follows.

- *Comprehensive Monitoring Plan* included 10 DPR parks and preserves. Surveillance-level monitoring occurred across all included DPR parks and preserves and resource-specific monitoring for 2 MSCP-covered habitats and 15 MSCP-covered species. DPR parks and preserves and monitored resources are collectively referred to as *Preserve Group 1* (ESA and ICF 2015).
- *Targeted Monitoring Plan* updated to include a total of 20 DPR parks and preserves. Surveillance-level monitoring occurred across all included DPR parks and preserves and resource-specific monitoring for 2 MSCP-covered habitats and 20 MSCP or draft North County MSCP-covered species. DPR parks and preserves and monitored resources are collectively referred to as *Preserve Group 2* (ESA and ICF 2022).
- *Targeted Monitoring Plan* updated to include a total of 31 DPR parks and preserves. Surveillance-level monitoring occurs across all included DPR parks and preserves and resource-specific monitoring for 2 MSCP-covered habitats and 25 MSCP or draft North County-covered species. DPR parks and preserves and monitored resources are collectively referred to as *Preserve Group 3* (present document).

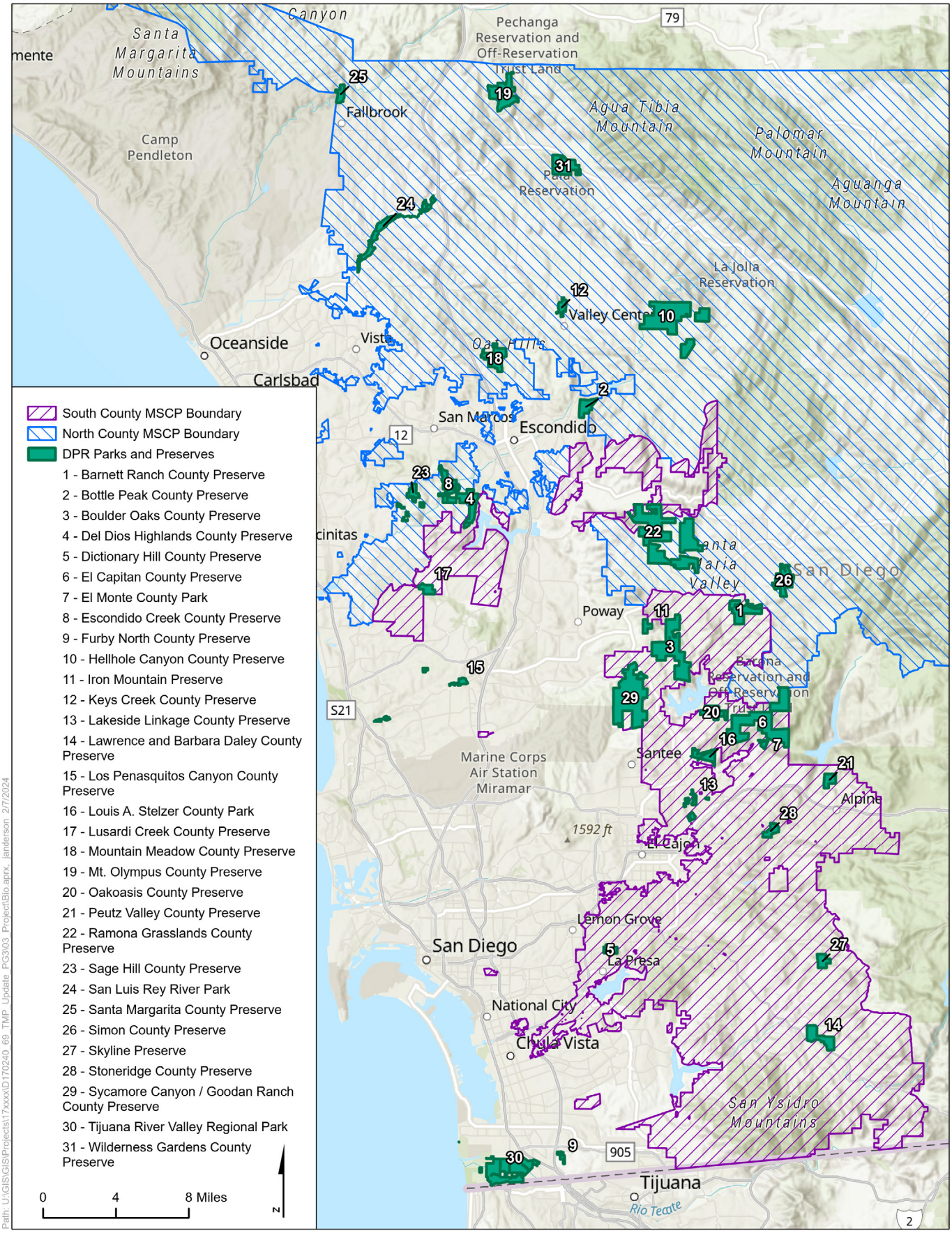
1.2 Area Covered by This Plan

The TMP includes 31 DPR parks and preserves (**Table 1**, **Figure 1 through Figure 32**) covered by South County MSCP Subarea Plan and the draft North County MSCP.

TABLE 1
DPR PARK AND PRESERVES BY MSCP AND FIGURE REFERENCES

DPR Park and Preserves	South County MSCP Subarea Plan	Draft North County MSCP	Figure #
Preserve Group 1			
1. Boulder Oaks County Preserve	X		2
2. Del Dios Highlands County Preserve	X	X	3
3. El Capitan County Preserve	X	X	4
4. El Monte County Park	X		5
5. Lakeside Linkage County Preserve[1]	X		6
6. Louis A. Stelzer County Park	X		7
7. Lusardi Creek County Preserve	X		8
8. Oakoasis County Preserve	X		9
9. Ramona Grasslands County Preserve[1,2]	X	X	10a, 10b
10. Sycamore Canyon/Goodan Ranch County Preserve[2]	X		11
Preserve Group 2			
11. Barnett Ranch County Preserve	X	X	12
12. Furby-North County Preserve	X[4]		13
13. Hellhole Canyon County Preserve[1]		X	14
14. Lawrence and Barbara Daley County Preserve	X		15
15. Mount Olympus County Preserve		X	16
16. Santa Margarita County Preserve		X	17
17. Simon County Preserve		X	18
18. Stoneridge County Preserve	X		19
19. Tijuana River Valley Regional Park	X[4]		20
20. Wilderness Gardens County Preserve		X	21
Preserve Group 3			
21. Bottle Peak County Preserve		X	22
22. Dictionary Hill County Preserve	X		23
23. Escondido Creek County Preserve		X	24
24. Iron Mountain County Preserve	X		25
25. Keys Creek County Preserve		X	26
26. Los Peñasquitos Canyon County Preserve[3]	X[4]		27
27. Mountain Meadow County Preserve		X	28
28. Peutz Valley County Preserve	X		29
29. Sage Hill County Preserve		X	30
30. San Luis Rey River Park		X	31
31. Skyline County Preserve	X		32

1. Includes additions with completed baseline biological survey reports: Fureigh addition (Hellhole Canyon County Preserve), Centex addition (Lakeside Linkage County Preserve), and Ramona Carroll and Trussell additions (Ramona Grasslands County Preserve).
2. Includes additions shown in figures, but that do not yet have baseline biological survey reports: Metzler addition (Ramona Grasslands County Preserve), Miera addition (Sycamore Canyon/Goodan Ranch County Preserve).
3. Added for vernal pool monitoring but does not yet have baseline biological resources survey report.
4 Furby-North County Preserve, Los Peñasquitos Canyon County Preserve, and Tijuana River Valley Regional Park are in the City of San Diego MSCP Subarea Plan area and are managed by DPR in accordance with the City of San Diego MSCP Subarea Plan and will be consistent with the County of San Diego Subarea Plan.



Path: U:\GIS\GIS\Projects\17xxxx\D170240_69_TMP_Update_PG3\03_ProjectBio.aprx, janderson 2/7/2024

Figure 1
Preserves Overview
Targeted Monitoring Plan

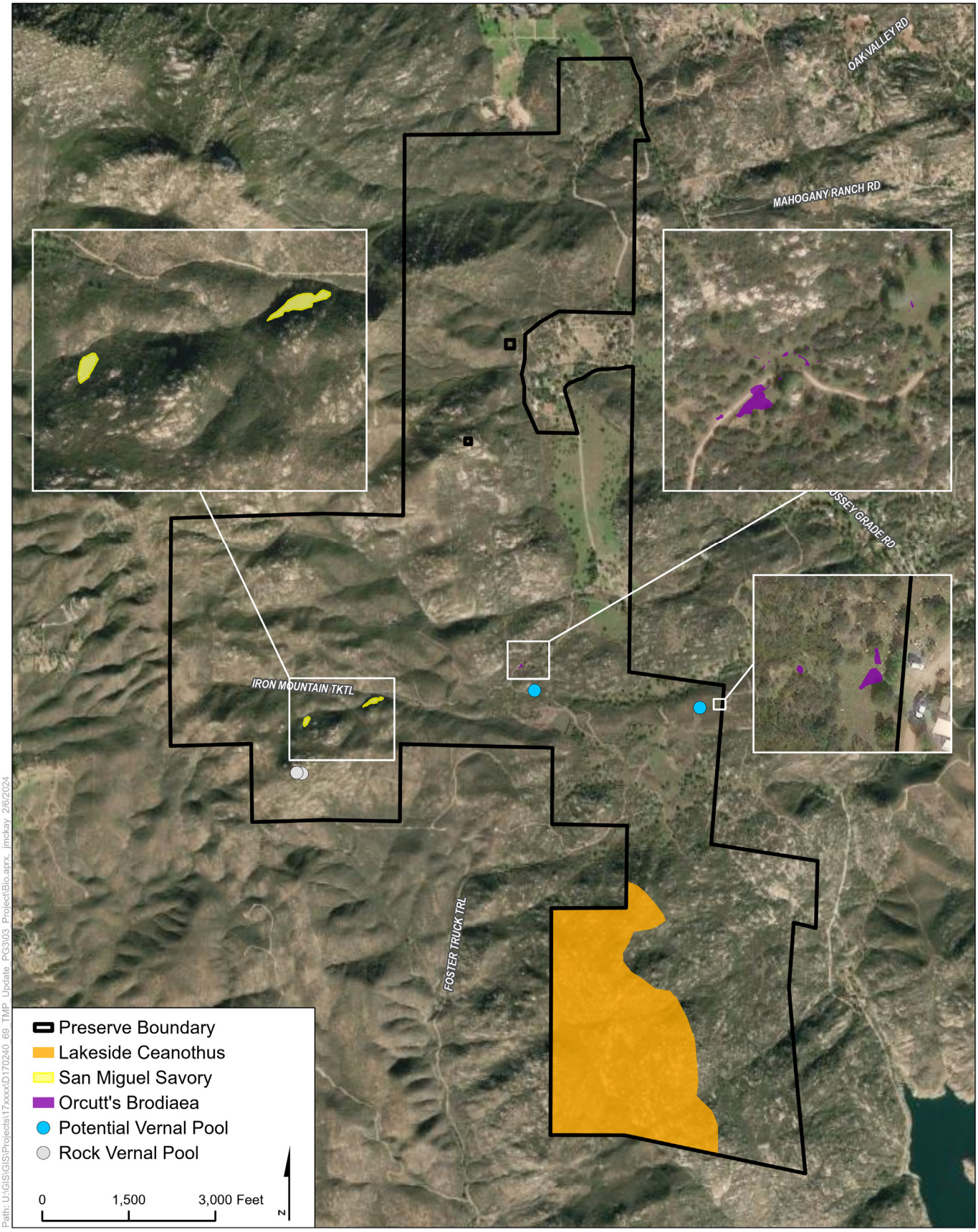


Figure 2
Boulder Oaks County Preserve
Targeted Monitoring Plan

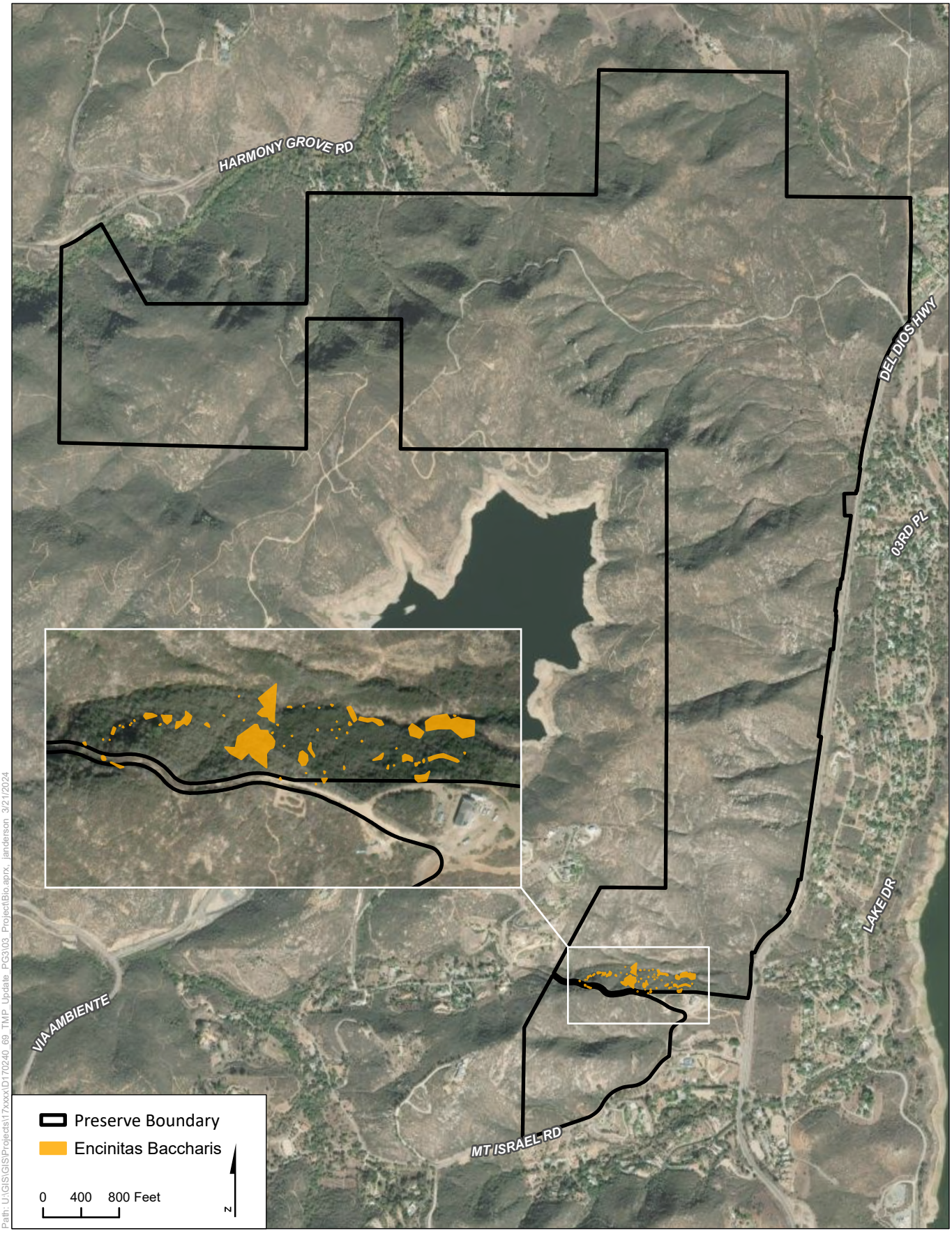


Figure 3
Del Dios Highlands County Preserve
Targeted Monitoring Plan

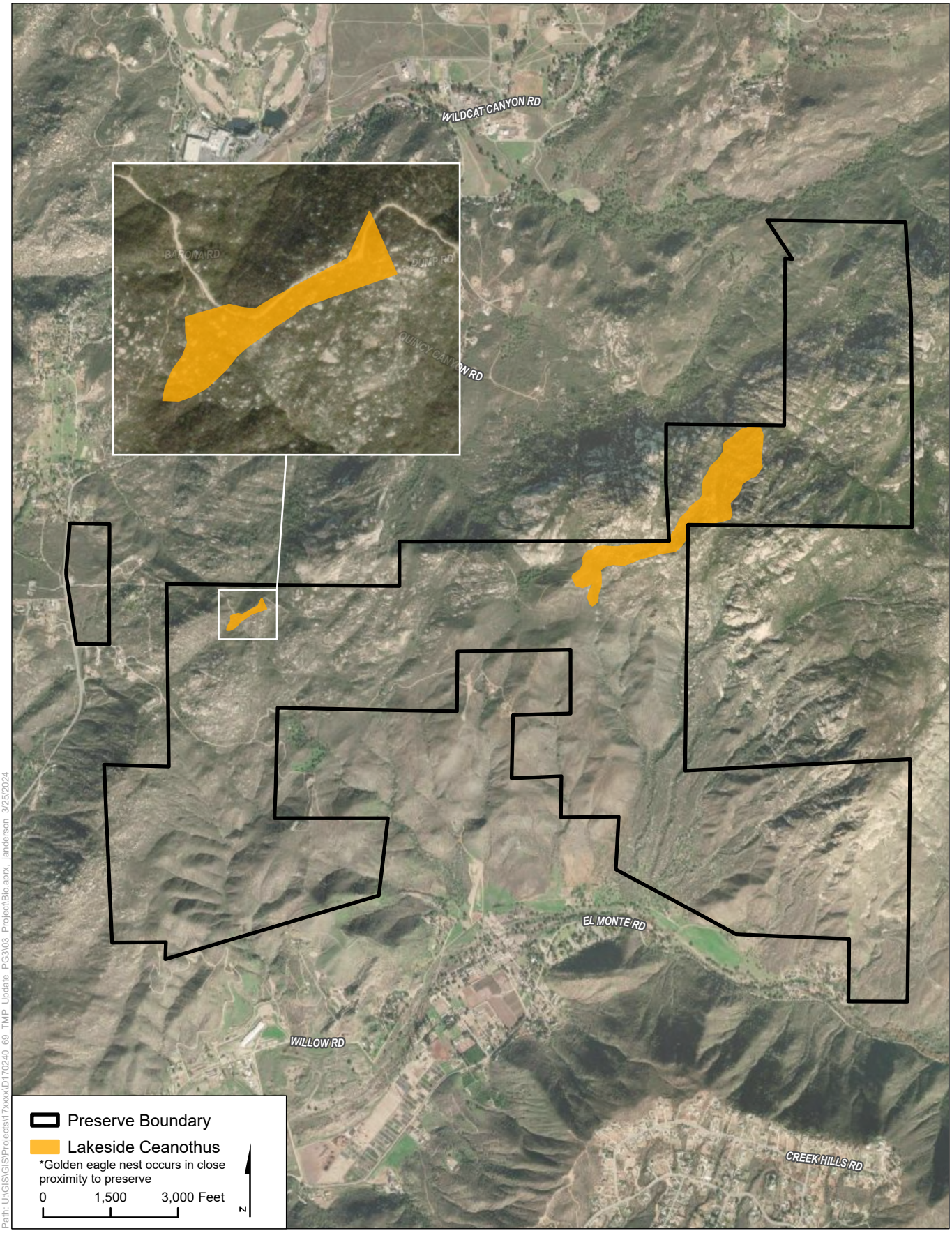


Figure 4
El Capitan County Preserve
Targeted Monitoring Plan

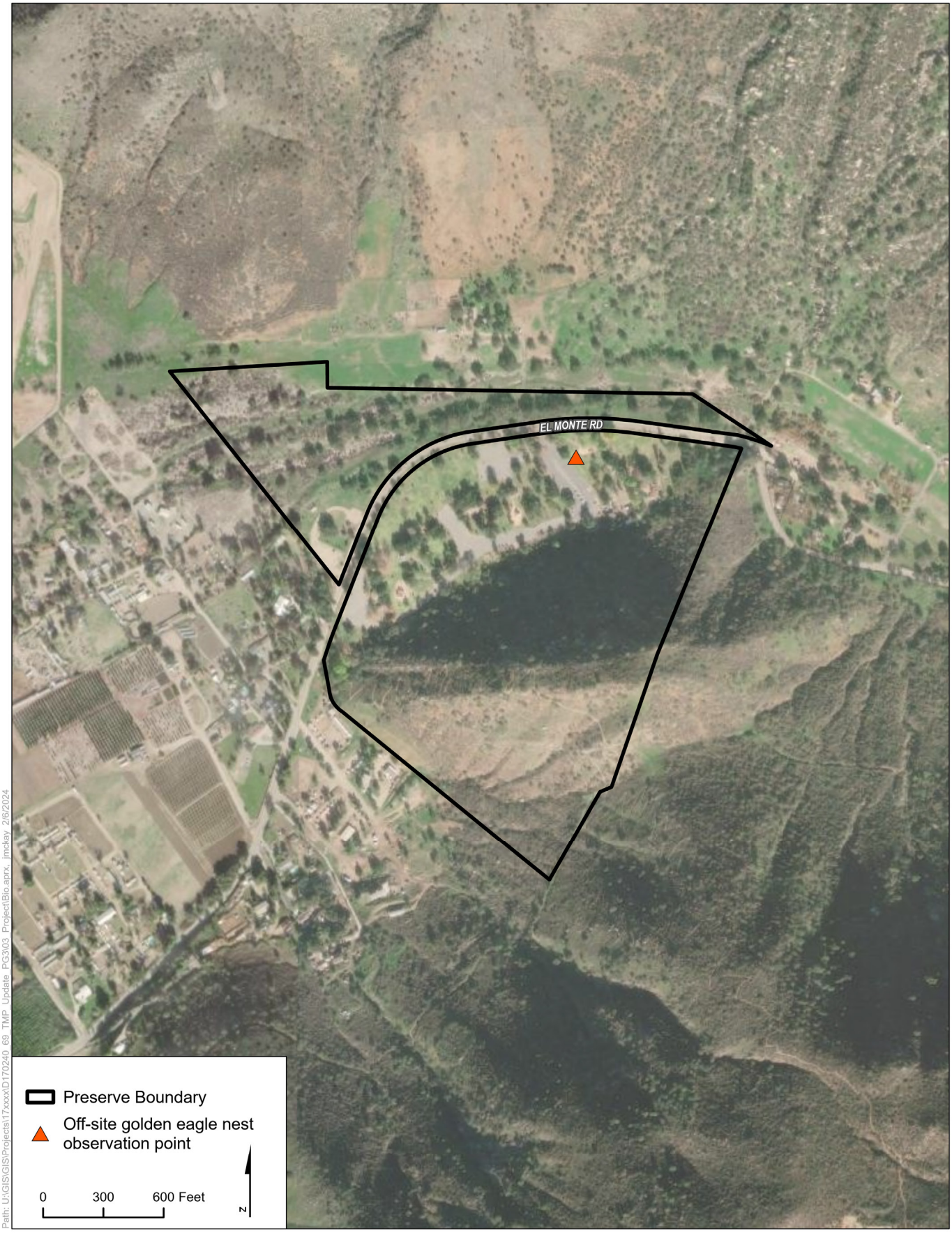


Figure 5
El Monte County Park
Targeted Monitoring Plan

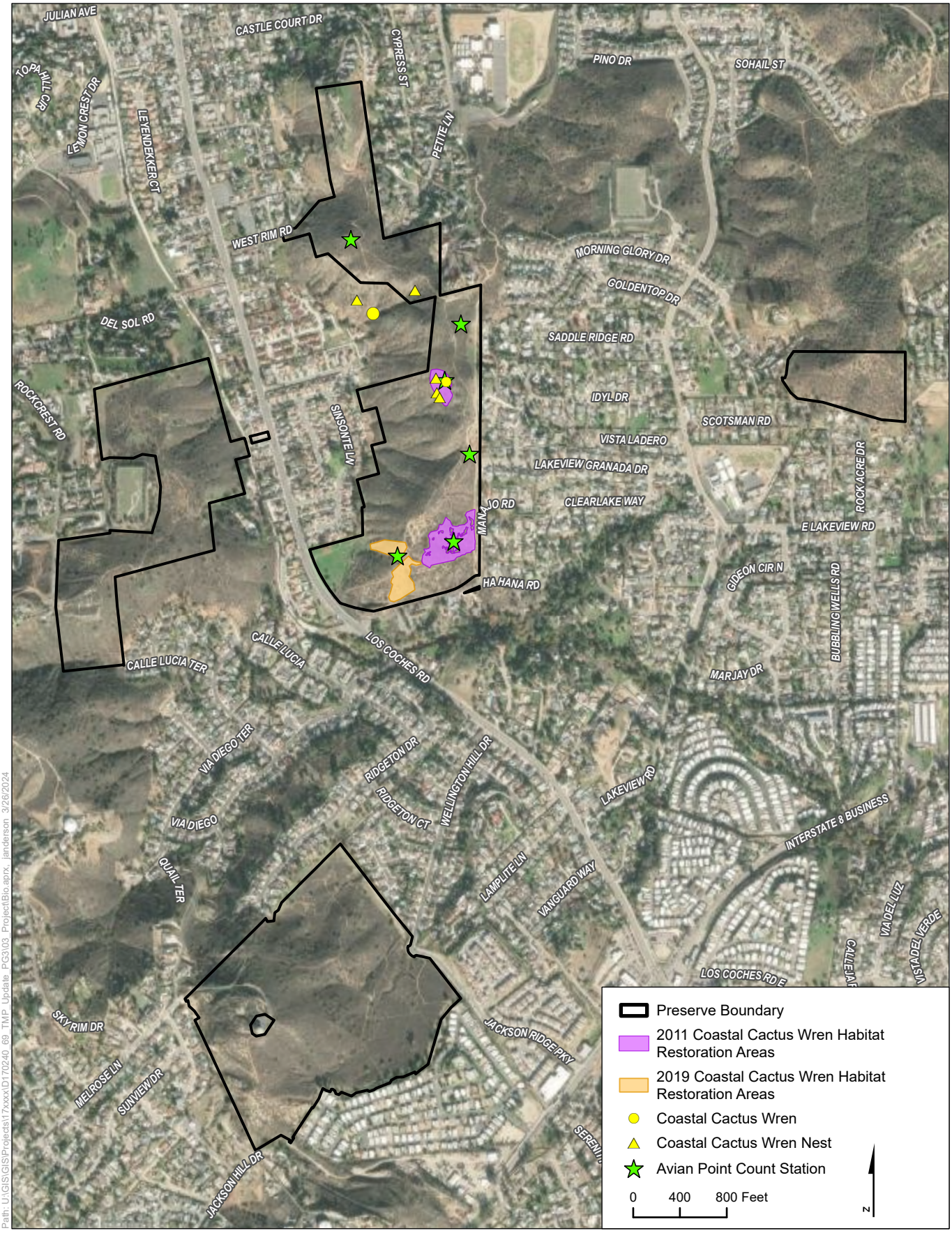


Figure 6
Lakeside Linkage County Preserve
Targeted Monitoring Plan

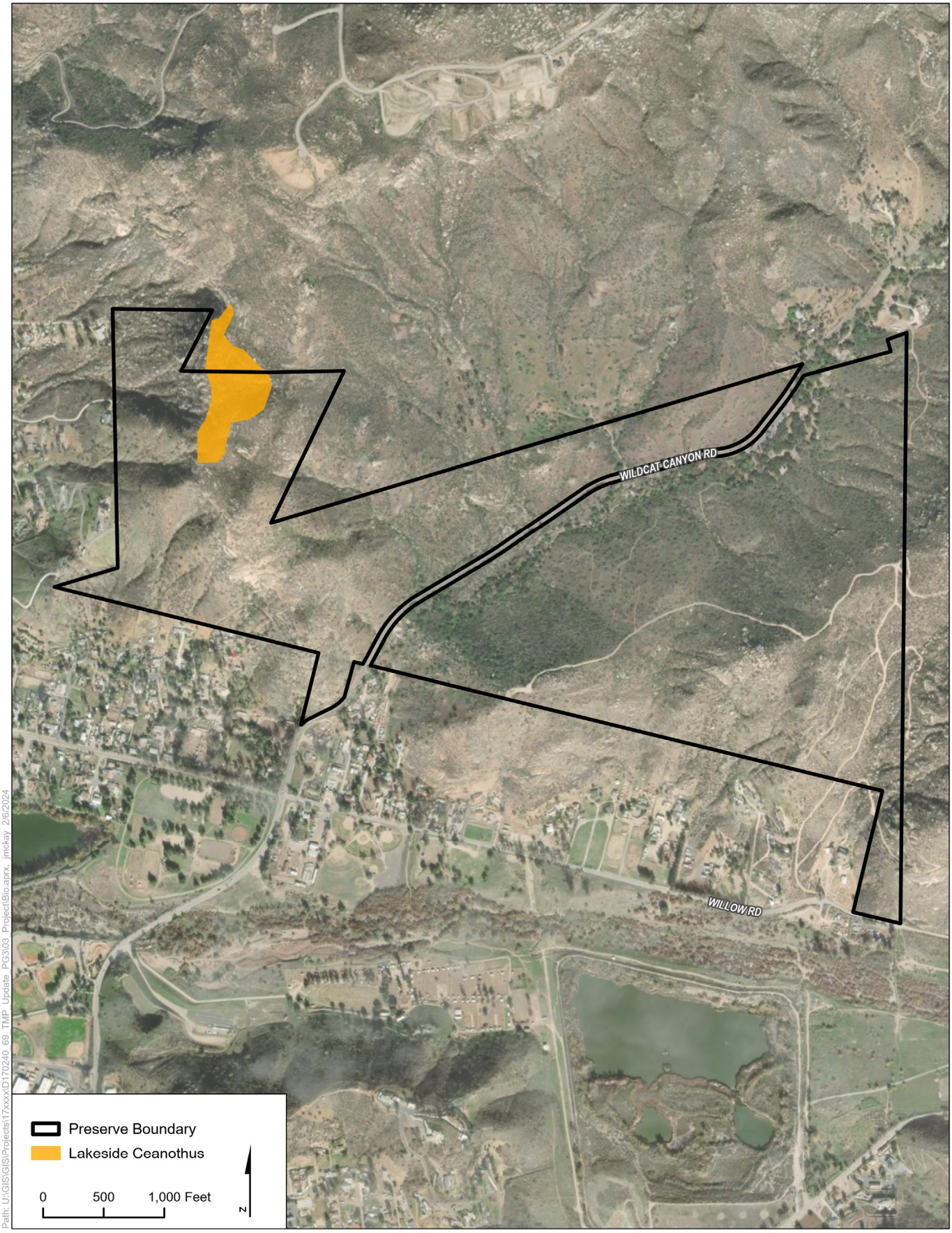


Figure 7
Louis A. Stelzer County Park
Targeted Monitoring Plan

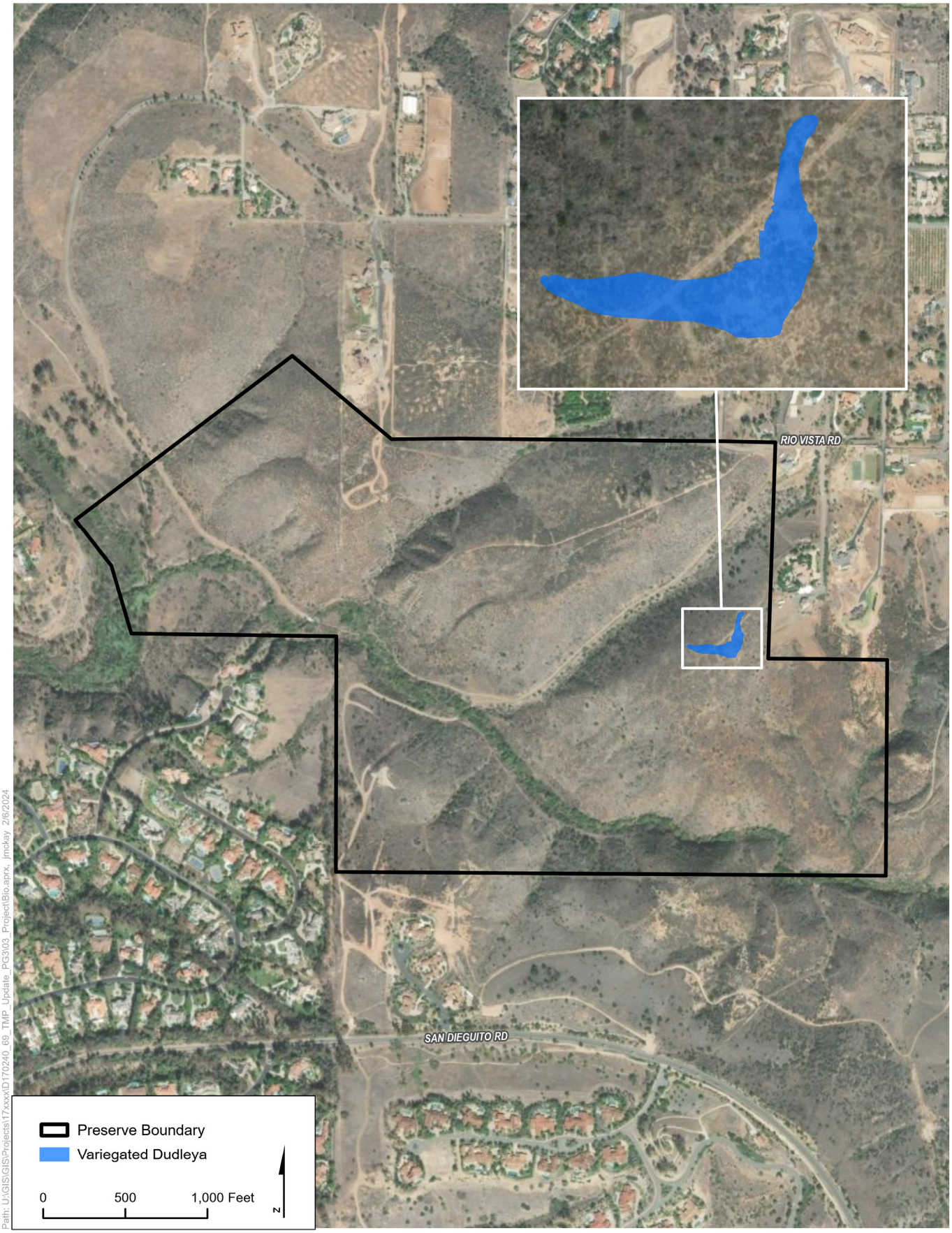


Figure 8
Lusardi Creek County Preserve
Targeted Monitoring Plan

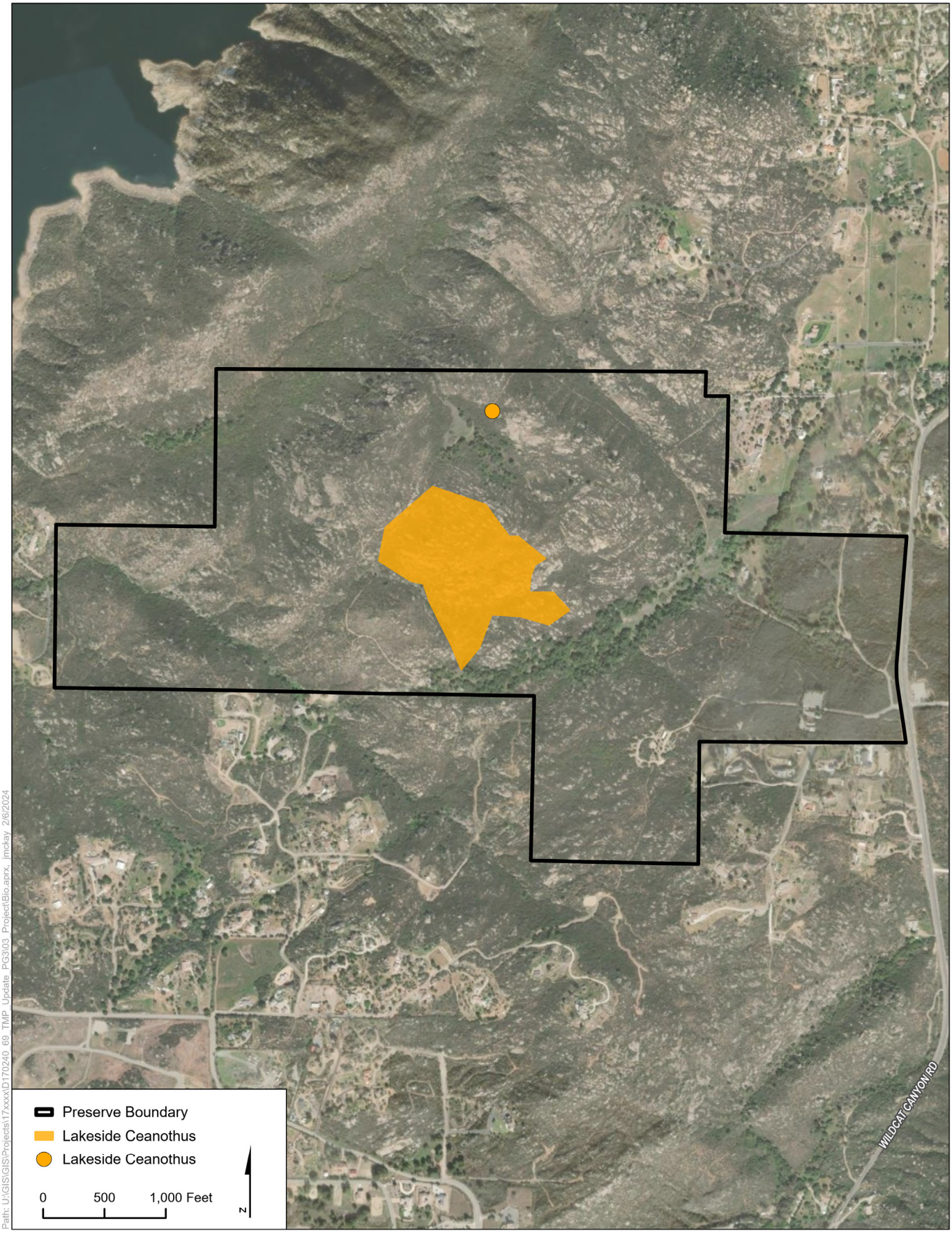


Figure 9
Oakoasis County Preserve
Targeted Monitoring Plan

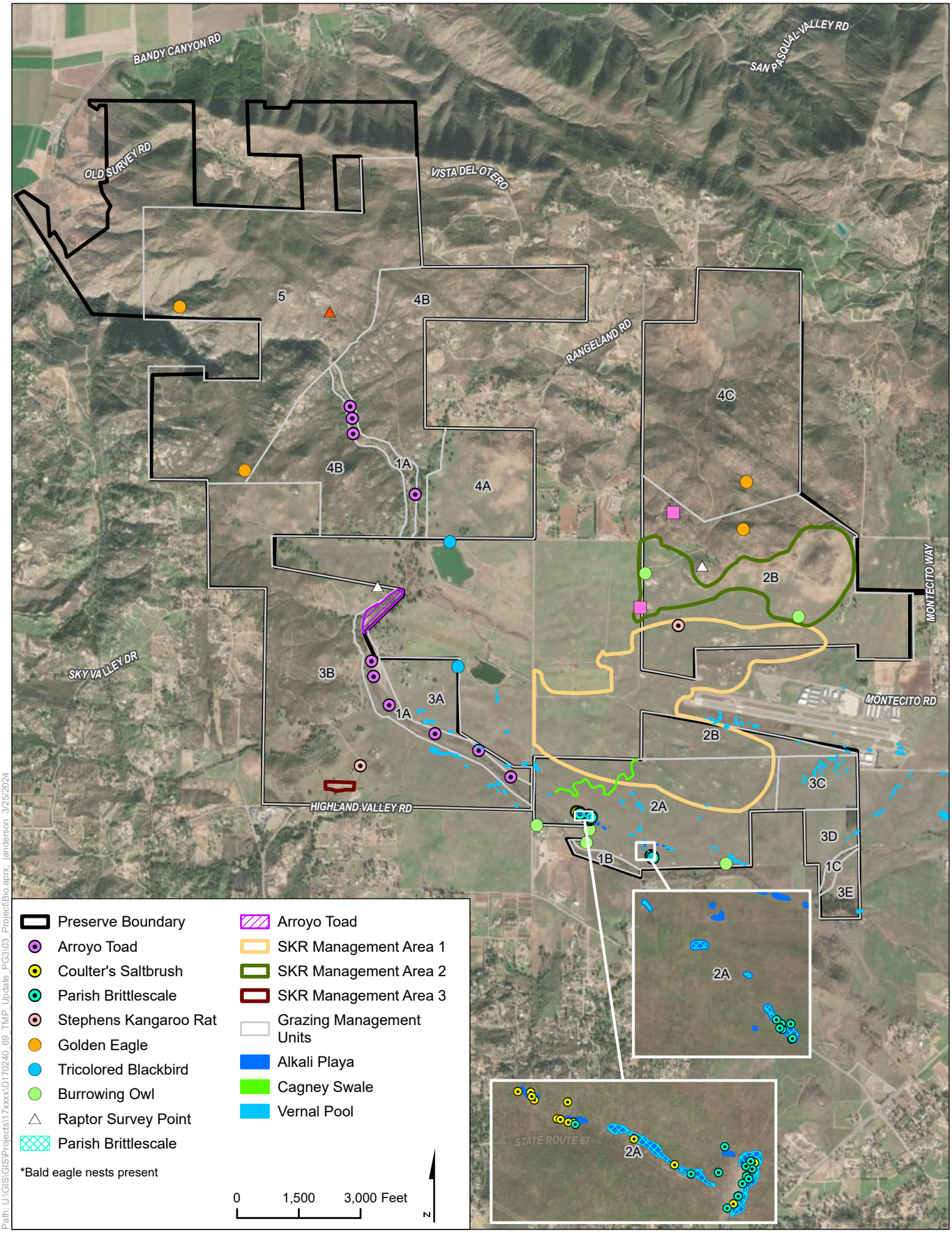


Figure 10a
Ramona Grasslands County Preserve
Targeted Monitoring Plan

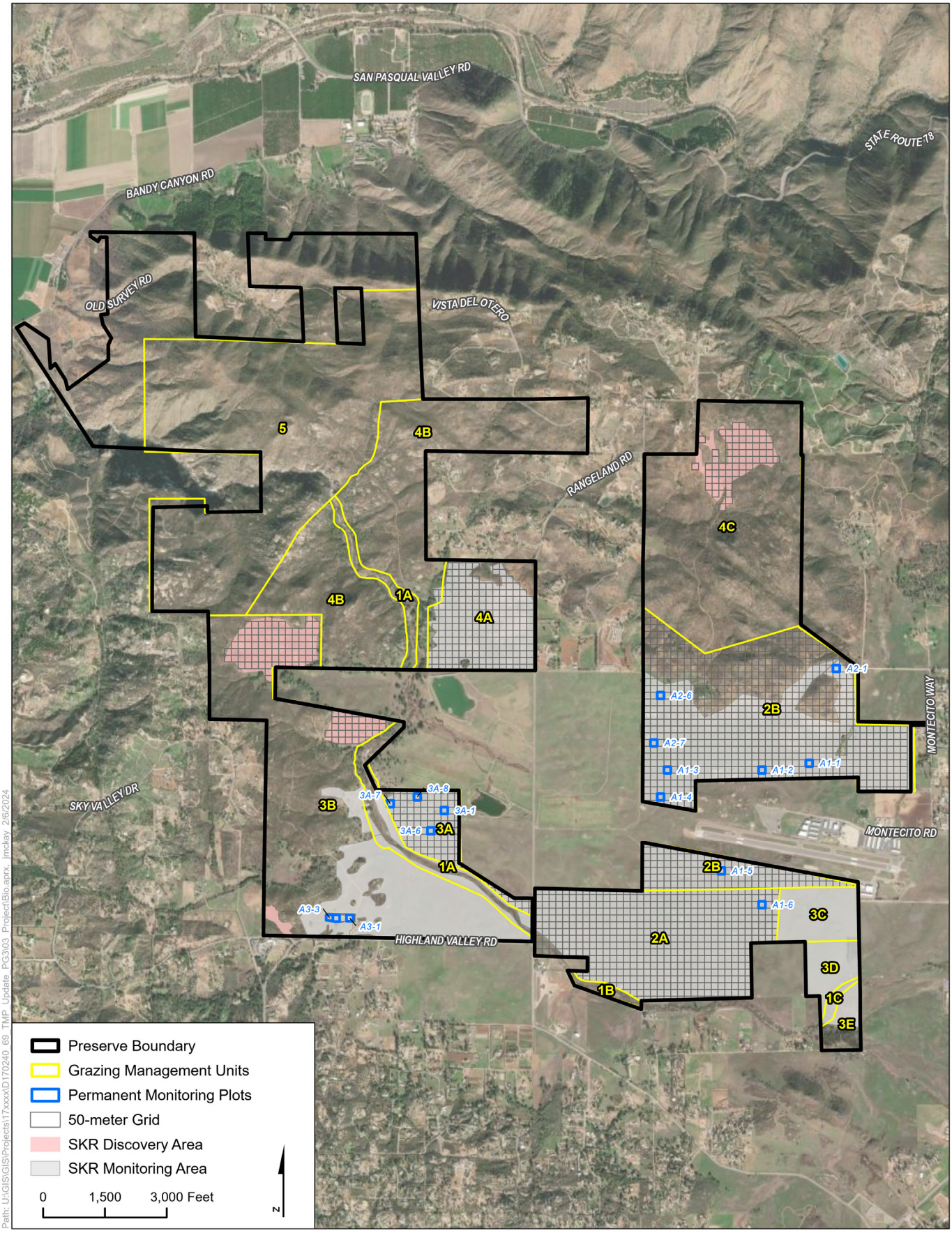


Figure 10b
Modified SKR Monitoring Areas at Ramona Grasslands County Preserve
Targeted Monitoring Plan

