San Diego Management and Monitoring Program

Work Accomplished 2020-2024

and Planned Future Work

Report Prepared for:

San Diego Association of Governments Environmental Mitigation Program

SANDAG
TransNet program

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Acronyms

BLM	Bureau of Land Management
CAGN	Coastal California gnatcatcher
CFWO	Carlsbad Fish and Wildlife Office
CNDDB	California Natural Diversity Database
CSS	Coastal sage scrub
EDRR	Early detection rapid response
ES	Ecological site
GSDRCD	Greater San Diego Resource Conservation District
IMG	Inspect and manage
MOM	Master Occurrence Matrix
MSCP	Multiple Species Conservation Program
MSP	Management and Monitoring Strategic Plan for Conserved Lands in Western San Diego County: A Strategic Habitat Conservation Roadmap
NPS	National Park Service
RAA	Resource Avoidance Area
READ	Resource Advisor
RDM	Residual dry matter
SANDAG	San Diego Association of Governments
SC- MTX	Southern California Multi-Taxa Database
SC- NBC	Southern California/ Northern Baja California
SDMMP	San Diego Management and Monitoring Program
SDNHM	San Diego Natural History Museum
SDZWA	San Diego Zoo Wildlife Alliance
SHB	Shothole borers
TNC	The Nature Conservancy
UCM	University of Central Missouri
UCR	University of California, Riverside
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VTM	Vegetation Type Map

Executive Summary

The San Diego Management and Monitoring Program (SDMMP) coordinates science-based, biological management and monitoring of Conserved Lands in San Diego County, partnering with land managers and researchers. SDMMP implements regional objectives from the Management and Monitoring Strategic Plan for Conserved Lands in Western San Diego County: A Strategic Habitat Conservation Roadmap (MSP Roadmap; SDMMP and TNC 2017). Regional objectives and actions are completed by SDMMP staff with funding provided by the San Diego Association of Governments (SANDAG) to U.S. Geological Survey (USGS). This report provides a summary of the work from 2020-2024 for Tasks 1, 2, 3, 13, and 15 in Collaborative Agreement No. S548642 between SDMMP, SANDAG, and USGS. Tasks 1, 2, 3, 13, and 15 cover the ecological support, database management, GIS management, website development and support, and program coordination completed by SDMMP and partners. The final section of the report includes a list of future steps for each task and SDMMP. A comprehensive list of all peer-reviewed products (journal publications, reports, datasets), conference presentations and posters, and outreach meetings resulting from these tasks is included in Appendix A.

The five years of ecological and science support spans 36 project areas focused on sensitive species, vegetation communities, and threats and stressors. Nearly 250 science products were produced by the regional program from journal publications, reports, datasets, webportals and presentations at national conferences and local outreach meetings. The program resulted in 25 journal publications, 58 reports, 33 datasets, 117 presentations, and 6 web tools.

Introduction

This report provides a summary of work completed by San Diego Management and Monitoring Program (SDMMP) staff with funding provided by San Diego Association of Governments (SANDAG) to U.S. Geological Survey (USGS) through Collaborative Agreement No. S548642. It also summarizes implementation of partner projects coordinated by SDMMP staff to complete regional objectives in the Management and Monitoring

Strategic Plan for Conserved Lands in Western San Diego County: A Strategic Habitat Conservation Roadmap (MSP Roadmap; SDMMP and TNC 2017). SDMMP staff completed work described in Agreement Tasks 1, 2, 3, 13, and 15 for 2020-24.

In Task 1, we describe the 36 topic areas (i.e., species, vegetation communities and threats) with one or more projects that SDMMP has coordinated from 2020 through 2024 as part of implementing the MSP Roadmap objectives, including the summary of project results and outcomes, synopsis of monitoring and management activities based on the MSP Roadmap, and future (next steps) for management and monitoring objectives. We indicate the roles that SDMMP played in each project. In Appendix A, we list all the science products produced for these projects, such as journal publications, reports, presentations, and datasets and indicate those that are co-authored by SDMMP staff. By describing each project more broadly and listing all science products, not just those produced by SDMMP, we are able to showcase the achievements of SDMMP's program, allowing us to better track progress over time while still indicating the role that SDMMP staff play. In Tasks 2, 3, 13, and 15 we describe the database, GIS, webportal, and coordination components of SDMMP's program. This report is intended to reflect the team approach by which SDMMP operates. Frequently, work and deliverables associated with a particular task are completed by the SDMMP team and not just staff associated with a particular task. The report is organized by tasks, although it is emphasized that deliverables are often a joint product of SDMMP staff.

Task 1: SDMMP Ecological Support Deliverables

This task provides science support to the SDMMP and provides ecological input for: updating and implementing the monitoring and adaptive management program documents; coordinating and implementing management and monitoring objectives from the MSP Roadmap (SDMMP and TNC 2017); developing indicators and metrics and preparing a report on the State of the Preserve, providing input into creation of the SDMMP metrics dashboard, and conducting outreach about the State of the Preserve report; updating content on the SDMPP webportal; organizing workshops to obtain input from scientists and land managers on priority monitoring and adaptive management needs; conducting literature reviews and syntheses; analyzing existing and new data sets; designing monitoring

strategies/protocols (including cost analyses); preparing monitoring and management plans; developing predictive models to facilitate monitoring and management activities; maintaining a prioritized research needs list; participating in writing grant proposals to help implement elements of the adaptive management and monitoring programs; preparing synthesized and analyzed data sets utilizing the MSP Roadmap web portal and other resources; working with preserve managers to design monitoring and management projects and analyzing the results; preparing science presentations, reports, and publications; and working as a member of the SDMMP team to further the goals of the SDMMP.

Goals and work priorities are established by SDMMP in collaboration with U.S. Geological Survey (USGS) and SANDAG leads. The SDMMP Ecologist develops work plans, timelines, and budgets to meet identified goals and priorities.

Summary

See Table 1 for a summary of project results and outcomes, synopsis of monitoring and management activities implemented based on the MSP Roadmap, and future (next steps) for management and monitoring objectives. A total of 36 topic areas involving species, vegetation communities, and threats had one or more projects implemented to achieve various MSP Roadmap activities. Implementation of regional management and monitoring program objectives resulted in USGS, SDMMP, and partners producing 25 journal publications, 58 reports, 33 datasets, 117 presentations, and 6 web tools. In addition, most topic areas have project pages with downloadable data on the SDMMP webportal.

Table 1. Summary of Ecological Support Projects. Summary of project results and outcomes, synopsis of monitoring and management activities implemented based on the MSP Roadmap, and future (next steps) management and monitoring objectives. SDMMP Roles to assist with implementation of the MSP Roadmap are defined as: ANAL = analysis and modeling; COOR = project coordination among many partners; DBM = database management; FW = field work to collect data; GIS = GIS analyses and creation of map viewers and figures for publications; PM = SDMMP internal project management and coordination with implementing partners; PR = project product review; PUB = publication co-author; SOW = developing project scopes of works; SS = providing science support; and WP = project inclusion on SDMMP webportal.

Years	Synopsis of monitoring and management projects implemented from the MSP Roadmap	Summary of project products, results, and outcomes	Future (next steps) management and monitoring objectives	SDMMP Roles
American Badger Connectivity Study				
2020-2023	• USGS conducted American Badger (*Taxidea taxus*) surveys from 2020-2023. The objective was to characterize American Badger use of areas where American Badger sign was detected in 2015 and expand into new areas with more recent reports of American Badger activity.	• Data has been finalized and a preliminary draft is in review. The final report has not been published.	• Next steps are for USGS to develop management and monitoring framework building upon analyses of data collected from 2011 through 2023, including the threat matrix, habitat and connectivity model, and a potential sampling design. • The monitoring strategy is likely to include passive monitoring with burrow surveys, canine scent surveys, and camera traps. Because it is difficult to determine the number of individuals with these methods, continuing work on facial recognition from photographs and	PM, SOW

			genetic tools can help to identify and count individuals. To improve genetic tools requires developing a species-specific microsatellite library for southern California to identify individual American Badgers from scat. • A radiotelemetry study could assess home range, space use, and habitat selection by American Badgers in San Diego County (Brehme et al. 2020).	
Arroyo Toad Monitoring and Management				
2020-2024	• From 2020 to 2024, USGS coordinated and conducted county-wide Arroyo Toad (*Anaxyrus californicus*) surveys and habitat evaluations.	• Data have been finalized and a preliminary draft is in review. The final report has not been published.	• Next steps are for USGS with greater participation by partners to continue monitoring Arroyo Toad populations in 2025 and 2026 and collecting data on invasive aquatic species across San Diego County. • USGS will conduct discovery site surveys based on suitable habitat analyses that can predict new Arroyo Toad populations at historically occupied sites. • Continued USGS and partner monitoring beyond 2026 would provide useful information on occupancy trends and	DBM, GIS, SOW, WP

			patterns related to climate, hydrology, habitat changes, and non-native aquatic species.	
Bat Management Plan				
2021-2024	• San Diego County has many bat species of conservation concern and a management plan that prioritizes occurrences for management based on a species and threat analyses could be beneficial for decision making. • USGS, San Diego Natural History Museum (SDNHM), and SDMMP compiled existing bat community monitoring data to identify and prioritize potential conserved lands for management based on bat species richness, the presence of Townsend's Big-eared Bat (*Corynorhinus townsendii*) and Pallid Bat (*Antrozous pallidus*) and ranking of threats to roosting and foraging habitat. Using species and threat scores, each sampling area was placed into one of four conservation categories ranging from greatest conservation need and highest priority (high species score,	• The prioritization strategy identifies areas of high conservation value and risk of threats and prioritizes opportunities to improve bat habitat on conserved lands in western San Diego County. • Urbanization, presence of artificial lights, and areas sampled on unconserved lands were associated with significant decreases in bat species richness. • For two high priority conservation species: absence of Townsend's Big-eared Bat was associated with urbanization, artificial lights, and areas sampled on unconserved lands, while there was no significant effect of these threats on the presence of Pallid Bat. Pallid Bat is less prevalent in the study	• Next steps are to implement management priorities in the bat management strategy. • The strategy recommends more long-term monitoring including roost surveys and species richness surveys. Standardizing sampling methods could help ensure equal effort across sample areas and identify spatial gaps in sampling where additional data would be useful, especially in the northern and eastern portions of San Diego County. • Habitat models for different species could be used to identify under-sampled habitats and test associations between habitat, climate, and landscape features with the presence of specific bat species. • Pallid and Townsend's Big-eared Bats could benefit from management to reduce threats to roost sites and Pallid	DBM, GIS, PM, PUB, SOW, SS, WP

	high threat score) to lowest conservation need and priority (low species score, low threat score). • The results of these analyses were used to prepare a bat conservation and management strategy for conserved lands in western San Diego County.	area and may be more vulnerable to impacts to low lying foraging habitat than Townsend's Big-eared Bat. Pallid Bat is also more likely to use artificial roosting structures so installation of bat houses may be beneficial in areas with limited natural roost sites.	Bat foraging habitat could be improved through management.	
Coastal California Gnatcatcher Post-Fire Recovery Study				
2020-2024	• In 2014, USGS and SDMMP developed a postfire study design and protocols to document recovery of coastal California gnatcatchers (*Polioptila californica californica:* CAGN) from extremely large wildfires in San Diego County in 2003, 2007, and 2014. • USGS conducted the post-fire study in 2015, 2016, 2020, and 2024 collecting data on gnatcatcher occupancy and habitat attributes at 423 sampling plots in San Diego County.	• In 2016, coastal California gnatcatcher occupancy was 24 percent overall. When comparing occupancy between burned and unburned sites, occupancy was twice that in unburned habitat. It may take decades for burned coastal sage scrub to achieve occupancy levels typical of unburned habitat. • Coastal sagebrush (*Artemisia californica*) was the strongest predictor of gnatcatcher occupancy followed by California buckwheat (*Eriogonum fasciculatum*) and sunflowers (*Encelia* spp. and *Bahiopsis laciniata*). Laurel sumac (*Malosma laurina*) and herbaceous	• After coastal California gnatcatcher post-fire 2024 monitoring results are analyzed in 2025, USGS and partners can determine whether there has been sufficient recovery in gnatcatcher occupancy and habitat conditions to justify ending the post-fire study. • The results of this study can be used to develop management projects to increase gnatcatcher occupancy by improving the quality of coastal sage scrub habitat affected by wildfire over the last 25 years.	ANAL, DBM, GIS, PM, PO, PR, PUB, SOW, SS, WP

		cover, especially nonnative grasses, negatively influenced occupancy. • In 2020, woody cover changed little from 2016, while herbaceous cover increased at postfire points. • Modeled occupancy in 2020 increased at unburned plots but varied from increasing in more recently burned plots to no change or declining in older burned plots.		
California Gnatcatcher Regional and Subregional Monitoring Program				
2020-2024	• USGS, SDMMP, and the wildlife agencies developed a regional and subregional monitoring program in 2015. The survey area encompassed the USA portion of the gnatcatcher's range from Ventura County south to the International Border and east to the foothills of the Eastern Peninsular Range. • USGS and partners surveyed for coastal California gnatcatchers at 334 regional plots and 182 subregional plots on conserved lands in San Diego County in 2016, 2020, and 2024.	• Regional monitoring of coastal California gnatcatchers in 2016 found 23 percent of plots surveyed were occupied, reflecting the effect of massive wildfires in the previous 15 years. • At the regional scale, coastal sagebrush and California buckwheat were positive predictors of occupancy. Total shrub cover showed a threshold response, with increasing occupancy up to 30-40 percent total shrub cover and then declining occupancy as shrub cover	• USGS, the wildlife agencies, and other partners across southern California plan to continue regional and subregional long-term monitoring in 2028. This could allow for a better understanding of coastal California gnatcatcher population dynamics (occupancy and extinction and colonization rates) and vegetation characteristics over time under varying environmental conditions, particularly precipitation patterns.	ANAL, DBM, GIS, PM, PO, PR, PUB, SOW, SS, WP

		increased. Total herbaceous cover was negatively related to occupancy. • For the San Diego subregion, occupancy was 20 percent in 2016. Coastal sagebrush and time since last fire were the strongest predictors of occupancy. • In 2020, woody and herbaceous cover had increased since 2016 at regional and subregional scales. Coastal sagebrush and California buckwheat were positive predictors of colonization and total herbaceous cover had a negative effect. There were more predictors of extinction including cover of laurel sumac and grass, increasing extinction risk, and cover of coastal sagebrush, sunflowers, bare ground, and time since fire reducing extinction risk. Modeled gnatcatcher occupancy increased at regional and subregional scales in 2020 compared to 2016.		
Coastal California Gnatcatcher Range-wide Genetics				