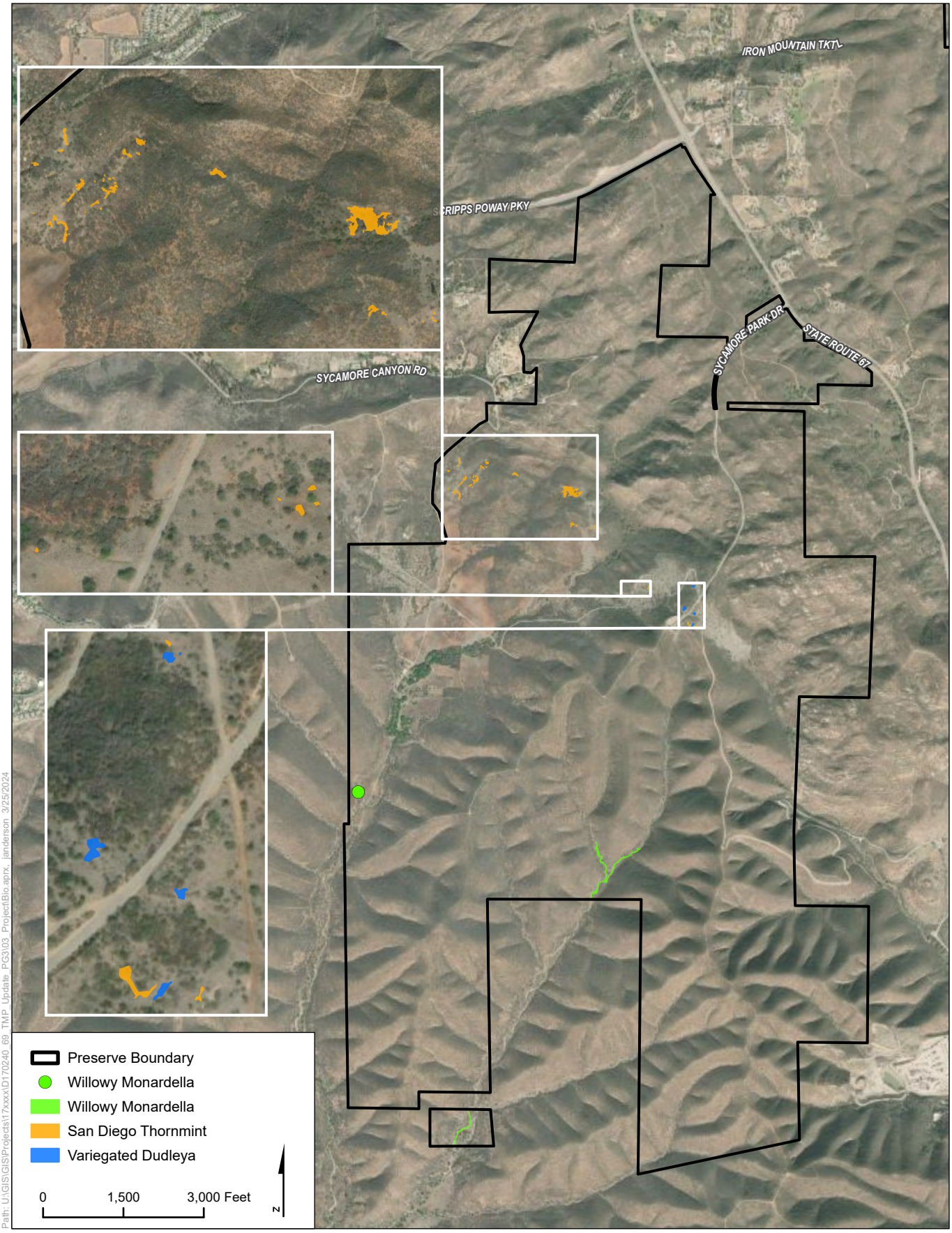


Figure 11
Sycamore Canyon/Goodan Ranch County Preserve
Targeted Monitoring Plan

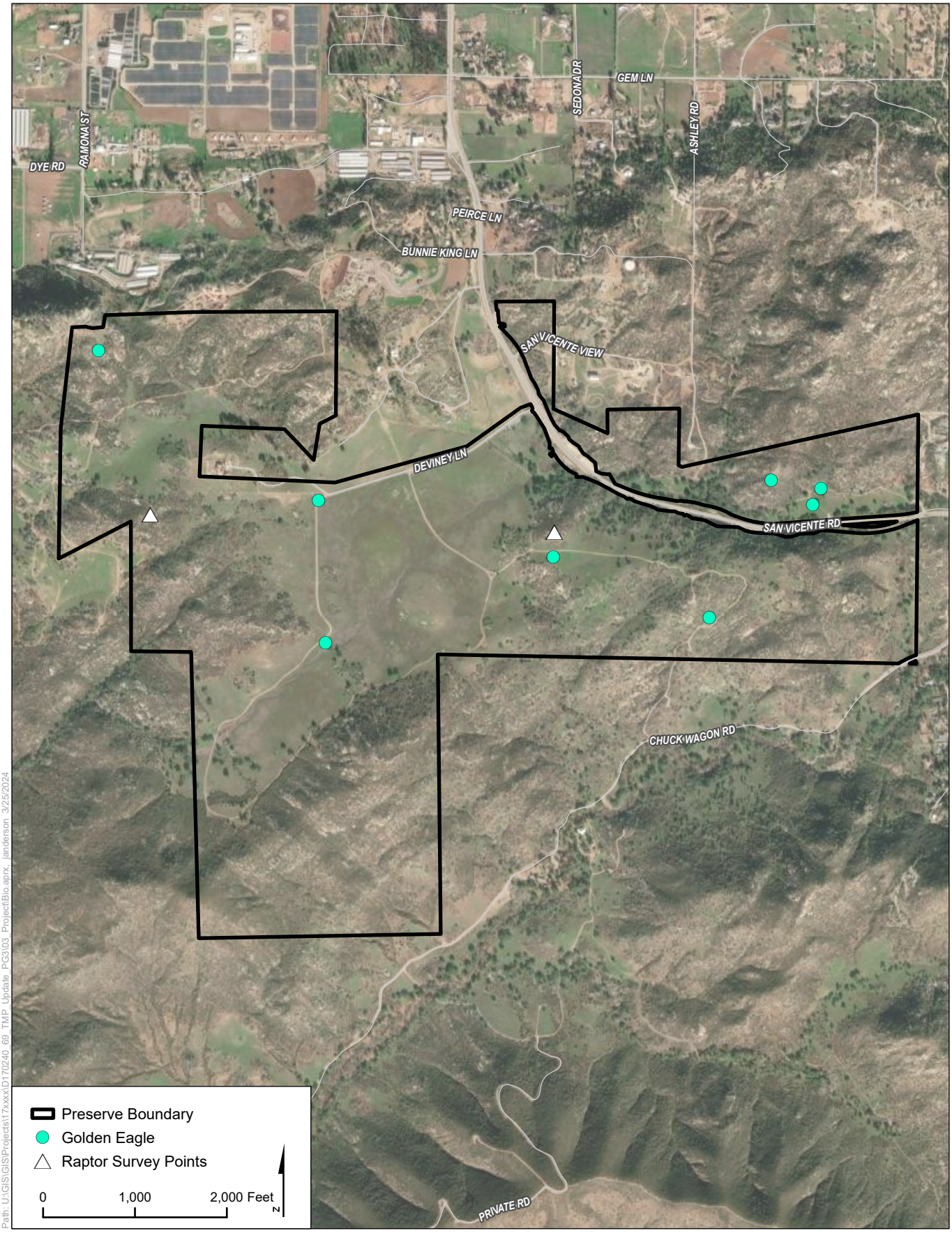


Figure 12
Barnett Ranch County Preserve
Targeted Monitoring Plan

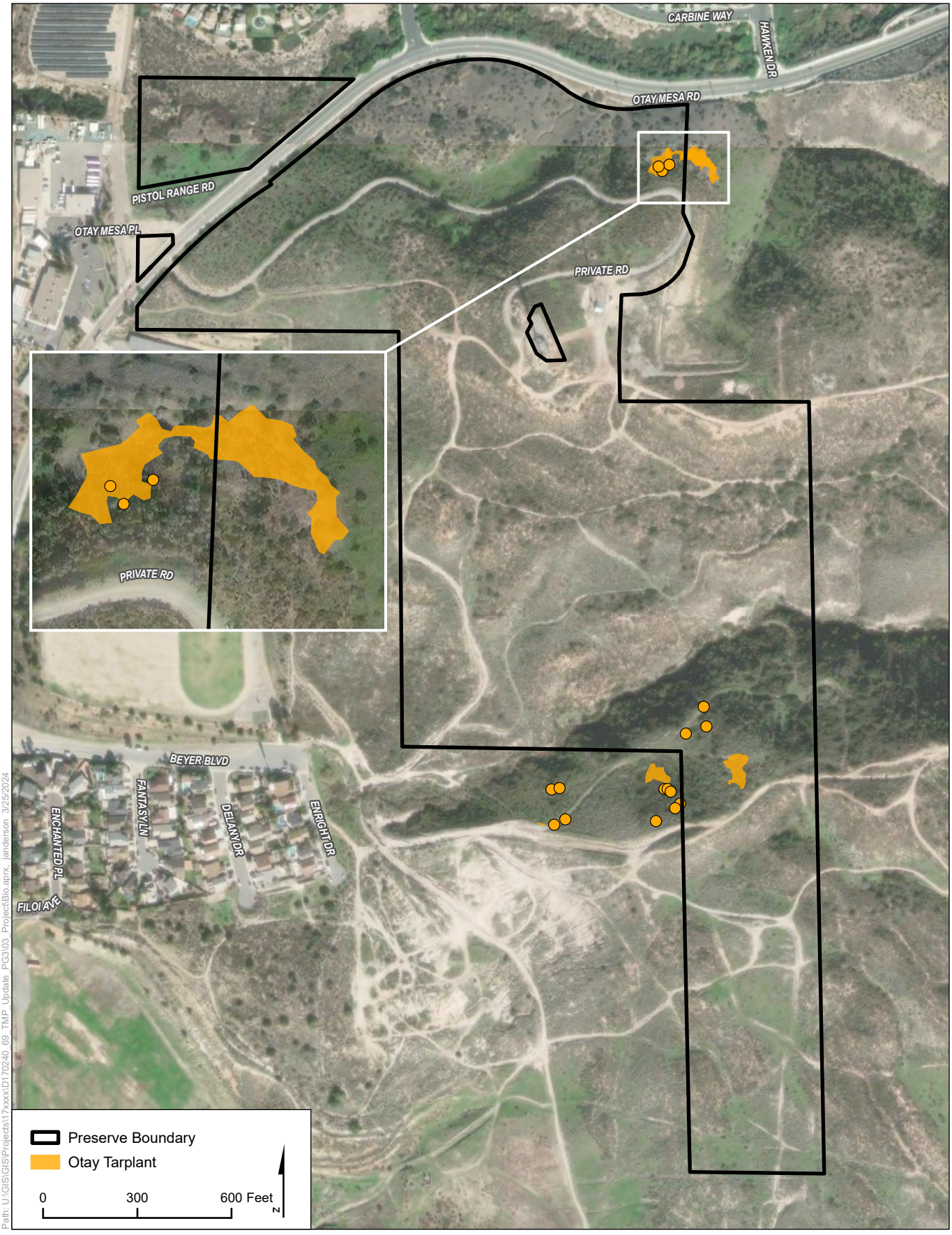


Figure 13
Furby-North County Preserve
Targeted Monitoring Plan

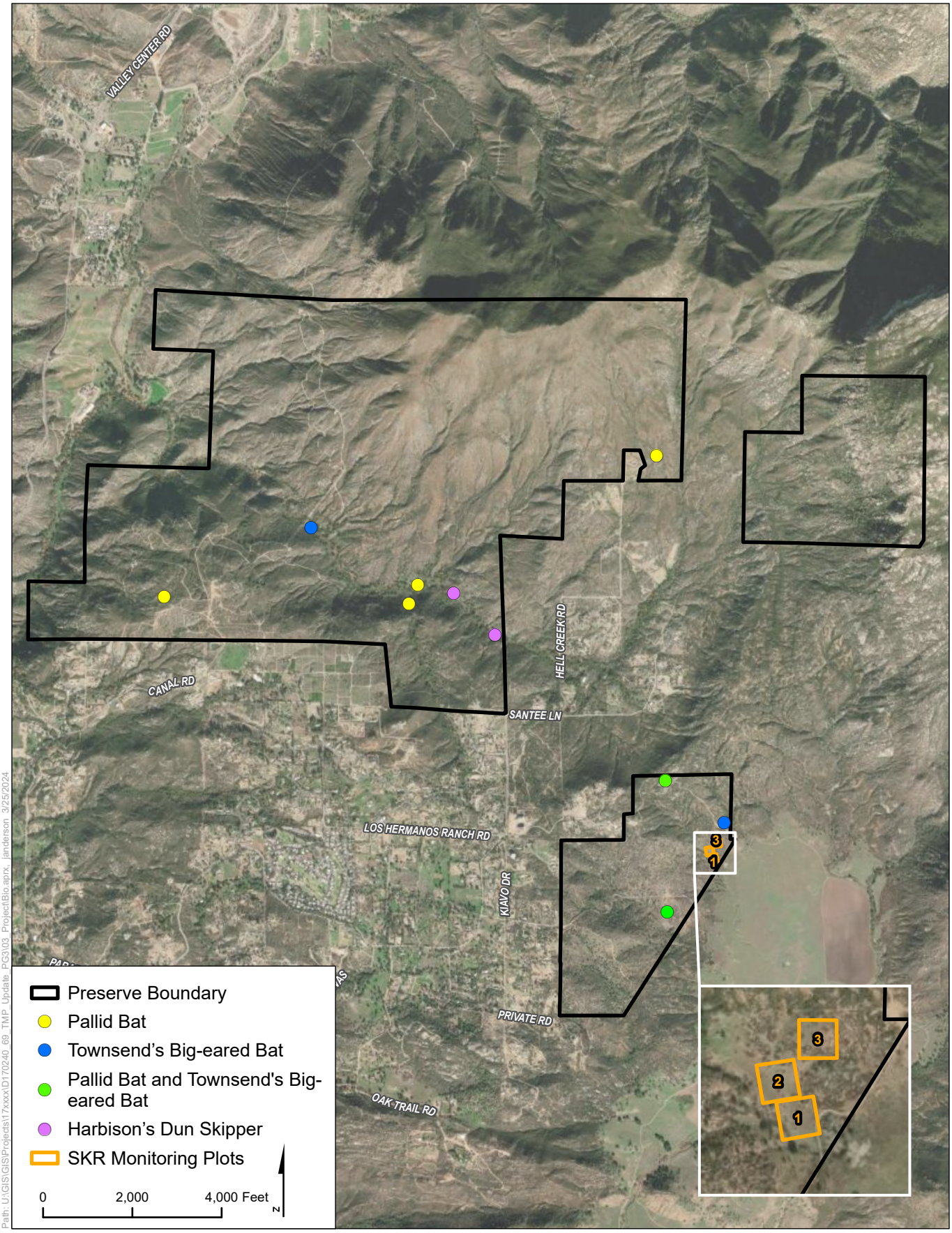


Figure 14
Hellhole Canyon County Preserve
Targeted Monitoring Plan

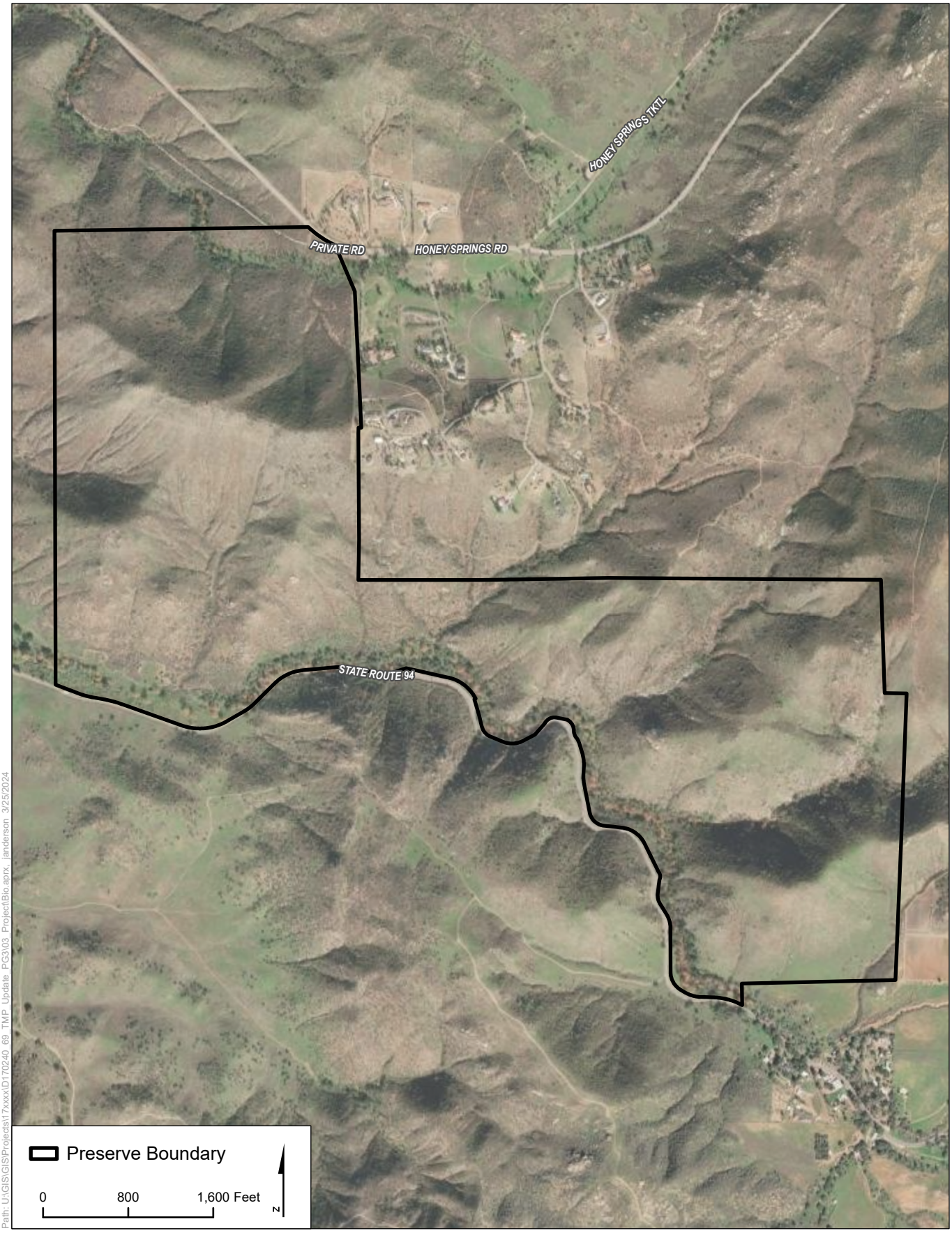


Figure 15
Lawrence and Barbara Daley County Preserve
Targeted Monitoring Plan

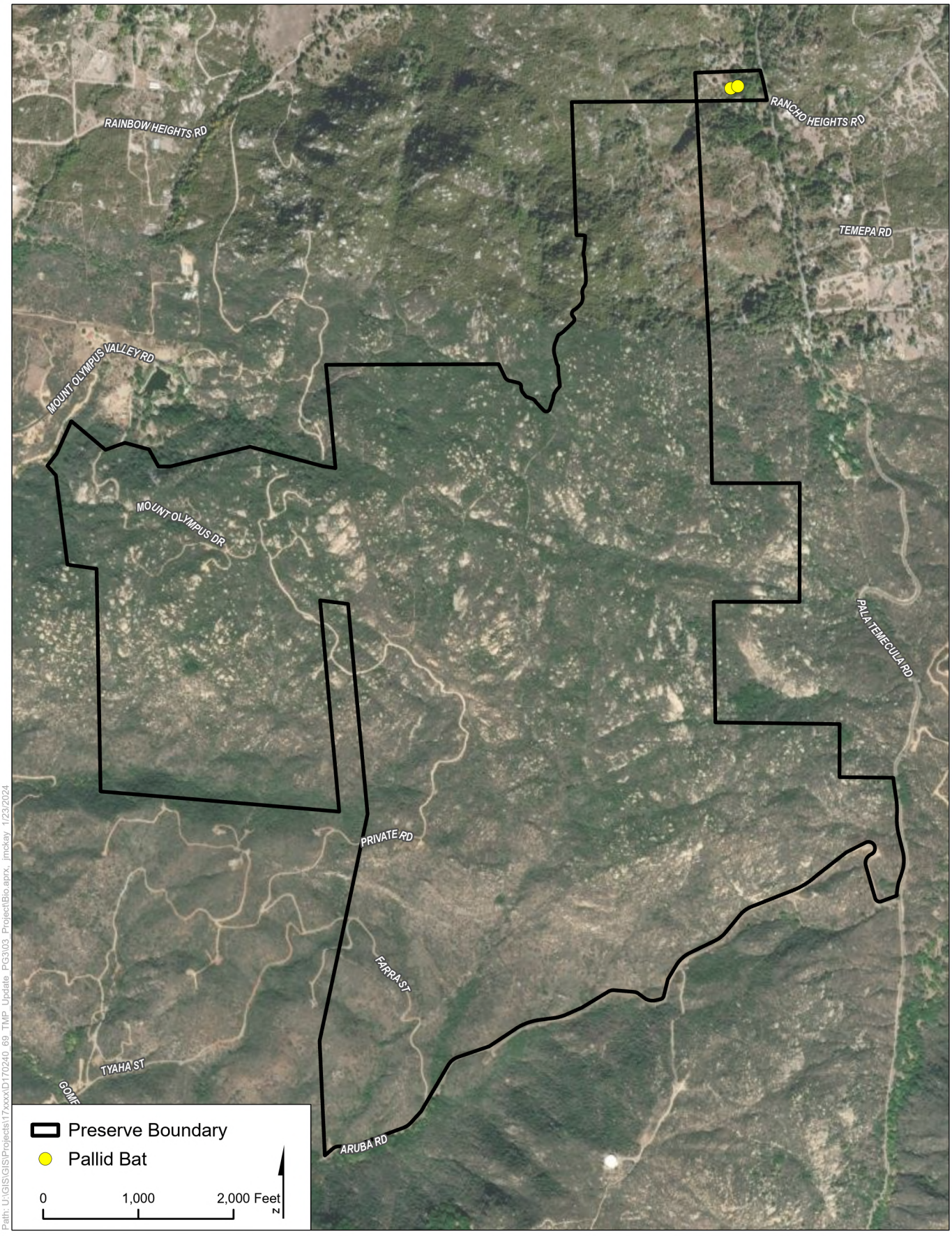


Figure 16
Mount Olympus County Preserve
Targeted Monitoring Plan

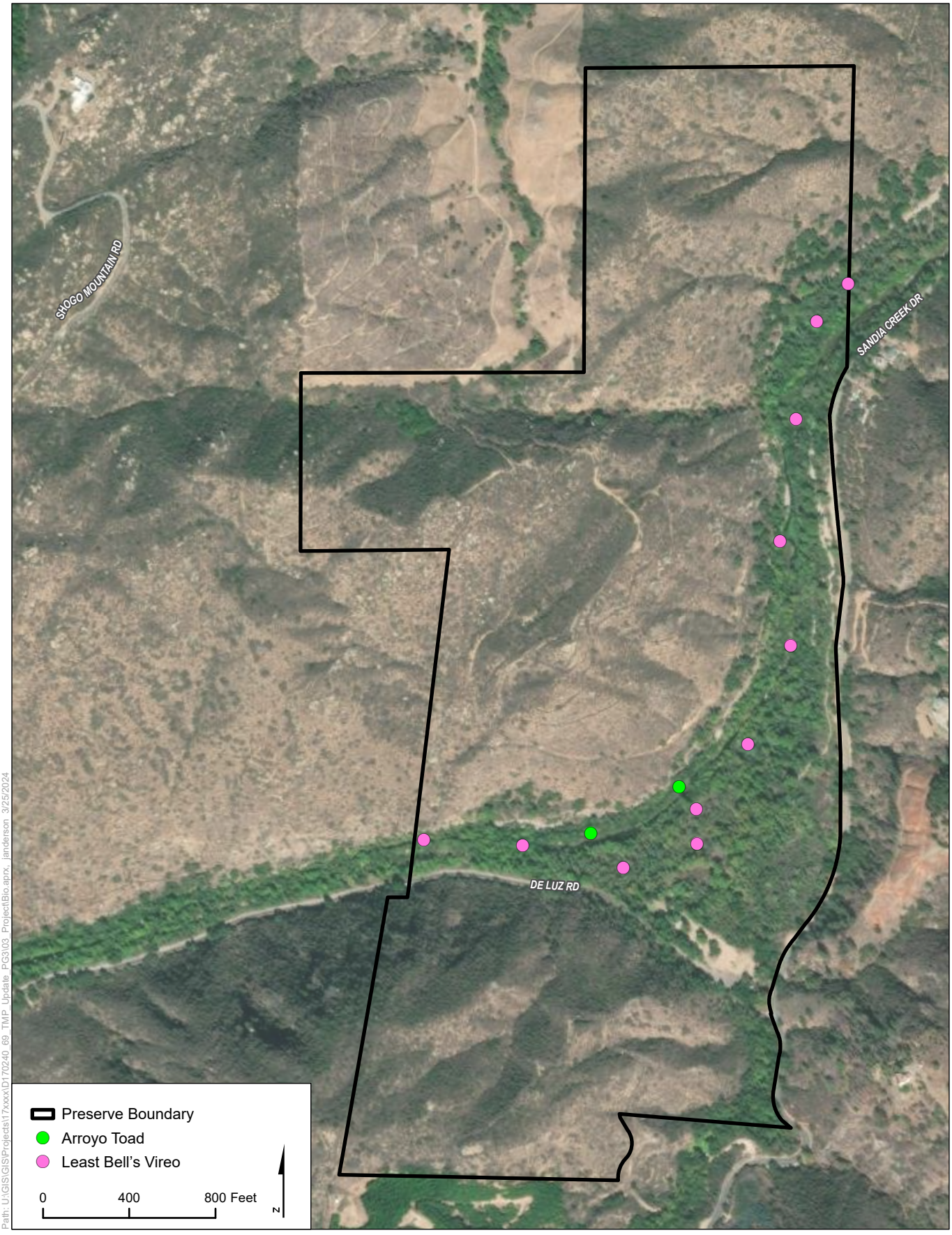


Figure 17
Santa Margarita County Preserve
Targeted Monitoring Plan

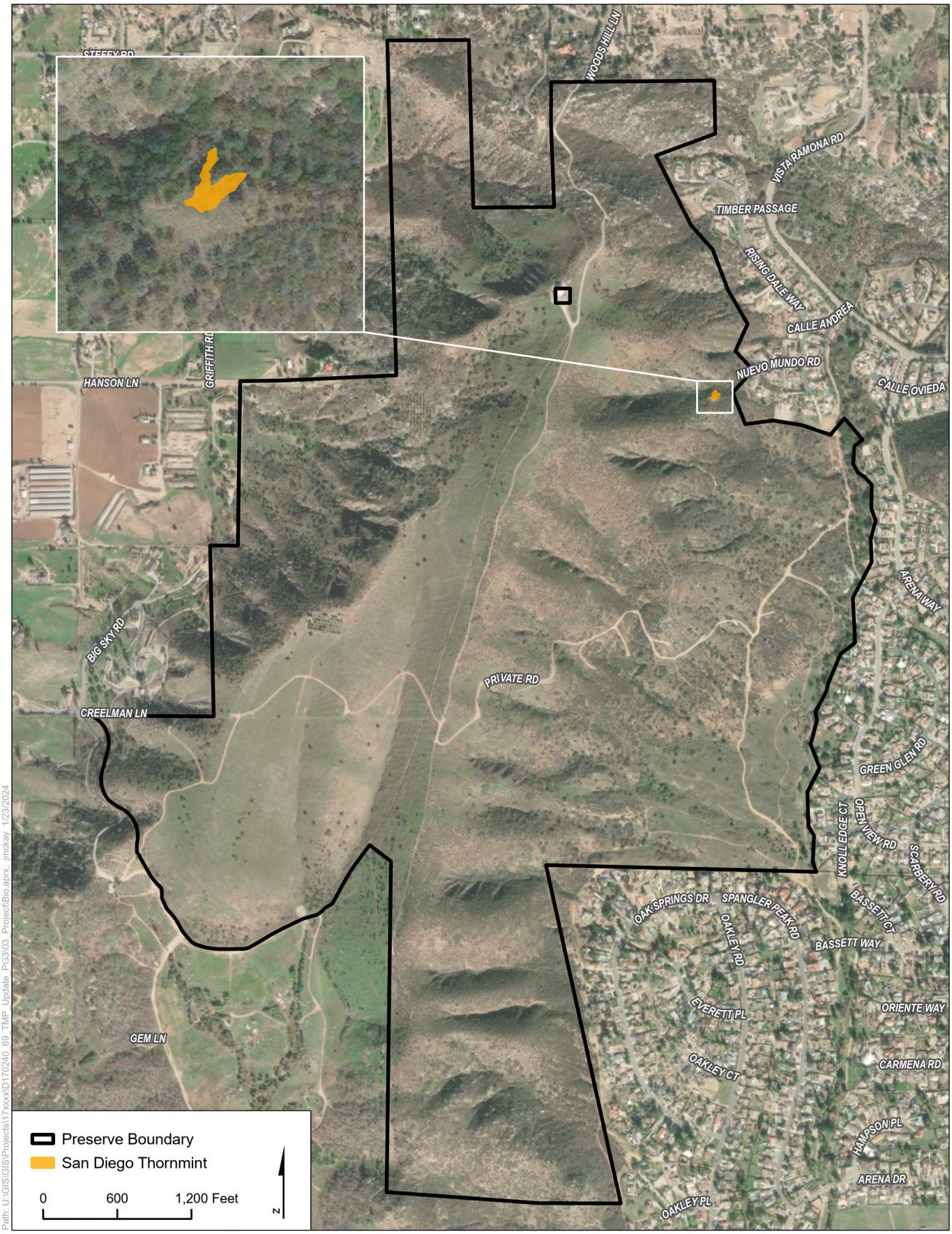


Figure 18
Simon County Preserve
Targeted Monitoring Plan

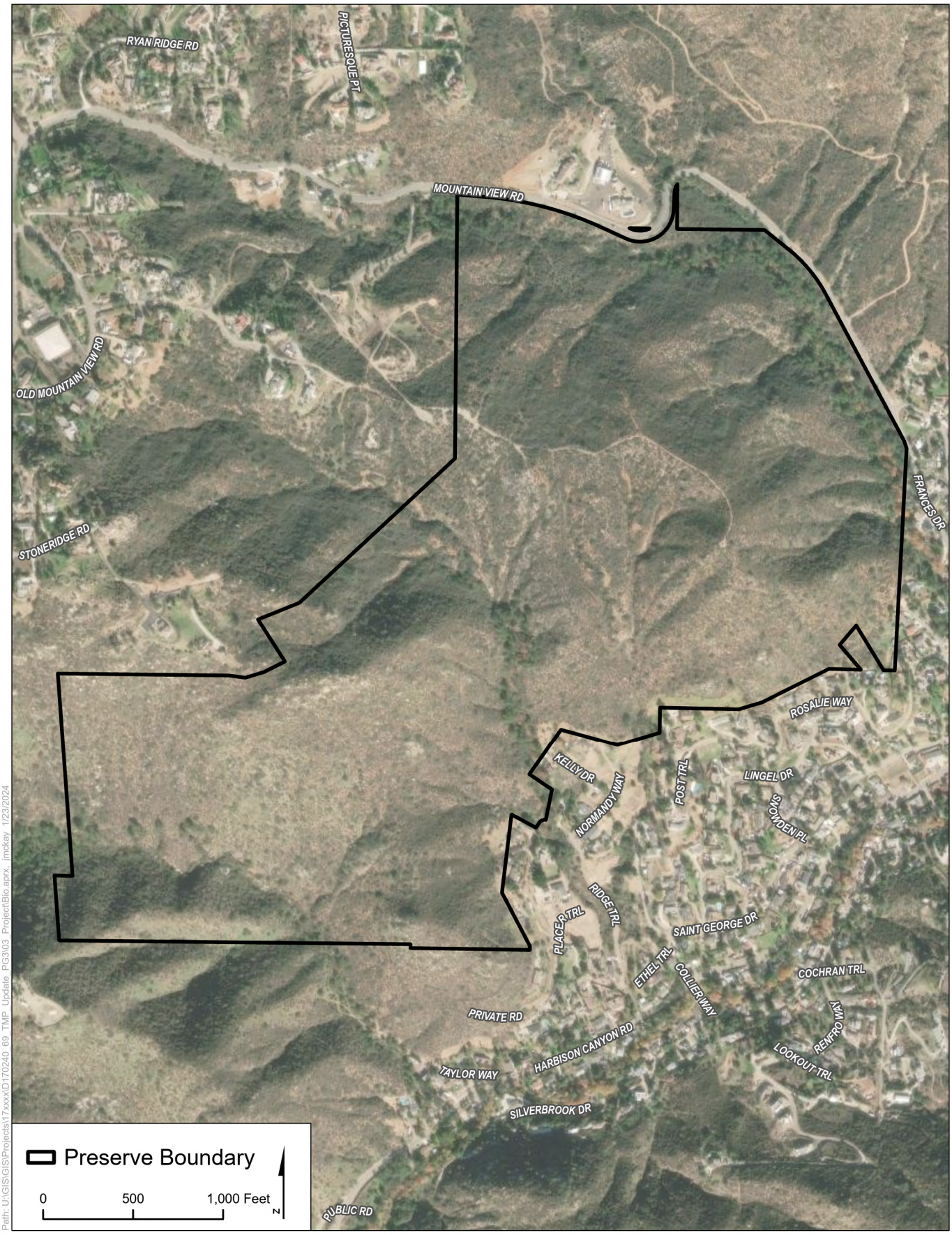


Figure 19
Stoneridge County Preserve
Targeted Monitoring Plan

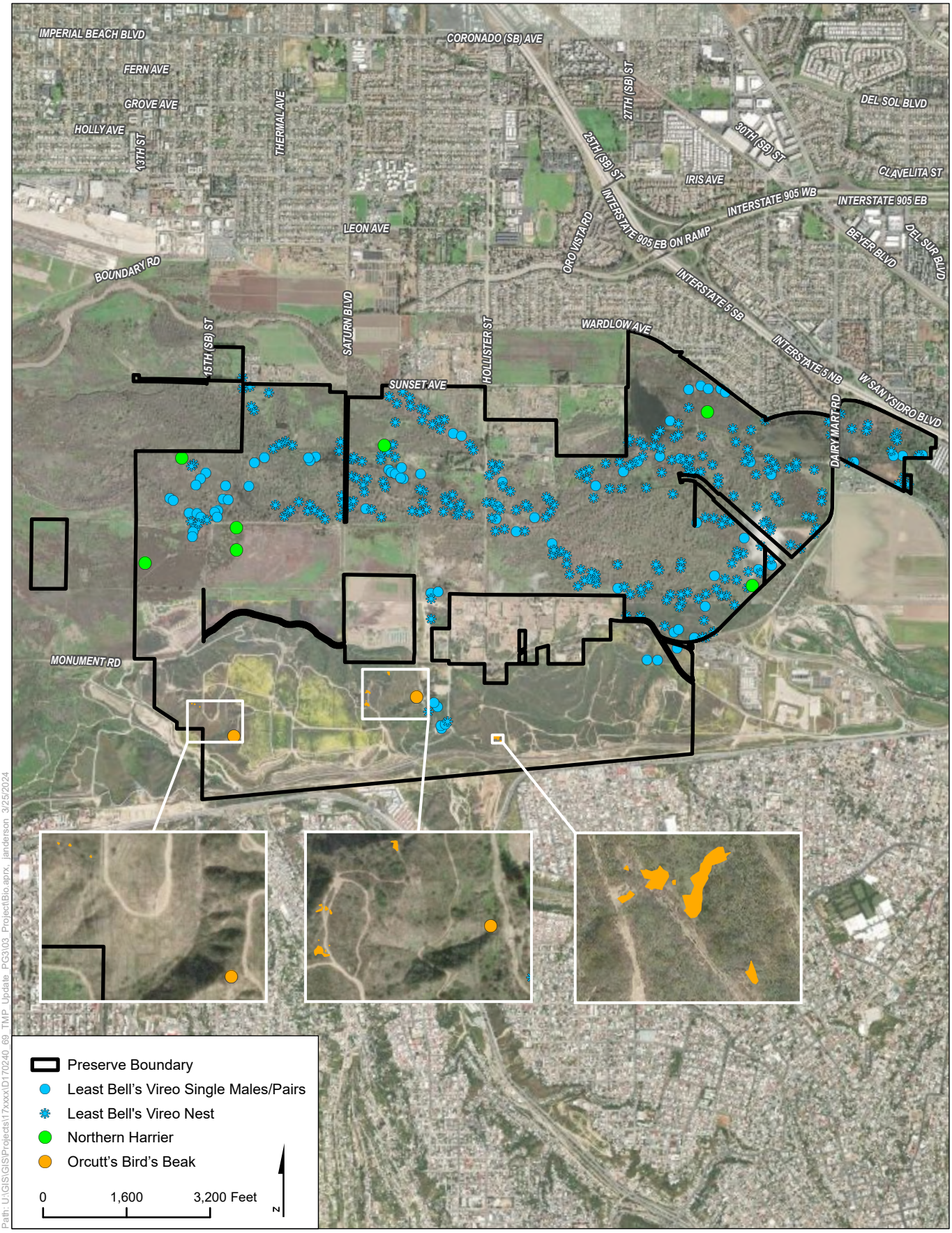


Figure 20
Tijuana River Valley Regional Park
Targeted Monitoring Plan

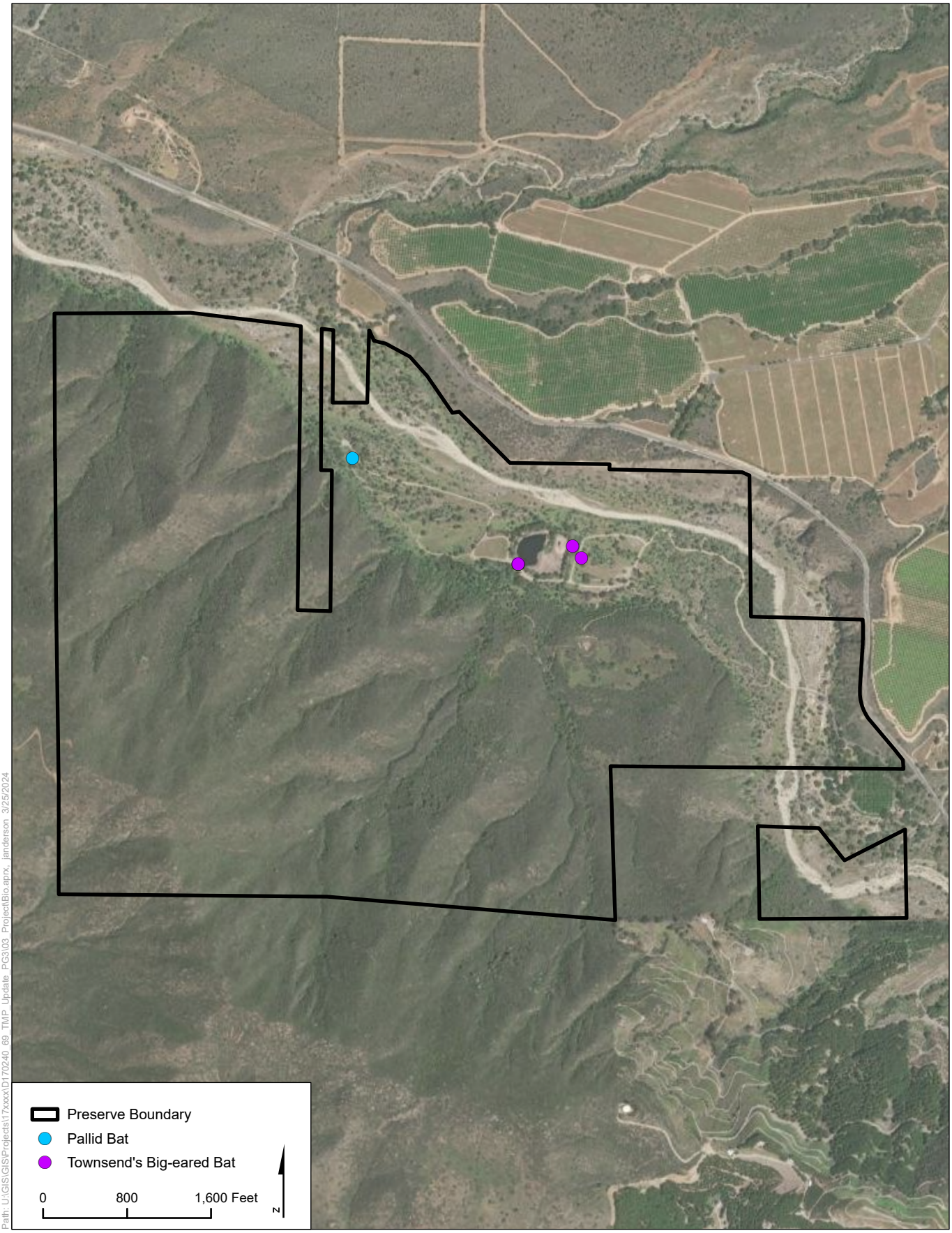


Figure 21
Wilderness Gardens County Preserve
Targeted Monitoring Plan

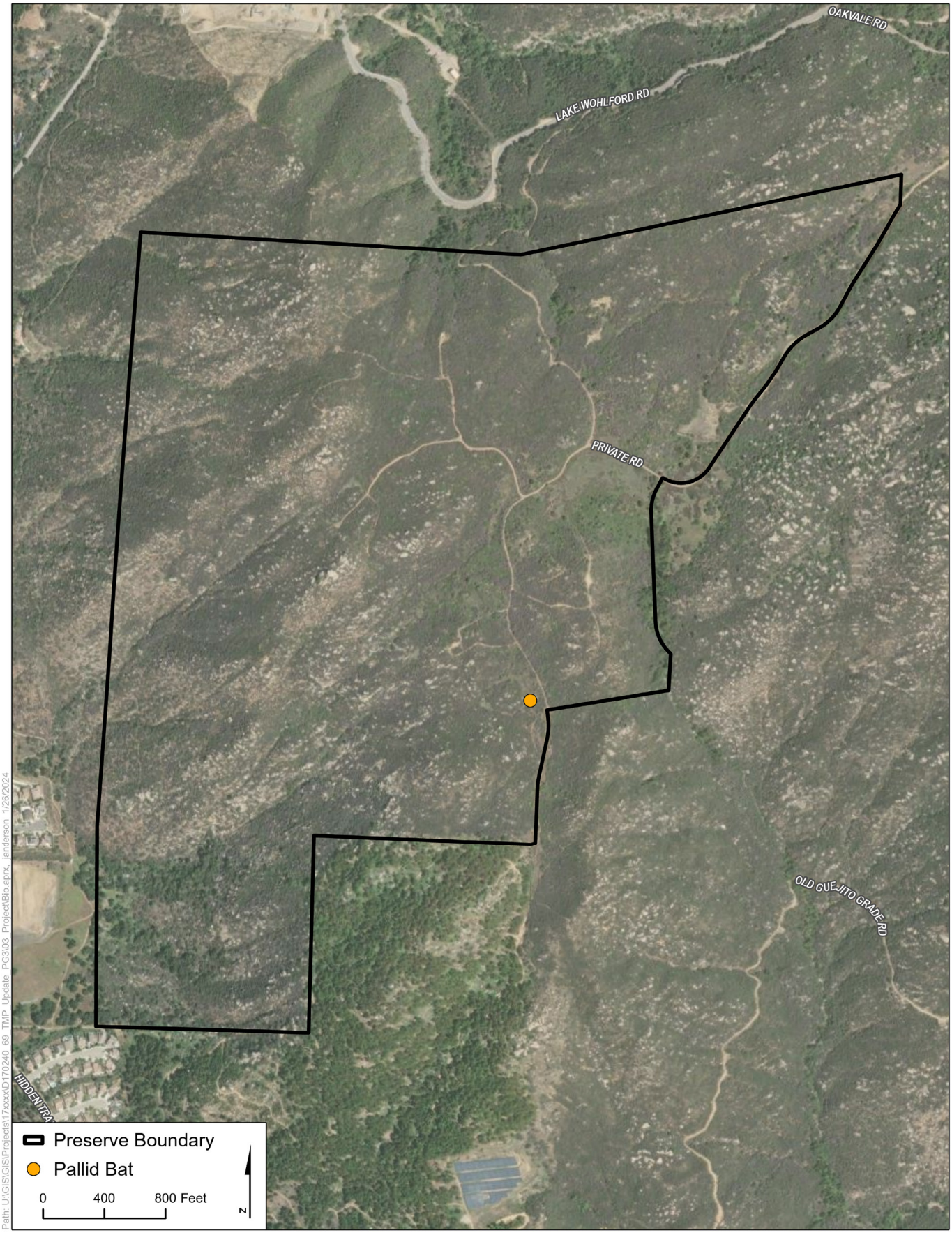


Figure 22
Bottle Peak County Preserve
Targeted Monitoring Plan

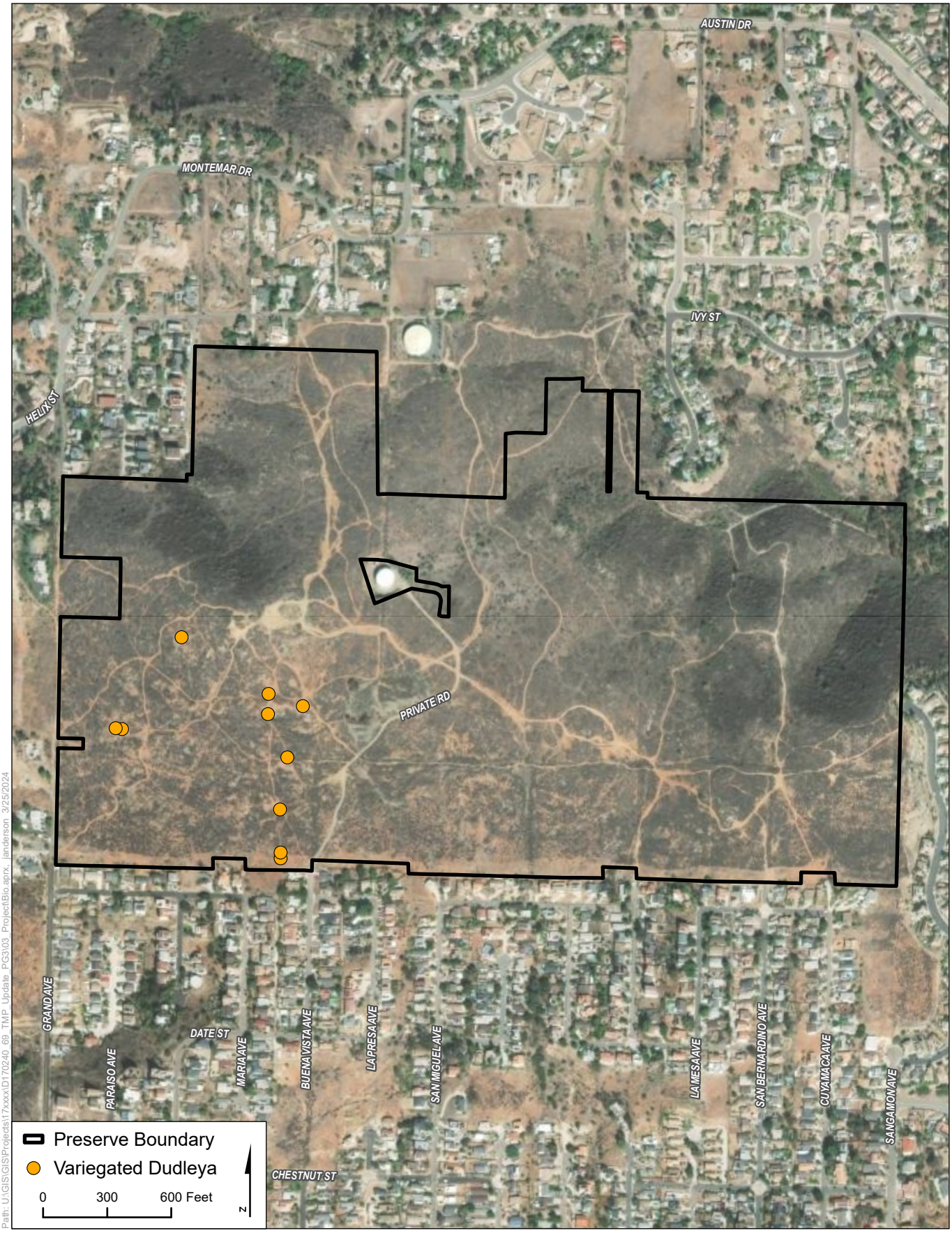


Figure 23
Dictionary Hill County Preserve
Targeted Monitoring Plan

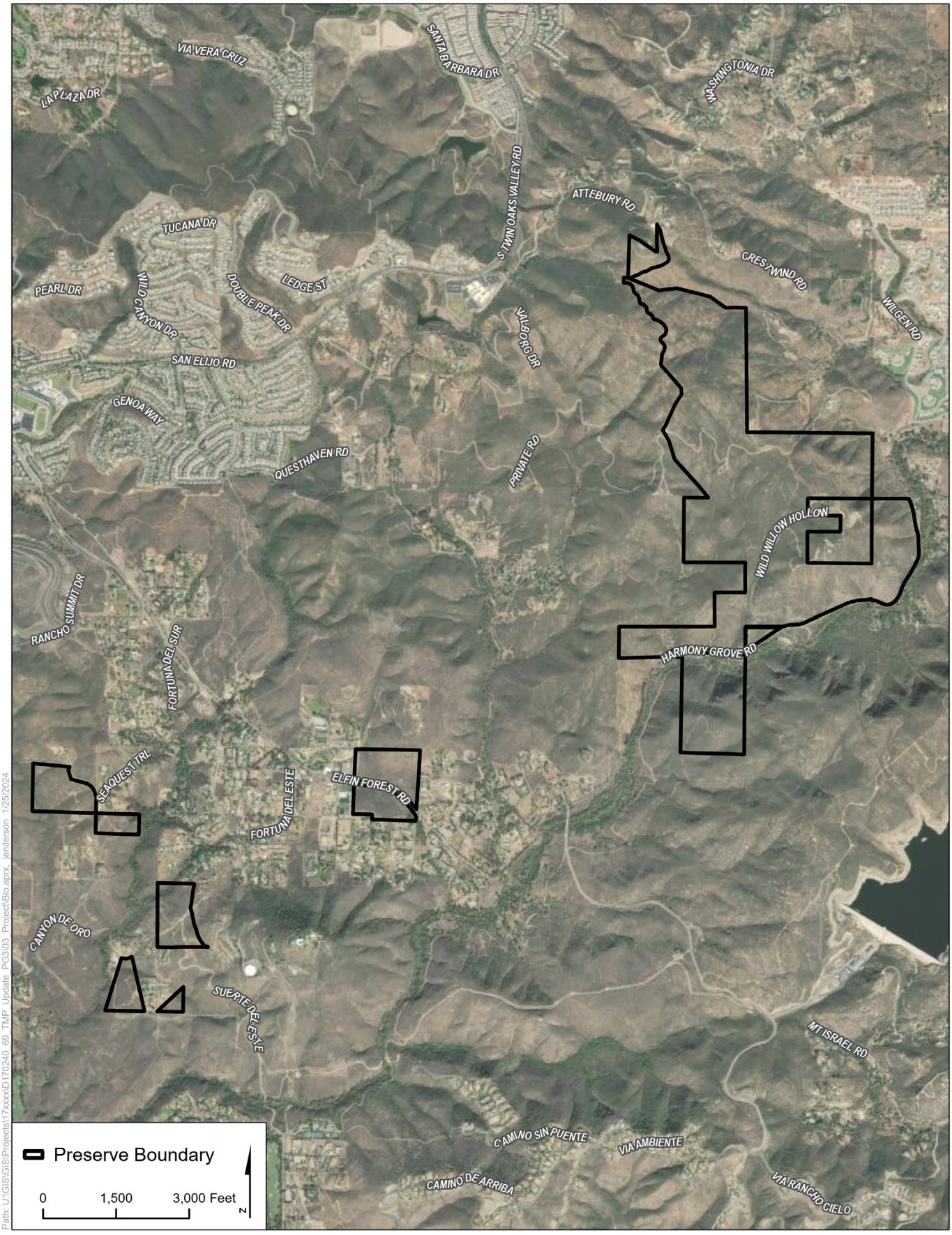


Figure 24
Escondido Creek County Preserve
Targeted Monitoring Plan

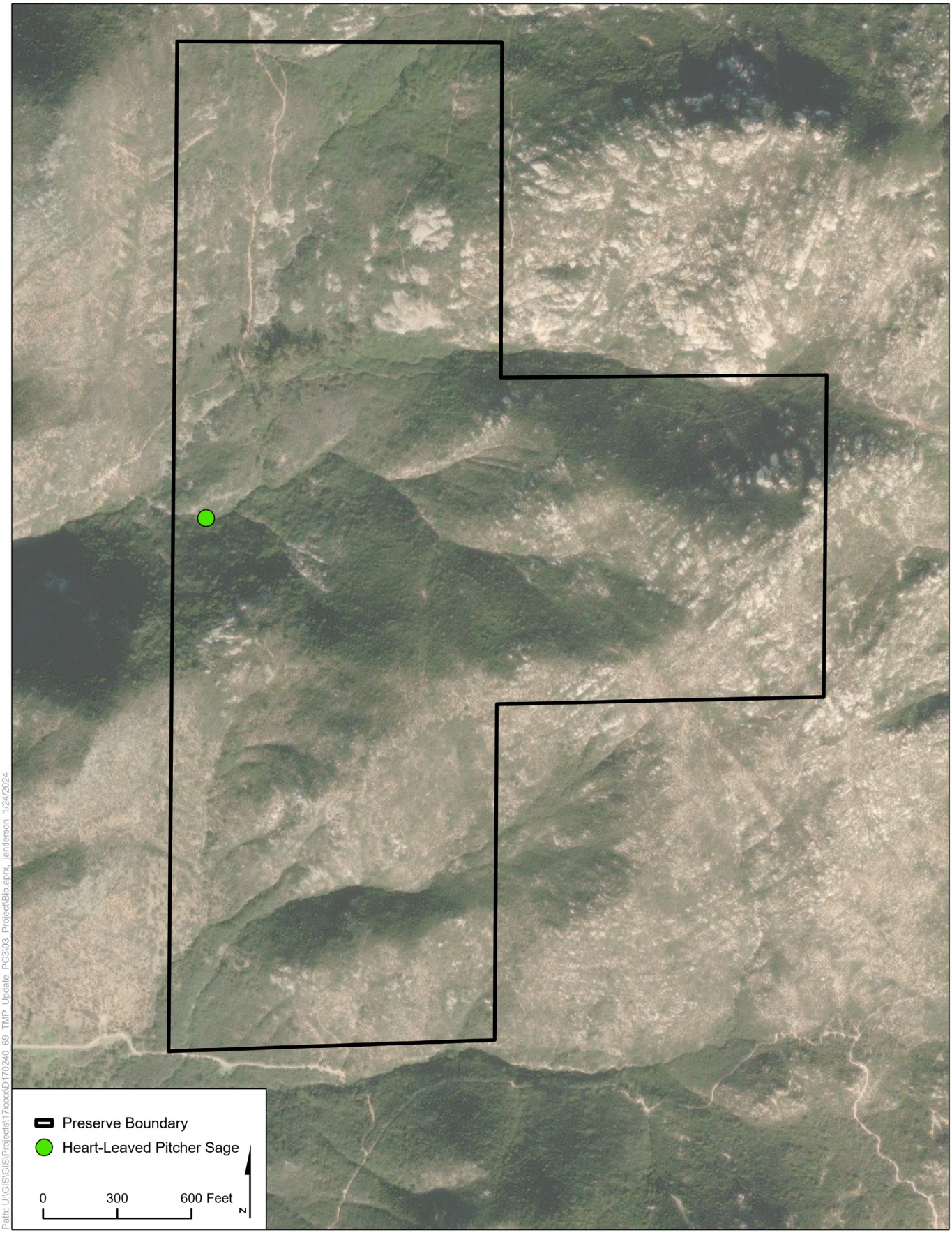


Figure 25
Iron Mountain County Preserve
Targeted Monitoring Plan

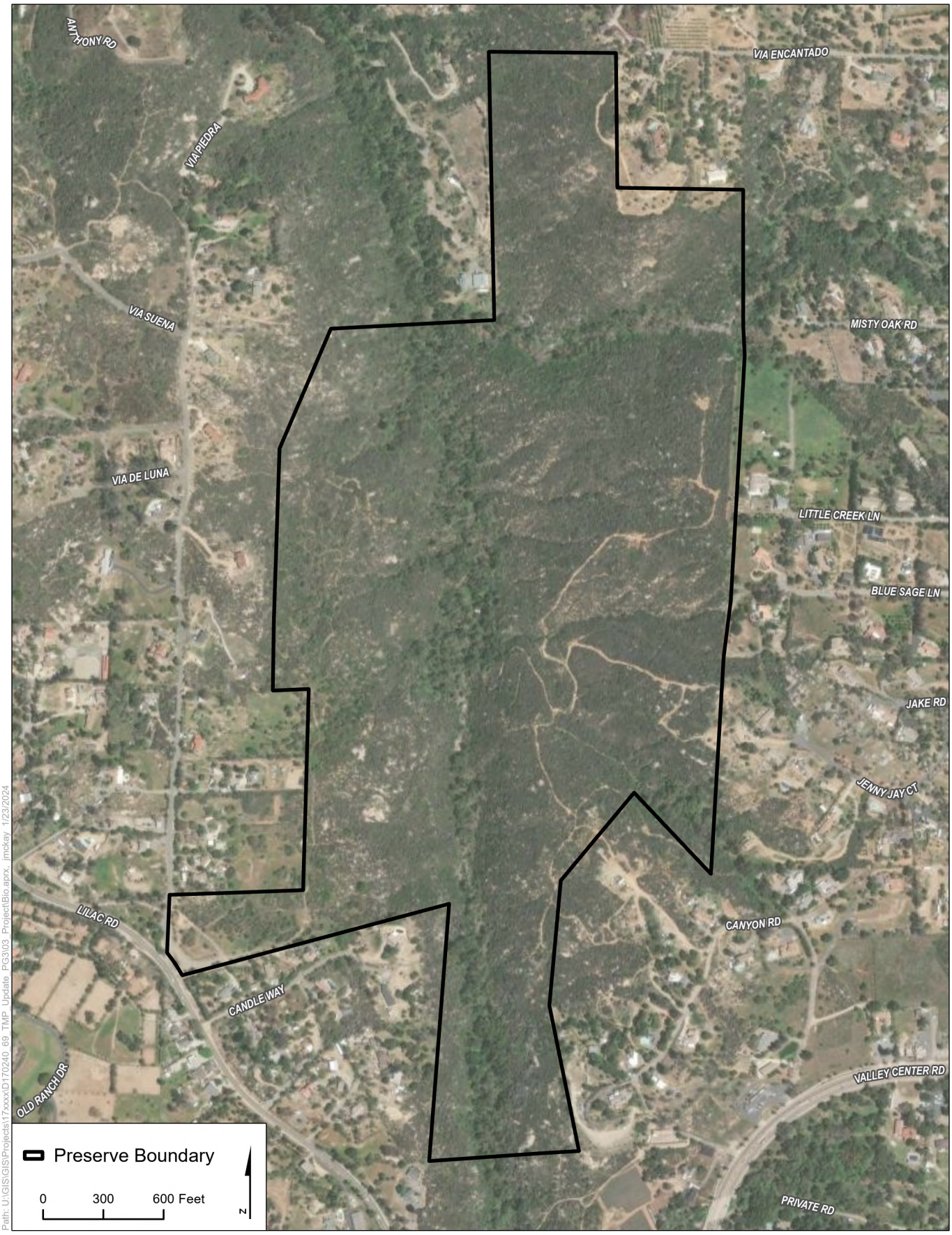


Figure 26
Keys Creek County Preserve
Targeted Monitoring Plan

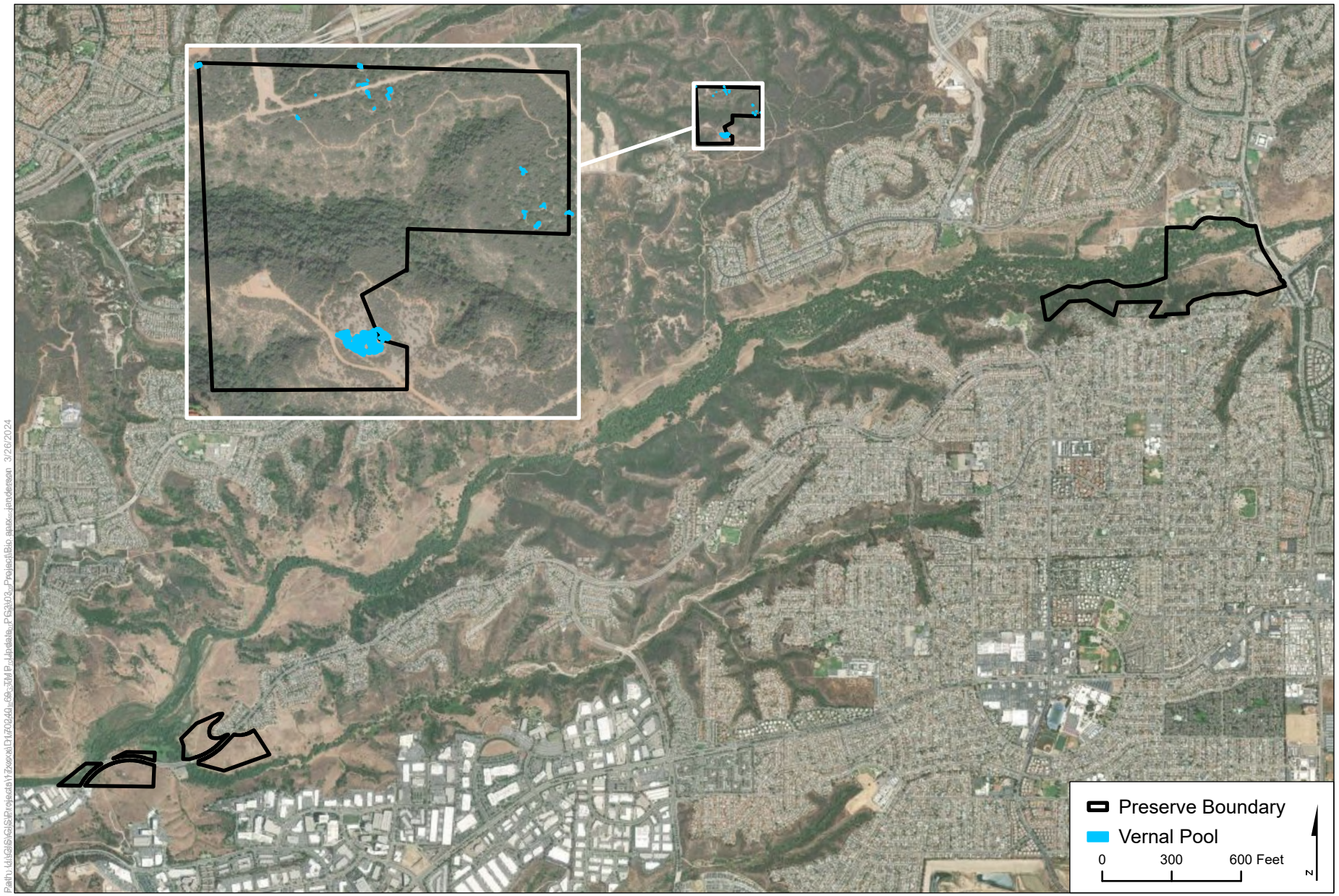


Figure 27
Los Peñasquitos Canyon County Preserve
Targeted Monitoring Plan

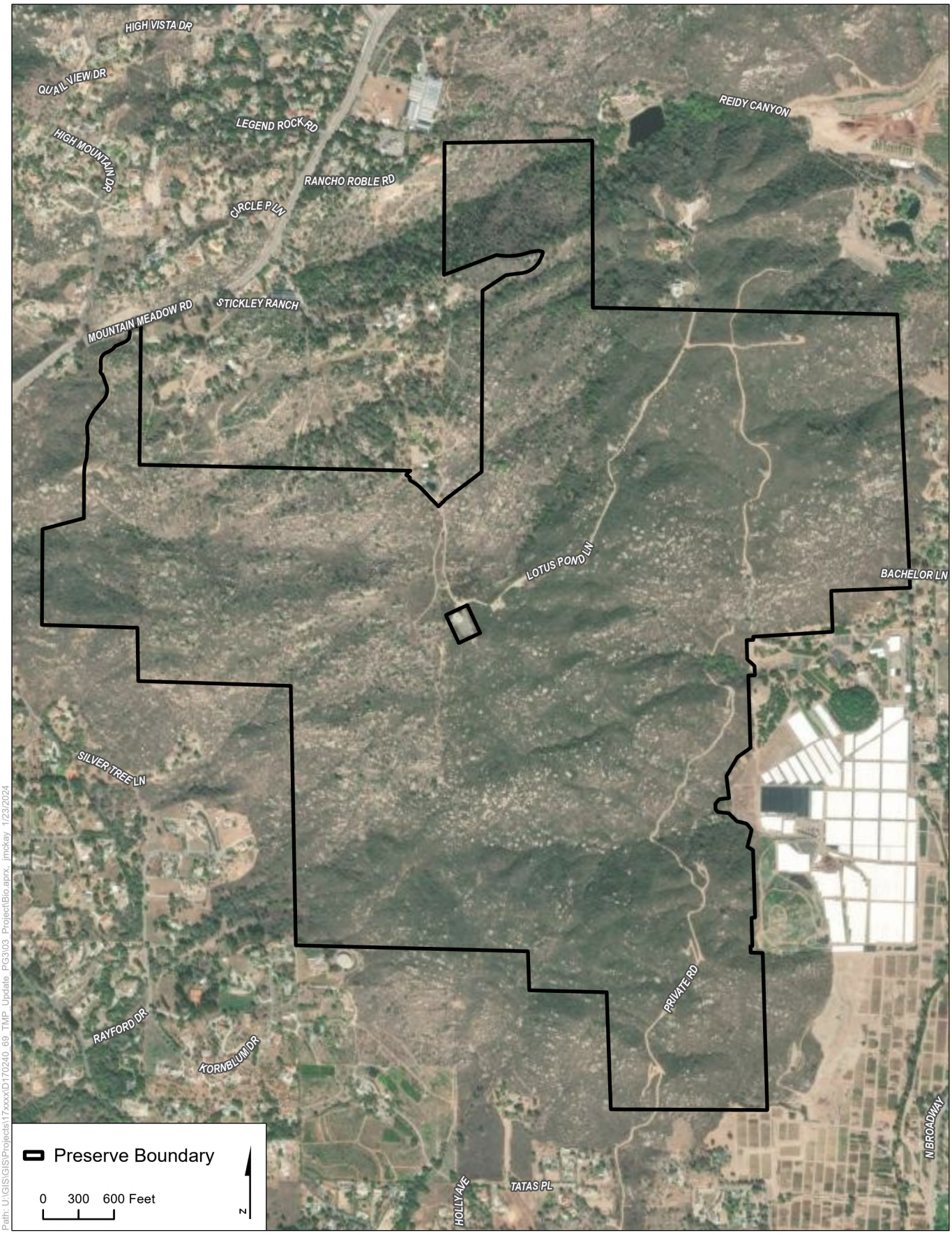


Figure 28
Mountain Meadow County Preserve
Targeted Monitoring Plan

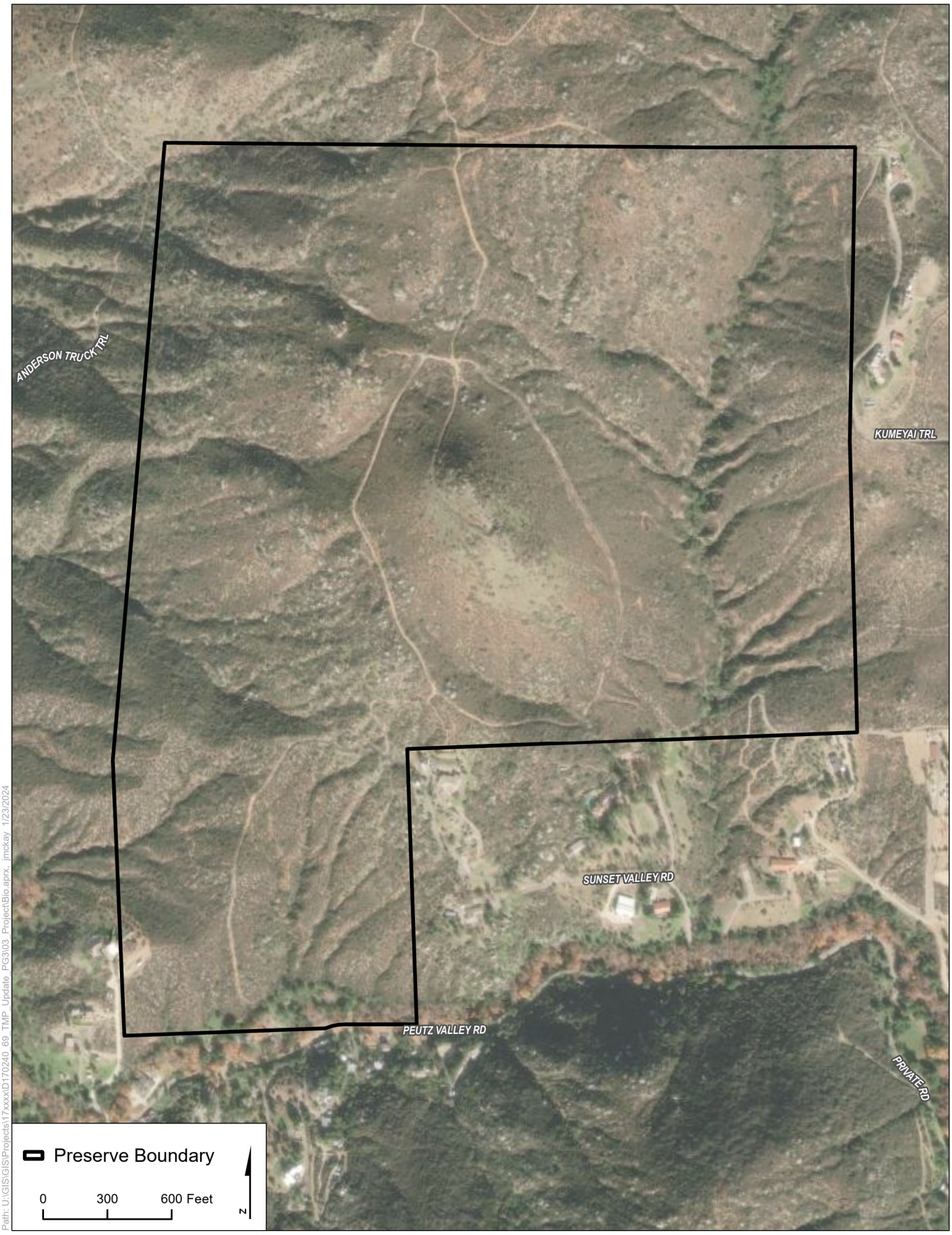


Figure 29
Peutz Valley County Preserve
Targeted Monitoring Plan

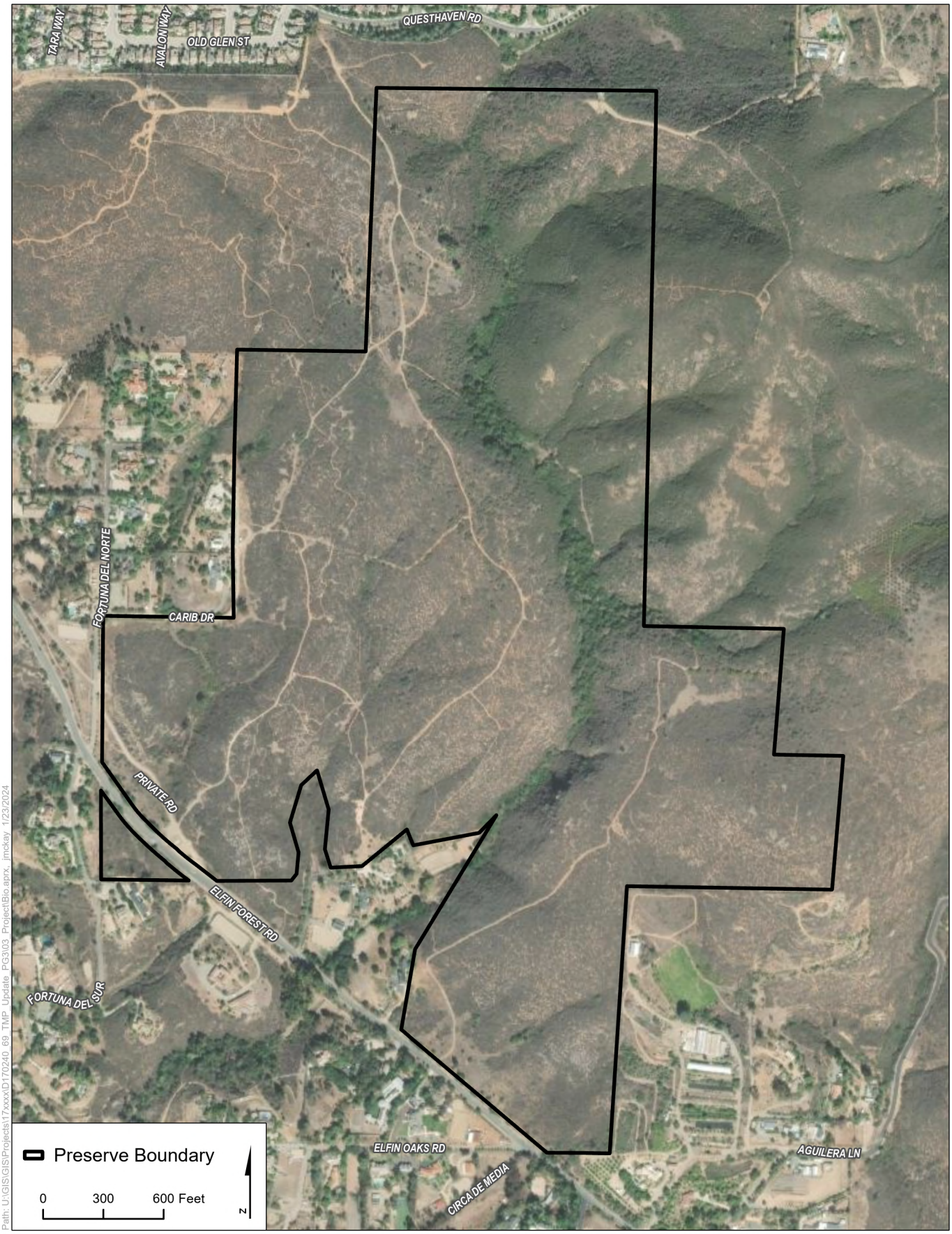


Figure 30
Sage Hill County Preserve
Targeted Monitoring Plan

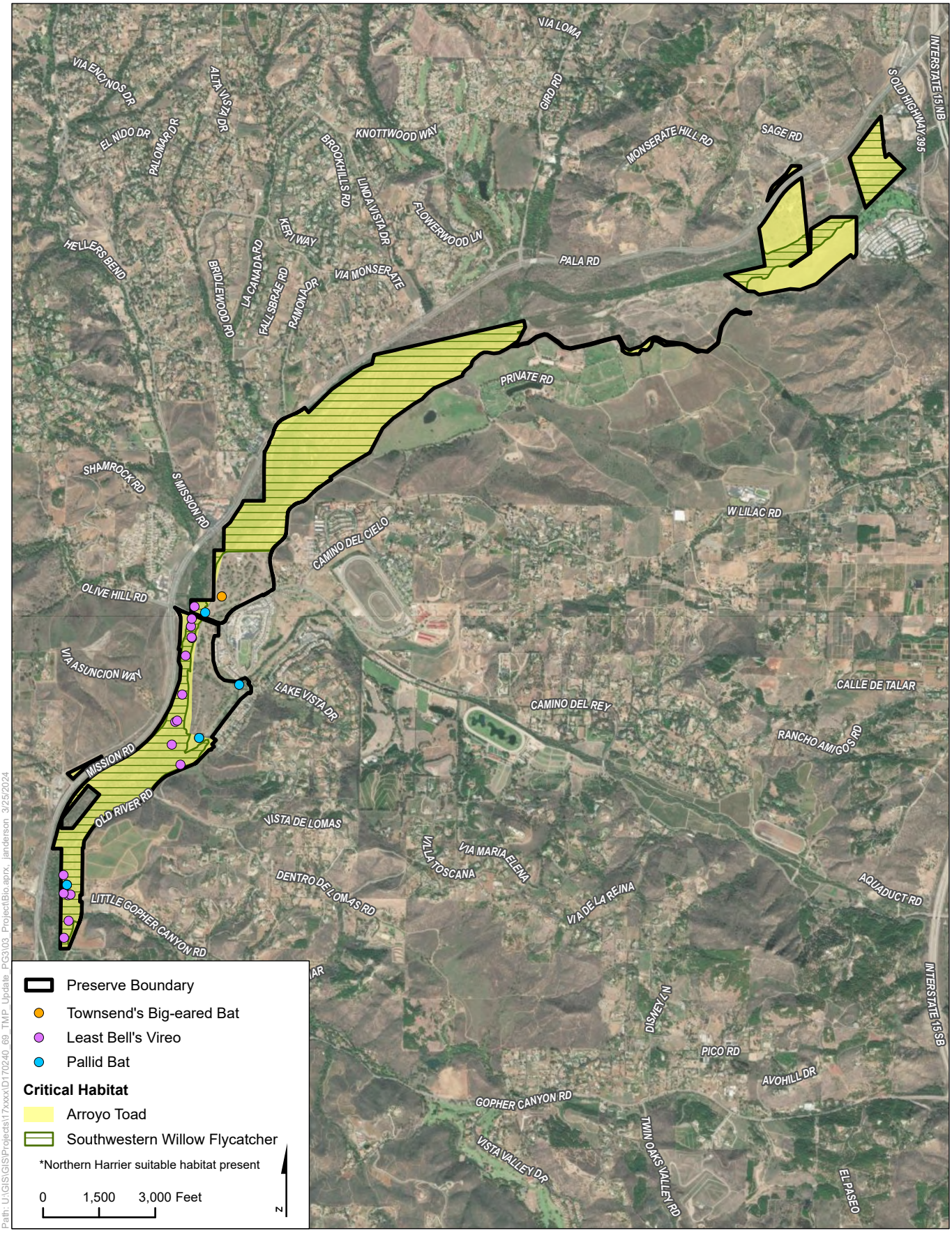


Figure 31
San Luis Rey River Park
Targeted Monitoring Plan

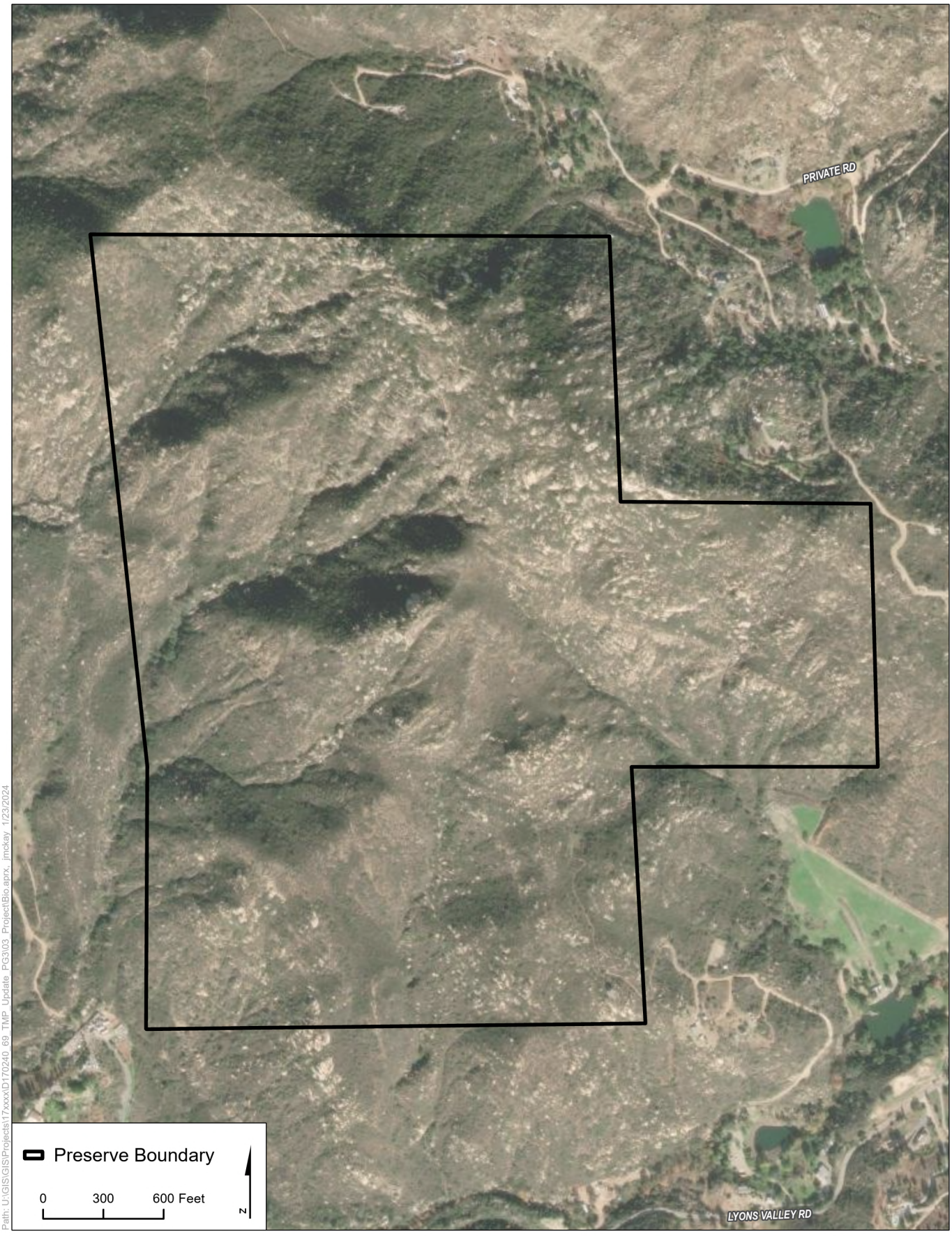


Figure 32
Skyline County Preserve
Targeted Monitoring Plan

1.3 Regulatory and Regional Context

1.3.1 MSCP Overview

The MSCP is a comprehensive habitat conservation planning program and one of the subregional habitat-planning efforts in San Diego County that contribute to the conservation of regional biodiversity through coordination with other habitat conservation planning efforts throughout Southern California. Agencies participating in the MSCP include the County, other local jurisdictions, the USFWS, and CDFW. The MSCP is considered an umbrella plan. Local jurisdictions and special districts implement their respective portions of the MSCP through Subarea Plans, which describe specific implementing mechanisms for the MSCP. Subarea Plans serve as Habitat Conservation Plans (HCPs) pursuant to Section 10(a)(1)(B) of the federal Endangered Species Act and Natural Community Conservation Plans (NCCPs) pursuant to the California NCCP Act of 1991 (amended in 2001).

The South County MSCP Subarea Plan was adopted by the County in October 1997 and covers 23 vegetation communities and 85 plant and animal species. Species-specific monitoring and management requirements for the South County MSCP Subarea Plan are summarized in Table 3-5 of the MSCP Plan. The assurances and obligations to implement the South County MSCP Subarea Plan, including monitoring and management, are established in the Implementing Agreement (County of San Diego 1998), signed by the County, USFWS, and CDFW (formerly California Department of Fish and Game [CDFG][1]).

The County is preparing the draft North County MSCP for its northwestern unincorporated areas. The current proposed covered species list proposes 41 species (a draft list was provided by DPR in August 2023 and is referenced in this document). It is a stand-alone plan and not a Subarea Plan. When the draft North County MSCP is adopted, it will include species-specific monitoring and management requirements for the covered species and a formal implementing agreement.

1.3.2 Regional Monitoring and Management Coordination

Context for Regional Coordination

The MSCP umbrella plan (August 1998) included a Biological Monitoring Plan (Ogden 1996) for the plan area that provided a framework to prioritize and guide biological monitoring of habitats, covered species, and wildlife movement corridors within the South County MSCP Plan Area. Portions of the Biological Monitoring Plan were tested (e.g., gnatcatcher protocol) in the first years of implementation of the MSCP. It was quickly determined that the protocols and approach needed to be refined.

The Biological Monitoring Plan was initially evaluated in 2001 by the Conservation Biology Institute (CBI 2001), and then again in 2005 (Hierl et al. 2005). Both reviews concluded that many of the protocols needed to be reexamined and adapted to the most current scientific knowledge/strategies available, and highlighted the need for better coordination across the plan area and centralized data storage and analysis. Subsequently, numerous other studies were conducted to reevaluate and refine the monitoring strategy, including prioritization (Franklin et al. 2006; Regan et al. 2006), monitoring methods (Deutschman and

[1] The California Department of Fish and Game (CDFG) changed its name to California Department of Fish and Wildlife (CDFW) on January 1, 2013.

Strahm 2009; McEachern et al. 2007; McEachern and Sutter 2010; Tracey et al. 2011; Winchell et al. 2008), adaptive management (Atkinson et al. 2004), and overall approach (Deutschman et al. 2012; Hierl et al. 2005).

The San Diego Management and Monitoring Program (SDMMP) was established by SANDAG to coordinate monitoring and management activities across the region, establish regional priorities, foster communication among land managers, and promote best management practices (BMPs). This coordination across political boundaries and multiple jurisdictions ensures a synergistic approach to the conservation of sensitive habitats and rare plant and animal species. The following strategic plans have been prepared to guide monitoring and management throughout the region: *Management and Monitoring Strategic Plan for Conserved Lands in Western San Diego County* ([Management and Monitoring Strategic Plan]; SDMMP and TNC 2017); *Invasive Plant Species Strategic Plan* (CBI 2012); *Connectivity Monitoring Strategic Plan* (SDMMP 2011); *Management Strategic Plan Framework Rare Plant Management for Conserved Lands in Western San Diego County* (AECOM, CBI, and SDMMP 2021a); and *Management Strategic Plan Seed Collection, Banking, and Bulking Plan for Conserved Lands in Western San Diego County* (AECOM, CBI, and SDMMP 2021b). The *Management Strategic Plan Framework Rare Plant Management for Conserved Lands in Western San Diego County* identifies regional goals and objectives, prioritizes species within the MSCP area that warrant focused species management, and discusses threats to the species and to certain high-priority populations (AECOM, CBI, and SDMMP 2021a).

IEMM is another important resource for land managers and policy-makers in the San Diego region. IEMM was established by SDSU to provide expertise and science-based technical knowledge to improve conservation of biological resources through development of efficient monitoring and management techniques. In addition to conducting research on the efficiency of different monitoring techniques, IEMM has conducted workshops on developing conceptual models, developing goals and objectives, and the challenges of monitoring and management within the MSCP.

Current Coordination

The County coordinates closely with the Wildlife Agencies, SDMMP, and IEMM to ensure that it is meeting the obligations of the MSCP Subarea Plan and uses science-based methods for monitoring and management of species and conserved lands in a manner consistent with other land managers in the region. Adaptive management is an iterative process; hence, long-term coordination is important to gain an understanding of ecological processes and fill data gaps. It is critical that land managers work through uncertainties together in a consistent manner to develop efficient protocols to implement the recommendations made by the studies described above. It is also important to collaborate so that information (e.g., lessons learned) can be shared with one another. For example, as more is learned about the biological needs and threats of a given species, more effective management treatments may be developed. In addition, by implementing, comparing, and tracking different monitoring techniques, it may be possible to acquire useful, accurate information in a fraction of the time and/or cost required by previous efforts.

The County coordinates with regional monitoring programs to ensure consistent monitoring methodologies and to avoid duplication of survey efforts. SDMMP's regional monitoring schedule, provided by Dr. Kristine Preston, follows the monitoring objectives in the Management and Monitoring

Strategic Plan and provides species-specific monitoring frequencies through 2026. The regional monitoring schedule encompasses more species than those covered under the TMP and the TMP covers species and habitats that do not have regional monitoring. For the purposes of the TMP, **Table 2** presents the regional monitoring schedule for only TMP species and projects the anticipated schedule through 2031. The monitoring and management schedule recommended by the TMP is provided in Section 2.4, *Monitoring and Management Schedule and Frequency*.

TABLE 2
SDMMP REGIONAL MONITORING SCHEDULE

TMP Monitoring	2025	2026	2027	2028	2029	2030	2031
Surveillance Monitoring							
Vegetation mapping					✓[1]		
Resource-Specific Monitoring							
San Diego thornmint	✓	✓	✓	✓	✓	✓	✓
Encinitas baccharis	✓		✓		✓		✓
Orcutt's brodiaea	✓		✓		✓		✓
Lakeside ceanothus					✓[1]		
San Miguel savory	✓		✓		✓		✓
Otay tarplant	✓	✓	✓	✓	✓	✓	✓
Orcutt's bird's-beak	✓		✓		✓		✓
Variegated dudleya	✓			✓			✓
Willowy monardella	✓	✓	✓	✓	✓	✓	✓
Harbison's dun skipper	✓	✓	✓	✓	✓	✓	✓
Arroyo toad	✓	✓	✓	✓	✓	✓	✓
Tricolored blackbird		✓		✓		✓	
Burrowing owl	✓	✓	✓	✓	✓	✓	✓
Coastal cactus wren	✓	✓	✓	✓	✓	✓	✓
Southwestern willow flycatcher	✓	✓	✓	✓	✓	✓	✓
Least Bell's vireo		✓					

1. SDMMP conducted vegetation monitoring for coastal sage scrub, chapparal, and grassland habitat in regional vegetation monitoring plots in 2024 and is anticipated to be conducted again in 2028 or 2029. Lakeside ceanothus is monitored if present in the monitoring plots.

1.3.3 Status of County Monitoring and Management

The goal of the MSCP is to maintain ecosystem function and persistence of extant populations of covered species, to conserve biodiversity across the region, and to protect and enhance viable populations of covered species. This goal is met through the acquisition and conservation of high-quality habitats, the wildlife linkages between the large, conserved areas and smaller areas that support rare vegetation (e.g., vernal pools) by local, state, and federal agencies; management of biological resources; and long-term biological monitoring. The County implements this effort through acquisition and management of DPR parks and preserves within the South County MSCP Subarea Plan and draft North County MSCP Plan areas.

The South County MSCP Subarea Plan's Framework Management Plan provides general guidance for monitoring and management in the MSCP area. It guides the development of management directives in the RMPs. Baseline biological surveys are conducted for each preserve following acquisition. Survey outcomes include mapped vegetation communities, inventoried native and non-native plant and wildlife species, identified and quantified sensitive species, mapped invasive non-native plant species, and assessed potential wildlife movement corridors. This information is used to develop preserve-specific RMPs. Preserve-specific RMPs provide a framework for long-term stewardship, management, and monitoring actions that will be undertaken to protect the biological resources within the preserve. The TMP (county-wide species focus) is used in conjunction with the RMPs (preserve-specific habitat stewardship focus) as follows:

- RMPs provide detailed preserve-specific biological information, including baseline vegetation mapping and sensitive species locations, and include a preserve-level *framework* for general stewardship management activities (including public access). These management frameworks are incorporated into the TMP by reference, and are generally performed by County Operations Division staff (rangers). More substantial stewardship activities are reported in the South County MSCP Subarea Plan annual report.
- The TMP is an adaptive *implementation* plan that includes focused goals and objectives for target resources and detailed monitoring protocols. It is intended to achieve the management directives for species per the adopted South County MSCP Subarea Plan's Framework Management Plan. An RMP focuses on an individual preserve, whereas the TMP takes a holistic view across the entire South County MSCP Subarea Plan and draft North County MSCP Plan areas, focusing on the needs of species across County-managed preserves (31 DPR parks and preserves as described above are now included in the plan, and others will be added in the future).

The following diagram describes the relationship between the RMPs and the TMP and shows how these are related to the broader MSCP documents (**Figure 33**). The methods used to develop the TMP are described in Section 1.4 below.

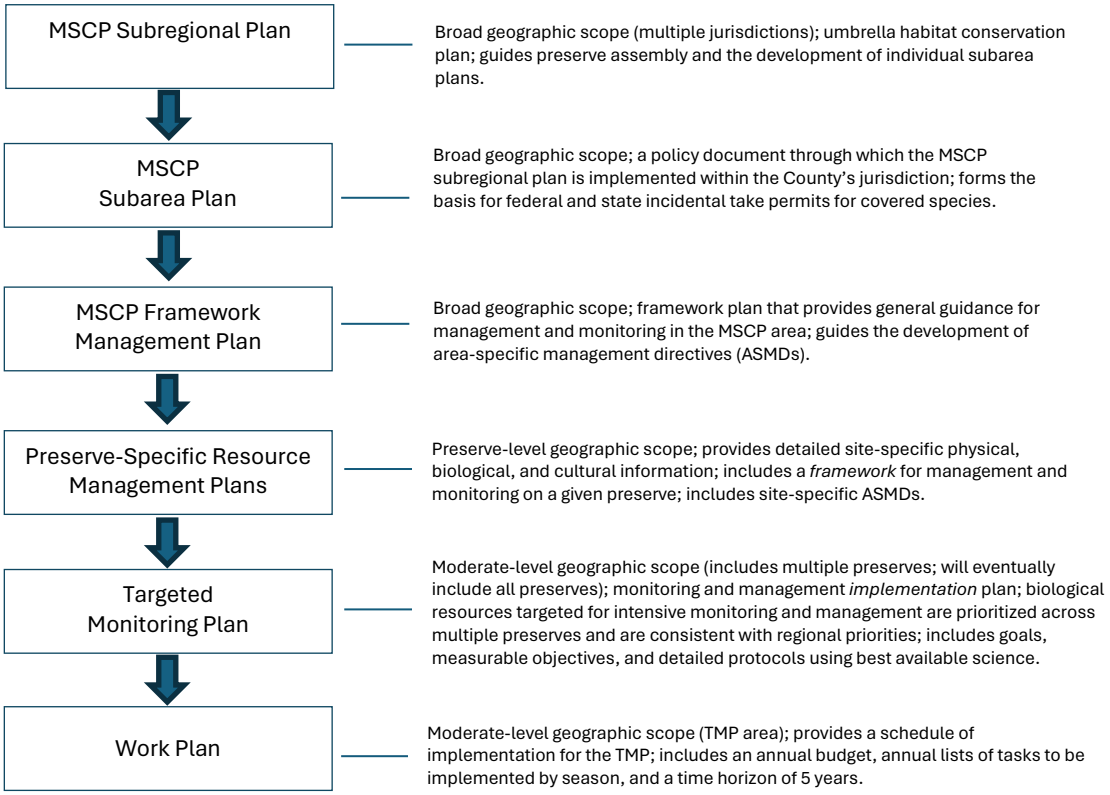


Figure 33
A Comparison of the MSCP Guidance Documents, RMP, TMP, and Work Plan

1.3.4 Limitations and Constraints

There are two main constraints to TMP implementation—fiscal year funding availability and timing of tasks that are influenced by climate.

- **Fiscal year funding availability.** Implementation and/or the timing of monitoring proposed in the TMP will be based on funding availability in any fiscal year. Further prioritization will be needed if funds are limited. The County will estimate the cost of implementing the tasks in this TMP and prepare a work plan that will describe the schedule and timing of implementation and identify unfunded tasks. Unfunded tasks could be funded in the future with grant money and/or performed by volunteers.

  Every year the County reviews the regional monitoring schedules set by SDMMP. TMP surveys on DPR parks and preserves are timed to occur synchronously with the regional monitoring schedule. The County foresees increased collaboration with regional monitoring partners such as SDMMP and USGS.

- **Climate.** Other factors that could affect the timing of some tasks include climate. For example, in low-rainfall years, it may be prudent to not conduct arroyo toad (*Anaxyrus californicus*) monitoring and many aspects of vernal pool monitoring. For arroyo toads, surveys must be conducted when water is present and the toads are breeding, which generally falls within an average to above-average rain year. For vernal pools, hydrologic, quantitative vegetation, and San Diego fairy shrimp (*Branchinecta sandiegonensis*) survey protocols require inundation to occur. If inundation does not occur due to insufficient precipitation, the County will consider shifting these monitoring surveys to a year with appropriate conditions to yield optimal results; however, qualitative monitoring will still be conducted annually to inform adaptive management.

  For plant surveys, it may be beneficial to conduct surveys in dry years to understand the influence of interannual variability in rainfall and temperature. The County will consider truncating the survey effort if blooming is reduced or species are not detected during bloom checks. At a minimum, plant occurrences will be visited to inform adaptive management.

1.4 Process Overview and Methods of Analysis

The TMP was developed in coordination with SDMMP, IEMM, DPR staff, scientific experts, and the Wildlife Agencies (**Appendix A**), and under the guidance of relevant reports and strategic plans, including *Development of Reserve-Level Species and Habitat Monitoring Strategies* (Deutschman et al. 2012), *Monitoring and Management in the San Diego Multiple Species Conservation Program: Results from a Structured Workshop Final Report* (Deutschman and Strahm 2012), and *Management and Monitoring Strategic Plan for Conserved Lands in Western San Diego County* (SDMMP and TNC 2017). The TMP:

- Fulfills both local and some aspects of regional monitoring priorities identified in the MSCP, where applicable (e.g., monitoring and management of specific populations of covered species identified within DPR parks and preserves).
- Prioritizes monitoring needs based on identified regional priorities and an analysis of preserve-level priorities.
- Contains clear goals and "SMART" objectives (described in Section 1.4.3).
- Uses scientifically defensible methods developed in coordination with other MSCP stakeholders.
- Includes a monitoring and management feedback mechanism (Section 3).
- Determines funding priorities using status and trends and effectiveness monitoring to inform monitoring schedules and adaptive management.

1.4.1 Site Assessment

Baseline Biological Survey Reports and RMPs were reviewed, and reconnaissance-level site visits conducted to obtain a general overview of each preserve and evaluate preserve-specific threats. DPR staff was interviewed to obtain current, local knowledge of on-site sensitive resources, threats, and management actions. This site assessment process was followed for the development of Preserve Group 1, Preserve Group 2, and Preserve Group 3.

1.4.2 Resource Prioritization

Species covered by the South County MSCP Subarea Plan and draft North County MSCP were reviewed and prioritized for inclusion in the TMP. The South County MSCP Subarea Plan covers 85 species and the draft North County MSCP proposes 41 species for coverage (as of August 2023). Covered species and habitats (collectively, resources) were evaluated to determine monitoring and management priorities. (Resource monitoring is performed in a coordinated manner among all stakeholders to ensure the most efficient use of limited resources.) Resource prioritization occurred consistent with Deutschman and Strahm (2012), as follows:

- The ability to address MSCP goals and objectives
- The ability to answer key management questions
- The degree of threat to the resource or species[2]
- The ability of land manager to positively alter or manage the landscape to meet a desired objective (e.g., minimize threats, enhance habitat)
- The ability to extrapolate information about the ecosystem based on measurable factors (such as species presence or productivity)

TMP resource prioritization was initiated by compiling a list of covered species known to occur on the 31 DPR parks and preserves (see **Appendix B**). Because the TMP is intended to achieve MSCP compliance, it focuses on MSCP-covered species, as well as species that are proposed for coverage in the draft North County MSCP that are not already covered in the South County MSCP Subarea Plan. Prioritization for each Preserve Group was tailored as follows:

- **Preserve Group 1.** Prioritization was refined based on regional MSCP prioritization developed by Regan et al. (2006); the Management and Monitoring Strategic Plan (SDMMP and TNC 2017), which includes regional and population-specific priorities; specific mitigation requirements for the Ramona Grasslands County Preserve; preserve-specific priorities; and discussions with SDMMP and the Wildlife Agencies.
- **Preserve Group 2.** Prioritization was refined based on current regional monitoring priorities based on the final Management and Monitoring Strategic Plan (SDMMP and TNC 2017), as well as preserve-level MSCP coverage, preserve-specific priorities, and discussions with SDMMP, the Wildlife Agencies, and species experts.

[2] Threats were assessed at the preserve-level and then evaluated to see if they affected targeted resources (e.g., vernal pools) or species (e.g., plant population). Threats are monitored and managed in relation to the target resource or species. Priorities are established on a case-by-case basis if there is conflict between resource or species management.

- **Preserve Group 3.** Prioritization was refined based on current regional monitoring priorities based on the final Management and Monitoring Strategic Plan (SDMMP and TNC 2017), as well as preserve-level MSCP coverage, preserve-specific priorities, and discussions with SDMMP, the Wildlife Agencies, and species experts.

Species prioritization focused only on species for which population-level monitoring was considered critical for effective management and did not include species that the Management and Monitoring Strategic Plan recommended can be protected by monitoring and management of their habitat. Through these efforts, a total of 25 plant and wildlife species were identified for species-specific monitoring (**Table 3**).

Vegetation communities and habitats were also reviewed for inclusion in the TMP monitoring program. Vernal pools and alkali playas were included because these habitats are very rare and support a suite of MSCP-covered and non-covered sensitive species, such as San Diego fairy shrimp, Coulter's saltbush (*Atriplex coulteri*), Parish's brittlescale (*Atriplex parishii* var. *parishii*), and spreading navarretia (*Navarretia fossalis*). Other vegetation communities were evaluated as habitat for specific target species (i.e., grassland foraging habitat for eagles and other raptors, grassland habitat to support Stephens' kangaroo rat [*Dipodomys stephensi*, SKR] and burrowing owl [*Athene cunicularia*], coastal sage/cactus scrub for coastal cactus wren [*Campylorhynchus brunneicapillus sandiegensis*], and riparian and surrounding upland habitat for arroyo toad). Monitoring for these habitats is included in species-specific protocols.

1.4.3 Biological Goals and Objectives

The TMP is a well-designed monitoring program with clear goals and objectives and an adaptive management approach. Goals are defined as broad, concise, visionary statements that set the overall direction for monitoring and management. Objectives are the precise, measurable statements of how a goal will be attained. Objectives are "SMART": Specific, Measurable, Achievable, Results-oriented, and Time-fixed for its biological goals and objectives (Deutschman et al. 2012). "Specific" refers to clear, detailed statements; "measurable" consists of criteria to measure progress toward the objective; "achievable" means that the objective is feasible and realistic; "results-oriented" signifies that an end result is specified; and "time-fixed" refers to a specified time frame within which the objective will be met. Not all objectives meet all SMART criteria; however, most criteria are met and result in stronger, more effective objectives (Deutschman et al. 2012).

The following resources were used in the initial development of the goals and objectives: MSCP Table 3-5 (conditions for species coverage), goals and objectives in the *Management and Monitoring Strategic Plan* (SDMMP and TNC 2017), and preserve-specific RMPs. Goals and objectives were developed in an iterative manner. A threats assessment was conducted and conceptual models were developed for each resource (described in the Section 1.4.4 below), and based on this information, the goals and objectives were reevaluated and revised. Further refinements occurred based on discussions with scientific experts, SDMMP, and the Wildlife Agencies.

TABLE 3
RESOURCES PRIORITIZED FOR MONITORING

Common Name	Scientific Name	Location by Management and Monitoring Strategic Plan Management Unit (MU)[1]																												
		MU1	MU3				MU4												MU5		MU6						MU8					
		TR	DH	LB	SR	FN	SK	BO	BR	IM	LL	S	EC	EM	LA	O	PV	SG	HC	RG	BP	DD	ES	LC	SH	KC	MM	MO	SL	SM	WG	LP
Habitats																																
Vernal pool habitat																				X												X
• Spreading navarretia[2]	*Navarretia fossalis*																			CH[3]												
• San Diego fairy shrimp[2]	*Branchinecta sandiegonensis*																			X												
Alkali playa habitat																				X												
Species																																
San Diego thornmint	*Acanthomintha ilicifolia*											X						X														
Encinitas baccharis	*Baccharis vanessae*																					X										
Orcutt's brodiaea	*Brodiaea orcuttii*							X																								
Lakeside ceanothus	*Ceanothus cyaneus*							X					X		X	X																
San Miguel savory	*Clinopodium (Satureja) chandleri*							X																								
Otay tarplant	*Deinandra conjugens*					X																										
Orcutt's bird's-beak	*Dicranostegia orcuttiana*	X																														
Variegated dudleya	*Dudleya variegata*		X															X						X								
Heart-leaved pitcher sage	*Lepechinia cardiophylla*									X																						
Willowy monardella	*Monardella viminea*																	X														
Harbison's dun skipper	*Euphyes vestris harbisoni*																		X						X[6]							
Arroyo toad	*Anaxyrus californicus*																			X									X[4]	X		
Tricolored blackbird	*Agelaius tricolor*																			X												
Golden eagle	*Aquila chrysaetos*												X							X												
Burrowing owl	*Athene cunicularia*																			X												
Coastal cactus wren	*Campylorhynchus brunneicapillus sandiegensis*										X[5]																					
Northern harrier	*Circus cyaneus*	X																											X[4]			
Southwestern willow flycatcher	*Empidonax traillii extimus*																												X[4]			
Bald eagle	*Haliaeetus leucocephalus*																			X												
Least Bell's vireo	*Vireo bellii pusillus*	X																											X	X		
Pallid bat	*Antrozous pallidus*																		X		X							X	X		X	
Townsend's big-eared bat	*Corynorhinus townsendii*																		X										X		X	
Stephens' kangaroo rat	*Dipodomys stephensi*																		X	X												

NOTES:

1. BR = Barnett Ranch, BP = Bottle Peak, BO = Boulder Oaks, DD = Del Dios Highlands, DH = Dictionary Hill, EC = El Capitan, EM = El Monte, ES = Escondido Creek, FN = Furby-North, HC = Hellhole Canyon, IM = Iron Mountain, KC = Keys Creek, LL = Lakeside Linkage, LB = Lawrence and Barbara Daley, LP = Los Peñasquitos, LA = Louis A. Stelzer County Park, LC = Lusardi Creek, MM = Mountain Meadow, MO = Mount Olympus, O = Oakoasis, PV = Peutz Valley, RG = Ramona Grasslands, SH = Sage Hill, SL = San Luis Rey River Park, SM = Santa Margarita, S = Simon, SK = Skyline, SR = Stoneridge, SG = Sycamore Canyon/Goodan Ranch, TR = Tijuana River Valley Regional Park, WG = Wilderness Gardens.
2. Monitoring occurs as part of habitat monitoring.
3. Ramona Grasslands County Preserve has critical habitat for spreading navarretia; spreading navarretia does not occur on the preserve but occurs on adjacent land.
4. Arroyo toad and southwestern willow flycatcher not detected during baseline surveys; however, species is known to occur and has critical habitat within the San Luis Rey River Park. Northern harrier was not detected during baseline surveys; however, suitable habitat is present within the San Luis Rey River Park.
5. A portion of the Lakeside Linkage County Preserve is undergoing coastal cactus wren habitat restoration to provide additional habitat.
6. Harbison's dun skipper not detected during baseline surveys; however, suitable habitat exists within the Sage Hill County Preserve.

This page is intentionally left blank.

1.4.4 Conceptual Models

Conceptual models were developed for TMP habitats and species. Conceptual models are a key component of the TMP's adaptive management program. They provide a framework for documenting what is known about a species or ecological system, including system processes and dynamics, and they are used to identify critical uncertainties (Atkinson et al. 2004; Hierl et al. 2005; Lewison et al. 2012). Conceptual models help land managers understand the natural drivers and anthropogenic threats that may affect a resource and better evaluate their inter-relationship dynamics, thereby informing the adaptive management decision-making process. For the purposes of TMP preserve-level adaptive management, conceptual models focus on aspects related to monitoring and management of the target resources but are detailed enough to address defined goals and provide specific management-related information (Lewison et al. 2012). They are simple enough to clearly identify the most important monitoring and management targets within the control of a land manager.

For consistency, conceptual models for the TMP follow *A Conceptual Model for Otay Tarplant (*Deinandra conjugens*)*, which was prepared by IEMM (Strahm 2012), and the guidance provided in Lewison et al. (2012). Species and habitat information were obtained from the following sources: other existing conceptual models, species accounts from the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP), USFWS recovery plans, USFWS 5-year reviews, and interviews with species experts (Appendix A).

Conceptual models were prepared for vernal pool/alkali playa habitat, San Diego thornmint (*Acanthomintha ilicifolia*), Encinitas baccharis (*Baccharis vanessae*), Orcutt's brodiaea (*Brodiaea orcuttii*), Lakeside ceanothus (*Ceanothus cyaneus*), San Miguel savory (*Clinopodium chandleri*), Otay tarplant, Orcutt's bird's-beak (*Dicranostegia orcuttiana*), variegated dudleya (*Dudleya variegata*), heart-leaved pitcher sage (*Lepechinia cardiophylla*), willowy monardella (*Monardella viminea*), Harbison's dun skipper (*Euphyes vestris harbisoni*), arroyo toad, golden eagle (*Aquila chrysaetos*), bald eagle (*Haliaeetus lecucephalus*), northern harrier (*Circus cyaneus*), southwestern willow flycatcher (*Empidonax traillii extimus*), least Bell's vireo (*Vireo bellii pusillus*), pallid bat (*Antrozous pallidus*), Townsend's big-eared bat (*Corynorhinus townsendii*), and SKR. For each conceptual model, the procedural steps below were followed, using the visual conventions in Strahm (2012) unless otherwise noted. The full conceptual models are included in **Appendix C**.

1. The "bounds of the system of interest" (Lewison et al. 2012) were established to be the County-owned or managed DPR parks and preserves described in Section 1.2 (Figure 1).
2. A conservation management goal (green box) and monitoring goal (brown box) were developed and placed at the top of the model.
3. Key anthropogenic threats were identified (pink boxes). Note that Strahm (2012) used red outlines for threats recommended for monitoring and gray outlines for other threats. Our models do not make this differentiation.
4. Key natural drivers were identified (blue boxes).
5. Measurable aspects (e.g., life history traits of a given species) were identified (light-green boxes inside darker-green ovals).
6. Relationships between the threats, drivers, and measurable aspects were identified and labeled with arrows. Darker arrows represent what is believed to be the primary relationships, and lighter arrows

represent secondary relationships. To simplify the models, only the key relationships thought to be important to monitoring and management were included.

7. Color-coded tables were prepared that define each element in the conceptual model diagram. For example, each natural driver (blue boxes) is included in a blue table that defines each driver and lists the key sources of information. Tables were also created for anthropogenic threats and measurable aspects of the species.
8. To document the thought process that occurred during conceptual model development, a master table was prepared that describes each relationship and lists critical uncertainties, potential management actions, and potential monitoring actions as they relate to one another. Unlike the Otay tarplant model, management actions and critical uncertainties were not included in the diagram and associated with specific relationships because it was felt that there were areas of overlap, resulting in more complexity and confusion, and less flexibility.

The following points are noted for the conceptual models in this TMP: (1) the models were tailored for the TMP priority species populations located within the 31 DPR parks and preserves discussed in the TMP and are not meant to be used for other preserve systems that may require a different prioritization of threats and management actions, and (2) the models represent a comprehensive snapshot of what we know now, and are expected to evolve as new information becomes available.

SECTION 2
Monitoring Program

2.1 Overview

The MSCP requires compliance monitoring and effectiveness monitoring. According to the USFWS Five Point Policy (USFWS 2000), **compliance monitoring** verifies that the permittee is carrying out the terms of the HCP, permit, and Implementing Agreement, and **effectiveness monitoring** evaluates whether the conservation program of the HCP is achieving the biological goals and objectives identified in the MSCP. Compliance monitoring can generally be performed through geographic information system (GIS) analysis of the acres of conserved target vegetation communities as well as tracking the implementation of monitoring and management tasks. Effectiveness monitoring is conducted by the County through implementation of the TMP in coordination with regional monitoring efforts. The monitoring strategy used in the TMP consists of a combination of surveillance-type monitoring (e.g., ongoing assessments of threats and habitat condition, and presence/absence surveys to confirm presence of target species), baseline condition assessments to determine population-specific threats and conditions, and monitoring to assess the response of a particular species to specific management treatments. The monitoring strategy informs the County's management actions at the individual preserve level, as well as throughout the MSCP planning area, and ties into the regional monitoring and management strategy. SDMMP develops BMPs and regional monitoring and management implementation plans for priority MSCP species and vegetation communities. TMP implementation informs SDMMP's efforts and in turn, SDMMP's implementation plans inform TMP updates. DPR prepares work plans after the draft TMP Annual Report is complete to provide a summary of proposed operations, maintenance, and management tasks to be performed on the park or preserve.

2.2 Surveillance-Level Goals and Objectives

Surveillance-level goals and objectives focus on such activities as regular patrols, threats assessments, and occurrence or status monitoring to identify changes in the status or condition of vegetation communities and species that do not require more focused monitoring. Many goals and objectives from preserve-level RMPs (see **Appendix D** for a complete summary of the management directives included in the RMPs) were included as surveillance-level goals and objectives.

Management Goal

- Ensure the persistence of MSCP-covered species and habitats, native biodiversity, and opportunities for wildlife movement within County-managed conserved lands.

Monitoring Goal

- Perform regular surveillance monitoring to ensure the ecological integrity of the preserve system and inform adaptive management decisions.

Management Objective

- Quarterly, or more often as needed, conduct stewardship-level activities to protect biological resources throughout the County's preserve system, including installing and mending fences and signs, controlling small infestations of invasive non-native plant species where feasible, closing unauthorized trails, conducting trail maintenance, ensuring that recreation is compatible with conservation, and interfacing with the public in accordance with the preserve-specific RMP.

Monitoring Objectives

- Conduct regular patrols, habitat condition assessments, threats assessments, and presence/absence surveys throughout the County's preserve system at the appropriate frequency (quarterly, annually, every 5 years, or as needed) as described in the preserve-specific RMPs or in the methods below.
- At selected locations within Ramona Grasslands County Preserves, monitor the effects of recreational use on newly opened trails on the adjacent native habitat annually for 5 years by assessing invasive non-native plant species cover, trail width, potential effects on selected sensitive species, presence of invasive non-native animal species (e.g., cowbirds), and off-trail use (e.g., number of unauthorized trails) in relationship to trail use capacity (e.g., weekend vs. all week; heavy vs. less frequent). Once opened, monitor the effects of recreation use on newly opened trails within selected locations of Boulder Oaks County Preserve.

Methods

1. **Coordinate with other entities prior to conducting management or monitoring as follows:**
    a. On-site DPR staff regarding their routine general condition and threats assessments, invasive non-native plant species mapping and treatments, and managed public access within each preserve to ensure protection of biological and cultural resources. On-site DPR staff responsibilities include regular property patrols; manage public access in sensitive areas; provide public outreach; maintain fencing, gates, signs, and lighting; maintain trails and access roads; pick up trash; install appropriate erosion control measures; and coordinate with emergency response personnel following implementation measures C.1–C.7 and D.1–D.8 of site-specific RMPs. These activities are required by the RMP and completed as part of day-to-day DPR park and preserve operations and maintenance. Maintenance activities in sensitive areas are informed by TMP adaptive management recommendations.
    b. SANDAG/SDMMP regarding regional vegetation mapping throughout San Diego County to inform the regional monitoring program.
    c. Regional monitoring partners regarding monitoring and management activities to ensure that efforts are not being duplicated and to minimize impacts on vegetation communities and target species.

2. **Conduct habitat and species surveillance and conduct adaptive management actions as necessary (see Appendix D for a summary of management directives included in the RMPs as referenced below).**
    a. Conduct habitat monitoring at 10-year intervals, as described in site-specific RMPs, or after a change in conditions (e.g., fire, drought), following the procedures outlined in implementation measure A.1.1 (in site-specific RMPs) and indicate whether management actions are needed. A general condition and threats assessment will be conducted along with the habitat monitoring at 10-year intervals.
    b. Note that, in coordination with the Wildlife Agencies and SDMMP, vegetation mapping conducted for the purpose of the RMPs could be superseded by regional efforts to remap the vegetation throughout western San Diego County using the *Vegetation Classification Manual for Western San Diego County* (SANDAG 2011). However, this regional-scale mapping will likely

not meet the needs for site-specific habitat monitoring. Therefore, vegetation mapping to the alliance level using the Western San Diego County Vegetation Manual would be conducted in the field initially and compared with regional mapping to assess accuracy at the site-specific scale.

c. Conduct general wildlife and rare plant surveys during baseline surveys or more often as needed following catastrophic events such as wildfires following the procedures outlined in implementation measure A.1.2 in site-specific RMPs.

d. Conduct invasive non-native plant species mapping every 10 years to assess new invasions or re-invasions of non-native plant species within each preserve following implementation measure A.1.3 in site-specific RMPs.

   i. Reduce, control, or eradicate invasive non-native plants known to be detrimental to native species or the local ecosystem following implementation measure B.2 in site-specific RMPs.

   ii. Prioritize treatment of invasive non-native plant species.

   iii. Manage and minimize the expansion of non-native plant species following implementation measure B.3 in site-specific RMPs.

   iv. Document new occurrences of invasive non-native plant species or species that are high priority for regional eradication and notify SDMMP to facilitate regional tracking and control.

   v. To determine efficacy of treatments, monitor treated areas annually and adjust treatment methods and target species as needed to meet management objectives.

   vi. Use of herbicides on DPR parks and preserves is evaluated on a case-by-case basis and follows current County policies. A written pest control recommendation is required from a pest control advisor when herbicide is proposed for use by a non-County entity and must be approved by the County prior to implementation.

e. Evaluate site-specific wildlife corridor monitoring in coordination with regional efforts, if these efforts identify recommendations that fall within DPR parks and preserves. The recommendations (e.g., habitat restoration) will be considered as part of adaptive management. General wildlife corridor monitoring will be conducted at the regional level and coordinated by SDMMP. For example, American badger (*Taxidea taxus*) is a target species for monitoring regional-scale functional connectivity of upland and grassland habitats. Study results will inform grassland management on DPR parks and preserves to maintain or enhance wildlife connectivity.

3. Provide fire management in consideration of biological and cultural resources protection.

a. Conduct fire management activities described in implementation measure B.4 in site-specific RMPs (see Appendix D).

4. Reduce, control, or, where feasible, eradicate invasive non-native fauna known to be detrimental to native species and/or the local ecosystem, as described in site-specific RMPs.

a. Conduct surveys for the presence of invasive non-native wildlife species of special management concern every 5 years, following implementation measure A.5 in site-specific RMPs. (Species-specific monitoring intervals are presented in the subsequent sections and range from annually to every 5 years.)

b. Document new occurrences of invasive non-native fauna or species that are high priority for regional eradication and notify SDMMP to facilitate regional tracking and control.

5. **Restore degraded habitats to protect and enhance populations of MSCP-covered species through stabilization of eroded lands and strategic revegetation.**

    a. Annually assess and determine the need for restoration activities within DPR parks and preserves, following implementation measure B.1 in site-specific RMPs.

6. **Through regular patrols of properties manage public access within each DPR park or preserve to ensure protection of biological and cultural resources through implementation of the RMPs.**

    a. Off-trail biking, hiking or equestrian use is prohibited in preserves where multi-use trails are open to the public. These prohibited uses are clearly specified on preserve kiosks, signage and/or trail maps.

    b. Through baseline biological resources surveys narrow endemics and critical populations, and all covered species populations in the properties have been identified and mapped so these areas can be avoided and/or monitored. Updated information on sensitive species in relation to public access points will be obtained during general wildlife and rare plant surveys in conjunction with habitat monitoring.

    c. DPR staff will monitor public access roads, staging areas, and trails for degradation and off-trail access and use and provide necessary repair/maintenance in accordance with the Preserve Trail Guidelines (County of San Diego 2018).

    d. DPR will provide sufficient signage to clearly identify public access to properties. Barriers such as vegetation, rocks/boulders or fencing may be necessary to protect highly sensitive areas. The appropriate types of barriers to be used will be determined based on location, setting and use.

    e. Protection and preservation of cultural resources will comply with County of San Diego ordinances (Title 4; Public Property, Division 1; Parks and Beaches, Article 2, Section 41.113), and applicable state and federal laws, which will be enforced by the appropriate law enforcement authorities.

    f. If a property user is suspected of vandalism to cultural resources, the appropriate law enforcement authorities shall be notified. More aggressive measures may be needed if vandalism and damage continue or increase.

7. **Conduct before and after assessments on planned or newly opened trails to assess impacts on adjacent habitats and sensitive flora and fauna.**

    a. In Boulder Oaks and Ramona Grasslands County Preserves where trails are planned or have been constructed in or around habitats where sensitive plant and animal species occur, conduct before and after trail use assessments following methods described by IRC (2012).

        i. *Identify study plots.* Prior to the construction of trails, identify a minimum number of three study plots along the planned trail alignment. The number and location of plots and transects is dependent on how many representative or sensitive vegetation communities and habitats are being traversed by the planned trail system. Representative study areas can include vegetation communities, wildlife corridors, slopes, rock outcrops, edges of water bodies, etc.

        ii. *Assess level of human activity.* Using motion-activated wildlife cameras at permanent locations within each study plot, determine the level of human activity for 1 year prior to the formal trail opening. Camera placement should follow recommendations given by IRC (2012) and should be concealed and protected from vandalism or theft. Continue human activity monitoring for 5 years. If feasible, use trail counters in some of the camera locations and compare results of the two methods.

iii. *Assess wildlife activity.* Using the same motion-activated cameras described above, assess wildlife activity as described by the IRC (2012).

iv. *Vegetation monitoring.* Survey at least three vegetation transects per plot during the spring blooming season (IRC 2012, Appendix 1). Place 25-meter transects perpendicular to the proposed trail, starting at the edge of the trail. Install permanent markers using rebar or a similar method at the beginning and end of each transect. To avoid trampling, the beginning marker can be offset by 1 meter. Starting at 0 meters, place a 1-meter quadrat every 5 meters along the length of the transect (this varies slightly from the IRC methods, which include quadrats only at 0.5 meters, 5 meters, and 25 meters), alternating on the right and left of the transect line, and collect the following information: plant species or cover (bare ground or litter), absolute percent cover, and average height of each plant species. From these data, species richness, percent cover of non-native plant species, and composition will be calculated. Take three standard photographs from 0 meters at each transect as follows: (1) along the trail in one direction, (2) along the trail in the opposite direction, and (3) along the transect perpendicular to the trail.

v. *Trail quality.* At the permanent transect locations, measure the depth and width of trails using the methods described by the IRC (2012, Appendix 1).

vi. *Data analysis.* Collect and analyze data prior to trail construction and then annually for 5 years after the trail is opened to determine if there is a correlation between level of human use and other variables, such as a reduction in wildlife use, vegetation disturbance (higher cover of non-native plant species or reduced species richness), or trail degradation (trails becoming wider or deeper). Compare vegetation data from 2 meters and 20 meters to detect differences in the level of degradation close to and farther away from the trail.

vii. *Apply adaptive management.* If the data show a correlation between human use and a decline in trail quality or degradation of biological resource, apply appropriate adaptive management actions (e.g., reinforcing the trail with decomposed granite, adding fencing along the trail to keep hikers from straying off trail, seasonal closure of trails).

b. In addition, conduct preserve-specific and species-specific studies before and after trail construction as identified in the species-specific sections below (e.g., for raptors and golden eagles at Ramona Grasslands County Preserve).

c. Use the information gathered to inform trail design and placement, signage, repair, restoration and remediation, and public outreach, and to consider fencing trails that are currently not fenced.

2.3 Resource-Specific Goals and Objectives

Preserve-level monitoring goals, objectives, and implementable tasks were developed in collaboration with SDMMP and scientific experts to comply with applicable conditions for MSCP-covered species (see Management Directive A.3 in the preserve-specific RMPs). As described below, goals and objectives for the high-priority species focus on the collection of baseline population information, occurrence data, and threats assessments to inform regional efforts to develop effective BMPs and implementation plans for monitoring and management at the preserve and regional levels.

Resource-specific monitoring frequency varies by resource; however, the monitoring frequency is based on a 5-year cycle. Monitoring results and techniques are reevaluated every 5 years. With each 5-year cycle, information from regional monitoring and management implementation plans are incorporated into the TMP.

The following TMP resource sections follow a standard structure to provide a brief resource profile, resource-specific monitoring and adaptive management goals and objectives, and associated methodologies. For all resources, regional coordination is included in the methods. Profiles include the following information.

- **Status.** The federal, state, County, and MSCP-coverage status is provided.
- **Habitat.** Habitat requirements are summarized.
- **Life History.** A brief life history is provided.
- **Threats.** A brief summary of known threats within the region and within DPR parks and preserves covered by the TMP is provided.
- **Preserve-Level Status.** Resource status on DPR parks and preserves covered by the TMP is provided. This includes a summary of baseline conditions, status and trends monitoring, and status of adaptive management implementation. Information is updated during each 5-year TMP update to provide the current species status in DPR parks and preserves covered by the TMP.

2.3.1 Vernal Pools and Alkali Playas

Status: Considered sensitive and provides habitat for federally/state-listed endangered plant and wildlife species.

Habitat: Clay soils on mesa tops and in grasslands.

Life History: Ephemeral ponding with succession of endemic plants and wildlife adapted to seasonal ponding and drying cycle.

Threats: Habitat destruction and modification, alteration of wetland hydrology, off-road vehicle activity, cattle grazing, and competition from non-native species (USFWS 1998). Threats from invasive non-native plants (e.g., forbs or grasses tolerant to inundation or salinity) can include altering hydrology and vegetation structure, composition, and density within pools and playas. Threats from invasive non-native wildlife include predation (e.g., American bullfrog [*Lithobates catesbeianus*]) or hybridization (e.g., versatile fairy shrimp]) within vernal pool fauna. Additional threats to vernal pools and alkali playas include degraded water quality from threats including grazing, oil, pesticides, fertilizer, turbidity, sediment deposits, or salinity.

Preserve-Level Status: This habitat is known to occur within the Ramona Grasslands County Preserve. This habitat is believed to occur within the Los Peñasquitos Canyon County Preserve; however, baseline surveys need to be conducted to document current conditions. Vernal pool locations have been mapped by the City of San Diego associated with the City of San Diego Vernal Pool Habitat Conservation Plan [VPHCP] City of San Diego 2019. These locations will be refined through the baseline surveys.

Ramona Grasslands County Preserve. Vernal pools and alkali playas at Ramona Grasslands County Preserve are primarily threatened by invasive non-native plants, altered hydrology, and cattle-related effects from grazing. A total of 71 vernal pools, one vernal swale (Cagney swale), and 23 alkali playas (playas) were mapped within the Ramona Grasslands County Preserve boundaries during baseline

biological surveys (CBI 2007b). The pools and playas associated with the Ramona Grasslands County Preserve include the following.

- **Ramona Airport mitigation pools** are in the southeast portion of the preserve, conserved as mitigation for the Ramona Airport Runway Expansion Project.
- **Oak Country pools** are in the southwest portion of the preserve formerly known as "Oak Country."
- **Cagney pools** are located in the southeast portion of the preserve formerly known as the "Cagney parcel."
- **Cumming Ranch pools** are located to the east of the preserve within the Cumming Ranch open space.
- **Hardy pools** are located in the southeast area of the southeast portion of the preserve formerly known as "Hardy Ranch."
- **Alkali playas** are located in the southeast portion of the preserve formerly known as "Cagney parcel."

Of the 71 known vernal pools, 19 vernal pools (including Cagney swale) and 1 alkali playa within Ramona Airport mitigation, Oak Country, Cagney, Cumming Ranch, and Hardy pools were prioritized for monitoring (c20, e3e, e45, e48, e52, e53, e56, e58, e59, e61, e62, e63, e77, e82, ev3, p13, p14, p7, Cagney Swale, and raap17); these are collectively referred to as the 20 study locations. Seven sample pools are included at the Ramona Airport mitigation pools, as identified in the *Ramona Airport Improvement Project Vernal Pools and Wetland Mitigation Properties Monitoring Report* (AECOM 2012). A subset of pools within the Cagney, Oak Country, Cumming Ranch, and Hardy pool complexes were identified using stratified sampling design and included the presence of San Diego fairy shrimp.

Quantitative vegetation monitoring, hydrologic assessments, and San Diego fairy shrimp surveys for 20 study locations were conducted in 2016 to determine the baseline conditions of native plant species richness, percent cover of non-native forbs and grasses, and presence and cover of vernal pool indicator species and hydrology. Baseline wet-season and dry-season San Diego fairy shrimp surveys were conducted between December 2016 through April 2017 and September 2016, respectively, pursuant to USFWS Survey Guidelines for the Listed Large Branchiopods (USFWS 2017) to determine baseline occupancy and approximate population density of San Diego fairy shrimp within the 20 study locations. Quantitative monitoring occurred in 2017 at 20 study locations. Qualitative monitoring occurred within the 20 study locations annually from 2017 to 2023, with the exception of 2020 due to the COVID-19 pandemic and the associated stay-at-home order. San Diego fairy shrimp monitoring was conducted in 2022 (ESA 2023b). In 2023, study locations were revised to include three additional alkali playas (raap4, raap6, and raap14), and pool e82 was removed based on hydrologic monitoring results collected in 2023 (ESA 2024) for a total of 22 study locations.

The *Ramona Grasslands, Santa Ysabel, and Boulder Oaks Preserves Grazing Management Plan* (ESA 2019) provides guidance for the management of natural resources on Ramona Grasslands County Preserve through grazing. This plan identifies multiple goals and objectives, including to maintain and improve alkali playa plant species and vernal pool habitat for San Diego fairy shrimp and vernal pool specific plant species at Ramona Grasslands County Preserve. The plan also identifies residual dry matter (RDM) monitoring targets to manage grazing prescriptions. RDM monitoring is used to quantify the impact of cattle grazing on grasslands and determine if species-specific habitat management targets are being achieved. RDM monitoring occurred at Ramona Grasslands County Preserve between 2016 and 2023, with

the exception of 2020 due to the COVID-19 pandemic and the associated stay-at-home order. Focused management targeting invasive non-native plant species and thatch at select pools was conducted in 2021, 2022, and 2023 (ESA 2024). Future management will continue to be informed by monitoring results.

Los Peñasquitos Canyon County Preserve. Approximately 44 vernal pools were detected during surveys conducted in 2024.

Management Goals

- Maintain vernal pool and alkali playa habitat to support stable populations of vernal pool and alkali playa species covered by the MSCP and proposed to be covered by the draft North County MSCP. Maintain 8.81 acres of alkali playa vegetation community.
- Enhance vernal pool and alkali playa habitat to increase resilience to environmental stochasticity, maintain genetic diversity, and ensure long-term ecological function within the Ramona Grasslands County Preserve and Los Peñasquitos Canyon County Preserve.

Monitoring Goals

- Monitor the vegetation, hydrology, and species composition within vernal pool and alkali playa habitat on the Ramona Grasslands County Preserve to ensure that the management methods being used are maintaining the habitat in a suitable condition to support San Diego fairy shrimp, spreading navarretia, and other sensitive vernal pool species covered by the MSCP and proposed to be covered by the draft North County MSCP.
- Monitor the vegetation, hydrology, and species composition within vernal pool habitat on the Los Peñasquitos Canyon County Preserve to ensure that the management methods being used are maintaining the habitat in a suitable condition to support sensitive vernal pool species covered by the MSCP.
- Monitor for the long-term viability of any introduced vernal pool and alkali playa plant species.
- Track populations of Coulter's saltbush and Parish's brittlescale within alkali playa habitat and record incidental observations. (Note: SDMMP monitors Parish's brittlescale as part of the regional monitoring program.)

Management Objectives

- Annually use grazing and mechanical means to reduce invasive non-native plant species cover, reduce thatch, and maintain vernal pool watershed integrity and water storage functions (City of San Diego 2020) within Grazing Management Units 2A, 2B, 3A, 3B, 3C, and 3D on Ramona Grasslands County Preserve (Figure 10a). At the County's discretion, management methods may be revisited and revised to best meet the needs of the preserve in accordance with the VPHCP [page 124, section 5.3.2 (1)(n)]. Maintain RDM at 800–1,500 pounds per acre within Grazing Management Units 3C and 3D for vernal pool habitat and other RDM standards for associated management units and targets (ESA 2019). Maintain invasive non-native plant species cover at less than 20 percent within vernal pool basins.
- Conduct additional adaptive management actions based on the results of long-term monitoring and threats assessment, as necessary (e.g., revise RDM targets, change grazing regime).
- Identify high-priority areas for enhancement and/or reintroduction of vernal pool plant species, including spreading navarretia, a vernal pool target species.
  - Conduct focused surveys for extant spreading navarretia populations within the surrounding Ramona area. If a population is located, initiate seed collection (less than or equal to 10% should be collected).

  - Create an enhancement plan for reintroduction of species into predetermined pools in coordination with DPR and the wildlife agencies.

- Identify high-priority areas for enhancement and/or reintroduction of alkali playa plant species, including Coulter's saltbush and Parish's brittlescale, two alkali playa target species. Evaluate the feasibility of enhancing known occurrences within the Ramona Grasslands County Preserve.
  - Initiate seed collection (less than or equal to 10% should be collected) from extant populations within the Preserve (detected at raap 4 and raap 6 for Parish's brittlescale and raap 17 and raap 6 for Coulter's saltbush).
  - Create an enhancement plan for reintroduction of species into predetermined playas in coordination with DPR and the wildlife agencies.
- Evaluate the feasibility of establishing a population of San Diego button celery (*Eryngium aristulatum*) in these areas. Collect seeds from known San Diego button celery populations in the vicinity in downtown Ramona.
- Coordinate enhancement and/or reintroduction efforts with the City of San Diego, SDMMP, IEMM, Endangered Habitats Conservancy, and the Wildlife Agencies.

Monitoring Objectives

- Establish baseline conditions to document current conditions and inform monitoring and management needs at Los Peñasquitos Canyon County Preserve.
- Assess the status of spreading navarretia and San Diego fairy shrimp on Ramona Grasslands County Preserve.
- Monitor RDM values within Grazing Management Units 3C and 3D to ensure that the values are within vernal pool habitat target limits on Ramona Grasslands County Preserve. Evaluate the effectiveness of the grazing program to reduce the cover of thatch and invasive non-native plant species.
- Conduct vegetation monitoring, hydrologic assessments, and San Diego fairy shrimp surveys in vernal pools located in the Ramona Airport mitigation pools, and vernal pools within the Oak Country, Cagney, and Cumming Ranch parcels to assess species richness, species composition, percent cover of non-native grasses and forbs, and duration of inundation to inform adaptive management.
- Monitor alkali playa habitat within Ramona Grasslands County Preserve parcels to assess the status of Coulter's saltbush and Parish's brittlescale, species richness and species composition within alkali playas, and percent cover of non-native plant species to inform adaptive management.
- Evaluate potential threats to vernal pool and alkali playa species, vernal pool habitat, and alkali playa habitat. Based on monitoring results, evaluate whether the identified potential threats are having a negative impact on the species or habitat, and implement proactive adaptive management actions as necessary. Monitoring frequencies are discussed in the methods section below.

Methods

1. **Coordinate with other entities prior to conducting management or monitoring as follows:**
   a. On-site DPR staff regarding the appropriate time to conduct surveys based on site conditions and management needs.
   b. SDMMP and the City of San Diego regarding vernal pool and alkali playa species surveys conducted as part of the regional monitoring and management program to ensure that efforts are not being duplicated and to minimize impacts on the species.

2. Establish baseline conditions for vernal pools at Los Peñasquitos Canyon County Preserve.

a. The 17 known vernal pool locations were verified and refined through reconnaissance surveys conducted in 2024. Approximately 44 vernal pools were detected during surveys conducted in 2024. Baseline qualitative and quantitative monitoring documented vernal pool plant species (as well as cover, abundance, and distribution of each plant species observed) and vernal pool faunal indicator species and their abundance. Results of surveys will be discussed in the 2024 TMP annual report. San Diego fairy shrimp monitoring and hydrologic monitoring are anticipated to occur in 2025.

b. Search historical records for vernal pool locations and natural resources (i.e., plant and wildlife species, soils, physical features, etc.) including CNDDB records, biological survey reports and studies performed by researchers and consultants, Vernal Pools of Southern California Recovery Plan (USFWS 1998), VPHCP (City of San Diego 2019) and other official documents and available GIS databases.

c. Conduct a reconnaissance survey to map the perimeter of the current extent of vernal pools detected during favorable conditions (e.g., maximum inundation and/or presence of vernal pool indicator plant species) that occur inside the preserve boundary.

d. Establish a photo point at each vernal pool, taken from the vernal pool edge and facing north and recorded using a sub-meter accuracy global positioning system (GPS) unit.

e. Conduct quantitative vegetation monitoring at the study locations established during the reconnaissance survey during suitable wet season (approximately March) and dry season (approximately April to May) as described in the quantitative vegetation monitoring methodology below to establish baseline conditions at Los Peñasquitos Canyon County Preserve.

f. Conduct hydrologic monitoring during an adequate rainy season as described in the hydrologic monitoring methodology below to establish baseline conditions at Los Peñasquitos Canyon County Preserve.

g. Conduct San Diego fairy shrimp monitoring pursuant to USFWS Survey Guidelines for the Listed Large Branchiopods (USFWS 2017) to determine baseline occupancy and approximate population density of San Diego fairy shrimp at Los Peñasquitos Canyon County Preserve.

h. Once baseline conditions are established, a subset of vernal pools may be prioritized by DPR for future long-term monitoring to identify adaptive management recommendations.

3. Conduct quantitative vegetation monitoring twice per year, every 3 years.

a. Quantitative monitoring will survey the 22 study locations at Ramona Grasslands County Preserve and the selected subsample of vernal pools at Los Peñasquitos Canyon County Preserve. Quantitative surveys will be conducted during peak ecological conditions during the wet phase and dry phase (approximately between January 31 and May 31) to capture all possible indicator species present within a vernal pool or alkali playa and/or special-status species known to occur within the preserve (City of San Diego 2019). Conducting quantitative surveys during the entire growing season will provide an opportunity to capture aquatic species as well as species that become visible once there is no water in the vernal pool or alkali playa and provide a more complete dataset for the abundance, distribution, and cover of each species present. The selected subsample of pools and playas may be reevaluated to inform preserve-wide management; however, sampled pools should include those that have been documented to support fairy shrimp populations.

b. The goal of quantitative monitoring is to record vernal pool and playa functions. The surveys should be conducted only during favorable conditions in a given year and should be timed to coincide with the appropriate conditions for vernal pool indicator species and annual alkali playa

species to be expressed. Quantitative monitoring is not recommended in rainfall years that received less than 65 percent of the average rainfall (as measured at Ramona Airport; City of San Diego 2019). However, in years of inadequate rainfall or ponding, quantitative monitoring would still yield valuable management data to describe existing conditions including non-native plant cover for developing appropriate adaptive management recommendations. Monitoring will be conducted from the pool and playa margins to minimize the trampling of sensitive resources and the inadvertent transferring of plant seeds and shrimp cysts.

c. The survey protocol for quantitative monitoring will consist of vernal pool and playa plant species inventory, as well as cover, abundance, and distribution for each species observed. Cover estimates will be made by using cover classes taken from the California Native Plant Society's (CNPS's) plant cover methodology and inventory, abundance and distribution information will be collected using ranges and categories for each data field to allow for a more rapid and repeatable assessment within each pool or playa. Using this methodology, complete the following.

    i. Estimated absolute percent cover of each focal plant species in a pool or playa is grouped in the following classes to track changes in cover over time: less than 25 percent, 25–49 percent, and 50+ percent. Use of the CNPS class system allows for valuable data collection without the time required for other types of vegetation assessments (e.g., transects, plot-frames).

        - Collect cover classes for all plant species within each pool, including focal sensitive species, vernal pool plant indicator species (USACE 1997; City of San Diego 2019), native species, and invasive non-native species. Cover classes will be collected for all plant species within each playa, including focal sensitive species, native species, and invasive non-native species.

            • Focal sensitive plant species include San Diego button-celery, San Diego Mesa mint, Otay Mesa mint, spreading navarretia, Orcutt's grass, San Diego fairy shrimp, and Riverside fairy shrimp.

            • Vernal pool plant indicator species follows the VPHCP Appendix A, Vernal Pool Species List (City of San Diego 2019).

        - Assign a distribution and abundance class for each species. Distribution will consist of three classes, solitary (occurring as single plants widely dispersed within the pool or playa), patches (occurring as small groups or clumps scattered within the pool or playa), or carpets (occurring as dense stands within the pool or playa). Species abundance will consist of three classes, 0–50 individuals, 51–100 individuals, 101–500, and >500 individuals. Distribution and abundance data will be collected for all vernal pool and playa species observed and included in the inventory.

d. Photo-monitoring will occur at each pool or playa during all quantitative monitoring visits to track the habitat quality (hydrology, disturbance) and plant cover of the pool and playa using permanent photo-points. Photo-point location and direction will be recorded with a sub-meter accuracy global positioning system (GPS) unit.

e. Maintain a species list of observed vernal pool indicator species (City of San Diego 2019) during each visit, to record early (wet) and late (dry) season vernal pool plants. Maintain a species list of plants associated with playa habitats during each visit.

4. Conduct qualitative monitoring of vernal pools and playas twice per year, annually.

a. Qualitative monitoring will survey the 22 study locations at Ramona Grasslands County Preserve and the selected subsample of vernal pools at Los Peñasquitos Canyon County Preserve. Qualitative surveys will be conducted during peak ecological conditions (approximately between January 31 and May 31) for vernal pool indicator plant species and/or special-status species

known to occur within the preserve (City of San Diego 2019). The selected subsample of pools and playas may be reevaluated to inform preserve-wide management; however, sampled pools should include those that have been documented to support fairy shrimp populations.

b. The goal of qualitative monitoring is to verify inundation and to assess threats to the pools and playas. This will be conducted every year regardless of the amount of rainfall received. The subsample of pools and playas to be monitored may be adjusted to inform management; however, they will include pools that have been documented to support fairy shrimp populations.

c. Water quality/edge effects: Inspect vernal pools for water quality issues. These include turbidity, sediments, herbicides, pesticides, or fertilizer. Turbidity may be caused by cattle (wallowing and trampling), particularly during the wet season. Sediments may be deposited from erosional runoff entering pools. Pesticides and herbicides may remove otherwise inundation-tolerant plants from pools. Fertilizer runoff may cause excessive algal blooms within pools.

d. Invasive non-native plant species: A general assessment of invasive non-native plant and animal invasion will be made during each qualitative survey for the vernal pool, playa, and surrounding upland areas. Observations of invasive non-native plant species and invasive non-native wildlife presence will be noted. Particular emphasis will be placed on recording the invasion of inundation-tolerant weeds, including perennial ryegrass (*Festuca perennis*), pacific bent-grass (*Agrostis avenacea*), annual rabbit' s foot grass (*Polypogon monspeliensis*), and grass poly (*Lythrum hyssopifolia*) as well as on perennial weeds, including Bermuda grass (*Cynodon dactylon*), artichoke thistle (*Cynara cardunculus*), perennial pepperweed (*Lepidium latifolium*), and black mustard (*Brassica nigra*).

e. Trespass/topographic disturbance: Each pool or playa will be evaluated for topographic disturbance or signs of trespass. Examples of trespassing include off-road vehicle (OHV) activity, off-trail use, and unauthorized cattle grazing. Topographic disturbance may also be caused by erosion as well as sediment deposition from erosional runoff that may be entering pools and playas.

f. Vernal pool and alkali playa target species monitoring: Record the presence of target sensitive plant species, including spreading navarretia, Parish's brittlescale, and Coulter's saltbush. Record incidental observations of any sensitive animal species, including San Diego fairy shrimp and spadefoot toad (*Spea hammondii*).

g. Keep a species list of observed vernal pool indicator species (City of San Diego 2019) during each qualitative visit, to record whether both early (wet) and late (dry) season vernal pool plants are present. Additionally, plants associated with playa habitats will be monitored to include a species list during each qualitative visit.

5. Conduct hydrologic monitoring every 5 years.

a. Quantitatively measure and record hydrology in the 22 study locations within Ramona Grasslands County Preserve and the selected subsample of vernal pools at Los Peñasquitos Canyon County Preserve during an adequate rainy season by measuring water depth, unless some sort of threat or disturbance occurs, in which case additional measurements may be necessary.

b. Manual data collection: A ruler may be installed in the deepest point within each monitoring pool, if not already installed. Every 5 years, water depth will be measured 24 hours after the end of a major storm (0.5 inches of precipitation) and every 3 to 5 days thereafter until the pool has drained. Photos will be taken during each hydrological monitoring visit to document inundation qualitatively.

c. Electronic data collection: Alternatively, i-Button temperature sensors may be installed to monitor hydrology. Depending on the depth of the pool, about six to ten iButtons will be mounted in 1-inch intervals along a wooden stake. The wooden stake with the iButtons will be placed in the deepest location of each vernal pool basin that will be monitored. The data will illustrate the

temperature differential between the iButtons under water and above water, thereby allowing for the determination of the water level during the rainy season. The advantage of using iButtons is to reduce labor time; site visits are required only once for installation, and then at the end of the season to download data (rather than visiting the site after every rain event and every 3 to 5 days thereafter). Data collection will occur once per rainy season. However, it is advisable to check iButtons during other surveys conducted at the site to ensure that the iButton data are recording accurately. iButtons are removed and reinstalled every 5 years.

d. The following data shall be collected/recorded: total number of days inundated at the deepest point; maximum number of days continuously inundated at deepest point; coefficient of variation of water depth at deepest point; mean water depth at deepest point; and number of times drained completely during the wet season. In general, the range and coefficient of variation of the hydrological parameters are more meaningful as a comparative measure for pool systems than is the mean.

6. Conduct wet season San Diego fairy shrimp monitoring every 5 years.

a. Conduct wet season San Diego fairy shrimp surveys in the 22 study locations at Ramona Grasslands County Preserve and within the selected subsample of vernal pools at Los Peñasquitos Canyon County Preserve, depending on hydrological data results and adequacy of pool inundation, during an adequate rainy season. Wet season surveys will inform San Diego fairy shrimp occupancy; determine the species, including potential invasion with versatile fairy shrimp; and provide a general understanding of the quality of vernal pools.

b. Follow a modified protocol consisting of up to five survey visits conducted every 10 to 14 days when pools are inundated. If rainfall and/or temperatures are not favorable for surveying, an altered survey schedule may be followed. Modifications to the USFWS survey guidelines shall be discussed in consultation with USFWS at the time surveys are planned.

7. Review management thresholds and identify high-priority enhancement areas.

a. Management thresholds will be reviewed for the following: cover of focal sensitive plants, cover of combined invasive non-native plants, fairy shrimp species occupancy, and approximate species density of San Diego fairy shrimp using qualitative and quantitative monitoring, and historical information. Regional efforts to develop vernal pool monitoring thresholds by SDMMP and/or the Wildlife Agencies shall be regularly evaluated.

b. Monitoring and management activities shall be guided by the City of San Diego Vernal Pool HCP (City of San Diego 2019), City of San Diego Vernal Pool HCP Vernal Pool Management and Monitoring Plan (City of San Diego 2020), and/or the Management and Monitoring Strategic Plan (SDMMP and TNC 2017) and refined to fit County-specific sites/conditions. Current monitoring and management thresholds for implementation of the measures outlined below in item 9, *Conduct invasive non-native plant species treatment/removal as necessary* are as follows:

   i. If the results of quantitative and qualitative data show negative trends.

   ii. If a decrease of one cover class of focal plant species over 5 years is observed.

   iii. If an average increase of at least one cover class of total non-native cover over 5 years or less is detected.

   iv. If the hydrological network (inlet and outlet features) and water storage (maximum depth within +/-10 percent of baseline) functions within a pool, playa, or complex show a decline in hydrologic functionality, adaptive management actions will be devised to avoid further declines.

   v. If a 20 percent decline in fairy shrimp species presence over 5 years is detected, then adaptive management actions will be devised to avoid further declines.

vi. If versatile fairy shrimp are found, adaptive management actions will be devised to avoid hybridization between the federally listed as endangered San Diego fairy shrimp and versatile fairy shrimp (Bauder et al. 2009).

8. Conduct Fall RDM monitoring at Ramona Grasslands County Preserve, annually.

a. Rangeland monitoring will be conducted in the fall, as recommended in the *Residual Dry Matter Monitoring for the Ramona Grasslands Preserve, October 2020* report (ESA 2021a). RDM monitoring will follow the methodology, goals, and objectives described in the *Ramona Grasslands, Santa Ysabel, and Boulder Oaks Preserves Grazing Management Plan* (ESA 2019). RDM monitoring in the fall determines if the stocking rate was appropriate to achieve RDM targets by management unit.

Spring cattle grazing is conducted to shift species composition within vernal pool watersheds toward native annual forbs; reduce abundance of invasive non-native grasses, which reduces evapotranspiration; and promote longer vernal pool inundation periods, which increases the likelihood of San Diego fairy shrimp being able to complete their lifecycle within the pool. Target grazing intensities are based on threshold RDM values for Grazing Management Units 1–5 (Figure 10b), including the following, which support vernal pools and/or alkali playas:

i. **Grazing Management Units 2A, 2B, and 3A:** RDM threshold is 400–800 pounds per acre to maintain SKR habitat, grazing can occur year-round.

ii. **Grazing Management Unit 3B:** RDM threshold is 800–1,500 pounds per acre to support flexible use; grazing can occur year-round.

iii. **Grazing Management Units 3C and 3D:** RDM threshold is 800–1,500 pounds per acre to maintain vernal pool habitat; grazing can occur after pools are no longer inundated (approximately April to June).

9. Conduct invasive non-native plant species treatment/removal as necessary.

a. Invasive non-native plants and thatch affect both the vigor of native plant populations and the hydrology of pool systems and are the greatest threat to preserved pools. Based on monitoring results, conduct invasive non-native plant species removal as described below as needed (e.g., using an adaptive management approach).

b. Pools and playas that have greater than 20 percent cover of invasive non-native plants will be considered for management actions to provide enhancement. Management may include manual or mechanical dethatching and increased dry-season grazing. At the County's discretion, management methods may be revisited and revised to best meet the needs of the preserve in accordance with the VPHCP [page 124, section 5.3.2 (1)(n)]. Native plant patches will remain in the vernal pool basins, where present; native but aggressive species such as fascicled tarweed will be controlled within the pools and playas, when necessary, especially during years under drought conditions, to allow adequate space and resources for vernal pool and playa species.

i. Control of thatch within the watershed of the Ramona Grasslands County Preserve may be performed as a last effort to reduce thatch cover. This activity is timed prior to flowering and seed set, but not during periods when the soils are wet (to avoid impacts to native habitat).

ii. Flag vernal pool and playa perimeters including a 20-foot buffer area and conduct dethatching within this area around individual vernal pool and playa basins. Identify and mark vernal pool, playa, and upland native plant species to avoid impacts to these species during the dethatching process.

iii. Apply light application of water to upland areas prior to and during dethatching process to control dust, as-needed. All vernal pool and playa areas will be hand weeded and/or dethatched

by scalping non-native vegetation to the soil surface with weed-eaters followed by light raking and vacuuming of vernal pool basins and playas. Seed may be collected prior to dethatching activities to minimize removal of the native seed bank. The need for collection will be determined based on results of quantitative monitoring. All cut non-native plant material will be manually collected, bagged, and properly disposed of at an approved off-site facility.

10. Conduct additional management actions as necessary.

a. Identify threats observed during monitoring and implement actions to reduce those threats.

b. Trash/debris: Pools and playas will be kept free of trash and livestock manure will not be allowed to build up in pools. Manure may be removed to a location outside of the pool watersheds as needed.

c. Edge effects: Recommendations for addressing edge effects that are noted during qualitative monitoring will be implemented, including fragmentation of pools and playas and their watershed, adjacency to trails or management roads, trespassing, and invasive non-native plant species sources.

d. Trespass damage repair: During qualitative assessment, any signs of trespass by pedestrians, horses, mountain bikes, or off-road vehicle use will be assessed for damage. Unauthorized trails will be closed and signage installed, where appropriate. Damage that alters hydrology will be assessed and measures will be implemented to resolve the problem.

e. Topographic Repair: The qualitative assessment of topographic disturbance will evaluate and record the following: pool and playa integrity and hydrologic function; shape and size of disturbance and overall pool and playa; depth and duration of ponding; need for handwork or mechanical equipment for repairs; and need for watershed analysis and/or microtopographic alterations. Pools and playas with moderate topographic disturbance will be assigned for restoration by hand tools. Pools or playas with severe or extensive topographic disturbance will require mechanized equipment use.

f. Managed Grazing: Control access of large domestic livestock within Ramona Grasslands County Preserve (per the *Ramona Grasslands, Santa Ysabel, and Boulder Oaks Preserves Grazing Management Plan* [ESA 2019]) during the wet season in Management Unit 3C (Ramona Airport mitigation pools). Managed grazing will be restricted to the fall and early winter when non-native annual grasses have germinated, but prior to the inundation of vernal pools. Grazing shall not occur when vernal pools are inundated to avoid trampling of sensitive vernal pool resources.

11. Evaluate monitoring results and implement the following adaptive management actions as necessary.

a. Analyze the following quantitative data for each pool or playa: total cover of the target species, total cover of vernal pool indicator species, total cover of native species, total cover of non-native species, and species diversity (number of plant species). Compare values from quantitative monitoring results and compare values between any enhancement and control areas. Ideally, data is collected when rainfall/ponding is adequate and within 3–5 days (ideally same day) of the previous sampling to limit other variances.

b. Evaluate monitoring results and implement adaptive management strategies as necessary. For example, protect pools from erosional sedimentation during the wet season if topography or hydrologic functions are being impaired.

c. Ensure that management thresholds are being met. The established thresholds are referenced above in the Vernal pools and Alkali playa methods. Management protocols may be adjusted as-needed, depending on the results of qualitative and quantitative monitoring. Consider conducting management trials to compare different management techniques.

d. Consider increasing intensity of active invasive non-native plant management or implementing active restoration. At the County's discretion, management methods may be revisited and revised to best meet the needs of the preserve in accordance with the VPHCP [page 124, section 5.3.2 (1)(n)].

e. Consider the reintroduction of vernal pool endemics including spreading navarretia, San Diego button celery, little mousetail (*Myosurus minimus*), and toothed downingia (*Downingia cuspidata*) to pools with functioning hydrology and controlled weeds. These species were selected due to previously known occurrences and the potential for success. The reintroduction of any federally or state-listed species must be approved by USFWS.

f. Five-year evaluation. At the end of 5 years, reevaluate the management treatment and thresholds based on the results of quantitative and qualitative monitoring (see methods section). Specifically, evaluate the need for additional/habitat-specific management actions. During this evaluation, coordinate with the SDMMP and the City of San Diego to ensure that management targets and methods used for monitoring and management are compatible with regional efforts. Monitoring and management of the study locations within Ramona Grasslands County Preserve and the selected subsample of vernal pools at Los Peñasquitos Canyon County Preserve may also be reevaluated to inform preserve-wide management.

2.3.2 San Diego Thornmint (*Acanthomintha ilicifolia*)

Federal/State/California Rare Plant Rank (CRPR)/MSCP/County Status: Federally listed as threatened/state-listed as endangered/1B.1/MSCP-covered, narrow endemic/County List A.

Habitat: Gabbro and calcareous clay soil lenses within grassland or coastal sage scrub. Occurs on friable (crumbly) soils on gentle southeast to west facing slopes in openings in chaparral, coastal sage scrub and grasslands (SDMMP and TNC 2017).

Life History: Annual aromatic herb; blooms April–June. Flowers are typically white with a lavender to purple lower lip and diagnostic spiny bracts found beneath the flower clusters. Four seeds are produced by each flower and fall directly onto the soil surface below the plant. This species stores very little seed in the soil creating a short-lived seed bank (USFWS 2009c).

Threats: Invasive non-native grasses, particularly purple false brome (*Brachypodium distachyon*), and forbs, including tocalote (*Centaurea melitensis*), black mustard, and spiny sowthistle (*Sonchus asper*), can outcompete San Diego thornmint and potentially change soil chemistry and contribute to altered fire regime (SDNHM 2018a); dense thatch that may reduce pollinators; trampling; soil disturbance and erosion; and habitat fragmentation (*Acanthomintha* Working Group pers. comm.). The greatest threats to this species within DPR parks and preserves are invasive non-native plant species, thatch buildup, and drought conditions, which may be causing a decline in populations (SDNHM 2018a).

Preserve-Level Status: Species is known to occur within Simon and Sycamore Canyon/Goodan Ranch County Preserves. Species was historically reported within Ramona Grasslands and El Capitan County Preserves but is believed to be extirpated at Ramona Grasslands County Preserve and misreported at El Capitan County Preserve.

Simon County Preserve. During baseline biodiversity surveys, a large population (approximately 5,000–10,000 individuals) was detected along the eastern boundary of Simon County Preserve, toward the north end of the parcel (Dudek 2010). Current and historical data was assembled and reviewed for the

population at Simon County Preserve. A baseline assessment and one permanent monitoring plot was established for the Simon County Preserve population on April 26, 2016 (SDMMP 2023). A soil type and texture field assessment was conducted per the CNPS vegetation rapid assessment methodology (CNPS 2007 [Brewer and McCann 1982]), as described in Section D.2, Appendix D of the Adaptive Management Framework for San Diego Thornmint (CBI 2014) on April 8, 2021 (ESA 2022a). Long-term monitoring was conducted in 2021, 2022, and 2023 and is ongoing. Focused management targeting invasive non-native plant species, predominantly brome (*Bromus* spp.) grasses and tocalote, was conducted in 2022 (ESA 2024). Future management will continue to be informed by monitoring results.

Sycamore Canyon/Goodan Ranch County Preserve. During baseline biodiversity surveys, it was estimated that more than 10,000 plants occur in several locations within the northern portion of Sycamore Canyon/Goodan Ranch County Preserve (ICF 2008b). The preserve population was identified as a major population in the MSCP and meets the definition of a large population (more than 10,000 individuals). Recent census data indicate that it is one of the largest extant populations in the county and is important because of its location relative to other populations to the northeast, southeast, southwest, and west (CBI 2014). Baseline assessments, clay lenses mapping and soil type and texture field assessment, and 11 permanent monitoring plots were established for the preserve on April 22, 2016, May 4–5, 2016, and May 4, 2017 (ICF 2017; SDMMP 2022c). In coordination with SDMMP in 2024, DPR removed six permanent monitoring plots (i.e., SYGOACIL02, SYGOACIL03, SYGOACIL04, SYGOACIL07, SYGOACIL09, and SYGOACIL11) from future monitoring due to small plot counts or proximity to other permanent monitoring plots; therefore, monitoring in 2024 onward focuses on the remaining five permanent monitoring plots. Long-term monitoring was conducted in 2019, 2021, 2022, and 2023 and is ongoing. Focused management targeting invasive non-native plant species and thatch at select permanent monitoring plots was conducted in 2022 and 2023 (ESA 2023a; ESA 2023b). Future management will continue to be informed by monitoring results.

Ramona Grasslands County Preserve. A small population historically occurred in clay soils on Ramona Grasslands County Preserve. Population was not relocated during follow-up and reconnaissance surveys conducted in 2016, 2017, 2018, or 2022 (ICF 2017; SDMMP 2022c; ESA 2023b). Population is assumed extirpated.

El Capitan County Preserve. A population of unknown size was historically reported on El Capitan County Preserve (CBI 2014). The population was not relocated during reconnaissance surveys conducted in 2022 and on-site habitat is not suitable for this species (ESA 2023). The population is assumed as misidentified or misreported.

Management Goal

- Ensure persistence of San Diego thornmint by maintaining and enhancing existing populations at Simon and Sycamore Canyon/Goodan Ranch County Preserves.

Monitoring Goals

- Conduct reconnaissance surveys for San Diego thornmint populations on DPR parks and preserves where the species was documented (e.g., Ramona Grasslands County Preserve and El Capitan County Preserve) to confirm species presence and population is extant.
- Monitor the full extent of San Diego thornmint populations at Simon and Sycamore Canyon/Goodan Ranch County Preserves. Use status, habitat condition, and threats monitoring results to determine

appropriate adaptive management actions to protect San Diego thornmint populations on DPR parks and preserves.

- Monitor and evaluate the response of San Diego thornmint on Simon and Sycamore Canyon/Goodan Ranch County Preserves to invasive non-native plant species management, thatch removal, and/or other management actions within selected populations.

Management Objectives

- Implement focused management for populations on Simon and Sycamore Canyon/Goodan Ranch County Preserves, as needed. Maintain at least a baseline acreage of suitable clay lens habitat (to be delineated the first year of long-term monitoring). Conduct invasive non-native plant species removal and thatch removal as needed. Maintain less than 10 percent cover of purple false brome and less than 20 percent cover of other invasive non-native plants within management areas.
- Based on the results of annual monitoring (species, habitat condition, and threats), determine if potential threats are negatively affecting the species and implement additional adaptive management actions as necessary (i.e., inspect and manage the species, seed collection).

Monitoring Objectives

- Collect baseline data on the status, habitat condition, and threats for new San Diego thornmint populations.
- Conduct long-term monitoring of all extant populations and evaluate the status (perimeter and abundance) of San Diego thornmint populations on Simon and Sycamore Canyon/Goodan Ranch County Preserves annually and evaluate the response of San Diego thornmint populations to focused management actions.
- Collect covariate data on vegetation composition and cover, soils, invasive non-native plants, and other threats. Ensure consistency in data collection across the Management Strategic Plan Area (MSPA) by using SDMMP's most recent Management and Monitoring Strategic Plan (MSP) Rare Plant IMG Monitoring Protocol. Using the information collected, identify or refine appropriate management actions.

Methods

1. **Coordinate with other entities prior to conducting management or monitoring as follows:**
    a. On-site DPR staff regarding the best time to conduct surveys based on site conditions and bloom checks, management needs, and newly observed locations.
    b. Friends of Sycamore Canyon/Goodan Ranch County Preserve regarding annual San Diego thornmint monitoring on the preserve as part of occurrence monitoring.
    c. Regional monitoring partners, including SANDAG/SDMMP, regarding rare plant population surveys throughout western San Diego County to inform the regional monitoring program and ensure that efforts are not being duplicated and to minimize impacts on the species. Regional monitoring for San Diego thornmint occurs annually.

2. Conduct focused invasive non-native plant species removal as needed as described in the *Adaptive Management Framework for the Endangered San Diego Thornmint* (CBI 2014, Appendix D).

a. Delineate San Diego thornmint management boundaries prior to conducting invasive non-native plant species removal.

i. The Simon County Preserve and the Sycamore Canyon/Goodan Ranch County Preserve populations have a large extent (greater than 10 square meters). Due to the large population extent, the management area for these populations will be delineated along the edge of the population's cumulative maximum extent (the extent across all previous survey years). If sufficient funds for management are available, this management boundary should encompass the entire population. If not, the management boundary may include only a portion of the population. The perimeter of the management area will be mapped so that it can be relocated in the future.

ii. Preserves that support small spatial extent (10 square meters or less) populations of San Diego thornmint will demarcate the management boundary with a square or rectangular plot that will encompass the entire population. (If the extent is greater than 10 square meters, delineation will follow the protocol for populations with a large extent.)

b. Conduct invasive non-native plant species removal as needed following the Invasive Control Protocols for San Diego Thornmint (CBI 2012). The protocol is summarized below.

i. Small extent populations. Hand clip and hand pull all invasive non-native plants and thatch from within the management plot, as feasible. Where San Diego thornmint plants are growing more than 1 foot apart and no invasive non-native plant species are clustered around individuals, herbicide may be used by applying with a backpack sprayer or wand applicator (see protocol for details). Apply herbicide in a 3-foot-wide buffer strip outside of and adjacent to the management plot to inhibit invasive non-native plant growth and production of seeds that could disperse into the management plot.

ii. Large extent populations (e.g., Sycamore Canyon/Goodan Ranch and Simon County Preserve populations). Where San Diego thornmint plants grow close together (i.e., less than 1 foot between individuals), hand-clip or hand-pull invasive non-native plant species following the methods for small extant populations. Where plants grow more than 1 foot apart, but invasive non-native plant species are clustered around individuals, hand-clip or hand-pull invasive non-native plant species in a 2- to 3-foot radius around each individual. Where San Diego thornmint plants are growing more than 1 foot apart and no invasive non-native plant species are clustered around individuals, apply herbicide as described in the protocol. Apply herbicide in a 3-foot-wide buffer strip outside of and adjacent to the management plot to inhibit invasive non-native plant growth and production of seeds that could disperse into the management plot.

iii. Maintain less than 10 percent purple false brome and less than 20 percent of other invasive non-native plant species within the management area.

iv. Key Considerations:

- This activity must be conducted or supervised by a qualified biologist who is able to identify San Diego thornmint plants, as well as other native and non-native plant species.
- Hand removal is timed with the following considerations: (a) hand removal is conducted when the soil is dry to reduce soil disturbance, and (b) removal of invasive non-native plant species, especially purple false brome, is conducted prior to seed set. Cut non-native biomass should be manually collected, bagged, and properly disposed of at an approved off-site facility.

- Use of herbicides on DPR parks and preserves is evaluated on a case-by-case basis and follows current County policies. A written pest control recommendation is required from a pest control advisor when herbicide is proposed for use by a non-County entity and must be approved by the County prior to implementation.
- Because the phenology of invasive non-native plants varies among species and rain events can trigger growth events, multiple visits may be necessary for effective control using herbicides.
- Minimize trampling impacts by restricting foot placement within the clay lens to the degree feasible.

3. Monitor established San Diego thornmint populations at Simon and Sycamore Canyon/Goodan Ranch County Preserves annually following SDMMP protocols.

a. Conduct long-term monitoring, habitat assessment, and threats assessment following the most recent MSP Rare Plant IMG Monitoring Protocol (SDMMP 2022a). Established permanent monitoring plots and photo-monitoring stations will be used. The protocol includes the following steps:

i. Within established permanent monitoring plots, conduct occurrence status assessment as described in the protocol using the Rare Plant Occurrence Monitoring Form. Monitor during the blooming season, preferably April or May. However, the exact timing will depend on the weather. Coordinate with the on-site DPR staff to determine the best timing.

ii. Map the perimeter of the current extent of the occurrence. This will represent the maximum extent of the occurrence. In subsequent years, the occurrence may vary in size and the maximum extent will expand to include all areas occupied by the plant across survey years.

iii. Conduct photo-monitoring as described in the protocol.

iv. Conduct a habitat assessment within the permanent monitoring plot using the Rare Plant Habitat and Threats Assessment Form.

v. Conduct a threats assessment within the maximum extent of the occurrence and an adjacent 10-meter buffer area using the Rare Plant Habitat and Threats Assessment Form.

vi. Provide management recommendations for the site.

vii. Submit data annually to the South Coast Multi-Taxa Database (SC-MTX) website and SDMMP for incorporation in regional monitoring analysis.

4. Evaluate monitoring results and implement adaptive management actions as necessary.

a. Coordinate with SDMMP to evaluate monitoring results annually and identify management recommendations for the site. Implement adaptive management strategies as necessary. For example, protect populations from trampling if new unauthorized trails are observed in the vicinity of San Diego thornmint populations by installing fencing or signage, or rerouting or closing trails, as appropriate.

b. Coordinate with SDMMP prior to monitoring at least annually to identify any changes to the rare plant monitoring protocol or San Diego thornmint BMPs. Implement changes as necessary to annual monitoring and management efforts.

c. Five-year evaluation. At the end of 5 years, reevaluate data collection methods and the management treatment and thresholds based on the response of San Diego thornmint populations within and outside of treatment areas.

2.3.3 Encinitas Baccharis (*Baccharis vanessae*)

Federal/State/CRPR/MSCP/County Status: Federally listed as threatened/state-listed as endangered/1B.1/MSCP-covered, narrow endemic/County List A.

Habitat: Sandstone soils within chaparral on north-facing slopes. Chamise (*Adenostoma fasciculatum*) is the most common associate in its preferred habitat (SDNHM 2018a).

Life History: Perennial shrub, dioecious. Blooms August–November. Rangewide absence of reproduction evidenced by the lack of documented establishment of seedlings (USFWS 2011a). This species is thought to require an opening in canopy (disturbance) followed by late spring or summer rains for seedlings to establish. Fire plays an important role in opening up canopy and stimulating flowering and seedling establishment (SDMMP and TNC 2017). Seeds are believed to be short-lived, lasting less than a year in the soil and less than 2 years in storage (USFWS 2011a).

Threats: Altered fire regime, drought, low seedling recruitment, low seed viability, seed predation, reduced reproductive potential at older age classes, fuel modification, trampling, and invasive non-native plant species. Small, isolated occurrences with little connectivity and dioecious trait make it vulnerable to demographic and environmental stochasticity (SDMMP and TNC 2017; SDNHM 2018a). This species does not appear to be threatened by unauthorized human use within DPR parks and preserves. The greatest threats to this species within DPR parks and preserves are likely drought and potentially seed predation from seed-eating insects in the genus *Melanopleurus*. This insect has a striking black and red pattern and was observed during 2019 monitoring. However, more information is needed to determine the exact site-specific threats and whether the population is stable or declining.

Preserve-Level Status: A large population of approximately 350 individuals occurs on Del Dios Highlands County Preserve population. A baseline population and threats assessment was conducted and three permanent monitoring plots were established at Del Dios Highlands County Preserve on July 24 and 30, 2015 (ICF 2015). Long-term monitoring was conducted in 2021 and 2023 and is ongoing.

Monitoring Goal

- Monitor the persistence of Encinitas baccharis on Del Dios Highlands County Preserve.
- Use status, habitat condition, and threats monitoring results to determine appropriate adaptive management actions to protect Encinitas baccharis populations on Del Dios Highlands County Preserve.
- Monitor and evaluate the response of Encinitas baccharis to implemented management actions.

Management Goal

- Ensure persistence of Encinitas baccharis by maintaining and enhancing existing populations at Del Dios Highlands County Preserve.

Monitoring Objectives

- Conduct long-term monitoring following SDMMP's most recent MSP Rare Plant IMG Monitoring Protocol and collect additional sex and age data for Encinitas baccharis plants within the three permanent monitoring plots every 2 years. Collect covariate data on vegetation composition and cover, soils, invasive non-native plants, and other threats. Ensure consistency in data collection across the MSPA by using rare plant monitoring protocols and forms developed by SDMMP.

- Based on monitoring results, evaluate: (1) if potential threats are negatively affecting the species, (2) adaptive management actions to be implemented, and (3) if implemented management actions are having the desired effect.

Management Objectives

- Maintain 30 acres of habitat on Del Dios Highlands County Preserve to support the Encinitas baccharis population. Maintain less than 20 percent ground cover of invasive non-native plant species in the vicinity of the Encinitas baccharis population. Implement appropriate management actions to protect the Del Dios Highlands population of Encinitas baccharis, as indicated by the monitoring results (i.e., inspect and manage the species). Management actions could include invasive non-native plant species control, access control, erosion control, pest management, and pre-fire management.
- Evaluate and coordinate management priorities based on the regional implementation plan and BMPs, developed by SDMMP in 2019, to enhance existing occurrences and establish new occurrences of Encinitas baccharis (e.g., implementing seed collection, banking, and bulking). Reevaluate and coordinate with SDMMP on the effectiveness of implemented management priorities and actions.

Methods

1. Coordinate with other entities prior to conducting management or monitoring as follows:

a. Regional monitoring partners, including SANDAG/SDMMP, regarding rare plant population surveys throughout western San Diego County to inform the regional monitoring program and ensure that efforts are not being duplicated and to minimize impacts on the species. Regional monitoring for Encinitas baccharis, including the population at Del Dios Highlands County Preserve, occurred in 2015, 2017, 2019, 2021, and 2023, and is scheduled for 2025.

2. Monitor the Encinitas baccharis population at Del Dios Highlands County Preserve every 2 years following SDMMP protocols.

a. Conduct long-term monitoring, habitat assessment, and threats assessment following the most recent MSP rare plant monitoring protocol (SDMMP 2022a). Established permanent monitoring plots and photo-monitoring stations will be used. The protocol includes the following steps:

i. Within established permanent monitoring plots, conduct occurrence status assessment as described in the protocol using the Rare Plant Occurrence Monitoring Form. Monitor during the blooming season. However, the exact timing will depend on the weather. Coordinate with the on-site ranger to determine the best timing.

ii. Map the perimeter of the current extent of the occurrence. This will represent the maximum extent of the occurrence. In subsequent years, the occurrence may vary in size and the maximum extent will expand to include all areas occupied by the plant across survey years.

iii. Conduct photo-monitoring as described in the protocol.

iv. Conduct habitat assessment within the permanent monitoring plot using the Rare Plant Habitat and Threats Assessment Form.

v. Conduct threats assessment within the maximum extent of the occurrence and an adjacent 10-meter buffer area using the Rare Plant Habitat and Threats Assessment Form.

b. In addition, the following information, which is not included in the Rare Plants Occurrence Monitoring Form, is recorded:

i. Identify and record the sex and age of each shrub. The following data are recorded for each plot: total number of adult female shrubs, total number of adult male shrubs, and total number of seedlings. A seedling is defined as 4 inches or fewer in height.

ii. Determine the male:female ratio between by counting the total number of males and females within each plot.

- Provide management recommendations for the site.
- Submit data annually to the SC-MTX website and SDMMP for incorporation in regional monitoring analysis.

c. Key Considerations:

i. Flowers must be present to correctly identify the species and determine if a given shrub is male or female. Ensure that plants are at peak bloom. Additional site visits may be necessary to ensure the appropriate timing of the fieldwork.

ii. Encinitas baccharis is difficult to identify. Monitoring is conducted by a qualified botanist who is able to identify the various species of baccharis, as well as other native and non-native species, and able to tell the sexes apart.

iii. Extra care is taken to avoid trampling the Encinitas baccharis plants or surrounding native vegetation.

3. Evaluate monitoring results and implement adaptive management actions as necessary.

a. Coordinate with SDMMP to evaluate monitoring results and identify management recommendations for the site. Implement adaptive management strategies as necessary. For example, protect shrubs from habitat destruction if new unauthorized trails are observed in the vicinity by installing appropriate access controls.

b. Coordinate with SDMMP prior to monitoring at least annually to identify any changes to the rare plant monitoring protocol or to evaluate new species-specific monitoring protocol or BMPs. Implement changes as necessary to monitoring and management efforts.

c. Five-year evaluation. At the end of 5 years, reevaluate data collection methods and the management strategy.

2.3.4 Orcutt's Brodiaea (*Brodiaea orcuttii*)

Federal/State/CRPR/MSCP/County Status: Not federally listed/not state-listed/1B.1/MSCP-covered/County List A.

Habitat: Mesic, gravelly clay loam soils in valley and foothill grasslands, meadows, and vernal pools (CNPS 2023).

Life History: Perennial herb (bulb). Blooms April–July. Species is bulbiferous, meaning, it has an underground storage root which grows and produces leaves after the first rain. Orcutt's brodiaea are self-incompatible with only a portion of the population flowering each year causing fluctuations in the number of individuals year to year. Surveys conducted during the flowering period are needed to determine the presence of this species.

Threats: Development, invasive non-native plant species, grazing, trampling and/or degradation of habitat caused by human intrusion, unauthorized access, and OHV activity (SDMMP and TNC 2017). The greatest threat to this species within DPR parks and preserves is invasive non-native plant species and unauthorized human access.

Preserve-Level Status: Orcutt's brodiaea is known to occur within the eastern portion of Boulder Oaks County Preserve.

Boulder Oaks County Preserve. Population occurs in the eastern portion of the preserve within non-native grassland (Jones and Stokes 2007). A baseline population assessment and establishment of one permanent monitoring plot within the preserve was conducted on May 18, 2016. The population size has ranged between 0 and 271 individuals during surveys conducted between 2016 and 2021. Rare plant monitoring for Orcutt's brodiaea in 2023 estimated the population size to be 12,833 individuals (SDMMP 2023).

Management Goal

- Maintain or enhance existing Orcutt's brodiaea occurrences on Boulder Oaks County Preserve to increase resilience to environmental and demographic stochasticity to support species persistence over the long term.

Monitoring Goal:

- Conduct reconnaissance surveys for Orcutt's brodiaea populations on DPR parks and preserves where the species was documented (e.g., Boulder Oaks County Preserve) to confirm species presence and population is extant.
- Monitor the full extent of Orcutt's brodiaea populations at Boulder Oaks County Preserve. Use status, habitat condition, and threats monitoring results to determine appropriate adaptive management actions to protect Orcutt's brodiaea populations on DPR parks and preserves.
- Monitor and evaluate the response of Orcutt's brodiaea on Boulder Oaks County Preserve to invasive non-native plant species management, thatch removal, and/or other management actions within selected populations.

Management Objectives

- Maintain less than 20 percent absolute cover of invasive non-native plant species. Implement focused management for populations on Boulder Oaks County Preserve, as needed. Conduct invasive non-native plant species removal and thatch removal as needed.
- Based on the results of monitoring (species, habitat condition, and threats), determine if potential threats are negatively affecting the species, and implement additional adaptive management actions as necessary (i.e., inspect and manage the species).

Monitoring Objectives

- Collect baseline data to confirm the status, habitat condition, and threats for Orcutt's brodiaea populations (e.g., Boulder Oaks County Preserve).
- Conduct long-term monitoring of all extant populations and evaluate the status (perimeter and abundance) of Orcutt's brodiaea populations on Boulder Oaks County Preserve.
- Monitor and evaluate the response of Orcutt's brodiaea within Boulder Oaks County Preserve to focused management actions.

Methods

1. Coordinate with other entities prior to conducting management or monitoring as follows:

a. On-site DPR staff regarding the best time to conduct surveys based on site conditions, management needs, and newly observed locations.

b. SDMMP and other entities that may conduct genetic analyses to determine genetic relationships with other Brodiaea species.

c. Regional monitoring partners, including SANDAG/SDMMP, regarding rare plant population surveys throughout western San Diego County to inform the regional monitoring program and ensure that efforts are not being duplicated and to minimize impacts on the species. Regional monitoring for Orcutt's brodiaea occurs every 2 years and will occur in 2025.

2. Conduct a reconnaissance survey and establish baseline conditions and monitor Orcutt's brodiaea population at Boulder Oaks County Preserve every 2 years following SDMMP protocols.

a. Conduct reconnaissance survey to confirm and establish baseline conditions:

i. Confirm the presence of known occurrences (Jones and Stokes 2007, SDMMP 2023) within the Boulder Oaks County Preserve in the field during the blooming period (April through July) on a year with average or higher rainfall.

ii. Conduct an area search in the vicinity of known occurrences in suitable habitat to look for additional occurrences. Collect GPS coordinates for all new plants observed using a GPS with submeter accuracy.

iii. If needed, establish new permanent monitoring plot(s) within Boulder Oaks County Preserve, depending on how many plants are found and how far apart they are, according to the most recent MSP Rare Plant Monitoring Protocol (SDMMP 2022a).

- Permanently mark monitoring plot(s) center point and photo point locations using metal rebar and tag and collect GPS coordinates of these locations to ensure that the plots can be relocated easily in the future.

b. Conduct long-term monitoring, habitat assessment, and threats assessment following the most recent MSP Rare Plant Monitoring Protocol (SDMMP 2022a). Established permanent monitoring plots and photo-monitoring stations will be used. The protocol includes the following steps:

i. Within established permanent monitoring plots, conduct occurrence status assessment as described in the protocol, using the Rare Plant Occurrence Monitoring Form. Count and record the number of individuals (complete counts). Individuals are identified by looking where stems come out of the ground. Stems that come out of the same location are considered one plant. If there are too many individuals to count, reevaluate the counting methodology following recommendations in McEachern and Sutter (2010).

ii. Map the perimeter of the current extent of the occurrence. This will represent the maximum extent of the occurrence. In subsequent years, the occurrence may vary in size and the maximum extent will expand to include all areas occupied by the plant across survey years.

iii. Conduct photo-monitoring as described in the protocol.

iv. Conduct habitat assessment within the permanent monitoring plot using the Rare Plant Habitat and Threats Assessment Form.

v. Conduct threats assessment within the maximum extent of the occurrence and an adjacent 10-meter buffer area Rare Plant Habitat and Threats Assessment Form.

vi. Provide management recommendations for the site.

vii. Submit data annually to the SC-MTX website and SDMMP for incorporation in regional monitoring analysis.

c. Key Considerations:

i. Ensure that plants are at peak bloom when conducting surveys. Additional site visits may be necessary to ensure the appropriate timing of the fieldwork.

ii. Monitoring is conducted by a qualified botanist who is able to identify vegetative and flowering forms of Orcutt's brodiaea, as well as other native and non-native species.

3. Evaluate monitoring results and implement adaptive management actions as necessary.

a. Coordinate with SDMMP to evaluate monitoring results and identify management recommendations for the site. Implement adaptive management strategies as necessary. For example:

i. Removal of invasive non-native grasses and forbs within occupied habitat and suitable habitat areas.

ii. Dethatching within and adjacent to the population.

iii. Installation of access control (e.g., fencing, signage) and erosion control BMPs to prevent habitat disturbance and erosion/soil compaction from unauthorized access in occupied and suitable habitat areas.

iv. Close and restore unauthorized roads and trails in the vicinity of occupied and suitable habitat.

v. Monitor road maintenance in the vicinity of occupied and suitable habitat to prevent road expansion into occupied and suitable habitat.

b. Coordinate with SDMMP prior to monitoring at least annually to identify any changes to the rare plant monitoring protocol or to evaluate new species-specific monitoring protocol or BMPs. Implement changes as necessary to monitoring and management efforts.

c. Five-year evaluation. At the end of 5 years, reevaluate data collection methods and the management strategy.

4. Conduct focused invasive non-native plant species removal as needed.

a. Delineate Orcutt's brodiaea management boundaries prior to conducting invasive non-native plant species removal.

b. Conduct thatch removal and invasive non-native plant species removal as needed to reduce invasive non-native cover to less than 20 percent.

c. Key Considerations:

i. This activity must be conducted or supervised by a qualified biologist who is able to identify Orcutt's brodiaea plants, as well as other native and non-native plant species.

ii. Thatch removal is implemented in summer or fall via manual or mechanical methods. The biomass should be manually collected, bagged, and properly disposed of at an approved off-site facility.

iii. Use of herbicides on DPR parks and preserves is evaluated on a case-by-case basis and follows current County policies. A written pest control recommendation is required from a pest control advisor when herbicide is proposed for use by a non-County entity and must be approved by the County prior to implementation.

iv. Hand removal is timed with the following considerations: (a) hand removal is conducted when the soil is dry to reduce soil disturbance, and (b) removal of invasive non-native plant species, especially invasive non-native grass species, is conducted prior to seed set.

v. Because the phenology of invasive non-native plants varies among species and rain events can trigger growth events, multiple visits may be necessary for effective control using herbicides.

2.3.5 Lakeside Ceanothus (*Ceanothus cyaneus*)

Federal/State/CRPR/MSCP/County Status: Not federally listed/not state-listed/1B.2/MSCP-covered, narrow endemic/County List A.

Habitat: Chaparral; often occurs in rocky, remote, very steep locations with difficult access.

Life History: Perennial evergreen shrub. Blooms April–June. Lakeside ceanothus is a narrow endemic species with a restricted distribution. Regenerates by seed only after a fire; depends on sufficient soil seed bank for long-term persistence (P. Gordon-Reedy pers. comm.).

Threats: Frequent fires appear to be a major threat. The seed bank needs time between fires to build up (P. Gordon-Reedy pers. comm.). Invasive non-native plant species may also be a threat, by deterring pollinators and increasing potential for fire (Klein 2009). With the exception of wildfire, populations within DPR parks and preserves do not appear to be highly threatened; occurrences are in remote, inaccessible locations, which likely protect them from edge effects. An aging population and low seedling recruitment may be a site-specific threat for this species.

Preserve-Level Status: Occurs in fairly large populations within Boulder Oaks, El Capitan, and Oakoasis County Preserves, and Louis A. Stelzer County Park.

Boulder Oaks County Preserve. A baseline population and threats assessment was conducted and two permanent monitoring plots were established for the Boulder Oaks County Preserve population on August 4, 2015 (ICF 2015). Rare plant monitoring for Lakeside ceanothus in 2021 estimated the population size to be 1,100 individuals (ESA 2022a). Long-term monitoring is ongoing.

El Capitan County Preserve. A baseline population and threats assessment was conducted and two permanent monitoring plots were established for the El Capitan County Preserve population on August 6, 2015 (ICF 2015). Rare plant monitoring for Lakeside ceanothus in 2021 estimated the population size to be 450 individuals (ESA 2022a). Long-term monitoring is ongoing.

Oakoasis County Preserve. A baseline population and threats assessment was conducted and one permanent monitoring plot was established for the Oakoasis County Preserve population on August 6, 2015 (ICF 2015). Rare plant monitoring for Lakeside ceanothus in 2021 estimated the population size to be 573 individuals (ESA 2022a). Long-term monitoring is ongoing.

Louis A. Stelzer County Park. A baseline population and threats assessment was conducted and one permanent monitoring plot was established for the Louis A. Stelzer County Park population on July 31, 2015 (ICF 2015). Rare plant monitoring for Lakeside ceanothus in 2021 estimated the population size to be 428 individuals (ESA 2022a). Long-term monitoring is ongoing.

Management Goal

- Ensure persistence of Lakeside ceanothus by maintaining populations within Boulder Oaks County Preserve, El Capitan County Preserve, Oakoasis County Preserve, and Louis A. Stelzer County Park.

Monitoring Goal

- Collect baseline threats and habitat information about Lakeside ceanothus to provide a better understanding of stressors and general condition of plants and surrounding habitat at selected locations within Boulder Oaks County Preserve, El Capitan County Preserve, Oakoasis County Preserve, and Louis A. Stelzer County Park.
- Use status, habitat condition, and threats monitoring results to determine appropriate adaptive management actions to protect Lakeside ceanothus populations on DPR parks and preserves.
- Monitor and evaluate the response of Lakeside ceanothus to implemented management actions.

Management Objectives

- Conduct routine management within Boulder Oaks County Preserve, El Capitan County Preserve, Oakoasis County Preserve, and Louis A. Stelzer County Park as needed and indicated by the monitoring results.

Monitoring Objectives

- Conduct a baseline population and threats assessment within a total of six locations on Boulder Oaks County Preserve, Oakoasis County Preserve, Louis A. Stelzer County Park, and El Capitan County Preserve during the blooming period (April–June) in 2015.
- Conduct long-term monitoring following SDMMP's most recent MSP Rare Plant IMG Monitoring Protocol every 5 years thereafter at each of the six permanent monitoring plots to ensure consistency in data collection across the MSPA. Using the information collected, identify or refine appropriate management actions.

Methods

1. **Coordinate with other entities conducting rare plant surveys.**
    a. On-site DPR staff regarding the best time to conduct surveys based on site conditions and bloom checks, management needs, and newly observed locations.
    b. Regional monitoring partners, including SANDAG/SDMMP, regarding rare plant population surveys throughout western San Diego County to inform the regional monitoring program and ensure that efforts are not being duplicated and to minimize impacts on the species.
2. **Monitor the Lakeside ceanothus populations at Boulder Oaks, El Capitan, Oakoasis County Preserves and Louis A. Stelzer County Park once every 5 years following SDMMP protocols.**
    a. Conduct long-term monitoring, habitat assessment, and threats assessment following the most recent MSP rare plant monitoring protocol (SDMMP 2022a). Established permanent monitoring plots and photo-monitoring stations will be used. The protocol includes the following steps:
        i. Within established permanent monitoring plots, conduct occurrence status assessment as described in the protocol, using the Rare Plant Occurrence Monitoring Form. Monitor during the blooming season. However, the exact timing will depend on the weather.
        ii. Map the perimeter of the current extent of the occurrence if feasible. This will represent the maximum extent of the occurrence. In subsequent years, the occurrence may vary in size and the maximum extent will expand to include all areas occupied by the plant across survey

years. Topography and plant density may prevent delineation of the full population extent. In these cases, map the boundaries of the occurrence that are feasible to access and delineate and make notes indicating that the extent is likely larger.

iii. Conduct photo-monitoring as described in the protocol.

iv. Conduct habitat assessment within the permanent monitoring plot using the Rare Plant Habitat and Threats Assessment Form.

v. Conduct threats assessment within the maximum extent of the occurrence and an adjacent 10-meter buffer area Rare Plant Habitat and Threats Assessment Form. If the entire area is not accessible due to topography or vegetation density, assess as much area as possible and note the area of assessment on the datasheet.

vi. Provide management recommendations for the site.

vii. Submit data to the SC-MTX website and SDMMP for incorporation in regional monitoring analysis.

b. Key Considerations:

i. Conduct surveys only during a year with adequate (near average) rainfall. Ensure that plants are at peak bloom. Additional site visits may be necessary to ensure the appropriate timing of the fieldwork.

ii. Evaluate site access to plant populations using desktop analyses, field reconnaissance surveys, and consultation with past surveyors. The plant populations are located in difficult to access locations. Historic access may be overgrown or impassable. Additional coordination with on-site DPR staff may be warranted to safely access population locations.

3. Evaluate monitoring results and implement adaptive management actions as necessary.

a. Coordinate with SDMMP to evaluate monitoring results and identify management recommendations for the site. Implement adaptive management strategies as necessary. For example, conduct invasive non-native plant species management in the vicinity of the Lakeside ceanothus population on Boulder Oaks, El Capitan, and Oakoasis County Preserves, and Louis A. Stelzer Park, as necessary to maintain less than 20 percent invasive non-native plant species cover.

b. Coordinate with SDMMP prior to monitoring at least annually to identify any changes to the rare plant monitoring protocol or to evaluate new species-specific monitoring protocol or BMPs. Implement changes as necessary to monitoring and management efforts.

c. Implement pre-fire actions, such as those described in B.4 of the RMPs (see Appendix D) to prevent mortality from wildfire. Incorporate BMPs from the regional Fire Management Strategic Plan when it is completed by SDMMP (has not been completed as of 2024).

d. Five-year evaluation. At the end of 5 years, reevaluate data collection methods and the management strategy based on monitoring results.

2.3.6 San Miguel Savory (*Clinopodium chandleri*)

Federal/State/CRPR/MSCP/County Status: Not federally listed/not state-listed/1B.2/MSCP-covered/County List A.

Habitat: Rocky, gabbroic, or metavolcanic soils within chaparral, coastal sage scrub, woodland, or grassland habitat. Found on chamise-dominated slopes on loamy soils (CNPS 2023).

Life History: Short-lived perennial shrub. Blooms March–July. It has small white to lavender flowers clustered in leaf axils with white hairs found along the stems. Shrub height averages 2-5dm and it is often found in the shade of larger shrubs within chaparral (SDMMP and TNC 2017).

Threats: Possibly altered fire regime. Boulder Oaks County Preserve population burned in 2007. There are only two isolated occurrences with a small number of individuals within the MSCP area, making this species highly vulnerable to extirpation through demographic and environmental stochasticity (CNPS 2023). Within DPR parks and preserves, the greatest threat is small population size. More information is needed to evaluate additional threats and status of the population.

Preserve-Level Status: A population of approximately 100 individuals was documented within Boulder Oaks County Preserve, which persisted in the understory of chaparral burned in 2003 (ICF 2013; SDMMP 2023). A baseline population assessment and establishment of two permanent monitoring plots within the Boulder Oaks County Preserve population was conducted on April 6 and 16, 2016 (ICF 2017). From 2016 to 2019, the population was monitored annually. The frequency for long-term monitoring was then reduced to every 2 years, consistent with the regional monitoring frequency. Recent monitoring in 2023 estimates the Preserve population to be 607 individuals (ESA 2023). Focused management was conducted in 2021, 2022, and 2023. Future management will continue to be informed by monitoring results.

Management Goal

- Ensure persistence of San Miguel savory by maintaining and enhancing existing populations at Boulder Oaks County Preserve.

Monitoring Goals

- Collect baseline information within the full extent of San Miguel savory within Boulder Oaks County Preserve to provide a better understanding of species abundance, distribution, habitat condition, and potential threats, and to inform adaptive management decisions.
- Use status, habitat condition, and threats monitoring results to determine appropriate adaptive management actions to protect San Miguel savory populations on DPR parks and preserves.
- Monitor and evaluate the response of San Miguel savory to implemented management actions.

Management Objectives

- Maintain less than 20 percent cover of invasive non-native plant species within management areas. Conduct routine management of the San Miguel savory on Boulder Oaks County Preserve as indicated by the monitoring results (i.e., inspect and manage the species), as-needed.
- Upon availability, reevaluate management priorities based on the regional implementation plan and BMPs, which will be developed by SDMMP to enhance existing occurrences and establish new occurrences of San Miguel savory.

Monitoring Objectives

- Conduct long-term monitoring following SDMMP's most recent MSP Rare Plant IMG Monitoring Protocol every 2 years to ensure consistency in data collection across the MSPA. Using the information collected, identify or refine appropriate management actions.

Methods

1. Coordinate with other entities conducting rare plant surveys.

a. On-site DPR staff regarding the best time to conduct surveys based on site conditions and bloom checks, management needs, and newly observed locations.

b. Regional monitoring partners, including SANDAG/SDMMP, regarding rare plant population surveys throughout western San Diego County to inform the regional monitoring program and ensure that efforts are not being duplicated and to minimize impacts on the species. Regional monitoring for San Miguel savory occurs every 2 years and will occur in 2025.

2. Monitor the San Miguel savory population at Boulder Oaks County Preserve once every 2 years following SDMMP protocols.

a. Conduct long-term monitoring, habitat assessment, and threats assessment following the most recent MSP Rare Plant IMG Monitoring Protocol (SDMMP 2022a). Established permanent monitoring plots and photo-monitoring stations will be used. The protocol includes the following steps:

i. Within established permanent monitoring plots, conduct occurrence status assessment as described in the protocol, using the Rare Plant Occurrence Monitoring Form.

ii. Map the perimeter of the current extent of the occurrence. This will represent the maximum extent of the occurrence. In subsequent years, the occurrence may vary in size and the maximum extent will expand to include all areas occupied by the plant across survey years.

iii. Conduct photo-monitoring as described in the protocol.

iv. Conduct habitat assessment within the permanent monitoring plot using the Rare Plant Habitat and Threats Assessment Form.

v. Conduct threats assessment within the maximum extent of the occurrence and an adjacent 10-meter buffer area Rare Plant Habitat and Threats Assessment Form.

vi. Provide management recommendations for the site.

vii. Submit data following monitoring to the SC-MTX website and SDMMP for incorporation in regional monitoring analysis.

b. Key Considerations:

i. Ensure that plants are at peak bloom when conducting surveys. Additional site visits may be necessary to ensure the appropriate timing of the fieldwork.

ii. Monitoring is conducted by a qualified botanist who is able to identify San Miguel savory, as well as other native and non-native plant species.

3. Conduct routine management annually as needed.

a. Delineate a management area around each plant or clump of plants. The management area consists of the cumulative maximum extents and includes a buffer of 10 meters around plants or clumps. Map the perimeter of the management area so that it can be relocated in the future. Conduct annual invasive non-native plant species removal within management area to maintain less than 25 percent cover of invasive non-native plants. Invasive non-native plants next to San Miguel savory plants are pulled by hand. The remaining area can be controlled with herbicide or mechanical methods.

b. Implement access controls to avoid trampling or other routine management actions as determined by annual monitoring.

c. Key Considerations:

i. This activity must be conducted or supervised by a qualified biologist who is able to identify San Miguel savory plants, as well as other native and invasive non-native plant species.

ii. Cut non-native biomass should be manually collected, bagged, and properly disposed of at an approved off-site facility.

iii. Use of herbicides on DPR parks and preserves is evaluated on a case-by-case basis and follows current County policies. A written pest control recommendation is required from a pest control advisor when herbicide is proposed for use by a non-County entity and must be approved by the County prior to implementation.

4. Evaluate monitoring results and implement additional adaptive management actions as necessary.

a. Coordinate with SDMMP to evaluate monitoring results and identify management recommendations for the site. Implement adaptive management strategies as necessary.

b. Coordinate with SDMMP prior to monitoring at least annually to identify any changes to the rare plant monitoring protocol or to evaluate new species-specific monitoring protocol or BMPs. Implement changes as necessary to monitoring and management efforts.

c. Five-year evaluation. At the end of 5 years, reevaluate data collection methods and the management strategy.

2.3.7 Otay Tarplant (*Deinandra conjugens*)

Federal/State/CRPR/MSCP/County Status: Federally listed as threatened/state-listed as endangered/1B.1/MSCP-covered, narrow endemic/County List A.

Habitat: Clay soils within grassland or open coastal scrub habitat. Has been detected in Paradise Valley on sandy loam or loam soils (SDNHM 2018a).

Life History: Annual dicot herb. Blooms May–June. Self-incompatible breeding system and only a portion of the individuals in the seed bank germinate each year, so populations numbers are known to fluctuate from year to year (SDNHM 2018a).

Threats: Primary threat is invasive non-native plant species, particularly annual grasses (e.g., purple false brome) and forbs (e.g., tocalote), and thatch buildup (SDNHM 2018a). Edge effects and/or degradation of habitat may result from unauthorized trails, OHV use, grazing, trampling, and maintenance of access roads, utility corridors, and fuel modification zones (J. Vinje pers. comm.; SDMMP and TNC 2017). The greatest threat to this species within DPR parks and preserves is invasive non-native plant species and thatch buildup, which may be causing a decline in populations.

Preserve-Level Status: A population of Otay tarplant occurs along the northern boundary of the Furby-North County Preserve and a baseline population assessment and establishment of one permanent monitoring plot was conducted on June 29, 2016 (SDMMP 2023). Additional Otay tarplant individuals were detected in 2020 in the southern portion of the Furby-North County Preserve during surveys conducted in association with a City of San Diego private development project. These individuals were not detected during DPR baseline surveys. In 2023, a reconnaissance survey and baseline population assessment occurred, and a new permanent monitoring plot and photo-monitoring station was established

at this location. Recent monitoring in 2023 estimates the Preserve population to be 3,667 individuals (ESA 2023a). Long-term monitoring was conducted annually since 2016 and is ongoing. Focused management was conducted in 2021, 2022, and 2023. Future management will continue to be informed by monitoring results.

Management Goal

- Maintain or enhance existing Otay tarplant occurrences on Furby-North County Preserve to increase resilience to environmental and demographic stochasticity to support species persistence over the long term.

Monitoring Goals

- Monitor the Otay tarplant population at Furby-North County Preserve. Use status, habitat condition, and threats monitoring results to determine appropriate adaptive management actions to protect Otay tarplant populations on DPR parks and preserves.
- Monitor and evaluate the response of Otay tarplant to implemented management actions.

Management Objectives

- Control invasive non-native grasses and forbs to less than 20 percent absolute cover and remove thatch within habitat (documented and potential locations within clay soils in Furby-North County Preserve) for Otay tarplant to maintain open areas and reduce weed competition.
- Protect clay soils with fencing, signage, and/or erosion control BMPs as necessary so they do not become impacted (e.g., compacted) or eroded, and scarify/decompact and/or remediate erosion as needed.
- Collect Otay tarplant seed during the summer and apply (can be applied the same day it is collected if weeds are sufficiently controlled) to enhance and potentially expand the spatial extent in Furby-North County Preserve as needed based on adaptive management recommendations. As part of objective, delineate potential suitable habitat on Furby-North County Preserve for expanded or new occurrence locations.
- Control unauthorized human access within suitable habitat for Otay tarplant, and close and restore unauthorized trails and roads.

Monitoring Objectives

- Conduct long-term monitoring following SDMMP's most recent MSP Rare Plant IMG Monitoring Protocol on an annual basis. Long-term monitoring includes conducting a threats assessment for presence and percentage of invasive non-native grasses and forbs and disturbance to soil conditions, and discussion of management recommendations.
- Monitor and document seed collection and application on Furby-North County Preserve, if conducted as part of adaptive management. Monitor per SDMMP's most recent MSP Rare Plant IMG Monitoring Protocol to document changes in population density and extent.
- Monitor per SDMMP's most recent MSP Rare Plant IMG Monitoring Protocol, including, as part of the threats assessment, documenting the disturbance category and taking notes regarding unauthorized trails and roads, and discuss in IMG management recommendations.

Methods

1. Coordinate with other entities prior to conducting management or monitoring as follows:

a. On-site DPR staff regarding the best time to conduct surveys based on site conditions, management needs, and newly observed locations.

b. Regional monitoring partners, including SANDAG/SDMMP, regarding rare plant population surveys throughout western San Diego County to inform the regional monitoring program and ensure that efforts are not being duplicated and to minimize impacts on the species. Regional monitoring for Otay tarplant occurs annually.

2. Monitor established Otay tarplant populations at Furby-North County Preserve annually following SDMMP protocols.

a. Conduct long-term monitoring, habitat assessment, and threats assessment following the most recent MSP Rare Plant IMG Monitoring Protocol (SDMMP 2022a). Established permanent monitoring plots and photo-monitoring stations will be used. The protocol includes the following steps:

i. Within established permanent monitoring plots, conduct occurrence status assessment as described in the protocol, using the Rare Plant Occurrence Monitoring Form. Count and record the number of individuals (complete counts). Individuals are identified by looking where stems come out of the ground. Stems that come out of the same location are considered one plant. If there are too many individuals to count, reevaluate the counting methodology following recommendations in McEachern and Sutter (2010).

ii. Map the perimeter of the current extent of the occurrence. This will represent the maximum extent of the occurrence. In subsequent years, the occurrence may vary in size and the maximum extent will expand to include all areas occupied by the plant across survey years.

iii. Conduct photo-monitoring as described in the protocol.

iv. Conduct habitat assessment within the permanent monitoring plot using the Rare Plant Habitat and Threats Assessment Form.

v. Conduct threats assessment within the maximum extent of the occurrence and an adjacent 10-meter buffer area using the Rare Plant Habitat and Threats Assessment Form.

vi. Provide management recommendations for the site.

vii. Submit data annually to the SC-MTX website and SDMMP for incorporation in regional monitoring analysis.

b. Key Considerations:

i. Ensure that plants are at peak bloom when conducting surveys. Additional site visits may be necessary to ensure the appropriate timing of the fieldwork.

ii. Cut non-native biomass should be manually collected, bagged, and properly disposed of at an approved off-site facility.

iii. Monitoring is conducted by a qualified botanist who is able to identify vegetative and flowering forms of Otay tarplant, as well as other native and non-native species.

3. Conduct focused invasive non-native plant species removal as needed.

a. Delineate Otay tarplant management boundaries around cumulative maximum extents prior to conducting invasive non-native plant species removal.

b. Conduct thatch removal and invasive non-native plant species removal as needed to reduce invasive non-native cover to less than 20 percent absolute cover or less.

c. Key Considerations:

i. This activity must be conducted or supervised by a qualified biologist who is able to identify Otay tarplant plants, as well as other native and non-native plant species.

ii. Thatch removal is implemented in summer or fall via manual or mechanical methods. The biomass should be manually collected, bagged, and properly disposed of at an approved off-site facility.

iii. Use of herbicides on DPR parks and preserves is evaluated on a case-by-case basis and follows current County policies. A written pest control recommendation is required from a pest control advisor when herbicide is proposed for use by a non-County entity and must be approved by the County prior to implementation.

iv. Hand removal is timed with the following considerations: (a) hand removal is conducted when the soil is dry to reduce soil disturbance, and (b) removal of invasive non-native plant species, especially invasive non-native grass species, is conducted prior to seed set.

v. Because the phenology of invasive non-native plants varies among species and rain events can trigger growth events, multiple visits may be necessary for effective control using herbicides.

4. Evaluate monitoring results and implement adaptive management actions as necessary.

a. Coordinate with SDMMP to evaluate monitoring results and identify management recommendations for the site. Implement adaptive management strategies as necessary. For example:

i. Remove thatch and invasive non-native grasses within and adjacent to the population.

ii. Collect Otay tarplant seed during the summer and seed application to enhance and potentially expand the spatial extent of the population.

iii. Install access control (e.g., fencing, signage) and erosion control BMPs to prevent habitat disturbance and erosion/soil compaction from unauthorized access.

iv. Close and restore unauthorized roads and trails in the vicinity of occupied and suitable habitat.

b. Coordinate with SDMMP prior to monitoring at least annually to identify any changes to the rare plant monitoring protocol or to evaluate new species-specific monitoring protocol or BMPs. Implement changes as necessary to monitoring and management efforts.

c. Five-year evaluation. At the end of 5 years, reevaluate data collection methods and the management strategy.

2.3.8 Orcutt's Bird's-Beak (*Dicranostegia [Cordylanthus] orcuttiana*)

Federal/State/CRPR/MSCP/County Status: Not federally listed/not state-listed/2B.1/MSCP-covered/County List B.

Habitat: Sandy loam or sandy clay loam soils in coastal sage scrub (SDNHM 2018a).

Life History: Annual dicot herb. Blooms March–September. Species is hemiparasitic, meaning it can live either as a parasite or as an annual plant.

Threats: Orcutt's bird's-beak's primary threats are edge effects and/or degradation of habitat caused by human intrusion, unauthorized access, and off-road vehicle activity. Consequently, invasive non-native

plant species are also a substantial threat to this species (J. Vinje pers. comm.; SDMMP and TNC 2017). The greatest threat to this species within DPR parks and preserves is invasive non-native plant species and unauthorized human access.

Preserve-Level Status: A baseline population assessment and establishment of two permanent monitoring plots within the Tijuana River Valley Regional Park population was conducted on June 29, 2016, and June 5, 2017 (SDMMP 2022b). One small population occurs in the Smuggler's Gulch area (estimated between 0 and 24 individuals between 2017 and 2018), and one larger population occurs in the south-central portion of the park (estimated between 2 and 3,500 individuals between 2016 and 2018). The larger population is located in an area bisected by unauthorized roads, adjacent to an area treated for weeds by U.S. Border Patrol (SDMMP 2019). From 2016 to 2023, the two occurrences were monitored annually, with the exception of 2020 due to the COVID-19 pandemic and the associated stay-at-home order. The frequency for long-term monitoring was then reduced to every 2 years, consistent with the regional monitoring schedule. Long-term monitoring is ongoing and will occur in 2025 to realign with regional monitoring. Additional discovery surveys for this species conducted by regional monitoring partners in 2021 detected new populations within the Tijuana River Valley Regional Park (SDMMP 2022b) and additional permanent monitoring plots may be established at these locations in the future. Focused management at the two established permanent monitoring plots occurred in 2023 (ESA 2024). Future management will continue to be informed by monitoring results.

Management Goal

- Maintain or enhance existing Orcutt's bird's-beak occurrences in Tijuana River Valley Regional Park to increase resilience to environmental and demographic stochasticity to support species persistence over the long term.

Monitoring Goals

- Conduct monitoring for Orcutt's bird's-beak populations at Tijuana River Valley Regional Park. Use status, habitat condition, and threats monitoring results to determine appropriate adaptive management actions to protect Orcutt's bird's-beak populations on DPR parks and preserves.
- Monitor and evaluate the response of Orcutt's bird's-beak to implemented management actions.

Management Objectives

- Control unauthorized human access within and adjacent to suitable habitat for Orcutt's bird's-beak, including closing and restoring unauthorized trails and roads (resulting from U.S. Border Patrol activities), and monitoring road maintenance to prevent road expansion or adjacent impacts.
- Control invasive non-native grasses and forbs and remove thatch within suitable habitat (documented and potential locations on mesas and along Smuggler's Gulch in Tijuana River Valley Regional Park) for Orcutt's bird's-beak to maintain sufficient open areas and reduce weed competition.
- Protect soils with fencing, signage and/or erosion control BMPs as necessary so they do not become eroded or impacted (e.g., compacted from trampling), and remediate erosion and/or scarify/decompact as needed.
- Collect Orcutt's bird's-beak seed during the summer and apply (can be applied the same day it is collected if weeds are sufficiently controlled) to enhance and potentially expand the spatial extent in Tijuana River Valley Regional Park as needed based on adaptive management recommendations. As part of this objective, delineate potential suitable habitat within Tijuana River Valley Regional Park for expanded or new occurrence locations.

Monitoring Objectives

- Conduct long-term monitoring following SDMMP's most recent MSP Rare Plant IMG Monitoring Protocol every 2 years. Long-term monitoring includes conducting a threats assessment for presence and percentage of invasive non-native grasses and forbs, documenting the disturbance category and taking notes regarding unauthorized trails, roads, and soil conditions, and discussing IMG management recommendations.
- Monitor and document seed collection and application within Tijuana River Valley Regional Park, if conducted as part of adaptive management. Monitor per SDMMP's most recent MSP Rare Plant IMG Monitoring Protocol to document changes in population density and extent.

Methods

1. **Coordinate with other entities prior to conducting management or monitoring as follows:**
    a. On-site DPR staff regarding the best time to conduct surveys based on site conditions, management needs, and newly observed locations.
    b. Regional monitoring partners, including SANDAG/SDMMP, regarding rare plant population surveys throughout western San Diego County to inform the regional monitoring program and ensure that efforts are not being duplicated and to minimize impacts on the species. Regional monitoring for Orcutt's bird's-beak occurs every 2 years and will occur in 2023 and 2025.
2. **Conduct reconnaissance surveys to establish baseline conditions for new Orcutt's bird's-beak populations. Monitor established Orcutt's bird's-beak populations at Tijuana River Valley Regional Park every 2 years following SDMMP protocols.**
    a. Establish baseline conditions for new Orcutt's bird's-beak populations.
        i. Conduct a reconnaissance survey and establish baseline conditions for Orcutt's bird's-beak in 2025. Permanent monitoring plot(s), photo-monitoring station(s), and baseline conditions will be established consistent with the most recent MSP Rare Plant IMG Monitoring Protocol (SDMMP 2022a).
    b. Conduct long-term monitoring, habitat assessment, and threats assessment following the most recent MSP Rare Plant Monitoring Protocol (SDMMP 2022a). Established permanent monitoring plots and photo-monitoring stations will be used. The protocol includes the following steps:
        i. Within established permanent monitoring plots, conduct occurrence status assessment as described in the protocol, using the Rare Plant Occurrence Monitoring Form. Count and record the number of individuals (complete counts). Individuals are identified by looking where stems come out of the ground. Stems that come out of the same location are considered one plant. If there are too many individuals to count, reevaluate the counting methodology following recommendations in McEachern and Sutter (2010).
        ii. Map the perimeter of the current extent of the occurrence. This will represent the maximum extent of the occurrence. In subsequent years, the occurrence may vary in size and the maximum extent will expand to include all areas occupied by the plant across survey years.
        iii. Conduct photo-monitoring as described in the protocol.
        iv. Conduct habitat assessment within the permanent monitoring plot using the Rare Plant Habitat and Threats Assessment Form.
        v. Conduct threats assessment within the maximum extent of the occurrence and an adjacent 10-meter buffer area Rare Plant Habitat and Threats Assessment Form.
        vi. Provide management recommendations for the site.

vii. Submit data annually to the SC-MTX website and SDMMP for incorporation in regional monitoring analysis.

c. Key Considerations:

i. Ensure that plants are at peak bloom when conducting surveys. Additional site visits may be necessary to ensure the appropriate timing of the fieldwork.

ii. Cut non-native biomass should be manually collected, bagged, and properly disposed of at an approved off-site facility.

iii. Monitoring is conducted by a qualified botanist who is able to identify vegetative and flowering forms of Orcutt's bird's-beak, as well as other native and non-native species.