2020-2022	• USGS conducted a range-wide genetic study of coastal California gnatcatcher in Baja California, Mexico and southern California, USA. The purpose of the study was to develop a genomic dataset to examine genetic structure and subspecies classification based on morphological characteristics, gene-environment interactions, and demographic history.	• The study found that there are two distinct genetic groups with evidence for restricted gene flow at the U.S. – Mexico international border. Hypothesized subspecies south of the border did not show significant genetic differentiation. Climate associated loci were more strongly differentiated than climate neutral loci suggesting local climate adaptation likely drove genetic differentiation after the Holocene Range expansion. Patterns of genetic substructure are consistent with patterns of habitat loss and fragmentation in southern California. Retaining and restoring connectivity in southern California could preserve adaptive potential to allow for future range expansion and long-term persistence of the coastal California gnatcatcher.	• SDMMP is working on linkage evaluations to maintain connectivity between coastal California gnatcatcher populations in San Diego County and with populations in neighboring counties to the north.	
Coastal Cactus Wren Genetics				
2020-2024	• USGS conducted a genetic monitoring study of coastal cactus wrens (*Campylorhynchus brunneicapillus*	• The genetic monitoring study found that there was a significant decline in genetic diversity in the San	• Management to slow the loss of genetic diversity and isolation in coastal cactus wrens in western San Diego County	DBM, PM, PR, PUB, SOW, SS

	sandiegensis) in western San Diego County to see if genetic diversity was declining over time. Initial genetic sampling was conducted in 2011-2012 with follow up sampling in 2019-2020. Simulation modeling was used to evaluate potential future genetic condition of wren populations with varying rates of dispersal between genetic clusters and the implications for cactus wren management. • USGS and SDMMP used cactus wren genetics data from San Diego and Orange Counties along with data collected on reproduction and survival to evaluate whether genetic diversity was affecting fitness.	Pasqual genetic cluster of cactus wrens and a decline in allelic richness of the Sweetwater genetic cluster. Local diversity declined even with some dispersal between populations within genetic clusters. • Simulations indicate cactus wren populations will continue to lose genetic diversity for many generations even if gene flow among them is increased. Habitat restoration may bolster local population sizes and allelic richness while translocation from source populations outside San Diego may be needed to restore genetic diversity in the short term. • USGS and SDMMP are preparing the genetics and fitness publication.	could include a two-pronged approach that combines swapping eggs between genetic clusters to increase gene flow and habitat restoration. Research suggests that the addition of a single successful migrant per generation is helpful in retaining genetic diversity. • When there is available funding, USGS and SDMMP intend to conduct a pilot study to test methods to swap eggs and increase genetic diversity.	
Coastal Cactus Wren Habitat Conservation Strategy				
2020-2024	• USGS, SDMMP and the Nature Conservancy (TNC) is preparing an updated coastal cactus wren management strategy, assessing 46 locations to identify and prioritize	• The strategy has been submitted for USGS review.	• The updated cactus wren management strategy can guide development of projects that when implemented can increase cactus wren populations and	ANAL, DBM, GIS, PM, PUB, SOW, SS, WP

	management actions to bolster wren populations and improve connectivity. This strategy summarizes information on factors affecting cactus wren population dynamics, distribution and abundance, productivity survival and dispersal, wren diet and food availability, population genetic structure and cactus scrub habitat condition. This information is used to develop a management strategy and to then identify and prioritize location-specific management actions based on a threat matrix, management prioritization decision tree, and evaluation of opportunities for cactus scrub expansion.		improve their persistence on conserved lands. • Monitoring and tracking the habitat management methods and wren population outcomes of these projects can continue to improve best practices for managing cactus scrub habitat. • Updating cactus mapping and expanding monitoring to new locations with cactus scrub habitat management would help to track success of management efforts.	
Coastal Cactus Wren Monitoring				
2020-2024	• USGS conducted annual monitoring for coastal cactus wrens in 2015 and 2017-2024 in south and central San Diego County (Otay, Sweetwater/Encanto, and Lake Jennings genetic clusters), including expanding survey areas in the San Pasqual Valley genetic cluster in 2019	• Coastal cactus wrens occupied 35 percent of survey plots in south San Diego County in 2020 with 109 territories documented. Over the next five years, occupancy and the number of territories declined. By 2023, 26 percent of survey plots were occupied	• USGS plans to continue annual monitoring in 2025 and 2026, and monitoring is planned for 2027 through 2029. This monitoring provides critical information for cactus wrens on their population status, management needs, and documents the effectiveness of management actions.	DBM, GIS, PM, PR, SOW, SS, WP

	and 2022-2024. Data are collected on wren occupancy, number of territories and habitat covariates.	with only 85 territories. Data for 2024 have not yet been analyzed. • In 2022, San Pasqual Valley survey plots were added to include north San Diego County. Wrens were detected at 86 percent of survey plots with 96 territories. There was also a decline over time with 74 percent of survey plots occupied and 82 territories in 2023. Data for 2024 have not yet been analyzed. • Cactus wren populations on conserved lands have declined significantly since the 1990s because of wildfire, drought, and small population size.		
Coastal Sage Scrub, Chaparral, and Grassland Vegetation Monitoring				
2021-2024	• SDMMP and USGS prepared the chaparral, coastal sage scrub, and grassland monitoring strategy and selected sample plots by 2024. • Field monitoring was initiated by AECOM in spring 2024.	• This strategy details the vegetation monitoring program including the purpose to assess ecological integrity of coastal sage scrub and chaparral vegetation communities, planned survey methods, and analyses that will be completed with collected data. This strategy did not include analyses	• SDMMP, USGS, and partners are planning to analyze 2024 data collected on plant species composition and cover, soil characteristics, and pollinator community richness and species abundance to evaluate ecological integrity in coastal sage scrub and chaparral vegetation communities.	ANAL, COOR, DBM, FW, GIS, PM, PO, PUB, SOW, SS, WP

		from historic or recent monitoring. Vegetation survey methods incorporate 90 m plots with a species inventory and recording high resolution unmanned aerial vehicle imagery. Herbaceous quadrat cover data and soil samples are collected at each plot. • Rapid assessment animal protocols were developed by taxa and species.	• Historic and recently collected data on coastal sage scrub, chaparral and grassland species cover and composition are being analyzed by USGS and SDMMP to assess change in these vegetation communities over time and associated factors. • SDMMP has initiated a landscape-scale analysis of changes in vegetation communities using remote sensing, Rangeland models, and GIS layers. • Regional monitoring of chaparral, coastal sage scrub (CSS), and grassland vegetation is planned at regular intervals (e.g., every four years) with additional taxa surveys included in future years to evaluate ecological integrity more fully.	
Connectivity Linkage Project				
2023-2024	• SDMMP, USGS, and TNC are conducting a connectivity meta-analysis as the basis for preparing linkage plans with identified actions to improve connectivity. • The meta-analysis is based upon results from numerous connectivity studies	• The map of linkages and crossing infrastructure is in review by partners, including experts and wildlife agencies. Once the linkages have been completed and published, the plan is to make the connectivity viewer available for partners. The	• This project is ongoing and SDMMP will update the connectivity viewer as new focus species are included and new connectivity research study results become available.	ANAL, COOR, GIS, PM, SOW, SS, WP

	conducted from 2006-2023 in the region. Focus animals included southern mule deer (*Odocoileus hemionus fuliginatus*), mountain lion (*Puma concolor concolor*), American Badger, coastal California gnatcatcher, and coastal cactus wren. • Through discussions with experts and the wildlife agencies, priority areas are identified for acquisition, restoration, and improvements of crossing infrastructure to enhance connectivity for individual species and for suites of species.	connectivity viewer will be an online ArcGIS map viewer that shows linkage alignments, conserved lands, habitat model predictions, road crossing infrastructure, and has detailed attribute data describing the linkages and crossing structures.	• SDMMP intends work with partners to develop linkage implementation strategies for priority linkages. • A public version of the viewer should be helpful to stakeholders for planning projects to improve linkages and crossing infrastructure.	
Enforcement Coordination				
2023-2024	• The objective is to prepare an Enforcement Strategy to assist land managers in reducing threats from human use of the preserves. • SDMMP organized a 2023 Enforcement Coordination Meeting with USFWS, Endangered Habitats Conservancy, City of San Diego Parks and Recreation, and SANDAG. Based on their feedback, SDMMP created an	• There were 185 unique responses from the Human Use/Enforcement Survey sent out to partners in September 2024. Twenty-one land managers completed the enforcement survey on ArcGIS Online, representing over 100 preserves or open space areas around the county. Results are currently being analyzed.	• Using survey responses, SDMMP intends to create a priority map of enforcement concerns. • This map could then be used to develop strategies to assist land managers with implementing enforcement priorities.	ANAL, COOR, GIS, PM, SOW, WP

	enforcement survey hosted on ArcGIS Online to send out to land managers. The survey will inform a priority map of enforcement concerns in the region for an enforcement strategic plan. • The survey was sent out to almost 600 partners to gather information on current enforcement needs and the solutions they are using. Those who responded to the survey were able to submit their results to the online map, allowing for spatially explicit survey responses.			
Fire Management				
2022-2024	• USGS and SDMMP worked with a wildfire coordinator to integrate land manager data into wildland fire decision support databases and a Resource Avoidance Area (RAA) Map. • In 2023, USGS started a Resource Advisor (READ) Cohort to better integrate local, state, and federal READs with Incident Command.	• The wildfire coordinator gathered data from 15 land managers for entry into the fire decision support database. He has incorporated data from federal, state, and local jurisdictions, as well as a few local non-profit organizations. This database has been used on active incidents. • Two spatial databases were created and expanded. One map is designed	• USGS and SDMMP intend to continue working on the fire management objectives of building the RAA Map and incorporating land manager data in the Wildland Fire Decision Support Systems and continue the quarterly READ Cohort Meetings in 2025 and 2026. • The wildfire coordinator will continue working with nonprofit land managers to integrate their data in the RAA Map and	GIS, COOR, PC, PM, PR, SOW, WP

	• Consultants, BLM, USGS, and SDMMP developed special species and habitat flashcards for READs to hand out during a fire incident.	for fire personnel and includes infrastructure useful while fighting a fire (roads, water sources, etc.). It also includes sensitive areas to avoid and what actions should be avoided. The second map is designed for READs with biology backgrounds. It includes all species information, high slopes, important soil types, and riparian areas. • USGS and SDMMP held four READ cohort meetings with fire agencies. These meetings were attended by fire personnel from CalFire, BLM, USFWS, CA State Parks, CDFW, NPS, local NGOs, SD County, USGS, tribal constituents, and private contractors. The USGS cohort now has three qualified READs. USGS READs have been on about 20 fires since 2020. • Finalized sensitive species flashcards (BLM-Funded) for six different sensitive species. These were printed, laminated, and passed out during READ Cohort Meetings to help	the Wildland Fire Decision Support Database. • Once all land manager data is entered into the RAA Map GIS database, the next step is to add biosecurity concerns into the database. • The fire coordination team will work to make the maps available offline in a format that keeps the features and clickable information. • If more funding is available, the team can continue making flashcards for additional species and habitats.	

		spread out to stations around the county, starting in south San Diego County near the border.		
Golden Eagle Conservation Framework				
2021-2024	• The Golden Eagle (*Aquila chrysaetos canadensis*) management strategy being prepared by USGS, SDMMP and partners is still under review and revision. The draft strategy provides information on the species in San Diego County such as historic and current distribution and abundance, life cycle and reproduction, habitat requirements, movements, and diet and prey. The next sections describe threats and potential management strategies to reduce threats. The strategy then characterizes specific threats to Golden Eagle management areas followed by management objectives within these areas and finally discusses knowledge gaps.	• The MSP Roadmap calls for completion of a Golden Eagle management strategy and a monitoring approach based on information obtained from the 2015-2019 research study on eagle movements, occupancy, and nesting status. • To develop the management strategy, Golden Eagle nesting data were compiled from a variety of sources representing eagle nesting activity in San Diego County since the 1980s. • GIS-based analyses were undertaken for southern California to characterize the intensity of threats across the landscape. • A threats matrix was developed for nesting and foraging areas to	• With completion of the Golden Eagle monitoring approach, a pilot monitoring study is being implemented in 2025. • Land managers, USGS, SDMMP, and other partners can begin coordinating implementation of high priority management actions in the Golden Eagle conservation framework with funding through land manager preserve funds, *TransNet* Land Management Grants, and other grant sources.	ANAL, DBM, GIS, PM, PUB, SOW, SS, WP

		identify and prioritize management needs.		
Grazing Monitoring Study				
2021-2024	• Following discussions and recommendations by the SDMMP-formed Grazing Working Group, a grazing research team from UC Berkeley began the Grazing Monitoring Pilot Project at Rancho Jamul Ecological Reserve and Hollenbeck Canyon Wildlife Area to assess grazing as a landscape-scale management tool in grasslands and CSS habitat, as well as for sensitive species [e.g. burrowing owl *(Athene cunicularia hypugaea*), Otay tarplant (*Deinandra conjugens*)]. • In Spring 2022, continuing through 2024, the research team selected and established study plots. Vegetation production at the sites was measured every fall using residual dry matter (RDM). Species composition and cover data were collected every spring during vegetation surveys.	• Ecological site (ES) descriptions and state and transition models were determined for 54 study plots using the data collected during fall and spring monitoring. • Across all ESs, increases in grazing intensity led to decreases in exotic annual grass cover and increases in exotic annual forb cover (Bartolome et al. 2024). • There was a negative relationship between animal unit density per acre and grass cover in alluvial ES, suggesting the removal of grazing may cause transitions to grasslands of near monocultures of ripgut brome and long beaked filaree. • Indications from Rancho Jamul show that grazing is a useful management tool for improving burrowing owl habitat and foraging.	• Vegetation monitoring and RDM sampling will continue 2025-2026 at existing plots at Rancho Jamul Ecological Reserve and Hollenbeck Canyon Wildlife Area to evaluate grazing on sensitive species such as western burrowing owl, coastal California gnatcatcher, and Quino checkerspot butterfly (*Euphydryas editha quino*). • In 2025 and 2026, vegetation monitoring and RDM sampling will expand to new sites in Ramona. • The next phase of this project will include more work on woody shrubs. Additional work investigating relationships between grazing, ecological sites, and recruitment and cover of coastal sagebrush and California buckwheat is planned. Research will further investigate	COOR, FW, PM, PR, SOW, SS, WP