3. Evaluate monitoring results and implement adaptive management actions as necessary.

a. Coordinate with SDMMP to evaluate monitoring results and identify management recommendations for the site. Implement adaptive management strategies as necessary. For example:

i. Removal of invasive non-native grasses and forbs within occupied habitat and suitable habitat areas (e.g., mesas and Smuggler's Gulch).

ii. Collection of Orcutt's bird's-beak seed within 3 weeks of seeing fruit and when the tips of the fruit capsule start to open, indicating the seed is ripe (likely late summer). The entire fruit capsule should be collected by hand before all seeds are dehisced (burst open). Seed can be stored in a low-moisture environment at refrigerated temperatures. Seed should be applied in the fall, prior to a rain event if feasible, and no later than December 1, in and around the known populations to enhance and potentially expand the spatial extent of the population.

iii. Installation of access control (e.g., fencing, signage) and erosion control BMPs to prevent habitat disturbance and erosion/soil compaction from unauthorized access in occupied and suitable habitat areas.

iv. Closure and restoration of unauthorized roads and trails in the vicinity of occupied and suitable habitat. Coordinate with U.S. Border Patrol regarding road closures.

v. Monitoring of road maintenance in the vicinity of occupied and suitable habitat to prevent road expansion into occupied and suitable habitat.

b. Coordinate with SDMMP prior to monitoring at least annually to identify any changes to the rare plant monitoring protocol or to evaluate new species-specific monitoring protocol or BMPs. Implement changes as necessary to monitoring and management efforts.

c. Five-year evaluation. At the end of 5 years, reevaluate data collection methods and the management strategy.

2.3.9 Variegated Dudleya (*Dudleya variegata*)

Federal/State/CRPR/MSCP/County Status: Not federally listed/not state-listed/1B.2/MSCP-covered, narrow endemic/County List A.

Habitat: Clay soils within chaparral, coastal sage scrub, or grassland. Sometimes found in association with vernal pools. Often found in rocky substrates.

Life History: Perennial dicot herb, succulent, corm. Blooms April–June. This species is cryptic and difficult to observe unless it is in bloom (Regan et al. 2006). Exhibits high inter-year variability in percentage of plants that bloom in a given year (K. Preston pers. comm.).

Threats: Invasive non-native plants, illegal trails, OHV activity, illegal goat grazing, and small occurrences vulnerable to demographic and environmental stochasticity (SDMMP and TNC 2017). The greatest threats to this species within DPR parks and preserves are invasive non-native plant species, thatch buildup, herbivory, and unauthorized human access.

Preserve-Level Status: This species is known to occur within Lusardi Creek and Sycamore Canyon/Goodan Ranch, and Dictionary Hill County Preserves.

Lusardi Creek County Preserve. One population occurs on Lusardi Creek County Preserve in grassland habitat within Huerhuero soils (moderately well-drained loam with a clay subsoil) and Olivenhain soils (well-drained deep cobbly loam) (ICF Jones and Stokes 2008; County DPR 2009). A baseline population assessment and establishment of one permanent monitoring plot within the preserve population was conducted on April 27, 2016 (ICF 2017). From 2016 to 2019, this species was monitored annually. From 2019 onward, the frequency for long-term monitoring was reduced to every 3 years, consistent with regional monitoring. Long-term monitoring was conducted in 2021 and 2023 to align with the regional monitoring frequency, which is scheduled to occur in 2025. Recent monitoring in 2023 estimates the Preserve population to be 9 individuals (ESA 2023a). Long-term monitoring is ongoing. Focused management was conducted in 2018, 2019, 2021, 2022, and 2023 (ESA 2023a; ESA 2023b). Future management will continue to be informed by monitoring results.

Sycamore Canyon/Goodan Ranch County Preserve. A couple of small populations occur east and west of the staging area on the northern portion of the preserve on friable clay soils in grassland habitat. A baseline population assessment and establishment of two permanent monitoring plots within the Sycamore Canyon/Goodan Ranch County Preserve population was conducted on June 23, 2017, and April 14, 2021 (ICF 2008b; County DPR 2009; ICF 2018a; ESA 2022a). From 2017 to 2019, this species was monitored annually. From 2019 onward, the frequency for long-term monitoring was reduced to every 3 years, consistent with regional monitoring. Long-term monitoring was conducted in 2021 and 2023 to align with regional monitoring frequency, which is scheduled to occur in 2025. Recent monitoring in 2023 estimates the Preserve population to be 1,348 individuals (ESA 2023a). Long-term monitoring is ongoing. Focused management was conducted in 2022 and 2023. Future management will continue to be informed by monitoring results.

Dictionary Hill County Preserve. Several small populations occur on Dictionary Hill County Preserve on rocky clay soils in grassland and coastal sage scrub habitat. One population has an estimated 1,000 plants (M. Dodero, pers. comm.). A reconnaissance survey and baseline population assessment will be conducted and a permanent monitoring plot(s) and photo-monitoring station(s) will be established in 2025, followed by long-term monitoring. Future management will be informed by annual monitoring results.

Management Goal

- Ensure persistence of variegated dudleya by maintaining and enhancing existing populations at Sycamore Canyon/Goodan Ranch County Preserve, Lusardi Creek County Preserve, and Dictionary Hill County Preserve.

Monitoring Goals

- Collect baseline information about variegated dudleya to provide a better understanding of abundance, population extent, plant condition, habitat condition, and potential threats within

Sycamore Canyon/Goodan Ranch County Preserve, Lusardi Creek County Preserve, and Dictionary Hill County Preserve.

- Conduct monitoring for variegated dudleya populations within DPR parks and preserves. Use status, habitat condition, and threats monitoring results to determine appropriate adaptive management actions to protect variegated dudleya populations on DPR parks and preserves.
- Monitor and evaluate the response of variegated dudleya to implemented management actions.

Management Objectives

- Maintain less than 20 percent ground cover of invasive non-native plant species in the vicinity of the variegated dudleya population. Implement additional appropriate adaptive management actions to protect the variegated dudleya on Dictionary Hill, Lusardi Creek, and Sycamore Canyon/Goodan Ranch County Preserves as indicated by the monitoring results (i.e., inspect and manage the species), annually. Management actions could include invasive non-native plant species control, access control, unauthorized trail closure, fuel management timing. and pre-fire management.

Monitoring Objectives

- Conduct long-term monitoring following SDMMP's most recent MSP Rare Plant IMG Monitoring Protocol every 3 years. Long-term monitoring consists of collecting covariate data on vegetation composition and cover, soils, invasive non-native plants, and other threats. Using the information collected, identify, or refine appropriate management actions.

Methods

1. **Coordinate with other entities prior to conducting management or monitoring as follows:**
    a. On-site DPR staff regarding the best time to conduct surveys based on site conditions, management needs, and newly observed locations.
    b. Friends of Sycamore Canyon/Goodan Ranch County Preserve regarding annual plant counts on the Sycamore Canyon/Goodan Ranch County Preserve as part of occurrence monitoring.
    c. Regional monitoring partners, including SANDAG/SDMMP, regarding rare plant population surveys throughout western San Diego County to inform the regional monitoring program and ensure that efforts are not being duplicated and to minimize impacts on the species. Regional monitoring for variegated dudleya occurs every 3 years.
2. **Conduct reconnaissance surveys to establish baseline conditions for the variegated dudleya populations at Dictionary Hill County Preserve. Monitor established variegated dudleya populations at Dictionary Hill, Lusardi Creek, and Sycamore Canyon/Goodan Ranch County Preserves every 3 years following SDMMP protocols.**
    a. Establish baseline conditions for new variegated dudleya populations.
        i. Conduct a reconnaissance survey and establish baseline conditions for variegated dudleya individuals in the Dictionary Hill County Preserve in 2025. Permanent monitoring plot(s), photo-monitoring station(s), and baseline conditions will be established consistent with the most recent MSP Rare Plant IMG Monitoring Protocol (SDMMP 2022a).
    b. Conduct long-term monitoring, habitat assessment, and threats assessment following the most recent MSP Rare Plant Monitoring Protocol (SDMMP 2022a). Established permanent monitoring plots and photo-monitoring stations will be used. The protocol includes the following steps:
        i. Within established permanent monitoring plots, conduct occurrence status assessment as described in the protocol, using the Rare Plant Occurrence Monitoring Form. Count and

record the number of individuals (complete counts). Individuals are identified by looking where stems come out of the ground. Stems that come out of the same location are considered one plant. If there are too many individuals to count, reevaluate the counting methodology following recommendations in McEachern and Sutter (2010).

ii. Map the perimeter of the current extent of the occurrence. This will represent the maximum extent of the occurrence. In subsequent years, the occurrence may vary in size and the maximum extent will expand to include all areas occupied by the plant across survey years.

iii. Conduct photo-monitoring as described in the protocol.

iv. Conduct habitat assessment within the permanent monitoring plot using the Rare Plant Habitat and Threats Assessment Form.

v. Conduct threats assessment within the maximum extent of the occurrence and an adjacent 10-meter buffer area Rare Plant Habitat and Threats Assessment Form.

vi. Provide management recommendations for the site.

vii. Submit data annually to the SC-MTX website and SDMMP for incorporation in regional monitoring analysis.

c. Key Considerations:

i. Ensure that plants are at peak bloom when conducting surveys. Additional site visits may be necessary to ensure the appropriate timing of the fieldwork.

ii. Monitoring is conducted by a qualified botanist who is able to identify vegetative and flowering forms of variegated dudleya, as well as other native and non-native species.

3. Conduct focused management annually.

a. Delineate a management area around each polygon (group) of plants. The management area includes the cumulative maximum extent and a buffer of 10 meters around plants or clumps. Map the perimeter of the management area so that it can be relocated in the future. Conduct annual invasive non-native plant species removal within the management area to maintain less than 20 percent cover of invasive non-native plants. Weeds next to variegated dudleya plants are pulled by hand. The remaining area can be controlled with herbicide or mechanical methods.

b. Implement access controls to avoid trampling or other routine management actions as determined by annual monitoring.

c. Key Considerations:

i. This activity must be conducted or supervised by a qualified biologist who is able to identify variegated dudleya plants, as well as other native and non-native plant species.

ii. Cut non-native biomass should be manually collected, bagged, and properly disposed of at an approved off-site facility.

iii. Use of herbicides on DPR parks and preserves is evaluated on a case-by-case basis and follows current County policies. A written pest control recommendation is required from a pest control advisor when herbicide is proposed for use by a non-County entity and must be approved by the County prior to implementation.

iv. Fuel management zone activities should be timed to occur after plants have dropped seed.

4. **Evaluate monitoring results and implement adaptive management actions as necessary.**
    a. Coordinate with SDMMP to evaluate monitoring results and identify management recommendations for the site. Implement adaptive management strategies as necessary.
    b. Coordinate with SDMMP prior to monitoring at least annually to identify any changes to the rare plant monitoring protocol or to evaluate new species-specific monitoring protocol or BMPs. Implement changes as necessary to monitoring and management efforts.
    c. Five-year evaluation. At the end of 5 years, reevaluate data collection methods and the management strategy. Variegated dudleya populations within DPR parks and preserves have had low numbers in recent years and face trampling, fuel management activities, invasive non-native plant, and dense thatch cover threats.

2.3.10 Heart-Leaved Pitcher Sage (*Lepechinia cardiophylla*)

Federal/State/CRPR/MSCP/County Status: Not federally listed/not state-listed/1B.2/MSCP-covered/County List A.

Habitat: Rocky fine sandy loams in cismontane woodlands and chaparral vegetation communities.

Life History: Perennial shrub. Blooms April–July. It has 1–3 cm white-to-lavender funnel-shaped flowers found at the end of delicate stems. Leaves are large, hairy, and heart shaped at their base (Jepson 2024). As the fruit matures, the calyx enlarges and turns scarlet purple, enclosing the developing round nutlets (SDMMP and TNC 2017; CNPS 2023). Reported to be a fire follower.

Threats: Development, potentially by road maintenance, powerline installation, and fuel break maintenance. There are only three isolated occurrences with a small number of individuals within San Diego County, making this species highly vulnerable to extirpation through demographic and environmental stochasticity (SDMMP and TNC 2017). Within the DPR parks and preserves, the greatest threat is small population size. More information is needed to evaluate additional threats and status of the population.

Preserve-Level Status: Heart-leaved pitcher sage occurs in the west-central portion of the Iron Mountain Preserve (Harris & Associates 2021). A reconnaissance survey and baseline population assessment will be conducted and permanent monitoring plot(s) and photo-monitoring station(s) will be established in 2025, followed by long-term monitoring.

Management Goal

- Ensure persistence of heart-leaved pitcher sage by maintaining and enhancing populations within the Iron Mountain County Preserve.

Monitoring Goals

- Conduct a baseline survey of the full extent of heart-leaved pitcher sage on Iron Mountain County Preserve to evaluate the species' status, habitat condition, and potential threats. Use status, habitat condition, and threats monitoring results to determine appropriate adaptive management actions to protect heart-leaved pitcher sage populations on DPR parks and preserves.
- Monitor and evaluate the response of heart-leaved pitcher sage within Iron Mountain County Preserve to adaptive management within selected populations for 5 years.

Management Objectives

- Maintain less than 20 percent absolute cover of invasive non-native plant species. Implement focused management for populations on Iron Mountain County Preserve, as needed. Conduct invasive non-native plant species removal and thatch removal as needed.
- Based on the results of monitoring (species, habitat condition, and threats), determine if potential threats are negatively affecting the species, and implement additional adaptive management actions as necessary (i.e., inspect and manage the species, summer seed collection and application, control unauthorized human access within suitable habitat, and close and restore unauthorized trails and roads).

Monitoring Objectives

- Collect baseline data on the status, habitat condition, and threats for new heart-leaved pitcher sage populations (e.g., Iron Mountain County Preserve, reported by Harris & Associates [2021]).
- Conduct long-term monitoring following SDMMP's most recent MSP Rare Plant IMG monitoring protocol every 2 years to ensure consistency in data collection across the MSPA. Using the information collected, identify or refine appropriate management actions. Long-term monitoring includes conducting a threats assessment for presence and percentage of invasive non-native grasses and forbs, documenting the disturbance category and taking notes regarding unauthorized trails and roads, and discussing IMG management recommendations.

Methods

1. **Coordinate with other entities conducting rare plant surveys.**
    a. On-site DPR staff regarding the best time to conduct surveys based on site conditions, management needs, and newly observed locations.
    b. Regional monitoring partners, including SANDAG/SDMMP, regarding rare plant population surveys throughout western San Diego County to inform the regional monitoring program and ensure that efforts are not being duplicated and to minimize impacts on the species. Regional monitoring is not currently being conducted for heart-leaved pitcher sage.
2. **Conduct reconnaissance surveys to establish baseline conditions for the heart-leaved pitcher sage at Iron Mountain County Preserve. Monitor established heart-leaved pitcher sage populations every 2 years following SDMMP protocols.**
    a. Establish baseline conditions for new heart-leaved pitcher sage populations.
        i. Conduct a reconnaissance survey during the blooming period (April–July) on a year with average or higher rainfall and establish baseline conditions for heart-leaved pitcher sage in 2025.
        ii. Establish permanent monitoring plot(s), photo-monitoring station(s), and baseline conditions within Iron Mountain County Preserve consistent with the most recent MSP Rare Plant IMG Monitoring Protocol (SDMMP 2022a).
            - Permanently mark monitoring plot(s) center point and photo point locations using metal rebar and tag and, using a GPS with submeter accuracy, collect GPS coordinates of these locations to ensure that the plots can be relocated easily in the future.
    b. Conduct long-term monitoring, habitat assessment, and threats assessment following the most recent MSP Rare Plant Monitoring Protocol (SDMMP 2022a). Established permanent monitoring plots and photo-monitoring stations will be used. The protocol includes the following steps:
        i. Within each permanent monitoring plot, conduct occurrence status assessment as described in the protocol, using the Rare Plant Occurrence Monitoring Form.

ii. Map the perimeter of the current extent of the occurrence. This will represent the maximum extent of the occurrence. In subsequent years, the occurrence may vary in size and the maximum extent will expand to include all areas occupied by the plant across survey years.

iii. Conduct photo-monitoring as described in the protocol.

iv. Conduct habitat assessment within the permanent monitoring plot using the Rare Plant Habitat and Threats Assessment Form.

v. Conduct threats assessment within the maximum extent of the occurrence and an adjacent 10-meter buffer area Rare Plant Habitat and Threats Assessment Form.

vi. Provide management recommendations for the site.

vii. Submit data following monitoring to the SC-MTX website and SDMMP for incorporation in regional monitoring analysis.

c. Key Considerations:

i. Ensure that plants are at peak bloom when conducting surveys. Additional site visits may be necessary to ensure the appropriate timing of the fieldwork.

ii. Monitoring is conducted by a qualified botanist who is able to identify heart-leaved pitcher sage, as well as other native and non-native plant species.

3. Conduct focused invasive non-native plant species removal as needed.

a. Delineate a management area around each plant or clump of plants. The management area includes the cumulative maximum extent and a buffer of 10 meters around plants or clumps. Conduct annual invasive non-native plant species removal within management area to maintain less than 20 percent cover of invasive non-native plants. Invasive non-native plants next to heart-leaved pitcher sage plants should be pulled by hand. The remaining area can be controlled with herbicide or mechanical methods.

b. Implement access controls to avoid damage and/or trampling or other routine management actions as determined by annual monitoring.

c. Key Considerations:

i. This activity must be conducted or supervised by a qualified biologist who is able to identify heart-leaved pitcher sage plants, as well as other native and invasive non-native plant species.

ii. Use of herbicides on DPR parks and preserves is evaluated on a case-by-case basis and follows current County policies. A written pest control recommendation is required from a pest control advisor when herbicide is proposed for use by a non-County entity and must be approved by the County prior to implementation.

iii. Because the phenology of invasive non-native plants varies among species and rain events can trigger growth events, multiple visits may be necessary for effective control using herbicides.

iv. Hand removal is timed with the following considerations: (a) hand removal is conducted when the soil is dry to reduce soil disturbance, and (b) removal of invasive non-native plant species, especially invasive non-native grass species, is conducted prior to seed set. Cut non-native biomass should be manually collected, bagged, and properly disposed of at an approved off-site facility.

4. **Evaluate monitoring results and implement additional adaptive management actions as necessary.**
    a. Coordinate with SDMMP to evaluate monitoring results and identify management recommendations for the site. Implement adaptive management strategies as necessary. For example:
        i. Remove thatch and invasive non-native grasses within and adjacent to the population.
        ii. Collect heart-leaved pitcher sage seed during late summer (i.e., after the species April-July flowering period) and apply seed during the late fall, after the start of the rainy season, to enhance and potentially expand the spatial extent of the population.
        iii. Install access control (e.g., fencing, signage) and erosion control BMPs to prevent habitat disturbance and erosion/soil compaction from unauthorized access.
        iv. Close and restore unauthorized roads and trails in the vicinity of occupied and suitable habitat.
    b. Coordinate with SDMMP prior to monitoring to identify any changes to the rare plant monitoring protocol or to evaluate new species-specific monitoring protocol or BMPs. Implement changes as necessary to monitoring and management efforts.
    c. Five-year evaluation. At the end of 5 years, reevaluate data collection methods and the management strategy.

2.3.11 Willowy Monardella (*Monardella viminea*)

Federal/State/CRPR/MSCP/County Status: Federally listed as endangered/state-listed as endangered/1B.1/MSCP-covered, narrow endemic/County List A.

Habitat: Rocky, coarse, and sandy alluvial, ephemeral drainages and washes within chaparral, coastal sage scrub, riparian scrub, riparian forest, or woodland habitat. Sandy soils along streams with generally a southern aspect (SDNHM 2018a).

Life History: Perennial dicot herb with a woody base. Blooms late May–August. Peak flowering time occurs from early June to mid-July and is the best time to conduct surveys (Rebman and Dossey 2006). Forms clusters or colonies of plants and sends out runners. Reproduces both by seed and asexually via vegetative shoots (AECOM 2022).

Threats: Altered hydrology and erosion, increasing urbanization and development around suitable habitat, urban runoff, altered fire regime, drought, invasive non-native plants, inviable seeds, and poor recruitment; small occurrences are vulnerable to demographic and environmental stochasticity (Rebman and Dossey 2006; AECOM 2022). Within DPR parks and preserves, the primary threats are altered hydrology and invasive non-native plant species.

Preserve-Level Status: A population of approximately 300–400 occurs along two unnamed drainages within the southern portion of the Sycamore Canyon/Goodan Ranch County Preserve. A second small population area occurs further south along the same drainage in the recently acquired 20-acre Sycamore South parcel. A third small population area occurs near the western border of this Preserve, downstream from populations on City of San Diego Multi-Habitat Planning Area. A baseline population assessment and establishment of three permanent monitoring plots within the Sycamore Canyon/Goodan Ranch

County Preserve population was conducted on July 7, 2015, June 22, 2016, and June 9, 2021 (ICF 2015; ICF 2017; ESA 2022a). Long-term monitoring is ongoing and was conducted in 2021, 2022, and 2023. Focused management targeting invasive non-native plant species and competitive native plants was conducted in 2023 (ESA 2024). Future management will continue to be informed by monitoring results.

Management Goal

- Ensure persistence of willowy monardella by maintaining and enhancing populations within the Sycamore Canyon/Goodan Ranch County Preserve.

Monitoring Goals

- Conduct a baseline survey of the full extent of willowy monardella on Sycamore Canyon/Goodan Ranch County Preserve to evaluate the species' status, habitat condition, and potential threats.
- Conduct monitoring for willowy monardella populations within Sycamore Canyon/Goodan Ranch County Preserve. Use status, habitat condition, and threats monitoring results to determine appropriate adaptive management actions to protect willowy monardella populations on DPR parks and preserves.
- Monitor and evaluate the response of willowy monardella within Sycamore Canyon/Goodan Ranch County Preserve to invasive non-native plant species management and thatch removal within selected populations for 5 years.

Management Objectives

- Implement focused management for target populations on Sycamore Canyon/Goodan Ranch County Preserve. Maintain less than 10 percent cover non-native species and thatch around plants in high-intensive weed management areas (i.e., hand-weeded) and maintain less than 20 percent cover of invasive weed in the spaces between high-intensive weed management areas in management areas.
- Management objectives and actions related to altered hydrology will be developed by SDMMP based on the results of a regional hydrological study that will be conducted to assess stream morphology and its impacts on the species (K. Preston pers. comm.).

Monitoring Objectives

- Conduct long-term monitoring following SDMMP's most recent MSP Rare Plant IMG Monitoring Protocol annually to evaluate the response of willowy monardella populations to focused management actions. Long-term monitoring consists of collecting covariate data on vegetation composition and cover, soils, invasive non-native plants, and other threats. Using the information collected, determine if specific threats are having a detrimental effect on the species, and identify or refine appropriate management actions.

Methods

1. **Coordinate with other entities prior to conducting management or monitoring as follows:**
    a. On-site DPR staff regarding the best time to conduct surveys based on site conditions, management needs, and newly observed locations.
    b. Friends of Sycamore Canyon/Goodan Ranch County Preserve regarding annual plant counts on the Sycamore Canyon/Goodan Ranch County Preserve as part of occurrence monitoring.
    c. Regional monitoring partners, including SANDAG/SDMMP, regarding rare plant population surveys throughout western San Diego County to inform the regional monitoring program and ensure that

efforts are not being duplicated and to minimize impacts on the species. Regional monitoring for willowy monardella occurs annually.

d. San Diego Natural History Museum regarding plant collection for genetic studies.

2. Conduct focused invasive non-native plant species removal as needed.

a. Delineate management area boundaries prior to conducting invasive non-native plant species removal and collect GPS coordinates for the management area so that they can be found easily in subsequent years.

b. Management methods are based on discussions with M. Kelly (M. Kelly, pers. comm.). Management plots will consist of two areas: (1) more intensive hand-weeding around clusters of plants, and (2) slightly less intensive weeding within the remaining portion of the treatment plot. Delineate (using a submeter GPS unit) and flag high-intensive management areas approximately 2- to 3-foot buffer around clusters willowy monardella plants. Flag the perimeter of both treatment and control areas. **Figure 34** shows what the treatment plot might look like. The dark green areas represent clusters of willowy monardella plants, the orange areas within the treatment plot represent the more intensive hand-weeding treatment, and the yellow area represents the less intensive treatment area.

c. Within each high-intensive management area (orange areas in Figure 34), hand weed to bare ground, removing at least 90 percent of invasive non-native plants and thatch. This activity must be conducted or supervised by a qualified biologist who is able to identify willowy monardella, as well as other native and non-native plant species.

d. Within the remaining area of the treatment plot (yellow areas in Figure 34), remove at least 80 percent of invasive non-native species using an appropriate herbicide for stream habitats.

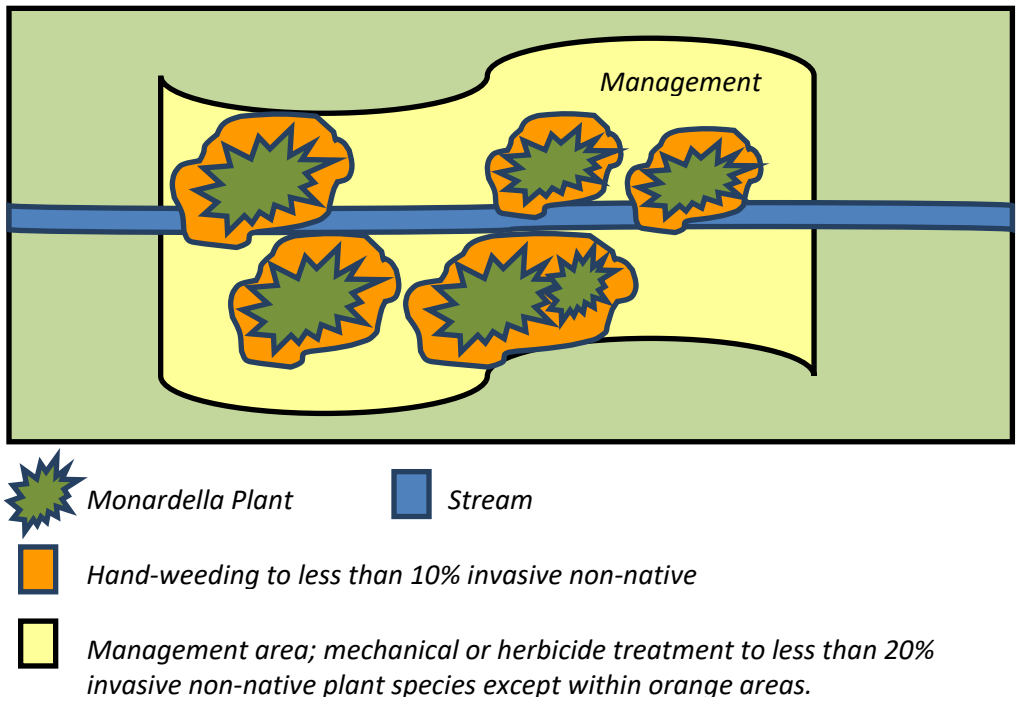


Figure 34
Willowy Monardella Management Area Diagram

e. Key Considerations:

i. This activity must be conducted or supervised by a qualified biologist who is able to identify willowy monardella plants, as well as other native and non-native plant species.

ii. Cut non-native biomass should be manually collected, bagged, and properly disposed of at an approved off-site facility.

iii. Use of herbicides on DPR parks and preserves is evaluated on a case-by-case basis and follows current County policies. A written pest control recommendation is required from a pest control advisor when herbicide is proposed for use by a non-County entity and must be approved by the County prior to implementation.

3. Monitor the willowy monardella population at Sycamore Canyon/Goodan Ranch County Preserve annually.

a. Conduct long-term monitoring following the most recent MSP Rare Plant Monitoring Protocol (SDMMP 2022a). Establish permanent monitoring plots and photo-monitoring stations will be used. The protocol includes the following steps:

i. Conduct occurrence status assessment as described in the protocol, using the Rare Plant Occurrence Monitoring Form. When counting, conduct a complete count. Counting units are clusters or patches of willowy monardella. A cluster is defined as plants within 0.5 meters of one another (Rebman and Dossey 2006).

ii. Map the perimeter of the current extent of the occurrence. This will represent the maximum extent of the occurrence. In subsequent years, the occurrence may vary in size and the maximum extent will expand to include all areas occupied by the plant across survey years.

iii. Conduct photo monitoring as described in the protocol.

iv. Conduct habitat assessment within the permanent monitoring plot using the Rare Plant Habitat and Threats Assessment Form.

v. Conduct threats assessment within the maximum extent of the occurrence and an adjacent 10-meter buffer area Rare Plant Habitat and Threats Assessment Form.

vi. Provide management recommendations for the site.

b. Collect additional monitoring data (see Rebman and Dossey 2006):

i. Record the number of patches, area covered by the patches, and volume of patches.

ii. Characterize the growth stages of the plants in each patch as follows:

- Seedling: lacks multiple stems and is under 4 inches tall
- Juvenile: lacks multiple stems and is more than 4 inches tall
- Mature: more than 4 inches tall and has fewer than 20 stems
- Adult: more than 4 inches tall and has more than 20 stems

c. Submit data annually to the SC-MTX website and SDMMP for incorporation in regional monitoring analysis.

d. Key Considerations:

i. This activity must be conducted by a qualified biologist who is able to identify vegetative and flowering willowy monardella plants, as well as other native and non-native plant species.

ii. Conduct surveys during the peak blooming period (June through mid-July).

4. Evaluate monitoring results and implement adaptive management actions as necessary.

a. Coordinate with SDMMP to evaluate monitoring results and determine (1) if threats, such as habitat and hydrological changes, lack of recruitment, invasive non-native plant species, or drought conditions, are having a detrimental effect on the population, and (2) additional adaptive management actions that to be implemented to protect the species, such as seed collection, banking, and bulking (AECOM 2022).

b. Coordinate with SDMMP prior to monitoring at least annually to identify any changes to the rare plant monitoring protocol or BMPs. Implement changes as necessary to annual monitoring and management efforts.

c. Five-year evaluation. At the end of 5 years, reevaluate data collection methods and the management treatment and thresholds based on the response of willow monardella populations within and outside of treatment areas.

2.3.12 Harbison's Dun Skipper (*Euphyes vestris harbisoni*)

Federal/State/CRPR/MSCP/County Status: Not federally listed/not state-listed/County Group 1.

Habitat: Inhabits creeks and drainages with San Diego sedge (*Carex spissa*), the only known host plant for this species, which typically occurs within shaded oak riparian woodland habitats (Marschalek and Deutschman 2018). Harbison's dun skipper adults may also occur within sycamore and willow riparian habitats, and although skippers remain close to their host plants, they have been documented feeding on a variety of nectar sources, typically with white, pink, or purple flowers (Marschalek and Deutschman 2016; Marschalek and Deutschman 2018).

Life History: Females deposit eggs on the underside of San Diego sedge host plant where hibernaculum of larva and pupa occurs until adults emerge in late spring or early summer (Marschalek and Deutschman 2015). Adults have been recorded from mid-May to mid-July and remain close to their larval food source while foraging on white, pink, or purple flowers (Marschalek and Deutschman 2018).

Threats: Threats include reproductive dependency upon San Diego sedge, habitat alteration/loss, altered fire regime, drought, grazing, and habitat degradation from invasive non-native plant species and tree pests (goldspotted oak borer [*Agrilus coxalis*]) (Marschalek and Deutschman 2015; Marschalek and Deutschman 2016; SDMMP and TNC 2017; Marschalek 2021). Limited nectar sources adjacent to larval host plants appears to be the biggest threat to this species within DPR parks and preserves.

Preserve-Level Status: Suitable habitat is known to occur within Hellhole Canyon and Sage Hill County Preserves. Species is present within Hellhole Canyon County Preserve.

Hellhole Canyon County Preserve. Species is known to occur in Hellhole Canyon County Preserve in very low numbers. Focused surveys occurred in 2013, 2014, 2016, 2017, 2021, 2022, and 2023. Daily maximum counts ranged from 0 to 4 individuals (Marschalek and Deutschman 2016; Marschalek and Deutschman 2018; Marschalek 2021; ESA 2022a; ESA 2023a; ESA 2023a; ESA 2024; Marschalek 2021). Baseline host plant mapping was conducted on April 22–23, 2021, within Hellhole Canyon County Preserve. The distribution and density of San Diego sedge within suitable willow riparian and oak riparian woodland habitats associated with Hell Creek and its southern tributary was documented (ESA 2022a). Long-term monitoring is ongoing. Focused management consisting of non-native annual removal and

reseeding with native nectar sources for Harbison's dun skipper was conducted within occupied habitat in the fall of 2023 (ESA 2023) and is expected to continue through 2025. Future management will continue to be based on monitoring results.

Sage Hill County Preserve. Host plant mapping for this species was conducted in 2022 during baseline biodiversity surveys, and species has the potential to occur on-site.

Management Goal

- Maintain or enhance Harbison's dun skipper occupied habitat, historically occupied habitat, and the landscape connections between them to create resilient, self-sustaining populations and species persistence over the long term within Hellhole Canyon County Preserve and Sage Hill County Preserve.

Monitoring Goals

- Conduct surveys to collect information on host plant (San Diego sedge) distribution and adult, larval, and hibernaculum surveys to document the butterfly's current distribution and population size and threat data to inform management needs.
- Conduct monitoring for Harbison's dun skipper populations within Hellhole Canyon County Preserve and Sage Hill County Preserve. Use status, habitat condition, and threats monitoring results to determine appropriate adaptive management actions to protect and enhance Harbison's dun skipper populations on DPR parks and preserves.
- Monitor and evaluate the response of Harbison's dun skipper to implemented management actions.

Management Objectives

- Control invasive non-native plant species that may outcompete oak woodlands that provide habitat for San Diego sedge, including arundo and other invasive non-native plants.
- If occurring, control invasive tree pests such as goldspotted oak borer and shot hole borer (*Euwallacea* spp.) that infest oak woodlands that provide habitat for San Diego sedge and treat or remove severely infested trees.
- Restore or enhance oak woodlands after a wildfire to maintain San Diego sedge populations.
- Implement seeding of potential native nectar sources (e.g., hedge nettle [*Stachys rigida*], cobweb thistle [Cirsium occidentale], California loosestrife [*Lythrum californicum*], and chaparral bushmallow [*Malacothamnus fasciculatus*]) around larval host plants within suitable willow riparian and oak riparian woodland habitat.

Monitoring Objectives

- Conduct host plant mapping every 5 years, or following a change in conditions (e.g., heavy rains, fire, drought).
- Monitor adult Harbison's dun skipper populations annually during the flight season to assess population size, annual variation in population size, and effects of management actions on population size.
- Monitor and document presence/absence of goldspotted oak borer and shot hole borer in oak woodlands and riparian habitats.
- Using the information collected, identify or refine appropriate management actions.

Methods

1. **Coordinate with other entities prior to conducting management or monitoring as follows:**
    a. SANDAG/SDMMP regarding San Diego sedge and Harbison's dun skipper surveys throughout western San Diego County to inform the regional monitoring program. Regional monitoring is conducted annually.
    b. Regional monitoring partners regarding monitoring and management activities to ensure that efforts are not being duplicated and to minimize impacts on the species.
2. **Map locations of host plant, San Diego sedge, within Hellhole Canyon and Sage Hill County Preserves every 5 years.**
    a. Conduct host plant mapping every 5 years, or following a change in conditions (e.g., heavy rains, fire, drought). If larvae are detected incidentally during host plant mapping, occurrences will be mapped.
    b. Prior to surveying, perform a literature and data review of all documented San Diego sedge locations within Hellhole Canyon County Preserve, including San Diego Natural History Museum's Plant Atlas, Calflora, SDMMP's MOM database, and biological reports pertaining to Hellhole Canyon County Preserve. In addition, review vegetation maps and aerial imagery to assess the potentially suitable riparian woodland habitat within Hellhole Canyon County Preserve areas to be surveyed for host plant, with the primary focus on oak riparian woodlands.
    c. Map the locations of San Diego sedge plants and estimate counts. Incorporate this mapping into a GIS shapefile.
    d. As an optional task, perform a larval survey concurrently with this task during hibernaculum (February to early May) to refine locations for adult surveys and inform management.
3. **Conduct surveys for Harbison's dun skipper annually, within Hellhole Canyon and Sage Hill County Preserves.**
    a. Conduct annual adult surveys during the flight season between May 15 through June 30. Because the flight season is short—only 4 to 6 weeks at any one site—two surveys are performed within this period (Marschalek and Deutschman 2015). Surveys focus on immediate areas surrounding San Diego sedge locations and work outward to nearby potential nectar sources. Surveys are conducted in appropriate weather (sunny or partly sunny, 68–95°F, and modest wind speeds of less than 15 mph) (Marschalek and Deutschman 2015). Potential nectar sources and all butterfly species observed during surveys are recorded.
4. **Conduct habitat condition and threat assessments in the vicinity of San Diego sedge annually, within Hellhole Canyon and Sage Hill County Preserves.**
    a. Habitat assessments refer to *Rare Butterfly Management and Conservation Planning* (Marschalek and Deutschman 2016) and consist of assessing tree species, composition of tree canopy, percent of canopy that is thinning, percent of dead trees, and percent of trees with fire damage. General health conditions of San Diego sedge include if leaves are green, green with brown tips, or mostly brown. Presence of flowing and standing water is also recorded.
    b. Threats to habitat are assessed, including drought, climate change, human intrusion, pesticide use, altered hydrology, altered fire regime, invasive non-native plant species including native cattail (*Typha* spp.) that can outcompete San Diego sedge and tree pests.
    c. Trees are monitored for signs and symptoms of goldspotted oak borer and shot hole borer in accordance with the methods outlined in the DPR Emergent Tree Pests Plan.
    d. Preliminary adaptive management recommendations are noted during surveys.

5. Evaluate monitoring results and implement the following adaptive management actions as necessary.

a. Review monitoring results to determine (1) if identified threats are having a direct negative effect on the species or habitat, (2) if adaptive management actions need to be implemented, and/or (3) if adaptive management actions that have been previously implemented are functioning as expected.

b. Provide adaptive management recommendations, if any, based on monitoring results and include in the TMP annual report. These are included in the monitoring data sheets. Adaptive management recommendations may include the following:

   i. Seeding of potential nectar source (e.g., hedge nettle, cobweb thistle, California loosestrife, and chaparral bushmallow) around larval host plants within suitable willow riparian and oak riparian woodland habitat.

   ii. Removal of invasive non-native plants from creeks and drainages supporting San Diego sedge.

   iii. Removal of isolated trees with goldspotted oak borer or shot hole borer infestations, per UC Riverside guidelines. Tree maintenance occurs outside of Harbison's dun skipper flight season and nesting bird season to avoid impacts to Harbison's dun skipper and nesting birds.

   iv. Access control measures to prevent habitat disturbance from human intrusion into key habitat areas.

c. Incorporate adaptive management recommendations into the preserve's annual work plan and coordinate with on-site DPR staff to implement actions.

d. Submit monitoring and management data to the SC-MTX website and SDMMP for incorporation in regional monitoring analysis.

e. Five-year evaluation. At the end of 5 years, reevaluate the species-specific goals, objectives, and methods in the TMP.

2.3.13 Arroyo Toad (*Anaxyrus californicus*)

Federal/State/MSCP/County Status: Federally listed as endangered/state species of special concern/MSCP-covered, narrow endemic/County Group 1.

Habitat: Breeding habitat consists of slow-moving perennial or intermittent streams with shallow, sandy to gravelly pools adjacent to sand or fine gravel terraces. This stream habitat is dynamic, with marked seasonal and annual fluctuations in rainfall and flooding, resulting in regular, natural disturbance (USFWS 2000). Non-breeding season habitat consists of adjacent uplands, such as grassland, coastal sage scrub, chaparral, or oak woodland.

Life History: Arroyo toads generally breed in stream pools between early to mid-March and early July. The remainder of the year is spent aestivating in adjacent upland habitat.

Threats: General species threats are as follows.

a. Non-native wildlife (e.g., predators), such as the American bullfrog and red swamp crayfish (*Procambarus clarkii*) may result in the direct loss of arroyo toads and affect population size.

b. Altered hydrology resulting in the loss of coarse sediments, the modification of the channel from the American beaver (*Castor canadensis*), an increase in vegetation density due to the decrease or

elimination of scouring flows (e.g., drought), or a substantial increase of heavy flows during the breeding season that results in the washing of larvae and egg strands downstream.

c. Livestock grazing resulting in the crushing of individuals (i.e., larvae, juveniles/subadults, and adults), egg strands, and burrows; and the compaction of soil. Livestock can alter hydrology when they enter the bed and banks of the water channel. This increases sedimentation downstream and has the potential to affect the way the aquatic resource conveys water.

d. Non-native plant species, particularly giant reed (*Arundo donax*), tamarisk (*Tamarix* spp.), and Uruguayan primrose (*Ludwigia hexapetala*), may alter the natural hydrology of both waterways by eliminating sandbars, breeding pools, and infesting immediately adjacent, upland habitats.

e. Chytridiomycosis, an infectious amphibian disease caused by a fungus (*Batrachochytrium dendrobatidis*), may infect arroyo toads and affect population size (USFWS 2009b).

Preserve-specific threats are as follows.

Ramona Grasslands County Preserve. Primary site-specific threats include non-native wildlife (e.g., predators) such as American bullfrogs and red swamp crayfish and presence of invasive non-native plant species. In 2021, trampling by cattle was also observed as a threat to arroyo toad; however, this was not identified as a threat during 2023 surveys.

Santa Margarita County Preserve. Primary site-specific threats include unauthorized human access, presence of invasive non-native plant species, presence of non-native predators, and potential alterations to upstream hydrology. Altered hydrology results in unseasonably high flows within the Santa Margarita River which may result in viable clutches (i.e., egg strands and larvae) being washed downstream. High flows may be the most significant limiting factors for the species in Santa Margarita. American beaver was documented during 2021 surveys; however, no adverse effects from American beaver were documented due to the significance of the high flows.

San Luis Rey River Park. Primary site-specific threats include presence of invasive non-native wildlife (e.g., predators) such as American bullfrogs and red swamp crayfish and potential alterations to upstream hydrology, resulting in unseasonably low or high flows within the San Luis Rey River. This may cause a lack of suitable breeding pools or result in viable clutches (i.e., egg strands and larvae) being washed downstream.

Wilderness Gardens County Preserve. Primary site-specific threats include presence of invasive non-native wildlife (e.g., predators) such as American bullfrogs and red swamp crayfish, fire, and potential alterations to upstream hydrology, resulting in unseasonably low or high flows within the San Luis Rey River. This may cause a lack of suitable breeding pools or result in viable clutches (i.e., egg strands and larvae) being washed downstream.

Preserve-Level Status: The arroyo toad occurs within Ramona Grasslands and Santa Margarita County Preserves and San Luis Rey River Park.

Ramona Grasslands County Preserve. Arroyo toad was documented within Santa Maria Creek, west of Rangeland Road, primarily downstream from the Ramona Municipal Water District Property (ICF 2010). There are no historic detections of the species east of Rangeland Road. USGS established 23 survey reaches: 22-30, 33-45, 52-53, which are each divided into two survey segments (A and B). Monitoring

was conducted in 2016, 2018, 2021, 2022, and 2023 to document occupancy and breeding of arroyo toads, habitat conditions, and threats to arroyo toad (ICF 2017; ICF 2018b; ESA 2022a; ESA 2023a; ESA 2024). Of the 18 reaches surveyed during the 2023 monitoring surveys, a total of 12 reach segments supported breeding and larval toad development (ESA 2024). Long-term monitoring is ongoing. The *Ramona Grasslands, Santa Ysabel, and Boulder Oaks Preserves Grazing Management Plan* (ESA 2019) provides guidance for the management of natural resources through grazing on Ramona Grasslands County Preserve. This plan identifies multiple goals and objectives, including to maintain and improve habitat for arroyo toad at Ramona Grasslands County Preserve. The plan also identifies RDM monitoring targets to manage grazing prescriptions. RDM monitoring occurred in 2016–2023, with the exception of 2020 due to the COVID-19 pandemic and the associated stay-at-home order.

Santa Margarita County Preserve. Species was detected in the Santa Margarita River in 2011 within the Santa Margarita County Preserve (ICF 2012). Because of the degree of water velocity and water height in the Santa Margarita River, ongoing monitoring has been suspended.

San Luis Rey River Park. Species was detected in the San Luis Rey River in 2006 within the San Luis Rey River Park (Caltrans 2010) and at additional acquisition parcels in 2013 (WRA 2014) and critical habitat is present within the San Luis Rey River Park. Two survey reaches have been established by USGS, which will be referenced during monitoring surveys to ensure adequate coverage within the San Luis Rey River Park.

Wilderness Gardens County Preserve. Arroyo toad was not detected during baseline surveys in 2009; however, the species was documented within 5 miles of the Wilderness Gardens County Preserve, within the San Luis Rey River (MBA 2010b). Critical habitat is present within the Wilderness Gardens County Preserve. USGS has been performing surveys within the Wilderness Gardens County Preserve through a DPR issued Right-of-Entry permit. The most recent citing by USGS in 2023 was a deceased individual adult (pers comm. USGS); surveys within the Wilderness Gardens County Preserve by USGS are ongoing.

Management Goals

- Ensure the persistence of arroyo toads within the Ramona Grasslands County Preserve, Santa Margarita County Preserve, and San Luis Rey River Park by maintaining and enhancing breeding and adjacent upland habitat.
- Preserve the natural geomorphological conditions within the San Luis Rey River, Santa Maria Creek (including upstream portions of the creek), and the Santa Margarita River to promote arroyo toad breeding and preserve existing habitat.

Monitoring Goal

- Monitor the status (occupancy and evidence of breeding) and evaluate the response of arroyo toads on the Ramona Grasslands County Preserve, Santa Margarita County Preserve, and San Luis Rey River Park to the management of vegetation and non-native predator control.

Management Objectives

- Maintain the arroyo toad population on the San Luis Rey River Park, Ramona Grasslands County Preserve and Santa Margarita County Preserve. Based on the results of the annual monitoring and threats assessment, conduct adaptive management actions as necessary (i.e., inspect and manage the species).

Monitoring Objectives

- Evaluate the status of arroyo toad populations within San Luis Rey River at San Luis Rey River Park, Santa Maria Creek at Ramona Grasslands County Preserve and the Santa Margarita River within Santa Margarita County Preserve annually.
- Evaluate the habitat condition (collect covariate data) and identify potential threats to arroyo toads on San Luis Rey River Park, Ramona Grasslands County Preserve and Santa Margarita County Preserve annually, such as a prevalence of non-native predators or non-native plant species, or obvious changes to hydrology that may affect arroyo toad breeding.
- Monitor the effectiveness of the grazing program to reduce the cover of thatch and invasive non-native plant species within Grazing Management Unit 1A at Ramona Grasslands County Preserve as described in the *Ramona Grasslands, Santa Ysabel, and Boulder Oaks Preserves Grazing Management Plan* (ESA 2019). Use the monitoring data to inform adaptive management actions.
- Based on the results of the threats assessment, habitat condition assessment (including assessment of the effects of grazing), and species status surveys, evaluate whether the identified potential threats are having a negative impact on the resident arroyo toads and breeding success/recruitment.

Methods

1. **Coordinate with other entities prior to conducting management or monitoring as follows:**
    a. SANDAG/SDMMP regarding surveys throughout western San Diego County to inform the regional monitoring program. Regional monitoring is conducted annually by USGS (funding through 2026).
    b. SDMMP and USGS regarding regional and site-specific objectives, monitoring methods, analysis of results, and adaptive management measures to consider implementing. This includes adjustments to survey timing, monitoring methods, whether to forego monitoring due to drought conditions, and appropriate interval and level of effort for predator eradication efforts.
    c. Regional monitoring partners regarding monitoring and management activities to ensure that efforts are not being duplicated and to minimize impacts on the species.

2. **Monitor the status of arroyo toad, evaluate the condition of the habitat, and identify potential threats annually along San Luis Rey River within San Luis Rey River Park, Santa Maria Creek within Ramona Grasslands County Preserve, and along the Santa Margarita River within Santa Margarita County Preserve.**
    a. Conduct surveys along each USGS-established 125-meter survey segment, within San Luis Rey River Park, Ramona Grasslands and Santa Margarita County Preserves.
    b. Conduct daytime surveys according to the *USGS Aquatic Species and Habitat Assessment Protocol Rivers, Streams, and Creeks-Paper* (USGS 2020) for arroyo toad in each 125-meter survey reach during the breeding season (March through June). The species status will be assessed by documenting presence of egg strands and larvae (or any other life stage). The survey must be conducted when water is present and the toads are breeding, which generally falls within an average to above-average rain year.
    c. Follow the USGS survey protocol closely during surveys. The primary surveyor must be able to identify arroyo toad eggs and tadpoles. General survey methods, based on the protocol, are paraphrased below:
        - Prepare for the site visit; ensure that the USGS reaches are mapped within each preserve and prepare a field kit with all appropriate equipment, including electronic field data collection forms.

- Navigate to the site and collect preliminary data beginning at the starting point for the segment, including reach number, weather conditions, etc. The surveyor will be walking upstream from the beginning of one reach to the end. The surveyor will continue to collect data along each waterway, until the end of each DPR park or preserve is reached. A separate datasheet will be filled out for each survey segment.
- Collect information regarding vegetation composition, presence/absence of breeding habitat, and water quality/stream measurements along each survey reach.
- Using the "visual encounter" method, search for arroyo toads (or any non-native/invasive plants or predators) along each segment, documenting any observations made. All life stages of the arroyo toad are documented during each survey.
- Document any disturbances (e.g., human and/or livestock) to habitat.
- At the end of the survey, clean and disinfect boots and all equipment in a 16:1 water/bleach mixture to prevent the spread of pathogens.

d. Note preliminary adaptive management recommendations during surveys.

3. Evaluate the effect of grazing on the grassland habitat on Ramona Grasslands County Preserve by conducting Fall RDM monitoring.

a. Rangeland monitoring will be conducted in the fall, as recommended in the *Residual Dry Matter Monitoring for the Ramona Grasslands Preserve, October 2020* report (ESA 2021a). RDM monitoring will follow the methodology, goals, and objectives described in the *Ramona Grasslands, Santa Ysabel, and Boulder Oaks Preserves Grazing Management Plan* to observe the effects of cattle grazing on riparian pastures that support arroyo toad (ESA 2019). RDM monitoring in the fall determines if the stocking rate was appropriate to achieve RDM targets by management unit.

b. Targeted cattle grazing between August and January maintains mid-seral riparian vegetation states while providing soil and stream bank protection from erosion. Target grazing intensities are based on threshold RDM values for Grazing Management Units 1–5 (Figure 10b), including the following, which support riparian pasture habitat for arroyo toad:

   i. **Grazing Management Unit 1A, 1B, and 1C:** RDM threshold is 800-2,000 pounds per acre for riparian pasture critical for maintaining arroyo toad habitat; grazing can occur from August to January.

4. Manage and monitor invasive non-native wildlife (predators) species annually within Santa Maria Creek within Ramona Grasslands County Preserve.

a. Survey potential source populations within a 5-kilometer area for non-native predators, particularly bullfrogs and red swamp crayfish. Once population numbers are determined, consult with the USGS to identify an appropriate interval and level of effort to implement eradication efforts for the target species within the Ramona Grasslands County Preserve as well as the source populations outside of the preserve, where feasible. Active removal of these species would be easiest during the late summer and fall when deeper pools become smaller and more isolated and may include seining and capture, and/or the spearing of individuals (Orchard 2011; Cadre Environmental 2007).

b. First priority to implement eradication efforts will be within DPR parks and preserves. Second priority will be to coordinate efforts with adjacent landowners (e.g., Ramona Municipal Water District) to control source populations within the 5-kilometer search area.

c. Monitor populations of non-native predator populations every 3 years on privately owned land, if feasible.

5. **Manage Non-native/Invasive Vegetation.**
    a. Conduct annual surveys along the San Luis Rey River, Santa Maria Creek, and Santa Margarita River within San Luis Rey River Park and Ramona Grasslands and Santa Margarita County Preserves to identify areas of non-native/invasive non-native plant infestations. Remove and control invasive non-native plants along San Luis Rey River, Santa Maria Creek, and Santa Margarita River, particularly giant reed, Uruguayan primrose, and tamarisk.

6. **Evaluate monitoring results and implement adaptive management actions as necessary within San Luis Rey River Park and Ramona Grasslands County and Santa Margarita County Preserves.**
    a. Review monitoring results to determine (1) if identified threats are having a direct negative effect on the species or habitat, (2) if the management triggers in the grazing program (i.e., RDM values) are not sufficiently thinning the vegetation to maintain habitat suitable to the arroyo toad specific to Ramona Grasslands County Preserve, and (3) if adaptive management actions that have been previously implemented are producing the desired effects.
    b. Provide adaptive management recommendations, if any, based on monitoring results and include in the TMP annual report. These are included in the monitoring data sheets. Adaptive management recommendations may include revising the grazing program management triggers (RDM values) specific to Ramona Grasslands County Preserve, installing or fixing fencing to exclude cattle from the riparian areas specific to Ramona Grasslands County Preserve, changing the predator control strategy (currently only implemented within Ramona Grasslands County Preserve), or conducting habitat restoration along the creeks.
    c. Incorporate adaptive management recommendations into the work plans and coordinate with on-site DPR staff to implement actions.
    d. Submit monitoring and management data annually to the SC-MTX website and SDMMP for incorporation in regional monitoring analysis.
    e. Five-year evaluation. At the end of 5 years, reevaluate the species-specific goals, objectives, and methods in the TMP.

2.3.14 Tricolored Blackbird (*Agelaius tricolor*)

Federal/State/MSCP/County Status: Not listed/State listed as Threatened/MSCP-covered/County Group 1.

Habitat: Tricolored blackbirds (*Agelaius tricolor*) nest in dense colonies in freshwater marshes/wetlands and occasionally in moist thickets (e.g., Himalayan blackberry [*Rubus discolor*]), agricultural fields, and sewage treatment plants; foraging generally occurs in adjacent grassland, pastures, or agricultural fields (Churchwell et al. 2005; Unitt 2004).

Life History: Tricolored blackbirds are the most intensively gregarious bird species in California, with males and females normally remaining in large flocks together year-round (Unitt 2004). Wintering tricolored blackbirds often congregate in huge, mixed-species blackbird flocks that forage in grasslands and agricultural fields with low-growing vegetation and at dairies and feedlots (Shuford and Gardali 2008). Flocks may travel for some distance between nesting and feeding areas. The species is nearly restricted to California, and apparently makes only relatively short-distance seasonal movements. Nesting sites may be used for many years, or just one season, with productivity of young varying greatly from

year to year (Unitt 2004). Breeding occurs March through July. Because tricolored blackbird flocks regularly abandon and re-occupy nesting sites, population trend monitoring can be complicated.

Threats: Threats to the tricolored blackbird in San Diego County include loss, alteration, fragmentation, and degradation of wetland breeding habitat; contamination of wetlands with agricultural runoff (e.g., pesticides and salts); human disturbance; and predation at nesting colonies (SDMMP and TNC 2017). Lack of foraging habitat sufficiently large to support a large breeding colony has also been detrimental to this species (Unitt 2004).

Preserve-Level Status: The tricolored blackbird occurs in proximity to Ramona Grasslands County Preserve. Management opportunities are being evaluated on the Wilderness Gardens County Preserve.

Ramona Grasslands County Preserve. The preserve provides foraging habitat for the tricolored blackbird nesting colony (approximately 450 individuals [AECOM 2021d]) known to occur on the adjacent Ramona Municipal Water District (RMWD) Ponds (Unitt 2004). This species has been repeatedly documented within Ramona Grasslands County Preserve from 2009 to 2021 (eBird 2021); however, habitat assessments conducted on the preserve have determined that while suitable foraging habitat is present, no nesting or breeding has been detected as of the most recent survey conducted in 2023 (ESA 2024). Long-term monitoring is ongoing.

Wilderness Gardens County Preserve. Tricolored blackbirds are not known to occur on the preserve (MBA 2010b). There is a pond on-site that may provide suitable breeding habitat if restored. The County is evaluating restoration opportunities outside of the TMP.

Management Goal

- Maintain suitable foraging and nesting habitat for tricolored blackbirds on Ramona Grasslands County Preserve.

Monitoring Goal

- Monitor the status of tricolored blackbirds in suitable habitat along Santa Maria Creek in the southern portion of Ramona Grasslands County Preserve and evaluate the threats to this species. Map and quantify the extent of suitable habitat on-site and identify opportunities to expand habitat.

Management Objectives

- Maintain suitable foraging habitat and expand habitat into opportunity areas as feasible on Ramona Grasslands County Preserve.
- Conduct adaptive management actions (i.e., inspect and manage the species) based on the results of monitoring and threats assessment, as necessary.

Monitoring Objectives

- Conduct presence/absence surveys every 2 years during the breeding season (March–July) within suitable habitat along Santa Maria Creek on Ramona Grasslands County Preserve. Document the presence or absence of nesting colonies or individuals, and document signs of nesting.
- Evaluate the habitat condition (i.e., suitability of the habitat for tricolored blackbird) and identify potential threats to the species on Ramona Grasslands County Preserve every 2 years. Use the monitoring data to inform adaptive management actions. Based on the results of the threats

assessment, habitat condition assessment, and species status surveys, evaluate whether the identified potential threats are having a negative impact on the tricolored blackbirds.

Methods

1. Coordinate with other entities prior to conducting management or monitoring as follows:

a. SANDAG/SDMMP regarding the regional tricolored blackbird surveys throughout the County to inform the regional monitoring program. Regional monitoring will occur annually from 2022 through 2026, including on Ramona Grasslands County Preserve. After 2026, the monitoring frequency will continue to be annually when funding allows, but will be every 2 years at a minimum (K. Preston pers. comm.).

b. Regional monitoring partners regarding monitoring and management activities to ensure that efforts are not being duplicated and to minimize impacts on the species.

2. Map areas that provide opportunities for expansion.

a. Identify and map any areas along Santa Maria Creek that could be restored to suitable tricolored blackbird breeding habitat through passive or active means.

3. Monitor the status of tricolored blackbirds on Ramona Grasslands County Preserve every 2 years in coordination with statewide surveys.

a. Conduct focused species surveys during the height of the breeding season (April) every 2 years. Survey methods will follow the regional breeding surveys and habitat and threat assessments protocol developed by SDMMP (AECOM 2021c). Coordinate the timing of the surveys with the statewide CDFW surveys.

4. Conduct habitat condition and threats assessments every 2 years.

a. Conduct a habitat condition and threat assessments within habitat areas. The protocol will follow the SDMMP's tricolored blackbird habitat and threat assessments protocol (AECOM 2021c).

b. Note preliminary adaptive management recommendations during surveys.

5. Evaluate monitoring results and implement the following adaptive management actions as necessary.

a. Review monitoring results to determine (1) if identified threats are having a direct negative effect on the species or habitat, (2) if adaptive management actions that have been previously implemented are producing the desired effects, and (3) if additional adaptive management strategies are necessary.

b. Provide adaptive management recommendations based on monitoring results and include in the TMP annual report. These are included in the monitoring data sheets. Adaptive management actions for suitable foraging habitat may include habitat restoration, invasive non-native plant species control, and avoidance of the use of herbicides (Churchwell et al. 2005; Meese 2014).

c. Incorporate adaptive management recommendations into Ramona Grassland County Preserve's annual work plan and coordinate with on-site DPR staff to implement actions.

d. Submit monitoring and management data to the SC-MTX website and SDMMP for incorporation in regional monitoring analysis.

e. Five-year evaluation. At the end of 5 years, reevaluate the species-specific goals, objectives, and methods in the TMP. The SDMMP is expected to prepare a regional management implementation plan, including management BMPs, for enhancing existing occurrences and establishing new occurrences of tricolored blackbirds. Management objectives (adaptive management actions) will be reevaluated by the County as part of the TMP once the regional plan is completed.

2.3.15 Burrowing Owl (*Athene cunicularia*)

Federal/State/MSCP/County Status: Not federally listed/state species of special concern/MSCP-covered, narrow endemic/County Group 1.

Habitat: Large expanses of sparsely vegetated areas, such as grasslands, lowland scrub, fallow agricultural lands, coastal dunes, and open desert scrub, on gentle terrain with an abundance of active small mammal burrows (Unitt 2004).

Life History: Burrowing owls are a year-round resident (plus wintering individuals) with altricial young and use burrows year-round. Burrowing owls require fossorial mammals to create burrows and manage habitat (Klute et al. 2003). Burrowing owl breeding season extends from February through August.

Threats: Invasive non-native plant species (reduces suitable habitat), habitat reduction, lack of fossorial mammals to create burrows, predation (coyotes, raptors, ravens), and rodenticides, which reduce prey availability (SDMMP and TNC 2017). In addition, human intrusion/unauthorized access can cause changes in behavior and can lead to direct mortality (collisions, depredation); disease or poisoning caused by pest control has led to a decline in populations; and habitat loss and fragmentation caused by human degradation; or urban development have led to a reduction of burrowing owl populations (Chipman et al. 2008; Berardelli et al. 2010; Unitt 2004; Klute et al. 2003). In addition, a parasite called sticktight flea has previously been detected on burrowing owl populations, which may cause anemia among other health impacts (SDZWA 2018). Altered fire regimes, drought, and hydrology are also notable threats.

Preserve-Level Status: A habitat assessment was conducted on Sycamore Canyon/Goodan Ranch, Boulder Oaks, and Ramona Grasslands County Preserves in 2016 and Barnett Ranch and Hellhole Canyon County Preserves in 2021 for burrowing owl with no individuals or sign observed (ICF 2017; ESA 2022a). Sycamore Canyon/Goodan Ranch, Boulder Oaks, and Barnett Ranch County Preserves have suitable habitat for burrowing owl but have no documentation of the species on-site. Species have been documented on Ramona Grasslands and Hellhole Canyon County Preserves. Only Ramona Grasslands County Preserve is being actively managed and monitored for this species at this time.

The San Diego Zoo Institute for Conservation Research in collaboration with SDMMP prepared a conservation and management plan, including management recommendations for enhancing existing occurrences and establishing new occurrences of burrowing owls (San Diego Zoo Institute for Conservation Research 2017). Site-specific management objectives (adaptive management actions) for burrowing owls were reevaluated by the County. The following County Preserves are in the proposed burrowing owl recovery node locations: Ramona Grasslands and Barnett Ranch (San Diego Zoo Institute for Conservation Research 2017).

Ramona Grasslands County Preserve. The preserve provides foraging and breeding habitat for dispersing owls from the adjacent Ramona Grasslands Conservation Bank managed by San Diego Habitat Conservancy. In 2005, relocated owls were introduced to enhanced habitat south of the southeastern portion of the former Wildlife Research Institute property. These owls successfully bred in low numbers. In 2009, burrowing owls were detected diurnally near the southern edge of the preserve where the Wildlife Research Institute installed artificial burrows. During nocturnal surveys, burrowing owls were detected

foraging on the south and northeast portions of the preserve (ICF 2010). As of 2014, Wildlife Research Institute no longer owned property adjacent to the preserve and artificial burrows were removed.

Wintering burrowing owls have been sporadically observed in the preserve, but no recent breeding is known on-site. Burrowing owls were released on the adjacent Ramona Grasslands Conservation Bank in 2021 where artificial burrows were installed. Monitoring was conducted and burrowing owl sign was detected in 2022 (ESA 2023a). Management units were established for flexible use at Ramona Grasslands County Preserve, which includes maintaining raptor foraging habitat within the grasslands. Consistent with the Burrowing Owl Conservation and Management Plan, the County has conducted grazing to ensure that an open ground and vegetation structure is maintained for burrowing owls (San Diego Zoo Institute for Conservation Research 2017). RDM monitoring occurred in 2016–2023, with the exception of 2020 due to the COVID-19 pandemic and the associated stay-at-home order. Long-term monitoring is ongoing.

Hellhole Canyon County Preserve. A single burrowing owl was observed at the point count station located in the central area of the preserve (TAIC 2008b). During 2021 habitat assessment surveys, Hellhole Canyon County Preserve was documented to have no suitable habitat due to the lack of burrows, burrow surrogates or presence of fossorial mammal dens. Areas that could be restored to burrowing owl habitat through passive or active means were identified (ESA 2022a).

Barnett Ranch County Preserve. Raptor baseline point count study began in the fall of 2020 and extended through the 2021 breeding season (ESA 2021c). This study concluded that there are suitable burrows on-site; however, the vegetation is too high. Vegetation management will need to be implemented before the preserve could be suitable for burrowing owl. Areas that could be restored to burrowing owl habitat through passive or active means were identified (J. Catino-Davenport, pers. comm.).

Management Goals

- First Priority – Maintain high-quality habitat suitable for foraging and nesting burrowing owls on Ramona Grasslands County Preserve to support at least one burrowing owl node. High-quality habitat includes a robust, self-sustaining population of California ground squirrels (*Spermophilus beecheyi*) with well-developed burrow mounds and entrances (aprons). A node is an area of approximately 150 acres that is able to support at least five pairs of burrowing owls.
- Second Priority – Coordinate with adjacent landowners to provide and maintain suitable foraging and nesting habitat for several nodes in the Ramona Grasslands County Preserve. The exact number of nodes will be determined based on an assessment of habitat suitability and threats within the preserve and adjacent lands.

Monitoring Goals

- Within DPR parks and preserves, delineate potential future burrowing owl reintroduction areas (i.e., habitat suitable to support a self-sustaining population of foraging and nesting burrowing owls).
- Monitor the habitat on Ramona Grasslands County Preserve to ensure that the habitat is suitable for breeding burrowing owls, based on the most current scientific information. Document the status of the species (including presence/absence and foraging or nesting behavior) and potential threats to the species on Ramona Grasslands County Preserve.

Management Objective

- Maintain suitable foraging and nesting habitat on Ramona Grasslands County Preserve by continued implementation of the managed grazing program (ESA 2019). Based on the results of the monitoring and threats assessment, conduct adaptive management actions as necessary (i.e., inspect and manage the species).

Monitoring Objectives

- Conduct presence/absence surveys during the breeding season (February–August) within suitable burrowing owl habitat on Ramona Grasslands County Preserve every 3 years. Document the presence or absence of individuals, and document foraging behavior and signs of nesting.
- Evaluate the habitat condition (i.e., suitability of the habitat for burrowing owls) and identify potential threats to the species on Ramona Grasslands County Preserve every 3 years.
- Monitor the effectiveness of the grazing program to reduce the cover of thatch and invasive non-native plant species within Grazing Management Units 2A, 2B, 3A, 3B, 3C, 3D, and 4A in Ramona Grasslands Preserve as described in the *Ramona Grasslands, Santa Ysabel, and Boulder Oaks Preserves Grazing Management Plan* (ESA 2019). Use the monitoring data to inform adaptive management actions.
- Based on the results of the threats assessment, habitat condition assessment (including assessment of the effects of grazing), and species status surveys, evaluate whether the identified potential threats are having a negative impact on the burrowing owl habitat.

Methods

1. **Coordinate with other entities prior to conducting management or monitoring as follows:**
    a. SANDAG/SDMMP, the Wildlife Agencies, and other appropriate entities regarding regional and site-specific goals, objectives, monitoring methods, and BMPs. Review the latest research regarding habitat preferences, population dynamics, and threats.
    b. SANDAG/SDMMP regarding development of species-specific threat assessment.
    c. Adjacent landowners (e.g., Ramona Grasslands Conservation Bank, Ramona Municipal Water District) regarding the implementation of the TMP and regional goals and objectives.
    d. Regional monitoring partners regarding monitoring and management activities to ensure that efforts are not being duplicated and to minimize impacts on the species.
2. **Identify, characterize, and delineate burrowing owl habitat every 3 years.**
    a. Conduct a detailed habitat assessment within Ramona Grasslands County Preserve to identify areas suitable for burrowing owl foraging and breeding, and capable of supporting no less than one node (i.e., five pairs).
    b. Use the methodology described in the CDFW *Staff Report on Burrowing Owl Mitigation* (CDFG 2012). Habitat suitability is evaluated based on the most current knowledge of burrowing owl habitat preferences, such as soil type, topography, presence/absence of California ground squirrels, presence/absence of refugia, presence/absence of or protection from predators, presence/absence of burrows, vegetation (low/open vs. tall/dense), etc. Identify high-priority areas (i.e., areas with an established California ground squirrel population and other preferred habitat characteristics) within Ramona Grasslands County Preserve.

c. The habitat evaluation will include documentation (including photographs) of site conditions, an evaluation of threats and other limiting factors (such as lack of burrows or California ground squirrels), and delineation on an aerial map.

3. Monitor the status of burrowing owls on the Ramona Grasslands County Preserve every 3 years.

a. Conduct presence/absence surveys for burrowing owls within suitable habitat (delineated under number 2 above) every 3 years during the breeding season (February 15 through July 15). Use the methodology described in Appendix D of the CDFW *Staff Report on Burrowing Owl Mitigation* (CDFG 2012) as much as feasible (i.e., if time and budget allow).

b. Document the presence of burrowing owls and/or signs of burrow occupancy by collecting GPS coordinates. Estimate the number of individuals and document any signs of nesting.

c. In the immediate vicinity of observed owls, document the characteristics of the habitat, including burrows, and the presence and abundance of fossorial mammals in suitable burrowing owl habitat.

4. Conduct threats assessment and habitat condition assessment within monitoring plots in the vicinity of documented occurrences at Ramona Grasslands County Preserve every 3 years.

a. Conduct the threats assessment and habitat condition assessment within monitoring plots (10-meter circular area to be consistent with the habitat monitoring plot in the most recent SDMMP Rare Plant Monitoring Protocol [SDMMP 2020]). If feasible, at least one monitoring plot per grassland Grazing Management Unit (2A, 2B, 3A, 3B, 3C, 3D, and 4A) at Ramona Grasslands County Preserve is evaluated. However, the assessment of threats and habitat condition focuses on the following:

   i. High-priority areas identified under number 2 above.

   ii. In the vicinity of documented occurrences (i.e., direct observations made during that year's species survey, observations from previous years' surveys, or incidental observations made during other site visits).

b. To limit disturbance by the monitoring biologist, estimate the perimeter of the monitoring plot rather than installing permanent markers or using a measuring tape. Threats and habitat assessments are conducted concurrently and can be conducted at the same time as species surveys.

c. Conduct a threats assessment. Until SDMMP or other appropriate entity develops a species-specific threats assessment protocol, use the threats assessment protocol in SDMMP's most recent Rare Plant Monitoring Protocol (see Section V. of the Rare Plant Habitat and Threats Assessment Data Form [SDMMP 2020]). Document the following with field notes: observations of predators such as coyotes or raptors, signs of unauthorized access such as off-road vehicle use, lack of mammal burrows, potential use of rodenticide, and thick or tall vegetation. Threats assessments can be conducted concurrently with species surveys and/or habitat condition assessments.

d. Conduct a burrowing owl habitat assessment. Until SDMMP or other appropriate entity develops a species-specific habitat condition assessment protocol, follow the methods in Section IV of the most recent SDMMP Rare Plant Monitoring Protocol (SDMMP 2020). Document the following with field notes: presence/absence of California ground squirrels, presence/absence of mammal burrows, percent cover of bare ground, and presence/absence of brush piles, scattered shrubs, or structures that could be used as cover to hide from predators. Take photographs of the monitoring area as described in the rare plant protocol.

e. Note preliminary adaptive management recommendations during surveys.

5. Evaluate the effect of grazing on the grassland habitat on Ramona Grasslands County Preserve by conducting Fall RDM monitoring.

a. Grazing Management Units 3B, 4A, and 4B were established for flexible use, which includes maintaining raptor foraging habitat within the grasslands. Consistent with the Burrowing Owl Conservation and Management Plan, the County will continue grazing to ensure that an open ground and vegetation structure is maintained for burrowing owls (San Diego Zoo Institute for Conservation Research 2017).

b. Rangeland monitoring will be conducted in the fall, as recommended in the *Residual Dry Matter Monitoring for the Ramona Grasslands Preserve, October 2020* report (ESA 2021a). RDM monitoring will follow the methodology, goals, and objectives described in the *Ramona Grasslands, Santa Ysabel, and Boulder Oaks Preserves Grazing Management Plan* to observe the effects of cattle grazing on grassland stands suitable for raptor foraging and flexible use (ESA 2019). RDM monitoring in the fall determines if the stocking rate was appropriate to achieve RDM targets by management unit.

c. Cattle grazing to support flexible use can occur year-round to provide flexibility in timing and intensity of grazing. Target grazing intensities are based on threshold RDM values for Grazing Management Units 1–5 (Figure 10b), including the following, which support flexible use that can include raptor foraging habitat within grassland stands:

   i. **Grazing Management Units 3B, 4A, and 4B:** RDM threshold is 800–1,500 pounds per acre to support flexible use; grazing can occur year-round.

d. Note that the RDM thresholds were not established specifically to maintain burrowing owl habitat. Grazing Management Units 3B, 4A, and 4B were established for flexible use which can include maintaining raptor foraging habitat within on-site grasslands. Once the potential burrowing owl habitat has been refined (under number 2 above), reevaluate the RDM thresholds within suitable burrowing owl areas to ensure that they are appropriate to maintain habitat for this species.

6. Evaluate monitoring results and implement adaptive management actions as necessary.

a. Review monitoring results to determine: (1) if identified threats are having a direct negative effect on the species or habitat, (2) if the management triggers in the grazing program (i.e., RDM values) are not sufficiently thinning the vegetation to maintain habitat suitable to the burrowing owl, (3) if adaptive management actions that have been previously implemented are producing the desired effects, and (3) if additional adaptive management strategies are necessary.

b. Provide adaptive management recommendations, if any, based on monitoring results and include in the TMP annual report. These are included in the monitoring data sheets. Adaptive management actions could include revision of the grazing program management triggers (RDM values), introduction of California ground squirrels to provide burrows for the owl, installation of brush piles to provide cover against predators, installation of fencing along roads to prevent mortality from roadkill, installation and maintenance of artificial burrows, and outreach to neighboring landowners to prevent the use of rodenticides for rodent control. Note that many of these strategies will require additional funding.

c. Incorporate adaptive management recommendations into the Ramona Grasslands County Preserve's annual work plan and coordinate with on-site DPR staff to implement actions.

d. Submit monitoring and management data every year surveys are conducted to the SC-MTX website and SDMMP for incorporation in regional monitoring analysis.

e. Coordinate with SDMMP and the San Diego Zoo Institute for Conservation Research to identify new BMPs, species-specific monitoring protocols, information about habitat preferences, and opportunities

to collaborate. If appropriate, the County will consider active translocation of burrowing owls onto their preserve lands consistent with the methods described in *Burrowing Owl Conservation and Management Plan* (San Diego Zoo Institute for Conservation Research 2017). Implement changes as necessary to monitoring and management efforts.

f. Five-year evaluation. At the end of 5 years, reevaluate the species-specific goals, objectives, and methods in the TMP.

2.3.16 Coastal Cactus Wren (*Campylorhynchus brunneicapillus sandiegensis*)

Federal/State/MSCP/County Status: Not federally listed/state species of special concern/MSCP-covered, narrow endemic/County Group 1.

Habitat: This species is restricte to coastal sage scrub habitat dominated by patches of mature prickly pear (*Opuntia* spp.) or cholla cactus species (*Cylindropuntia* spp.).

Life History: Coastal cactus wren is a year-round resident with altricial young and makes football-shaped nests of almost exclusively cactus (prickly pear in northern San Diego County and chollas in southern San Diego County, with an overlap of both cactus species occurring in the center of the county). Three genetic clusters exist with limited dispersal between them in western San Diego County and a fourth cluster extends from northwestern San Diego County north into Orange County (SDMMP and TNC 2017). The species prefers mature cactus stands on south- and southwest-facing slopes and surrounding open upland scrub habitat. Coastal cactus wrens maintain nests for roosting year-round; therefore, observations of nest building and occupied nests do not necessarily confirm that nesting is occurring. Peak nesting in San Diego County appears to occur from mid-March to early June (Unitt 2004).

Threats: The greatest threats to coastal cactus wrens are habitat loss and fragmentation, altered fire regime, invasive non-native plant species, drought caused food limitation, and predation. Populations are now small and isolated leading to a loss of genetic diversity and increased vulnerability to local population extirpation (SDMMP and TNC 2017).

Preserve-Level Status: Coastal cactus wren occurs within Lakeside Linkage County Preserve and was first documented nesting on-site in 2019 (ESA 2019). Occupied habitat also occurs on private property adjacent to Lakeside Linkage County Preserve. Approximately 2 acres of extant habitat is located on the easternmost property of Lakeside Linkage County Preserve (ICF 2008c) and a total of 7 acres have been currently restored in the central portion of Lakeside Linkage County Preserve. The County has implemented active coastal cactus wren habitat restoration within the central portion of the Lakeside Linkage County Preserve to benefit dispersal and expansion of adjacent populations. Prickly pear cactus (*Opuntia littoralis*) and coast cholla (*Cylindropuntia prolifera*) were planted on 5 acres of coastal sage scrub habitat on a southwestern-facing slope, and dethatching and weed removal was performed from 2011 to 2016 (ICF 2016). In the fall of 2019, 2 acres of additional coastal cactus wren habitat were restored in the central portion of Lakeside Linkage Preserve.

Seven avian point count stations were established in 2011 on Lakeside Linkage County Preserve to capture potential coastal cactus wren activity in and around the two original cactus restoration areas and evaluate the suitability of the restored cactus stands for coastal cactus wren breeding. Monitoring began in

2011 and were conducted annually through 2016 as part of the restoration project. In 2018, one of the point count stations was removed to reduce redundancy for a total of six avian point count stations (Figure 6) (ICF 2018b). In 2022, four avian point count surveys and nesting bird surveys were conducted at Lakeside Linkage Preserve with a focus on coastal cactus wren. Coastal cactus wren was detected during these surveys; however, no nesting behavior was documented on- or off-site (ESA 2023a). Long-term monitoring is ongoing.

In 2023, focused management within coastal cactus wren habitat restoration areas was conducted at Lakeside Linkage County Preserve to reduce overall height of standing biomass and disarticulation of herbaceous non-native plants (ESA 2024).

Management Goal

- Restore, enhance, or maintain 25 acres of suitable foraging and nesting cactus scrub habitat for at least five pairs of coastal cactus wrens on Lakeside Linkage County Preserve to benefit expansion and dispersal of adjacent wren populations (2 acres extant plus 23 acres restored).

Monitoring Goal

- Monitor the condition of restored habitat on Lakeside Linkage County Preserve to ensure suitability for the coastal cactus wren, monitor for the status of coastal cactus wren within the restored habitat, and evaluate potential threats to the species.

Management Objectives

- Over 10 years, restore and maintain 11 additional acres of suitable foraging and nesting habitat, bringing the total suitable foraging and nesting habitat within Lakeside Linkage County Preserve to 20 acres.
- The SDMMP prepared the *South San Diego County Coastal Cactus Wren (Campylorhynchus brunneicapillus) Habitat Conservation and Management Plan*, a regional habitat conservation and management plan. It includes habitat enhancement, establishing cactus nursery stands, and planning and implementing the cactus scrub habitat linkages (TNC and SDMMP 2015). Site-specific management objectives (adaptive management actions) will be reevaluated by the County once the plan is updated in 2025.

Monitoring Objectives

- Monitor species status and habitat condition by conducting avian point counts, photo-monitoring, and vegetation density estimates within cactus restoration sites on Lakeside Linkage to ensure suitability for the coastal cactus wren and inform restoration efforts for the final 5 acres of habitat.
- Based on the results of the species surveys, habitat condition assessment, and threats assessment, evaluate whether or not the identified potential threats are having a negative impact on habitat or species (if they move into the area).

Methods

1. **Coordinate with other entities prior to conducting management or monitoring as follows:**
    a. SANDAG/SDMMP regarding regional surveys in southern San Diego County to inform the regional monitoring program. Regional monitoring occurs annually; however, there is not a monitoring plot on Lakeside Linkage County Preserve.
    b. SANDAG/SDMMP regarding development of species-specific threat assessment.

c. Regional monitoring partners regarding monitoring and management activities to ensure that efforts are not being duplicated and to minimize impacts on the species.

2. Monitor the status of coastal cactus wrens and other birds on-site every 3 years.

a. Conduct avian point counts monthly from March through June.

b. Immediately after point count surveys, conduct nesting surveys specific for coastal cactus wren. GPS nest location, photograph, and record plant species and nest height. Observe and record nest success (qualified biologists only) and number of fledglings.

3. Conduct a habitat evaluation and threats assessment every 3 years within restored areas.

a. Conduct a habitat condition assessment. Use the established photo-monitoring and describe qualitative changes until cactus stands reach maturity. Permanent photo stations were established in 2011 within the two cactus restoration sites.

b. Conduct a threats assessment. Use the threats assessment protocol in the USGS Cactus Wren Survey Guide (see item #4 under Cactus Wren Detection [USGS 2017]). The threats assessment includes an evaluation of the vegetation as it pertains to the needs of coastal cactus wren (e.g., dominant non-cactus shrub species, vegetation overtopping cactus, cactus health).

c. Note preliminary adaptive management recommendations during surveys.

4. Restore an additional 11 acres of habitat to support up to two pairs of cactus wren (currently unfunded).

a. Based on the most current scientific information regarding habitat preferences for the coastal cactus wren, develop and implement a restoration plan for 11 additional acres of habitat. This will increase the total habitat on-site to 20 acres (2 acres extant plus 7 acres restored plus 11 acres planned for restoration). Unless otherwise specified in the literature, the habitat should:

i. Contain one or both of prickly pear and cholla cactus species.

ii. Include cactus patches of at least 3.3 meters by 4.5 meters in size.

iii. Consist of at least 40 to 50 percent cover of cactus at maturity within planted patches (within 10 years).

iv. Include other species known to be important to the coastal cactus wren, including blue elderberry (*Sambucus nigra* ssp. *caerulea*), California sagebrush (*Artemisia californica*), and California buckwheat (*Eriogonum fasciculatum*).

v. Be placed on south-facing or west-facing slopes.

vi. Be managed by controlling invasive non-native plant species and removing thatch.

b. Conduct restoration maintenance (e.g., protect cactus from herbivory, conduct invasive non-native plant species and thatch removal) until the habitat reaches maturity, and perform habitat monitoring as described above.

5. Evaluate monitoring results and implement adaptive management actions as necessary.

a. Review monitoring results to determine (1) if identified threats are having a direct negative effect on the species or habitat, (2) if adaptive management actions that have been previously implemented are producing the desired effects, and (3) if additional adaptive management strategies are necessary.

b. Provide adaptive management recommendations based on monitoring results and include in the TMP annual report. These are included in the monitoring data sheets.

c. Adaptive management actions could include installing cages to prevent herbivory to installed cactus, increasing or changing invasive non-native plant species control methods, increasing the density of cactus within restored areas, or implementing additional habitat restoration. If the habitat does not meet the following criteria, appropriate remedial actions are implemented:

   i. The site resists invasion by invasive non-native plant species and does not require significant maintenance measures as documented by less than 25 percent cover of annual invasive non-native grass and forb species.

   ii. Overall, the habitat consists of at least 40 to 50 percent cover of cactus within planted patches (within 10 years).

   iii. Incorporate adaptive management recommendations into the preserve's annual work plan and coordinate with on-site DPR staff to implement actions such as trimming shrubs or vines overgrowing on cactus patches.

d. Submit monitoring and management data every year surveys are conducted to the SC-MTX website and SDMMP for incorporation in regional monitoring analysis.

e. Five-year evaluation. At the end of 5 years, reevaluate the species-specific goals, objectives, and methods in the TMP.

2.3.17 Golden Eagle (*Aquila chrysaetos*) and Bald Eagle (*Haliaeetus leucocephalus*)

Golden Eagle

Federal/State/MSCP/County Status: Not federally listed; Bald and Golden Eagle Protection Act/state Fully Protected Species/MSCP-covered, narrow endemic (nesting)/County Group 1.

Habitat: Golden eagles nest on cliff ledges or trees on steep slopes and forage in grasslands, sage scrub, or open chaparral (Unitt 2004).

Life History: The golden eagle occurs as both a permanent resident and migrant throughout California. Breeding season extends from late January through August. This species feeds mainly on black-tailed jackrabbits (*Lepus californicus*) and California ground squirrels as well as other small mammals, birds, and reptiles.

Threats: Threats include loss of foraging areas, loss of nesting habitat, fragmented foraging habitat, encroachment of non-native vegetation within grasslands, pesticide poisoning, lead poisoning, recreational activities, unauthorized human activity, and collision with man-made structures such as wind turbines and power lines (CDFW 2013).

Preserve-Level Status: Golden eagles historically nested on Del Dios and El Capitan County Preserves and in close proximity to Iron Mountain, Ramona Grasslands and Hellhole Canyon County Preserves (TAIC 2008a; Harris & Associates 2021; ICF 2010; ICF 2008a; TAIC 2008b).

Del Dios Highlands County Preserve. The golden eagle nest site is likely extirpated and was last documented as active in 2001 (TAIC 2008a).

El Capitan County Preserve. The golden eagle nest site in close proximity to El Capitan County Preserve is occupied and most recently fledged in 2022 (ESA 2022b).

Ramona Grasslands County Preserve. The golden eagle nest in close proximity to the Ramona Grasslands is occupied. An active nest is present on an adjacent cliff face off-site from the Ramona Grasslands County Preserve since 2014 (ESA 2020). During general biological surveys conducted in Ramona Grasslands Preserve in 2009, golden eagles were observed on numerous occasions throughout the season (ICF 2010). Baseline point count studies began in the fall of 2013 and extended through the 2014 breeding season of the *Ramona Grasslands Preserve Eagle/Raptor Foraging Study* occurring for 3 years (2013–2016) (AECOM 2017a). An additional *Ramona Grasslands Preserve Eagle/Raptor Foraging Study* occurred for 5 years (2018–2023) (ESA 2023). These studies served to establish the pre- and post-raptor use from the opening of the Old Survey Road 97 Trail in the northwest portion of the preserve. This trail is open outside of the golden eagle breeding season on Saturdays and Sundays only, on a permit only basis for hiking (no dogs), biking, and equestrian use. Study results demonstrate the effectiveness of the raptor conservation area in the northwest portion of the preserve. Nest monitoring and raptor foraging studies are ongoing. In addition, management units were established for flexible use at Ramona Grasslands County Preserve, which includes maintaining raptor foraging habitat within the grasslands. RDM monitoring occurred in 2016–2023, with the exception of 2020 due to the COVID-19 pandemic and the associated stay-at-home order.

Hellhole Canyon County Preserve. The golden eagle nest in close proximity to Hellhole Canyon County Preserve is occupied. The nest status for the nest in proximity to Hellhole Canyon County Preserve last successfully fledged in 2018.

Iron Mountain County Preserve. The golden eagle nest in close proximity to Iron Mountain County Preserve is unoccupied. The nest in proximity to Iron Mountain County Preserve was last occupied in 2017.

Golden eagles forage within the following TMP preserves: Sycamore Canyon/Goodan Ranch, Ramona Grasslands, Boulder Oaks, Barnett Ranch, and Simon County Preserves. Within Barnett Ranch County Preserve, golden eagles were observed perching and soaring within the preserve during general biological surveys (HELIX 2004). Baseline point count studies for the Barnett Ranch County Preserve occurred in the fall of 2020 and through the 2021 breeding season (ESA 2021c). Due to vegetation height and lack of foraging eagle observations on the Barnett Ranch County Preserve from 2020 to 2021, surveys were discontinued until vegetation management could be implemented. Surveys will resume to determine the management effectiveness.

Bald Eagle

Federal/State/MSCP/County Status: Federally delisted; Bald and Golden Eagle Protection Act/state listed as endangered; state Fully Protected Species/MSCP-covered/County Group 1.

Habitat: Generally prefer habitat that is near a large body of water and large trees for nesting or roosting. However, if sufficient prey is present, this species may occur in other habitat types, as demonstrated by its presence on Ramona Grasslands County Preserve.

Life History: This species forages on fish, waterfowl, rabbits, and rodents. At the Ramona Grasslands County Preserve, the bald eagle is believed to forage mainly on California ground squirrels, as well as waterfowl on the adjacent Ramona Municipal Water District effluent ponds, and steal from other species. Breeding season extends from late January through August.

Threats: The greatest potential threats to this species on Ramona Grasslands County Preserve may be the lack of prey availability. Additional threats include negative impacts from Ramona Municipal Water District activities, Ramona Airport activities, and unauthorized human activity; however, these impacts are not clearly understood.

Preserve-Level Status: A pair of bald eagles has established a nest on the Ramona Grasslands County Preserve boundary, adjacent to the Ramona Municipal Water District property, and northwest of the Ramona Airport. In 2013, the pair successfully raised and fledged one chick for the first time (AECOM 2014) and have continued to breed in the same tree until 2022. The pair moved to a new nest tree in 2023 located entirely within the Ramona Grasslands County Preserve. The pair last successfully raised and fledged one chick in 2023. During baseline point county studies for the Barnett Ranch County Preserve from the fall of 2020 through the 2021 breeding season, bald eagles were observed flying over the preserve on an irregular basis (ESA 2021c). See golden eagle section for the status of the baseline studies and RDM monitoring.

Golden Eagle and Bald Eagle

Management Goal

- Maintain suitable foraging and nesting habitat to support breeding pairs of golden eagles on Ramona Grasslands County Preserve, Sycamore Canyon/Goodan Ranch County Preserve, Boulder Oaks County Preserve, El Capitan County Preserve, Barnett Ranch County Preserve, Hellhole Canyon County Preserve, Iron Mountain County Preserve, and Simon County Preserve and maintain a breeding pair of bald eagles on Ramona Grasslands County Preserve.

Monitoring Goal

- Use baseline information on eagle and raptor foraging to provide a better understanding of species abundance and distribution within Ramona Grasslands County Preserve and Barnett Ranch County Preserve, to inform adaptive management decisions (e.g., trail feasibility, alignments and seasonal closures) and provide a reference point for future studies or assessments pertaining to public use. Evaluate potential threats to the species.
- Conduct a baseline foraging analysis to understand the foraging habits of golden eagles on Barnett Ranch County Preserve and golden eagles and bald eagles on Ramona Grasslands County Preserve. Continue the Ramona Grasslands County Preserve study annually to determine foraging success. The Barnett Ranch County Preserve study will not resume until grassland habitat management has been conducted.

Management Objectives

- Maintain suitable foraging habitat for golden eagles on Barnett Ranch County Preserve, Boulder Oaks County Preserve, Simon County Preserve, and Lawrence and Barbara Daley County Preserve; suitable nesting habitat for golden eagles on El Capitan County Preserve and Hellhole Canyon County Preserve; and suitable foraging and nesting habitat for golden eagles and bald eagles on Ramona Grasslands County Preserve.

- Based on the results of the foraging study and threats assessment, conduct adaptive management actions as necessary (i.e., inspect and manage the species).
- Continue implementation of the managed grazing program at Ramona Grasslands County Preserve.

Monitoring Objectives

- Conduct a monthly habitat use and foraging study at Ramona Grasslands County Preserve, annually.
- Conduct surveys of golden eagle nest sites adjacent to Ramona Grasslands and within El Capitan County Preserves.
- Monitor the effectiveness of the grazing program to reduce the cover of thatch and invasive non-native plant species within Grazing Management Units 3B, 4A, and 4B to benefit raptor foraging (i.e., increase prey base) as described in the *Ramona Grasslands, Santa Ysabel, and Boulder Oaks Preserves Grazing Management Plan* (ESA 2019).

Methods

1. Coordinate with other entities prior to conducting management or monitoring as follows:

a. SANDAG/SDMMP and other regional monitoring partners (e.g., USGS, WRI) regarding regional and site-specific goals, objectives, monitoring methods, surveying effort, and recommended adaptive management actions for the golden and bald eagles.

b. USGS regarding review of the SDMMP Golden Eagle Management Plan when it is through the preparation process.

c. Regional monitoring partners regarding monitoring and management activities to ensure that efforts are not being duplicated and to minimize impacts on the species.

2. Monitor raptor use and foraging behavior within the Ramona Grasslands County Preserve, annually.

a. Use established sampling points in the Ramona Grasslands Preserve (Figure 10a).

i. Northeast (NE) survey point. One point-count station is located at a high point (a hill feature known as the "lookout" or "house on the hill") in the northeast portion of the preserve (proposed to be open to public use in Phase I). This feature provides unlimited sky visibility for the entire Preserve, including visibility toward the southeast (quadrant not proposed for public use), southwest (quadrant currently open to the public), and northwest (proposed for public use (hiking, biking, and equestrian) outside of the golden eagle breeding season Saturday and Sunday only on a permit only basis). Ultimate raptor behavior such as prey diving may not be visible from this vantage point toward the northern boundary of the northeast quadrant. However, good visibility of the rocky outcrops used by raptors for perching can be had from this vantage.

ii. Revised Northwest (NW) survey point. Due to the potential of the original NW survey point being used as a perch site for golden eagles, the survey point was revised in August 2023. The revised NW survey point-count station is located on a small hill near an oak tree that would provide a clear view of the northwest grassland habitat and known eagle/raptor perch sites.

iii. Six surveys will occur in each season: two surveys per month in spring (March, April, and May), summer (June, July, and August), fall (September, October, and November), and winter (December, January, and February). Each location will be surveyed for a 4-hour period generally between the hours of 6:00 a.m. and 5:30 p.m. However, survey times may start earlier and end later as daylight hours increase. The starting point count location for each survey will rotate each month (i.e., begin morning survey at northeastern quadrant 1 month, and the following month

begin the morning survey at the northwestern quadrant). The timing of the surveys will also be rotated (e.g., morning and afternoon/mid-morning and late afternoon).

b. When a raptor is detected within or near the preserve boundary, the ornithologist will record the following:

   i. Date and time of observation.

   ii. Identification Tag, if applicable (i.e., a unique value assigned to an individual raptor to allow a biologist to take data on multiple observations of the same individual and to allow data to be distinguished between multiple individuals that may be present in the preserve).

   iii. Identification of the raptor species.

   iv. The initial distance, direction/bearing, and direction-of-flight of the raptor observation.

   v. Detection type (i.e., visual or auditory).

   vi. Number of individuals.

   vii. Individual(s) age/sex (if known).

   viii. Raptor's behavior within the preserve; definitions of raptor behaviors are as follows:

   - Direct flight. Continuous flapping of wings in a directional flight.
   - Circling-soaring. Rising in a circular motion with wings outstretched (often associated with raptors catching thermals).
   - Meandering. Wandering flight with no directional course.
   - Kiting. Remaining in a fixed place in moving air on motionless wings.
   - Hovering. Remaining in a fixed place into the wind by flapping.
   - Stooping/prey diving. Diving from above with wings folded, usually in pursuit of prey.
   - Perched. Stationary on an object such as a rock, utility pole, or tree.

   ix. Time observed within or adjacent to the preserve. If only a single raptor is in view for an extended period of time or exhibits several types of raptor behavior, additional information on behavior was noted.

   x. Raptor flight paths mapped in the field for special-status and MSCP-covered raptors with potential to breed on the preserve on electronic field form (i.e., Collector). No hard map copies are created.

   If more than one raptor is in view, data will be collected on all raptors present (to the extent possible) in order to document the raptor activity occurring. Precedence will be given to eagles and federal or state special-status species.

c. Document incidental observations of eagle prey base, such as California ground squirrel and black-tailed jackrabbit.

3. Monitor the nesting behavior of golden eagles on the El Capitan County Preserve and off-site nest location at Ramona Grasslands County Preserve annually.

a. Conduct nest monitoring surveys for golden eagles annually as recommended by Pagel et al. 2010. Two 4-hour visits are conducted, once in early February and once at the beginning or mid-March, to determine nest status (active vs. inactive). Four 4-hour visits will be scheduled monthly between April and July to determine nest success (fledged or failed) if the nest site is determined to be active.

b. Document the start and end times, date, and weather at the beginning and end of each nest monitoring survey. The time and duration of each golden eagle observation will be recorded, including nesting behavior (nest building, incubating, feeding young, no activity). Additional observation data such as fledgling observations. Behaviors, prey items, or territory interactions will be noted when possible.

4. Evaluate the effect of grazing on the grassland habitat on Ramona Grasslands Preserve by conducting Fall RDM monitoring.

a. Rangeland monitoring will be conducted in the fall, as recommended in the *Residual Dry Matter Monitoring for the Ramona Grasslands Preserve, October 2020* report (ESA 2021a). RDM monitoring will follow the methodology, goals, and objectives described in the *Ramona Grasslands, Santa Ysabel, and Boulder Oaks Preserves Grazing Management Plan* to observe the effects of cattle grazing on grassland stands suitable for raptor foraging and flexible use (ESA 2019). RDM monitoring in the fall determines if the stocking rate was appropriate to achieve RDM targets by management unit.

Cattle grazing to support flexible use can occur year-round to provide flexibility in timing and intensity of grazing. Target grazing intensities are based on threshold RDM values for Grazing Management Units 1–5 (Figure 10a), including the following, which support flexible use that can include raptor foraging habitat within grassland stands:

i. **Grazing Management Units 3B, 4A, and 4B:** RDM threshold is 800–1,500 pounds per acre to support flexible use; grazing can occur year-round.

5. Evaluate monitoring results and implement adaptive management actions as necessary.

a. Prepare annual report describing the results of the raptor foraging study.

b. Evaluate the grazing program results to determine if the management triggers in the grazing program (i.e., RDM values) are sufficiently thinning the vegetation to maintain habitat suitable to foraging eagles and other raptors.

c. Based on regional and site-specific monitoring results, implement adaptive management strategies as necessary. Management actions could include revising the grazing program management triggers (RDM values) or implementing access control in active eagle foraging areas.

d. Submit monitoring and management data annually to the SC-MTX website and SDMMP for incorporation in regional monitoring analysis.

e. Five-year evaluation. At the end of 5 years, reevaluate the species-specific goals, objectives, and methods in the TMP.

2.3.18 Northern Harrier (*Circus cyaneus*)

Federal/State/MSCP/County Status: Not federally listed/state species of special concern (nesting)/MSCP-covered/County Group 1.

Habitat: Northern harrier nest in marsh or other dense vegetation like shrublands (Unitt 2004). The species forage in open or low-height vegetated habitat such as agricultural and non-native grassland.

Life History: Northern harriers occur as residents and migrants throughout California marshes and fields and are rarely documented nesting in Southern California (Unitt 2004). Northern harriers nest on the ground, usually in tall, dense clumps of vegetation, either alone or in loose colonies. Typically, northern harriers rear one brood per season, which generally occurs from March through August, however, most

activity occurs between April and July in southern California. Individuals feed on small to medium-sized animals including rodents, birds, reptiles, and frogs (SDMMP and TNC 2017).

Threats: Within the Tijuana River Valley Regional Park and San Luis Rey River Park, the primary threat is degradation or loss of habitat caused by human intrusion, particularly due to the northern harrier's ground nesting preferences. Other threats include invasive non-native plants, altered fire regimes, predation from invasive non-native animals, and human trash attracting nest predators (SDMMP and TNC 2017; P. Bloom pers. comm.; Dechant et al. 2002; Dudek 2011b).

Preserve-Level Status: Northern harrier occurs within the Tijuana River Valley Regional Park, San Luis Rey River Park, and Ramona Grasslands, Furby-North, Lawrence and Barbara Daley, Mount Olympus, Skyline, Escondido Creek, and Simon County Preserves. Foraging activity only was observed on the Ramona Grasslands, Lawrence and Barbara Daley, Furby-North, Mount Olympus, Skyline, Escondido Creek, and Simon County Preserves (ICF 2010; TAIC and ESA 2011a; TAIC and ESA 2011b; MBA 2010a; ESA 2023c; Dudek 2011a, Dudek 2010). The species breeds or has the potential to at the following preserves.

Tijuana River Valley Regional Park. This species is known to occur, forage, and breed within the Tijuana River Valley Regional Park (HELIX 2019; ESA 2022a). It was documented as abundant in winter, hunting in the fields north of Monument Road, atop Spooner's Mesa and in coastal marshes west of the Tijuana River Valley Regional Park (County DPR 2007a). Three territories were documented in 2021 and two successfully fledged young (ESA 2022a; AECOM 2021b). In 2022, three territories were documented, and one successfully fledged young. In 2023, one territory was documented and fledged young successfully (ESA 2024). Long-term monitoring is ongoing.

San Luis Rey River Park. This species is known to occur in the vicinity of the San Luis Rey River Park (Caltrans 2010). High quality foraging habitat and potential breeding habitat can be found within the San Luis Rey River Park (Dudek 2011b).

Management Goal

- Maintain suitable nesting and foraging habitat for northern harrier within the Tijuana River Valley Regional Park and San Luis Rey River Park.

Monitoring Goal

- Collect baseline information on northern harriers and their nesting and foraging habitat to provide a better understanding of the species abundance and distribution within the Tijuana River Valley Regional Park and San Luis Rey River Park.

Management Objectives

- Once a nest site has been detected on the Tijuana River Valley Regional Park or San Luis Rey River Park, execute a nest buffer (a minimum of 500 feet, if feasible).
- Manage grasslands within 4 miles of nesting habitat to provide foraging habitat on Tijuana River Valley Regional Park.

Monitoring Objectives

- Monitor northern harriers nesting behavior within the Tijuana River Valley Regional Park and San Luis Rey River Park to determine nesting status (e.g., Were the adults on-site? What type of nesting behavior was observed [nesting building, incubation, etc.]? Was the nest attempt successful? If nest attempted failed, what was the cause of the nest failure?).
- Study and observe northern harrier foraging behaviors within 4 miles of their nest site.
- Identify potential threats to the northern harriers' nest success and prey source within Tijuana River Valley Regional Park and San Luis Rey River Park to inform adaptive management actions.

Methods

1. Coordinate with other entities prior to conducting management or monitoring as follows:

a. SANDAG/SDMMP regarding species surveys to inform the regional monitoring program. Regional monitoring occurred in 2021. No future regional monitoring is planned at this time.

b. Regional monitoring partners regarding monitoring and management activities to ensure that efforts are not being duplicated and to minimize impacts on the species.

2. Monitor the nesting behavior of northern harriers on the Tijuana River Valley Regional Park and San Luis Rey River Park annually.

a. Conduct nesting surveys for northern harrier, once a month for 4 months, during the breeding season (March–August), preferably once a month from March through June.

b. Document the presence of northern harrier individuals and/or signs of nesting by collecting GPS coordinates.

c. In the immediate vicinity of observed northern harrier nest sites, document the characteristics of the habitat and the presence of prey (e.g., small mammals) in suitable habitat. Documentation of prey is incidental and occurs during the last nest survey.

3. Conduct threats assessment and habitat condition assessment on the Tijuana River Valley Regional Park and San Luis Rey River Park in the vicinity of nesting location(s) annually.

a. Conduct a threats assessment. The protocol will follow the SDMMP's northern harrier habitat and threat assessments protocol (AECOM 2021a). Potential threats to the northern harrier's net success and prey source are considered and specifically identified in the notes section. The threats assessments are conducted concurrently with the habitat assessment, and performed during the last nesting survey.

b. Conduct northern harrier habitat assessment. The protocol will follow the SDMMP's northern harrier habitat and threat assessments protocol (AECOM 2021a). If habitat suitability subpolygons have not already been established, subpolygons will be established following the SDMMP's protocol (AECOM 2021a). The threats assessments are conducted concurrently with the habitat assessment and performed during the last nesting survey.

c. Note preliminary adaptive management recommendations during surveys.

4. Evaluate monitoring results and implement adaptive management actions as necessary.

a. Review monitoring results from the species surveys, threats and habitat condition assessments to determine (1) if identified threats are having a direct negative effect on the species or habitat, (2) if adaptive management actions need to be implemented, and/or (3) if adaptive management actions that have been previously implemented are functioning as expected.

b. Provide adaptive management recommendations, if any, based on the results of annual monitoring and include in the TMP annual report. These are included in the monitoring data sheets. Adaptive management recommendations may include (but are not limited to):
    i. If active nesting is found in the vicinity of trails or other recreational areas, execute a nesting buffer that is at least 500 feet using signs where feasible in order to protect the nest while it is active.
    ii. Closure of unauthorized trails in the vicinity of key nesting and foraging areas.
    iii. Coordinate with adjacent land managers (e.g., California State Parks, USFWS National Wildlife Refuge, National Oceanic and Atmospheric Administration [NOAA]) to minimize activities in the vicinity of the nest site(s) that might interfere with nesting during the breeding season, if necessary, on Tijuana River Valley Regional Park.
    iv. Outreach to neighboring landowners to prevent the use of rodenticides for rodent control.
c. Incorporate adaptive management recommendations into the preserve's annual work plan and coordinate with on-site DPR staff to implement actions.
d. Submit monitoring and management data annually to the SC-MTX website and SDMMP for incorporation in regional monitoring analysis.
e. Five-year evaluation. At the end of 5 years, reevaluate the species-specific goals, objectives, and methods in the TMP.

2.3.19 Southwestern Willow Flycatcher (*Empidonax traillii extimus*)

Federal/State/MSCP/County Status: Listed as federally endangered/state endangered/MSCP-covered, narrow endemic/County Group 1

Habitat: Breeds in dense riparian habitat, almost always near water. Sites that remain dry for multiple seasons typically do not support breeding populations. Nesting habitat is typically dominated or co-dominated by tree and shrub species such as willows (*Salix* spp.), seepwillow (*Baccharis* spp.), boxelder (*Acer negundo*), stinging nettle (*Urtica* spp.), blackberry (*Rubus* spp.), cottonwood (*Populus* spp.), oak (*Quercus* spp.), arrowweed (*Pluchea sericea*), tamarisk (also known as saltcedar; *Tamarix ramosissima*), and Russian olive (*Elaeagnus angustifolia*) (USFWS 2002; Howell and Kus 2022).

Life History: Southwestern willow flycatcher (flycatcher) occurs as a summer resident in southern California, Arizona, New Mexico, southern Nevada and Utah, western Texas, southwestern Colorado, and possibly northern portions of the Mexican states of Baja California, Sonora and Chihuahua (USFWS 2002). Individuals arrive on the breeding grounds from early May to early June, with nesting typically starting in June (USFWS 2002). Nests are open cups, typically built near or over water, either in an upright crotch or suspended between branches. Historically, the vast majority were found in willows, but at sites where willows have been removed or replaced by invasives, nests are now found in a variety of trees, including oaks, tamarisk, and Russian olive. Southwestern willow flycatchers are insectivorous, their prey largely consisting of flying insects, ranging from flying ants to dragonflies, that are usually taken on the wing but occasionally gleaned from foliage (Sogge et al. 2010; Unitt 2004).

Threats: Threats include invasive non-native plant species, degradation or loss of habitat caused by human intrusion, nest parasitism by the brown-headed cowbird (*Molothrus ater*; cowbird), as well as invasive tree pests that target southwestern willow flycatcher habitat, such as the shot hole borer

(SDMMP and TNC 2017). Other threats include climate change and altered hydrology; however, there are no applicable management options for these threats. There is also potential for threats from non-native Argentine ants, light, and noise, as well as predation from feral cats. Threats within the San Luis Rey River Park include nest parasitism and invasive non-native plants, with potential threats from human intrusion/unauthorized access, invasive tree pests, drought, climate change, altered fire regime and hydrology, pesticides, disease, and direct mortality (SDMMP and TNC 2017; USFWS 2006).

Preserve-Level Status: This species is known to occur, forage, and breed within the San Luis Rey River Park (ICF 2019). Southwestern willow flycatcher individuals were recorded breeding within the San Luis Rey River Park during focused surveys in 2013 and there are previous detection records from 2002, 2006, and 2007 (ICF 2019; Dudek 2011b). Critical habitat is present within the San Luis Rey River Park.

Management Goal

- Maintain and enhance suitable habitat for southwestern willow flycatcher to encourage recolonization of flycatcher breeding pair(s) within the San Luis Rey River Park.

Monitoring Goal

- Monitor status of southwestern willow flycatcher population in San Luis Rey River Park and monitor habitat conditions and threats to inform management needs.

Management Objectives

- Maintain suitable habitat for flycatcher within the San Luis Rey River Park by managing invasive non-native plant species that may disrupt habitat structure (e.g., *Arundo* spp.). Since flycatcher are known to nest in tamarisk (*Tamarix* spp.), should flycatcher be detected and tamarisk is targeted for removal, replacement native tree or shrub species should be planted to maintain suitable nesting habitat.
- Completely remove isolated trees and/or treat branches of high-value trees with shot hole borer infestations, if detected, per UC Riverside handling guidelines.
- Control cowbird parasitism within the San Luis Rey River Park through trapping and removal program as necessary based on results from presence/absence surveys.

Monitoring Objectives

- Conduct presence/absence surveys annually for 3 years and then every 3 years thereafter during the breeding season (May-July) within suitable flycatcher habitat on San Luis Rey River Park. If individuals are detected, coordination with regional monitoring entities may be initiated to capture nest monitoring data.
- Monitor riparian habitats within the San Luis Rey River Park to inform the need for restoration/enhancement and invasive non-native plant and wildlife species control.
- Monitor and document presence/absence of shot hole borer in the San Luis Rey River Park.

Methods

1. **Coordinate with other entities prior to conducting management or monitoring as follows:**
    a. SANDAG/SDMMP regarding species surveys throughout San Diego County to inform the regional monitoring program. Regional monitoring is being conducted annually.
    b. Regional monitoring partners regarding monitoring and management activities to ensure that efforts are not being duplicated and to minimize impacts on the species.

2. Conduct presence/absence surveys annually for 3 years and then every 3 years thereafter.

a. Conduct USFWS protocol survey annually for 3 years from May through July to locate southwestern willow flycatcher territories and determine baseline breeding status in San Luis Rey River Park. After baseline breeding status is documented, conduct USFWS protocol surveys every 3 years.

b. Surveys for southwestern willow flycatcher require a recovery permit pursuant to section 10(a)(1)(A) of the Endangered Species Act. Surveys will follow the established USFWS survey protocol for southwestern willow flycatcher as described in Sogge et al. 2010. At least 3 surveys shall occur between May 15 and July 17, at least one survey per survey period (periods are May 15 to May 31, June 1 to June 24, and June 25 to July 17), at least 5 days apart to maximize detection. Surveys should be conducted and repeated within established survey blocks to allow for monitoring of population trends.

   i. *San Luis Rey River Park.* Suitable southwestern willow flycatcher habitat shall be surveyed at least 3 times. The number of survey blocks within the San Luis Rey River Park will be determined by the surveyor's ability to move through the habitat in accordance with survey protocol requirements to ensure adequate coverage of the Park's southwestern willow flycatcher population.

      - All southwestern willow flycatcher detections are recorded and plotted to estimate the number and location of occupied territories and mapped on the appropriate USGS quadrangle map.
      - Data pertaining to status and distribution (e.g. numbers and locations of paired or unpaired territorial males, ages, and sexes of all birds encountered), and any leg bands detected shall be noted and recorded during each survey.
      - Brown-headed cowbirds (Molothrus ater): record number and locations for any individuals detected within flycatcher territory during each survey and report to USFWS (Sogge et al. 2010).
      - Least Bell's vireo and yellow-billed cuckoo (Coccyzus americanus): record number and locations for any individuals detected within southwestern willow flycatcher territory during each survey and report to USFWS as soon as possible in order to avoid potential harassment of this endangered species due to multiple survey efforts.
      - A final report with maps, survey dates, times, and description or accounts of the methods locations, data, and information identified is prepared and provided to USFWS within 45 days following completion of survey efforts. An annual summary of all southwestern willow flycatcher survey efforts is submitted by January 31 of the following year.

3. Implement brown-headed cowbird control program, as needed, if nest parasitism is observed incidentally during presence/absence surveys.

a. Implement cowbird control based on presence/absence survey results, and coordinate control needs across other on-site special-status species. If moderate to high levels of nest parasitism are incidentally observed, cowbird trapping is the preferred method of control (Kus and Whitfield 2005).

   i. Coordinate with other entities conducting ongoing cowbird trapping efforts within the San Luis Rey River to maximize effectiveness of cowbird trapping program.

b. Cowbird traps shall be performed according to the methodologies outlined in the *Tijuana River Valley Regional Park Cowbird Trapping Program* (County of San Diego 2007b), which include erecting traps by March 15 in areas near concentrated uses, such as staging areas or well-used trails that are accessible to vehicles and have water and perching areas nearby.

i. Traps will be checked daily from March 15 through June 1, at which point they shall be removed.

ii. A reconnaissance of the area shall be conducted to identify potential predators and measures shall be implemented to prevent the predation of trapped birds.

iii. One gallon of water shall be provided in each trap along with bird feed; both shall be replaced regularly.

iv. Incidentally trapped/non-target birds will be collected with a net and released, while adult cowbirds will be humanely euthanized.

v. Data sheets and documentation of the year's trapping program shall be submitted to the County. Should only low levels of parasitism be observed or be limited to distinct geographic areas, alternative methodologies such as mist-netting may be implemented as appropriate.

4. Evaluate monitoring results and implement adaptive management actions as necessary.

a. Review monitoring results from the species surveys, threats assessment and habitat condition assessment to determine (1) if identified threats are having a direct negative effect on the species or habitat, (2) if adaptive management actions need to be implemented, and/or (3) if adaptive management actions that have been previously implemented are functioning as expected.

b. Provide adaptive management recommendations, if any, based on monitoring results and include in the TMP annual report. These are included in the monitoring data sheets. Adaptive management recommendations may include (but are not limited to):

i. Cowbird control to prevent nest parasitism, per the methods outline above.

ii. Removal of isolated trees and/or treatment of branches on high-value trees with shot hole borer infestations, per UC Riverside guidelines. Tree maintenance occurs outside of bird breeding season to avoid impacts to southwestern willow flycatcher.

- Plant willow (*Salix* spp.) saplings to replace diseased or dead willows within the San Luis Rey River Park where suitable habitat is not recovering.

iii. Remove and control invasive non-native plants along San Luis Rey River particularly giant reed (*Arundo donax*) and tamarisk (*Tamarix* spp.).

iv. Coordination with adjacent land managers (e.g., California State Parks, USFWS National Wildlife Refuge, NOAA) regarding cowbird and shot hole borer monitoring and management, if necessary.

c. Incorporate adaptive management recommendations into the preserve's annual work plan and coordinate with on-site DPR staff to implement actions.

d. Submit monitoring and management data annually to the SC-MTX website and SDMMP for incorporation in regional monitoring analysis.

e. Three-year evaluation. At the end of 3 years, reevaluate the species-specific goals, objectives, and methods in the TMP.

2.3.20 Least Bell's Vireo (*Vireo bellii pusillus*)

Federal/State/MSCP/County Status: Listed as federally endangered/state endangered/MSCP-covered, narrow endemic/County Group 1

Habitat: Dependent upon riparian habitat during breeding, and an overall strong preference for willow-dominated woodland or scrub along streams or rivers. During flooding, individuals also use marginal upland scrub adjacent to riparian woodland (SDMMP and TNC 2017).

Life History: Least Bell's vireo occur as summer residents in southern California, which supports 99 percent of the total population (54 percent in San Diego County, 30 percent in Riverside County). Breeding begins in late March, with nesting from early April through July. Nests are typically built in horizontal forks of a tree or shrub branch 1–2 meters high, with a stratified canopy and thick understory for nesting and foraging. Individuals depend on riparian habitat during the breeding season and display a large preference for willow-dominated woodland or scrub typically along streams and rivers throughout Southern California and northwestern Baja California, Mexico. Diet consists primarily of insects such as caterpillars, beetles, and grasshoppers (SDMMP and TNC 2017; Spiegelberg pers. comm.).

Threats: Threats within the Tijuana River Valley Regional Park include invasive non-native plant species, degradation or loss of habitat caused by human intrusion, nest parasitism by the cowbird, as well as invasive tree pests that target least Bell's vireo habitat, such as the shot hole borer (SDMMP and TNC 2017). Other notable threats include climate change and altered hydrology; however, there are no applicable management options for these threats. There is also potential for threats from non-native Argentine ants, light and noise, as well as predation from feral cats. Threats within San Luis Rey River Park and Santa Margarita County Preserve include nest parasitism and invasive non-native plants, with potential threats from human intrusion/unauthorized access, invasive tree pests, drought, climate change, altered fire regime and hydrology, pesticides, disease, and direct mortality (SDMMP and TNC 2017; USFWS 2006).

Preserve-Level Status: The least Bell's vireo (vireo) occurs within Tijuana River Valley Regional Park, San Luis Rey River Park, and Santa Margarita County Preserve.

Tijuana River Valley Regional Park. Least Bell's vireo individuals within the Tijuana River Valley Regional Park were recorded as present and abundant, breeding in riparian areas of the Tijuana River Valley Regional Park (County DPR 2007a). During 2021 surveys, 77 single males and 101 pairs were detected (ESA 2022a). DPR is in the process of implementing the Tijuana River Valley Invasive Species Removal and Restoration Habitat Restoration Plan including restoration of least Bell's vireo habitat. Implementation of the Habitat Restoration Plan includes restoration efforts that will occur outside of nesting bird season.

Santa Margarita County Preserve. During 2011 baseline surveys within the Santa Margarita County Preserve, three singing males were detected; however, breeding was not confirmed due to dense vegetation (ICF 2012). Long-term monitoring was conducted in 2021, 2022, and 2023. During 2021 surveys, six single males and five pairs were detected; nest searching was not performed, but one nest was found incidentally (ESA 2022a). During 2022 surveys, five single males and four pairs were detected (ESA 2023a). During 2023 surveys, six single males and seven pairs were detected; although nest searching was not performed, one nest was incidentally discovered (ESA 2024). Long-term monitoring is ongoing. A cowbird trapping program was established within this preserve in 2022 and implemented in 2022 and 2023 (ESA 2024). Implementation of the trapping program is ongoing.

San Luis Rey River Park. Surveys in 2013 and 2018 found least Bell's vireo to be breeding throughout the San Luis Rey River Park. The Park and the entire San Luis Rey River valley in the Park's vicinity has been designated by USFWS as least Bell's vireo Critical Habitat (ICF 2019).

Management Goal

- Maintain suitable breeding habitat for least Bell's vireo and maintain vireo breeding pairs within the Tijuana River Valley Regional Park, San Luis Rey River Park, and Santa Margarita County Preserve.

Monitoring Goal

- Monitor status of breeding vireo populations in Tijuana River Valley Regional Park, San Luis Rey River Park, and Santa Margarita County Preserve and monitor habitat conditions and threats to inform management needs.

Management Objectives

- Maintain suitable nesting habitat for vireo by managing invasive non-native plant species that may disrupt habitat structure (e.g., *Arundo* spp., *Tamarisk* spp.) on Tijuana River Valley Regional Park, San Luis Rey River Park, and Santa Margarita County Preserve. Replacement native tree or shrub species may be planted to maintain suitable nesting habitat.
- Completely remove isolated trees and/or treat branches of high-value trees with shot hole borer infestations, per UC Riverside handling guidelines. In areas of Tijuana River Valley Regional Park where nesting habitat is not recovering, restore and enhance as necessary.
- Control cowbird parasitism through trapping and removal program, as necessary based on monitoring results on Tijuana River Valley Regional Park, San Luis Rey River Park, and Santa Margarita County Preserve.

Monitoring Objectives

- Conduct presence/absence surveys every 3 years during the breeding season (April-July) within suitable vireo habitat on Santa Margarita County Preserve and Tijuana River Valley Regional Park. Conduct presence/absence surveys annually for 3 years and then every 3 years thereafter on San Luis Rey River Park.
- Conduct nest monitoring as needed in conjunction with implementation of cowbird trapping efforts to track the effectiveness of trapping and removal program.
- Monitor and document presence/absence of shot hole borer in Tijuana River Valley Regional Park, San Luis Rey River Park, and Santa Margarita County Preserve. Monitor recovery of shot hole borer–infested riparian habitats in Tijuana River Valley Regional Park to inform the need for restoration/enhancement and invasive non-native wildlife species control.

Methods

1. **Coordinate with other entities prior to conducting management or monitoring as follows:**
    a. SANDAG/SDMMP regarding species surveys throughout San Diego County to inform the regional monitoring program. Regional monitoring to document effects of shot hole borer within Tijuana River Valley occurred in 2020 and 2023 and a final year is planned for 2026.
    b. Regional monitoring partners regarding monitoring and management activities to ensure that efforts are not being duplicated and to minimize impacts on the species.
2. **Conduct presence/absence surveys every 3 years within Santa Margarita County Preserve and Tijuana River Valley Regional Park. Conduct presence/absence surveys annually for 3 years and then every 3 years thereafter on San Luis Rey River Park.**
    a. Conduct presence/absence monitoring in April–July annually for 3 years to determine baseline breeding status in San Luis Rey River Park. Conduct presence/absence monitoring every 3 years to

locate vireo territories and determine breeding status of males on San Luis Rey River Park, Santa Margarita County Preserve, and Tijuana River Valley Regional Park. Conduct surveys specific for least Bell's vireo following modified USFWS Least Bell's Vireo Survey Guidelines (USFWS 2001).

b. Recovery permits pursuant to section 10(a)(1)(A) of the Endangered Species Act are not required for presence/absence surveys as long as protocol is followed and vocalization tapes are not used. However, surveys are conducted by qualified biologists familiar with vocalization and plumage of adult and juvenile individuals to maximize detection. Surveys shall occur between April 10 and July 31, at least 10 days apart to maximize detection. Individual surveys cover no more than 3 linear kilometers or no more than 50 hectares of habitat. Surveys should be conducted and repeated within established survey blocks to allow for monitoring of population trends.

   i. *Santa Margarita County Preserve.* Suitable vireo habitat shall be surveyed at least 4 times. Santa Margarita County Preserve is surveyed in its entirety over 1 day for each survey pass.

   ii. *Tijuana River Valley Regional Park.* Suitable vireo habitat shall be surveyed at least 4 times. Tijuana River Valley Regional Park is divided into seven survey blocks for each survey pass.

   iii. *San Luis Rey River Park.* Suitable vireo habitat shall be surveyed at least 4 times. Survey blocks will be established in accordance with the USFWS Least Bell's Vireo Survey Guidelines (USFWS 2001) during the first year of monitoring to ensure adequate coverage of the Park's vireo population.

   - All vireo detections are recorded and plotted to provide an estimate of the number and location of occupied territories and mapped on the appropriate USGS quadrangle map.
   - Data pertaining to status and distribution (e.g. numbers and locations of paired or unpaired territorial males, ages, and sexes of all birds encountered), and any leg bands detected shall be noted and recorded during each survey.
   - Brown-headed cowbirds (*Molothrus ater*): record number and locations for any individuals detected within vireo territory during each survey and report to USFWS (Peterson et al. 2004).
   - Southwestern willow flycatcher and yellow-billed cuckoo (*Coccyzus americanus*): record number and locations for any individuals detected within vireo territory during each survey and report to USFWS as soon as possible in order to avoid potential harassment of these endangered species due to multiple survey efforts.
   - A final report with maps, survey dates, times, and description or accounts of the methods locations, data, and information identified is prepared and provided to USFWS within 45 days following completion of survey efforts. An annual summary of all vireo survey efforts is submitted by January 31 of the following year.

3. Monitor shot hole borer and habitat recovery at Tijuana River Valley Regional Park annually or based on Emergent Tree Pest Plan recommendations.

a. Trees are monitored for signs and symptoms of shot hole borer in accordance with the methods outlined in the DPR Emergent Tree Pests Plan. As this species is already documented within the Tijuana River Valley Regional Park, long-term monitoring efforts may consist of trapping to document presence/absence and/or tree health surveys to document infestation levels.

b. Establish permanent monitoring plots and conduct quantitative vegetation monitoring using the using the relevé method (CNPS 2007) within the Tijuana River, in riparian areas. A comparison of long-term quantitative vegetation data are included in the annual TMP monitoring report and is used to inform adaptive management decisions related to restoration and enhancement of habitat.

4. Implement brown-headed cowbird control program, as needed, if nest parasitism is observed incidentally during presence/absence surveys.

a. Implement cowbird control based on presence/absence survey results, and coordinate control needs across other on-site special-status species. If moderate to high levels of nest parasitism are incidentally observed, cowbird trapping is the preferred method of control (Kus and Whitfield 2005).

i. Coordinate with other entities conducting ongoing cowbird trapping efforts within the San Luis Rey River, Santa Margarita River, and Tijuana River to maximize effectiveness of brown-headed cowbird trapping program.

b. Cowbird traps shall be performed according to the methodologies outlined in the *Tijuana River Valley Regional Park Cowbird Trapping Program* (County of San Diego 2007b), which include erecting traps by March 15 in areas near concentrated uses, such as staging areas or well-used trails that are accessible to vehicles and have water and perching areas nearby.

i. Traps will be checked daily from March 15 through June 1, at which point they shall be removed.

ii. A reconnaissance of the area shall be conducted to identify potential predators and measures shall be implemented to prevent the predation of trapped birds.

iii. One gallon of water shall be provided in each trap along with bird feed; both shall be replaced regularly.

iv. Incidentally trapped/non-target birds will be collected with a net and released, while adult cowbirds will be humanely euthanized.

v. Data sheets and documentation of the year's trapping program shall be submitted to the County. Should only low levels of parasitism be observed or be limited to distinct geographic areas, alternative methodologies such as mist-netting may be implemented as appropriate.

5. Evaluate monitoring results and implement adaptive management actions as necessary.

a. Review monitoring results from the species surveys, threats assessment and habitat condition assessment to determine (1) if identified threats are having a direct negative effect on the species or habitat, (2) if adaptive management actions need to be implemented, and/or (3) if adaptive management actions that have been previously implemented are functioning as expected.

b. Provide adaptive management recommendations, if any, based on monitoring results and include in the TMP annual report. These are included in the monitoring data sheets. Adaptive management recommendations may include (but are not limited to):

i. Cowbird control to prevent nest parasitism, per the methods outlined above for, San Luis Rey River Park, Santa Margarita Preserve, and Tijuana River Valley Regional Park.

ii. Removal of isolated trees and/or treatment of branches on high-value trees with shot hole borer infestations, per UC Riverside guidelines on Tijuana River Valley Regional Park. Tree maintenance occurs outside of bird breeding season to avoid impacts to least Bell's vireo.

- Replace willow (*Salix* spp.) saplings to replace diseased or dead willows within DPR parks and preserves where suitable habitat is not recovering.

iii. Remove and control invasive non-native plants within suitable habitat particularly giant reed (*Arundo donax*) and tamarisk (*Tamarix* spp.).

iv. Restoration and enhancement of riparian habitat in areas of Tijuana River Valley Regional Park where nesting habitat is not recovering.

v. Coordination with adjacent land managers (e.g., California State Parks, USFWS National Wildlife Refuge, NOAA) regarding cowbird and shot hole borer monitoring and management, if necessary, on San Luis Rey River Park, Santa Margarita Preserve, and Tijuana River Valley Regional Park.

vi. Conduct nest monitoring in conjunction with cowbird trapping program, if determined necessary based on whether there was (1) an increase in incidental brown-headed cowbird parasitism, (2) an increase in observations of the cowbird population with a reduction in vireo territory numbers, and (3) a significant increase in the brown-headed cowbird population. This would be conducted in consultation with regional entities on San Luis Rey River Park, Santa Margarita Preserve, and Tijuana River Valley Regional Park.

- Vireo pairs will be monitored to determine nesting activity, locate nests to detect/facilitate cowbird egg removal from nests and allow determination of clutch size date of initiation, hatch rate, and fledge rate. Small mirrors or cameras on extendable poles may be used to facilitate examination of nest contents. Surveyors will be careful not to create trails directly leading to nests or approaching nests when potential predators or cowbirds are nearby. Cowbird eggs found in vireo nests shall be removed with adhesive tape in order to minimize disturbance to vireo eggs. Field notes shall include as much detail as possible regarding the success/fate of the nests; unhatched vireo eggs will be inspected to determine and record the cause of unsuccessful hatching, if possible (Kus 1999).

c. Incorporate adaptive management recommendations into the preserve's annual work plan and coordinate with on-site DPR staff to implement actions.

d. Submit monitoring and management data annually to the SC-MTX website and SDMMP for incorporation in regional monitoring analysis.

e. Six-year evaluation. At the end of 6 years, reevaluate the species-specific goals, objectives, and methods in the TMP.

2.3.21 Pallid Bat (*Antrozous pallidus*)

Federal/State/MSCP/County Status: Not federally listed/CDFW Species of Special Concern/draft North County MSCP proposed covered/County Group 2.

Habitat: Multiple habitat-roosting species that can be found in crevices and/or cavity-type situations such as rock crevices, caves, tree hollows, mines, buildings, and bridges. Usually found foraging on terrestrial arthropods in oak savannah-type habitats, grassy oak and sycamore-lined river terraces, native grasslands, and sparsely vegetated scrublands (Krutzsch 1948; D. Stokes pers. comm.).

Life History: Mates from late October through February. Fertilization is delayed, gestation is 53 to 71 days. Maternity colonies form in early April, and may have a dozen to 100 individuals. Males may roost separately or in the nursery colony. Young are born from April through July, mostly from May through June. Hibernates in winter near the summer day roost (Hermanson and O'Shea 1983).

Threats: Highly sensitive to disturbance of roosting sites (Harris 2000a), such as human disturbance from recreational activities within caves and on rock faces, and fires destroying roosting sites (Rochester et al. 2010; SDMMP and TNC 2017; D. Stokes pers. comm.). Invasive non-native plants (D. Stokes pers. comm.; OWI 2016), invasive non-native pests such as goldspotted oak borer and shot hole borer (D. Stokes pers. comm.; OWI 2016; UC IPM 2013; UC IPM 2017), and long-term fires (SDMMP and

TNC 2017) can alter foraging habitat and impact foraging success. Limited supply of water can affect survival, particularly lactating females (D. Stokes pers. comm.; OWI 2016; SDMMP and TNC 2017; Taylor 2007; SDNHM 2018b) and absorption of pesticides through the skin or ingestion of impacted prey are also potential threats (SDMMP and TNC 2017; Ferguson and Azerrad 2004). White-nose syndrome, a fungal disease, is also a threat to this species, though has not yet been diagnosed in this species and is not yet known in California as of 2019 (BCI 2024). Trash and dumping generally degrades habitat quality for wildlife, including bats, and off-road vehicle use potentially impacts terrestrial arthropods and, therefore, could negatively affect foraging bats (ESA 2022a).

Preserve-Level Status: This species is known to occur in San Luis Rey River Park, Hellhole Canyon, Mount Olympus, Bottle Peak, and Wilderness Gardens County Preserves.

San Luis Rey River Park. Species was detected during 2019 baseline biological surveys (ICF 2019).

Hellhole Canyon County Preserve. Species was detected along Hell Creek in the eastern portion of Hellhole Canyon County Preserve during 2008 baseline biological surveys (TAIC 2008b). Figure 14 shows the two locations where pallid bat was recorded via detector (northern location) and captured via mist-netting (southern location). It was also detected within the Hellhole Canyon County Preserve Additions (Addition 1, Addition 3, Sierra Verde, and Fureigh Additions) during 2019 and 2021 baseline biological surveys (ESA 2021b; ESA 2023d). Roosting and foraging habitat assessments took place in 2021, 2022, and 2023 at Hellhole Canyon County Preserve. Suitable habitat including rocky outcrops, boulders, and oaks and other tree species that could provide pallid bat roosting opportunities were observed on-site (ESA 2022a; ESA 2023a; ESA 2023b). Passive acoustic surveys also occurred in 2021. Although there were potential foraging echolocation calls recorded, there were no detections of roosting pallid bat during the surveys (ESA 2022a). Transect acoustic monitoring was conducted in 2022 and 2023; however, pallid bat was not detected on the preserve (ESA 2023a; ESA 2023b).

Mount Olympus County Preserve. Species was detected during 2009 baseline biological surveys (MBA 2010a) and the locations of the detectors that recorded this species are shown on Figure 16. Roosting and foraging habitat assessments took place in 2021, 2022, and 2023 at Mount Olympus County Preserve. Suitable habitat including rocky outcrops, boulders, oaks and other tree species, and abandoned human-made structures that could provide pallid bat roosting opportunities were observed on-site (ESA 2022a; ESA 2023a; ESA 2023b). Passive acoustic surveys also occurred and detected pallid bat in 2021. Transect acoustic monitoring was conducted in 2022 and 2023 and two occurrences of pallid bat were recorded for 2022 (ESA 2023a).

Bottle Peak County Preserve. Species was detected during 2014 baseline biological surveys (AECOM 2015).

Wilderness Gardens County Preserve. Species was detected in the northern portion of Wilderness Gardens County Preserve during 2009 baseline biological surveys (MBA 2010b). The location of the detector that recorded this species is shown in Figure 21. Roosting and foraging habitat assessments took place in 2021, 2022, and 2023 at Wilderness Gardens County Preserve. Suitable habitat including historic and unused buildings, rocky outcrops, and suitable trees that could provide pallid bat roosting opportunities were observed on-site (ESA 2022a; ESA 2023a; ESA 2023b). Passive acoustic surveys also occurred and detected pallid bat in 2021. Transect acoustic monitoring was conducted in 2022 and 2023; however, pallid bat was not detected on the preserve (ESA 2023a; ESA 2023b).

This species was also detected at El Monte County Park and Stoneridge, Boulder Oaks, and Sycamore Canyon/Goodan Ranch County Preserves; however, this is not a covered species under the South County MSCP Subarea Plan.

Management Goal

- Protect pallid bat roosts from destruction and human disturbance and maintain suitable foraging habitat (e.g., open, uncluttered vegetation) within commuting distance of pallid bat roosts within the San Luis Rey River Park, Bottle Peak County Preserve, Hellhole Canyon County Preserve, Mount Olympus County Preserve, and Wilderness Gardens County Preserve.

Monitoring Goal

- Conduct surveys to monitor the status of pallid bat occupancy and roosting and foraging habitat within San Luis Rey River Park, Bottle Peak County Preserve, Hellhole Canyon County Preserve, Mount Olympus County Preserve, and Wilderness Gardens County Preserve to document current distribution and threat data to inform management needs.

Management Objectives

- Protect pallid bat roosts from destruction and human disturbance through fencing, signage, and other access control measures, as needed.
- Maintain suitable pallid bat foraging habitat (e.g., open, uncluttered vegetation) by managing invasive non-native plant species and restoring or enhancing habitat as necessary.
- Provide supplemental open water sources for pallid bats in known foraging habitat where quality natural open water sources have declined.
- Provide artificial roosts for pallid bats if existing roosts are destroyed, lack available water, or are determined to be vulnerable to disturbance.

Monitoring Objectives

- Monitor bat activity in potential roosting areas in all four seasons to determine roosting locations and when roosts are being used.
- Inspect pallid bat roosts on an annual basis, taking care not to disturb the bats, and monitor for sign of threats within a suitable buffer as determined by the biologist based on field conditions.
- Monitor known and potential pallid bat foraging areas for potential threats such as invasive non-native plant species and other forms of habitat disturbance.
- Monitor known pallid bat foraging habitat to determine whether drought or altered hydrology are resulting in reduced or inadequate open water sources.
- Monitor to determine if artificial roosts are being utilized by the pallid bat, if applicable.

Methods

1. **Coordinate with other entities prior to conducting management or monitoring as follows:**
    a. SANDAG/SDMMP regarding species surveys throughout San Diego County to inform the regional monitoring program.
    b. SANDAG/SDMMP regarding development of species-specific threats assessment.
    c. Regional monitoring partners regarding monitoring and management activities to ensure that efforts are not being duplicated and to minimize impacts on the species.

2. Evaluate pallid bat occupancy (e.g., roosting and foraging) within San Luis Rey River Park, Bottle Peak County Preserve, Hellhole Canyon County Preserve, Mount Olympus County Preserve, and Wilderness Gardens County Preserve every 5 years.

a. Foraging bat surveys: Determine potential foraging areas for pallid bats within the San Luis Rey River Park, Bottle Peak County Preserve, Hellhole Canyon County Preserve, Mount Olympus County Preserve, and Wilderness Gardens County Preserve based on vegetation mapping.

   Conduct acoustic detection and mist-netting according to the methodologies described below.

b. Acoustic detection:

   i. Conduct acoustic detections during two survey periods, once in spring and once in fall, consisting of two nights each.

   ii. Within each potential foraging area, place a high-sensitivity ultrasonic bat detector at a height of approximately 1 to 9 meters. If a directional microphone is used, the microphone is at a 45-degree angle, oriented toward the direction bats are expected to forage in, to maximize the probability of detecting and recording bat vocalizations.

   iii. The acoustic detector begins recording at approximately sunset and run for a total of 3 hours.

   iv. If a standard Anabat acoustic detector is used, the settings are as follows: Set the division ratio to 16, and the sensitivity level to 8 (maximum setting is 10), except in habitat settings where background noise interferes with sound reception. In these instances, the sensitivity setting can be reduced to 7.5 or 7.

   v. During the acoustic detection period, surveyors will listen (using the unaided ear) for audible social calls of pallid bats and use spotlights to aid in visual species identification and confirmation of foraging behavior.

c. Mist-netting:

   i. Mist-netting is known to have higher detection probabilities than using only acoustic techniques. Mist-netting activities are authorized by the County prior to conducting surveys.

   ii. Mist-netting will be implemented simultaneously with the acoustic techniques above. Mist-nets will be placed in areas where they will likely intercept flying bats, such as over relatively small bodies of water and in vegetation flyaways (Kunz et al. 1996).

   iii. Number of mist-nets implemented and their dimensions can vary dependent on size of potential foraging area. Mist-nets are placed within 100 meters of the acoustic setup location and will be operated during the same timeframe as the acoustic survey, for a total of 3 hours beginning at approximately sunset.

   iv. All bats captured during mist-netting will be processed and released immediately. Information to be collected during species processing will include:

      - Species
      - Age (juvenile/adult)
      - Tooth wear (rated 1–4 as rough estimate of age based on wear on the least worn upper canine: 1 = needle sharp, 2 = showing some wear, 3 = worn such that length of tooth approximates width, and 4 = tooth completely worn to base or missing completely)
      - Sex
      - Reproductive status
      - Parasite load

- Presence/absence of signs of white-nose syndrome (e.g., scarring of wing membranes)
- General measurements
- Photograph of individual (as feasible)
- Record vocalizations of captured bats with the bat detector during release to collect a reference library of "known" bat vocalization sequences
- Anything else noteworthy

d. Roost surveys: Conduct roost surveys during each season for an entire year to determine baseline occupancy and then on 5-year intervals to determine locations and temporal usage of summer, winter, day, and night roosts for pallid bats. Roost surveys are conducted cautiously as pallid bats are extremely sensitive to disturbance at roost sites (Harris 2000a), according to the methodologies described below.

   i. Determine potential roosting areas (e.g., tree cavities, rocky cliffs, outcrops, and natural caves) for pallid bats within the San Luis Rey River Park, Hellhole Canyon County Preserve, Bottle Peak County Preserve, and Wilderness Gardens County Preserve based on aerial maps.

   ii. Conduct emergence surveys at known or suspected roost sites using a bat detector and visually surveying the entrance to the potential roost site from approximately 0.5 hours before to 1 hour after dusk.

   iii. If safely accessible, conduct internal inspections of potential roost sites using visual observations of roosting bats, culled insect parts deposited by bats, and/or guano (requires surveyors familiar with species-specific bat guano or the use of DNA analysis). Avoid day roost inspections unless there is an indication of recent human disturbance or vandalism that warrants investigation.

   iv. If diurnal/nocturnal internal roost inspections are inaccessible, too disruptive to roosting bats, or cannot be used to effectively determine species and use of potential roost sites, conduct mist-net surveys, if feasible, using the methods outlined above.

3. Conduct threats assessment for foraging and roosting habitats within the preserves annually.

a. Conduct a threats assessment in key roosting and foraging areas annually. Until SDMMP or other appropriate entity develops a species-specific threats assessment protocol, use the threats assessment protocol in SDMMP's most recent Rare Plant Monitoring Protocol (see Section V. of the Rare Plant Habitat and Threats Assessment Data Form [SDMMP 2020]). The threats assessments are conducted concurrently with the foraging bat and roost surveys.

b. Note preliminary adaptive management recommendations during surveys.

4. Evaluate monitoring results and implement adaptive management actions as necessary.

a. Review monitoring results from the species surveys, threats and habitat condition assessment to determine (1) if identified threats are having a direct negative effect on the species or habitat, (2) if adaptive management actions need to be implemented, and/or (3) if adaptive management actions that have been previously implemented are functioning as expected.

b. Provide adaptive management recommendations, if any, based on monitoring results and include in the TMP annual report. These are included in the monitoring data sheets. Adaptive management recommendations may include (but are not limited to):

   Installation of bat boxes and/or artificial roosts to support pallid bats, particularly if existing roost sites are threatened or destroyed. Artificially constructed roost structures are placed at

locations away from areas of high human activity such that they are unlikely to be disturbed or vandalized.

Installation of supplemental open water sources for pallid bats if natural quality open water sources have declined or are not present.

Protection of known roost sites through installation of fencing, signage, and other access control measures.

Invasive non-native species removal and habitat enhancement within key foraging areas, as needed.

c. Incorporate adaptive management recommendations into the preserve's annual work plan and coordinate with on-site DPR staff to implement actions.

d. Submit monitoring and management data annually to the SC-MTX website and SDMMP for incorporation in regional monitoring analysis.

e. Five-year evaluation. At the end of 5 years, reevaluate the species-specific goals, objectives, and methods in the TMP.

2.3.22 Townsend's Big-Eared Bat (*Corynorhinus townsendii*)

Federal/State/MSCP/County Status: Not federally listed/state species of special concern/draft North County MSCP proposed covered/County Group 2.

Habitat: Obligate cave-roosting species that can be found within natural caves and artificial cave-like structures such as abandoned mines); however, use of specific mines is dynamic and may vary among seasons and years (Sherwin et al. 2000). Winter roosting requirements are different from their summer requirements, with stable cool, humid environments preferred in the winter (Pierson and Rainey 1996; Sherwin 1998). Forages predominantly on moth species close to vegetation and may glean insects directly from branches of shrubs and trees within oak woodland, ironwood forests, and riparian woodland (Fellers and Pierson 2002).

Life History: Mates from November–February. Fertilization is delayed, gestation is 56–100 days. Maternity colonies form in caves, tunnels, mines, and buildings, and may have less than 100 individuals. Young are born in May and June, peaking in late May. Hibernates from October to April.

Threats: Highly sensitive to disturbance of roosting sites (Harris 2000b) and intolerant of human disturbance, such has from recreational activities within caves and on rock faces (Stokes et al. 2005; D. Stokes pers. comm.), and fires destroying roosting sites (Stokes et al. 2005; D. Stokes pers. comm.; SDMMP and TNC 2017). Invasive non-native plants (D. Stokes pers. comm.; OWI 2016), invasive non-native pests such as goldspotted oak borer and shot hole borer (D. Stokes pers. comm.), and long-term fires (SDMMP and TNC 2017) can alter foraging habitat and impact foraging success. Limited supply of water can affect survival, particularly lactating females (D. Stokes pers. comm.; SDMMP and TNC 2017; Taylor 2007) and absorption of pesticides through the skin or ingestion of impacted prey are also potential threats (SDMMP and TNC 2017). White-nose syndrome, a fungal disease, has been diagnosed in this species, but is not yet known how it affects this species or in populations in California as of 2024 (BCI 2024).

Preserve-Level Status: This species is known to occur in San Luis Rey River Park, Hellhole Canyon, and Wilderness Gardens County Preserves.

San Luis Rey River Park. Species detected during 2019 baseline biological surveys (ICF 2019).

Hellhole Canyon County Preserve. Species detected along Hell Creek, near the flume crossing in the south-central portion of Hellhole Canyon County Preserve during 2008 baseline biological surveys (TAIC 2008b). It was also detected within the Sierra Verde Addition and the Fureigh Addition to the Hellhole Canyon County Preserve during 2019 and 2021 baseline biological surveys (ESA 2021b; ESA 2023d). Roosting and foraging habitat assessments took place in 2021, 2022, and 2023 at Hellhole Canyon County Preserve. Suitable habitat including boulder strewn areas, on-site trees with hollows and cavities, and off-site boulders and rocky outcrops were observed on-site (ESA 2022a; ESA 2023a; ESA 2023b). Passive acoustic surveys also occurred in 2021; however, there were no confirmed or potential Townsend's big-eared bat detections at Hellhole Canyon County Preserve (ESA 2022a). Transect acoustic monitoring was conducted in 2022 and 2023; however, Townsend's big-eared bat was not detected on the preserve (ESA 2023a; ESA 2023b).

Wilderness Gardens County Preserve. Species detected at Wilderness Gardens County Preserve during focused surveys conducted by San Diego Natural History Museum from 2015 to 2017 (SDNHM 2018b). Within Wilderness Gardens County Preserve, this species was detected around the man-made pond. Roosting and foraging habitat assessments took place in 2021, 2022, and 2023 at Wilderness Gardens County Preserve. Suitable habitat including abandoned buildings, exposed rocky outcrops, and some trees (ESA 2022a; ESA 2023a; ESA 2023b). Passive acoustic surveys also occurred in 2021 and Townsend's big-eared bat presence was confirmed (ESA 2022a). Transect acoustic monitoring was conducted in 2022 and 2023; however, Townsend's big-eared bat was not detected on the preserve (ESA 2023a; ESA 2023b).

This species was also detected at El Monte and Louis A. Stelzer County Parks, and Lakeside Linkage, Skyline, Lawrence and Barbara Daley, Oakoasis, and Del Dios Highlands (in the southern portion) County Preserves; however, it is not a covered species under the South County MSCP Subarea Plan. This species was also detected at Escondido Creek County Preserve; however, no suitable roosting habitat is present (AECOM 2017b). Only a possible detection was documented at Mount Olympus County Preserve (ESA 2022a).

Management Goal

- Protect Townsend's big-eared bat roosts from destruction and human disturbance and maintain suitable foraging habitat (e.g., extensive riparian and oak woodland habitat with near-perennial open water sources) within commuting distance of Townsend's big-eared bat roosts within San Luis Rey River Park, Hellhole Canyon County Preserve, and Wilderness Gardens County Preserve.

Monitoring Goal

- Continue to conduct surveys to monitor the status of Townsend's big-eared bat occupancy and roosting and foraging habitat within San Luis Rey River Park, Hellhole Canyon County Preserve, and Wilderness Gardens County Preserve to track distribution and threat data to inform management needs.

Management Objectives

- Protect Townsend's big-eared bat roosts from destruction and human disturbance through fencing, signage, and other access control measures, as needed.
- Maintain suitable Townsend's big-eared bat foraging habitat (e.g., riparian and oak woodland habitat with nearby perennial open water) by managing invasive non-native plant species and restoring or enhancing habitat as necessary.
- Provide supplemental open water sources for Townsend's big-eared bats in known foraging habitat where quality natural open water sources have declined.

Monitoring Objectives

- Monitor bat activity in potential roosting areas in all four seasons to determine roosting locations and when roosts are being used.
- Inspect Townsend's big-eared bat roosts on an annual basis, taking care not to disturb the bats, and monitor for threats within a suitable buffer as determined by the biologist based on field conditions.
- Monitor known and potential Townsend's big-eared bat foraging areas for potential threats such as invasive non-native plant species and other forms of habitat disturbance.
- Monitor known Townsend's big-eared bat foraging habitat to determine whether drought or altered hydrology are resulting in reduced or inadequate open water sources.

Methods

1. **Coordinate with other entities prior to conducting management or monitoring as follows:**
    a. SANDAG/SDMMP regarding species surveys throughout San Diego County to inform the regional monitoring program. Regional monitoring is planned for 2025.
    b. SANDAG/SDMMP regarding development of species-specific threats assessment.
    c. Regional monitoring partners regarding monitoring and management activities to ensure that efforts are not being duplicated and to minimize impacts on the species.
2. **Evaluate Townsend's big-eared bat occupancy (e.g., roosting and foraging) within San Luis Rey River Park, Hellhole Canyon County Preserve, and Wilderness Gardens County Preserve every 5 years.**
    a. Foraging bat surveys: Determine potential foraging areas, such as oak woodland and riparian woodland habitats, for Townsend's big-eared bat within the San Luis Rey River Park, Hellhole Canyon County Preserve, and Wilderness Gardens County Preserve based on vegetation mapping.

       Conduct acoustic detection and mist-netting according to the methodologies described below.
    b. Acoustic detection:
        i. Conduct acoustic detections during two survey periods, once in spring and once in fall, consisting of two nights each.
        ii. Within each potential foraging area, place a high-sensitivity ultrasonic bat detector at a height of approximately 1 to 9 meters. If a directional microphone is used, the microphone is at a 45-degree angle, oriented toward the direction bats are expected to forage in, to maximize the probability of detecting and recording bat vocalizations.
        iii. The acoustic detector begins recording at approximately sunset and run for a total of 3 hours.

iv. If a standard Anabat acoustic detector is used, the settings are as follows: Set the division ratio to 16, and the sensitivity level to 8 (maximum setting is 10), except in habitat settings where background noise interferes with sound reception. In these instances, the sensitivity setting can be reduced to 7.5 or 7.

v. During the acoustic detection period, surveyors will use spotlights to aid in visual species identification and confirmation of foraging behavior.

c. Mist-netting:

i. Mist-netting is known to have higher detection probabilities than using only acoustic techniques. Mist-netting activities are authorized by the County prior to conducting surveys.

ii. Mist-netting will be implemented simultaneously with the acoustic techniques above. Mist-nets will be placed in areas where they will likely intercept flying bats, such as over relatively small bodies of water and in vegetation flyaways (Kunz et al. 1996).

iii. Number of mist-nets implemented and their dimensions can vary dependent on size of potential foraging area. Mist-nets are placed within 100 meters of the acoustic setup location and will be operated during the same timeframe as the acoustic survey, for a total of 3 hours beginning at approximately sunset.

iv. All bats captured during mist-netting will be processed and released immediately. Information to be collected during species processing will include:

- Species
- Age (juvenile/adult)
- Tooth wear (rated 1–4 as rough estimate of age based on wear on the least worn upper canine: 1 = needle sharp, 2 = showing some wear, 3 = worn such that length of tooth approximates width, and 4 = tooth completely worn to base or missing completely)
- Sex
- Reproductive status
- Parasite load
- Presence/absence of signs of white-nose syndrome (e.g., scarring of wing membranes)
- General measurements
- Photograph of individual (as feasible)
- Record vocalizations of captured bats with the bat detector during release to collect a reference library of “known” bat vocalization sequences
- Anything else noteworthy

d. Roost surveys: Conduct roost surveys during each season for an entire year to determine baseline occupancy and then on 5-year intervals to determine locations and temporal usage of summer, winter, day, and night roosts for Townsend’s big-eared bats. Roost surveys are conducted cautiously as Townsend’s big-eared bats are extremely sensitive to disturbance at roost sites (Harris 2000b), according to the methodologies below.

i. Determine potential roosting areas (e.g., natural caves and/or artificial cave-like structures) for Townsend’s big-eared bats within the within the San Luis Rey River Park, Hellhole Canyon County Preserve, and Wilderness Gardens County Preserve based on aerial maps.

ii. Conduct emergence surveys at known or suspected roost sites using a bat detector and visually surveying the entrance to the potential roost site from approximately 0.5 hours before to 1 hour after dusk.

iii. If safely accessible, conduct internal inspections of potential roost sites using visual observations of roosting bats, culled insect parts deposited by bats, and/or guano (requires surveyors familiar with species-specific bat guano or the use of DNA analysis). Avoid day roost inspections unless there is an indication of recent human disturbance or vandalism that warrants investigation.

iv. If diurnal/nocturnal internal roost inspections are inaccessible, too disruptive to roosting bats, or cannot be used to effectively determine species and use of potential roost sites, conduct mist-net surveys, if feasible, using the methods outlined in method 2c above.

3. Conduct threats assessment for foraging and roosting habitats within the preserves annually.

a. Conduct a threats assessment in key roosting and foraging areas annually. Until SDMMP or other appropriate entity develops a species-specific threats assessment protocol, use the threats assessment protocol in SDMMP's most recent Rare Plant Monitoring Protocol (see Section V. of the Rare Plant Habitat and Threats Assessment Data Form [SDMMP 2020]). The threats assessments are conducted concurrently with the foraging bat and roost surveys.

b. Note preliminary adaptive management recommendations during surveys.

4. Evaluate monitoring results and implement adaptive management actions as necessary.

a. Review monitoring results from the species surveys, threats assessment and habitat condition assessment to determine: (1) if identified threats are having a direct negative effect on the species or habitat, (2) if adaptive management actions need to be implemented, and/or (3) if adaptive management actions that have been previously implemented are functioning as expected.

b. Provide adaptive management recommendations, if any, based on monitoring results and include in TMP annual report. These are included in the monitoring data sheets. Adaptive management recommendations may include (but are not limited to):

i. Installation of artificially constructed concrete or rock cave-like structures to support the obligate cave-roosting needs of Townsend's big-eared bats, particularly if existing roost sites are threatened or destroyed. Artificially constructed structures are placed at locations away from areas of high human activity such that they are unlikely to be disturbed or vandalized.

ii. Installation of supplemental open water sources for Townsend's big-eared bats if natural quality open water sources have declined or are not present.

iii. Protection of known roost sites through installation of fencing, signage, and other access control measures.

iv. Invasive non-native species removal and habitat enhancement within key foraging areas, as needed.

c. Incorporate adaptive management recommendations into the preserve's annual work plan and coordinate with on-site DPR staff to implement actions.

d. Submit monitoring and management data annually to the SC-MTX website and SDMMP for incorporation in regional monitoring analysis.

e. Five-year evaluation. At the end of 5 years, reevaluate the species-specific goals, objectives, and methods in the TMP.

2.3.23 Stephens' Kangaroo Rat (*Dipodomys stephensi*)

Federal/State/MSCP/County Status: Federally listed as threatened/state-listed as threatened/draft North County MSCP proposed covered/County Group 1.

Habitat: Prefers open grassland habitat dominated by low forbs, such as filaree (*Erodium* spp.), with sparse perennial plant cover and gentle topography. Loamy or sandy soils and sufficient bare ground must be present for sand bathing and digging burrows. Vegetative cover is generally less than 50 percent in the summer (Burke et al. 1991).

Life History: SKR is a nocturnal burrowing rodent that feeds almost exclusively on seeds, although some insects and green vegetation are eaten as well.

Threats: Non-native plant infestation (e.g., thick cover of non-native grasses) and habitat conversion, climate change, drought stress, rodent control (pesticides), and predation. Isolated populations may be at risk of inbreeding.

Preserve-Level Status: Species occurs within Ramona Grasslands and Hellhole Canyon County Preserves.

Ramona Grasslands County Preserve. Species occurs within Ramona Grasslands County Preserve north and south of Ramona Airport (and north of Santa Maria Creek) in the northeastern and southeastern portions of the preserve. These areas are identified as SKR Management Areas 1 and 2 (Spencer and Montgomery 2007), as shown in Figure 10a. The portions of SKR Management Area 1 and 2 that occur within the Ramona Grasslands County Preserve (230.4 acres and 155.1 acres, respectively) are referred to as "core habitat areas." More recently, SKR observations were also made south of Santa Maria Creek in the southwestern portion of the preserve (ICF 2010). A 3-acre SKR Management Area was created just to the northwest of the staging area as mitigation for construction of the staging area in the southwest portion of the Ramona Grasslands County Preserve (shown as SKR Management Area 3 on Figure 10a).

Long-term monitoring plots were initially established within SKR habitat in Ramona Grasslands County Preserve in 2016, following an adapted methodology used by Cheryl Brehme in her SKR monitoring at Camp Pendleton (Brehme et al. 2016). These plots were established in core habitat areas, defined as SKR Management Areas 1 and 2 within Grazing Management Units 2A, 2B, and 3A, plus the 3-acre SKR Management Area 3 (Figure 10b). Areas within Grazing Management Units 2A and 2B outside of the SKR Management Areas were not included for the initial focused monitoring. Within the selected core monitoring areas, a 50-meter by 50-meter grid pattern was overlain onto a georeferenced aerial photograph. A total of 25 sample plots were randomly selected within this grid overlay and three additional sample plots were selected within SKR Management Area 3 for burrow/sign search and habitat characterization. Of these 28 sample plots, 10 plots subsequently received confirmation live-trapping as part of the 2016 SKR monitoring effort (ICF 2017). The 28 established sample plots were monitored again for burrow/sign search and habitat characterization during the winter 2017–2018 SKR monitoring effort (ICF 2018b). From 2019 onward, annual monitoring consisted of allocating approximately 50 percent of the monitoring effort at the permanent plots that were established within the core habitat area, approximately 25 percent of the monitoring effort to randomly selected plots within the SKR monitoring area, and approximately 25 percent of the monitoring effort to randomly selected plots within the SKR

discovery area (Figure 10b). In 2021, 2022, and 2023, habitat assessments were conducted at the 28 monitoring plots to determine occupancy and to characterize the potential for each plot to support SKR (ESA 2022a; ESA 2023a; ESA 2024). Live trapping was conducted in 2022 only in the 3-acre SKR management area in the southwest portion of the preserve. Long-term monitoring is ongoing. RDM monitoring is used to quantify the impact of cattle grazing on grasslands and determine if species-specific habitat management targets, such as open, low-growing grassland habitat for SKR, are being achieved. RDM monitoring occurred in 2016–2023, with the exception of 2020 due to the COVID-19 pandemic and the associated stay-at-home order.

Hellhole Canyon County Preserve. Species was detected within Hellhole Canyon County Preserve, specifically within the northeastern portion of the Sierra Verde Addition (Figure 14) (ESA 2021b). Three monitoring plots were live trapped within the northeastern portion of the Sierra Verde parcel of Hellhole Canyon County Preserve in 2020 during baseline surveys and confirmed SKR presence in one of the three trapping plots (ESA 2021b). Habitat assessments were conducted at the three monitoring plots 2021, 2022, and 2023 to determine occupancy and characterize the potential for each plot to support SKR (ESA 2022a; ESA 2023a; ESA 2023b). Focused management was conducted in 2022 and 2023 within suitable SRK habitat (ESA 2023a; ESA 2023b). Future management will continue to be informed by monitoring results.

Management Goal

- Ensure persistence of SKR by maintaining and enhancing 900 acres of habitat at Ramona Grasslands County Preserve and 45 acres of habitat at Hellhole Canyon County Preserve through grazing, targeted mowing, and/or invasive plant treatment.

Monitoring Goal

- Monitor grassland vegetation on Ramona Grasslands County Preserve to ensure that the grazing program is maintaining the habitat in suitable condition to support populations of SKR. Monitor habitat conditions at Hellhole Canyon County Preserve to ensure habitat suitability persists.
- Document the status of SKR and potential threats to determine if the threats are negatively affecting SKR.

Management Objectives

- Continue to implement the managed grazing program at Ramona Grasslands County Preserve. Continue to conduct RDM monitoring to observe the effects of cattle grazing on loamy grassland soils that are suitable for SKR and determine if grazing needs to be adjusted.
- Maintain less than 20 percent ground cover of invasive non-native plant species in areas Ramona Grasslands and Hellhole Canyon County Preserves identified as suitable habitat for SKR.
- Based on the results of the annual monitoring and threats assessment at Ramona Grasslands and Hellhole Canyon County Preserves, conduct additional adaptive management actions as necessary (i.e., inspect and manage the species).

Monitoring Objectives

- Conduct annual burrow/sign search, habitat characterization, and threats assessment monitoring within Ramona Grasslands and Hellhole Canyon County Preserves. Conduct live trapping for SKR every 10 years within Ramona Grasslands and Hellhole Canyon County Preserves.

- Conduct fall RDM monitoring annually as recommended in the *Residual Dry Matter Monitoring for the Ramona Grasslands Preserve, October 2020* report (ESA 2021a) to monitor the effectiveness of the grazing program to reduce the cover of thatch and invasive non-native plant species.
- Based on the results of the threats assessment, habitat condition assessment (including assessment of the effects of grazing), and species status surveys, evaluate whether the identified potential threats are having a negative impact on SKR. Use the monitoring data to inform adaptive management actions.

Methods

1. Coordinate with other entities prior to conducting management or monitoring as follows:

a. SANDAG/SDMMP regarding species surveys throughout San Diego County to inform the regional monitoring program. Note, no regional SDMMP surveys for SKR are planned.

b. USGS, Wildlife Agencies, Western Riverside MSHCP, and Camp Pendleton regarding monitoring protocols to ensure consistency with one another.

c. Regional monitoring partners regarding monitoring and management activities to ensure that efforts are not being duplicated and to minimize impacts on the species. The Stephens' Kangaroo Rat Rangewide Management and Monitoring Plan provides strategies to assist in SKR recovery efforts as well as standardize methodologies (Spencer et. al. 2021).

2. Conduct a burrow/sign search and habitat characterization annually.

a. *Ramona Grasslands County Preserve.* A total of 28 monitoring plots will be assessed annually, including 16 permanent plots in the core habitat areas are monitored every year (Figure 10b): A1-1 to A1-6, A2-1, A2-6, A2-7, 3A-1, 3A-6, 3A-7, 3A-8, A3-1, A3-2, and A3-3, 6 randomly selected plots within the SKR monitoring area (to investigate the SKR monitoring area for continuing presence and distribution of kangaroo rat), and 6 randomly selected plots within the SKR discovery area (to investigate if SKR are colonizing appropriate habitat in nearby, non-contiguous portions of the preserve).

b. *Hellhole Canyon County Preserve.* Due to the size of the suitable SKR habitat at Hellhole Canyon County Preserve, monitoring will consist of the sample plots established during 2020 live trapping and will not be randomized (Figure 14).

c. Surveyors will navigate to the sample plots using appropriate GPS hardware and GIS software. Upon arrival at each sample plot, all four corners of the plot will be temporarily flagged, and a photograph taken from the southeast corner facing northwest.

d. Within each sample plot, conduct a complete search for active kangaroo rat sign (e.g., burrows, tracks, dust bathing sites, scat, and runways). If a plot does not contain any kangaroo rat sign or potentially active kangaroo rat burrows, define the plot as "not occupied."

e. For each sample plot, complete a habitat assessment form to document habitat variables and related information. Current habitat assessment forms were modeled after the field forms used by Brehme et al. 2016 (adapted from a field form in Montgomery et al. 2008), which provided documentation of estimates of bare ground; percent cover of grass, forbs, shrub, and litter; abundance of gopher and California ground squirrel burrows; types of disturbances; types of kangaroo rat sign observed; land use; potential for SKR; and comments. Example completed habitat assessment forms for 2016 are included in the annual monitoring report (ICF 2017).

f. Identify any potential threats to SKR.

g. The signs search and habitat characterization are performed in fall (i.e., October–December). This evaluation is conducted by a qualified SKR biologist familiar with the sign of SKR and other burrowing species.

3. **Confirm presence or absence of SKR in areas with active sign within Ramona Grasslands and Hellhole Canyon County Preserves every 10 years.**

   a. All plots that had positive potential SKR sign would be trapped every 10 years. If kangaroo rat sign is not present, trapping frequency can be adjusted based on adaptive management recommendations.

   b. SKR often co-occurs with the Dulzura kangaroo rat (*Dipodomys simulans*); therefore, it is important to confirm presence of SKR with trapping surveys. Using live trapping, conduct Percent Area Occupied (PAO) surveys within plots within which potential SKR sign was identified during the burrow/sign search.

   c. Within each plot to be trapped, conduct live trapping for a minimum of 2 consecutive nights (four trap events). A total of 25 traps will be used in a 5-by-5 array, spaced approximately 10 meters apart. When obvious sign is within a few meters of a trapping point, place the trap next to burrow entrances, dust bathing sites, or runways to maximize capture success.

   d. Conduct the trapping in the fall (i.e., October–December); November through December is the preferred time period. Trapping must be conducted by a qualified, permitted SKR biologist.

   e. After 2 consecutive nights of confirmatory trapping with negative results in plots rated as "high" potential for SKR and exhibiting clear kangaroo rat sign, extend the trapping effort to a maximum of 4 consecutive nights.

   f. After the initial monitoring period (2016 for Ramona Grasslands County Preserve and 2020 for Hellhole Canyon County Preserve), trapping surveys will be conducted every 10 years to determine abundance (and density of burrows) within the survey plots.

4. **Implement vegetation management pursuant to the *Ramona Grasslands, Santa Ysabel, and Boulder Oaks Preserves Grazing Management Plan* (ESA 2019) and modify existing grazing regime as necessary based on ground cover surveys.**

   a. Management for SKR habitat strives to maintain sparse cover of annual forbs and grasses, and to prevent dense invasions by non-native grasses, such as bromes and oats (*Avena* spp.), which can crowd out forbs and perpetuate an unnatural fire cycle that eliminates native plants. Suitable habitat for SKR will be maintained by managed grazing and other methods as follows:

      i. Rangeland monitoring will be conducted in the fall, as recommended in the *Residual Dry Matter Monitoring for the Ramona Grasslands Preserve, October 2020* report (ESA 2021a). RDM monitoring will follow the methodology, goals, and objectives described in the *Ramona Grasslands, Santa Ysabel, and Boulder Oaks Preserves Grazing Management Plan* to observe the effects of cattle grazing on loamy grassland soils that are suitable for SKR (ESA 2019). RDM monitoring in the fall determines if the stocking rate was appropriate to achieve RDM targets by management unit.

         Cattle grazing can reduce above-ground biomass and shift species composition to higher forb cover and improve habitat for SKR. Target grazing intensities are based on threshold RDM values for Grazing Management Units 1–5 (Figure 10b), including the following, which support suitable habitat for SKR:

         - **Grazing Management Units 2A, 2B, and 3A:** RDM threshold is 400–800 pounds per acre to maintain SKR habitat, grazing can occur year-round.

5. **Implement vegetation management within the Hellhole Canyon County Preserve.**

   a. Within suitable habitat for SKR, conduct management to remove taller-growing ruderal invasive non-native vegetation to reduce the overall height of standing biomass. Invasive non-native vegetation

should be manually or mechanically cut to the ground; however, vegetation should be left to 2 inches from the ground in areas where burrows were present to avoid disturbance of burrows. The biomass should be manually collected, bagged, and properly disposed of at an approved off-site facility.

6. Evaluate monitoring results and implement adaptive management actions as necessary.

a. As part of the adaptive management of the SKR monitoring program, the established SKR monitoring area and discovery area boundaries at Ramona Grasslands County Preserve and the established sample plots at Hellhole Canyon County Preserve shall be reevaluated on a regular basis (e.g., once every 5 years) to account for any changes that occur to the preserve as a result of factors such as fire, drought, land management practices (e.g., grazing), and future land acquisition.

b. Annually review monitoring results from the species status surveys, habitat condition surveys, and grazing program, currently only applicable to Ramona Grasslands County Preserve, to determine: (1) if identified threats are having a direct negative effect on the species or habitat, (2) if the management triggers in the grazing program (i.e., RDM values) are not sufficiently thinning the vegetation to maintain habitat suitable to SKR, and (3) if adaptive management actions that have been previously implemented are functioning as expected.

c. Provide adaptive management recommendations, if any, based on monitoring results and include in the TMP annual report. These are included in the monitoring data sheets.

d. Incorporate adaptive management recommendations into the preserves' work plans and coordinate with on-site DPR staff to implement actions.

e. Coordinate with SDMMP and USGS at least annually to evaluate BMPs, species-specific monitoring protocols, and data analysis. Implement changes as necessary to annual monitoring and management efforts.

f. Submit monitoring and management data annually to the SC-MTX website and SDMMP for incorporation in regional monitoring analysis.

g. Five-year evaluation. At the end of 5 years, reevaluate the species-specific goals, objectives, and methods in the TMP.

2.4 Monitoring and Management Schedule and Frequency

As described in Section 1.3.2, *Regional Monitoring and Management Coordination*, the County coordinates with regional monitoring programs to ensure use of consistent methodologies and avoid duplication of survey efforts; however, as stated in Section 1.3.4, *Limitations and Constraints*, climate and other factors may affect the timing of some tasks such as arroyo toad surveys, vernal pool hydrologic and San Diego fairy shrimp survey protocols, which require a certain level of rainfall or inundation to occur. The County will consider these factors on an ongoing basis when finalizing the schedule outlined in **Table 4**.