	• In October 2024, new study sites were established in Ramona to assess grazing impacts at grassland, CSS, and vernal pool sites in northern San Diego.	• There was a statistically significant positive association between grazing intensity and shrub cover (Bartolome et al. 2024). • Grazing is positively associated with shrub cover across all ESs and negatively associated with annual grass cover. • Observed changes in vegetation structure and composition, show promise that livestock grazing can benefit Otay tarplant.	phytolith samples to shed light on vegetation drivers and ES potential. • "Additional work, including applying grazing modifications, is merited to better understand the mechanisms associated with increased grazing in CSS shrub species and the potential negative effects on cryptogamic soil crusts and habitat of species such as tricolored blackbird and Quino checkerspot butterfly" (Bartolome et al. 2024). • In the next phase of the study, researchers will expand the study into additional habitats such as vernal pools with sensitive species [San Diego fairy shrimp (*Branchinecta sandiegensis*) and rare plants] and grasslands supporting Stephens' kangaroo rat (*Dipodomys stephensi*), as well as selectively begin modifying conservation grazing practices.	
Harbison's Dun Skipper				

2021-2024	• The University of Central Missouri (UCM) conducted adult Harbison's dun skipper (*Euphyes vestris harbisoni*) surveys in 2021 and continued through 2024 to record maximum numbers of individuals detected along transects at sites previously occupied 2013-2017 and to expand surveys into new areas. • In addition to the surveys, other objectives that were implemented include collection of non-lethal genetic samples, a mark-recapture study to assess population size at specific sites, habitat study, and discovery surveys to look for butterflies in new areas.	• During 2013-2017, Harbison's dun skipper adults were observed at 14 sites in western San Diego County. In 2021, 13 of these sites were surveyed and Harbison's dun skippers were observed at only six with population sizes (maximum counts of 2-4 individuals) matching those of the smallest populations recorded during the 2013-2017 surveys. Marked recapture surveys in 2022 at five sites showed that the population was larger than the daily maximum count but were still small. In 2023, the study expanded to 16 sites with adults detected at five for a total of 9 males and 3 females. Despite being a wetter year, the populations were very small. In 2024, there were 18 sites surveyed with adults detected at seven for a total of 22 males and 11 females. The higher number of skippers in 2024 is attributed to the host plant, San Diego sedge (*Carex spissa*), becoming broadly established and more abundant during the wet winter	• Larval surveys are planned for fall and winter in 2024-2025 and 2025-2026 to compare larval and adult counts from spring/summer surveys in 2024 and 2025. • Surveys are planned to continue annually given the small percentage of occupied sites with small numbers of butterflies and to document resiliency to threats such as drought, floods, and wildfire. • Management actions are prioritized in the Harbison's dun skipper management plan and are available for implementation by partners using preserve funds, *TransNet* land management grants and other funding sources. • CDFW is leading development of a proposal for habitat restoration and potential Harbison's dun skipper reintroduction to previously occupied sites where the butterfly has not been detected in recent years.	DBM, FW, PM, SOW, SS, WP

		of 2023 combined with the continued wet conditions in winter of 2024. • Harbison's dun skipper has a very restricted distribution in southern California and northern Mexico with concerns that threats are leading to extirpation of populations. • Habitat analyses showed that woodlands with San Diego sedge hostplant were more likely to be occupied at higher elevations with warmer summer temperatures. There were no significant differences in measured habitat characteristics in occupied vs unoccupied parts of the woodlands.		
Hermes Copper				
2020-2024	• SDMMP coordinated with experts from UCM, US Fish and Wildlife Service, California Department of Fish and Wildlife, Bureau of Land Management, and US Forest Service to fulfill MSP monitoring and management objectives for Hermes Copper (*Lycaena hermes*). From 2020-2024, UCM monitored	• Since 2019, the Hermes copper range has been restricted with a continuing decline in numbers and disappearance from sites. Habitat loss and fragmentation due to urban development, wildfire, and drought have caused populations to disappear over the last few decades and the	• In 2025 and 2026 monitoring will be continued at sentinel sites and discovery survey efforts expanded, including at Lawson Peak and Potrero, the new conservation acquisition at Skyline Ranch North, and along the Sunrise Power Link north of Lawson Valley Road.	ANAL, COOR, DBM, FW, GIS, PM, PO, SOW, SS, WP

	sentinel sites and along with partners conducted discovery surveys for Hermes copper in areas modeled as suitable habitat and near areas of known or historical populations. • BLM initiated efforts to secure funding for a BLM habitat restoration grant and a proposal was developed by Greater San Diego Resource Conservation District (GSDRCD), US Forest Service (USFS), San Diego Zoo Wildlife Alliance (SDZWA), Wildspring Ecology, members of the Viejas Tribe, and SDMMP.	distribution has shrunk to the southeast margin of the species' historical range. • The two largest populations at Roberts Ranch South and Bell Bluff, if burned in a wildfire could result in loss of most individuals of this species. Roberts Ranch South, the largest known population has varied from a single survey day maximum count of 95 individuals in 2019 to a low of 35 in 2022, and 66 individuals in 2024. • In 2023 and 2024, higher than average rainfall interrupted a long-term intensive drought and a few butterflies were seen at Lawson Peak and Lyon's Valley where they hadn't been seen for several years. • A BLM grant was awarded to GSDRCD, USFS, SDZWA, Wildspring Ecology, and Viejas Tribe to restore lands and study spiny redberry (*Rhamnus crocea*) host plant	• If butterfly populations increase, partners can continue development of best management practices for egg collection, captive rearing, and translocation of butterflies to previously occupied or new sites where future drought effects can be ameliorated (e.g., more favorable environmental conditions, supplemental water, invasive plant control). • A BLM grant awarded to several partners will be implemented from 2025-2027 to restore habitat, grow spiny redberry for restoration, captive rearing and to experiment with environmental conditions at the edge of its range, and to study spiny redberry chemical compounds to investigate host plant suitability.	

		characteristics under varying environmental conditions.		
Invasive Animal Coordination				
2020-2024	• USGS developed and implemented an invasive animal management framework for all potential invasive animals in San Diego using results from a 2-day invasive animal prioritization workshop with multiple taxa experts. Taxa experts provided a brief description of the main threats from each taxonomic group (Richmond et al. 2023). American Beaver (*Castor canadensis*) ranked as highest priority species for management. • SDMMP continued to implement the shothole borers (SHB) [Polyphagous and Kurushio (*Euwallaceae* spp.)] management strategy by facilitating an Invasive SHB Identification Workshop for partners at the San Elijo Lagoon Nature Center with Dr. Akif Eskalen and Dr. Shannon Lynch in May 2022. • USGS implemented invasive animal management in 2020-2024. USGS monitored community science	• <u>Invasive Species Prioritization:</u> Identified 51 priority species through a workshop with taxa experts. USGS developed a risk analysis protocol for prioritizing management of non-native species that incorporates risk and management. Protocol addresses nonnative animal species in the Southern California/ Northern Baja California (SC-NBC) ecoregion. It is a stepwise, semi-quantitative protocol applicable to any taxa in any predefined geographic area. Relies on consensus-building among taxonomic experts (Richmond et al. 2023). • <u>American Beaver (*Castor canadensis*):</u> American Beaver activity in the SC-NBC ecoregion threatens populations of the endangered arroyo toad through beaver dam impoundments that	• <u>Invasive Species Prioritization:</u> A follow-up risk analysis could be expanded to include the next tier of taxa beyond the top 5 posing the greatest risk, a process that might change the prioritization reported. • USGS and SDMMP intend to continue implementing the invasive animal management strategy for known and horizon species.	COOR, GIS, PM, PR, PUB, SOW, SS, WP

	platforms for new records of an invasive whiptail, Sonoran Spotted Whiptail (*Aspidoscelis sonorae*), in San Diego. They conducted four field surveys at two Oceanside locations. Points of interest between these two initial sites were surveyed to determine whether it was one connected population with intermediate sites (Fisher et al. 2022).	impact toad breeding and create deeper pooled habitat that promotes invasive aquatics. Through extensive paleontological, zooarchaeological, and historical survey data review, USGS refutes the claim that American beaver is native to the region. Best practices suggest American beaver management in the SC-NBC ecoregion could be employed when beaver ecology negatively impacts indigenous species and habitat (Richmond et al. 2021). • <u>Invasive Whiptail:</u> Sonoran Spotted Whiptail was identified from iNaturalist observations at two locations in Oceanside. The sites are on opposite sides of the San Luis Rey River suggesting possible population expansion following either a single introduction or separate introduction events. USGS documented the first known record of Sonoran Spotted Whiptail in San Diego County and showed this		

		species is continuing to spread in Southern California. Created a diagnostic key to help land managers and community scientists to properly identify and photograph Sonoran Spotted Whiptail (Fisher et al. 2022).		
Invasive Plant Coordination				
2020-2024	• As part of the SANDAG-funded Early Detection Rapid Response (EDRR) Program, SDMMP coordinated with contractors to continue treating EDRR level 1, 2, and 3 invasive plant species as prioritized for treatment by the Invasive Plant Coordinator. The coordinator worked with property owners, land managers, and work crews to obtain the required right of entry permits. The coordinator worked on multiple species at sites across the county, visiting sites and assessing areas to treat. The coordinator and crews surveyed and treated level 1 and 2 species from the Invasive Plant Strategic Plan.	• The EDRR program treated invasive plants at 171 sites, treated 258 acres of invasive plants, surveyed 480 acres of invasive plants, and controlled 615,586 invasive plants. 15 plant species were treated. Additionally, giant reed retreatments occurred and stinknet plants were treated around sensitive habitat. • SDMMP is developing a viewer on the SDMMP website to show all areas of SANDAG-funded EDRR and other invasive plant treatment.	• EDRR level 1 and 2 species, stinknet and giant reed treatment and retreatment projects will continue in 2025 and 2026.	COOR, PM, PR, SOW, SS, WP

	• SDMMP identified limited level 3 species to receive treatment. Stinknet (*Oncosiphon pilulifer*) was treated in areas critical to MSP species and their habitat. Giant reed (*Arundo donax*) retreatment also occurred in several watersheds.			
Least Bell's Vireo Surveys and Habitat Model				
2020, 2023	• USGS completed Least Bell's vireo (*Vireo bellii pusillus*) surveys and shothole borer assessments in the Tijuana River Valley and San Diego River in 2020 and 2023. • USGS developed a habitat model for the occupied range in southern California and projected it into the historic range to evaluate suitable habitat where vireos might recolonize their former range.	• A report for the least Bell's vireo and shothole borer study is not yet available. • The USGS habitat model for the least Bell's vireo performed well in the current range and discriminated among riparian habitats with only 6 percent predicted as suitable (Preston et al. 2021). On average, suitable vireo habitat had more than 60-percent riparian vegetation and flat land at the 150-m scale, little to no slope, and was within 130 m of water.	• One more round of least Bell's vireo and shothole borer monitoring will be conducted in 2026. • A final least Bell's vireo survey report will be prepared in 2026 with results for all survey years.	PM, PUB, SOW, SS, WP
Mountain Lion				
2020-2024	• From 2020 to 2024, UC Davis Wildlife Health Center (UC Davis)	• A mountain lion monitoring plan was developed laying out different options	• UC Davis, USGS and SDMMP working with many other partners intends to	DBM, GIS, PM, PR,

	researchers completed objectives to prepare a long-term monitoring strategy to document mountain lion population status, connectivity, and distribution in the Eastern Peninsula Range in San Diego County. Monitoring plan development included a literature review focused on developing genetic samples from scat and hair-based sampling, camera-based monitoring techniques, and mortality monitoring. • Other supporting tasks were to assist with photo identification software development by providing high-quality mountain lion photographs from trail cameras in the Santa Ana Mountain and collecting mountain lion carcasses to determine cause of death, and gather tissue samples for genetic, pathology and toxicology analyses. • To reduce mountain lion mortality from depredation permits, the UC Davis team also worked on developing and testing different	that are being tested with a pilot study. • Livestock predation deterrence techniques continue to be developed and tested as it is difficult to find a technique that remains effective over time.	continue to develop a camera monitoring network and software for identifying mountain lions that is supplemented with genetic sampling and mortality analyses to monitor mountain lions over the long-term. • Mountain lion mortality monitoring and carcass retrieval will continue in 2025 and 2026 with collection of tissue and genetic and blood samples to document disease and other causes of mortality. • Through 2026, UC Davis will continue to test methods to deter mountain lions from depredating livestock. • In 2025 and 2026, mountain lions along both sides of I-15 will be captured by UC Davis team and GPS collars attached to document movement and determine if mountain lions are crossing the I-15. • SDMMP's connectivity viewer with linkage and wildlife crossing infrastructure analyses can be used to develop prioritized management actions to improve connectivity.	SOW, SS, WP

	methods of deterring mountain lions from killing livestock. • In 2024, a pilot study was undertaken to integrate ongoing land manager camera studies into a network augmented with additional cameras from UC Davis and USGS. The goal is to test camera monitoring methods in conjunction with similar monitoring efforts of the mountain lion population in the Santa Ana Mountains in Orange County.		• SDMMP is part of a collaborative project funded by the state to develop population viability analyses for the Eastern Peninsular Range and other southern California mountain lion populations which will include genetics and connectivity analyses to identify key linkages and wildlife crossing infrastructure to maintain genetic connectivity and demographic rescue among mountain lion populations.	
North County Cactus Nursery and Restoration Projects, Cactus Fungal Pathogen				
2021-2024	• In 2021, AECOM staff discovered sick coastal pricklypear (*Opuntia littoralis*) cactus plants at a nursery used for restoration projects in San Diego. Field surveys across restoration sites and native habitats in San Diego revealed more diseased cacti with similar decay symptoms. • AECOM conducted surveys of cactus at 11 locations in central and north San Diego County. Infected cactus pads	• AECOM surveys found 10 of 11 survey areas had symptoms of fungal pathogens. The only site where no symptoms were detected was at the Safari Park in San Pasqual Valley. Observations of infection were of one or a few individuals at a location, the exception being Torrey Pines State Park where disease signs were widespread. • UC Davis studies showed that *Altenaria alternata* was the primary	• Cactus at the San Pasqual nursery will be assessed periodically to determine if they are symptomatic for disease.	PM, PR, SOW, SS

	were sent to UC Davis to identify the fungal pathogen. • After the fungus was identified, 48 healthy cactus pads from San Pasqual Battlefield State Park and Bernardo Mountain-Lake Hodges were sent to UC Davis for greenhouse trials to determine the pathogenicity of the fungi. Plants that were not inoculated and plants that were inoculated with *Alternaria alternata* fungus were placed in trials where they were exposed to either low level of humidity, high humidity and low or high irrigation.	fungal pathogen of the infected coastal pricklypear *A. alternata* can cause disease in previously healthy coastal pricklypear plants. • Inoculated cladodes from both the Battlefield State Park and Bernardo Mountain developed lesions, showing that coastal pricklypear does not have a natural resistance based on location. During both trials, irrigation level and humidity treatments had different effects on lesion size. As a result, it is recommended that nurseries maintain low humidity and refrain from over irrigating to manage *A. alternaria* infections. The trials show that at restoration sites, the symptoms of infected plants may be exacerbated during the rainy season or at locations closer to the ocean.		
Northern Harrier				
2021	• AECOM worked with SDMMP to develop a northern harrier *(Circus hudsonius)* survey and habitat assessment protocol in 2021. The survey protocol focused on	• In 2021, AECOM biologists conducted northern harrier visual surveys and habitat assessments at 27 areas on Conserved Lands in western San Diego County. Twenty-	• As funding becomes available, future surveys are planned for northern harriers in areas where they occurred in spring	DBM, GIS, PM SOW, SS, WP

	documenting harrier locations and behavior and recording any breeding activity. The habitat assessment included mapping areas where harriers might forage and nest.	six areas had potentially suitable nesting habitat and eight were occupied by harriers. Three surveys areas had confirmed nesting attempts. There were three confirmed nests and one potential nest at Tijuana Estuary with two nests producing large nestlings or fledglings. At San Elijo Lagoon, one nest successfully produced fledglings while Lake Hodges had one nest but no confirmed fledging. • Northern Harrier nests were in thick emergent vegetation in marsh habitat, tall grass in a floodplain, chaparral/coastal sage scrub, and in disturbed habitat with dead mustard. It was a very dry year, and it is possible that fewer harriers attempted to nest because vegetation was too short or sparse and/or prey availability was low.	2021 and in other areas with suitable nesting and foraging habitat. • In areas with potential northern harrier nesting habitat, it would be informative to evaluate prey abundance (particularly small mammals) that can affect breeding success. • Continue to coordinate with the County of San Diego Parks and Recreation Department on breeding surveys for northern harriers in the Tijuana River Valley.	
Pollinator Monitoring Plan				

2021-2024	• UCM analyzed pollinator data collected previously for Otay tarplant and California buckwheat. The results were used to develop a pollinator community monitoring plan. Pollinator monitoring was first implemented in 2024 as part of monitoring ecological integrity of the coastal sage scrub vegetation community.	• Pollinator monitoring results are not yet available as data were collected in spring 2024.	• The next step is to sort and identify pollinator specimens collected during pollinator monitoring and analyze these data plus records of netted insects. Part of the data analysis will be to analyze pollinator community and individual species relationships to coastal sage scrub plant composition and cover data collected during vegetation monitoring at the same plots as pollinators. These analyses will be used to assess the ecological integrity of vegetation communities at pollinator sample plots. • The results of these analyses will be used to identify potential management actions to improve coastal sage scrub quality in areas with low native pollinator diversity and abundance. • Pollinator community monitoring will be repeated when chaparral, coastal sage scrub and grassland vegetation community monitoring is conducted in four to five years.	GIS, PM, PR, SOW, SS, WP
Quino Checkerspot Butterfly				

2023-2024	• From 2022 through 2024, the UCLA La Kretz Center for California Conservation Science implemented a genomic study for Quino checkerspot butterfly as part of a larger genomics and phylogeography study of Edith's checkerspot (*Euphydryas editha*) in California. SANDAG funded more extensive analyses of population structure and gene flow and effects of translocation among populations of the Quino checkerspot butterfly subspecies in San Diego County. • In 2023, regional surveys, host plant mapping, and habitat assessments were conducted by AECOM at 14 sites in western San Diego County. • USFWS, SDZWA, and Wildspring Ecology implemented a captive rearing and population augmentation study from 2018 through 2021.	• The Quino checkerspot butterfly genomics study is ongoing. • During the 2023 surveys, three sites on Conserved Lands were occupied (Marron Valley/Little Tecate Peak, Copper Canyon, and Sycamore Canyon/Donahue Mountain). The long, cold, wet winter may have depressed populations later in the season. Several sites did not have suitable habitat or host plants. • USFWS, SDZWA, and Wildspring Ecology developed methods to capture gravid females, collect eggs in captivity, rear to larval and pupal stages, and translocate to sites on the San Diego NWR where Quino checkerspot butterfly had disappeared. While larvae and adults were detected following translocations, no permanent populations were established. Severe drought prior to and during the study likely contributed to the lack of a clear population response. The study showed that it is possible to	• Based on the 2023 surveys, future management could focus on cryptobiotic soils as much of the high-quality habitat supported healthy cryptobiotic soils. Soil management could include testing soil inoculations as a measure for quicker establishment of cryptobiotic soils. • Future surveys can prioritize Jacumba where no butterflies were detected in 2023, but which previously had many butterflies, and is at the southeastern edge of the butterfly's range. • After the County's Butterfly Habitat Conservation Plan is completed, a structured working group could help engage the community of scientists, biologists, and land managers involved in Quino checkerspot butterfly conservation and management. • Based on the captive rearing and population augmentation study, recommendations are to compare population estimates with known population size, conduct regional occupancy monitoring, analyze weather	FW, GIS, PM, SOW, SS, WP

		successfully rear and release viable larvae, • The translocation project found that some proportion of larvae remained in diapause every year, post-diapause larvae can live two years without feeding, and larvae are responsive to weather and host plant condition and can go in and out of diapause. Boom/bust dynamics appeared to play out at both regional and site-specific scales.	effects at a smaller scale, re-evaluate habitat requirements, conduct metapopulation modeling with full variance, and learn more about extended diapause.	
Rare Plant Discovery Surveys				
2021-2023	• SDMMP coordinated with AECOM to conduct rare plant surveys from 2021-2023 for 21 species on conserved lands. • In 2022 and 2023, SDMMP coordinated with AECOM to conduct botanical surveys of USFS lands within the footprint of the 2020 Valley Fire.	• In 2021, AECOM surveyed for MSP rare plant species and substantially expanded the mapped extent or found new occurrences in 41 instances. In 2022, 43 new or expanded occurrences were documented and in 2023 there were 56 instances. • AECOM surveyed USFS lands within the Valley Fire perimeter and documented 249 plant species. This	• Rare plant discovery surveys will be resumed when funding becomes available.	DBM, GIS, PM, SOW, SS, WP

		included three MSP Rare Plant Species. • AECOM in coordination with SDMMP is assisting partners in developing proposals to obtain funding for rare plant discovery surveys.		
Rare Plant Genetics				
2021-2024	• Genetic studies were initiated for five rare plant species during 2021-2024. Species studied included Orcutt's spineflower (*Chorizanthe orcuttiana*), thread-leaved brodiaea (*Brodiaea filifolia*), Orcutt's brodiaea (*Brodiaea orcutti*), Santa Rosa basalt brodiaea (*Brodiaea santarosae*), and Del Mar manzanita (*Arctostaphylos glandulosa* ssp. *crassifolia)*. • The Orcutt's spineflower project has conducted genetic sampling and environmental characterization, DNA processing, and is analyzing genetic data prior to preparing publications with results.	• There are no project results and outcomes to report as the projects are all ongoing with publications anticipated from 2025 to 2026.	• The three studies of five rare plant species will be completed by 2026. The results will be used to inform management strategies and prioritize management actions. • In 2026, a San Diego ambrosia (*Ambrosia pumila*) genetics study will begin with sample collection.	COOR, GIS, PM, PR, SOW, SS, WP

	• The Del Mar manzanita project is building upon previous efforts to expand and increase sampling effort to determine taxonomic relationships. • The study of three brodiaea species has started with collection of genetic samples in 2024.			
Rare Plant Inspect and Manage Monitoring				
2020-2024	• Rare plant "Inspect and Manage" (IMG) monitoring was conducted 2020-2024 by contracted botanists, land managers, SDMMP, and partners. • Annually, SDMMP determines the rare plant species scheduled for monitoring, updates the survey protocol and data sheets as needed, supports the Rare Plant Monitoring training, and assists land managers with rare plant surveys. Every fall, SDMMP staff clean up, collate, and input rare plant data into the rare plant database. • SDMMP prepared summary statistics and graphs for rare plant data with the	• Rare plant monitoring data for 2024 is being submitted by partners. From 2020-2023, there were 828 surveys for 24 rare plant species. • A draft of the Regional Rare Plant Management and Monitoring Program manuscript has been prepared and is under revision.	• Rare plant IMG monitoring will be implemented through 2029. • The Regional Rare Plant Management and Monitoring Program manuscript is planned for publication by 2026. • SDMMP plans to complete rare plant data analyses and a draft manuscript by 2026. • Based on the results of rare plant data analyses, SDMMP will evaluate and revise as needed the species prioritized for monitoring and any changes to monitoring frequency after 2026.	ANAL, COOR, DBM, FW, GIS, PM, PR, PUB, SOW, SS, WP

	most complete data sets. Staff are working with a statistician to analyze rare plant population size, threats, and management actions. • AECOM and SDMMP are preparing a manuscript describing the Regional Rare Plant Management and Monitoring Program for Conserved Lands in Western San Diego County.			
Rare Plant Management and Seed Plans				
2020	• The Management Strategic Plan Framework Rare Plant Management Plan for Conserved Lands in Western San Diego County with chapters for four species was published in 2020, with most of the work completed by 2019. • The plan was updated in 2021 with chapters for three additional species. • In addition to the management plans, companion seed collection and banking plans were completed for the seven species in 2020 and 2021.	• The 2020 management and seed plans were prepared with chapters for San Diego thornmint *(Acanthomintha ilicifolia)*, Nuttall's acmispon *(Acmispon prostratus)*, salt marsh bird's-beak *(Chloropyron maritimum maritimum)*, and Otay tarplant. • The 2021 updated management and seed plans included chapters for Orcutt's spineflower, short-leaved dudleya *(Dudleya brevifolia)*, and willowy monardella *(Monardella vimnea)*.	• Management and seed plans will be updated in 2026 to include chapters for Encinitas Baccharis and Blochman's dudleya.	COOR, PM, PUB, SOW, SS, WP

		• Management priorities are being implemented for these species, including habitat management, such as invasive plant control and population augmentation, and collection of seed for conservation banking and bulking for restoration.		
Regional Camera Monitoring Workshop and Strategy				
2020-2024	• USGS continued development of a regional camera monitoring strategy with development of database management tools.	• A workflow was created using a combination of the command window, MS Excel, and MS Access to process wildlife camera photos and document the species observed. • Camera Processing Beta Testing Workshop was held in August 2022. Land managers and SDMMP provided feedback on the process instructions.	• In 2025 and 2026, USGS intends to continue developing, testing, and assisting managers in use of database management tools and integrating cameras into regional camera monitoring network. • USGS and UC Davis intend to continue working on establishing a camera monitoring network to monitor mountain lions. This includes evaluating and improving software to process photos and identify species and potentially individuals.	PM, PR, SOW
Southwestern Pond Turtle Recovery				
2020-2024	• USGS continued studying nonnative aquatic species removal as a tool for	• American Bullfrogs (*Lithobates catesbeianus*) responded positively to greater than average rainfall in	• In 2025 and 2026, USGS intends to continue to monitor for and remove nonnative aquatic species from	ANAL, DBM, GIS, PM, PR,