TABLE 4
MONITORING AND MANAGEMENT SCHEDULE AND FREQUENCY

Task Description	Frequency	2025				2026				2027				2028				2029				2030				2031			
		Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec
SURVEILLANCE MONITORING 2																													
Conduct vegetation mapping (RMP A.1.1)	Baseline; every 10 years thereafter or more often as needed following catastrophic events (e.g. wildfire)		BP, BO, DD, EC, EM, LL, LC, LA, O, RG, SG, SL																BR, DH, ES, KC, MM, TR								FN, HC, IM, LB, MO, PV, SH, SM, S, SK, SR, WG		
Conduct general wildlife surveys (RMP A.1.2)	Baseline, or more often as needed following catastrophic events (e.g. wildfire)																												
Conduct general rare plant surveys (RMP A 1.2)	Baseline, or more often as needed following catastrophic events (e.g. wildfire)																												
Conduct surveillance monitoring for invasive non-native plant species (VMP)	Annually during routine patrols		all				all				all				all				all				all				all		
Map invasive non-native plant species (RMP A.1.3)	Every 10 years, or more often as needed		BP, BO, DD, EC, EM, LL, LC, LA, O, RG, SG, SL																BR, DH, ES, KC, MM TR				IM				FN, HC, IM, LB, MO, PV, SH, SM, S, SK, SR, WG		
Coordinate with regional wildlife monitoring efforts	Annually	all				all				all				all				all				all				all			
Conduct general invasive non-native wildlife surveys (RMP A.5)	Concurrently with species-specific monitoring	all				all				all				all				all				all				all			
Assess the need for site- specific restoration (RMP B.1)	Annually		all				all				all				all				all				all				all		
Monitor issues related to public access (RMP C.1-7, D. 1-8)	Quarterly or as needed	all				all				all				all				all				all				all			
RESOURCE-SPECIFIC MONITORING																													
Vernal Pools/Alkali Playas																													
Quantitative vegetation monitoring	Baseline, and every 3 years thereafter; early and late VP season									RG, LP	RG, LP											RG, LP	RG, LP						
Qualitative monitoring	Baseline, and annually thereafter; early and late VP season	LP, RG	LP, RG			LP, RG	LP, RG			LP, RG	LP, RG			LP, RG	LP, RG			LP, RG	LP, RG			LP, RG	LP, RG			LP, RG	LP, RG		
Hydrological monitoring	Baseline, and every 5 years thereafter	LP											RG								LP								
Fall Residual Dry Matter (RDM) monitoring	Annually				RG				RG				RG				RG				RG				RG				RG
Fairy shrimp monitoring, wet season	Every 5 years	LP								RG												LP							
Vernal pool weeding	As necessary		LP, RG				LP, RG				LP, RG				LP, RG				LP, RG				LP, RG				LP, RG		

Task Description	Frequency	2025				2026				2027				2028				2029				2030				2031			
		Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec
San Diego Thornmint																													
Conduct rare plant monitoring – quantitative population/habitat monitoring, threats assessment, and photo documentation	Annually		SG, S				SG, S				SG, S				SG, S				SG, S				SG, S				SG, S		
Conduct focused management	As needed			SG				SG				SG				SG				SG				SG				SG	
Encinitas Baccharis																													
Conduct rare plant monitoring – quantitative population/habitat monitoring, threats assessment, and photo documentation	Every 2 years			DD								DD								DD								DD	
Conduct focused management	As needed																												
Orcutt's Brodiaea																													
Conduct rare plant monitoring – quantitative population/habitat monitoring, threats assessment, and photo documentation	Every 2 years		BO (Apr-Jul)								BO (Apr-Jul)								BO (Apr-Jul)								BO (Apr-Jul)		
Conduct focused management	As needed																												
Lakeside Ceanothus																													
Conduct rare plant monitoring – quantitative population/habitat monitoring, threats assessment, and photo documentation	Every 5 years						BO, O, EC, S																				BO, O, EC, S		
San Miguel Savory																													
Conduct rare plant monitoring – quantitative population/habitat monitoring, threats assessment, and photo documentation	Every 2 years		BO (Mar-Jul)								BO (Mar-Jul)								BO (Mar-Jul)								BO (Mar-Jul)		
Conduct focused management	As needed		BO (Mar-Jul)								BO (Mar-Jul)								BO (Mar-Jul)								BO (Mar-Jul)		
Otay Tarplant																													
Conduct rare plant monitoring – quantitative population/habitat monitoring, threats assessment, and photo documentation	Annually		FN				FN				FN				FN				FN				FN				FN		
Conduct focused management	As needed		FN				FN				FN				FN				FN				FN				FN		
Orcutt's Bird's-Beak																													
Conduct rare plant monitoring – quantitative population/habitat monitoring, threats assessment, and photo documentation	Every 2 years		TR								TR								TR								TR		
Conduct focused management	As needed																												
Variegated Dudleya																													
Conduct rare plant monitoring – quantitative population/habitat monitoring, threats assessment, and photo documentation	Every 3 years		SG, LC, DH												SG, LC, DH												SG, LC, DH		

Task Description	Frequency	2025				2026				2027				2028				2029				2030				2031			
		Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec
Conduct focused management	As needed		SG, LC				SG, LC				SG, LC				SG, LC				SG, LC				SG, LC				SG, LC		
Heart-Leaved Pitcher Sage																													
Conduct rare plant monitoring – quantitative population/habitat monitoring, threats assessment, and photo documentation	Baseline; every 2 years thereafter		IM								IM									IM							IM		
Conduct focused management	As needed																												
Willowy Monardella																													
Conduct rare plant monitoring – quantitative population/habitat monitoring, threats assessment, and photo documentation	Annually		SG (May–Aug)				SG (May–Aug)				SG (May–Aug)				SG (May – Aug)				SG (May – Aug)				SG (May – Aug)				SG (May – Aug)		
Conduct focused management	As needed		SG (May–Aug)																										
Harbison's Dun Skipper																													
Map locations of host plant, San Diego sedge	Every 5 years						HC, SH (April)																				HC, SH (Apr)		
Adult flight season surveys	Annually		HC, SH (May–June)				HC, SH (May-June)				HC, SH (May-June)				HC, SH (May-June)				HC, SH (May-June)				HC, SH (May-June)				HC, SH (May-June)		
Habitat monitoring for goldspotted oak borer and shot hole borer	Annually or based on DPR Emergent Tree Pests Plan recommendation				HC, SH (Nov)				HC, SH (Nov)				HC, SH (Nov)				HC, SH (Nov)				HC, SH (Nov)				HC, SH (Nov)				HC, SH (Nov)
Conduct focused management	As needed				HC (Nov)																								
Arroyo Toad																													
Confirm survey segments	Baseline		SL																										
Collect quantitative population and habitat information	Baseline; annually thereafter		RG, SM, SL				RG, SM, SL				RG, SM, SL				RG, SM, SL				RG, SM, SL				RG, SM, SL				RG, SM, SL		
Fall Residual Dry Matter (RDM) monitoring	Annually				RG				RG				RG				RG				RG				RG				RG
Manage/monitor non-native wildlife	Annually			RG (monitor)				RG (monitor)				RG (monitor)				RG (monitor)				RG (monitor)				RG (monitor)				RG (monitor)	
Tricolored Blackbird																													
Conduct presence/absence survey	Every 2 years						RG (Apr)								RG (Apr)								RG (Apr)						
Conduct threats assessment	Every 2 years						RG (Apr)								RG (Apr)								RG (Apr)						
Burrowing Owl																													
Habitat assessment	Every 3 years		RG (February–August)												RG (February–August)														
Conduct presence/absence survey	Every 3 years		RG (February–August)												RG (February–August)														
Conduct threats assessment	Every 3 years		RG (February–August)												RG (February–August)														
Fall Residual Dry Matter (RDM) monitoring	Annually				RG				RG				RG				RG				RG				RG				RG

Task Description	Frequency	2025				2026				2027				2028				2029				2030				2031			
		Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec
Coastal Cactus Wren																													
Conduct avian point counts	Monthly during breeding season; every 3 years	LL (Mar–June)												LL (Mar–June)												LL (Mar–June)			
Conduct qualitative assessment, photo monitoring, and threats assessment	Every 3 years	LL (Mar–June)												LL (Mar–June)												LL (Mar–June)			
Conduct vegetation density estimates	Every 3 years		LL												LL												LL		
Restore 11 acres of additional habitat	Currently unfunded																												
Golden and Bald Eagles																													
Conduct raptor foraging study	Monthly, continuation will be determined by DPR	RG	RG	RG	RG	RG	RG	RG	RG	RG	RG	RG	RG	RG	RG	RG	RG	RG	RG	RG	RG	RG	RG	RG	RG	RG	RG	RG	RG
Nest monitoring	Annually	RG, EC	RG, EC			RG, EC	RG, EC			RG, EC	RG, EC			RG, EC	RG, EC			RG, EC	RG, EC			RG, EC	RG, EC			RG, EC	RG, EC		
Fall Residual Dry Matter (RDM) monitoring	Annually				RG				RG				RG				RG				RG				RG				RG
Northern Harrier																													
Nest monitoring	Annually	TR, SL (Mar–June)				TR, SL (Mar-Jun)				TR, SL (Mar-June)				TR, SL (Mar-Jun)				TR, SL (Mar-June)				TR, SL (Mar-Jun)				TR, SL (Mar-June)			
Threats assessment	Annually		TR, SL				TR, SL				TR, SL				TR, SL				TR, SL				TR, SL				TR, SL		
Southwestern Willow Flycatcher																													
Presence/absence surveys	Annually for 3 years and then every 3 years		SL (May-Jul)				SL (May-Jul)				SL (May-Jul)												SL (May-Jul)						
Brown-headed cowbird trapping	As needed (March 15 – June 1)																												
Least Bell's Vireo																													
Annual presence/absence surveys	Annually for 3 years and then every 3 years		SL (Apr-Jul)				SL (Apr-Jul)				SL (Apr-Jul)												SL (Apr-Jul)						
Presence/absence surveys	Every 3 years		TR (Apr-Jul)												SM, TR (Apr-Jul)												SM, TR (Apr-Jul)		
Monitor shot hole borer	Annually or based on DPR Emergent Tree Pests Plan recommendation				TR (Oct)				TR (Oct)				TR (Oct)				TR (Oct)				TR (Oct)				TR (Oct)				TR (Oct)
Monitor habitat recovery (TR only)	Annually or based on DPR Emergent Tree Pests Plan recommendation		TR				TR				TR				TR				TR				TR				TR		
Brown-headed cowbird trapping and as-needed nest monitoring	As needed (March 15 – June 1)		SM				SM				SM				SM				SM				SM				SM		
Pallid Bat																													
Roosting assessment	Baseline; every 5 years thereafter					HC, MO, WG, SL, BP	HC, MO, WG, SL, BP	HC, MO, WG, SL, BP	HC, MO, WG, SL, BP																	HC, MO, WG, SL, BP	HC, MO, WG, SL, BP	HC, MO, WG, SL, BP	HC, MO, WG, SL, BP

Task Description	Frequency	2025				2026				2027				2028				2029				2030				2031			
		Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec	Jan–Mar	Apr–June	July–Sept	Oct–Dec
Acoustic surveys and mist-netting	Baseline; every 5 years thereafter					HC, MO, WG, SL, BP	HC, MO, WG, SL, BP	HC, MO, WG, SL, BP	HC, MO, WG, SL, BP																	HC, MO, WG, SL, BP	HC, MO, WG, SL, BP	HC, MO, WG, SL, BP	HC, MO, WG, SL, BP
Threats assessment (roosting and foraging habitat)	Annually		HC, MO, WG				HC, MO, WG, SL, BP				HC, MO, WG, SL, BP				HC, MO, WG, SL, BP				HC, MO, WG, SL, BP				HC, MO, WG, SL, BP				
Townsend's Big-Eared Bat																													
Roosting assessment	Baseline; every 5 years thereafter					HC, SL, WG	HC, SL, WG	HC, SL, WG	HC, SL, WG																	HC, SL, WG	HC, SL, WG	HC, SL, WG	HC, SL, WG
Acoustic surveys and mist-netting	Baseline; every 5 years thereafter					HC, SL, WG	HC, SL, WG	HC, SL, WG	HC, SL, WG																	HC, SL, WG	HC, SL, WG	HC, SL, WG	HC, SL, WG
Threats assessment (roosting and foraging habitat)	Annually		HC, WG				HC, SL, WG				HC, SL, WG				HC, SL, WG				HC, SL, WG				HC, SL, WG				
Stephens' Kangaroo Rat																													
Conduct burrow counts/sign survey and habitat assessment	Annually or more frequently as needed based on RDM results				RG, HC				RG, HC				RG, HC				RG, HC				RG, HC				RG, HC				RG, HC
Conduct live SKR trapping	Every 10 years or more frequently as needed based on RDM results								RG																HC				
Fall Residual Dry Matter (RDM) monitoring	Annually				RG				RG				RG				RG				RG				RG				RG
Conduct habitat management	As needed at HC				HC				HC																				
Overall Tasks																													
Analyze monitoring data; compare treatments with controls	Annually	all				all				all				all				all				all				all			
Reevaluate goals, objectives, adaptive management, and monitoring methods	Annually	all				all				all				all				all				all				all			

NOTES: BR = Barnett Ranch, BP = Bottle Peak, BO = Boulder Oaks, DD = Del Dios Highlands, DH = Dictionary Hill, EC = El Capitan, EM = El Monte, ES = Escondido Creek, FN = Furby-North, HC = Hellhole Canyon, IM = Iron Mountain, KC = Keys Creek, LL = Lakeside Linkage, LB = Lawrence and Barbara Daley, LP = Los Peñasquitos, LA = Louis A. Stelzer County Park, LC = Lusardi Creek, MM = Mountain Meadow, MO = Mount Olympus, O = Oakoasis, PV = Peutz Valley, RG = Ramona Grasslands, SH = Sage Hill, SL = San Luis Rey River Park, SM = Santa Margarita, S = Simon, SK = Skyline, SR = Stoneridge, SG = Sycamore Canyon/Goodan Ranch, TR = Tijuana River Valley Regional Park, WG = Wilderness Gardens

This page is intentionally left blank.

SECTION 3
Reporting and Responsibilities

3.1 Overview

Reporting for this Targeted Monitoring Plan will consist of (1) data analysis and data management, (2) coordination with regional monitoring efforts, (3) coordination among County staff, (4) reevaluation of goals, objectives, and methods, and (5) documentation of results and recommendations in an annual report. This process is critical for successful adaptive management, as it will provide a feedback loop, which is a key step in the learning process. Implementation of this TMP will be conducted in an iterative manner in coordination with other regional monitoring and management efforts. The objectives and methods developed for this plan will be implemented for 5 years, integrated into the regional monitoring plan as appropriate, and refined in collaboration with other stakeholders, such as SDMMP, IEMM, the Wildlife Agencies, and scientific experts.

3.2 Collaboration

Data analysis is conducted in collaboration with SDMMP. Some analyses, such as results from surveillance monitoring or presence/absence surveys, will be fairly simple and straightforward. Other types of monitoring, such as testing the response of San Diego thornmint to a specific management treatment, will be more complicated and require statistical analysis. To ensure that the results are meaningful at both the preserve level and regional level, analysis is done in collaboration with SDMMP and adjacent land managers. This type of collaboration also occurs when reevaluating goals, objectives, monitoring protocols, and priorities for the following year. Therefore, at least one meeting among stakeholders is established annually to discuss results and data analysis.

It is equally important to collaborate among County staff, including program managers, environmental planners, biologists, and contractors who conducted on-the-ground monitoring and management activities. Likewise, data collection and analysis experience and consistency must be carefully evaluated and coordinated. If feasible, at least one annual roundtable discussion should be established to encourage information sharing and discussion of emerging threats and priorities for the coming year.

3.3 Reporting

Results from annual reporting for the monitoring program will be incorporated into the annual report for the MSCP. Additionally, the monitoring and management data will be submitted annually to SDMMP via the SC-MTX website for incorporation into the regional database. Monitoring reports explicitly state the monitoring goals and objectives, summarize monitoring and adaptive management actions that took place over the reporting year, describe data analysis and results, and discuss lessons learned and

recommendations for the coming year. Data analysis will be coordinated with SDMMP to ensure that meaningful information is provided by the monitoring effort. All of the following items are submitted with annual reports:

- Hard copy maps of monitoring locations, including codes or names for each plot, station, or point, if applicable.
- A digital copy of the monitoring data, threats assessments, plant condition assessments, and habitat assessments in an Excel spreadsheet or other compatible format, preferably using data templates developed by SDMMP (such as the SC-MTX Database).
- Metadata, including names of surveyors, survey dates, map datum, coordinate system, and GPS accuracy.
- GIS shapefiles of all data points and polygons taken during monitoring.
- Photographs associated with permanent photo stations or qualitative photos of an area, labeled with preserve name, plot number, photo number, and date.

3.4 Monitoring Plan Revision

As described above, the goals, objectives, priorities, and monitoring protocols are evaluated annually, and the TMP should be revised every 5 years in coordination with the Wildlife Agencies and SDMMP.

SECTION 4
References

AECOM. 2012. *Ramona Airport Improvement Project Vernal Pools and Wetland Mitigation Properties Monitoring Report*. Prepared for County of San Diego Department of Parks and Recreation and Department of Public Works, July 10, 2012.

———. 2014. *Year 1: September 2013 through August 2014 Ramona Grasslands Preserve Raptor Surveys Summary Report*. Prepared for the County of San Diego Department of Parks and Recreation. December.

———. 2015. *Baseline Biodiversity Report Bottle Peak Preserve*. Prepared for County of San Diego Department of Parks and Recreation. May.

———. 2017a. *Year 3: September 2015 through August 2016 Ramona Grasslands Preserve Raptor Surveys Summary Report*. Prepared for the County of San Diego Department of Parks and Recreation. April.

———. 2017b. *Baseline Biodiversity Survey Report for the Escondido Creek Preserve University Heights Property County of San Diego Department of Parks and Recreation*. Prepared for the County of San Diego Department of Parks and Recreation. June 2017.

———. 2021a. 2021 Northern Harrier Habitat and Threat Assessment Protocol.

———. 2021b. Summary of 2021 SDMMP Northern Harrier Surveys. Prepared for SDMMP. December 30, 2021.

———. 2021c. 2021 Tricolored Blackbird Habitat and Threat Assessment Protocol.

———. 2021d. Summary of 2021 SDMMP Tricolored Blackbird Surveys. Prepared for SDMMP. December 30, 2021.

———. 2022. *Assessment of Willowy Monardella (Monardella viminea) Status, Habitat, and Threats on Conserved Lands in San Diego County*. Prepared for SANDAG and SDMMP. June 2022.

AECOM, Conservation Biology Institute (CBI), and San Diego Management and Monitoring Program (SDMMP). 2021a. *Management Strategic Plan Framework Rare Plant Management for Conserved Lands in Western San Diego County*. Prepared for San Diego Association of Governments, March 2021.

———. 2021b. *Management Strategic Plan Seed Collection, Banking, and Bulking Plan for Conserved Lands in Western San Diego County*. Prepared for San Diego Association of Governments, March 2021.

Atkinson, A. J., B. S. Yang, R. N. Fisher, E. Ervin, T. J. Case, N. Scott, and H. B. Shaffer. 2003. MCB *Camp Pendleton Arroyo Toad Monitoring Protocol: 1. Summary of Results from a Workshop on August 27, 2002; 2. Monitoring Protocol and Targeted Studies*. U. S. Geological Survey technical report prepared for Marine Corp Base Camp Pendleton, Camp Pendleton, California. 42 pp.

Atkinson, A., P. Trenham, R. Fisher, S. Hathaway, B. Johnson, S. Torres, and Y. Moore. 2004. *Designing Monitoring Programs in an Adaptive Management Context for Regional Multiple Species Conservation Plans*, U.S. Geological Survey Technical Report. USGS Western Ecological Research Center, Sacramento, California. 69 pages.

Bat Conservation International (BCI). 2024. White-Nose Syndrome. Available: http://www.batcon.org/white-nose-syndrome. Accessed January 2024.

Bauder, E.T. 2005. "The Effect of an Unpredictable Precipitation Regime on Vernal Pool Hydrology." *Freshwater Biology*, Vol. 50, Issue 12. Department of Biology, San Diego State University, San Diego CA.

Bauder, E.T., A.J. Bohonak, B. Hecht, M.A. Simovich, D. Shaw, D.G. Jenkins, and M. Rains. 2009. *A Draft Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing Wetland Functions of Vernal Pool Depressional Wetlands in Southern California*. San Diego State University, San Diego, CA.

Bauder, E.T., and J.A. Sakrison. 1999. *Mechanisms of Persistence of San Diego Thornmint (*Acanthomintha ilicifolia*) Final Report*. Prepared for: California Department of Fish and Game Region 5 Natural Heritage Program. Borrego Springs, CA. November 1999.

Berardelli, Daniele, Martha J. Desmond, and Leigh Murray. 2010. "Reproductive Success of Burrowing Owls in Urban and Grassland Habitats in Southern New Mexico." *The Wilson Journal of Ornithology*, 122(1). 10 pages.

Brehme, C. S., K. P. Burnham, D. A. Kelt, A. R. Olsen, S.J. Montgomery, S. A. Hathaway, and R. N. Fisher. 2006. *Stephens' Kangaroo Rat (Dipodomys stephensi) Monitoring for MCB Camp Pendleton*. Prepared for Wildlife Management Branch, AC/S Environmental Security, Marine Corps Base Camp Pendleton. 55 pages.

Brehme, C. S., D. R. Clark, and R. N. Fisher. 2016. *Stephens' Kangaroo Rat Monitoring on MCB Camp Pendleton, Results and Trends Analyses for Fall–Winter 2014*. Prepared for Wildlife Management Branch, AC/S Environmental Security, Marine Corps Base Camp Pendleton. 52 pages.

Buehler, D. A. 2022. Bald Eagle (Haliaeetus leucocephalus), version 2.0. In Birds of the World (P. G. Rodewald and S. G. Mlodinow, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.baleag.02.

Burke, Russell L., Judy Tasse, Catherine Badgley, Suzanne R. Jones, Nancy Fishbem, Sarah Phillips, and Michael E. Soule. 1991. "Conservation of the Stephens' Kangaroo Rat (*Dipodomys stephensi*): Planning for Persistence." *Bulletin of the Southern California Academy of Sciences*, 90(1).

Cadre Environmental. 2007. *Arroyo Toad (*Bufo californicus*) Hydrogeomorphic Habitat Baseline Analysis/Radio Telemetry Study*. Rancho Los Flores – West Fork Mojave River & Grass Valley Creek. San Bernardino County. Final Report.

California Department of Fish and Game (CDFG). 2012. *Staff Report on Burrowing Owl Mitigation*. March 7, 2012. Available: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=83843&inline=true.

California Department of Fish and Wildlife (CDFW). 2013. Golden Eagles in California. Species account accessed at http://www.dfg.ca.gov/wildlife/nongame/raptors/goldeneagle, August 2013.

———. 2016. *A Status Review of Townsend's Big-Eared Bat (*Corynorhinus townsendii*) in California*. Report to the Fish and Game Commission. State of California, Natural Resources Agency, Department of Fish and Wildlife. Sacramento, California, USA.

California Native Plant Society (CNPS). 2007. *California Native Plant Society Relevé Protocol*. CNPS Vegetation Committee, revised August 23, 2007.

———. 2023. Inventory of Rare and Endangered Plants (online edition, v9.5). Website. Available: https://rareplants.cnps.org [accessed October 2023].

Caltrans. 2010. Natural Environment Study: State Route 76 Mission Road to Interstate 15 Highway Improvement Project in San Diego County, California. 11-SD-76 (PM 12.4/17.6), 11-SD-15 (PM 46.1/47.1), EA number 257110. August 2010.

Chipman, Erica D., Nancy E. McIntyre, Richard E. Strauss, Mark C. Wallace, James D. Ray, and Clint W. Boal. 2008. "Effects of Human Land Use on Western Burrowing Owl Foraging and Activity Budgets." *J. Raptor Res.*, 42(2).

City of San Diego. 2019. *Revised Final City of San Diego Habitat Conservation Plan*. October. Available: https://www.sandiego.gov/sites/default/files/2024-05/vphcp_revised_final_0.pdf.

City of San Diego. 2020. *Revised Final City of San Diego Habitat Conservation Plan Vernal Pool Management and Monitoring Plan Vernal Pool Management and Monitoring Plan*. January. Available: https://www.sandiego.gov/sites/default/files/vpmmp_final_020320.pd.f

Churchwell Roy, Geoffrey R. Geupel, William J. Hamilton III, and Debra Schlafmann. 2005. *Current Management and Monitoring of Tricolored Blackbirds*. USDA Forest Service Gen. Tech. Rep. PSW-GTR-191. 2005.

Conservation Biology Institute (CBI). 2001. *Status Summary of Biological Monitoring Protocols for the MSCP Program*. Unpublished.

———. 2007a. *Area Specific Management Directives for Ramona Grasslands Preserve*. Prepared for San Diego County Department of Parks and Recreation.

———. 2007b. *Baseline Conditions Report for Ramona Grasslands Preserve San Diego County*. Prepared for San Diego County Department of Parks and Recreation.

———. 2012. *Management Priorities for Invasive Non-native Plants, A Strategy for Regional Implementation*. San Diego County, California. September 2012. Management priorities for invasive non-native plants. Prepared for San Diego Association of Governments (SANDAG), contract no. 5001322. 83 pp.

———. 2014. *Adaptive Management Framework for the Endangered San Diego Thornmint,* Acanthomintha ilicifolia*, San Diego County, California*. Prepared for the California Department of Fish and Wildlife in collaboration with the San Diego Management and Monitoring Program. March 2014.

———. 2018. *Enhancing the Resilience of Edaphic Endemic Plants*. Prepared for the California Department of Fish and Wildlife Natural Community Conservation Planning Local Assistance Grant P1582108-01.County of San Diego. 1998. *Implementing Agreement by and between United States Fish and Wildlife Service, California Department of Fish and Game, County of San Diego*. County of San Diego Multiple Species Conservation Program. March 17.

County of San Diego, Parks and Recreation (County DPR). 2007a. Tijuana River Valley Regional Park Area Specific Management Directives. June 2007.

———. 2007b. *Tijuana River Valley Regional Park Cowbird Trapping Program*. San Diego, CA. May 2007.

———. 2009. *Resource Management Plan for Sycamore Canyon and Goodan Ranch Preserves*. June 2009.

———. 2018. *Preserve Trail Guidelines, Resource Management Guidelines for Trails in Preserves*. April 2018.

Dechant J.A., M.L. Sondreal, D.H. Johnson, L.D. Igl, and C.M. Goldade. 2002. Effects of Management Practices on Grassland Birds: Northern Harrier. USGS Northern Prairie Wildlife Research Center. 138.

Deutschman, D., and S. Strahm. 2009. *Improving Statistical Sampling and Vegetation Monitoring for the San Diego MSCP*, 2008 Final Report, Contract 5001033. Prepared for the San Diego Association of Governments. San Diego, California.

———. 2011. *Evaluation and Refinement of Vegetation Monitoring Methods for the San Diego Multiple Species Conservation Program*, 2010 Final Report, Contract 5001003 Amendment #1. Prepared for the San Diego Association of Governments, March 2011. San Diego, California.

———. 2012. *Monitoring and Management in the San Diego Multiple Species Conservation Program: Results from a Structured Workshop Final Report*, Contract Number 5001033. Prepared for San Diego Association of Governments, February 2012. San Diego, California.

Deutschman, D., R. Lewison, E. Marnocha, P. McIntyre, S. Strahm, and C. Tredick. 2012. *Development of Reserve-Level Species and Habitat Monitoring Strategies*, NCCP LAG #P0982020. Prepared for California Department of Fish and Game. Sacramento, California.

Dodero, M. 1995. Phylogenetic Analysis of Dudleya Subgenus Hasseanthus (Crassulaceae) Using Morphological and Allozyme Data. Master's Thesis, San Diego State University, California.

Dudek. 2010. *Baseline Biodiversity Survey for the Simon Preserve*. Prepared for the County of San Diego, Department of Parks and Recreation. March 2010.

———. 2011a. *Baseline Biodiversity Survey for the Escondido Preserve*. Prepared for the County of San Diego, Department of Parks and Recreation. May 2011.

———. 2011b. *Baseline Biodiversity Survey for the San Luis River Park*. Prepared for the County of San Diego Department of Parks and Recreation. October 2011.

eBird. 2021. eBird: An Online Database of Bird Distribution and Abundance [web application]. eBird, Ithaca, New York. Available: http://www.ebird.org. (Accessed: September 2021).

Eriksen, C.H. and D. Belk. 1999. *Fairy Shrimps of Calfornia's Puddles, Pools, and Playas*. Mad River Press.

ESA. 2019. *Ramona Grasslands, Santa Ysabel, and Boulder Oaks Preserves Grazing Management Plan*. Prepared for the County of San Diego Department of Parks and Recreation. October 15, 2019.

———. 2020. *Ramona Grasslands Preserve 2019–20 Raptor Surveys Summary Report*. Prepared for the County of San Diego Department of Parks and Recreation. November.

———. 2021a. *Residual Dry Matter Monitoring for the Ramona Grasslands Preserve, October 2020*. Prepared for the County of San Diego Department of Parks and Recreation. March 1, 2021.

———. 2021b. *Baseline Biodiversity Survey Report for the Hellhole Canyon Preserve Additions County of San Diego Department of Parks and Recreation*. Prepared for the County of San Diego Department of Parks and Recreation. January 2021.

———. 2021c. *Barnett Ranch Preserve 2020–2021 Raptor Surveys Summary Report*. Prepared for the County of San Diego Department of Parks and Recreation. October 2021.

———. 2022a. *Targeted Monitoring Plan Resource-Specific Monitoring: 2021 Annual Report*. Prepared for the County of San Diego Department of Parks and Recreation. May 2022.

———. 2022b. *Raptor Foraging Surveys & Nest Monitoring 2021–2022 Summary Report*. Prepared for the County of San Diego Department of Parks and Recreation. December 2022.

———. 2023a. *Targeted Monitoring Plan Resource-Specific Monitoring: 2022 Annual Report*. Prepared for the County of San Diego Department of Parks and Recreation. May 2023.

———. 2023b. *Ramona Grasslands Preserve 2022–2023 Raptor Surveys Summary Report*. Prepared for the County of San Diego Department of Parks and Recreation. November 2023.

———. 2023c. *Baseline Biodiversity Survey Report for the Skyline County Preserve County of San Diego Department of Parks and Recreation*. Prepared for the County of San Diego Department of Parks and Recreation. July 2023.

———. 2023d. *Baseline Biodiversity Survey Report for the Hellhole Canyon County Preserve Fureigh Addition County of San Diego Department of Parks and Recreation*. Prepared for the County of San Diego Department of Parks and Recreation. February 2024.

———. 2024. *Targeted Monitoring Plan Resource-Specific Monitoring: 2023 Annual Report*. Prepared for the County of San Diego Department of Parks and Recreation. February 2024.

ESA and ICF. 2015. *Comprehensive Monitoring Plan*. Prepared for the County of San Diego Department of Parks and Recreation. July 2015.

———. 2022. *Targeted Monitoring Plan*. Prepared for the County of San Diego Department of Parks and Recreation. December 2022.

Fellers, G. M. and E. D. Pierson. 2002. *Habitat use and foraging behavior of Townsend's big-eared bat (*Corynorhinus townsendii*) in coastal California*. Journal of Mammalogy, 83(1):167–177.

Ferguson, H. and J.M. Azerrad. 2004. Pallid Bat *Antrozous pallidus*. Washington Department of Fish and Wildlife Volume V: Mammals.

Franklin, J., L. Hierl, D. Deutschman, and H. Regan. 2006. *Grouping and Prioritizing Natural Communities for the San Diego Multiple Species Conservation Program*, LAG #P0450009. Prepared for California Department of Fish and Game, July 2006. Sacramento, California.

Hansen, D.L., R.J. Spaul, B. Woodbridge, D. Leal, J.R. Dunk, J.W. Watson, and J. T. Driscoll. 2017. *Human disturbance of breeding golden eagles (*Aquila chrysaetos*)*. Unpublished report prepared for the Western Golden Eagle Team, U.S. Fish and Wildlife Service. Available online at https://ecos.fws.gov/ServCat/Reference/Profile/112570.

Harris, J. 2000a. *Pallid Bat*. California Wildlife Habitat Relationships System. Updated May 2000.

———.2000b. *Townsend's Big-eared Bat*. California Wildlife Habitat Relationships System. Updated May 2000.

Harris & Associates. 2021. *Draft Baseline Biodiversity Report, Iron Mountain Preserve*. Prepared for: County of San Diego Department of Parks and Recreation. November 2021.

HELIX. 2004. *Barnett Ranch Open Space Preserve Area-Specific Management Directives*. Prepared for the County of San Diego Department of Parks and Recreation.

———. 2019. *Tijuana River Valley Regional Park Baseline Biodiversity Survey Report*. Preserved for the County of San Diego Department of Parks and Recreation. August.

Hermanson, J. W., and T. J. O'Shea. 1983. *Antrozous pallidus*. Mammal. Species No. 213. 8 pp.

Hierl, L., H. Regan, J. Franklin, and D. Deutschman. 2005. *Assessment of the Biological Monitoring Plan for San Diego's Multiple Species Conservation Program*, Local Assistance Grant #P0450009. Prepared for California Department of Fish and Game, August 2005. Sacramento, California.

Howell, S.L., and B.E. Kus. 2022. *Distribution and Abundance of Southwestern Willow Flycatchers (Empidonax traillii extimus) on the Upper San Luis Rey River, San Diego County, California—2022 Data Summary*. U.S. Geological Survey Data Report 1173, https://doi.org/10.3133/dr1173.

ICF. 2008a. *Baseline Biological Resources Evaluation, El Capitan Preserves*. Prepared for San Diego County. December.

———. 2008b. *Baseline Biological Resources Evaluation, Sycamore Canyon and Goodan Ranch Preserves*. Prepared for San Diego County. December.

———. 2008c. *Baseline Biological Resources Evaluation, Lakeside Linkage Open Space Preserve*. Prepared for San Diego County. December.

———. 2010. *Final Baseline Biodiversity Report for the Ramona Grasslands Preserve*. August. San Diego, CA. Prepared for: County of San Diego, Department of Parks and Recreation.

———. 2012. *Baseline Biodiversity Report Santa Margarita Preserve*. Prepared for the County of San Diego, Department of Parks and Recreation. January 2012.

———. 2013. *Draft Boulder Oaks Baseline Biodiversity Inventory*. Prepared for San Diego County, September 2013

———. 2015. *CMP Preserves Plant Surveys Report*. Prepared for: County of San Diego Department of Parks and Recreation. November 2015.

———. 2016. *Year 5 Annual Report for Lakeside Linkage Preserve Cactus Wren Habitat Restoration*. Prepared for San Diego County, September.

———. 2017. *CMP Resource-Specific Monitoring 2016 Annual Report*. Prepared for: County of San Diego Department of Parks and Recreation. November.

———. 2018a. *CMP Resource-Specific Monitoring 2017 Annual Report*. Prepared for: County of San Diego Department of Parks and Recreation. January.

———. 2018b. *Targeted Monitoring Plan Resource-Specific Monitoring 2018 Annual Report*. Prepared for: County of San Diego Department of Parks and Recreation. October.

———. 2019. *Baseline Biodiversity Report San Luis Rey River Park Acquisition Parcels*. Prepared for the County of San Diego, Department of Parks and Recreation. June 2019.

ICF Jones and Stokes. 2008. *Baseline Biological Resources Evaluation, Lusardi Creek Preserve*. Prepared for: County of San Diego Department of Parks and Recreation. December.

Irvine Ranch Conservancy (IRC). 2012. An Efficient Monitoring Framework and Methodologies for Adaptively Managing Human Access on NCCP Lands and Other Reserves in Southern California.

Jepson Flora Project (eds.) 2024. *Jepson eFlora*, https://ucjeps.berkeley.edu.eflora Accessed on Jan 25, 2024.

Jones and Stokes. 2007. *Baseline Biological Resources Evaluation, Boulder Oaks Open Space Preserve*. Prepared for: County of San Diego Department of Parks and Recreation. November.

Klein, M. 2009. *Pollinator study on Lakeside ceanothus (*Ceanothus cyaneus*) and San Diego thornmint (*Acanthomintha ilicifolia*)*. Prepared for the California Department of Fish and Game, Sacramento, California.

Klute, D. S., L. W. Ayers, M. T. Green, W. H. Howe, S. L. Jones, J. A. Shaffer, S. R. Sheffield, and T. S. Zimmerman. 2003. Status Assessment and Conservation Plan for the Western Burrowing Owl in the United States. U.S. Department of Interior, Fish and Wildlife Service, Biological Technical Publication FWS/BTP-R6001-2003, Washington, D.C.

Kochert, M.N., Steenhof, K., McIntyre, C.L., and E.H. Craig. 2002. "Golden Eagle (*Aquila chrysaetos*)." In *Birds of North America*. Cornell Lab of Ornithology. February 2002.

Krutzsch, P.H. 1948. *Ecological study of the bats of San Diego County, California*. MA Thesis, University of California, Berkeley, California. 184 pp.

Kunz, T. H., C. R. Tidemann, and G.C. Richards. 1996. *Capturing mammals: Small Volant mammals*. Pages 122–146. In Wilson, D.E., F.R. Cole, J.D. Nichols, R. Rudran, and M.S. Foster. 1996. Measuring and monitoring biological diversity: Standard methods for mammals. Smithsonian Institution Press, Washington and London. 409 pages.

Kus, B. E. 1999. *Impacts of Brown-headed Cowbird Parasitism on Productivity of the Endangered Least Bell's Vireo*. Studies in Avian Biology No. 18:160–166. https://sora.unm.edu/. Accessed December 2019.

Kus, B.E. and M.J. Whitfield. 2005. "Parasitism, Productivity, and Population Growth: Response of Least Bell's Vireos (*Vireo belli pusillus*) and Southwestern Willow Flycatchers (*Empidonax traillii extimus*) to Cowbird (*Molothrus* spp.) Control." *Ornithological Monographs*, 57:16–27.

Lewison R. L, E. Marnocha, C. Tredick, and P. McIntyre. 2012. *Developing Conceptual Models: Translating Knowledge into Action. Building and Implementing an Integrated Framework for Monitoring and Management in San Diego County*. Proceedings from a workshop held Wednesday, February 29, 2012, Mission Trails Regional Park. Institute of Ecological Monitoring and Management, San Diego State University.

Marschalek, D. 2021. *Hermes Copper Butterfly Surveys and Translocation Efforts. Task 8: 2021 Harbison's Dun Skipper Adult Surveys*. San Diego, CA. Prepared for San Diego Association of Governments.

Marschalek, D., and D. Deutschman. 2015. *Initial Investigation of Critical Biological Uncertainties for Harbison's Dun Skipper (*Euphyes vestris harbisoni*) on Conserved Lands in San Diego County*. San Diego, CA. Prepared for California Department of Fish and Wildlife.

———. 2016. *Rare Butterfly Management and Conservation Planning*. Prepared for San Diego Association of Governments.

———. 2018. *San Diego County Harbison's Dun Skipper (*Euphyes vestris harbisoni*) Habitat Conservation and Management Plan*. Prepared for San Diego Association of Governments.

McEachern, K., and R. Sutter. 2010. *Assessment of Eleven Years of Rare Plant Monitoring Data from the San Diego Multiple Species Conservation Plan*. U.S. Geological Survey, Ventura, California, and San Diego Area Governments, San Diego, California.

McEachern, K., B. Pavlik, J. Rebman, and R. Sutter. 2007. *San Diego Multiple Species Conservation Program (MSCP) Rare Plant Monitoring Review and Revision*: U.S. Geological Survey Scientific Investigations Report 2007-5016, 68 pp.

Meese, R. J. 2014. *Results of the 2014 Tricolored Blackbird Statewide Survey*. Department of Environmental Science and Policy, University of California, Davis, CA.

Michael Brandman Associates (MBA). 2010a. *Baseline Biodiversity Report for the Mount Olympus Preserve in Unincorporated San Diego County, California*. Prepared for the County of San Diego, Department of Parks and Recreation. Revised April 2010.

———. 2010b. *Baseline Biodiversity Report for the Wilderness Gardens Preserve in Unincorporated San Diego County, California*. Prepared for the County San Diego, Department of Parks and Recreation. April 2010.

Montgomery, S. J., D. J. Grout, C. M. Wolf, V. M. Shoblock, A. Davenport, and R. N. Knight. 2008. *Stephens' kangaroo rat monitoring program, and results of annual monitoring sessions between spring 2002 and fall 2004, at Naval Weapons Station Seal Beach Detachment Fallbrook*. Unpublished report submitted by SJM Biological Consultants to the Environmental Programs and Services Office, Naval Weapons Station Seal Beach Detachment Fallbrook, Fallbrook, CA.

Oberbauer, T.A., and J.M. Vanderwier. 1991. *The Vegetation and Geologic Substrate Association and its Effect on Development in Southern California*. San Diego Association of Geologists, October 1991.

Ogden Environmental and Energy Services Co., Inc. (Ogden). 1996. *Biological Monitoring Plan for the Multiple Species Conservation Program*. Prepared for City of San Diego, CDFG, and USFWS, January 1996. San Diego, California.

Orchard, S. A. 2011. Removal of the American bullfrog *Rana* (*Lithobates catesbeianus*) from a pond and a lake on Vancouver Island, British Columbia, Canada. Pages 217–221 In *Island Invasives: Eradication and Management*, edited by C. R. Veitch, M. N. Clout, and D. R. Towns. IUCN, Gland, Switzerland.

Oregon Wildlife Institute (OWI). 2016. *Conservation Assessment for the Pallid Bat (Antrozous pallidus) in Oregon and Washington*. Jennifer Gervais. June 2016.

Pagel, J. E., D. M. Whittington, and G. T. Allen. 2010. *Interim Golden Eagle Inventory and Monitoring Protocols and Other Recommendations*. Division of Migratory Birds, U.S. Fish and Wildlife Service. February.

Peterson B.L., B.E. Kus, and D.H. Deutschman. 2004. "Determining Nest Predators on the Least Bell's Vireo through Point Counts, Tracking Stations, and Video Photography." *Journal of Field Ornithology* 75:89–95.

Pierson, E. D., and W. E. Rainey. 1996. *The Distribution, Status and Management of Townsend's Big-Eared Bat (*Corynorhinus townsendii*) in California*. California Department of Fish and Game, Bird and Mammal Conservation Program Report 96-7:1–49.

Rebman, J., and R. Dossey. 2006. *Long Term Monitoring Plan and Baseline Survey of Willowy Monardella (*Monardella viminea*) at Marine Corps Air Station Miramar San Diego*.

Reed, S.E., C.L. Larson, and K.R. Crooks. 2019. *Effects of Human Use of NCCP Reserves on Reptile and Mammal Species in San Diego*. Wildlife Conservation Society Agreement #P1582100. Final Report. June 2019.

Regan, H., L. Hierl, J. Franklin, and D. Deutschman. 2006. *San Diego Multiple Species Conservation Program Covered Species Prioritization*. Local Assistance Grant #P0450009, California Department of Fish and Game, Sacramento, California. January 2006.

Reiser, C. H. 2001. *Rare Plants of San Diego County*. Imperial Beach, CA: Aquafir Press.

Rochester, C. J., Brehme, C. S., Clark, D. R., Stokes, D. C., Hathaway, S. A., and Fisher, R. N. 2010. "Reptile and Amphibian Responses to Large-Scale Wildfires in Southern California." *Journal of Herpetology*, 44:333–351. https://doi.org/10.1670/08-143.1

San Diego Association of Governments (SANDAG). 2011. *A Vegetation Classification Manual for Western San Diego County*. First Edition. February 2011.

San Diego Management and Monitoring Program (SDMMP). 2011. *Connectivity Monitoring Strategic Plan for the San Diego Preserve System*. Prepared for the San Diego Environmental Mitigation Program Working Group. January 2011, http://www.keepsandiegomoving.com/Libraries/EMP-doc/Connectivity_Monitoring_Strategic_ Plan.sflb.ashx, accessed December 2012.

———. 2019. Rare Plant IMG Results 2014–2019 [Data File].

———. 2020. *Management and Monitoring Strategic Plan (MSP Roadmap) 2020 Rare Plant Inspect and Manage Monitoring Protocol for Occurrences on Conserved Lands in Western San Diego County*. March 16, 2020.

———. 2022a. *Management and Monitoring Strategic Plan (MSP Roadmap) 2023 Rare Plant Inspect and Manage (IMG) Monitoring Protocol for Occurrences on Conserved Lands in Western San Diego County*. Updated November 7, 2022. https://sdmmp.com/upload/SDMMP_Repository/0/tj6mz3bkcfhsr01298p47wg5dvqyxn.pdf.

———. 2022b. Tijuana River Valley Regional Park Orcutt's Bird's-Beak Occurrences [Data File].

———. 2022c. Management & Monitoring Strategic Plan (MSP) Portal. https://sdmmp.com/portal.php. Accessed December 2023.

———. 2023. Rare Plant IMG Results 2014-2022 [Data File].

San Diego Management and Monitoring Program (SDMMP) and The Nature Conservancy (TNC). 2017. *Management and Monitoring Strategic Plan for Conserved Lands in Western San Diego County: A Strategic Habitat Conservation Roadmap*. 3 Volumes. Prepared for the SANDAG. San Diego.

San Diego Natural History Museum (SDNHM). 2018a. *A Report of Genetic Sample Collections and Curation for Six Rare Plants Within the San Diego MSPA. San Diego County, California*. Prepared for the San Diego Association of Governments.

———. 2018b. *Draft Final Report for Focused Pallid Bat (*Antrozous pallidus*) and Townsend's Big-eared Bat (*Corynorhinus townsedii*) Surveys in San Diego County, California*. [Draft] Prepared for the San Diego Management and Monitoring Program.

San Diego Zoo Institute for Conservation Research. 2017. *Burrowing Owl Conservation and Management Plan for San Diego County*. San Diego, CA: 85 pp.

San Diego Zoo Wildlife Alliance (SDZWA). 2018. Institute News: Burrowing Owls Brought to Safari Park Hospital for Care. Published July 10, 2018. Available: https://science.sandiegozoo.org/news/burrowing-owls-brought-safari-park-hospital-care

Sherwin, R. E. 1998. *Proceedings of the Western Bat Working Group workshop on ecology, conservation, and management of western bat species – species accounts, pallid bat (*Antrozous pallidus*)*. February 9–13, 1998, Reno, Nevada.

Sherwin R. E., D. Stricklan, and D. S. Rogers. 2000. *Roosting Affinities of Townsend's Big-Eared Bat (*Corynorhinus townsendii*) in Northern Utah*. Journal of Mammalogy 81:939-947.

Shuford, W.D. and T. Gardali, editors. 2008. *California Bird Species of Special Concern: A Ranked Assessment of Species, Subspecies, and Distinct Populations of Birds of Immediate Conservation Concern in California*. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento.

Sogge, M.K., Ahlers, Darrell, and Sferra, S.J., 2010. *A Natural History Summary and Survey Protocol for the Southwestern Willow Flycatcher*. U.S. Geological Survey Techniques and Methods 2A-10, 38 p.

Spencer, W., and S. Montgomery. 2007. *Biological Survey Report for the Santa Maria Creek Restoration Project: Stephens' Kangaroo Rat*. Prepared for: County of San Diego Department of Parks and Recreation; on behalf of: Technology Associates (TAIC), January 2007.

Spencer, W.D., D. DiPietro, H. Romsos, D. Shier, and R. Chock. 2021. *Stephens' Kangaroo Rat Rangewide Management and Monitoring Plan.* Unpublished report prepared by the Conservation Biology Institute for Bureau of Land Management and Riverside County Habitat Conservation Agency. March 2021.

Stokes, D.C., C.S. Brehme, S.A. Hathaway, and R.N. Fisher. 2005. *Bat Inventory of the Multiple Species Conservation Program Area in San Diego County, California*. Prepared for the County of San Diego and California Department of Fish and Game.

Strahm, S. 2012. *A Conceptual Model for Otay Tarplant (*Deinandra conjugens*)*. Institute for Ecological Monitoring and Management and San Diego State University. Prepared for The Nature Conservancy January 3, 2012.

Sweet, S.S. and B.K. Sullivan. 2005. "*Bufo californicus* Camp 1915: Arroyo Toad." In *Amphibian Declines: The Conservation Status of United State Species*, edited by M.J. Lannoo. Pp. 396-400. University of California Press, Berkeley, CA.

Taylor, D.A.R. 2007. "Water for Wildlife Helping Bats Find a Place to Drink." *Bats Magazine*, 25(1). Accessed: http://www.batcon.org/resources/media-education/bats-magazine/bat_article/168. December 2019.

Technology Associates International Incorporation (TAIC). 2005. *Ramona Vernal Pool Conservation Study, Ramona, California*. Prepared for the County of Sand Diego, Department of Planning and Land Use. January 2005.

———. 2008a. *Biological Diversity Baseline Report for the Del Dios Highlands Preserve County of San Diego*. Prepared for the County of San Diego, Department of Parks and Recreation. November 2008.

———. 2008b. *Biological Diversity Baseline Report for the Hellhole Canyon Preserve County of San Diego*. Prepared for the County of San Diego, Department of Parks and Recreation. October 2008.

Technology Associates International Corporation (TAIC) and ESA. 2011a. *Biological Diversity Baseline Report for the Lawrence and Barbara Daley Preserve County of San Diego*. Prepared for the County of San Diego, Department of Parks and Recreation. January 2011.

———. 2011b. *Biological Diversity Baseline Report for the Furby North Property County of San Diego*. Prepared for the County of San Diego, Department of Parks and Recreation. December 2011.

The Center for Natural Lands Management (CNLM). 2002. *Habitat Management Plan for the Kelly Ranch Habitat Conservation Area*. Prepared for U.S. Fish and Wildlife Service and California Department of Fish and Game. November.

———. 2005. *Habitat Management Plan for the Rancho La Costa Habitat Conservation Area*. Prepared for City of Carlsbad, City of San Marcos, U.S. Fish and Wildlife Service, and California Department of Fish and Game. June.

The Nature Conservancy (TNC) and SDMMP. 2015. *South San Diego County Coastal Cactus Wren (*Campylorhynchus brunneicapillus*) Habitat Conservation and Management Plan*. Prepared for San Diego Association of Governments. June 18, 2015.

Tracey, J., K. McEachern, and K. Greer. 2011. *San Diego Rare Plant Monitoring Plan: Fiscal Year 2011*. San Diego, California.

Unitt, P. 2004. *San Diego County Bird Atlas*. Proceedings of the San Diego Society of History. San Diego, California. October 2004.

U.S. Army Corps of Engineers (USACE). 1997. "Indicator Species for Vernal Pools." In *Special Public Notice, Regional General Conditions to Nationwide Permits*. November 25, 1997. Prepared by the Los Angeles District, Regulatory Branch. November 1997.

U.S. Fish and Wildlife Service (USFWS). 1998. *Vernal Pools of Southern California Recovery Plan*. U.S. Fish and Wildlife Service, Portland, Oregon. 113+ pp.

———. 2000. The HCP Addendum or "Five Point Policy." Addendum to the Handbook for Habitat Conservation Planning and Incidental Take Permitting Process; Notices. Federal Register. 65(106):35242-35257.

———. 2001. *Least Bell's Vireo Survey Guidelines*. USFWS, Carlsbad Fish and Wildlife Office, Carlsbad, California. January 2001.

———. 2002. *Final Recovery Plan Southwestern Willow Flycatcher (*Empidonax traillii extimus*)*. Prepared by Southwestern Willow Flycatcher Recovery Team Technical Subgroup. Prepared for Region 2 U.S. Fish and Wildlife Service, Albuquerque, New Mexico 87103. August 2002. 210 pp., Appendices A–O.

———. 2004. *Recovery Plan for* Deinandra conjugens *(Otay tarplant)*. 64 pp. December 7, 2004.

———. 2005. *Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Endangered Riverside Fairy Shrimp (*Streptocephalus woottoni*)*. 50 CFR Part 17 05-6825 vol.70, No. 69.

———. 2006. *Least Bell's Vireo (Vireo bellii pusillus) 5-Year Review Summary and Evaluation*. USFWS, Carlsbad Fish and Wildlife Office, Carlsbad, California. September 2006.

———. 2007. National Bald Eagle Management Guidelines. May 2007.

———. 2009a. *Deinandra conjugens* (Otay tarplant) 5-Year Review – No commendation in change of threatened status. Recovery priority number changes from 5 to 8C.

———. 2009b. Arroyo toad (*Bufo californicus [=microscaphus]*). 5-Year Review: Summary and Evaluation. USFWS, Ventura Fish and Wildlife Office, Ventura, California. August 2009.

———. 2009c. Acanthomintha ilicifolia *(San Diego thornmint), 5-Year Review: Summary and Evaluation*. USFWS, Carlsbad Fish and Wildlife Office, Carlsbad, California, August 2009.

———. 2011a. *Baccharis vanessae* (Encinitas baccharis). 5-Year Review: Summary and Evaluation. USFWS, Carlsbad Fish and Wildlife Office, Carlsbad, California. December 22, 2011.

———. 2011b. Stephen's Kangaroo Rat (*Dipodomys stephensi*) 5-Year Review: Short For Summary. Carlsbad Fish and Wildlife Office, Carlsbad, California, USA. July 22, 2011.

———. 2017. *Survey Guidelines for the Listed Large Branchiopods*. Pacific Southwest Region, Sacramento, California.

U.S. Geological Survey (USGS). 2017. Cactus Wren Survey Guide.

———. 2020. *USGS Aquatic Species and Habitat Assessment Protocol Rivers, Streams, and Creeks-Paper*. March 2020.

University of California Statewide Integrated Pest Management Program (UC IPM). 2013. Goldspotted Oak Borer. Publication 74163. January 2013.

———. 2017. Invasive Shot-Hole Borers + Fusarium Dieback: A Devastating Threat to California Trees. Accessed at https://ucanr.edu/sites/pshb/files/240640.pdf on October 24, 2018.

WRA, Inc. 2014. *Biological Resources Inventory Moosa Creek Mitigation Bank Property*. October.

Winchell, C., S. Ostermann-Kelm, T. Grant, A. Thompson, and G. Wagner. 2008. *San Diego Multiple Species Conservation Program Animal Monitoring Protocols*. Local Assistance Grant #P0585100, California Department of Fish and Game, Sacramento, California. February 2008.

White-Nose Syndrome. 2022. White-nose Syndrome Fact Sheet. Accessed January 29, 2024. https://www.whitenosesyndrome.org/mmedia-education/white-nose-syndrome-fact-sheet-june-2018.

Personal Communications

Acanthomintha Working Group. 2013.

Bloom, Peter. 2018. Bloom Biological, Inc.

Catino-Davenport, Jaclyn. 2021. Environmental Science Associates.

Dodero, Mark. 2023. Environmental Science Associates.

Estep, J. 2013. Estep Environmental Consulting.

Gordon-Reedy, Patricia. 2013. Conservation Biology Institute.

Kelly, Mike. 2013. Meeting. Kelly and Associates.

Leslie, Doug. 2013. ICF International.

Marschalek, Dan. 2018. University of Central Missouri.

Preston, Kris. 2015. San Diego Management and Monitoring Program.

Spiegelberg, Markus. 2018. Center for Natural Lands Management.

Stokes, Drew. 2018. San Diego Natural History Museum.

USGS. 2023. United States Geological Survey

Vinje, Jessie. 2018. Conservation Biology Institute.

This page is intentionally left blank.

Appendix A

Scientific Experts Contacted During TMP Development

TABLE 1
SCIENTIFIC EXPERTS CONTACTED DURING TMP DEVELOPMENT

Species or Habitat	Expert	Affiliation	Year Contacted	Comments
San Diego thornmint	Patrick McConnell	Center for Natural Lands Management	2013	Was instrumental in assisting with monitoring protocol for CMP based on long-term thornmint monitoring being conducted on CNLM properties as well as management strategies.
	Markus Spiegelberg	Center for Natural Lands Management	2013	Discussed long-term thornmint monitoring being conducted on CNLM properties.
	Carol Crafts	Friends of Goodan Ranch/Sycamore Canyon Preserve	2013	Interviewed and conducted site visit; Has been assisting with long-term monitoring of thornmint populations for several years based on methods developed by Mike Kelly.
	Jessie Vinje	Conservation Biology Institute	2013	Discussions about threats, habitat preferences, monitoring strategies, potential goals and objectives, seed collection, and management.
	Patricia Gordon-Reedy	Conservation Biology Institute	2013	Discussions about threats, habitat preferences, monitoring strategies, potential goals and objectives, seed collection, and management.
	Mike Kelly	Kelly and Associates	2013	Discussed site-specific stressors and management issues, as well as management triggers and monitoring methods.
	Michael Kline - pollinators	keps2@flite-tours.com	2013	Butterfly and pollinator expert; provided email response regarding pollinators.
	Zach Principe	The Nature Conservancy	2013	Provided general and site-specific (Ramona Grasslands) information.
	Jessie Vinje	Conservation Biology Institute	2019	Email and phone interview. Discussed general and site-specific (Simon Preserve) information regarding threats, critical uncertainties, monitoring, and management strategies.
	Markus Spiegelberg	Center for Natural Lands Management	2019	Phone interview. Discussed threats, critical uncertainties, monitoring, and management.
Otay Tarplant	Jessie Vinje	Conservation Biology Institute	2019	Email and phone interview. Discussed general and site-specific (Furby-North Preserve) information regarding threats, critical uncertainties, monitoring, and management strategies.
	Scott McMillan	AECOM	2019	Phone interview. Discussed propagation, species-specific requirements, threats, and management strategies.
Orcutt's bird's-beak	Jessie Vinje	Conservation Biology Institute	2019	Email and phone interview. Discussed general and site-specific (Tijuana River Valley Regional Park) information regarding threats, critical uncertainties, monitoring, and management strategies.
Orcutt's brodiaea	Kris Preston	SDMMP	2023	Discussed threats, regional status, monitoring, and management strategies during workshop.
Encinitas baccharis	Kris Preston	SDMMP	2013	Discussed threats and potential monitoring strategies. Provided updated information about regional goals and priorities for this species.
Heart-leaved pitcher sage	Kris Preston	SDMMP	2023	Discussed threats, regional status, monitoring, and management strategies during workshop.
Lakeside ceanothus	Patricia Gordon-Reedy		2013	Provided information about adaptation to fire, monitoring, management and life history. Assisted with monitoring objectives.
San Miguel savory	Kris Preston	SDMMP	2013	Discussed threats and potential monitoring strategies. Provided updated information about regional goals and priorities for this species.
Variegated dudleya	Patrick McConnell	Center for Natural Lands Management	2013	Discussed threats, life history, and potential management and monitoring strategies.
	Kris Preston	SDMMP	2013	Discussed threats, life history, and potential management and monitoring strategies. Provided updated information about regional goals and priorities for this species.
	Mike Kelly	Kelly and Associates	2013	Provided site specific stressor info, monitoring, and management.
Willowy monardella	Kris Preston	SDMMP	2013	Discussed threats, life history, and potential management and monitoring strategies. Provided updated information about regional goals and priorities for this species.
	Dale Ritenour	ICF International	2013	Provided site-specific information about species threats and life history.
	Mike Kelly	Kelly and Associates	2013	Discussed site-specific stressors and management issues, as well as management and monitoring methods.

Species or Habitat	Expert	Affiliation	Year Contacted	Comments
	Carol Crafts	Friends of Goodan Ranch/Sycamore Canyon Preserve	2013	Conducted site visit at Sycamore/Goodan Preserve—has been assisting with long-term monitoring of this species for several years.
Harbison's dun skipper	Dan Marschalek	University of Central Missouri	2019	Phone interview. Discussed general and site-specific (Hellhole Canyon Preserve) information regarding host plant, threats, and management strategies.
Arroyo toad	Brad Hollingsworth	San Diego Natural History Museum	2013	Emailed and received reply email. Recommended reviewing Sweet and Sullivan 2005 arroyo toad account. Provided report of surveys conducted at Ramona Grasslands in 2006.
	Kailash Mozumder	ICF International	2013	Phone interview. Provided information of surveys conducted at Ramona Grasslands in 2009. Also recommended reviewing Santa Maria Creek Hydrologic and Hydraulic Study prepared in 2006 and revised in 2009.
	Rob Lovich	U.S. Navy	2013	Phone interview. No specific information on Ramona Grasslands Preserve. Did recommend that populations in San Dieguito River be monitored and used as a barometer for the population in Santa Maria Creek.
	Robert Fisher	USGS	2023	Discussed threats, regional status, monitoring, and management strategies during workshop.
Golden and Bald eagles	Jim Estep	Estep Environmental Consulting	2013	Phone interview. Recreational activities can have long-term impacts on golden eagles, especially during the pairing and nesting period. Monitoring of ground squirrel population is necessary to determine prey abundance. Golden eagles are sensitive to grass heights during foraging.
	Doug Leslie	ICF International	2013	Phone interview. Recreational activities can have long-term impacts on golden eagles, especially during the pairing and nesting period. Golden eagles are sensitive to grass heights.
	Todd Katzner	West Virginia University	2013	Interviewed; discussed methods of conducting baseline foraging study for eagles.
	Peter Bloom	Bloom Biological Inc.	2019	Phone interview. Discussed threats and management.
Southwestern willow flycatcher	Robert Fisher	USGS	2023	Discussed threats, regional status, monitoring, and management strategies during workshop.
	Kris Preston	SDMMP	2023	Discussed threats, regional status, monitoring, and management strategies during workshop.
San Diego fairy shrimp	Andrew Bohonank		2013	Interviewed; recommended Bauder et al. 2009 for vernal pools and SANDAG model for San Diego fairy shrimp.
Pallid bat	Drew Stokes	San Diego Natural History Museum	2019	Phone interview. Discussed threats, monitoring, and management strategies.
Townsend's big-eared bat	Drew Stokes	San Diego Natural History Museum	2019	Phone interview. Discussed threats, monitoring, and management strategies.
Stephen's kangaroo rat	Steve Montgomery	SJM Biological Consultants	2013	Interviewed; discussed SKR monitoring on Ramona Grasslands Preserve.
	Wayne Spencer	Conservation Biology Institute	2013	Interviewed; discussed SKR monitoring on Ramona Grasslands Preserve.
Grasslands	Patricia Gordon Reedy	Conservation Biology Institute	2013	Interviewed; discussed goal and objective development; discussed management triggers. She is working on SD County Grasslands Project (funded by LAG).
	Zach Principe	The Nature Conservancy	2013	Interviewed; provided general and site-specific information (Ramona Grasslands Preserve).
Vernal Pools	Andrew Bohonank	San Diego State University	2013	Interviewed; recommended Bauder et al. 2009 for assessing vernal pools.
	Christina Schaefer	Environmental Science Associates (ESA)	2013	Provided expertise regarding vernal pool ecosystem function, management, and monitoring.
	Brenda McMillan	Environmental Science Associates (ESA)	2023	Provided expertise regarding vernal pool ecosystem function, management, and monitoring.

Appendix B
TMP Species Prioritization

Appendix B. Species Prioritization for County's Targeted Monitoring Plan

Scoring:
Regan et al 2006 priority Risk Group 1 = 2 pts; RG 2 = 1 pts
MSP SL and SO = 3 pts VF = 2 pts; SS and VG = 1 pt
RG (Ramona Grassland RMP) High priority = 1 pt

MSP Definitions: SL = persistence in MSPA is at high risk of loss without immediate management action; SO = persistence of one or more significant occurrences within MSPA is at risk of loss withouth immediate action. SS = occurrences considered more stable and at lower risk of extirpation compared to SL and SO, but still require species specific action. VF = vegetation management focus - species with limited distribution in MSPA or have specific vegetation characteristics that need to be managed; VG = vegetation management focus - species have a wider distribution in the MSPA or do not have specific vegetation characteristics that need to be managed.

Common Name	Scientific Name	Boulder Oaks **MU 4**	Lakeside Linkage **MU 4**	El Capitan Preserve **MU4**	El Monte **MU 4**	Stelzer Park **MU 4**	Oakoasis **MU 4**	Sycamore/Goodan **MU 4**	Ramona Gr **MU 5**	Del Dios (all) **MU 6**	Lusardi Creek **MU 6**	MSCP Risk Grp Regan et al, 2006	MSP Mgmt Category	RG Draft RMP (high, med, low)	POINTS	SCORE	County Species of Interest[1]
PLANTS																	
San Diego thornmint	***Acanthomintha ilicifolia***							X	X			1	SO	H	2+3+1	6	
California adolphia	*Adolphia californica*										X				0+0+0	0	
San Diego milk-vetch	*Astragalus oocarpus*								X					M	0+0+0	0	
Coulter's saltbush	*Atriplex coulteri*								X					M	0+0+0	0	
Parish's brittlescale	*Atriplex parishii* var. *parishii*								X					H	0+0+1	1	
Encinitas baccharis	***Baccharis vanessae***									X		1	SO		2+3+0	5	
San Diego goldenstar	*Bloomeria [Muilla] clevelandii*					X						2	SS		1+1+0	2	
Orcutt's brodiaea	*Brodiaea orcuttii*	X										3	SO		0+3+0	3	
California large-leaf filaree	*California macrophylla*								X					H	0+0+1	1	
Lakeside ceanothus	*Ceanothus cyaneus*	X		X		X	X								0+0+0	0	x
Wart-stemmed ceanothus	*Ceanothus verrucosus*									X		3			0+0+0	0	
Southern tarplant	*Centromadia parryi* ssp. *australis*								X					M	0+0+0	0	
Summer holly	*Comarostaphylis diversifolia ssp. diversifolia*									X	X				0+0+0	0	
Variegated dudleya	*Dudleya variegata*							X			X	2	SS		1+1+0	2	x
San Diego Barrel Cactus	*Ferocactus viridescens*										X	3			0+0+0	0	
San Diego marsh elder	*Iva hayesiana*			X							X				0+0+0	0	
Felt-leaved monardella	*Monardella hypoleuca ssp. lanata*	X		X								3			0+0+0	0	
Willowy monardella	*Monardella linoides* ssp. *viminea*							X				2	SL		1+3+0	4	x
Spreading navarretia	*Navarretia fossalis*								X			1			2+0+0	2	
Nuttall's scrub oak	*Quercus dumosa*										X				0+0+0	0	
Engelmann oak	*Quercus engelmannii*	X		X	X	X								L	0+0+0	0	
San Miguel savory	*Clinopodium (Satureja) chandleri*	X										3	SL		0+3+0	3	x

Appendix B. Species Prioritization for County's Comprehensive Monitoring Plan

Scoring:
Regan et al 2006 priority Risk Group 1 = 2 pts; RG 2 = 1 pts
MSP SL and SO = 3 pts VF = 2 pts; SS and VG = 1 pt
RG (Ramona Grassland RMP) High priority = 1 pt

MSP Definitions: SL = persistence in MSPA is at high risk of loss without immediate management action; SO = persistence of one or more significant occurrences within MSPA is at risk of loss withouth immediate action. SS = occurrences considered more stable and at lower risk of extirpation compared to SL and SO, but still require species specific action. VF = vegetation management focus - species with limited distribution in MSPA or have specific vegetation characteristics that need to be managed; VG = vegetation management focus - species have a wider distribution in the MSPA or do not have specific vegetation characteristics that need to be managed.

Common Name	Scientific Name	Boulder Oaks **MU 4**	Lakeside Linkage **MU 4**	El Capitan Preserve **MU4**	El Monte **MU 4**	Stelzer Park **MU 4**	Oakoasis **MU 4**	Sycamore/Goodan **MU 4**	Ramona Gr **MU 5**	Del Dios (all) **MU 6**	Lusardi Creek **MU 6**	MSCP Risk Grp Regan et al, 2006	MSP Mgmt Category	RG Draft RMP (high, med, low)	POINTS	SCORE	County Species of Interest[1]
INVERTS																	
San Diego fairy shrimp	***Branchinecta sandiegonensis***								X			**1**	SO/VF	**H**	2+3+1	**6**	
Quino checkerspot butterfly	*Euphydryas editha quino*												SL		0+3+0	3	
HERPS																	
Orange-throated whiptail	*Aspidoscelis hyperythrus beldingi*		X	X		X		X		X	X	3		M	0+0+0	0	
Arroyo toad	***Anaxyrus (Bufo) californicus***								X			2	SO	**H**	1+3+1	**5**	
Northern red-diamond rattlesnake	*Crotalus ruber ruber*	X		X				X		X	X			L	0+0+0	0	
Southwestern pond turtle	*Emys marmorata pallida*	?											SL		0+3+0	0	
Coast horned lizard	*Phrynosoma blainvillei (coronatum)*	X		X		X	X	X		X		3		L	0+0+0	0	
Western spadefoot toad	*Spea hammondi*	X		X					X	X				L	0+0+0	0	
BIRDS																	
Cooper's hawk	*Accipiter cooperi*	X	X	X				X	X	X	X	3		L	0+0+0	0	
Tricolored Blackbird	*Agelaius tricolor*								X			**1**		M	2+0+0	2	**x**
Rufous-crowned Sparrow	*Aimophila ruficeps canescens*	X	X	X	X	X	X	X		X	X	3		M	0+0+0	0	
Grasshopper sparrow	*Ammodramus savannarum*								X					L	0+0+0	0	
Bell's sage sparrow	*Amphispiza belli belli*	X		X				X		X					0+0+0	0	
Golden eagle	***Aquila chrysaetos***							X	X			2	SO	**H**	1+3+1	**5**	
Burrowing Owl	***Athene cunicularia***							X	X			**1**	SL	**H**	2+3+1	**6**	
Ferruginous hawk	*Buteo regalis*								X	X		3		L	0+0+0	0	
San Diego cactus wren	***Campylorhynchus brunneicapillus sandiegensis***		?									**1**	SO	**H**	2+3+1	**6**	
Northern harrier	*Circus cyanus*							X	X	X	X	3	SO		0+3+0	3	
Bald eagle	*Haliaeetus leucocephalus*								X			2		**H**	1+0+1	2	**x**
Yellow-breasted chat	*Icteria virens*	X					X	X		X						0	
White-faced ibis	*Plegadis chihi*									X		3			0+0+0	0	

Appendix B. Species Prioritization for County's Comprehensive Monitoring Plan

Scoring:
Regan et al 2006 priority Risk Group 1 = 2 pts; RG 2 = 1 pts
MSP SL and SO = 3 pts VF = 2 pts; SS and VG = 1 pt
RG (Ramona Grassland RMP) High priority = 1 pt

MSP Definitions: SL = persistence in MSPA is at high risk of loss without immediate management action; SO = persistence of one or more significant occurrences within MSPA is at risk of loss withouth immediate action. SS = occurrences considered more stable and at lower risk of extirpation compared to SL and SO, but still require species specific action. VF = vegetation management focus - species with limited distribution in MSPA or have specific vegetation characteristics that need to be managed; VG = vegetation management focus - species have a wider distribution in the MSPA or do not have specific vegetation characteristics that need to be managed.

Common Name	Scientific Name	Boulder Oaks **MU 4**	Lakeside Linkage **MU 4**	El Capitan Preserve **MU4**	El Monte **MU 4**	Stelzer Park **MU 4**	Oakoasis **MU 4**	Sycamore/Goodan **MU 4**	Ramona Gr **MU 5**	Del Dios (all) **MU 6**	Lusardi Creek **MU 6**	MSCP Risk Grp Regan et al, 2006	MSP Mgmt Category	RG Draft RMP (high, med, low)	POINTS	SCORE	County Species of Interest[1]
Coastal California gnatcatcher	*Polioptila californica californica*		X						CH	X	X	2			1+0+0	1	
MAMMALS																	
Pallid bat	*Antrozous pallidus*	X		X	X								SL		0+3+0	3	
Northwestern San Diego pocket mouse	*Chaetodipus fallax fallax*				X					X					0+0+0	0	
Townsend's big-eared bat	*Corynorhinus townsendii*			X	X	X	X			X			SO		0+3+0	0	
Stephens' kangaroo rat	*Dipodomys stephensi*								X					H	0+0+1	1	x
San Diego black-tailed jackrabbit	*Lepus californicus bennettii*							X		X					0+0+0	0	
Southern mule deer	*Odocoileus hemionus fuliginata*	X	X	X	X	X	X	X	X	X	X	3			0+0+0	0	
Mountain lion	*Puma concolor*								X	X					0+0+0	0	
American Badger	*Taxidea taxus*								X			**3**	SL		0+3+0	3	

[1] Explanation of County Species of Interest:

Ceanothus cyaneus - very restricted distribution; most occurrences are on county preserve lands

Dudleya variegata - CNPS rank 1B.2; relatively easy to monitor; funding available for management

Monardella viminea – federally endangered, few occurrences, highly imperiled

Navarretia fossalis – vernal pool species that occurs adjacent to Ramona Grasslands preserve; federal critical habitat is present on the preserve

Clinopodium chandleri - Recommended by SDMMP; currently known from only two conserved locations in the County , one of which is Boulder Oaks

Agelaius tricolor - Recommended by SDMMP. "Tricolored blackbird should be managed at Ramona Grasslands as this species breeds in very few areas in the County and needs every available location for breeding in any given year due to potential disturbance at colonies." <<mgmt yes, but should be monitored through regional efforts>>

Haliaeetus leucocephalus - new nesting location in Ramona Grasslands. Pair successfully fledged the young in 2013 for first time.

Dipodomys stephens - monitoring obligations for mitigation areas

Preserve Group 2 - Species Prioritization

Scoring: SO or SL = 3 pts; SS = 2 pts; VF or NA = 1 pt

Management Strategic Plan (MSP) Definitions:
SL = persistence in the MSP Area (MSPA) is at high risk of loss without immediate management action
SO = persistence of one or more significant occurrences within MSPA is at risk of loss without immediate action
SS = occurrences considered more stable and their persistence is at lower risk of loss compared to SL and SO, but still require species specific action.
VF = vegetation management focus - species with limited distribution in MSPA or have specific vegetation characteristics that need to be managed for persistence in MSPA
VG = vegetation management focus - species with a wider distribution in the MSPA or do not have specific vegetation characteristics that need to be managed
NA = not applicable - not prioritized as an SL, SO, SS, VF, or VG species by the MSP.

Common Name	Scientific Name	Tijuana River Valley Regional Park **MU1**	Furby-North **MU3**	Lawrence and Barbra Daley **MU3**	Stoneridge **MU3**	Barnett Ranch **MU4**	Simon **MU4**	Hellhole Canyon **MU5**	Mt. Olympus **MU8**	Santa Margarita **MU8**	Wilderness Gardens **MU8**	MSP Management Category	SCORE:	Proposed for Monitoring at Preserve Group 2?	Notes
MSCP (North or South)		S	S	S	S	N/S	N	N	N	N	N				
		Batch 2 Preserves													
PLANTS															
San Diego thornmint	*Acanthomintha ilicifolia*						X					SO	3	Yes	Included for monitoring at Simon County Preserve in 2019 TMP Update.
Thread-leaf brodiaea	*Brodiaea filifolia*											SS	2	No	Species does not occur in Preserve Group 2. (Note: species was previously misidentified at the Wilderness Gardens Preserve).
Orcutt's brodiaea	*Brodiaea orcuttii*						X		X			SO	3	No	Not a priority species for monitoring and management for preserves in the North County Plan area as it is not proposed for coverage by the draft North County Plan.
Wart-stemmed ceanothus	*Ceanothus verrucosus*	X										VF	1	No	Not a priority species for species-specific management and monitoring (species does well with vegetation management).
Snake cholla	*Cylindropuntia californica* var. *californica*		X									VF	1	No	Not a priority species for species-specific management and monitoring (species does well with vegetation management).
Otay tarplant	*Deinandra conjugens*		X									SS	2	Yes	Included for monitoring at Furby-North Property in 2019 TMP Update.
Orcutt's bird's-beak	*Dicranostegia orcuttiana*	X										SL	3	Yes	Included for monitoring at Tijuana River Valley Regional Park in 2019 TMP Update.
Palmer's goldenbush	*Ericameria palmeri* var. *palmeri*			X								VF	1	No	Not a priority species for species-specific management and monitoring (species does well with vegetation management).
San Diego barrel cactus	*Ferocactus viridescens*	X	X									VF	1	No	Not a priority species for species-specific management and monitoring (species does well with vegetation management).
Heart-leaved pitcher sage	*Lepechinia cardiophylla*								X		X	SL	3	No	Not a priority species for monitoring and management for preserves in the North County Plan area as it is not proposed for coverage by the draft North County Plan.
Felt-leaved monardella	*Monardella hypoleuca ssp. lanata*					X		X				VF	1	No	Not a priority species for species-specific management and monitoring (species does well with vegetation management).
Nuttall's scrub oak	*Quercus dumosa*	X										VF	1	No	Not a priority species for species-specific management and monitoring (species does well with vegetation management).
Engelmann oak	*Quercus engelmannii*			X	X	X	X	X	X	X		VF	1	No	Not a priority species for species-specific management and monitoring (species does well with vegetation management).
INVERTS															
Harbison's dun skipper	*Euphyes vestris harbisoni*							X				SL	3	Yes	Included for monitoring at Hellhole Canyon County Preserve in 2019 TMP Update.
HERPS															
Orange-throated whiptail	*Aspidoscelis hyperythrus beldingi*	X	X	X	X	X	X	X	X	X	X	NA	1	No	Not a priority species for species-specific management and monitoring.
Arroyo toad	*Anaxyrus (Bufo) californicus*									X		SO	3	Yes	Included for monitoring at Santa Margarita County Preserve in 2019 TMP Update.
Coast horned lizard	*Phrynosoma blainvillei (coronatum)*	X	X		X		X	X	X			NA	1	No	Not a priority species for species-specific management and monitoring.
BIRDS															
Cooper's hawk	*Accipiter cooperi*	X		X	X	X	X	X	X	X	X	NA	1	No	Not a priority species for species-specific management and monitoring.
Rufous-crowned sparrow	*Aimophila ruficeps canescens*	X	X	X	X	X	X	X		X		NA	1	No	Not a priority species for species-specific management and monitoring.
Golden eagle	*Aquila chrysaetos*					X						SO	3	Yes	Included for monitoring at Barnett Ranch County Preserve in 2019 TMP Update.
Burrowing owl	*Athene cunicularia*							X				SL	3	Yes	Included for monitoring at Hellhole Canyon County Preserve in 2019 TMP Update.
San Diego cactus wren	*Campylorhynchus brunneicapillus sandiegensis*		X									SO	3	No	Not a priority species for species-specific monitoring at Furby-North Property as this is not an important area for cactus wren; the habitat on-site is relatively isolated and is only utilized by 1-2 pairs. It is currently monitoring by SDMMP. Management actions will include treating invasive species in appropriate habitat, preventing trespass, etc.
Northern harrier	*Circus cyaneus*	X	X	X			X		X			SO	3	Yes	Included for monitoring at Tijuana River Valley Regional Park due to documented breeding within the park. Not a priority species for species-specific monitoring at Furby-North Property and Lawrence and Barbra Daley County Preserve as only foraging habitat is present. Not a priority species for monitoring and management for preserves in the North County Plan area as it is not proposed for coverage by the draft North County Plan.
Southwestern willow flycatcher	*Empidonax traillii extimus*	*										SL	3	No	Not a priority species for species-specific monitoring at Tijuana River Valley Regional Park as this species is no longer found on-site and only migrants have been recorded in the past.
Peregrine falcon	*Falco peregrinus*	X										NA	1	No	Not a priority species for species-specific management and monitoring.
Coastal California gnatcatcher	*Polioptila californica californica*	X	X	X	X		X			X		VF	1	No	Not a priority species for species-specific management and monitoring (species does well with vegetation management). Currently regional monitoring program is being implemented by SDMMP.
Ridgeway's rail	*Rallus longirostris levipes*	X										SO	3	No	Not a priority species for species-specific management and monitoring as species does not breed within the Tijuana River Valley Regional Park.
Western bluebird	*Sialia mexicana*					X						NA	1	No	Not a priority species for species-specific management and monitoring.
Least Bell's vireo	*Vireo bellii pusillus*	X								X		SO	3	Yes	Included for monitoring at Tijuana River Valley Regional Park and Santa Margarita County Preserve.(Note: least Bell's vireo was documented outside of Furby-North Property; however, preserve does not contain suitable habitat).
MAMMALS															
Pallid bat	*Antrozous pallidus*				X			X	X		X	SL	3	Yes	Included for monitoring at MSCP-applicable preserves only (Hellhole Canyon, Mt. Olympus, and Wilderness Gardens County Preserves).
Townsend's big-eared bat	*Corynorhinus townsendii*			X				X			X	SO	3	Yes	Included for monitoring at MSCP-applicable preserves only (Hellhole Canyon and Wilderness Gardens County Preserves.
Southern mule deer	*Odocoileus hemionus fuliginata*			X	X	X	X	X		X		SS	2	No	Difficult to provide species-specific management. Wildlife cameras are being installed at all preserves where this species has been detected.
Mountain lion	*Puma concolor*							X		X		SL	3	No	Difficult to provide species-specific management. Wildlife cameras are being installed at all preserves where this species has been detected (including Mt.Olympus and Wilderness Gardens County Preserves, which are Important Management Areas).
American badger	*Taxidea taxus*					X						SL	3	No	Large home range; difficult to monitor and manage. (Note: species was previously misidentified at the Furby-North Property).

Total: 29 covered species

Red = previously included for monitoring in 2015 CMP
Blue= new species included for monitoring in 2019 TMP Update (Preserve Group 2 only)

Note: MSCP covered species not included in the prioritization matrix did not occur within Preserve Group 2.

X Documented during County surveys (Kris Preston, Pers. Comm., 2018)

Appendix B. Species Prioritization for County's Comprehensive Monitoring Plan

Preserve Group 3 - Species Prioritization
Scoring: SO or SL = 3 pts; SS = 2 pts; VF or NA = 1 pt
Management Strategic Plan (MSP) Definitions:
SL = persistence in the MSP Area (MSPA) is at high risk of loss without immediate management action
SO = persistence of one or more significant occurrences within MSPA is at risk of loss without immediate action
SS = occurrences considered more stable and their persistence is at lower risk of loss compared to SL and SO, but still require species specific action.
VF = vegetation management focus - species with limited distribution in MSPA or have specific vegetation characteristics that need to be managed for persistence in MSPA
VG = vegetation management focus - species with a wider distribution in the MSPA or do not have specific vegetation characteristics that need to be managed
NA = not applicable - not prioritized as an SL, SO, SS, VF, or VG species by the MSP.

* = See Notes
X = Species occurrence detected, not covered under applicable MSCP
X = Species occurrence detected, covered under the applicable MSCP
CH = Critical Habitat
Red = previously included for monitoring in 2019 TMP Update
Blue = new species included for monitoring in 2024 TMP Update
Note: MSCP covered species not included in the prioritization matrix did not occur within Preserve Group 3

Common Name	Scientific Name	**Dictionary Hill** | MU3	**Iron Mountain** | MU4	**Lakeside Linkage - Centex Addition** | MU4	**Peutz Valley** | MU4	**Ramona Grasslands - Carroll, Trussell Additions** | MU5 & MU6	**Skyline** | MU3	**Los Peñasquitos**		**Bottle Peak** | MU6	**Escondido Creek** | MU6	**Hellhole Canyon -Fureigh Addition** | MU5	**Keys Creek** | MU8	**Mountain Meadow** | MU8	**Sage Hill** | MU6	**San Luis Rey River Park** | MU8	MSP Management Category	SCORE:	**Proposed for Monitoring at Preserve Group 3?**	**Notes**
MSCP (North or South)		SC	SC	SC	SC	SC	SC	SC		NC	NC	NC	NC	NC	NC	NC				
		Preserve Group 3 Preserves																		
PLANTS																				
Orcutt's brodiaea	*Brodiaea orcuttii*										*				*		SO	3	Yes	Included for monitoring at Boulder Oaks County Preserve (Preserve Group 1, MU4). *Note, species detected by SDMMP in Escondido Creek and Sage Hill County Preserves; however, this species is not included in draft North County MSCP species list.
Heart-leaved pitcher sage	*Lepechinia cardiophylla*		**X**														SL	3	Yes	Included for monitoring at Iron Mountain County Preserve in 2024 TMP Update.
San Diego goldenstar	*Bloomeria clevelandii*	**X**									X						SS	2	No	Not a priority species for species-specific management and monitoring (species does well with vegetation management).
Variegated dudleya	*Dudleya variegata*	**X**															SS	2	Yes	Included for monitoring at Dictionary Hill County Preserve in 2024 TMP Update.
Wart-stemmed ceanothus	*Ceanothus verrucosus*										X				X		VF	1	No	Not a priority species for species-specific management and monitoring. Not included in draft North County species list.
San Diego barrel cactus	*Ferrocactus viridescens*	**X**													X		VF	1	No	Not a priority species for species-specific management and monitoring.
Englemann oak	*Quercus engelmannii*						X			**X**		**X**	**X**	**X**			VF	1	No	Not a priority species for species-specific management and monitoring.
INVERTS																				
Harbison's dun skipper	*Euphyes vestris harbisoni*											*			*		SL	3	Yes	Species to be included in Butterfly HCP. Included for monitoring at Hellhole Canyon County Preserve and Sage Hill County Preserve. *Note: Continued monitoring within Hellhole Canyon County Preserve and expand into Fureigh Addition as necessary. Species not detected at Sage Hill Canyon County Preserve during baseline surveys; however, suitable habitat is present.
HERPS																				
Arroyo southwestern toad (Arroyo toad)	*Anaxyrus californicus*															**CH**	SO	3	Yes	Included for monitoring at San Luis Rey River Park County Preserve in 2024 TMP Update, critical habitat present.
Orange-throated whiptail (Belding's	*Asidoscelis hyperythrus*	**X**	**X**	**X**	**X**	**X**	**X**			X		X	X	X	X	X	NA	1	No	Not a priority species for species-specific management and monitoring.
San Diego horned lizard (San Diego coast	*Phrynosoma blainvillii*		**X**		**X**		**X**			**X**	**X**	**X**	**X**			**X**	NA	1	No	Not a priority species for species-specific management and monitoring.
Western spadefoot toad	*Spea hammondii*										**X**				**X**		VF	1	No	Not a priority species for species-specific management and monitoring. High potential to occur in Bottle Peak County Preserve and San Luis Rey River County Preserve.
Two-striped garter snake	*Thamnophis hammondii*										**X**						NA	1	No	Not a priority species for species-specific management and monitoring.
BIRDS																				
Golden eagle	*Aquila chrysaetos*		*			*	**X**					**X**					SO	3	No	Skyline and Hellhole Canyon County Preserve - Fureigh Addition occurrences were flyovers, no suitable nesting habitat occurs onsite. However, an active nesting pair is known to nest on Rodriguez Mountain, east of the Hellhole Canyon County Preserve. *Note: one nest is known to occur in proximity to Iron Mountain. One nest occurs in proximity to Ramona Grasslands, which is being monitored.
Northern harrier	*Circus (cyaneus) hudsonius*						**X**				**X**					*	SO	3	Yes	Included for monitoring at San Luis Rey River Park County Preserve in 2024 TMP Update, *Note, not verfied as present in baseline surveys, but recommended due to presence of suitable habitat. While species was detected at Escondido Creek County Preserve and Skyline County Preserve, no nesting habitat is present onsite.

Preserve Group 3 - Species Prioritization
Scoring: SO or SL = 3 pts; SS = 2 pts; VF or NA = 1 pt
Management Strategic Plan (MSP) Definitions:
SL = persistence in the MSP Area (MSPA) is at high risk of loss without immediate management action
SO = persistence of one or more significant occurrences within MSPA is at risk of loss without immediate action
SS = occurrences considered more stable and their persistence is at lower risk of loss compared to SL and SO, but still require species specific action.
VF = vegetation management focus - species with limited distribution in MSPA or have specific vegetation characteristics that need to be managed for persistence in MSPA
VG = vegetation management focus - species with a wider distribution in the MSPA or do not have specific vegetation characteristics that need to be managed
NA = not applicable - not prioritized as an SL, SO, SS, VF, or VG species by the MSP.