	Southwestern Pond Turtle (*Actinemys pallida*) recovery in San Diego. • USGS continued monitoring known populations of Southwestern Pond Turtles on conserved lands in San Diego County. • USGS continued to search for Southwestern Pond Turtles and suitable habitat within San Diego County.	2023 and 2024, reoccupying stream reaches previously cleared. Several hundred have needed to be removed from sites that were at zero detections in 2022. • Invasive species removal and Southwestern Pond Turtle translocation have also shown to be successful tools for management of the species. • The population at the Sycuan Peak Ecological Reserve continues to grow with new turtles detected in every year between 2020 and 2024. • The translocated population at the Nature Conservancy's Wheatley Preserve has become established with 10 new Southwestern Pond Turtles being detected in 2024, a population growth of 55 percent since the turtles were translocated. • During monitoring surveys, USGS detected recruitment in Escondido Creek (Escondido Creek Conservancy) and Santa Maria	Southwestern Pond Turtles restoration sites. • In 2025 and 2026, USGS intends to continue to monitor known populations of Southwestern Pond Turtles on conserved lands in San Diego County. • In 2025 and 2026, USGS intends to continue to investigate newly conserved properties for Southwestern Pond Turtle populations and habitat. • In 2025 and 2026, USGS intends to work with SDMMP, SANDAG, and partners to identify conservation priorities for the Southwestern Pond Turtle.	PUB, SOW, SS, WP

		Creek (Ramona Grasslands Preserve) illustrating success in local management by SDMMP partners. • During investigative surveys, USGS discovered Southwestern Pond Turtles at higher elevations than previously recorded in Pine Valley and Sweetwater River watersheds within California State Parks and USFS properties.		
Southwestern Willow Flycatcher Status and Demography				
2020-2024	• USGS conducted surveys for the southwestern willow flycatcher *(Empidonax traillii extimus)* from 2020 through 2024 at three locations along the upper San Luis Rey River and at Lake Henshaw. • USGS began a reproductive monitoring study at the Lake Henshaw location in 2024. The purpose of the study is to assess the impacts of brown-headed cowbird *(Molothrus ater)* on flycatcher nesting success and productivity.	• From 2020 to 2023, southwestern willow flycatchers declined and then stopped breeding along the upper San Luis Rey River while increasing in abundance at Lake Henshaw. In 2020, there were seven territories along the upper San Luis Rey River and 28 territories at Lake Henshaw. By 2023, there were no breeding pairs detected along the upper San Luis Rey River and there were 51 territories at Lake Henshaw. The results of 2024 surveys are not yet available.	• In 2025 and 2026, USGS intends to continue annual monitoring at Lake Henshaw and surveys at other sites throughout the MSP area. • In 2025, USGS intends to continue the study of the effects of nest parasitism on willow flycatcher reproduction. • Prioritized regional management actions from the conservation strategy are available for implementation in 2026.	DBM, GIS, PM, PUB, SOW, SS, WP

	• USGS worked on developing a draft southwestern willow flycatcher management strategy. • USGS completed the southwestern willow flycatcher conservation strategy in 2025.	• This shift in nesting areas appears to be due to the growth of willow riparian habitat at Lake Henshaw and degradation of breeding habitat at upper San Luis Rey due to oak tree mortality caused by the invasive goldspotted oak borer *(Agrilus auroguttatus).* • Southwestern willow flycatcher pairs are mostly monogamous with some polygynous pairings between one male and two females. • Results are not yet available for the reproductive monitoring study to document effects of brown-headed cowbird parasitism.		
State of the Preserve				
2020-2022	• SDMMP and USFWS prepared a state of the preserve report in 2022. The health of the regional preserve system is assessed by combining information on the environmental conditions and status of species in natural ecosystems with information on impacts from anthropogenic (human caused) threats.	• A total of 19 indicators were selected to represent the current health of the ecosystem in western San Diego County. Overall, the regional preserve system was determined to be a condition of Concern. Out of 19 indicators, 12	• An update of the State of the Preserve is anticipated after 2026 and will include evaluating existing indicator metrics as well as creating new metrics. It will also include adding more indicators in species, vegetation, and threat categories. • A limitation in determining metrics and indicator conditions is the lack of data or	ANAL, COOR, DBM, GIS, PM, PUB, SOW, SS, WP

	• SDMMP created a Metrics Dashboard for partners to visualize the status of indicators for various metrics.	were either Concern or Significant Concern. • Regional threats have increased in the last several decades and often interact to negatively impact the health of the regional preserve system.	the inconsistency of the type of data collected. This was especially true for evaluating implementation of management objectives. In the future, more information could be extracted if data were collected in a similar manner with the knowledge of how it would be incorporated into an update of this plan. One place that information is being standardized is in the SANDAG grant reporting program. Information collected there is the type of data in a format compatible with existing and planned metrics. Expanding this to other management projects would allow SDMMP to leverage more data across the county.	
Stinknet Monitoring and Treatment				
2020-2024	• After a meeting in early 2020 between SDMMP and land managers in the San Pasqual Valley, locations were prioritized for stinknet (*Oncosiphon pilulifer*) treatment in 2021 and 2022. • SDMMP staff mapped all reported stinknet locations and used the map for a priority treatment assessment	• Since January 2022, the Invasive Plant Coordinator and contractors treated stinknet at 5 sites. They treated a total of 7.7 acres, surveyed a total of 10.15 acres, and removed about 16,000 plants. • In addition to this, several land managers, some through SANDAG	• Stinknet mapping and control efforts will continue in 2025 and 2026, focused on controlling isolated infestations that can cause expansion of the species as well as controlling areas with priority sensitive species and habitats.	ANAL, COOR, DBM, FW, GIS, PM, SOW, SS, WP

	based on each location's access, habitat type, and sensitive species present. Treatment continued in 2023 and 2024. • Stinknet is the only level 3 species treated by the invasive plant species program, other than giant reed (*Arundo donax*) retreatment. Level 3 species are species that cannot be eradicated but may be suppressed to protect high value resource areas.	EMP *TransNet* grants, are or have treated stinknet on their lands. • SDMMP is creating a viewer on the SDMMP website to show all areas of known and treated stinknet within San Diego County.		
Threats and Stressors				
2022-2024	• The issue of aseasonal wetlands in urbanizing landscapes has received varying amounts of attention. The runoff can create a range of results from increased soil moisture levels to geomorphic changes in creeks and perennial flows in xeric landscapes. USGS conducts stream surveys and surface water monitoring across coastal draining watersheds in San Diego County to better understand how threats like development and drought impact local water flows. These data loggers collect water conductivity and	• From 2022 through 2024, USGS deployed data loggers at 133 sites across 15 coastal draining watersheds. During this period, USGS conducted 148 visual encounter surveys across the 133 surface water monitoring sites. Eight sites were established for the Southwestern Pond Turtles monitoring program, 70 sites for Arroyo Toad monitoring, and 55 sites as general aquatic biodiversity	• USGS intends to continue to gather and analyze data in 2025 and 2026 to inform management options for species under the influence of urban runoff.	ANAL, DBM, GIS, PM, SOW, SS, WP

	temperature at intervals between 15 minutes and 2 hours to build hydroperiod and temperature profiles for the streams. • R code was developed to automate data reduction and is being tested.	sites across a range of land uses in the watershed. • Data from the loggers has helped determine where urban runoff is providing aseasonal habitat for non-native aquatic problem species in areas inhabited by Arroyo Toads, Southwestern Pond Turtles and in vernal pools. Data from these loggers have also identified cold water resources needed for native fishes, including the steelhead *(Oncorhynchus mykiss)*.		
Tricolored Blackbird				
2021-2023	• In 2021, AECOM worked with SDMMP to develop a tricolored blackbird (*Agelaius tricolor;* TCBL) survey and habitat assessment protocol based upon the statewide monitoring protocol. Additional data collection focused on evaluating habitat characteristics and threats. • Surveys were implemented in 2021-2023 with suitable habitat mapped, breeding and foraging blackbirds	• Suitable tricolored blackbird nesting habitat was mapped at 18 of 31 survey areas in 2021, 12 of 24 in 2022, and 12 of 15 in 2023. While many of the survey areas had potential nesting habitat, most did not have nearby foraging habitat, especially in coastal areas. • The most suitable habitat for nesting colonies consisted of ponds in eastern San Diego County next to large	• AECOM will conduct tricolored blackbird surveys in 2026. A review of sites is planned to identify those with suitable nesting habitat and nearby foraging areas. Data for these sites will be evaluated to rank threats to nesting and foraging habitat and to identify and prioritize management actions to improve breeding and foraging conditions.	DBM, GIS, PM, SOW, SS, WP

	surveyed, and photos and other information collected on foraging adults and food items brought to nestlings. In 2021, 31 survey areas were evaluated for suitable habitat and use by breeding TCBLs. Twenty-four areas were surveyed in 2022 and 15 areas in 2023. The 2021 surveys were coordinated with southern California survey efforts. • The San Diego Natural History Museum was awarded funding by CDFW to conduct tricolored blackbird nesting surveys and research in 2024 and 2025. SDMMP shared protocols and data to promote consistency in methods for comparable datasets.	grasslands grazed by cattle. Tricolored blackbirds occupied three sites in 2021. There was a nesting colony of about 400 birds with fledglings at Rancho Jamul Ecological Reserve (south pond), 12 birds at a small pond on one of two visits in Pamo Valley, and a foraging flock of about 450 birds at Ramona Grasslands near a pond on Ramona Municipal Water District land. In 2022, tricolored blackbirds successfully nested at Puerta La Cruz near Lake Henshaw/Warner Springs and at Rancho Jamul Ecological Reserve (south pond), with 450 birds and 500 birds, respectively. Tricolored blackbirds were observed foraging near Lake Henshaw and Ramona Grasslands. Higher rainfall in 2023 may have contributed to high fledgling production at two colonies, with low or no success at two other colonies due to lack of nesting substrate and water drawdown. In the Lake Henshaw/Warner Springs area, Puerta La Cruz had a colony of about		

		350 birds and Swan Lake a colony of about 400 birds with both colonies producing many fledglings. At Rancho Jamul there were far fewer birds (45) at the South Pond as the cattail vegetation was in poor condition (dead, fallen over) from late season frost damage and there was no observed reproduction. The North Pond was also occupied by 35 birds with no fledglings observed, although a few females fed nestlings. At this pond the moat of water surrounding the sparse nesting substrate disappeared over the course of the season. Tricolored blackbirds were also observed foraging at Ramona Grasslands in 2023.		

Science Products Produced:

A full list of products produced for Task 1 is available in Appendix A.

Task 2: SDMMP Database Administration and Management Deliverables:

This task provides data management and administration to support SDMMP. The data management team leads database development and oversees its administration. This includes maintenance of the Southern California Multi-Taxa Database (SC-MTX) and data dictionary. The team creates data entry forms and templates developing standards and data use agreements. They collaborate on SDMMP science projects to identify, query, and reduce integrated data from SC-MTX for analysis. They provide these outputs in formats usable for data analysis and GIS presentation. This ensures accurate and consistent data integration and reporting. The data administration team organizes and maintains a variety of datasets. They work with scientists and local land managers to obtain data. They integrate data from contributed field forms, reports, and spatial databases into SC-MTX. They train and assist partners with data collection and entry. They develop queries and tools that provide benefit to managers and data contributors. This increases the integrity, usefulness, and lifetime of cooperator data.

This task also includes maintaining the SDMMP library of reports and updating the meeting information to the SDMMP website. SDMMP establishes goals and work priorities in collaboration with USGS leads.

Summary

See Table 2 for a summary of the data program; projects that included database management/databases developed; datasets being mined, maintained, and/or migrated to SC-MTX, MSP Portal, and/or other database; and compiled digital monitoring and management datasets in formats conducive for analyses.

Table 2. Database Management Summary. Summary of the data program; projects that included database management/databases developed; datasets being mined, maintained, and/or migrated to SC-MTX, MSP Portal, and/or other database; and compiled digital monitoring and management datasets in formats conducive for analyses.

Data Program	Projects that included database management/Databases developed	Datasets being mined, maintained, and/or migrated to SC-MTX, MSP Portal, and/or other databases	Compiled digital monitoring and management datasets in formats conducive for analyses
SDMMP GeoDatabase			
The SDMMP Geodatabase is an Esri SDE database within an MS SQL Server in USGS's NatWeb Data Science Program. Project data are stored as feature classes within the database, have associated metadata, and can be served to ArcGIS applications through catalogs. Data can also be integrated spatially or with tabular models direct queries in MS SQL Server.	Geospatial Partner Data: Conserved Lands Database Master Occurrence Matrix (MOM) Database USGS Stream Survey Data (Turtles, Toads) RECON Monitoring Data Historic Vegetation Type Map (VTM) Data from the National Park Service (in addition to UC Berkeley VTM data)	Mined: Wieslander VTM, USGS Stream Survey Database, USGS Pitfall Veg Database Maintained: Conserved Lands Database, MOM Occurrence Database, Rare Plant IMG Migrated: (see MOM)	Rare Plants IMG
MySQL / MultiTaxa Interface			

The MultiTaxa interface uses MySQL within the USGS's NatWeb Data Science Program. The data collected and presented through the GeoDatabase or the SDMMP Website are supported by tables and stored procedures in MySQL.	SDMMP.com Web Projects: Rare Plant IMG Species information, taxonomy, and attributes	Rare Plant IMG and Taxa information maintained	Rare Plant IMG compiled for reporting
MOM MOM is a compilation of datasets from both USGS, partners and external collections bringing together observation records of rare plants and animals. The SDMMP MOM online viewer is available to partners and collaborators to view and utilize to determine where to focus survey efforts for species management and conservation.	Rare Plant IMG, USGS Streams, USGS Riparian Bird, AECOM, RECON, Carlsbad Fish and Wildlife Office (CFWO), Discovery Surveys, San Diego (SD) County, California Natural Diversity Database (CNDDB), UC Riverside (UCR), CalFlora	California Consortium of Herbaria, Global Biodiversity Information Facility, iNaturalist, CNDDB, Calflora	RECON, AECOM, USGS Streams, USGS Riparian Bird, Rare Plant IMG, CFWO, SD County, Discovery Surveys, UCR
Rare Plant IMG			

Land managers and contracted biologists in coordination with the SDMMP collect the Rare Plant IMG survey data on mobile forms using Esri's Survey123. The regional biologists upload and QC their data to SC-MTX through the SDMMP web portal. This real time data integration expedites the analyses of species and population trends over time and the association between habitat and threat covariates and population dynamics.	Rare Plant IMG: Data collection via Esri's Survey123, data upload to SC-MTX through SDMMP.com web page, data qc through SDMMP.com web page, data reporting through SDMMP.com web page	Rare Plant IMG data being maintained in SC-MTX and mined for reporting and analysis	Rare Plant IMG surveys collected on Personal Digital Assistant (PDA) using Esri's Collector app.
Species Taxonomy and Attributes			
The species/taxa database houses the current taxonomy of species for which the program collects, mines, or manages data. The database is housed in the MySQL instance in NatWeb and supports SC-MTX as well as the data entry, data collection, and data reduction tools used by SDMMP and partners. This database provides the	Rare Plant IMG, MOM, Historic Vegetation Analysis	Integrated Taxonomic Information System, California Herps, Calflora, US Department of Agriculture Plants Database are mined and sourced for taxonomy and ecology information by species	-N/A-

nexus between the website's species pages and the data collected by partners.			

Products produced:

A full list of products produced for Task 2 is available in Appendix A.

Task 3: SDMMP GIS Analyst and Management Deliverables:

This task provides GIS analysis and management support to the SDMMP and will be the lead for: managing, organizing, and maintaining a variety of GIS datasets and viewers, and overseeing all aspects of spatial data management; identifying and conducting spatial data analyses to support the SDMMP in collaboration with the SDMMP Ecologist, Coordinator, Administrator, and Data Manager to identify and create analysis products for posting on the SDMMP website; identifying GIS related resources/data sets of importance to the SDMMP's various programs; working with SANDAG to maintain and update spatial data sets; working with SDMMP to develop data sharing agreements that allow SDMMP partner's spatial and other datasets to be inputted and extracted from the MSP portal; working with San Diego conservation partners to identify spatial data products that help them further their conservation efforts and build collaborations with other organizations; updating and maintaining the San Diego Conserved Lands Database; working with land managers and scientists to obtain spatial datasets and collaborate with the SDMMP team on scientific projects; analyzing spatial datasets; assisting with preparation of science reports and publications; preparing presentations and training materials; and working on other projects as a member of the SDMMP in collaboration with USGS leads. The SDMMP GIS Manager will develop work plans and timelines to meet identified goals and priorities.

Summary

For summary of spatial datasets and analyses, see Table 3.

Table 3. SDMMP GIS Analyst and Management Products. A summary of spatial datasets mined, maintained and/or migrated; description of the results of spatial analyses conduced; and draft spatial products prepared for SDMMP partners.

Project Name	**Spatial datasets being mined, maintained, and/or migrated to SC-MTX, the MSP portal, and other GIS viewers**	**Description of the results of spatial analyses conducted**	**Draft spatial products prepared for SDMMP partners**
American Badger Connectivity Study	American Badger hotline and survey data put into MTX/MOM and website		
Arroyo Toad Monitoring and Management	Arroyo Toad survey data incorporated into MTX/MOM and website		
Bats Surveys	Bat survey compilation and management plan data was incorporated into MTX/MOM and website	Created bat community metrics based on clusters of bat detections	
Coastal Cactus Wren Monitoring	Cactus wren data incorporated into MTX/MOM and website		Viewer with survey data on website
California Regional Gnatcatcher Monitoring and Fire Recovery	Regional CAGN data incorporated into MTX/MOM and website		Prepared online maps of results from 2014, 2016, and 2020 surveys, calculated new fire categories and summary data for survey points in 2020

California Regional Gnatcatcher Monitoring Program	Regional CAGN data incorporated into MTX/MOM and website		Prepared online maps of results from 2014, 2016, and 2020 surveys
Coastal Sage Scrub, Chaparral and Grassland Vegetation Monitoring	Pilot vegetation monitoring data incorporated into MTX/MOM and website		Prepared maps of historic vegetation, draft monitoring points, processed lidar data, calculated vegetation height and health from lidar and National Agriculture Imagery Program (NAIP)
Golden Eagle Monitoring and Management	Incorporated data into MTX/MOM and website (not public)	Hotspot analysis, metrics of nest and territories, cleanup of nest data, regression analysis on nest sites	Created hot spot analysis from telemetry data, created maps for report, online map for comments from working group
Least Bell's Vireo Surveys	Compiled covariate data for the State of California for habitat modeling	State-wide habitat suitability model and dataset	
Mountain Lion	Incorporated data into MTX/MOM and website. Data is not available publicly		
Rare Plant Genetics			Prepared maps for brodiaea occurrences site selection to be used for genetic study

Rare Plant Inspect and Manage Monitoring	Manages data from partners and creates outputs on website, incorporated into MTX/MOM and website, online maps with graphs and raw data	Analysis of rare plants is ongoing	
Rare Plant Management and Seed Plans			Prepared maps for 3 rare plant species seed plans
Southwestern Pond Turtle Recovery	Southwestern Pond Turtle data in MTX/MOM and website		
South San Diego County Coastal Cactus Wren Habitat Conservation Strategy			Prepared figures for management areas
Stinknet Monitoring and Treatment	Online map storing locations of stinknet and removal efforts		
Fire Management	Online map of fire infrastructure, species, sensitive resources maintained		
Enforcement Coordination	Created online map for land manager survey		
General website tasks			MOM database, threats, and other covariate layers maintained

			on SDMMP website, patch size calculations
Connectivity Linkages project	Compiled data from various connectivity reports into GIS database		Online map of linkages and recommended actions
Oak and Riparian mortality mapping		Analysis of tree lidar and canopy polygon layer that identified dead or dying trees in oak and riparian vegetation areas	Posted data of dead trees identified, shared in presentations
Conserved lands DB	Conserved property boundaries maintained in database and on website		Conserved lands database provided to SanGIS data warehouse quarterly
State of the Preserve report and dashboard			Dashboard of metrics results created and on website
Argentine ant probability			Richmond, J.Q., Matsuda, T., Brehme, C.S., Perkins, E.E., and Fisher, R.L. 2021 Predictability of invasive Argentine ants across Mediterranean ecoregions of southern California. *Western North American Naturalist*. 81(2). pp. 243-256

Species modeling		Willowy monardella and Hermes Copper- updated grid of species and covariate data	
Framework Management Plans			Prepared figures for use in management plans for 2 preserves

Products Produced

A full list of products produced for Task 3 is available in Appendix A.

Task 13: SDMMP Website, Database, & MSP Portal (1200357)

The USGS in collaboration with the SDMMP has previously created a data-driven website and MSP Portal that supports, manages, and allows access to regional data, projects, GIS shapefiles and maps, documents and reports, and the MSP Roadmap. The SDMMP website and MSP portal need continual improvement and management to increase functionality and use by land managers, scientists, planners, wildlife agencies, and other stakeholders. The USGS intends to work collaboratively with the SDMMP team to identify specific actions and develop timelines to meet priorities managed within the internal deadlines as described below.

Summary

- Implemented Rare Plants Database Module: data upload and validation, data management, tracking updates, sample points management, photo & spatial data upload and archival, internal & public report generation.
- Implemented the Metrics Dashboard.
- Implemented OccInfo (rare species occurrence information) management module. This module manages (updates, adds, removes) rare species occurrences in the database.
- Implemented SPPMaster (species master list with standardized taxonomy, codes, life forms, and status) management module. This module manages the master species list and associated metadata.
- Continual website updates, code optimization, bug fixes, security patches, and technology updates (php 8, mysql 8, bootstrap 5).
- Added database table structure to allow for management of Rare Plants dataset, from upload through QAQC process, to integration with existing database.
- Coded the Rare Plants reports for website output.

- Restructured tables that manage Rare Plant occurrences and sample points.
- Developed workflow for internal management of Rare Plants records during their lifecycle.
- Database coding to support data calls to website.
- Supported users with troubleshooting.
- Managed data querying and migration.

Task 15: SDMMP Coordinator Deliverables:

This task provides coordination support to the SDMMP and is responsible for assisting the SDMMP Team and SANDAG with facilitating the coordination and implementation of strategic plan projects with scientists, land owners/managers, other stakeholders, and other SANDAG contractors and keeping track of progress; preparing for (creating meeting materials, reserving rooms and IT support, identifying and coordinating speakers, etc.) and facilitating a variety of meetings, trainings, and workshops with stakeholders including, but not limited to, the monthly Management/Monitoring Coordination meeting, quarterly Land Manager Meetings, strategic plan workshops, focal species and project technical group meetings, and one-on-one meetings with stakeholders as needed and requested; preparing and giving PowerPoint presentations on the program and projects at meetings as needed and requested; working with the SDMMP team and USGS to support the current SDMMP website, MSP Portal, and other databases; assisting SANDAG in facilitating the *TransNet* Land Management Grants by providing input on the MSP priorities and application process, reviewing submitted applications, and working with land managers to develop proposals; developing technical support tools and training materials for stakeholders; and developing status reports on the program and projects to provide to SANDAG and the Regional Habitat Conservation Taskforce. The SDMMP Coordinator develops work plans, scopes of work, and timelines to meet identified goals and priorities in collaboration with SDMMP representatives and USGS leads.

Summary

- **Synopsis of monitoring and management activities implemented:**
  The SDMMP Coordinator assisted with all aspects of project management including scopes of work for various contracts and projects, including the invasive plant species management, Rare Plant Inspect and Manage surveys, grazing monitoring study, and more. The coordinator communicated with contract leads and participants through regular emails and/or meetings to monitor project progress. The SDMMP Coordinator supported the SDMMP website by adding new documents to the library, new events to the calendar, and new announcements and grant opportunities. They coordinated with SANDAG, scientists, landowners/managers, planners, and other SANDAG contractors to create project pages to track progress and ensure data and project documents were up to date on the web portal. The SDMMP Coordinator worked with SANDAG staff to develop a white paper appendix for the SANDAG Regional Plan update that covered the history of the Multiple Species Conservation Program (MSCP), Multiple Habitat Conservation Program, Environmental Mitigation Program, and SDMMP, regional management and monitoring accomplishments, and the habitat conservation vision going forward.

- **Summary of engagement with partners through meetings and outreach:**
  The SDMMP Coordinator organized and held 47 monthly Management and Monitoring Coordination meetings and 5 annual end-of-year meetings and luncheons from January 2020 through December 2024 for SDMMP partners (December 2024 meeting in planning stage). Meetings covered a variety of topics and were attended by 350 different people representing over 120 unique organizations. The coordinator organized and facilitated 10 quarterly MSP Land Manager Meetings from January 2020 through December 2024. Meetings were held at various locations across San Diego County and included presentations on resource management and round table updates from participants. The coordinator arranged and organized special trainings and workshops, as needed. These included a Shot-hole Borer Identification Training Workshops taught by researchers from the University of California in May 2022 that

was attended by 30 people. The SDMMP also cohosted a Lunch and Learn with the San Diego Foundation on January 28, 2020. The speaker was Brittany Cole Bush who discussed using prescribed grazing for fire prevention and restoration. The coordinator represented SDMMP at the State of Biodiversity Symposium (2020, 2024), Carlsbad Habitat Management Plan Public Meeting (2020, 2021, 2022, 2023), Western Riverside MSHCP Meetings (monthly), California Invasive Plant Council Conference (2020, 2022, 2023, 2024), Annual MSCP Workshop (2020, 2021, 2022, 2023), and the Volcan Mountain Symposium (April 2023). The coordinator hosted a table at the April 2024 California Forest and Fire Resiliency Southern California Meeting sharing information about the SDMMP and its fire management efforts. On the second day of the meeting, the coordinator hosted a field trip at Rancho Jamul to give an overview of the grazing monitoring project and the relation to fire management.

Future (next steps) for SDMMP

Task 1

- The science basis of the program continues to grow stronger as SDMMP oversees monitoring and research studies on species, habitats, and threats and develops management strategies to reduce the impact of threats. Based on innovative and top-tier scientific research, SDMMP and partners will continue to increase our understanding of species' population dynamics, individual and population responses to many different threats, habitat relationships, ecology, and life histories. This leads to a better understanding of management needs and development of best practices to be more effective in management outcomes.
- SDMMP anticipates continued growth in management needs for species and habitats with increasing global and landscape-scale threats affecting the regional preserve system. It is uncertain if management successes can keep up with the intensity and landscape-scale impacts of wildfire, drought, invasive species, and altered ecosystem functions.

Task 2

- SDMMP will invest in managing individual, separate data sets submitted by collaborators and partners distinguished by funding source and funding cycle. Data will then be integrated for reduction, analysis, and reporting by taxa and associated biology (functional/ecological role, protocol, survey methods/effort, etc.).
- SDMMP will continue to work with partners and collaborators to increase efficiency and automation of the data integration by establishing standards for data collection and submission to streamline the workflow from fieldwork to reporting and analysis.

Task 3

- SDMMP will update existing and past projects with changing GIS technology including new templates for the online map viewers and conversion of old file types to the best available.
- SDMMP will continue to work to standardize incoming data that reduces QAQC effort and produces datasets that are more useful for research across the county.
- SDMMP will continue to collect data from various partners into compiled databases for use by partners and to conduct regional analyses.

Task 13

- SDMMP will continue developing processes into a system for users to upload data.
- SDMMP will internally update the databases that are driving the SDMMP website as new data is available or needed.