* = See Notes
X = Species occurrence detected, not covered under applicable MSCP
X = Species occurrence detected, covered under the applicable MSCP
CH = Critical Habitat
Red = previously included for monitoring in 2019 TMP Update
Blue = new species included for monitoring in 2024 TMP Update
Note: MSCP covered species not included in the prioritization matrix did not occur within Preserve Group 3

Common Name	Scientific Name	**Dictionary Hill** | MU3	**Iron Mountain** | MU4	**Lakeside Linkage - Centex Addition** | MU4	**Peutz Valley** | MU4	**Ramona Grasslands - Carroll, Trussell Additions** | MU5 & MU6	**Skyline** | MU3	**Los Peñasquitos**		**Bottle Peak** | MU6	**Escondido Creek** | MU6	**Hellhole Canyon -Fureigh Addition** | MU5	**Keys Creek** | MU8	**Mountain Meadow** | MU8	**Sage Hill** | MU6	**San Luis Rey River Park** | MU8	MSP Management Category	SCORE:	**Proposed for Monitoring at Preserve Group 3?**	**Notes**
MSCP (North or South)		SC	SC	SC	SC	SC	SC	SC		NC	NC	NC	NC	NC	NC	NC				
		Preserve Group 3 Preserves																		
Southwestern willow flycatcher	*Empidonax traillii extimus*															**CH**	SL	3	Yes	Included for monitoring at San Luis Rey River Park County Preserve in 2024 TMP Update; critical habitat present.
Least Bell's vireo	*Vireo bellii pusillus*															**X**	SO	3	Yes	Included for monitoring at San Luis Rey River Park County Preserve in 2024 TMP Update.
Cooper's hawk	*Accipiter cooperii*	**X**	**X**	**X**			**X**				X		X	X	X	X	NA	1	No	Not a priority species for species-specific management and monitoring.
California rufous-crowned sparrow	*Aimophila ruficeps obscura*	**X**	**X**		**X**	**X**	**X**			X	X	X	X		X		NA	1	No	Not a priority species for species-specific management and monitoring.
Bell's (sage) sparrow	*Artemisospiza belli*										**X**						NA	1	No	Not a priority species for species-specific management and monitoring.
Swainson's hawk	*Buteo swainsoni*						**X**				X						NA	1	No	Not a priority species for species-specific management and monitoring.
White-tailed kite	*Elanus leucurus*										**X**						NA	1	No	Not a priority species for species-specific management and monitoring.
American peregrine falcon	*Falco peregrinus*				**X**												NA	1	No	Not a priority species for species-specific management and monitoring.
White-faced ibis	*Plegadis chihi*												X			X	NA	1	No	Not a priority species for species-specific management and monitoring.
Coastal California gnatcatcher (California gnatcatcher)	*Polioptila californica californica*	**X**		**X**		**X**				**CH**	**X**			**CH**	**X**	**X**	VF	1	No	Not a priority species for species-specific management and monitoring. Critical habitat present at Bottle Peak and Mountain Meadow. Note: DPR considering options for future monitoring if regional monitoring is discontinued.
Western bluebird	*Sialia mexicana*				**X**								X		X	X	NA	1	No	Not a priority species for species-specific management and monitoring.
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*															*	NA	1	No	*Note, species previously detected adjacent to San Luis Rey River Park County Preserve, propose presence/absence surveys through incidental observations during other bird monitoring.
MAMMALS																				
Pallid bat	*Antrozous pallidus*									**X**		**X**				**X**	SL	3	Yes	Included for monitoring at Bottle Peak County Preserve and San Luis Rey River Park County Preserve in 2024 TMP Update. Continued monitoring at Hellhole Canyon County Preserve, and expand into Fureigh Addition as necessary.
Townsend's big-eared bat	*Corynorhinus townsendii*			X			X				**X**	**X**				**X**	SO	3	Yes	Included for monitoring at San Luis Rey River Park County Preserve in 2024 TMP Update. Continued monitoring at Hellhole Canyon County Preserve, and expand into Fureigh Addition as necessary. While species was detected at Escondido Creek County Preserve, suitable roosting habitat is not present. This is a Draft North County MSCP species.
Mountain lion	*Puma concolor*		**X**		**X**							**X**		**X**			SL	3	No	Not a priority species for species-specific management and monitoring.
Southern mule deer (mule deer)	*Odocoileus hemionus fulginatus*		**X**	**X**	**X**	**X**				**X**	**X**	**X**			**X**	**X**	SS	2	No	Not a priority species for species-specific management and monitoring.
Southern California ringtail	*Bassariscus astusus* ssp. *octavus*						X										NA	1	No	Not a priority species for species-specific management and monitoring.
San Diego black-tailed jackrabbit	*Lepus californicus bennettii*										**X**	**X**			**X**		VF	1	No	Not a priority species for species-specific management and monitoring.
Habitat																				
Vernal Pools	*N/A*							X											Yes	Included for presence/absence monitoring as part of Los Peñasquitos Canyon County Preserve in 2024 TMP Update.

Total: 33 covered species

Appendix C

Conceptual Models and Documentation

Conceptual Model for Vernal Pools, Alkali Playa, and Associated Species

Management Goal	Monitoring Goal
Maintain vernal pool habitat to support stable populations of vernal pool and alkali playa species covered by the MSCP and proposed to be covered by the draft North County MSCP. Maintain 8.81 acres of alkali playa vegetation community. Enhance vernal pool and alkali playa habitat to increase resilience to environmental stochasticity, maintain genetic diversity, and ensure long-term ecological function within the Ramona Grasslands County Preserve and Los Peñasquitos County Preserve.	Monitor the vegetation, hydrology, and species composition within vernal pool and alkali playa habitat on the Ramona Grasslands County Preserve to ensure that the management methods being used are maintaining the habitat in a suitable condition to support San Diego fairy shrimp, spreading navarretia, and other vernal pool species covered by the MSCP and proposed to be covered by the draft North County MSCP. Monitor the vegetation, hydrology, and species composition within vernal pool habitat on the Los Peñasquitos Canyon County Preserve to ensure that the management methods being used are maintaining the habitat in a suitable condition to support sensitive vernal pool species covered by the MSCP. Monitor for the long-term viability of any introduced vernal pool and alkali playa plant species. Track populations of Coulter's saltbush and Parish's brittlescale within alkali playa habitat and record incidental observations.

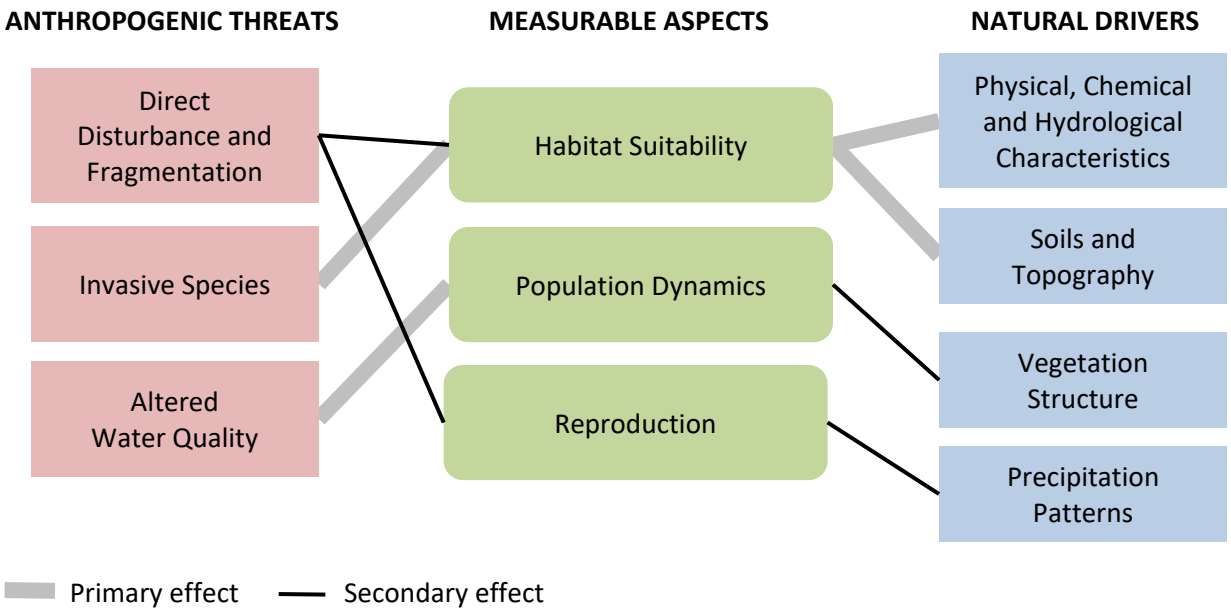


Table 1. Measurable Aspects of Vernal Pools and Alkali Playa

Model Element	Measurable Aspects of Vernal Pools and Alkali Playa	Citations
Habitat Suitability	Hydrology, hydroperiod of pool/playa, water quality, clay soils, plant composition.	TNC 2004; USFWS 2005; Bauder et al. 2009; TAIC 2005; CBI 2007b
Population Dynamics	Distribution and abundance of San Diego fairy shrimp and spreading navarretia.	TNC 2004; USFWS 2005; Bauder et al. 2009; TAIC 2005; CBI 2007b
Reproduction	Successful production of viable fairy shrimp cysts. Plant fecundity (seed production), seed viability and germination rates, and inputs to seed bank.	TNC 2004; USFWS 2005; Bauder et al. 2009

Table 2. Anthropogenic Threats to Vernal Pools and Alkali Playa

Model Element	Anthropogenic Threats to Vernal Pools and Alkali Playa	Citations
Direct Disturbance and Fragmentation	Excessive cattle impacts, trampling, OHV use, off-trail hiking, and mountain biking. Dirt roads and other alterations that affect hydrology and connectivity.	USFWS 2005, Regan et al. 2006, CBI 2007a
Invasive Species	Invasive plants and animals, which outcompete endemic flora and fauna, and alter hydrology, vegetation structure and density. Invasive animal species prey on or hybridize with vernal pool fauna. Includes forbs or non-native grasses tolerant to inundation or salinity.	USFWS 2005, TNC 2004, Regan et al. 2006
Altered Water Quality	Pollutants including pesticides, fertilizer, sediments, or salinity.	USFWS 2005, TNC 2004, Eriksen and Belk 1999

Table 3. Natural Drivers of Vernal Pools and Alkali Playa

Model Element	Natural Drivers of Vernal Pools and Alkali Playa	Citations
Physical, Chemical and Hydrological Characteristics	Water temperature, chemical composition, hydroperiod, depth and duration of ponding, and watershed size required to support endemic flora and fauna.	TNC 2004, USFWS 2005; Bauder et al. 2009; Bauder 2005; CBI 2007b
Soils and Topography	Impermeable substrates (e.g., clay soils) and flat topography, which support an appropriate ponding regime required by endemic flora and fauna.	TNC 2004, USFWS 2005, Bauder et al. 2009, Bauder 2005, CBI 2007b, TAIC 2005
Vegetation Structure	Vegetation composition, density and thatch which allow for runoff into the vernal pool basin, which in turn affects the rate in which flora and fauna can reproduce.	TNC 2004, USFWS 2005; Bauder et al. 2009; Bauder 2005; CBI 2007a
Precipitation Patterns	Rainfall timing and quantity, and weather between rainfall events (clouds vs. heat), which results in suitable conditions for vernal pool flora and fauna.	TNC 2004, USFWS 2005; Bauder et al. 2009; Bauder 2005; CBI 2007b

Table 4. Critical Uncertainties for Vernal Pools and Alkali Playa

Critical Uncertainties for Vernal Pools, Alkali Playa and Associated Species
What controllable factors (other than precipitation) affect vernal pool/playa hydrology?
To what extent do water level fluctuations in Santa Maria Creek contribute to the viability of the alkali playas?
What is the appropriate preserve size or buffer width to contribute to ecosystem function?
To what extent do vernal pools or swales and alkali playas in the Ramona Grasslands persist on Placentia, Visalia or other soil types?
What is the effective rate of biomass to vernal pool ratio?
What precipitation patterns are necessary to adequately support the pool communities at Ramona Grasslands?
Does trampling by grazers or soil compaction affect ability of pools/playas to hold water?
Does hydromodification have an effect (positive or negative) on pool/playa viability?
At what level do invasive species negatively affect pool ecosystems?
Which invasive species are most detrimental to vernal pool flora and fauna?
How can fairy shrimp hybridization be prevented?
At what level does disturbance and fragmentation (e.g. from grazing, grading, development, runoff) negatively affect reproduction of vernal pool flora and fairy shrimp?
At what level do pollutants negatively affect the function of pool ecosystems?
What pollutants affect flora and fauna?
What TDS and salinity levels persist in alkali playas?

Table 5. Potential Management Actions for Vernal Pools and Alkali Playa

Potential Management Actions for Vernal Pools, Alkali Playa and Associated Species
Prevent negative alteration or impacts within watershed.
Prevent fragmentation of pool/playa complexes and water source obstructions.
Prevent artificial runoff into pools/playas.
Encourage open vegetation community by managed grazing or active weeding.
Aggressively remove invasive species in vernal pool/playa basins and watersheds.
Manage the pool/playa watershed to sustain viability during drought years.
Prevent pedestrian and equestrian access to the area.
Manage access by cattle.
Allow managed grazing in pools heavily impacted by inundation-tolerant weeds (e.g. ryegrass, rabbitsfoot grass).
Test the effect of grazing in vernal pool basins.
Collaborate with Ramona Airport to prevent development and hydromodification of the pool/playa watershed.
Prevent chemicals from being applied to the watersheds of pools; herbicide application should not occur within a 5-foot buffer around vernal pool basins.
Maintain water quality by preventing erosion, sedimentation, and turbidity and Maintaining pH and TDS levels.
Restore pools on suitable soils and within the appropriate watershed.
Test fairy shrimp before inoculating restoration pools to prevent hybridization.

Table 6. Potential Monitoring Actions for Vernal Pools and Alkali Playa

Potential Management Actions for Vernal Pools, Alkali Playa and Associated Species
Include upland watersheds in the vernal pool monitoring protocol.
Monitor the vegetation density and composition in the pools and the associated watershed.
Monitor pools/playa hydrology to ensure that they are ponding sufficiently to support pool ecosystems.
Monitor for five years following drought years to monitor ecosystem function.
Monitor genetic variability of fairy shrimp.
Monitor the effects of grazing on the pool/playa ecosystem with respect to hydrology and vernal pool flora/fauna response. Use Residual Dry Matter (RDM) and other metrics, as necessary.
Monitor vegetation density and invasive species infestation rates in pools/playas and watersheds.
Monitor pools for the successful reproduction of San Diego fairy shrimp and spreading navarretia.
Monitor playas for the persistence of endemic species (e.g., *Atriplex coulteri* and *A. parishii*).
Monitor areas for illegal dumping or chemical application. Take water quality samples (temperature, pH) during fairy shrimp sampling or hydrological surveys.

Conceptual Model for San Diego Thornmint

Management Goal	Monitoring Goal
Ensure persistence of San Diego thornmint by maintaining and enhancing existing populations at Simon and Sycamore Canyon/Goodan Ranch County Preserves.	Conduct reconnaissance surveys for San Diego thornmint populations on DPR parks and preserves where the species was documented (e.g., Ramona Grasslands County Preserve and El Capitan County Preserve) to confirm species presence and population is extant. Monitor the full extent of thornmint populations at Simon and Sycamore Canyon/Goodan Ranch County Preserves. Use status, habitat condition, and threats monitoring results to determine appropriate adaptive management actions to protect San Diego thornmint populations on DPR parks and preserves. Monitor and evaluate the response of San Diego thornmint on Simon and Sycamore Canyon/Goodan Ranch County Preserves to invasive non-native plant species management, thatch removal, and/or other management actions within selected populations.

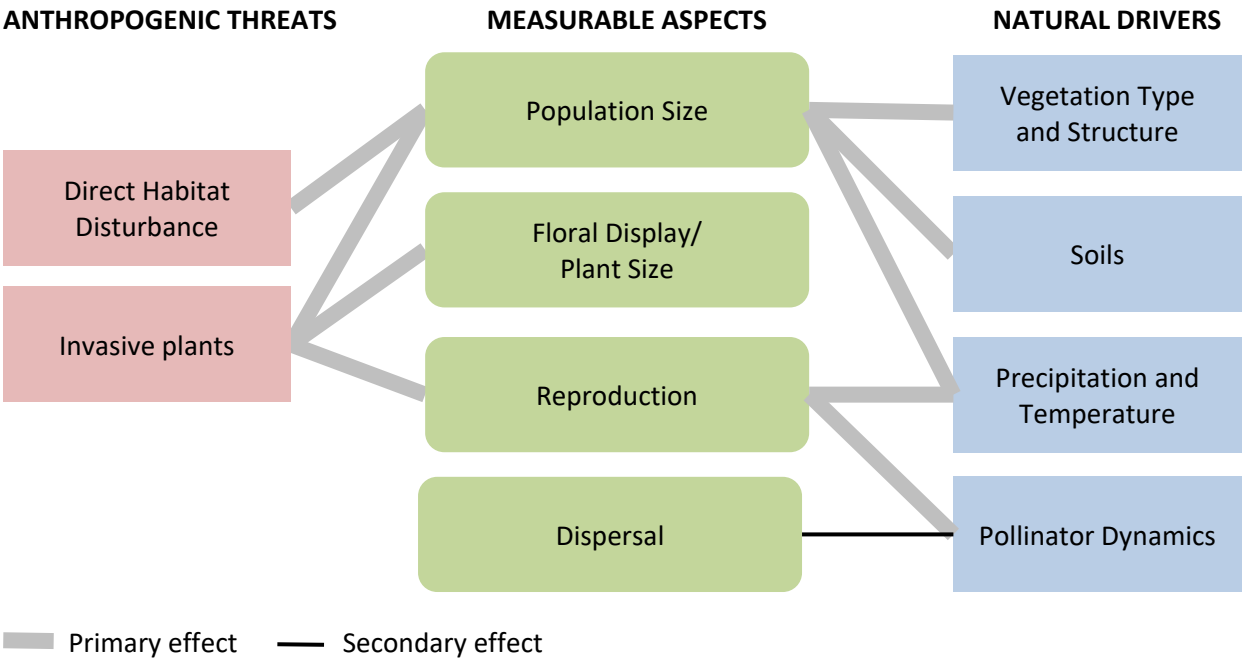


Table 1. Measurable Aspects of San Diego Thornmint

Model Element	Measurable Aspects of San Diego Thornmint	Citations
Population Size	Population size, density, extent.	CBI 2013 draft conceptual model, SDMMP and TNC 2017 Bauder and Sakrison 1999; USFWS 2009c
Floral Display and Plant Size	Plant biomass and flower visibility. Variables include plant height, branching, and flower production.	Acanthomintha Working Group, pers. comm.
Reproduction	Plant fecundity (seed production), seed viability and germination rates, and inputs to seed bank.	SDMMP and TNC 2017, CBI 2013 draft conceptual model, Bauder and Sakrison 1999, USFWS 2009c
Dispersal	Includes dispersal of seeds, pollination, and gene flow.	SDMMP and TNC 2017, CBI 2013 draft conceptual model, USFWS 2009c; Klein 2009

Table 2. Anthropogenic Threats to San Diego Thornmint

Model Element	Anthropogenic Threats to San Diego Thornmint	Citations
Direct Habitat Disturbance	Direct impacts leading to death of the plants or degradation of habitat; Includes trampling, OHV use, mountain bikes, equestrian use.	USFWS 2009c; Acanthomintha working Group; M. Kelly pers. comm. Rogers et al. 2011
Invasive Plants	Invasive non-native grasses and forbs, which compete for resources, and thatch build up. Also includes competitive native species, such as fascicled tarweed.	USFWS 2009c; Bauder and Sakrison 1997; Acanthomintha working Group; M. Kelly pers. comm.

Table 3. Natural Drivers of San Diego Thornmint

Model Element	Natural Drivers of San Diego Thornmint	Citations
Vegetation Type and Structure	Assemblages of plants in which *A. ilicifolia* occurs include grasslands, and open areas within chaparral and coastal sage scrub habitat. Must support pollinators.	Bauder and Sakrison 1999; USFWS 2009c, Acanthomintha Working Group, pers. comm.
Soils	Clay soils, sub-soils or clay lenses.	Acanthomintha Working Group, pers. comm., Oberbauer and Vanderwier 1991; USFWS 2009c
Precipitation and Temperature	Rainfall (timing and amount) and temperature, which both affect the germination rate and reproduction. Cool temperatures encourage germination; warm temperatures encourage invasive non-native plant species and thus competition.	Bauder and Sakrison 1999; USFWS 2009c, Acanthomintha Working Group, pers. comm.
Pollinator Dynamics	Main pollinators appear to be bees in the Apidae and Halictidae families. Seeds appear to be gravity dispersed; possibly other localized methods of dispersal.	Klein 2009; Bauder and Sakrison 1999; Rogers et al. 2011

Table 4. Critical Uncertainties for San Diego Thornmint

Critical Uncertainties for San Diego Thornmint
What degree of habitat disturbance by unauthorized users impact a given population?
What are the critical thresholds for invasive non-native plant species variables (e.g., percent cover, time of germination, etc.) that begin to affect the viability of a population?
What factors restrict thornmint to clay soils? (e.g. why is it not found in CSS openings)
How should seed dispersal be measured?
How should pollination and gene flow be measured?
How do thornmint populations respond to temperature changes, drought, or inundation?
How is thornmint reproduction affected by drought and inundation?
What is the longevity of seeds in the seed bank? In controlled storage?
How does fire affect survival and reproduction?
What is the genetic variability in local populations? Is there evidence of inbreeding depression?

Table 5. Potential Management Actions for San Diego Thornmint

Potential Management Actions for San Diego Thornmint
Conduct invasive non-native plant species control within known and potential locations of thornmint. Remove invasive non-native plant species within and around plants, including a buffer around population. Remove grass thatch.
Protect known populations and potential occurrences (suitable soils within appropriate habitat) from trampling and soil compaction by controlling human access through installation of signs and fences and by closing or re-routing trails, as necessary.
Ensure that soils do not become impacted or eroded.
Manage vegetation to be native, open, and sparse to allow for growth and dispersal.
Encourage the growth of native flowering plants in the vicinity of thornmint populations to support pollinators, especially bees; consider enhancing habitat by seeding or planting native species favorable to pollinators.
Collect seed (e.g., collect less than 10 percent of the total available seed in any given year, clean, and dry for short-term storage). Implement seeding efforts after invasive non-native plant management actions to support recolonization of these areas and augment the on-site population.

Table 6. Potential Monitoring Actions for San Diego Thornmint

Potential Monitoring Actions for San Diego Thornmint
Monitor plant population extent and density to assess impacts from habitat disturbance.
Monitor cover of bare ground, thatch, and invasive non-native plants; assess response of populations (size, extent, and/or density) to management actions.
Monitor effects of focused vegetation management to ensure appropriate vegetation structure.
Monitor seeding efforts to determine success.
Monitor soil compaction and signs of erosion around protected thornmint populations.
Monitor rainfall to see if there is a correlation with population dynamics (regional monitoring).
Conduct additional pollinator studies to better understand pollinator dynamics (regional monitoring).

Conceptual Model for Encinitas Baccharis

Management Goal	Monitoring Goal
Ensure persistence of Encinitas baccharis by maintaining and enhancing existing populations at Del Dios Highlands County Preserve.	Monitor the persistence of Encinitas baccharis on Del Dios Highlands County Preserve. Use status, habitat condition, and threats monitoring results to determine appropriate adaptive management actions to protect Encinitas baccharis populations on Del Dios Highlands County Preserve. Monitor and evaluate the response of Encinitas baccharis to implemented management actions.

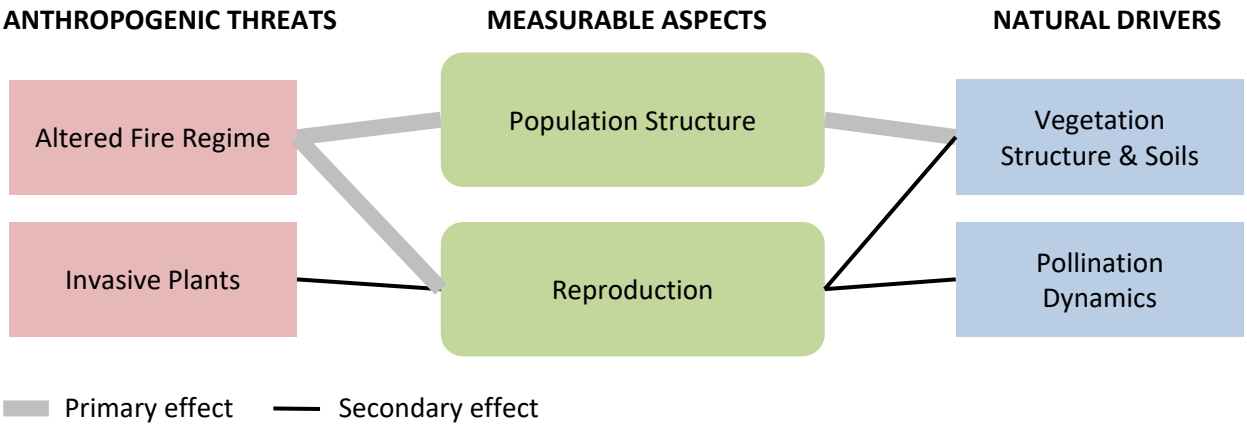


Table 1. Measurable Aspects of Encinitas Baccharis

Model Element	Measurable Aspects of Encinitas Baccharis	Citations
Population Structure	Population size, density, extent, age classes of individuals, seedlings.	USFWS 2011a, Reiser 2001
Reproduction	Post-fire regeneration. Plant fecundity (seed production), seed viability and germination rates, and inputs to seed bank.	USFWS 2011a, Reiser 2001

Table 2. Anthropogenic Threats to Encinitas Baccharis

Model Element	Anthropogenic Threats to Encinitas Baccharis	Citations
Altered Fire Regime	Fire frequency, intensity, and extent.	USFWS 2011a
Invasive Plants	Invasive non-native plants may crowd out suitable establishment sites for Encinitas baccharis, may alter fire regime, and may reduce performance of seedlings.	USFWS 2011a

Table 3. Natural Drivers of Encinitas Baccharis

Model Element	Natural Drivers of Encinitas Baccharis	Citations
Vegetation Structure and Soils	Restricted soil types, openings in structure of chaparral.	USFWS 2011a
Pollinator Dynamics	Encinitas baccharis may be pollinated by wind or insects.	USFWS 2011a

Table 4. Critical Uncertainties for Encinitas Baccharis

Critical Uncertainties for Encinitas Baccharis
What is the fire frequency that negatively affects the ability of mature plants to recover?
What fire frequency would prevent Baccharis seeding and regeneration?
How significant is the effect of invasive non-native plant species on native pollinators and Baccharis reproduction?
Why is this species not present in other appropriate soils/habitats in the vicinity? How important is soil type to this species?
What ecological conditions are necessary for successful reproduction?
What are the limiting factors to successful reproduction? How important are insect pollinators to successful reproduction?

Table 5. Potential Management Actions for Encinitas Baccharis

Potential Management Actions for Encinitas Baccharis
Determine appropriate substitute for a natural fire regime to perpetuate suitable habitat.
Investigate possible causes of seed mortality and low reproductive success.
Conduct invasive non-native plant species control in vicinity of Encinitas baccharis populations.
Maintain current vegetation structure.
Collect, raise, and outplant shrubs in suitable Del Dios Highlands County Preserve locations.
Investigate possible causes of seed mortality and low reproductive success, and manage populations for presence of both sexes of shrubs.

Table 6. Potential Monitoring Actions for Encinitas Baccharis

Potential Monitoring Actions for Encinitas Baccharis
Monitor populations and natural regeneration after fire.
Monitor seedling production after fire.
Monitor growth and persistence of Encinitas baccharis in weed control areas.
Conduct studies to better understand habitat and climatic requirements of this species.
Monitor recently burned areas for vigor of regenerating plants and for evidence of recruitment.
Conduct additional studies to better understand key factors in successful reproduction.

Conceptual Model for Orcutt's Brodiaea

Management Goal	Monitoring Goal
Maintain or enhance existing Orcutt's brodiaea occurrences on Boulder Oaks County Preserve to increase resilience to environmental and demographic stochasticity to support species persistence over the long term.	Conduct reconnaissance surveys for Orcutt's brodiaea populations on DPR parks and preserves where the species was documented (e.g., Boulder Oaks County Preserve) to confirm species presence and population is extant. Monitor the full extent of Orcutt's brodiaea populations at Boulder Oaks County Preserve. Use status, habitat condition, and threats monitoring results to determine appropriate adaptive management actions to protect Orcutt's brodiaea populations on DPR parks and preserves. Monitor and evaluate the response of Orcutt's brodiaea on Boulder Oaks County Preserve to invasive non-native plant species management, thatch removal, and/or other management actions within selected populations.

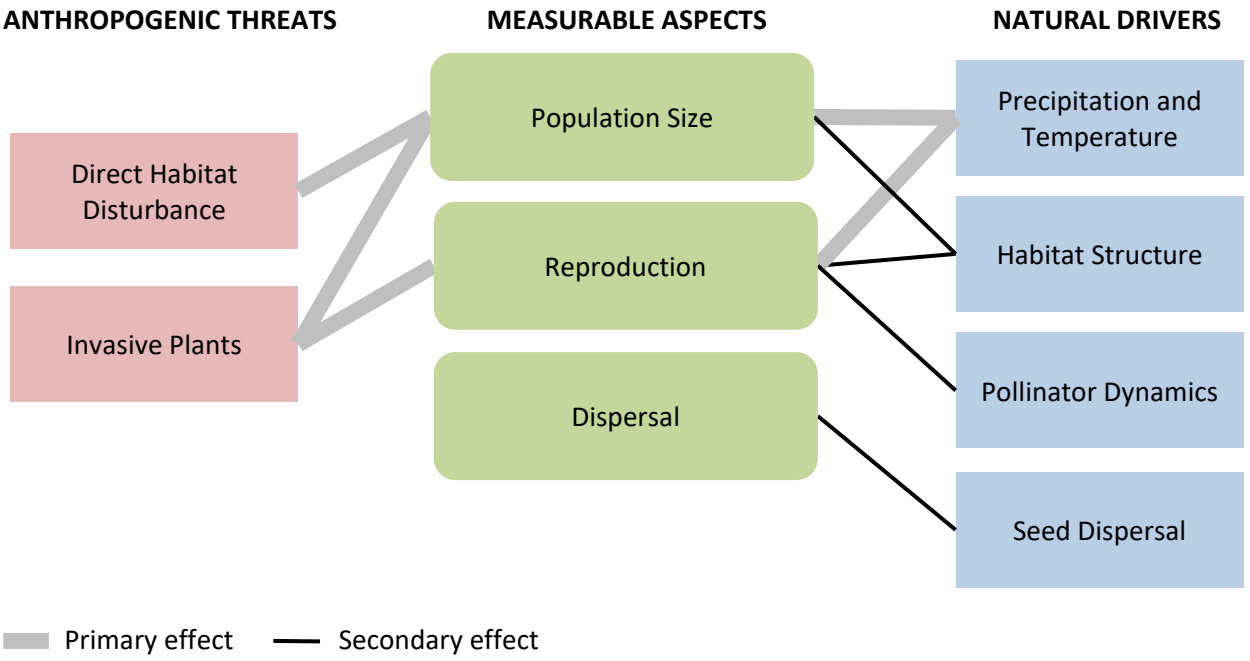


Table 1. Measurable Aspects of Orcutt's Brodiaea

Model Element	Measurable Aspects of Orcutt's Brodiaea	Citations
Population Size	Population size, density, extent.	SDMMP and TNC 2017
Reproduction	Plant fecundity (seed production), seed viability and germination rates, and inputs to seed bank.	SDMMP and TNC 2017
Dispersal	Includes dispersal of seeds, pollination, and gene flow.	SDMMP and TNC 2017

Table 2. Anthropogenic Threats to Orcutt's Brodiaea

Model Element	Anthropogenic Threats to Orcutt's Brodiaea	Citations
Direct Habitat Disturbance	Authorized and unauthorized activities (e.g., utility maintenance, access roads, trails, fire breaks, mountain bikes) have potential to result in above- or below-ground plant mortality in areas where these activities are present.	SDMMP and TNC 2017
Invasive Plants	Non-native forbs and grasses compete directly with Orcutt's brodiaea or suppress germination through thatch/litter accumulation. Too frequent fires can promote establishment of thatch.	SDMMP and TNC 2017, K. Preston pers. comm.

Table 3. Natural Drivers of Orcutt's Brodiaea

Model Element	Natural Drivers of Orcutt's Brodiaea	Citations
Precipitation and Temperature	Growth/density of plants strongly correlated to rainfall amounts. Prolonged and intensive drought can have a negative impact on vegetative growth and seeding; however, it is more resilient than other plants as corms can persist in soil.	SDMMP and TNC 2017, K. Preston pers. comm.
Habitat Structure	Occurs on clay soils in grasslands, mesic areas, swales, and vernal pools; also known to occur on terraces along streams; vulnerable to disturbance.	SDMMP and TNC 2017
Pollinator Dynamics	One study indicated *Coleoptera* and *Hymenoptera* as the most common pollinators. Orcutt's brodiaea is self-incompatible so small isolated populations are likely to be impacted by pollinator limitations.	SDMMP and TNC 2017
Seed Dispersal	Seeds are dispersed by the wind once fruits have dried.	SDMMP and TNC 2017

Table 4. Critical Uncertainties for Orcutt's Brodiaea

Critical Uncertainties for Orcutt's Brodiaea
What degree of habitat disturbance by unauthorized and authorized users impact a given population? What level and types of direct habitat disturbance impact the populations?
What are the critical thresholds for invasive non-native plant species variables (e.g., percent cover, time of germination, etc.) that begin to affect the viability of a population?
How is Orcutt's brodiaea reproduction and survival affected by drought and extended soil saturation?
How does the species respond to altered hydrology, physical soil disturbances, and thick thatch layers?
How should pollination and gene flow be measured?
What are the key dispersal mechanisms for this species? How does hybridization affect populations?

Table 5. Potential Management Actions for Orcutt's Brodiaea

Potential Management Actions for Orcutt's Brodiaea
Prohibit human access in areas that support this species via fencing and signage. Also, close and restore unauthorized trails and roads if detected.
Control invasive non-native grasses and forbs, and remove thatch (e.g., ≤20% absolute cover of non-native vegetation and thatch) within documented Orcutt's brodiaea habitat and 10-meter buffer area especially if an extant population is present. Ensure that soils do not become impacted or physically disturbed.
Manage the habitat (control invasive non-native plant species and favor native plant species) to support pollinators, especially native bees.

Table 6. Potential Monitoring Actions for Orcutt's Brodiaea

Potential Monitoring Actions for Orcutt's Brodiaea
Monitor per IMG protocol.
Monitor annually for unauthorized access impacts and road and trail maintenance indirect impacts.
Monitor flowering, fruiting, and vegetative plants (population estimates using only flowering individuals likely underestimates population size).
Monitor rainfall during survey years to determine if there is a correlation with population dynamics. Include vegetative vs. flowering counts in wet years and in subsequent years as only a subset of plants will flower in any given year.
Coordinate with regional pollinator monitoring studies to conduct studies onsite and better understand pollinator dynamics.

Conceptual Model for Lakeside Ceanothus

Management Goal	Monitoring Goal
Ensure persistence of Lakeside ceanothus by maintaining existing populations within Boulder Oaks County Preserve, El Capitan County Preserve, Oakoasis County Preserve, and Louis A. Stelzer County Park.	Collect baseline threats and habitat information about Lakeside ceanothus to provide a better understanding of stressors and general condition of plants and surrounding habitat at selected locations within Boulder Oaks County Preserve, El Capitan County Preserve, Oakoasis County Preserve, and Louis A. Stelzer County Park. Use status, habitat condition, and threats monitoring results to determine appropriate adaptive management actions to protect Lakeside ceanothus populations on DPR parks and preserves. Monitor and evaluate the response of Lakeside ceanothus to implemented management actions.

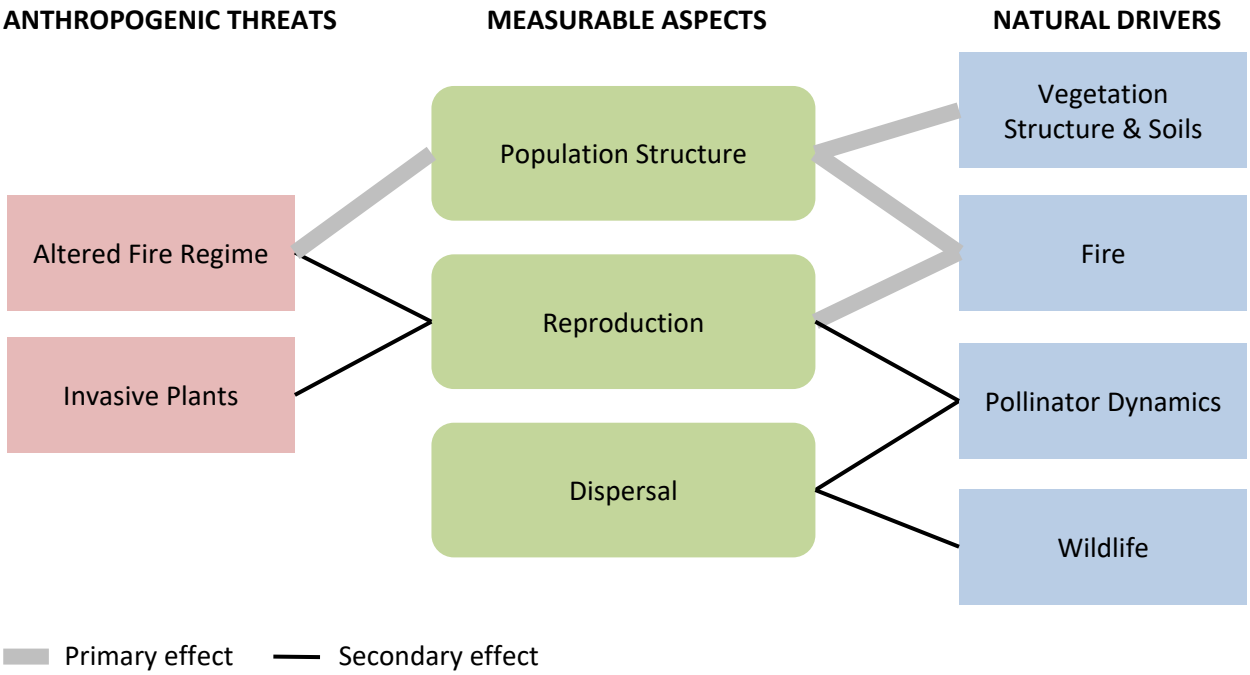


Table 1. Measurable Aspects of Lakeside Ceanothus

Model Element	Measurable Aspects of Lakeside Ceanothus	Citations
Population Structure	Population age class (e.g., seedling, reproductive maturity, senescence).	Reiser 2001, P. Gordon-Reedy pers. comm.
Reproduction	Plant fecundity (seed production), seed viability and germination rates, and inputs to seed bank.	Reiser 2001, P. Gordon-Reedy pers. comm.
Dispersal	Includes dispersal of seeds, pollination, and gene flow.	Reiser 2001, P. Gordon-Reedy pers. comm.

Table 2. Anthropogenic Threats to Lakeside Ceanothus

Model Element	Anthropogenic Threats to Lakeside Ceanothus	Citations
Altered Fire Regime	Fire frequency, intensity, and extent. Altered fire regimes could result in loss of plants, habitat degradation/type conversion.	P. Gordon-Reedy pers. comm.
Invasive Plants	Invasive non-native grasses and forbs, which outcompete native flowering plants that support insect pollinators. Post-fire invasion could inhibit germination and/or affect seedling survival. Invasive non-native plants that contribute fine fuels (e.g., grasses) could increase fire intensity.	Klein 2009

Table 3. Natural Drivers of Lakeside Ceanothus

Model Element	Natural Drivers of Lakeside Ceanothus	Citations
Vegetation Structure and Soils	The physical growth structure of the assemblage of plants in which Lakeside ceanothus occurs, including mixed chaparral, and which occurs on appropriate gabbroic soils in central San Diego County.	Reiser 2001, P. Gordon-Reedy pers. comm.
Fire	Natural fire interval and intensity, which may be necessary for seed germination.	P. Gordon-Reedy pers. comm.
Pollinator Dynamics	Main pollinators appear to be generalist insects, especially bees in the Andrenidae family. Wind does not appear to be a pollinating factor.	Klein 2009
Wildlife (seed dispersal agents)	Includes birds and mammals, which may be agents of seed dispersal.	P. Gordon-Reedy pers. comm.

Table 4. Critical Uncertainties for Lakeside Ceanothus

Critical Uncertainties for Lakeside Ceanothus
What is the fire frequency that negatively affects the ability of mature plants to recover?
What is the minimum fire-free interval necessary to allow re-establishment of an effective seed bank after a fire?
How significant is the effect of invasive non-native plant species on native pollinators and ceanothus reproduction?
Why is this species not present in other appropriate soils/habitats in the vicinity?
How important is soil type to this species?
What ecological conditions are necessary for successful reproduction?
What are the limiting factors to successful reproduction? How important are insect pollinators to successful reproduction?
Are invasive non-native plant species a threat to Lakeside ceanothus germination or seedling establishment?
Are populations on County preserves reproducing successfully?
What are the limiting biotic and edaphic factors to Lakeside ceanothus distribution?

Table 5. Potential Management Actions for Lakeside Ceanothus

Potential Management Actions for Lakeside Ceanothus
Control potential ignition sources in the vicinity of Lakeside ceanothus populations to reduce the potential for human-caused wildfires through access control (e.g., fencing, signage, etc.).
Conduct invasive non-native plant species control in vicinity of populations to encourage growth of native flowering plants that support ceanothus pollinators. Conduct this activity outside of native plant blooming period.
Conduct invasive non-native plant species control around populations to potentially reduce fire intensity.
Collect and bank seed for reseeding after catastrophic fires.

Table 6. Potential Monitoring Actions for Lakeside Ceanothus

Potential Monitoring Actions for Lakeside Ceanothus
Monitor populations, natural recruitment, after fire.
Monitor seedling establishment and survival after fire.
Conduct pollinator studies to better understand the dynamics between invasive non-native plant species and ceanothus reproduction.
Conduct studies to better understand habitat and climatic requirements of this species.
Monitor recently burned areas for production of viable seed.
Where seed production or viability are low, conduct studies to determine factors limiting successful reproduction.

Conceptual Model for San Miguel Savory

Management Goal	Monitoring Goal
Ensure persistence of San Miguel Savory by maintaining and enhancing existing populations at Boulder Oaks County Preserve.	Collect baseline information within the full extent of San Miguel savory within Boulder Oaks County Preserve to provide a better understanding of species abundance, distribution, habitat condition, and potential threats, and to inform adaptive management decisions. Use status, habitat condition, and threats monitoring results to determine appropriate adaptive management actions to protect San Miguel savory populations on DPR parks and preserves. Monitor and evaluate the response of San Miguel savory to implemented management actions.

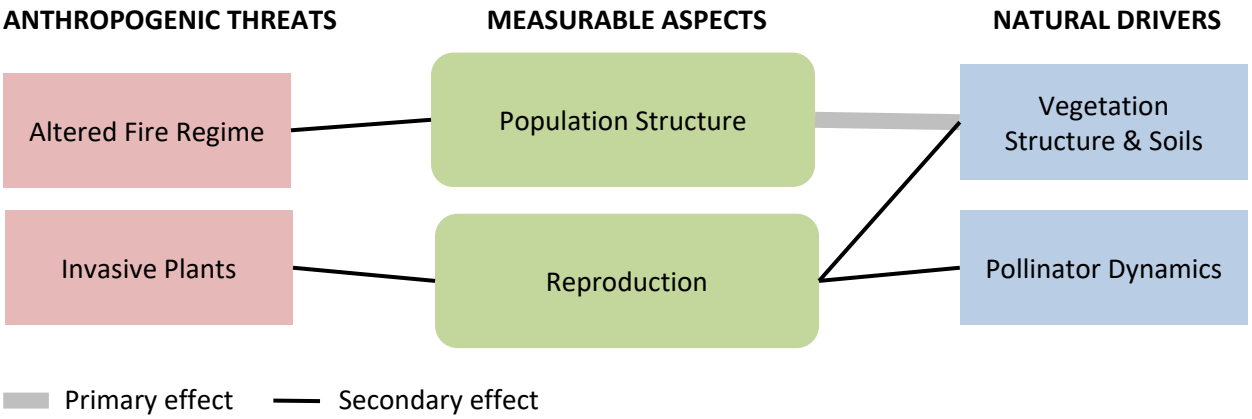


Table 1. Measurable Aspects of San Miguel Savory

Model Element	Measurable Aspects of San Miguel Savory	Citations
Population Structure	Population size, density, extent, age classes of individuals, seedlings.	Reiser 2001, SDMMP and TNC 2017
Reproduction	Post-fire regeneration. Plant fecundity (seed production), seed viability and germination rates, and inputs to seed bank.	Reiser 2001, SDMMP and TNC 2017

Table 2. Anthropogenic Threats to San Miguel Savory

Model Element	Anthropogenic Threats to San Miguel Savory	Citations
Altered Fire Regime	Fire frequency, intensity, and extent.	Regan 2006, SDMMP and TNC 2017
Invasive Plants	Invasive non-native plants may crowd out suitable establishment sites for San Miguel Savory, may alter fire regime, and may reduce performance of seedlings.	CNPS 2023

Table 3. Natural Drivers of San Miguel Savory

Model Element	Natural Drivers of San Miguel Savory	Citations
Vegetation Structure and Soils	Restricted to regionally uncommon soils, microhabitat requirements are unclear.	Reiser 2001
Pollinator Dynamics	San Miguel savory is likely pollinated by small insects or hummingbirds.	Reiser 2001

Table 4. Critical Uncertainties for San Miguel Savory

Critical Uncertainties for San Miguel Savory
What fire frequency negatively affects the ability of populations to recover post-fire?
How significant is the effect of invasive non-native plant species on San Miguel savory reproduction?
Why is this species not present in other appropriate soils/habitats in the vicinity? What soil types is this species restricted to?
What ecological conditions are necessary for successful reproduction?
Which species pollinate San Miguel savory and how important are they to successful reproduction? How viable are the seeds?

Table 5. Potential Management Actions for San Miguel Savory

Potential Management Actions for San Miguel Savory
Reduce fuel loads of invasive non-native plant species around San Miguel savory.
Conduct invasive non-native plant species control in vicinity of San Miguel savory populations.
Maintain current vegetation structure.
Collect seed, grow, and plant shrubs in suitable Boulder Oaks County Preserve locations.
Collect seeds and test for viability.

Table 6. Potential Monitoring Actions for San Miguel Savory

Potential Monitoring Actions for San Miguel Savory
Monitor populations qualitatively and with photo points to monitor post-fire recovery.
Monitor growth and persistence of San Miguel savory in weed control areas.
Conduct studies to better understand the microhabitat and soil requirements of this species.
Monitor recruitment of San Miguel Savory.
Conduct pollinator studies to better understand pollinator dynamics.

Conceptual Model for Otay Tarplant

Management Goal	Monitoring Goal
Maintain or enhance existing Otay tarplant occurrences on Furby-North County Preserve to increase resilience to environmental and demographic stochasticity to support species persistence over the long term.	Monitor the Otay tarplant population at Furby-North County Preserve. Use status, habitat condition, and threats monitoring results to determine appropriate adaptive management actions to protect Otay tarplant populations on DPR parks and preserves. Monitor and evaluate the response of Otay tarplant to implemented management actions.

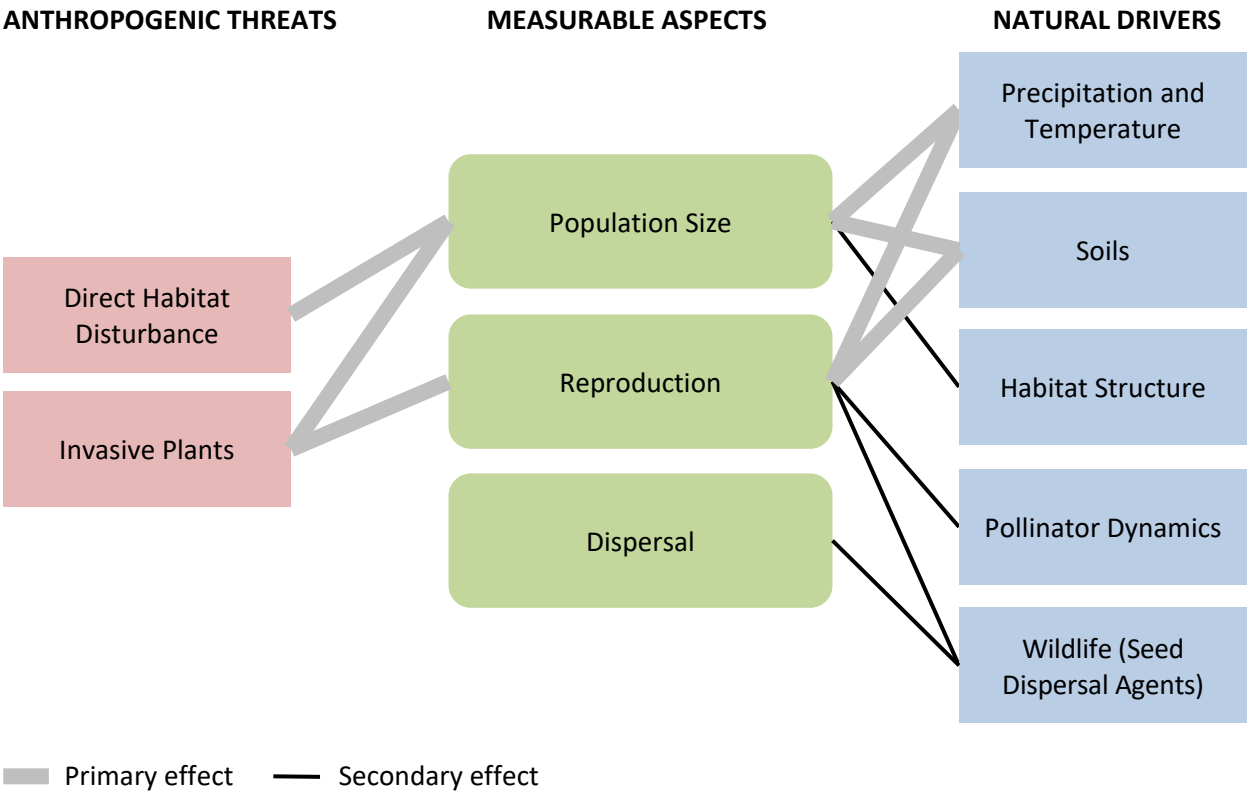


Table 1. Measurable Aspects of Otay Tarplant

Model Element	Measurable Aspects of Otay Tarplant	Citations
Population Size	Population size, density, extent, age classes of individuals, seedlings.	USFWS 2004, USFWS 2009a, CBI 2018, SDMMP and TNC 2017
Dispersal	Includes dispersal of seeds, pollination, and gene flow.	USFWS 2004, USFWS 2009a, CBI 2018, SDMMP and TNC 2017
Reproduction	Plant fecundity (seed production), seed viability and germination rates, and inputs to seed bank.	USFWS 2004, USFWS 2009a, CBI 2018, SDMMP and TNC 2017

Table 2. Anthropogenic Threats to Otay Tarplant

Model Element	Anthropogenic Threats to Otay Tarplant	Citations
Direct Habitat Disturbance	Authorized and unauthorized activities (e.g., utility maintenance, access roads, trails, fire breaks, off-highway vehicles, mountain bikes, equestrian use, grazing) have potential to result in above- or below-ground plant mortality in areas where these activities are present.	USFWS 2004, CBI 2018, SDMMP and TNC 2017
Invasive Plants	Invasive non-native forbs and grasses that compete directly with Otay tarplant or suppress germination through thatch/litter accumulation.	USFWS 2009a, CBI 2018, SDMMP and TNC 2017

Table 3. Natural Drivers of Otay Tarplant

Model Element	Natural Drivers of Otay Tarplant	Citations
Precipitation and Temperature	Growth/density of annual plants strongly correlated to rainfall amounts.	J. Vinje pers. comm.
Soils	Occurs on clay soils, subsoils, or lens (clay content of 25% or greater).	USFWS 2009a, CBI 2018
Habitat Structure	Occurs in grassland, open coastal sage scrub, or maritime succulent scrub.	USFWS 2009a, CBI 2018
Pollinator Dynamics	One study indicated bees as the most common pollinator, but another study also listed twelve other flying insects as pollinators.	SDMMP and TNC 2017
Wildlife (Seed Dispersal Agents)	Includes birds and mammals, which may be agents of seed dispersal. Can also be dispersed by the wind once seeds have dried.	SDMMP and TNC 2017

Table 4. Critical Uncertainties for Otay Tarplant

Critical Uncertainties for Otay Tarplant
How does the species respond to nitrogen deposition or other chemicals in the soil?
How should pollination and gene flow be measured?
Does Otay tarplant have a preferred vegetation structure?
What are the key dispersal mechanism for this species?
What degree of habitat disturbance by unauthorized users impact a population?
What are the critical thresholds for invasive non-native plant species that impact the viability of a population?
How is reproduction and survival affected by drought and extended soil saturation?

Table 5. Potential Management Actions for Otay Tarplant

Potential Management Actions for Otay Tarplant
Ensure soils do not become impacted or eroded.
Manage the habitat to support pollinators, especially bees, by providing alternative forage such as co-flowering yellow Asteraceae plants (e.g. *Gutierrezia californica, Isocoma menziesii, Deinandra fasciculata,* and *Holocarpha virgata* ssp. *elongata*).
Vegetation ground cover must be sufficiently open to allow for growth and dispersal.
Manage vegetation to provide habitat for potential seed dispersers (e.g. birds and mammals) by maintaining connectivity to habitat areas.
Prohibit human access in areas supporting this species. Close and restore unauthorized trails and roads adjacent to species populations.
Control invasive non-native grasses and forbs, and control thatch from habitat for this species.

Table 6. Potential Monitoring Actions for Otay Tarplant

Potential Monitoring Actions for Otay Tarplant
Monitor per SDMMP IMG protocol.
Monitor per IMG protocol. Also, monitor clay soils annually for impacts and erosion.
Monitor per IMG protocol. Also, monitor annually for unauthorized access impacts.
Monitor per IMG protocol. Also, monitor rainfall during survey years to determine if there is a correlation with population dynamics.

Conceptual Model for Orcutt's Bird's-Beak

Management Goal	Monitoring Goal
Maintain or enhance existing Orcutt's bird's-beak occurrences in Tijuana River Valley Regional Park to increase resilience to environmental and demographic stochasticity to support species persistence over the long term.	Conduct monitoring for Orcutt's bird's-beak populations at Tijuana River Valley Regional Park. Use status, habitat condition, and threats monitoring results to determine appropriate adaptive management actions to protect Orcutt's bird's-beak populations on DPR parks and preserves. Monitor and evaluate the response of Orcutt's bird's-beak to implemented management actions.

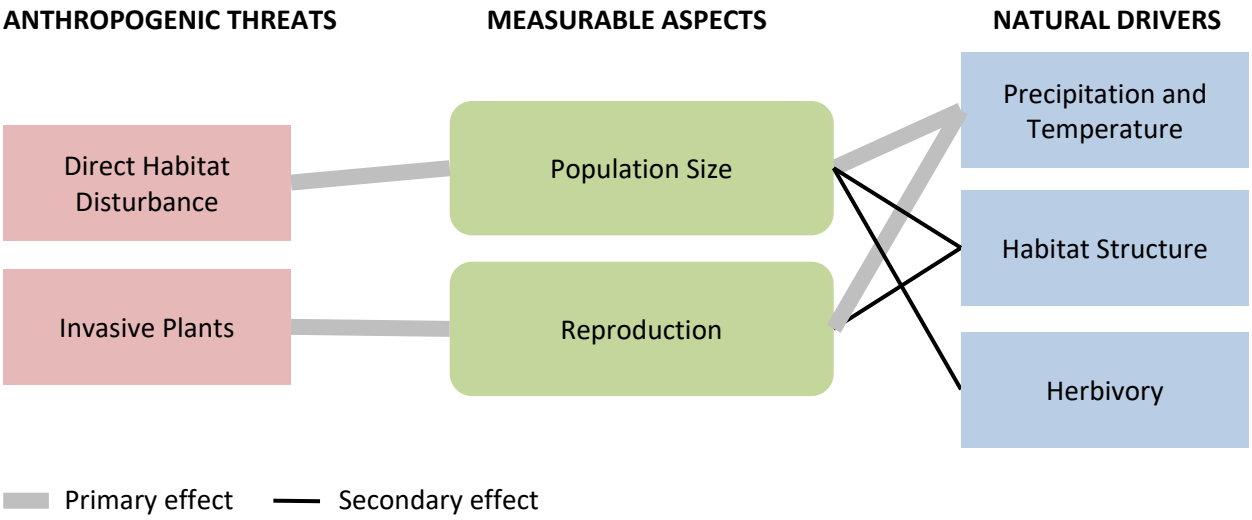


Table 1. Measurable Aspects of Orcutt's Bird's-Beak

Model Element	Measurable Aspects of Orcutt's Bird's-Beak	Citations
Population Size	Population size, density, extent.	TAIC 2010, SDMMP and TNC 2017
Reproduction	Plant fecundity (seed production), seed viability and germination rates, and inputs to seed bank.	TAIC 2010, SDMMP and TNC 2017
Dispersal	Includes dispersal of seeds, pollination, and gene flow.	TAIC 2010, SDMMP and TNC 2017

Table 2. Anthropogenic Threats to Orcutt's Bird's-Beak

Model Element	Anthropogenic Threats to Orcutt's Bird's-Beak	Citations
Direct Habitat Disturbance	Unauthorized trail access by equestrian, OHV, and Border Patrol. Trail development activities.	TAIC 2010, SDMMP and TNC 2017, Regan et al. 2006
Invasive Plants	Competition with invasive non-native plants may outcompete established populations.	TAIC 2010, SDMMP and TNC 2017

Table 3. Natural Drivers of Orcutt's Bird's-Beak

Model Element	Natural Drivers of Orcutt's Bird's-Beak	Citations
Precipitation and Temperature	Growth/density of annual plants strongly correlated to rainfall amounts.	J. Vinje pers. comm.
Habitat Structure	Hemiparasitic, unknown if it has a specific host plant or if it can be any common scrub habitat pollinator species.	San Diego Zoo ICR 2016
Herbivory	Populations adjacent to urban development with higher presence of rabbits and other herbivores can decimate populations.	J. Vinje pers. comm.

Table 4. Critical Uncertainties for Orcutt's Bird's-Beak

Critical Uncertainties for Orcutt's Bird's-Beak
What ecological conditions are necessary for successful reproduction? What density and type of invasive non-native plant species affect the species' ability to reproduce?
What degree of habitat disturbance by unauthorized users impact a given population?
Does Orcutt's bird's-beak have a specific host plant? What are the key dispersal mechanisms for this species?
What degree does herbivory activities impact a given population? Does this effect only specific populations adjacent to urban development?
How is Orcutt's bird's-beak reproduction and survival affected by drought and extended soil saturation?

Table 5. Potential Management Actions for Orcutt's Bird's-Beak

Potential Management Actions for Orcutt's Bird's-Beak
Control invasive non-native plants and erosion within documented Orcutt's bird's-beak habitat and buffer area.
Prohibit human access in areas containing this species via fencing and signage. Close and restore unauthorized trails and roads.
Manage habitat to favor natural predators of herbivores. For small and highly vulnerable populations, consider temporary fencing.

Table 6. Potential Monitoring Actions for Orcutt’s Bird’s-Beak

Potential Monitoring Actions for Orcutt's Bird’s-Beak
Monitor per SDMMP IMG protocol.
Monitor per IMG protocol. Also monitor annually for unauthorized access impacts.
Monitor per IMG protocol. Also, monitor rainfall during survey years to determine if there is a correlation with population dynamics.

Conceptual Model for Variegated Dudleya

Management Goal	Monitoring Goal
Ensure persistence of variegated dudleya by maintaining and enhancing existing populations at Sycamore Canyon/Goodan Ranch County Preserve, Lusardi Creek County Preserve, and Dictionary Hill County Preserve.	Collect baseline information about variegated dudleya to provide a better understanding of abundance, population extent, plant condition, habitat condition, and potential threats within Sycamore Canyon/Goodan Ranch County Preserve, Lusardi Creek County Preserve, and Dictionary Hill County Preserve. Conduct monitoring for variegated dudleya populations within DPR parks and preserves. Use status, habitat condition, and threats monitoring results to determine appropriate adaptive management actions to protect variegated dudleya populations on DPR parks and preserves. Monitor and evaluate the response of variegated dudleya to implemented management actions.

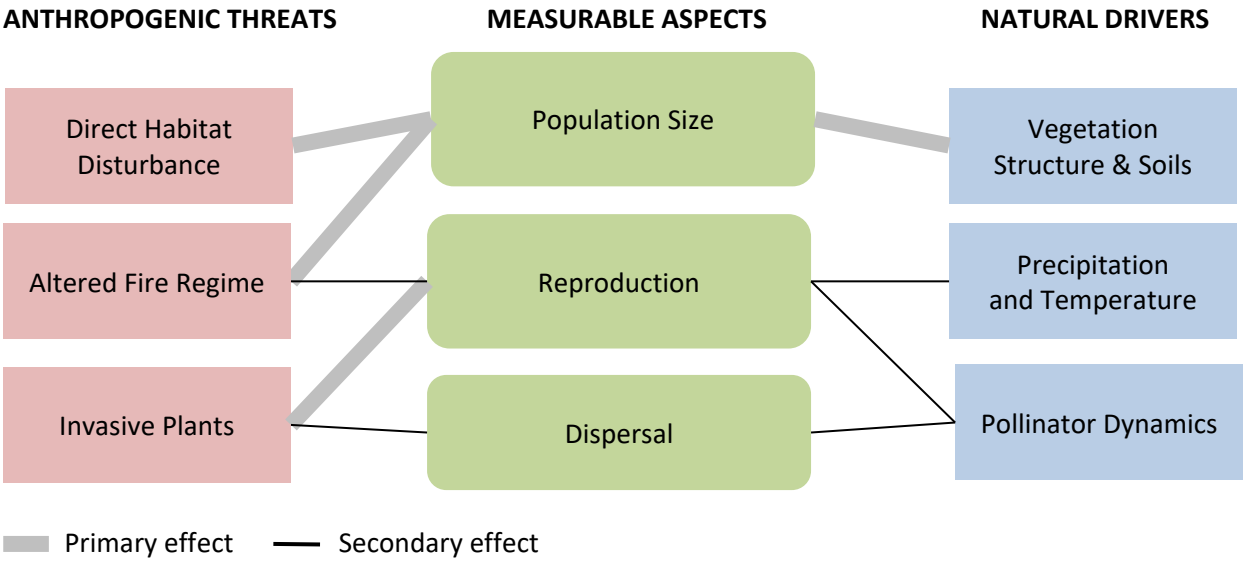


Table 1. Measurable Aspects of Variegated Dudleya

Model Element	Measurable Aspects of Variegated Dudleya	Citations
Population Size	Population size, density, extent.	SDMMP and TNC 2017; CBI 2012; Regan et. al. 2006; Dodero 1995
Reproduction	Plant fecundity (seed production), seed viability and germination rates, and inputs to seed bank.	MSP 2012; CBI 2012; Regan et. al. 2006; Dodero 1995
Dispersal	Includes dispersal of seeds, pollination, and gene flow.	CBI 2012; Dodero 1995; Klein pers. comm.

Table 2. Anthropogenic Threats to Variegated Dudleya

Model Element	Anthropogenic Threats to Variegated Dudleya	Citations
Direct Habitat Disturbance	Direct impacts leading to death of the plants or degradation of habitat; Includes trampling, OHV use, mountain bikes, equestrian use.	SDMMP and TNC 2017, M. Kelly pers. comm.
Altered Fire Regime	Fire frequency, intensity, and extent.	SDMMP and TNC 2017, M. Kelly pers. comm. M. Dodero pers. comm.
Invasive Plants	Invasive non-native grasses and forbs, which compete for resources, and may affect germination; also includes thatch build up.	SDMMP and TNC 2017, M. Kelly pers. comm., McKinney pers. comm. M. Dodero pers. comm.

Table 3. Natural Drivers of Variegated Dudleya

Model Element	Natural Drivers of Variegated Dudleya	Citations
Vegetation Structure and Soils	Assemblages of plants in which *D. variegata* occurs, including openings in chaparral and coastal sage scrub habitat. Must support pollinators. Clay soils; often rocky areas.	SDMMP and TNC 2017, M. Kelly pers. comm., CBI 2012, Reiser 1994; Dodero 1995
Precipitation and Temperature	Rainfall (timing and amount) and temperature, which both may affect the germination rate and reproduction.	SDMMP and TNC 2017, M. Kelly pers. comm., CBI 2012, Reiser 1994, Dodero 1995
Pollinator Dynamics	Insect pollinators and other forms of pollination.	Klein pers. comm., Dodero 1995

Table 4. Critical Uncertainties for Variegated Dudleya

Critical Uncertainties for Variegated Dudleya
What level and types of direct habitat disturbance impact the populations?
What fire frequency and intensity can this species tolerate?
What fire frequency and intensity depletes the seed bank?
What density and type of invasive non-native plant species affect the species' ability to reproduce?
What are the mechanisms of reproduction and pollination?
What are the key dispersal mechanisms for this species?
What maximum density of vegetation does this species require or tolerate?
What factors restrict this species to rocky, clayey areas?
How does timing and amount of rainfall affect the reproductive success of this species?
Does rainfall pattern affect native species differently than non-native annuals?
Which insects pollinate variegated dudleya? What are the habitat requirements of those pollinators? Are pollinators able to find variegated dudleya in dense grasses?

Table 5. Potential Management Actions for Variegated Dudleya

Potential Management Actions for Variegated Dudleya
Avoid trampling by prohibiting human access in areas occupied by this species.
Reduce ignition sources by controlling access throughout the preserve, especially in occupied areas.
Remove all invasive non-native plant species within and around populations.
Maintain an open vegetation structure in areas of suitable habitat.
Adjust timing of management to maximize invasive non-native plant control and minimize impacts to the species. Avoid conducting these activities during the dudleya blooming period, to protect seed production.
Manage the habitat to support pollinators.

Table 6. Potential Monitoring Actions for Variegated Dudleya

Potential Monitoring Actions for Variegated Dudleya
Monitor to detect and quantify the modes and frequency of unauthorized access.
Monitor plant population size to assess impacts from habitat disturbance.
Monitor recovery of population (population size and density) after a fire.
Conduct studies to determine seed bank's vulnerability to fire.
Monitor the effects of invasive non-native plant species control in terms of proportion of open vegetation structure, and reduction in invasive non-native plant species abundance.
Monitor plant population size and sign of herbivory to assess effects of herbivory fencing installation.
Monitor recruitment in different management treatment areas (e.g., different percent cover of invasive non-native plants and bare ground).
Conduct studies to determine key dispersal mechanisms.
Monitor temperature and rainfall patterns to determine if there is a correlation with population dynamics.
Conduct pollinator studies to understand mechanisms of pollination.

Conceptual Model for Heart-Leaved Pitcher Sage

Management Goal	Monitoring Goal
Ensure persistence of heart-leaved pitcher sage by maintaining and enhancing populations within the Iron Mountain County Preserve.	Conduct baseline survey of the full extent of heart-leaved pitcher sage on Iron Mountain County Preserve to evaluate the species' status, habitat condition, and potential threats. Use status, habitat condition, and threats monitoring results to determine appropriate adaptive management actions to protect heart-leaved pitcher sage populations on DPR parks and preserves. Monitor and evaluate the response of heart-leaved pitcher sage within Iron Mountain County Preserve to adaptive management within selected populations for 5 years.

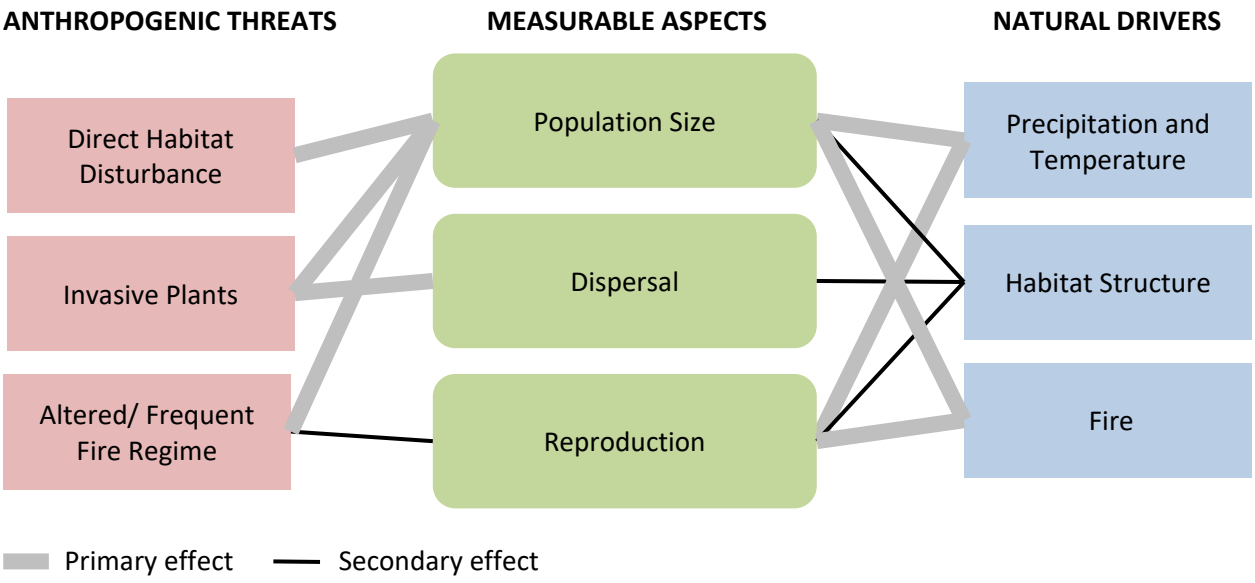


Table 1. Measurable Aspects of heart-leaved pitcher sage

Model Element	Measurable Aspects of Heart-Leaved Pitcher Sage	Citations
Population Size	Population size, density, extent.	SDMMP and TNC 2017
Reproduction	Plant fecundity (seed production), seed viability and germination rates, and inputs to seed bank.	SDMMP and TNC 2017
Dispersal	Includes dispersal of seeds, pollination, and gene flow.	SDMMP and TNC 2017

Table 2. Anthropogenic Threats to heart-leaved pitcher sage

Model Element	Anthropogenic Threats to Heart-Leaved Pitcher Sage	Citations
Direct Habitat Disturbance	Direct impacts to plants and degradation of habitat (e.g., utility/access road maintenance, trails, fire breaks, and mountain bikes can lead to mortality of individuals and small populations.	SDMMP and TNC 2017, CNPS 2023
Invasive Plants	Competition with non-native plants may outcompete and crowd out heart-leaved pitcher sage populations and seedling recruitment.	SDMMP and TNC 2017
Altered/Frequent Fire Regime	Fire frequency, intensity, and extent. Frequent fires can result in loss of plants, habitat degradation/type conversion.	K. Preston pers. comm.

Table 3. Natural Drivers of heart-leaved pitcher sage

Model Element	Natural Drivers of Heart-Leaved Pitcher Sage	Citations
Precipitation and Temperature	Growth, and reproduction of perennial plants and shrubs are correlated to rainfall amounts.	MSP 2017, CNPS 2023
Habitat Structure	Unknown if it has a specific pollinator species. Nutlets are dispersed by the wind and knocked to the ground once fruits have dried, seeds fall directly below plant. Some evidence it is a fire follower.	MSP 2017; Harris and Associates 2021 (draft)
Fire	Adapted to natural fire interval and intensity (some evidence it is a fire follower).	K. Preston pers, comm.

Table 4. Critical Uncertainties for heart-leaved pitcher sage

Critical Uncertainties for Heart-Leaved Pitcher Sage
What degree of habitat disturbance by unauthorized users impact a given population? What level and types of direct habitat disturbance impact the populations?
What ecological conditions are necessary for successful reproduction? What density and type of invasive non-native plant species affect the species' ability to reproduce?
Does heart-leaved pitcher sage have a specific pollinator or pollination mechanism? What are the key dispersal mechanisms for this species?
How is heart-leaved pitcher sage reproduction and survival affected by drought and extended soil saturation?
What are the key dispersal mechanisms for this species? How does fire affect populations?

Table 5. Potential Management Actions for heart-leaved pitcher sage

Potential Management Actions for Heart-Leaved Pitcher Sage
Prohibit human access in areas containing this species via fencing and signage. Close and restore unauthorized trails and keep authorized trails and roads from becoming wider.
Control invasive non-native plants (e.g., ≤20% absolute cover of non-native vegetation) within documented heart-leaved pitcher sage habitat and 10-meter buffer area especially if an extant seed bank is present.
Enhance habitat (e.g., chaparral) via control of invasive non-native plants, providing open areas for germination and population growth.

Table 6. Potential Monitoring Actions for heart-leaved pitcher sage

Potential Monitoring Actions for heart-leaved pitcher sage
Monitor per SDMMP IMG protocol.
Monitor annually for unauthorized access impacts.
Monitor rainfall during survey years to determine if there is a correlation with population dynamics.
Monitor recently burned areas for vigor of regenerating plants and for evidence of recruitment.
Monitor populations and natural regeneration after fire.
Monitor recently burned areas to detect new populations and/or expansion of maximum extent.

Conceptual Model for Willowy Monardella

Management Goal	Monitoring Goal
Ensure persistence of willowy monardella by maintaining and enhancing existing populations at Sycamore Canyon/Goodan Ranch County Preserve.	Conduct baseline survey of the full extent of willowy monardella on Sycamore Canyon/Goodan Ranch County Preserve to evaluate the species' status, habitat condition, and potential threats. Conduct monitoring for willowy monardella populations within Sycamore Canyon/Goodan Ranch County Preserve. Use status, habitat condition, and threats monitoring results to determine appropriate adaptive management actions to protect willowy monardella populations on DPR parks and preserves. Monitor and evaluate the response of willowy monardella within Sycamore Canyon/Goodan Ranch County Preserve to invasive non-native plant species management and thatch removal within selected populations for 5 years.

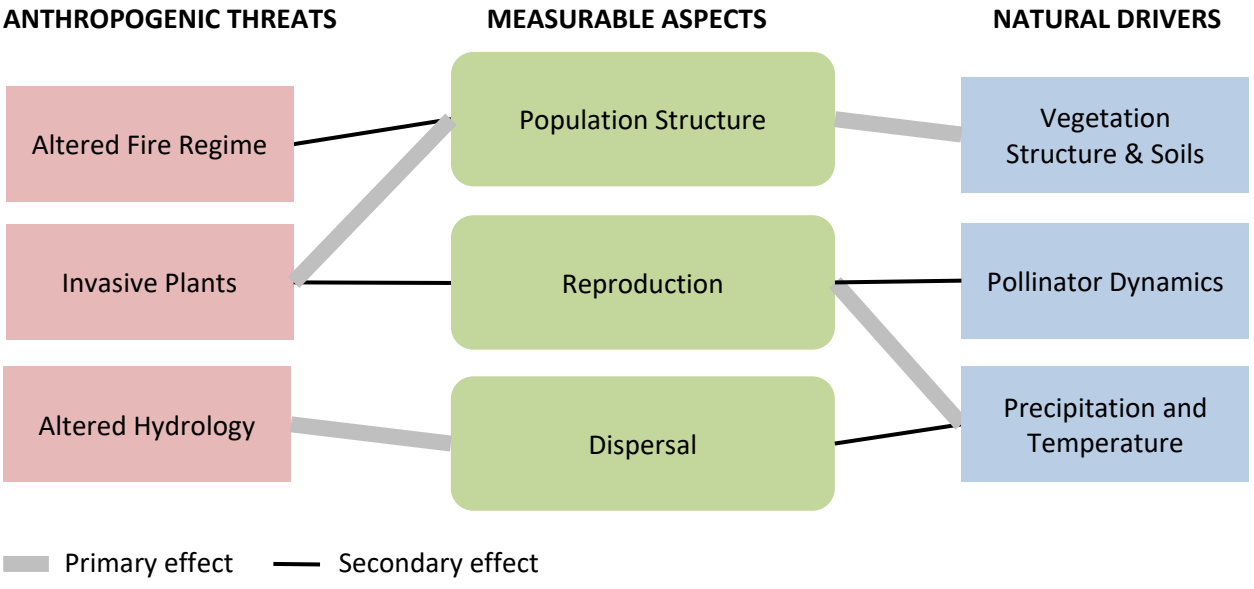


Table 1. Measurable Aspects of Willowy Monardella

Model Element	Measurable Aspects of Willowy Monardella	Citations
Population Structure	Population size, density, extent, age classes of individuals, seedling recruitment.	USFWS 2012, Rebman and Dossey 2006, Tracey et al. 2011, M. Kelly pers. comm.
Reproduction	Plant fecundity (seed production), seed viability and germination rates, and inputs to seed bank.	USFWS 2012, Rebman and Dossey 2006, Tracey et al. 2011, M. Kelly pers. comm.
Dispersal	Includes dispersal of seeds, pollination, and gene flow.	USFWS 2012, Rebman and Dossey 2006, Tracey et al. 2011, M. Kelly pers. comm.

Table 2. Anthropogenic Threats to Willowy Monardella

Model Element	Anthropogenic Threats to Willowy Monardella	Citations
Altered Fire Regime	Fire frequency, intensity, and extent.	USFWS 2012
Invasive Plants	Invasive non-native plant species, especially grasses, which outcompetes the plants and prevents seed sprouting. Includes thatch build-up.	USFWS 2012, Rebman and Dossey 2006, Tracey et al. 2011, M. Kelly pers. comm.
Altered Hydrology	Erosion under plants; lowering of water table; increased flow velocity and flood scours; channelization.	USFWS 2012, Rebman and Dossey 2006, Tracey et al. 2011, M. Kelly pers. comm.

Table 3. Natural Drivers of Willowy Monardella

Model Element	Natural Drivers of Willowy Monardella	Citations
Vegetation Structure & Soils	Occurs on streams, benches, and bars within streams and floodplains. Soils are typically eroding marine terraces with cobbles and sediments. Prefers lower energy stream locations including benches and meanders.	USFWS 2012, Rebman and Dossey 2006, Tracey et al. 2011, M. Kelly pers. comm.
Pollinator Dynamics	Pollinators include bees, butterflies, and flies. Seeds appear to be dispersed by runoff.	USFWS 2012, Klein pers comm.
Precipitation and Temperature	Rainfall (timing and amount) and temperature, which affect the germination rate, reproduction, and persistence.	USFWS 2012, Rebman and Dossey 2006, Tracey et al. 2011

Table 4. Critical Uncertainties for Willowy Monardella

Critical Uncertainties for Willowy Monardella
What intensity or frequency thresholds affect this species' ability to recover from fire?
What is the threshold of weed cover that starts to negatively impact survival of plants and seed germination?
Are willowy monardella ever able to recruit in areas with thatch?
What hydrologic conditions are required for successful seed dispersal?
Can willowy monardella colonize areas with dense vegetation?
What are the main pollinators for this species?
At what point do monardella individuals become too isolated for effective pollination?
What is the role of variation in precipitation, temperature, and drought in monardella dispersal and reproduction?
How well do seedlings and mature willowy monardella respond to drought?
How do ambient temperature and rainfall timing and amount affect the ability to successfully reproduce?

Table 5. Potential Management Actions for Willowy Monardella

Potential Management Actions for Willowy Monardella
Control invasive non-native plant species after fire; conduct post-fire restoration of willowy monardella and habitat.
Remove weeds and thatch in and around populations of willowy monardella.
Collect seed and transplant or propagate in nursery.
Remove weeds in and around stream benches near willowy monardella.
Conduct pollinator studies to better understand pollinator dynamics.
Manage the habitat for natural hydrologic conditions (reduced velocity, erosion and sedimentation).
Add rock weirs within channel to slow flows and encourage stream braiding.

Table 6. Potential Monitoring Actions for Willowy Monardella

Potential Monitoring Actions for Willowy Monardella
Monitor post-fire invasive non-native plant species cover; monitor recovery of plants, including recruitment.
Monitor effects of vegetation management on willowy monardella populations.
Monitor effects of vegetation management on reproductive success.
Monitor for recruitment downstream from extant populations.
Monitor effects of vegetation management on willowy monardella populations.
Monitor recruitment and seed production.
Monitor to assess the effect of drought and storm events on willowy monardella populations.
Monitor rainfall to see the effect of drought and storm events on willowy monardella populations.

Conceptual Model for Harbison's Dun Skipper

Management Goal	Monitoring Goal
Maintain or enhance Harbison's dun skipper (HDS) occupied habitat, historically occupied habitat, and the landscape connections between them to create resilient, self-sustaining populations and species persistence over the long term within Hellhole Canyon County Preserve and Sage Hill County Preserve.	Conduct surveys to collect information on host plant (San Diego sedge) distribution and adult, larval, and hibernaculum surveys to document the butterfly's current distribution and population size and threat data to inform management needs. Conduct monitoring for Harbison's dun skipper populations within Hellhole Canyon County Preserve and Sage Hill County Preserve. Use status, habitat condition, and threats monitoring results to determine appropriate adaptive management actions to protect and enhance Harbison's dun skipper populations on DPR parks and preserves. Monitor and evaluate the response of Harbison's dun skipper to implemented management actions.

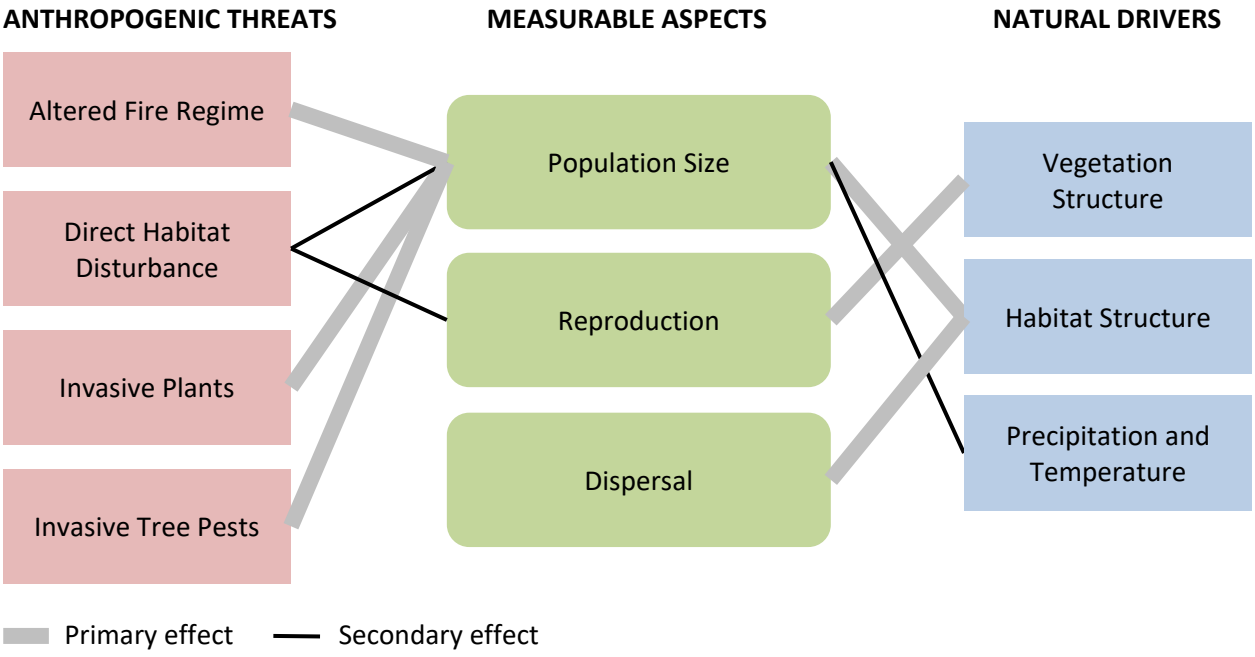


Table 1. Measurable Aspects of Harbison's Dun Skipper

Model Element	Measurable Aspects of Harbison's Dun Skipper	Citations
Population Size	Population size, density, and extent of adults and annual fluctuation of population size.	Marschalek and Deutschman 2015, Marschalek and Deutschman 2016, MSP and TNC 2017
Dispersal	Connectivity between populations and movement throughout oak woodlands and adjacent upland areas.	Marschalek and Deutschman 2015, Marschalek and Deutschman 2016, MSP and TNC 2017
Reproduction	Availability of host plant San Diego sedge (*Carex spissa*) for oviposition, larval feeding, and pupation.	Marschalek and Deutschman 2015, Marschalek and Deutschman 2016, MSP and TNC 2017

Table 2. Anthropogenic Threats to Harbison's Dun Skipper

Model Element	Anthropogenic Threats to Harbison's Dun Skipper	Citations
Altered Fire Regime	Wildfires cause direct mortality and can also kill oaks, which provide shade to San Diego sedge.	Marschalek and Deutschman 2016, MSP and TNC 2017
Invasive Plants	Invasive non-native plants such as giant reed may outcompete the San Diego sedge and alter vegetation structure.	Marschalek and Deutschman 2015, Marschalek and Deutschman 2016
Invasive Tree Pests	The gold spotted oak borer (GSOB) is responsible for killing oak trees. Oak tree mortality results in the thinning or loss of the canopy, reducing the amount of shade cast on sedge plants, which increases the water-stress of these sedge plants.	Marschalek and Deutschman 2015, Marschalek and Deutschman 2016
Direct Habitat Disturbance	Suitable habitat supporting San Diego sedge is found along riparian corridors and waterways where human trespass may occur.	Marschalek and Deutschman 2015, Marschalek and Deutschman 2016

Table 3. Natural Drivers of Harbison's Dun Skipper

Model Element	Natural Drivers of Harbison's Dun Skipper	Citations
Habitat Structure	Larvae are host-specialists, feeding only on the San Diego sedge that is often associated with riparian oak woodlands.	Marschalek and Deutschman 2015, SDMMP and TNC 2017
Vegetation Structure	HDS are found in chaparral or riparian areas that have narrow canyons or drainages, but oak woodland is the preferred vegetation community due to the balance of sun and shade. Host plant, San Diego sedge, is found in habitats with moving water or dry ravines (not pools of standing water). Should have upland areas adjacent to riparian areas with nectar sources.	Marschalek and Deutschman 2015, Marschalek and Deutschman 2016, SDMMP and TNC 2017
Precipitation and Temperature	Minimal precipitation is required to maintain San Diego sedge populations, oak woodland habitat, and nectar sources for HDS. Too much precipitation could cause flooding which may result in mortality of larvae. Flight season is strongly influenced by temperature and cloud cover with adults remaining inactive/unseen if below 75 degrees Fahrenheit.	Marschalek and Deutschman 2016, SDMMP and TNC 2017

Table 4. Critical Uncertainties for Harbison's Dun Skipper

Critical Uncertainties for Harbison's Dun Skipper
Do populations reestablish after fire events?
How do invasive non-native plant species impact Harbison's dun skipper mortality? What other factors could be causing skipper mortality?
What is the current status of gold spotted oak borer and oak mortality on Hellhole Canyon Preserve and proximity to San Diego sedge plant populations?
What is overall species dispersal behavior and impacts on gene flow?
Development of HDS (pupation, emergence, etc.) are not tightly synchronized among individuals at a single site.
Do HDS have a preferred nectar source? How far away can the nectar sources be from San Diego sedge? What are the habitat needs of the adult HDS?
How does temperature effect timing of emergence and the single annual flight season?