Task 15

- SDMMP will increase promotion of products produced in-house and by partners and continue to work with partners to highlight projects on social media, the SDMMP website, and at outreach meetings. SDMMP will increase engagement with community and outreach groups.

- SDMMP will increase engagement with partners by holding more in-person meetings to allow for more one-on-one interactions and personal attendance but will continue to also host them with the hybrid (virtual) option to allow for a broader reach.

All Tasks

- SDMMP will continue to coordinate implementation of MSP Roadmap management and monitoring objectives for the 2022-2026 planning cycle.
- SDMMP and partners are planning future adjustments in prioritizing and achieving regional management and monitoring objectives. There are challenges to meeting program objectives due to a potential temporary reduction in funding after 2029, coupled with uncertainties in funding amounts over the long term, and increasing program costs. A static budget with rapidly rising costs over the last several years has meant that management and monitoring objectives were delayed, funded through other means, or discontinued. SDMMP will continue to look for outside funding sources and partnerships to implement project objectives. These may come through obtaining external grants for partners to implement objectives, leveraging wildlife agency funds, partner contributions, and volunteer and citizen science involvement.

Appendix A. Science Products Produced, State and National Conferences, and Outreach Meetings and Events (2020-2024)

Science Products Produced

(SDMMP contributions in bold)

Arroyo Toad Monitoring and Management

Journal Publications:

Hitchcock, C. J., E. A. Gallegos, A. R. Backlin, R. Barabe, P. H. Bloom, K. Boss, C. S. Brehme, C.W. Brown, D.R. Clark, E.R. Clark, K. Cooper, J. Donnell, E. Ervin, P. Famolaro, K.M. Guiliam, J. J. Hancock, N. Hell, S. Howard, V. Hubbartt, P. Lieske, R. Lovich, T. Matsuda, K. Meyer-Wilkins, K. Muri, B. Nerhus, J. Nordland, B. Ortega, R. Packard, R., Ramirez, S. C. Stewart, S. Sweet, M. Warburton, J. Wells, R. Winkleman, K. Winter, B. Zitt, and R. N. Fisher. 2022. Range-wide persistence of the endangered arroyo toad (*Anaxyrus californicus*) for 20+ years following a prolonged drought. Ecology and Evolution; 12:e8796. https://doi.org/10.1002/ece3.8796.

Irving, K., K. T. Taniguchi-Quan, A. Santana, M. L. Treglia, R. N. Fisher, J. Haas, C. Loflen, **C. Brown**, and E. D. Stein. In Press. Vulnerability of an endangered amphibian to climate-change induced hydrologic change. River Research and Applications (in final review).

Bats Surveys

Journal Publications:

Myers, B., D. Stokes, **K. L. Preston**, R. N. Fisher, and A. G. Vandergast. 2024. Quantification of threats to bats at localized spatial scales for conservation and management. PLOS ONE 19: e0310812. https://doi.org/10.1371/journal.pone.0310812.

Data:

BatSurveyData.Myers2024PLOS.xlsx, https://sdmmp.com/view_project.php?sdid=SDMMP_SDID_187_628fcfa396d0d#data-files-tab

Coastal California Gnatcatcher Post-Fire Recovery Study

Journal Publications:

Kus, B. E., **K. L. Preston**, and A. Houston. 2024. Rangewide occupancy of a flagship species, the Coastal California Gnatcatcher (*Polioptila californica californica*) in southern California: Habitat associations and recovery from wildfire. PLoS ONE 19(7): e0306267. https://doi.org/10.1371/journal.pone.0306267

Data Releases:

Kus, B. E. and A. Houston. 2021. Rangewide occupancy and post-fire recovery of California gnatcatchers in southern California (ver 2.0, March 2023): U.S. Geological Survey data release. https://doi.org/10.5066/F7PC30JX.

Coastal California Gnatcatcher Regional and Subregional Monitoring Program

Journal Publications:

Kus, B. E., **K. L. Preston**, and A. Houston. 2024. Rangewide occupancy of a flagship species, the Coastal California Gnatcatcher (*Polioptila californica californica*) in southern California: Habitat associations and recovery from wildfire. PLoS ONE 19(7): e0306267. https://doi.org/10.1371/journal.pone.0306267

Reports:

Kus, B. E., A. Houston, and **K. L. Preston**. 2024. Occupancy dynamics of the Coastal California Gnatcatcher in southern California: U.S. Geological Survey Open-File Report 2024-1015, 34 p. https://doi.org/10.5066/F7PC30JX.

Data Releases:

Kus, B. E. and A. Houston. 2021. Rangewide occupancy and post-fire recovery of California gnatcatchers in southern California (ver 2.0, March 2023): U.S. Geological Survey data release, https://doi.org/10.5066/F7PC30JX

Web Tool:

California Gnatcatcher South Coast Regional Monitoring Program. https://sdmmp.com/view_project.php?sdid=SDID_201612021615.5#data-files-tab

Coastal California Gnatcatcher Range-wide Genetics

Journal Publications:

Vandergast, A. G., B. E. Kus, D. A. Wood, E. R. Milano, and **K. L. Preston**. 2022. Subspecies differentiation and range-wide genetic structure are driven by climate in the California gnatcatcher, a flagship species for coastal sage scrub conservation. Evolutionary Applications 15:1201-1217. https://doi.org/10.1111/eva.13429

Coastal Cactus Wren Genetics

Journal Publications:

Vandergast, A. G., B. E. Kus, J. G. Smith, and A. Mitelberg. 2022. Recent declines in genetic diversity with limited dispersal among coastal cactus wren populations in San Diego County, California. Conservation Science and Practice 2022: e12780, https://doi.org/10/1111/csp2.12780

Coastal Cactus Wren Monitoring

Journal Publications:

Winchell, C. S., K. P. Huyvaert, P. F. Doherty, J. M. Taylor, and T. J. Grant. 2021. Ecological correlates to habitat use in the Cactus Wren (*Campylorhynchus brunneicapillus*). The Wilson Journal of Ornithology 133: 408-416. https://doi.org/10.1676/19-00145.

Reports:

Lynn, S., A. Houston, and B. E. Kus. 2022. Distribution and demography of Coastal Cactus Wrens in Southern California, 2015–19: U.S. Geological Survey Open-File Report 2022–1044. 44 p. https://doi.org/10.3133/ofr20221044

Lynn, S. and B. E. Kus. 2021. Distribution and demography of coastal cactus wrens (*Campylorhynchus brunneicapillus*) in southern San Diego County, California—2020 data summary: U.S. Geological Survey Data Series 1138. 12 p. https://doi.org/10.3133/ds1138

Lynn, S. and B. E. Kus. 2022. Distribution and demography of coastal Cactus Wrens (*Campylorhynchus brunneicapillus*) in southern San Diego County, California—2021 Data summary: Data Report 1159. 14 p. https://doi.org/10.3133/ds1138

Lynn, S. and B. E. Kus. 2023. Distribution and demography of coastal Cactus Wrens (*Campylorhynchus brunneicapillus*) in San Diego County, California—2022 data summary: U.S. Geological Survey Data Report 1174. 14 p. https://doi.org/10.3133/dr1174

Lynn, S. and Kus, B. E. 2024. Distribution, abundance, and habitat characteristics of Coastal Cactus Wrens (*Campylorhynchus brunneicapillus*) in San Diego County, California—2023 data summary: U.S. Geological Survey Data Report 1196. 14 p. https://doi.org/ 10.3133/ dr1196

Data Releases:

Kus, B. E. and S. Lynn. 2021. Surveys and monitoring of coastal cactus wren in southern San Diego County: U.S. Geological Survey data release. https://doi.org/10.5066/F76H4FK5

Kus, B. E. and S. Lynn. 2022. Surveys and monitoring of Coastal Cactus Wren in Southern San Diego County: U.S. Geological Survey data release. https://doi.org/10.5066/F76H4FK5

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Vickers, D.V.M., W. T. and F. Nájera, D.V.M. 2024. Summary report of mountain lion hazing/deterrent testing devices testing aimed at reducing livestock predation and associated mountain lion depredation permits. University of California – Davis Agreement A37682 Amendment #2 SANDAG Contract #5005298 Amendment #2 (S890571), Task 2. https://sdmmp.com/view_article.php?cid=SDMMP_CID_187_66ff2ec0d7a9d

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Rare Plant Inspect and Manage Monitoring

Data:

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CLMA Stream Survey Datasheets 2022-2023.

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Reports:

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Howell, S. L. and B. E. Kus. 2024. Distribution and abundance of Southwestern Willow Flycatchers (*Empidonax traillii extimus*) on the Upper San Luis Rey River, San Diego County, California—2023 data summary: U.S. Geological Survey. Data Report 1194. 13 p. https://doi.org/10.3133/dr1194

Data Releases:

Howell, S. L. and B. E. Kus. 2022. Southwestern Willow Flycatcher (*Empidonax traillii extimus*) surveys and nest monitoring in San Diego County, California: U.S. Geological Survey data release. https://doi.org/10.5066/P96VC5Y4

Howell, S. L., and B. E. Kus. 2022. Southwestern Willow Flycatcher (*Empidonax traillii extimus*) surveys and nest monitoring in San Diego County, California (ver. 3.0, January 2024): U.S. Geological Survey data release. https://doi.org/10.5066/P96VC5Y4

Threats and Stressors

Journal Publications:

Richmond, J. Q., T. Matsuda, C. S. Brehme, **E. E. Perkins**, and R. N. Fisher. 2021. Predictability of invasive Argentine ant distributions across Mediterranean ecoregions of southern California. Western North American Naturalist 81:243-256. https://doi.org/10.3398/064.081.0208

Reports:

Williams D. M, **C. W. Brown**, and R. N. Fisher. Report in review. San Diego Streams Hydroperiod and Aquatic Species Study 2022-2024. U.S. Geological Survey Data Summary Report. https://sdmmp.com/view_article.php?cid=SDMMP_CID_187_67b519c4b880e

Data:

STICTables Datasheets 2022-2024.

STIC survey animals shapefile 2022-2024.

STIC survey loggers shapefile 2022-2024.

Tricolored Blackbird

Reports:

AECOM. 2021. Summary of 2021 SDMMP Tricolored Blackbird Surveys. Letter report to Kristine Preston, SDMMP on 12/30/2021. 1 p., https://sdmmp.com/view_article.php?cid=SDMMP_CID_187_623cb525526a1

AECOM. 2022. Summary of 2022 SDMMP Tricolored Blackbird Surveys. Letter report to Kristine Preston, SDMMP on 9/30/2022. 2 p., https://sdmmp.com/view_article.php?cid=SDMMP_CID_187_670449ee86b0a

AECOM. 2023. Summary of 2021 SDMMP Tricolored Blackbird Surveys. Letter report to Kristine Preston, SDMMP on 11/22/2023. 1 p., https://sdmmp.com/view_article.php?cid=SDMMP_CID_71_659d9935773c2

Data:

Tricolored Blackbird GIS 2021.zip, https://sdmmp.com/view_project.php?sdid=SDMMP_SDID_187_623ca61dcf808#data-files-tab

Tricolored Blackbird GIS 2022.zip, https://sdmmp.com/view_project.php?sdid=SDMMP_SDID_187_623ca61dcf808#data-files-tab

Tricolored Blackbird GIS 2023.zip, https://sdmmp.com/view_project.php?sdid=SDMMP_SDID_187_623ca61dcf808#data-files-tab

State of the Preserve

Reports

Preston, K., E. Perkins, C. Brown, S. McCutcheon, A. Bernabe, E. Luciani, B. Kus, and S. Wynn. 2022. State of the Regional Preserve System in Western San Diego County, USGS Cooperator report prepared for San Diego Association of Governments Environmental Mitigation Program, Agreements 5004597 and 548642. https://sdmmp.com/view_article.php?cid=SDMMP_CID_71_63979fd98137e

Web Tool:

Perkins, E. and D. Nguyen. Metrics Dashboard for State of the Preserve report. Dec 2022. https://sdmmp.com/metrics/dashboard.php

Miscellaneous

Reports

Watson, E., C. J. Rochester, **C. W. Brown**, D. A. Holmes, S. A. Hathaway, and R. N. Fisher. 2021. Multi-taxa database data dictionary: U.S. Geological Survey Techniques and Methods 16–B1, 149 p. https://doi.org/10.3133/tm16B1

Data Release:

Perkins, E. E., and Kus, B.E., 2022, Vegetation height in open space in San Diego County, derived from 2014 NAIP imagery and 2014/2015 lidar: U.S. Geological Survey data release. https://doi.org/10.5066/P9AKCQHY

Perkins, E. E., and Kus, B.E., 2023, Drainage areas for stream segments in western San Diego County: U.S. Geological Survey data release. https://doi.org/10.5066/P9VWVAV6

State and National Conference Presentations

American Badger Connectivity Study

C., Brehme, D. Adsit-Morris, P. Gould, and R. Fisher. (2024, October 19-23). Summary of USGS Research on American Badger (*Taxidea taxus*) in San Diego County. The Wildlife Society 2024 Conference, Baltimore, MD.

Coastal Sage Scrub, Chaparral, and Grassland Vegetation Monitoring

Perkins, E., P. Gould, J. Kingston, **C. Brown, K. L Preston**, and R. N Fisher. (2024, May 7-9). Chaparral and CSS Community Monitoring in San Diego County (poster). California Chaparral Symposium, San Luis Obispo, CA.

Connectivity Linkage Project

Perkins, E. (2024, December 10-12). Planning across NCCP areas for regional connectivity with genetic case studies to assess the landscape's permeability. Presentation to be given at the National Habitat Conservation Plan Coalition meeting. Palm Springs, CA.

Golden Eagle Conservation Framework

Thomsen, S. K., P. H. Bloom, M. Madden, J. Molden, J. Sebes, A. Duerr , T. Katzner, and R. N. Fisher. (2024, February 5-9). Drought influences home range size and space use of Golden Eagles in coastal southern California (poster). The Wildlife Society- Western Section. Sonoma, CA.