Table 5. Potential Management Actions for Harbison's Dun Skipper

Potential Management Actions for Harbison's Dun Skipper
Control invasive non-native plant species after fire; conduct post-fire restoration of San Diego sedge.
Remove giant reed and other invasive non-native plants that can outcompete San Diego sedge. Provide supplemental water to water-stressed San Diego sedge, if necessary for survival.
GSOB or SHB should be confirmed prior to management actions. Treat or remove and appropriately dispose of trees severely infested with GSOB and SHB as appropriate.
Prohibit human trespass from occurring where San Diego sedge is present.
Manage habitat structure to support necessary conditions for San Diego sedge (e.g. shade, moving water), when necessary.
Seed native potential nectar source adjacent to San Diego sedge patches within suitable HDS habitat to provide additional nectar sources for adult HDS.

Table 6. Potential Monitoring Actions for Harbison's Dun Skipper

Potential Monitoring Actions for Harbison's Dun Skipper
Monitor recovery of population after a wildfire.
Monitor during flight seasons to assess population sizes and annual variation in population size.
Conduct presence/absence surveys for GSOB and SHB in oak woodlands and riparian habitats using sticky traps appropriate for GSOB and SHB.
Survey and map populations of San Diego sedge and monitor populations to verify trespass is not occurring.
Monitor rainfall and temperature to see if there is a correlation with population size.

Conceptual Model for Arroyo Toad

Management Goal	Monitoring Goal
Ensure the persistence of arroyo toads within the Ramona Grasslands County Preserve, Santa Margarita County Preserve, and San Luis Rey River Park by maintaining and enhancing breeding and adjacent upland habitat. Preserve the natural geomorphological conditions within the San Luis Rey River, Santa Maria Creek (including upstream portions of the creek), and the Santa Margarita River to promote arroyo toad breeding and preserve existing habitat.	Monitor the status (occupancy and evidence of breeding) and evaluate the response of arroyo toads on the Ramona Grasslands County Preserve, Santa Margarita County Preserve, and San Luis Rey River Park to the management of vegetation and non-native predator control.

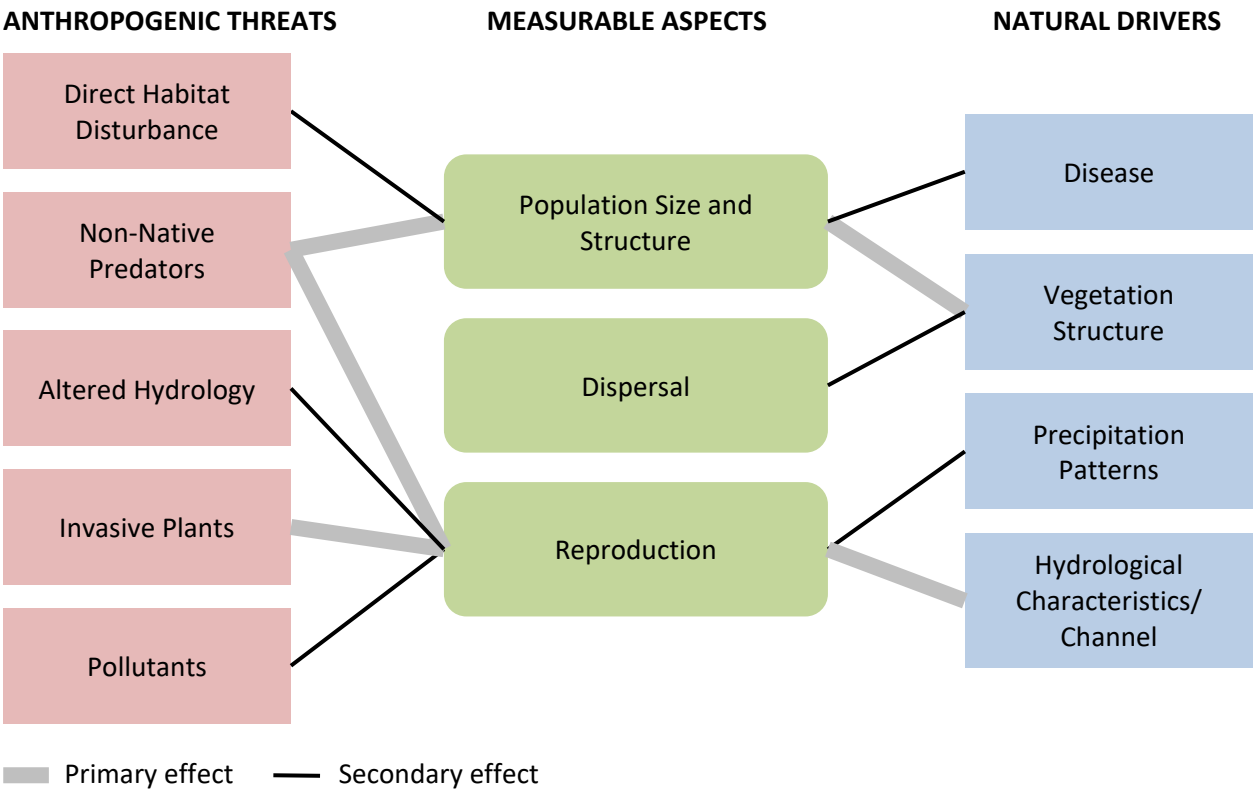


Table 1. Measurable Aspects of Arroyo Toad

Model Element	Measurable Aspects of Arroyo Toads	Citations
Population Size and Structure	Self-sustaining population that includes adults, larvae and eggs.	Atkinson et al. 2003, Sweet and Sullivan 2005, USFWS 2009b
Dispersal	Movement of adults within the stream channel and adjacent upland habitat during the breeding and non-breeding seasons.	Atkinson et al. 2003, Sweet and Sullivan 2005, USFWS 2009b; Mitrovich et al. 2011
Reproduction	Adult fecundity, mate availability, production of fertile offspring; successful hatching and metamorphosis of larvae to adults.	Atkinson et al. 2003, Sweet and Sullivan 2005, USFWS 200b9

Table 2. Anthropogenic Threats to Arroyo Toad

Model Element	Anthropogenic Threats to Arroyo Toads	Citations
Direct Habitat Disturbance	Trampling by humans or cattle, hand/mechanical removal of vegetation, and any other alteration of the channel, associated riparian vegetation and/or adjacent upland habitat. Also includes mortality from vehicles when toads migrate to uplands.	Atkinson et al. 2003, Sweet and Sullivan 2005, USFWS 2009b
Non-Native Predators	Bullfrogs, crayfish, mosquito fish, and sunfish.	Atkinson et al. 2003, Sweet and Sullivan 2005, USFWS 2009b
Altered Hydrology	Changes in hydrology, generally upstream, that include artificial input, construction of dams, and channelization of the bed and banks. Results in changes to the timing, quantity and duration of channel flows, as well as, a potential increase/decrease in sedimentation and scour.	Atkinson et al. 2003, Sweet and Sullivan 2005, USFWS 2009b
Invasive Plants	Invasive non-native plant species, such as tamarisk and giant reed that may alter stream hydrology by eliminating sandbars and breeding pools. Also includes upland weed invasion that may affect non-breeding aestivation habitat.	Atkinson et al. 2003, Sweet and Sullivan 2005, USFWS 2009b
Pollutants	Primary pollutants include urine and feces deposited within the stream by cattle. May include pollutants originating from urban and agricultural runoff, as well.	Atkinson et al. 2003, Sweet and Sullivan 2005, USFWS 2009b

Table 3. Natural Drivers of Arroyo Toad

Model Element	Natural Drivers of Arroyo Toads	Citations
Disease	Chytridiomycosis, an infectious amphibian disease caused by a fungus, and has been clearly linked to the decline and extinction of amphibians worldwide. It has been shown that arroyo toads are susceptible to this disease.	USFWS 2009b
Vegetation Structure	Prefer open, unvegetated sandy soils (as opposed to finer or coarser substrate), adjacent to the low-flow channel to call and engage in amplexus. Utilize open, upland areas within the adjacent riparian forest/woodland, grassland and shrubland for aestivate.	Atkinson et al. 2003, Sweet and Sullivan 2005, USFWS 2009b
Precipitation Pattern	Rainfall quantity and timing. High variability of rainfall patterns over time results in broad range of breeding phenology.	Atkinson et al. 2003, Sweet and Sullivan 2005, USFWS 2009b
Hydrological Characteristics and Channel Morphology	Arroyo toads require shallow, slow-moving streams and riparian habitats that are disturbed naturally on a regular basis, primarily by flooding that occurs outside of the breeding season. Stream order, grade, and floodplain width are important for habitat suitability. A stream must be large enough for channel scouring to occur but not so large that habitat structure is lost after floods.	Atkinson et al. 2003, Sweet and Sullivan 2005, USFWS 2009b

Table 4. Critical Uncertainties for Arroyo Toad

Critical Uncertainties for Arroyo Toad
What types of disturbance are problematic?
During what period of life cycle is disturbance most problematic?
What are the best methods for the eradication of bullfrogs and other predators?
What types of habitat restoration within a preserve area can remediate the effects of altered hydrology?
What are best methods to control invasive non-native plants?
What are sources of pollutants or sedimentation in Santa Maria Creek and San Luis Rey River?
Do arroyo toads in Ramona Grasslands test positive for the Chytrid fungus?
What is the best method to restore and maintain suitable vegetation structure for arroyo toads in riparian zone and in grasslands.
How will climate change affect precipitation patterns?
How will change in precipitation patterns affect arroyo toad breeding? Are there refugia or habitat buffers that would mitigate the effects of climate change?
What are best methods to maintain channel characteristics that are favorable for arroyo toad breeding?

Table 5. Potential Management Actions for Arroyo Toad

Potential Management Actions for Arroyo Toad
Restrict cattle or vehicle crossings from creek and riparian zone during breeding season.
Coordinate with the Ramona Municipal Water District to implement bullfrog eradication.
Identify artificial upstream source(s) of flow within the Santa Margarita River and San Luis Rey River and manage as necessary.
Control crayfish, mosquito fish, and sun fish as necessary.
Remove obstructions and clear out culverts as needed to retain stream flow and reduce sedimentation.
Remove and control invasive non-native plants in channel and along stream bank to improve habitat quality.
Monitor water quality and sediment load, especially during breeding season.
Clear vegetation on sandy terraces.
Manage non-breeding toad habitat to ensure and adequately open vegetation community.
Maintain open channel bottom via natural scour patterns.
Remove or thin dense vegetation (native and non-native) in stream channel and along stream bank.

Table 6. Potential Monitoring Actions for Arroyo Toad

Potential Monitoring Actions for Arroyo Toad
Monitor for cattle disturbance in Santa Maria Creek during breeding season.
Inspect roadways within proximity to San Luis Rey River, Santa Maria Creek, and the Santa Margarita River for vehicle mortalities.
Monitor number and local sources of non-native predators that affect arroyo toads.
Monitor hydrologic conditions and channel morphology to ensure appropriate conditions.
Conduct annual surveys to identify areas of invasive non-native plant infestations.
Monitor water quality and sediment load, especially after rains to determine if water quality is affected by urban runoff upstream.
Test arroyo toads in Ramona Grasslands and vicinity for the chytrid fungus.
Qualitatively monitor vegetation along stream channel and in adjacent uplands to ensure vegetation does not become too dense.
When conducting surveys to monitor the arroyo toad population in Santa Maria Creek, take stream gauge readings and measure surface flow velocity (cubic feet per second [cfs]).
Evaluate channel morphology and breeding suitability.

Conceptual Model for Golden Eagle and Bald Eagle

Management Goal	Monitoring Goal
Maintain suitable foraging and nesting habitat to support breeding pairs of golden eagles on Ramona Grasslands County Preserve, Sycamore Canyon/Goodan Ranch County Preserve, Boulder Oaks County Preserve, El Capitan County Preserve, Barnett Ranch County Preserve, Hellhole Canyon County Preserve, Iron Mountain County Preserve, and Simon County Preserve and maintain a breeding pair of bald eagles on Ramona Grasslands County Preserve.	Use baseline information on eagle and raptor foraging to provide a better understanding of species abundance and distribution within Ramona Grasslands County Preserve and Barnett Ranch County Preserve, to inform adaptive management decisions (e.g., trail feasibility, alignments and seasonal closures) and provide a reference point for future studies or assessments pertaining to public use. Evaluate potential threats to the species. Conduct a baseline foraging analysis to understand the foraging habits of golden eagles on Barnett Ranch County Preserve and golden eagles and bald eagles on Ramona Grasslands County Preserve. Continue the Ramona Grasslands County Preserve studies annually to determine foraging success. The Barnett Ranch County Preserve study will not resume until grassland habitat management has been conducted.

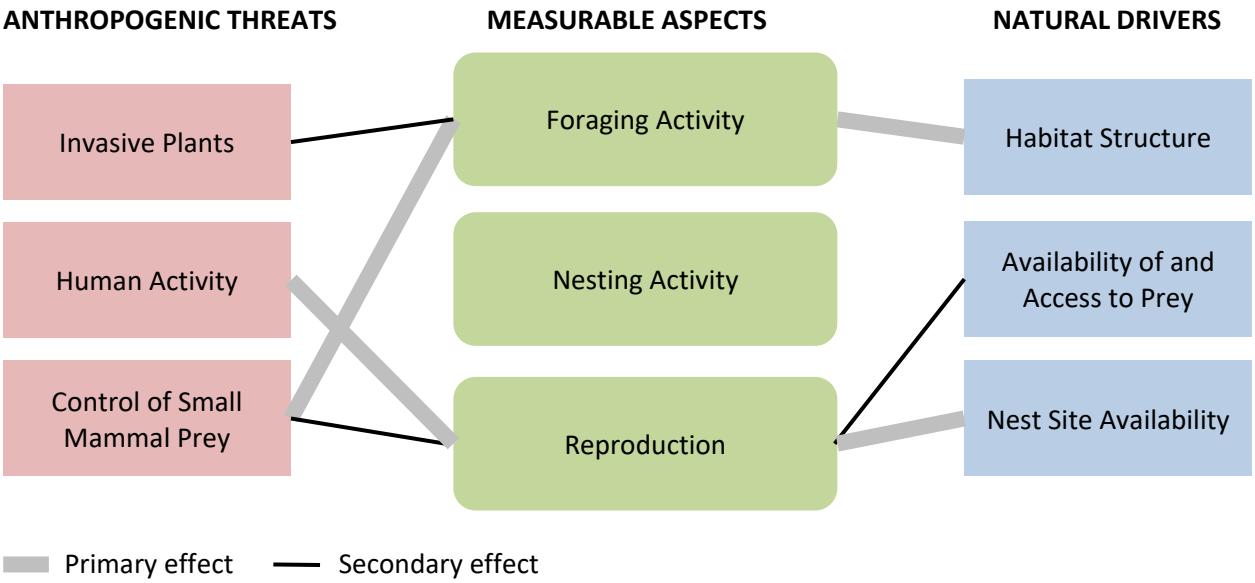


Table 1. Measurable Aspects of Golden Eagle and Bald Eagle

Model Element	Measurable Aspects of Eagles	Citations
Foraging Activity	Occurrence of active foraging behavior in suitable habitat. Frequency of foraging success.	Buehler 2000, Kochert et al. 2002, USFWS 2007, Pagel et al. 2010, J. Estep pers. comm., D. Leslie pers. comm.
Nesting Activity	Nesting area fidelity, pair formation, nesting attempts.	Buehler 2000, Kochert et al. 2002, USFWS 2007, Pagel et al. 2010, J. Estep pers. comm., D. Leslie pers. comm.
Reproduction	Nestling/fledging success. Recruitment into the breeding population.	Buehler 2000, Kochert et al. 2002, USFWS 2007, Pagel et al. 2010, J. Estep pers. comm., D. Leslie pers. comm.

Table 2. Anthropogenic Threats to Golden Eagle and Bald Eagle

Model Element	Natural Drivers of Eagles	Citations
Habitat Structure	Open grasslands and open shrub communities that support small mammals, especially ground squirrels. Perches to enable watching for prey. For bald eagle: open water supporting larger fish (note: this may not apply to Ramona Grasslands as the species may feed exclusively on small mammals at this location; more information is needed.	Buehler 2000, Kochert et al. 2002, USFWS 2007, Pagel et al. 2010, J. Estep pers. comm., D. Leslie pers. comm.
Availability of Prey	Prey numbers sufficient to support golden eagles and bald eagles.	Buehler 2000, Kochert et al. 2002, USFWS 2007, Pagel et al. 2010, J. Estep pers. comm., D. Leslie pers. comm.
Nest Site Availability	Cliffs and larger trees for golden eagles, larger trees for bald eagles.	Buehler 2000, Kochert et al. 2002, USFWS 2007, Pagel et al. 2010, J. Estep pers. comm., D. Leslie pers. comm.

Table 3. Natural Drivers of Golden Eagles and Bald Eagles

Model Element	Anthropogenic Threats to Eagles	Citations
Invasive Plants	Habitat conversions from open grassland to tall, dense habitats that may limit foraging ability.	J. Estep pers. comm.
Human Activity	Recreational and other human activities near nests can cause nest failure. Recreation activities including camping, trail hiking, rock climbing, mountain biking, hunting, OHV use. Other human activities include those associated with human development.	Kochert et al. 2002, Steidl and Anthony 2000, D. Leslie pers comm.
Ground Squirrel Control	Ground squirrel poisoning is practiced on some rangelands and near facilities and infrastructure (e.g., levees, dams). Pesticide residue may also persist in other prey species.	Kochert et al. 2002

Table 4. Critical Uncertainties for Golden Eagles and Bald Eagles

Critical Uncertainties for Eagles
What is the threshold of vegetation composition, height or density that substantially reduces foraging success?
What is an adequate buffer around active nest to avoid disturbance? How do different types of recreational and other activity impact eagle breeding behavior?
What is the prevalence of ground squirrel control in the vicinity of Ramona Grasslands?
What is the relationship between suitable nesting sites and suitable foraging habitat?
How does the amount of prey affect reproduction success?
What is the prey base and location for bald eagle on Ramona Grasslands?

Table 5. Potential Management Actions for Golden Eagles and Bald Eagles

Potential Management Actions for Eagles
Conduct managed grazing so that grass height and density encourages the persistence of ground squirrels.
Maintain a buffer around nests during the breeding season, particularly where golden and bald eagles are unaccustomed to such activity.
Prohibit poisoning of squirrels or other rodents. Work with adjacent land owners to minimize poisoning of ground squirrels.

Table 6. Potential Monitoring Actions for Golden Eagles and Bald Eagles

Potential Monitoring Actions for Eagles
Monitor the effects (e.g., vegetation structure and composition) of grazing, controlled burns, vegetation mowing, tilling and scraping as habitat management tools; test their efficacy in preserve-specific locations.
Monitor active eagle nests to determine if buffers are adequate and are being adhered to.
Monitor ground squirrels and other small mammals for signs of poisoning. If dead animals are found, conduct a necropsy to determine if the cause of death was poisoning.
Monitor eagle foraging activity (behavior and frequency of use) in response to vegetation management and recreational use.
Monitor suitable nest locations during nesting season to determine if eagles are exhibiting nesting behavior.

Conceptual Model for Northern Harrier

Management Goal	Monitoring Goal
Maintain suitable nesting and foraging habitat for northern harrier within the Tijuana River Valley Regional Park and San Luis Rey River Park.	Collect baseline information on northern harriers and their nesting and foraging habitat to provide a better understanding of the species abundance and distribution on the Tijuana River Valley Regional Park and San Luis Rey River Park.

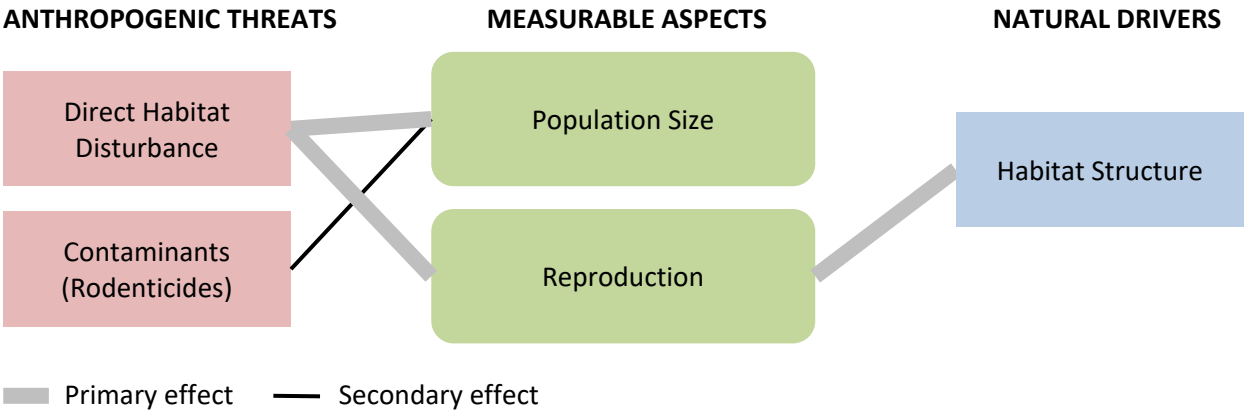


Table 1. Measurable Aspects of Northern Harrier

Model Element	Measurable Aspects of Northern Harrier	Citations
Population Size	Number of individuals or breeding pairs.	CNLM 2002, CNLM 2005, Dechant et al. 2002
Reproduction	Nest success, fledging survivorship, recruitment into the breeding population.	CNLM 2002, CNLM 2005, Dechant et al. 2002

Table 2. Anthropogenic Threats to Northern Harrier

Model Element	Anthropogenic Threats to Northern Harrier	Citations
Direct Habitat Disturbance	Loss of nesting habitat and foraging areas from urbanization as well as direct human disturbance of nest sites.	CNLM 2002, CNLM 2005, Dechant et al. 2002, P. Bloom pers. comm.
Contaminants (Rodenticides)	Secondary poisoning of northern harriers occurs when individuals consume prey killed or sickened by chemicals used to kill rodents. Also results in lower prey abundance.	SDMMP and TNC 2017, P. Bloom pers. comm.

Table 3. Natural Drivers of Northern Harrier

Model Element	Natural Drivers of Northern Harrier	Citations
Habitat Structure	Open habitats characterized by tall, dense vegetation and abundant residual vegetation. Nest mainly in undisturbed wetlands or grasslands.	SDMMP and TNC 2017, Dechant et al. 2002

Table 4. Critical Uncertainties for Northern Harrier

Critical Uncertainties for Northern Harrier
What is an adequate buffer around active nests to avoid disturbance?
How do different types of recreational and other activity impact northern harrier breeding behavior?
Does the harrier demonstrate nest fidelity?
What are the conflicting interests with the harrier population and the least tern colony near the Tijuana River Valley Regional Park (TRVRP)?
What is the prevalence of rodent control in the vicinity of TRVRP and San Luis Rey River Park (SLRRP)?
What is the prey base and foraging location of the harriers on TRVRP and SLRRP?

Table 5. Potential Management Actions for Northern Harrier

Potential Management Actions for Northern Harrier
Manage breeding habitat to support nesting for harriers by reducing habitat and/or nest site disturbance due to human disturbance.
Prohibit poisoning of rodents within TRVRP and SLRRP, including facilities and recreational fields. Work with adjacent land owners to minimize poisoning of rodents.
Maintain a buffer around active nests during the breeding season.

Table 6. Potential Monitoring Actions for Northern Harrier

Potential Monitoring Actions for Northern Harrier
Monitor and document harrier response to different types of human disturbances.
Monitor rodents within TRVRP and SLRRP for signs of poisoning. If dead rodents are found, conduct a necropsy to determine if the cause of death was poisoning.
Monitor and document harrier nest attempts and nest success within TRVRP and SLRRP. Monitor harrier nests to determine if buffers are adequate and are being adhered to.

Conceptual Model for Southwestern Willow Flycatcher

Management Goal	Monitoring Goal
Maintain and enhance suitable habitat for southwestern willow flycatcher (flycatcher) to encourage recolonization of flycatcher breeding pair(s) within the San Luis Rey River Park.	Monitor status of southwestern willow flycatcher population in San Luis Rey River Park and monitor habitat conditions and threats to inform management needs.

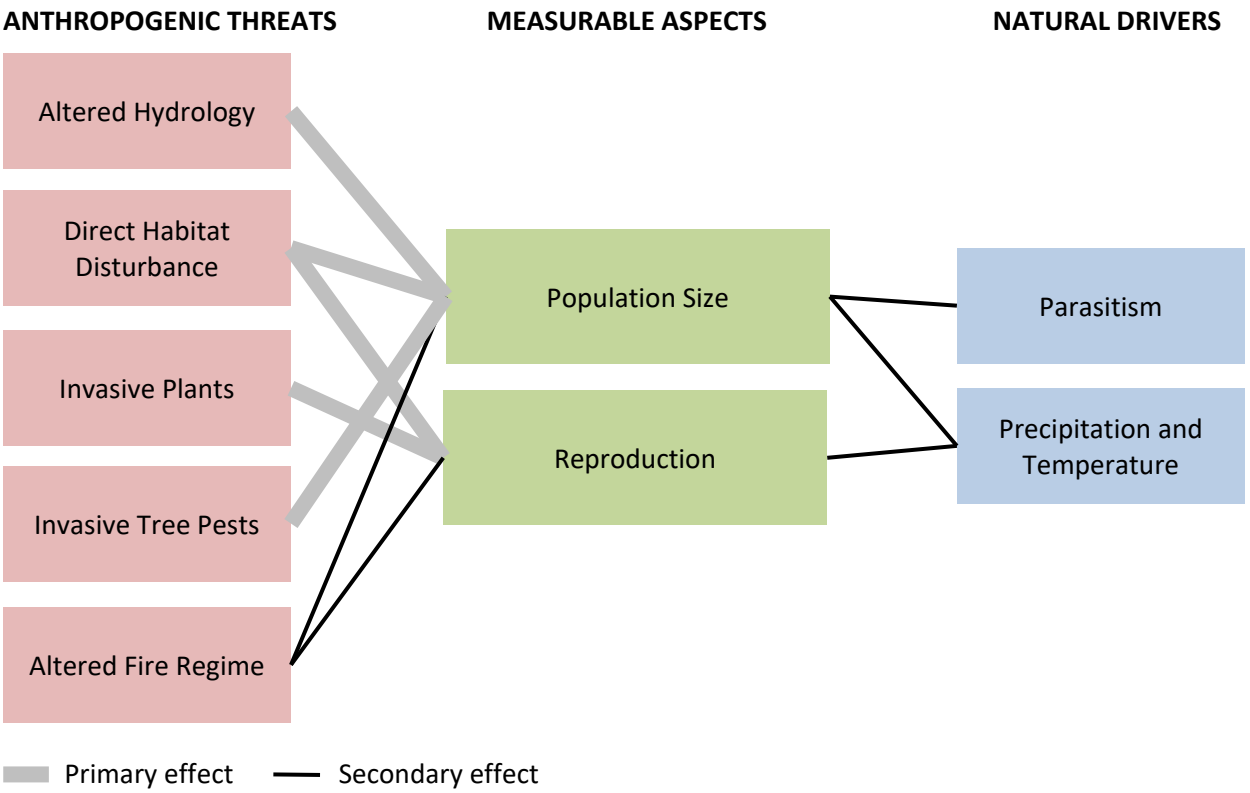


Table 1. Measurable Aspects of Southwestern Willow Flycatcher

Model Element	Measurable Aspects of Southwestern Willow Flycatcher	Citations
Population Size	Number of individuals or territorial pairs	USFWS 2002
Reproduction	Nest success, fledging survivorship	USFWS 2002

Table 2. Anthropogenic Threats to Southwestern Willow Flycatcher

Model Element	Anthropogenic Threats to Southwestern Willow Flycatcher	Citations
Altered Hydrology	Changes in suitable nesting habitat related to hydrological modifications (water diversions, dams, etc.).	USFWS 2002
Direct Habitat Disturbance	Loss of nesting habitat and foraging areas from urbanization as well as direct human disturbance of nest sites.	USFWS 2002
Invasive Plants	Invasive non-native plant species such as giant reed change habitat structure required for breeding flycatchers.	USFWS 2002
Invasive Tree Pests	Goldspotted oak borer (GSOB) and Kuroshio shothole borer (SHB) can alter preferred habitat structure for flycatchers by causing tree mortality.	Howell and Kus 2022
Altered Fire Regime	Flycatcher adults are likely able to escape fire. However, fires can result in the loss of breeding and foraging habitat and degradation by invasive non-native plants.	USFWS 2002

Table 3. Natural Drivers of Southwestern Willow Flycatcher

Model Element	Natural Drivers of Southwestern Willow Flycatcher	Citations
Parasitism	Brown-headed cowbird brood parasitism has been documented to reduce flycatcher nest success.	USFWS 2002
Precipitation and Temperature	Drought causes decreased surface water, which influences food availability.	K. Preston pers. comm.

Table 4. Critical Uncertainties for Southwestern Willow Flycatcher

Critical Uncertainties for Southwestern Willow Flycatcher
What types of habitat restoration within a preserve area can remediate the effects of altered hydrology?
What type of human disturbances are known to impact nesting flycatchers?
What is the threshold of invasive non-native plant cover that starts to negatively impact survival and nest success?
Is cowbird trapping appropriate for the San Luis Rey River Park? How long is it appropriate to continue cowbird trapping activities?
What are the high-risk fire areas that overlap with breeding and foraging habitat?
To what degree is tree loss from GSOB and/or SHB affecting population size?

Table 5. Potential Management Actions for Southwestern Willow Flycatcher

Potential Management Actions for Southwestern Willow Flycatcher
Enhance habitat by promoting seeps, small areas with surface water, during the flycatcher breeding season.
Manage suitable breeding habitat to support nesting for flycatchers by reducing habitat and/or nest site disturbance from human activities.
Remove and control invasive non-native plants in riparian habitat to improve habitat quality. Should flycatchers be detected and *Tamarix* sp. be targeted for removal, replacement native tree or shrub species should be planted to maintain suitable nesting habitat.
If surveys deem that cowbird presence is high enough to affect the flycatcher population in San Luis Rey River Park, set-up, manage, and maintain cowbird trapping activities.
Perform fire prevention and control activities in high-risk areas that overlap with breeding and foraging habitat.
If detected, coordinate with regional monitoring entities to determine appropriate management of the system/habitat which considers all sensitive and invasive non-native plant and faunal species management techniques.
Treat or remove and appropriately dispose of trees severely infested with GSOB and/or SHB as appropriate.
Where and to what extent should habitat enhancement management activities take place?

Table 6. Potential Monitoring Actions for Southwestern Willow Flycatcher

Potential Monitoring Actions for Southwestern Willow Flycatcher
Monitor hydrologic conditions, precipitation, and temperature to confirm appropriate soil and moisture conditions.
Monitor and document flycatcher response to different types of human disturbance.
Conduct surveys to identify areas of invasive non-native plant infestations. Monitor success of invasive non-native plant removal and implement adaptive management as needed.
If detected, establish nest monitoring program to evaluate threat from cowbirds and assess management needs to reduce threats (e.g., cowbird trapping activities).
If detected, monitor flycatcher nesting success to determine breeding and foraging habitat. This data will inform what areas should be managed for fire prevention and control activities.

Conceptual Model for Least Bell's Vireo

Management Goal	Monitoring Goal
Maintain suitable breeding habitat for least Bell's vireo (vireo) and maintain vireo breeding pairs within the Tijuana River Valley Regional Park, San Luis Rey River Park, and Santa Margarita County Preserve.	Monitor status of breeding least Bell's vireo populations in Tijuana River Valley Regional Park, San Luis Rey River Park, and Santa Margarita County Preserve, and monitor habitat conditions and threats to inform management needs.

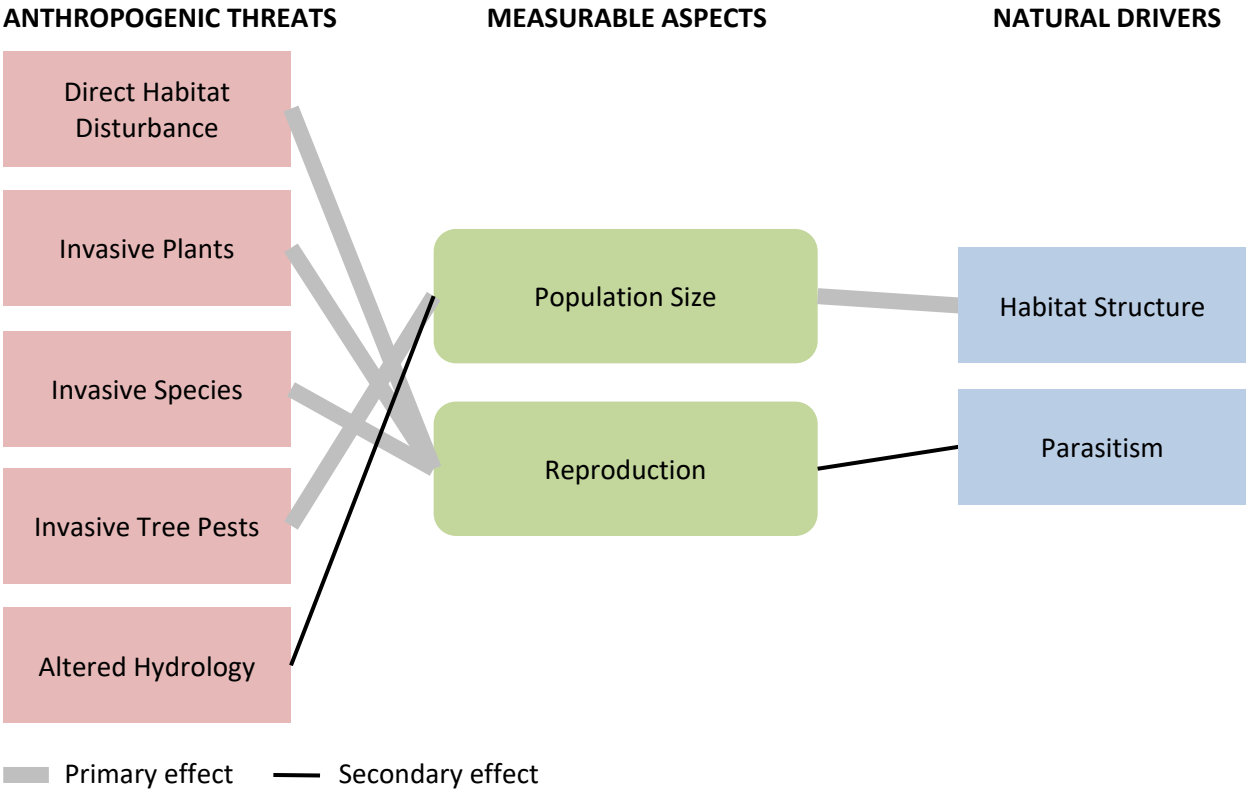


Table 1. Measurable Aspects of Least Bell's Vireo

Model Element	Measurable Aspects of Least Bell's Vireo	Citations
Population Size	Number of individuals or territorial pairs	Peterson et al. 2004, Kus and Whitfield 2005, USFWS 2006
Reproduction	Nest success, fledging survivorship	Peterson et al. 2004, Kus and Whitfield 2005, USFWS 2006

Table 2. Anthropogenic Threats to Least Bell's Vireo

Model Element	Anthropogenic Threats to Least Bell's Vireo	Citations
Direct Habitat Disturbance	Changes to habitat due to human recreation which can lead to higher nest failures and loss of suitable nesting habitat.	Kus and Whitfield 2005, USFWS 2006
Invasive Plants	Invasive non-native plant species such as giant reed and tamarisk change habitat structure required for breeding vireos.	Peterson et al. 2004, USFWS 2006
Invasive Species	Argentine ants can reduce nest success for vireos where habitat is adjacent to urban edges. Kuroshio shothole borer (SHB) and beavers can alter preferred habitat structure for vireos	Peterson et al. 2004, USFWS 2006
Invasive Tree Pests	SHB can alter preferred habitat structure for vireos by causing tree mortality.	Peterson et al. 2004, USFWS 2006
Altered Hydrology	Changes in suitable nesting habitat related to hydrological modifications (water diversions, dams, etc.).	Kus and Whitfield 2005, USFWS 2006

Table 3. Natural Drivers of Least Bell's Vireo

Model Element	Natural Drivers of Least Bell's Vireo	Citations
Habitat Structure	Vireos breed within riparian habitat, preferably willow-dominated woodland. Dense cover from 1-2 meters in height for nesting and foraging and a stratified canopy.	SDMMP and TNC 2017, M. M. Spiegelberg pers. comm.
Parasitism	Brown-headed cowbird brood parasitism has been documented to reduce vireo nest success.	Peterson et al. 2004, USFWS 2006

Table 4. Critical Uncertainties for Least Bell's Vireo

Critical Uncertainties for Least Bell's Vireo
Is cowbird trapping appropriate for the Tijuan River Valley Regional Park (TRVRP), San Luis Rey River Park (SLRRP), and Santa Margarita County Preserve? How long will it be appropriate to continue cowbird trapping activities?
What is an adequate buffer around active territories or nests to deter impacts?
How do different types of recreational and other activities impact vireo suitable habitat?
How often does Argentine ants affect reproduction success in vireos? Is this an issue at the TRVRP and SLRRP?
What is the threshold of invasive non-native plant cover that starts to negatively impact survival and nest success?
How effective will invasive non-native plant species removal be if the species is found throughout the Santa Margarita Watershed?
What are the best methods for SHB eradication?
What types of habitat restoration within a preserve area can remediate the effects of altered hydrology?

Table 5. Potential Management Actions for Least Bell's Vireo

Potential Management Actions for Least Bell's Vireo
Restrict human recreation and agricultural activities around territories or nests during the breeding season.
Remove and control invasive non-native plants in riparian habitat to improve habitat quality.
Implement an Argentine ant eradication program at active recreational areas.
SHB should be confirmed prior to management actions at SLRRP and Santa Margarita County Preserve (it is confirmed at TRVRP). Treat or remove and appropriately dispose of trees severely infested with GSOB and SHB as appropriate.
Reduce high water flow through riparian areas to keep canopy levels low and understory thick.
If removing vegetation, ensure there is continuous understory for suitable nesting and foraging habitat for vireo.
If surveys deem that cowbird presence is high enough to affect the vireo population in TRVRP, SLRRP, and Santa Margarita Preserve, set-up, manage, and maintain cowbird trapping activities.

Table 6. Potential Monitoring Actions for Least Bell's Vireo

Potential Monitoring Actions for Least Bell's Vireo
Monitor for human disturbance in the Santa Margarita County Preserve, SLRRP, and TRVRP.
Conduct surveys to identify areas of invasive non-native plant infestations. Implement measures to remove invasive non-native plants.
Monitor riparian habitat for Argentine ants, assess response of ant eradication by monitoring vireo nest success
Conduct presence/absence surveys for SHB in riparian habitat using sticky traps appropriate for SHB.
Monitor hydrologic conditions to ensure appropriate water levels for preferred vireo habitat structure (thick understory & stratified canopy).
Conduct surveys to identify habitat suitability and if management such as invasive non-native plant removal or invasive animal/pest species control needs to be implemented.
Monitor vireo nesting success to assess cowbird parasitism rates and the efficacy of trapping and other management actions.

Conceptual Model for Pallid Bat

Management Goal	Monitoring Goal
Protect pallid bat roosts from destruction and human disturbance and maintain suitable foraging habitat (e.g., open, uncluttered vegetation) within commuting distance of pallid bat roosts within the San Luis Rey River Park, Bottle Peak County Preserve, Hellhole Canyon County Preserve, Mount Olympus County Preserve, and Wilderness Gardens County Preserve.	Conduct surveys to monitor the status of pallid bat occupancy and roosting and foraging habitat within San Luis Rey River Park, Bottle Peak County Preserve, Hellhole Canyon County Preserve, Mount Olympus County Preserve, and Wilderness Gardens County Preserve to document current distribution and threat data to inform management needs.

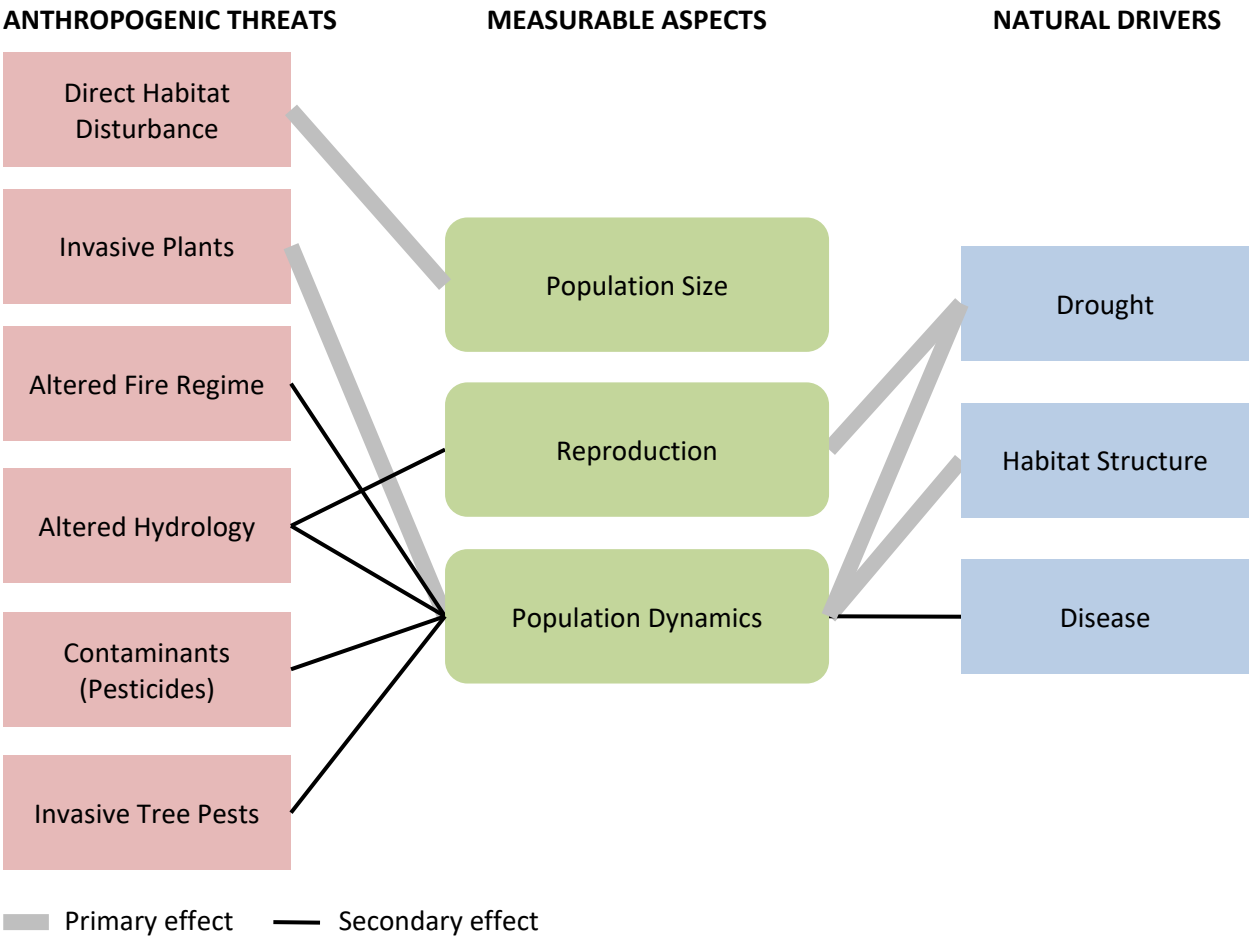


Table 1. Measurable Aspects of Pallid Bat

Model Element	Measurable Aspects of Pallid Bat	Citations
Population Dynamics	Counts, acoustic activity measurements, skin swabs for white-nose syndrome, blood withdrawal for pesticide measurements.	Rochester et al. 2010, SDMMP and TNC 2017, D. Stokes pers. comm, WNS 2022
Reproduction	Capture and examination to determine sex and reproductive status	Rochester et al. 2010, SDMMP and TNC 2017, D. Stokes pers. comm.

Table 2. Anthropogenic Threats to Pallid Bat

Model Element	Anthropogenic Threats to Pallid Bat	Citations
Direct Habitat Disturbance	Highly sensitive to human disturbance, including recreational activities within caves and on rock faces.	Rochester et al. 2010, SDMMP and TNC 2017, D. Stokes pers. comm.
Invasive Plants	Invasive non-native plants alter vegetation structure, which affects foraging success.	D. Stokes pers. comm., OWI 2016
Altered Fire Regime	Long-term fires can destroy roosting sites and damage foraging habitat	SDMMP and TNC 2017
Altered Hydrology	Limited supply of water can affect survival, especially of lactating females.	D. Stokes pers. comm., OWI 2016, SDMMP and TNC 2017, Taylor 2007, SDNHM 2018
Contaminants (Pesticides)	Absorption of pesticides through the skin or ingestion of poisoned prey may result in harm.	SDMMP and TNC 2017, Ferguson and Azerrad 2004
Invasive Tree Pests	Goldspotted oak borer (GSOB) and shot hole borer (SHB) can alter oak woodland habitat (foraging habitat).	D. Stokes pers. comm., OWI 2016, UC IPM 2013, UC IPM 2017

Table 3. Natural Drivers of Pallid Bat

Model Element	Natural Drivers of Pallid Bat	Citations
Drought	Limited supply of water can result in mortality, especially of lactating females.	D. Stokes pers. comm., OWI 2016, SDMMP and TNC 2017, Taylor 2007, SDNHM 2018b
Habitat Structure	Temperature ranges and proximity to foraging habitat affect locations and suitability of roosts, foraging habitat must be conducive to locating prey.	SDMMP and TNC 2017, OWI 2016, CDFW 2016
Disease	White-nose syndrome, which is prevalent in eastern US and has spread to Washington, can result in mortality of other bat species and has potential to affect this species.	D. Stokes pers. comm., WNS 2022, BCI 2024

Table 4. Critical Uncertainties for Pallid Bat

Critical Uncertainties for Pallid Bat
What is an appropriate buffer around human disturbance to limit negative effects on pallid bats?
To what extent does quantity of invasive non-native plants in vegetation communities affect foraging behavior? To what extent does it affect foraging success?
Where do high risk fire areas in San Diego County overlap with roosting and foraging habitat?
Are there sufficient open water sources that support pallid bat populations (especially lactating females)? What types of habitat restoration within a preserve area can remediate the effects of altered hydrology on open water drinking areas for bats?
Is absorption and/or biomagnification of pesticides occurring in pallid bats? If so, how does it affect their survival?
Can GSOB and SHB effectively be prevented from invading foraging and roosting areas?
What amount of open water is required to sustain a pallid bat population?
What is an appropriate number of roosts and in what locations should they be to support the population size and necessary roost diversity of the current pallid bat population?
Is white-nose syndrome a threat in San Diego County?

Table 5. Potential Management Actions for Pallid Bat

Potential Management Actions for Pallid Bat
Prohibit recreational activities and other human disturbances in roosting areas.
Implement invasive non-native plant control in oak woodlands and along channels in riparian habitat.
Perform fire prevention and control activities in high risk areas that overlap with roosting and foraging habitat.
Remove obstructions from culverts as needed to retain existing water flow into open water areas and maintain a sufficient "swoop zone." Provide supplemental open water resources in areas impacted by altered hydrology.
Limit the use of pesticides within pallid bat roosting and foraging habitat.
GSOB or SHB should be confirmed prior to management actions. Treat or remove and appropriately dispose of trees severely infested with GSOB and SHB as appropriate.
Avoid disturbance/alteration of natural water sources used by bats and provide supplemental water sources for bat use near roosts where natural water sources appear limited.
Preserve and limit human disturbance at known roost locations. Construct artificial roosts in different temperature ranges within preserve areas. Avoid the use of corrugated culvert gates.
To prevent the potential spread of white-nose syndrome, prevent human presence in caves or other areas where pallid bats are known to roost or hibernate. County staff should clean shoes and gear before entering caves or other roost and hibernation areas.

Table 6. Potential Monitoring Actions for Pallid Bat

Potential Monitoring Actions for Pallid Bat
Patrol potential roosting habitat for signs of human disturbance.
Conduct surveys to identify areas of invasive non-native plant infestations. Implement measures to remove invasive non-native plants.
Monitor bat activity (via acoustic measurements) to determine utilized roost and foraging habitat. This data will inform what areas should be managed for fire prevention and control activities.
Monitor open water areas and surrounding hydrologic conditions to ensure conditions are appropriate. Monitor bat use (via acoustic activity) of supplemental water sources to determine whether they are being utilized.
If a dead bat is found, extract blood to determine presence of pesticides.
Conduct presence/absence surveys for GSOB and SHB in oak woodlands and riparian habitats using sticky traps appropriate for GSOB and SHB.
Conduct surveys to determine available open water sources near known bat roosts. Monitor bat use (via acoustic activity) of supplemental water sources to determine whether they are being utilized.
Monitor bat activity (via acoustic measurements) to determine utilized roosting areas and conduct surveys to determine optimal new artificial roost locations.
If white-nose syndrome is reported nearby, capture individuals to perform a skin swab to check for the presence of the white-nose syndrome fungus.

Conceptual Model for Townsend's Big-Eared Bat

Management Goal	Monitoring Goal
Protect Townsend's big-eared bat roosts from destruction and human disturbance and maintain suitable foraging habitat (e.g., extensive riparian and oak woodland habitat with near-perennial open water sources) within commuting distance of Townsend's big-eared bat roosts within San Luis Rey River Park, Hellhole Canyon County Preserve, and Wilderness Gardens County Preserve.	Conduct surveys to monitor the status of Townsend's big-eared bat occupancy and roosting and foraging habitat within San Luis Rey River Park, Hellhole Canyon County Preserve, and Wilderness Gardens County Preserve to track distribution and threat data to inform management needs.

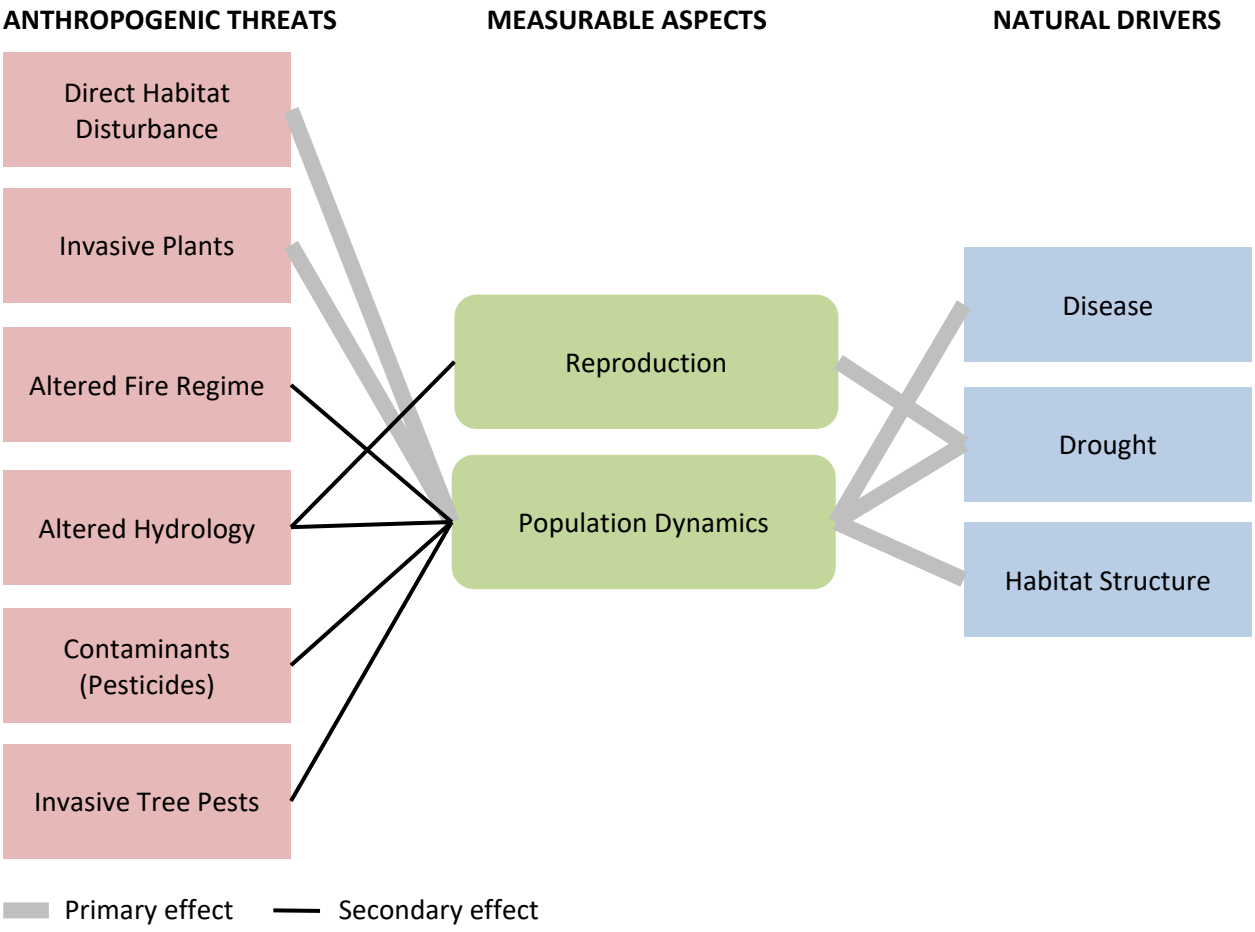


Table 1. Measurable Aspects of Townsend's Big-Eared Bat

Model Element	Measurable Aspects of Townsend's Big-Eared Bat	Citations
Population Dynamics	Counts, acoustic activity measurements, skin swabs for white-nose syndrome, blood withdrawal for pesticide measurements.	Stokes et al. 2005, SDMMP and TNC 2017, D. Stokes pers. comm.
Reproduction	Capture and examination to determine sex and reproductive status.	Stokes et al. 2005, SDMMP and TNC 2017, D. Stokes pers. comm.

Table 2. Anthropogenic Threats to Townsend's Big-Eared Bat

Model Element	Anthropogenic Threats to Townsend's Big-Eared Bat	Citations
Direct Habitat Disturbance	Highly sensitive to human disturbance, including recreational activities within caves and on rock faces.	Stokes et al. 2005, D. Stokes pers. comm.
Invasive Plants	Invasive non-native plants alter vegetation structure, which affects foraging success.	D. Stokes pers. comm., SDNHM 2018
Altered Fire Regime	Long-term fires can destroy roosting sites and damage foraging habitat.	SDMMP and TNC 2017
Altered Hydrology	Limited supply of water can affect survival, especially of lactating females.	D. Stokes pers. comm., SDMMP and TNC 2017, Taylor 2007, SDNHM 2018
Contaminants (Pesticides)	Absorption of pesticides through the skin or ingestion of poisoned prey may result in harm.	SDMMP and TNC 2017, SDNHM 2018
Invasive Tree Pests	Goldspotted oak borer (GSOB) and shot hole borer (SHB) can alter oak woodland habitat (foraging habitat).	D. Stokes pers. comm.

Table 3. Natural Drivers of Townsend's Big-Eared Bat

Model Element	Natural Drivers of Townsend's Big-Eared Bat	Citations
Disease	White-nose syndrome.	D. Stokes pers. comm., WNS 2022, BCI 2024, CDFW 2016
Drought	Limited supply of water can affect survival, especially of lactating females.	D. Stokes pers. comm., SDMMP and TNC 2017, Taylor 2007, SDNHM 2018
Habitat Structure	Temperature ranges, roost proximity to foraging habitat.	SDMMP and TNC 2017, CDFW 2016

Table 4. Critical Uncertainties for Townsend's Big-Eared Bat

Critical Uncertainties for Townsend's Big-Eared Bat
What is an appropriate buffer around human disturbance to limit negative effects on Townsend's big-eared bats?
To what extent does quantity of invasive non-native plants within vegetation communities affect foraging behavior? To what extent does it affect foraging success?
Where do high risk fire areas overlap with roosting and foraging habitat?
Are there sufficient open water sources that support Townsend's big-eared bat populations (especially lactating females)? What types of habitat restoration within a preserve area can remediate the effects of altered hydrology on open water drinking areas for bats?
Is absorption and/or biomagnification of pesticides occurring in Townsend's big-eared bats? If so, how does it affect their survival?
Can GSOB and SHB effectively be prevented from invading foraging and roosting areas?
Is white-nose syndrome a threat to Townsend's big-eared bats in San Diego County?
What amount of open water is required to sustain a Townsend's big-eared bat population?
What is an appropriate number of roosts and in what locations should they be to support the population size and necessary roost diversity of the current Townsend's big-eared bat population?

Table 5. Potential Management Actions for Townsend's Big-Eared Bat

Potential Management Actions for Townsend's Big-Eared Bat
Prohibit recreational activities and other human disturbances in roosting areas.
Implement invasive non-native plant control in oak woodlands and along channels in riparian habitat.
Perform fire prevention and control activities in high risk areas that overlap with roosting and foraging habitat.
Remove obstructions from culverts as needed to retain existing water flow into open water areas and maintain a sufficient "swoop zone." Provide supplemental open water resources in areas impacted by altered hydrology.
Limit the use of pesticides within Townsend's big-eared bat roosting habitat and foraging habitat.
GSOB and SHB should be confirmed prior to management actions. Treat or remove and appropriately dispose of trees severely infested with GSOB and SHB as appropriate.
To prevent the potential spread of white-nose syndrome, prevent human presence in areas where Townsend's big-eared bats are known to roost or hibernate (e.g. mines, caves, and/or tunnels). County staff should clean shoes and gear before entering caves or other roost and hibernation areas.
Provide supplemental water sources for bat use near roosts where natural water sources appear limited in the summer and early fall during drought conditions. Monitor bat use (via acoustic activity) of supplemental water sources to determine whether they are being utilized.
Preserve known roost locations and limit human disturbance at known roost locations. Avoid the use of corrugated culvert gates.

Table 6. Potential Monitoring Actions for Townsend’s Big-Eared Bat

Potential Monitoring Actions for Townsend's Big-Eared Bat
Patrol potential roosting habitat for signs of human disturbance.
Conduct surveys to identify areas of invasive non-native plant infestations. Implement measures to remove invasive non-native plants.
Monitor bat activity (via acoustic measurements) to determine utilized roost and foraging habitat. This data will inform what areas should be managed for fire prevention and control activities.
Avoid disturbance/alteration of open water areas with known or potential use by the Townsend's big-eared bat. Monitor open water in known foraging areas of Townsend's big-eared bat to ensure they have not become obstructed with vegetation such that an aquatic insect community is no longer supported and/or drinking is no longer possible for Townsend's big-eared bat.
If a dead bat is found, extract blood to determine presence of pesticides.
Conduct presence/absence surveys for GSOB and SHB in oak woodlands and riparian habitats using sticky traps appropriate for GSOB and SHB.
If white-nose syndrome is reported nearby, capture individuals to perform a skin swab to check for the presence of the white-nose syndrome fungus.
Conduct surveys to determine available open water sources near known bat roosts. Monitor bat use (via acoustic activity) of supplemental water sources to determine whether they are being utilized.
Monitor bat activity (via acoustic measurements) to determine utilized roost areas and conduct surveys to determine optimal new artificial roost locations.

Conceptual Model for Stephens' Kangaroo Rat

Management Goal	Monitoring Goal
Ensure the persistence of Stephens' kangaroo rat (SKR) by maintaining and enhancing 900 acres of habitat at Ramona Grasslands County Preserve and 45 acres of habitat at Hellhole Canyon County Preserve through grazing, targeted mowing, and/or invasive non-native plant treatment.	Monitor grassland vegetation on Ramona Grasslands County Preserve to ensure that the grazing program is maintaining the habitat in suitable condition to support populations of Stephens' kangaroo rat. Monitor habitat conditions at Hellhole Canyon County Preserve to ensure habitat suitability persists. Document the status of Stephens' kangaroo rat and potential threats to determine if the threats are negatively affecting Stephens' kangaroo rat.

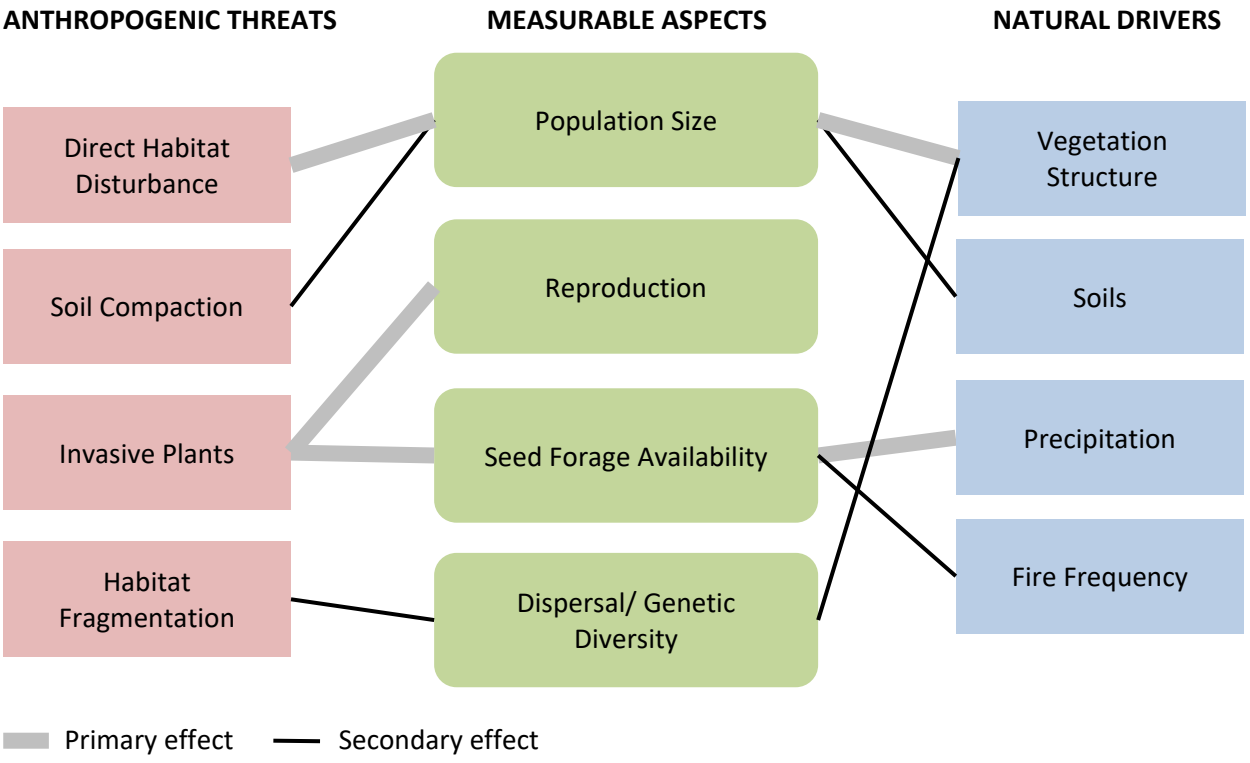


Table 1. Measurable Aspects of Stephens' Kangaroo Rat

Model Element	Measurable Aspects of Stephen's Kangaroo Rat	Citations
Population Size	The number and density of individuals. Includes fluctuations of population size in relation to variability in seed production.	Brehme et al. 2006, Brehme et al. 2016, USFWS 2011b
Reproduction	Adult fecundity, mate availability, production of fertile offspring.	Brehme et al. 2006, Brehme et al. 2016, USFWS 2011b
Seed Forage Availability	Abundance and accessibility of seeds on the ground and in caches. Seeds from native and non-native plants used as source of food and water.	Brehme et al. 2006, Brehme et al. 2016, USFWS 2011b
Dispersal/Genetic Diversity	Dispersal of individuals, recolonization of suitable habitat, genetic isolation due to fragmentation of habitat.	Brehme et al. 2005, Brehme et al. 2016, USFWS 2011b

Table 2. Anthropogenic Threats to Stephens' Kangaroo Rat

Model Element	Anthropogenic Threats to Stephen's Kangaroo Rats	Citations
Direct Habitat Disturbance	OHV use, off trail hiking and mountain biking.	Brehme et al. 2006, Brehme et al. 2016, USFWS 2011b
Soil Compaction	Excessive soil compaction as a result of OHV use.	Brehme et al. 2006, Brehme et al. 2016, USFWS 2011b
Invasive Plants	Invasive non-native grasses and herbaceous vegetation that have taller and more dense structure.	Brehme et al. 2006, Brehme et al. 2016, USFWS 2011b

Table 3. Natural Drivers of Stephens' Kangaroo Rat

Model Element	Natural Drivers of Stephen's Kangaroo Rats	Citations
Vegetation Structure	Open grasslands with minimal shrub cover. Bipedal locomotion requires open habitats on gentle slopes for efficient movement and foraging.	Brehme et al. 2006, Brehme et al. 2016, USFWS 2011b
Soils	Stable, friable soils promote burrowing by fossorial mammals.	Brehme et al. 2006, Brehme et al. 2016, USFWS 2011b
Precipitation	Amount of rain seasonally or over time. Drought years result in low seed production. Conversely, high seed production from high rainfall years may also increase plant growth resulting in reduced foraging efficiency.	Brehme et al. 2006, Brehme et al. 2016, USFWS 2011b
Fire	Fires burn off above-ground biomass, including seed forage.	Brehme et al. 2006, Brehme et al. 2016, USFWS 2011b

Table 4. Critical Uncertainties for Stephens' Kangaroo Rat

Critical Uncertainties for Stephen's Kangaroo Rat
How does direct habitat disturbance at Ramona Grasslands County Preserve affect the local population?
Does compaction from overgrazing by cattle grazing at Ramona Grasslands County Preserve negatively affect SKR populations by compacting soils?
How is the use of grazing for invasive non-native plant species control at Ramona Grasslands County Preserve balanced by the opening of habitat by grazing?
How does off-road use by the public affect local populations of SKR?
What is the threshold of vegetation cover tolerated by SKR? What is the minimum amount of bare ground required?
What types and at what density do weeds outcompete native seed-producing plants used for forage?
What types and at what density do weeds outcompete native seed-producing plants used for forage?
What is the vegetation structure of the grasslands at Ramona Grasslands and Hellhole Canyon County Preserves?
What are the best ways to maintain open grassland structure?
What soils/habitat would be available to SKR if vegetative biomass was removed?
How will climate change affect precipitation patterns?
How will changes in precipitation patterns affect habitat and seed availability for SKR?
What is the minimum fire interval required to maintain sufficient seed resources for foraging?

Table 5. Potential Management Actions for Stephens' Kangaroo Rat

Potential Management Actions for Stephens' Kangaroo Rat
Prevent OHV use.
Close or reroute trails in occupied SKR habitat.
Educate public to only walk or mountain bike on designated trails.
Prepare and implement a grazing plan specific to SKR to prevent overgrazing at Ramona Grasslands County Preserve.
Use managed grazing and fencing to move cattle in and out of occupied habitat at Ramona Grasslands County Preserve.
Control the accumulation of above-ground biomass by implementing vegetation management actions (e.g., managed grazing and controlled burns [for initial clearing only]).
Conduct weed abatement targeting species that outcompete native seed producers.
Protect the habitat against fires.

Table 6. Potential Monitoring Actions for Stephens' Kangaroo Rat

Potential Monitoring Actions for Stephens' Kangaroo Rat
Patrol to look for signs of OHV use and off-trail hiking or biking.
Monitor populations in areas with grazing at Ramona Grasslands County Preserve.
Investigate effects of grazing, controlled burns, and vegetation mowing as habitat management tools, and monitor the response of SKR.
Investigate effects of grazing, controlled burns, and vegetation mowing as habitat management tools and which test their efficacy in site-specific locations.
Monitor soil conditions (e.g., level of compaction) in areas with grazing at Ramona Grasslands County Preserve.
Monitor seed bank and availability of seeds after a fire.

Appendix D

Summary of Resource Management Plan (RMP) Management Directives

Summary of Management Directives in Preserve Specific Resource Management Plans

* Note that some of the numbering is slightly different among the RMPs because non-relevant ASMDs are not included in some RMPs

Directive	Resource	Description
A.1 Conduct habitat monitoring to ensure MSCP goals and DPR objectives are met (Priority 1)		
A.1.1	habitat-general	DPR will conduct habitat monitoring at five-year intervals. On-going monitoring within the Preserve will identify any adverse changes in vegetation community distribution and habitat quality, such as changes from fire, invasion by non-natives or decline of existing species, and indicate if modifications to current management actions are needed. More frequent monitoring may be required following a significant fire within the Preserve. The main product of this monitoring will be a report that will include a discussion of monitoring objectives, monitoring methods to meet those objectives, and an updated vegetation community map.
A.1.2	wildlife and rare plants-general	DPR will conduct general wildlife and rare plant surveys at five-year intervals utilizing and refining baseline monitoring methods to facilitate trend and distribution status analysis. This information will be included in the monitoring report.
A.1.3	invasive species	DPR will conduct monitoring for invasive plant species at five-year intervals to assess invasion or re-invasion by invasive, nonnative plants within the Preserve. These surveys will focus on areas where invasive, non-native plants have been detected in the past, but also look for new occurrences in the Preserve. This information will be included in the monitoring report.
A.2 Meet the corridor monitoring requirements of the MSCP (Priority 2)		
A.2.1	movement corridors	DPR will conduct corridor monitoring at five-year intervals in conjunction with habitat monitoring, and general wildlife and rare plant surveys (see implementation measures A.1.1 and A.1.2). The scope of monitoring will be sufficient to determine if corridors are being utilized, but not to determine the extent of use (i.e., how many individuals of any given species use a corridor). The results of the assessment of habitat linkage function, including a list of species detected, will be included in the monitoring report.
A.3 Comply with applicable conditions of coverage for South County MSCP Covered Species and/or provide management and monitoring of North County MSCP Covered Species (Priority 1)		
A.3.1	species-specific	Each RMP details the species-specific implementation measures for MSCP-covered species for a given preserve. Species-specific management and monitoring actions and protocols in the CMP supersede those described in the individual RMPs for priority species (i.e., those included in the CMP), as the CMP is based on more current species information, methods developed using the best available science, and regional goals.
A.4 Provide management and monitoring of other sensitive species listed on the County's Sensitive Plant List (Lists A and B) (Priority 1)		
A.4.1	species-specific	DPR will conduct surveys of County List A and List B plant species, not covered by the MSCP, within the Preserve. Surveys will document the locations of species populations, and quantify the number of individuals and/or the acreage of these populations. These surveys will be conducted at five-year intervals in conjunction with habitat monitoring.
A.5 Reduce, control, or eradicate invasive non-native fauna known to be detrimental to native species or local ecosystem (Priority 2)		
A.5.1	invasive fauna	DPR will conduct surveys for the presence of invasive, non-native wildlife species of management concern, including cowbirds and European starlings as well as Argentine ants, at five-year intervals in conjunction with habitat monitoring and general wildlife surveys (see A.1.1 and A.1.2). Subsequent surveys will document and monitor the extent of cowbird parasitism on target species nests, if any, in the Preserve.
A.5.2	invasive fauna	If future monitoring indicates that cowbird parasitism is occurring within the Preserve and having a detrimental effect on native bird species, DPR will consider establishing a cowbird trapping program to increase the nesting success of target species.
A.5.3	invasive fauna	On a case-by-case basis, some limited trapping of non-native predators may be necessary at strategic locations, and where determined feasible to protect ground- and shrub-nesting birds, lizards, and other sensitive species from excessive predation. If implemented, the program would only be on a temporary basis and where significant problem has been identified and therefore needed to maintain balance of wildlife in the Preserve and the MSCP preserve system. The program would be operated in a humane manner, providing adequate shade and water, and checking all traps twice daily. Signage at access points and noticing of adjacent residents will inform people that trapping occurs, and how to retrieve and contain their pets.
A.5.4	invasive fauna	Institute an equestrian education program regarding the potential negative impacts to native ecosystems from the accumulation of non-point source pollutants (e.g., increased potential for occurrence of cowbirds) in staging areas and on frequently used trails. This could be accomplished through implementation of a signage program and interaction between rangers and trail users. See also implementation measure B.3.2.
A.5.5	invasive fauna	Provide materials for clean up by equestrian users of staging areas to keep it free of non-point source pollutants that may attract cowbirds or other invasive, non-native species. See also implementation measure B.3.3.
A.6 Allow for future research opportunities within the preserve (Priority 2)		
A.6.1	research	DPR will accept and review proposals for scientific research, monitoring, and habitat restoration and enhancement activities, which are permitted within the MSCP Preserve. Proposed research activities will be subject to approval by DPR. All such activities must obtain any necessary permits and shall be consistent with this RMP. Additionally, any person conducting research of any kind within the Preserve shall obtain a Right-of-Entry Permit from DPR, which will outline the precautions to be taken to preserve and protect sensitive biological and cultural resources within the Preserve, and require the results of any research be made available to DPR.
B.1 Restore degraded habitats to protect and enhance populations of rare and sensitive species through stabilization of eroded lands and strategic revegetation (Priority 2)		
B.1.1	restoration	DPR will implement passive restoration methods (e.g., perform weed and erosion control) in proposed passive restoration areas. Since the process of recruitment and establishment of native plant species has already begun, no soil disturbance (e.g., ripping, tilling, grading) or other soil preparation is recommended. Passive restoration areas will be maintained weed free, as feasible, to allow native recruitment to continue until these areas are reincorporated back into the surrounding southern mixed chaparral. Should natural recruitment slow or stop over time, DPR will consider incorporation of active restoration in these areas including seed application or installation of container plants.
B.1.2	restoration	DPR will implement active restoration methods (e.g., soil preparation, seed application and installation of container plants) in proposed active restoration areas. Any plant materials will be native species from San Diego County, preferably originating within 25 miles of the Preserve. Quantities, rates and composition of seed mixes or planting palettes will be determined on an individual basis, based on the existing plant composition surrounding the restoration sites.

Summary of Management Directives in Preserve Specific Resource Management Plans

* Note that some of the numbering is slightly different among the RMPs because non-relevant ASMDs are not included in some RMPs

Directive	Resource	Description
B.2 Reduce, control, or eradicate non-native flora known to be detrimental to native species and local ecosystem (Priority 1)		
B.2.1	invasive plants	DPR park rangers will routinely pull weeds or remove any invasive, non-native plant species in early stages of growth observed along trails or access roads.
B.2.2	invasive plants	DPR will coordinate with other agencies, non-profit organizations, and/or volunteer groups in order to seek funding and implement invasive, non-native plant removal projects within the Preserve. Precedence will be given to those species identified as high priority, followed by moderate and then low priority species. See also B.4.5.
B.3 Manage and minimize the expansion of invasive, non-native flora within the Preserve (Priority 2)		
B.3.1	invasive plants	DPR will implement an educational program for Preserve visitors and adjacent residents in order to discourage introduction of invasive, non-native plants into the Preserve. Provided information will discuss invasive plants harmful to the Preserve, and prevention methods. The program may also encourage residents to voluntarily remove invasive, non-native plants from their landscaping. See also D.8.1.
B.3.2	invasive plants	DPR will institute an equestrian education program regarding the potential negative impacts to native ecosystems from the accumulation of non-point source pollutants (e.g., spread of non-native seeds) in staging areas and on frequently used trails. This could be accomplished through implementation of a signage program and interaction between rangers and trail users. Specific signage should state, "Don't Plant a Pest! Feeding horses weed free feed for at least 72 hours prior to Preserve entry helps preserve our natural environment". See also implementation measure A.4.4.
B.3.3	invasive plants	DPR will provide materials for clean up by equestrian users of staging areas to keep it free of non-point source pollutants that may attract cowbirds or other invasive, non-native species. See also implementation measure A.4.5.
B.4 Provide for fire management activities that are sensitive to natural and cultural resources (Priority 1)		
B.4.1	fire management	Park ranger staff will maintain, and extend where necessary, the established fuel modification zones on Preserve property adjacent to the existing residential structures within 100 feet of the Preserve boundary. Management of the fuel modification zone and defensible space will adhere to CAL FIRE and local fire district requirements.
B.4.2	fire management	Park ranger staff will install and maintain inconspicuous fuel modification extent markers for all fuel modification zones to minimize additional thinning outside the intended areas and protect adjacent sensitive resources.
B.4.3	fire management	Park ranger staff will maintain designated multi-use trails that serves as an access road, as needed, to remove fuels and maintain a 10- to 20-foot-wide travel surface in order to facilitate emergency response and access. See also C.5.1.
B.4.4	fire management	Park ranger staff will coordinate with SDG&E to conduct fuel reduction (especially non-native trees) beneath the high voltage electrical transmission lines that cross the Preserve, and along utility line access roads to reduce the likelihood of ignitions and fire spread.
B.4.5	fire management	DPR will coordinate with other agencies, non-profit organizations, and/or volunteer groups in order to seek funding and implement non-native, invasive plant removal projects for priority species that pose fire hazards within the Preserve. See also B.2.2.
B.4.6	fire management	DPR will continue to coordinate with CAL FIRE and local fire departments to ensure that the fire response and implementation measures outlined in the RMPs and Vegetation Management Plans (if applicable) are up-to-date and adequate for effective fire response within the Preserve. As part of this effort, DPR will review fire history maps at least once every 10 years to determine if Preserve lands are within natural fire return intervals and for estimation of fuel age class.
C.1 Limit types of public uses to those appropriate for the Preserve (Priority 1)		
C.1.1	public use	Park ranger staff will enforce the prohibited public uses and restrictions within the Preserve. Park rangers may call the sheriff for legal enforcement, as appropriate.
C.1.2	public use	Park ranger staff will ensure that prohibited uses are clearly specified on kiosks, signage and/or trail maps.
C.2 Manage public access in sensitive biological and cultural resource areas within the Preserve (Priority 1)		
C.2.1	public use	DPR has identified and mapped sensitive vegetation communities, plant and wildlife species, and cultural sites in the Preserve so that these areas can be avoided and/or monitored. Updated information on sensitive resources in relation to public access areas will be obtained in conjunction with routine monitoring activities (see A.1.1 and A.1.2).
C.2.2	public use	DPR will provide sufficient signage to clearly identify public access areas within the Preserve. In areas where adverse effects to sensitive resources are observed, DPR will implement measures to restrict public access in order to protect highly sensitive areas. Measures may include barriers such as vegetation, rocks/boulders or fencing. The appropriate types of barriers to be used will be determined based on location, setting and use.
C.3 Provide interpretive and educational materials (Priority 2)		
C.3.1	public use	DPR will share outreach and educational information, and notify the public of volunteer opportunities that advance the management, monitoring, and stewardship resources available, and objectives of this RMP. This information will be provided on the DPR website, www.sdparks.org.
C.3.2	public use	DPR will identify opportunities for educational trail-side signage and educational kiosks within the Preserve. In addition, signage provided at access points and on trails maps provides a form of education. The use of signs that attract attention to sensitive species or cultural resources will be limited so as to not invite disturbance. See also E.2.3 and E.3.1.
C.4 Analyze any future proposed public access such that recreational use of the Preserve is consistent with the protection and enhancement of biological and cultural resources (Priority 2)		
C.4.1	public use	If, in the future, it is decided to open additional areas of the Preserve to the public, DPR will develop a comprehensive Public Access Plan to determine the appropriate level of public access and recreational use within the Preserve, and provide recommendations for preferred trail alignments and features compatible with the protection and enhancement of biological and cultural resources. DPR will ensure that any proposed trail system is compatible with the MSCP and the County-approved Community Trails Master Plan.
C.4.2	public use	DPR will explore opportunities for public access and viewpoints at the Derbas house site and ensure that any new public-use trails are designed and constructed to avoid and/or minimize impacts to sensitive biological and cultural resource areas.
C.4.3	public use	DPR will ensure that any future proposed trails will undergo environmental review in accordance with CEQA prior to public use of the Preserve.

Summary of Management Directives in Preserve Specific Resource Management Plans

* Note that some of the numbering is slightly different among the RMPs because non-relevant ASMDs are not included in some RMPs

Directive	Resource	Description
C.5 Install and maintain fencing and gates within the Preserve (Priority 1)		
C.5.1	public use	Park ranger staff will install fencing and/or gates as needed to restrict unauthorized access and protect particularly sensitive resources from impacts. Points of unauthorized public access and sensitive resource impacts will be identified in conjunction with routine monitoring activities (see A.1.1 and A.1.2). DPR will ensure that any fences or gates will be designed and located so they do not impede wildlife movement or impact cultural resources.
C.5.2	public use	Ranger staff will regularly inspect and maintain all fencing and gates within the Preserve. Fencing segments and gates will be repaired or replaced as necessary.
C.6 Properly maintain access roads, staging areas and trails for user safety, to protect natural and cultural resources, and to provide high-quality user experiences (Priority 1)		
C.6.1	public use	Park ranger staff will monitor access roads, staging areas, and trails for degradation and off-trail access and use. If necessary, park ranger staff will provide necessary repair/maintenance in accordance with the adopted Community Trails Master Plan. See also B.4.3.
C.6.2	public use	If temporary closure of a trail is deemed necessary for maintenance or remediation, temporary closure actions will be accompanied by educational support, and public notification through signs and/or public meeting announcements. An implementation schedule will be written by DPR Operations staff when maintenance or remediation is deemed necessary. The trail will be posted with signage that indicates temporary closure and the primary reason for the temporary closure (e.g., erosion issues, sensitive biological resource impacts). Finally, signs will provide contact information for anyone wishing to provide input on trail use or gain additional information regarding temporary closure of trails. Once posted, the trails in need of maintenance will be blocked with A-frame barricades and/or caution tape. Enforcement of the temporary closure of a trail will require increased ranger patrols of these areas and investigations to determine if the barriers are effective.
C.6.3	public use	DPR will restore degraded habitats, control non-native plant species along trails, and reduce detrimental edge effects through spot treatment of non-native plants, maintenance and stabilization of trails, and strategic revegetation. Measures to counter the effects of trail erosion may include the use of stone or wood cross-joints, edge plantings of native grasses, and mulching of the trail in accordance with the adopted Community Trails Master Plan. See also B.1.1 and B.1.2.
C.6.4	public use	If unauthorized trail formation is observed by park ranger staff, those specific areas will be posted with clear signage reminding the public to remain on authorized trails.
C.7 Install, and maintain appropriate signage to effectively communicate important information to Preserve visitors (Priority 1)		
C.6.1	public use	Park ranger staff will regularly inspect and maintain all posted signs within the Preserve in good condition. Signs shall be kept free from vandalism and will be repaired or replaced as necessary.
D.1 Maintain a safe and healthy environment for Preserve users (Priority 1)		
D.1.1	operations and facility maintenance	Park ranger staff will maintain the trash receptacles provided at the main entrance and staging area. The trash receptacles are designed to be secure from intrusion by wildlife species. Park ranger staff will regularly empty trash receptacles at least twice a week or more/less as deemed necessary.
D.1.2	operations and facility maintenance	DPR will prohibit the permanent storage of hazardous and toxic materials within the Preserve. Any temporary storage must be in accordance with applicable regulations, and otherwise designed to minimize any potential impacts.
D.2 Publicize and enforce regulations regarding littering/dumping (Priority 1)		
D.2.1	operations and facility maintenance	DPR will ensure that regulations regarding littering/dumping (County Code of Regulatory Ordinance Section 41.116) are clearly posted (e.g., on kiosks and at staging area) and enforced within the Preserve. Penalties for littering and dumping will be imposed by law enforcement officers sufficient to prevent recurrence and reimburse costs to remove and dispose of debris, restore the area if needed, and pay for additional DPR staff time. Areas where dumping recurs will be evaluated for potential barrier placement. Additional monitoring and enforcement will be provided as needed.
D.3 Retain SM Creek in natural condition		
D.3.1	hydrological management	DPR will review the data resulting from the County Watershed Protection Program, which monitors water quality throughout the County annually for pollutants that are likely to be delivered from nearby land use, to identify any potential water quality concerns within the Preserve.
D.3.2-4	hydrological management	Additional preserve-specific actions are included in the RMPs
D.4 Cooperate with public health and safety personnel to achieve their goals while helping to reduce or eliminate impacts to biological and cultural resources within the Preserve (Priority 1)		
D.4.1	public health and safety	DPR will allow law enforcement officials and all medical, rescue and other emergency services to access Preserve property as necessary to enforce the law and carry out operations necessary to protect the health, safety, and welfare of the public. DPR will coordinate with the applicable agencies to inform field personnel of the locations of particularly sensitive biological and significant cultural resources and how to minimize damage to these resources.
D.4.2	public health and safety	DPR will maintain the existing local fire agency locks on all Preserve gates. DPR ranger staff will report any removed or missing locks to the appropriate fire agency.
D.5 Provide for a safe recreational experience for Preserve visitors (Priority 1)		
D.5.1	public health and safety	In the event of a natural disaster, such as a fire or flood, DPR shall evacuate the Preserve and coordinate with the Emergency Operations Center. In addition, staff will coordinate with the local agency in charge of responding to the emergency and, if possible, assist where necessary.
D.6 Coordinate with adjacent landowners and open space land managers (Priority 1)		
D.6.1	adjacency management	DPR will coordinate with the Water Authority and OMWD as the adjacent open space landowners and land managers on an annual basis, or more regularly as needed, to ensure the contiguous preserved habitat is managed consistently and in accordance with the MSCP and adjacent NCCP/HCPs.
D.7 Enforce Preserve boundaries (Priority 1)		
D.7.1	enforcement	DPR and park ranger staff will enforce, prevent, and remove illegal intrusions into the Preserve (e.g., orchards, decks) on an annual basis, in addition to a complaint basis.
D.8 Educate residents in surrounding areas about Preserve adjacency issues (Priority 2)		
D.8.1	public use and education	DPR will post this RMP on the DPR website (www.sdparks.org) to inform surrounding residents of Preserve adjacency issues including access, appropriate landscaping, construction or disturbance within the Preserve boundaries, pet intrusion, and fire management. See also B.3.1.
E.1 - E.5 cultural resources		