Grazing Monitoring Study

Bartolome, J. and F. Ratcliff. 2023. SANDAG Grazing Study. (2023, 8 May). Presentation to the Rangeland Management Advisory Council and California Pacific Section of the Society for Rangeland Management. San Diego, CA.

Ratcliff, F., J. Bartolome, L. Huntsinger, M. D. White. (2024, 29 January) Developing ecological sites to guide grazing on San Diego County conserved lands. Presentation to the Society for Range Management. Sparks Nevada.

Harbison's Dun Skipper

Lyons, A. R. and D. A. Marschalek. (2021, November 1-3). Assessing the status of the threatened skipper, *Euphyes vestris harbisoni*, in southern California. (submitted). Entomological Society of America Conference, Denver, CO.

Lyons, A. R. and D. A. Marschalek. (2023, November 5-8). Population declines and habitat preferences of the threatened skipper *Euphyes vestris harbisoni* in southern California. (submitted). Entomological Society of America Conference, National Harbor, MD.

Hermes Copper

Marschalek, D. A and D. H. Deutschman. (2022, November 13-16). Twenty years of butterfly transect data from southern California: With a focus on the threatened *Lycaena hermes*. Entomological Society of America Conference. (submitted). Vancouver, BC.

Invasive Animal Coordination

Fisher, S., D. Williams, T. Edgarian, C. Rochester, J. Nordland, J., Gannon, A. Louros, N. Smith, S. Williams, E. Ervin, J. Sebes, B. Hollingsworth, C. Mcallister, C., Croom, H.B. Shaffer, and R.N. Fisher. (2024, January 11-12). A New Tiger Salamander King in Town: Documenting the Spread of Barred Tiger Salamanders (*Ambystoma mavortium*) within San Diego County. (poster). California-Nevada Amphibian Populations Task Force. Merced, CA.

Fisher, S., D. Williams, T. Edgarian, C. Rochester, J. Nordland, J., Gannon, A. Louros, N. Smith, S. Williams, E. Ervin, J. Sebes, B. Hollingsworth, C. Mcallister, C., Croom, H. B. Shaffer, and R. N. Fisher. (2024, March 25-29). A New Tiger Salamander King in Town: Documenting the Spread of Barred Tiger Salamanders (*Ambystoma mavortium*) within San Diego County. (poster). National Military Fish and Wildlife Association.

Fisher, S., R. Inman, T. Esque, K. Baumberger, A. Backlin, M. Wong, G. Pauly, and R. N. Fisher. (2022, July 27-31). A plague of lizards: parthenogenic whiptails are spreading throughout urban Southern California. Joint Meeting Ichthyologists and Herpetologists. Spokane, WA.

North County Cactus Nursery and Restoration Projects, Cactus Fungal Pathogen

Acker, S., D. Arndt-Truong, R. Kashyap, D. Mathews, and J. Del Castillo Munera. (2023, April 14). Elucidating the Causes of *Opuntia littoralis* Decay in Native Nurseries and Restoration Sites in Southern California. UC Davis Undergraduate Research Conference. Davis, CA.

Pollinator Monitoring Plan

Marschalek, D. A. (2021, October 5). San Diego's Insects and Their Dependence on Native Plants. California Native Plant Society. (virtual presentation). San Diego, CA.

Marschalek, D. A. and D. H. Deutschman. (2021, November 1-3). Insect decomposers for assessing ecosystem health and resiliency. (poster). Entomological Society of America Conference, Denver, CO.

Rare Plant Inspect and Manage Monitoring

Vinje, J., **K. Preston**, and J. Hartsook. (2021, November 5). San Diego Management and Monitoring Program Regional Rare Plant Program. Presentation at San Diego Botany Symposium, San Diego, CA.

Vinje, J., **K. Preston**, D. Brand-Ramirez, J. Hartsook, S. Strahm, and M. Mulligan. (2023, November 4). San Diego County's Regional Rare Plant Monitoring Program: Lessons learned from a decade of monitoring. Presented at Southern California Botanical Symposium, Claremont, CA.

Brand-Ramirez, D. (2024, May). AECOM Practical Strategies for Rare Plant/Seed Management. A San Diego Management and Monitoring Program (SDMMP) Public Regional Resource. Presented at the California Society for Ecological Restoration, Redlands, CA.

Southwestern Pond Turtle Recovery

Brown C., R. N. Fisher, and T. C. Owens. (2020, January 9). Research for Restoration and Recovery of a Protected Species Results of Management Actions for the Southern Western Pond Turtle (*Emys pallida*) in San Diego. (presentation). Amphibian Population Task Force Annual Meeting. San Diego, CA.

Brown C., R. N. Fisher, and T. C. Owens. (2022, August 11). Making Baby Turtles: Studying Restoration Actions for the miniature Western Pond Turtle (*Actinemys pallida*) in San Diego. (presentation). Turtle Survival Alliance Meeting. Tucson, AZ.

Southwestern Willow Flycatcher Status and Demography

Kus, B. E., S. Howell, and S. Mendia. (2022, Jun 27-July 2). Regional declines in the endangered Southwestern Willow Flycatcher: A response to long-term drought? Joint Annual Meeting of the American Ornithological Society and Birds Caribbean, San Juan, Puerto Rico.

Kus, B. E., S. Howell, R. Pottinger, M. Treadwell, and S. Mendia. (2020, November 12). Status of the Southwestern Willow Flycatcher in California. Presentation in workshop on Southwestern Willow Flycatcher - Riparian Ecology Workshop 1, hosted by RiversEdge West. (Virtual conference).

State of the Preserve

Perkins, E., K. Preston, K. Smith, K. Greer, D. Nguyen, **S. McCutcheon, C. Brown**, and **A. Bernabe**. (2023, August 6-11). Communicating ecological integrity metrics to a broader audience using web tools. Ecological Society of America Annual Conference. Portland, OR.

Miscellaneous

McCutcheon, S. (2024, February 15). San Diego Management and Monitoring Program (SDMMP). Presentation at the Santa Ana River Science and Conservation Symposium, Redlands, CA.

McCutcheon, S. (2024, December 10-12). Leveraging Partner Engagement and Collaboration for a Successful Regional Management and Monitoring Program. Presentation to be given at the National Habitat Conservation Plan Coalition meeting, Palm Springs, CA.

Preston, K., B. Kus, and A. Vandergast. (2024, December 10-12). A tale of two co-occurring birds: different management strategies revealed by monitoring and research. Presentation to be given at the National Habitat Conservation Plan Coalition meeting, Palm Springs, CA.

Preston, K. L., E. Perkins, K. Smith, K. Greer. (2023, April 6-11). Implementing a science-based management approach for conserved species and habitat under global change. Presentation to the Ecological Society of America 2023 Conference, Portland, OR.

Preston, K., and R. Fisher. (2021, April 11-14). Cross-boundary monitoring and management to guide climate-smart interventions for species of conservation concern. Presentation to International Association of Landscape Ecologists, (virtual conference).

Presentation at Outreach Meetings/Events

Arroyo Toad Monitoring and Management

Fisher, R. N. and J. Tracey. 2020. Development of a region-wide monitoring strategy for the endangered arroyo toad to inform adaptive management and long-term trends.

Presentation to the SDMMP Management and Monitoring Coordination Meeting. 26 February 2020.

Bats Surveys

Fisher, R. N. 2022. Bat virome study and ties to emerging infectious diseases. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 25 May2022 (virtual meeting).

Myers, B., D. Stokes, **K. Preston**, R. Fisher, and A. Vandergast. 2022. Bat Management in San Diego County. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 25 May 2022 (virtual meeting).

Coastal California Gnatcatcher Post-Fire Recovery Study

Kus, B. E. 2023. Response of California Gnatcatchers to wildfire. Presentation to the Mission Trails Regional Park Eco Ambassadors, 22 October 2023, San Diego, CA.

Kus, B. E. 2024. Response of California Gnatcatchers to wildfire. Presentation to the Mission Trails Regional Park Eco Ambassadors, 10 March 2024, San Diego, CA

Coastal California Gnatcatcher Regional and Subregional Monitoring Program

Kus, B. 2023. 2024 California Gnatcatcher Regional Occupancy Surveys. Presentation to the San Diego Management and Monitoring Program Annual Meeting. 13 December 2023.

Kus, B. E., **K. L. Preston,** and A. Houston. 2020. Trends in California Gnatcatcher occupancy: Preliminary results of 2020 rangewide surveys. Presentation to the San Diego Management and Monitoring Program Annual Meeting. 9 December 2020 (virtual meeting).

Vandergast, A. 2022. Subspecies differentiation and range- wide genetic structure are driven by climate in the California gnatcatcher, a flagship species for coastal sage scrub conservation. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 19 July 2022 (virtual meeting).

Coastal Cactus Wren Monitoring

Kus, B. 2021. Distribution and Demography of Coastal Cactus Wrens in southern San Diego County. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 28 July 2021 (virtual meeting).

Vandergast, A. 2021. Status Update on the Light-Footed Ridgway's Rail Study and Cactus Wren Genetics Update. Presentation to the San Diego Management and Monitoring Program Annual Meeting. 8 December 2021 (virtual meeting).

Kus, B.E. (2022, November 18). Conservation of the Coastal Cactus Wren in southern California (virtual presentation). Sea and Sage Audubon Society, Irvine, CA.

Vandergast, A. 2023. Cactus Wren Fitness Study. Presentation to the San Diego Management and Monitoring Program Annual Meeting. 13 December 2023.

Coastal Sage Scrub, Chaparral, and Grassland Vegetation Monitoring

Brand-Ramirez, D. 2024. 2024 Vegetation Monitoring Review. Presentation to be given to the SDMMP Management and Monitoring Coordination Meeting. 23 October 2024.

Perkins, E. 2020. Modeling Ecological Integrity Using High-Resolution Imagery and Lidar. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 28 October 2020 (virtual meeting).

Perkins, E. 2023. Information and Feedback on the Next County-wide Vegetation Map Update. Presentation to the SDMMP Management and Monitoring Strategic Plan Land Managers Meeting. 28 February 2023.

Perkins, E. 2023. Vegetation monitoring with drones. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 26 April 2023 (virtual meeting).

Perkins, E. and **K. L. Preston**. 2023. CSS and chaparral vegetation monitoring plan. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 25 October 2023 (virtual meeting).

Preston, K.L. 2021. Vegetation Mapping Discussion. Presentation to the SDMMP Management and Monitoring Strategic Plan Land Managers Meeting. 10 August 2021.

Preston, K. and E. Perkins. 2023. Coastal Sage Scrub and Chaparral Vegetation Monitoring Plan. Presentation to the Regional Habitat Conservation Taskforce. 12 December 2023.

Connectivity Linkage Project

Perkins, E. 2023. Regional Linkage Evaluation and Prioritization. Presentation at Environmental Mitigation Program Working Group. 13 June 2023.

Perkins, E. 2024. Linkage Evaluation Update. Presentation at the SDMMP Management and Monitoring Coordination Meeting. 28 March 2024.

Smith, T. and N. Frost. 2022. Wildlife Crossing Planning Efforts for Interstate 15 in the Santa Ana-Palomar Mountains Linkage. Presentation to the San Diego Management and Monitoring Program Annual Meeting. 14 December 2022 (virtual meeting)

Fire Management

Fisher, R. N. 2022. USGS Project Updates and Resource Advisor Coordination. Presentation to the SDMMP Management and Monitoring Strategic Plan Land Managers Meeting. 10 August 2022.

Scully, P. 2023. Brief Update on Fire Coordination and Resource Avoidance Area Mapping Database. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 26 July 2023 (virtual meeting).

Golden Eagle Conservation Framework

Fisher, R. N. 2024. Golden Eagle Management Plan Update. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 24 January 2024 (virtual meeting).

Fisher, R. N. and G. de León-Girón. 2021. Outcomes from Golden Eagle Research in Southern California and Northern Baja California. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 26 May 2021 (virtual meeting).

Grazing Monitoring Study

Bartolome, J., L. Huntsinger, L. Ford, M. White, M. Shapero, F. Ratcliff, K. Motamed, J. Qiao. 2022. Can Grazing Management Enhance Conservation Values? Presentation to the Interagency Working Group Meeting (San Diego, CA). 10 May 2022.

Bartolome, J., L. Huntsinger, L. Ford, M. White, M. Shapero, F. Ratcliff, K. Motamed, J. Qiao, C. Nygard. 2022. SANDAG Grazing Study. Progress and Next Steps. A presentation to the SDMMP Grazing Working Group. 27 September 2022 (virtual meeting).

Huntsinger, L., K. Motamed, L. Ford, M. Shapero, J. Bartolome, and F. Ratcliff. 2021. Overview of Grazing Monitoring Plan Pilot Project. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 24 February 2021 (virtual meeting).

Ratcliff, F., J. Bartolome, L. Huntsinger, M. Shapero, L. Ford, M. White, K. Motamed, J. Qiao. 2022. SANDAG Grazing Study Progress Report. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 24 August 2022 (virtual meeting).

Ratcliff, F., J. Bartolome, L. Huntsinger, M. White, J. Qiao. 2024. Ranch-scale Approaches for Conservation Grazing. An Update from the SANDAG Grazing Study. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 25 September 2024 (virtual meeting).

Hermes Copper

Marschalek, D. 2020. Hermes copper and Harbison’s dun skipper: Where we are and where we are going? Presentation to the SDMMP Management and Monitoring Coordination Meeting. 26 August 2020 (virtual meeting).

Marschalek, D. 2021. San Diego Insect Conservation Update: Hermes Copper, Harbison's Dun Skipper, Pollinators. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 25 August 2021 (virtual meeting).

Invasive Animal Coordination

Eskalen, A. and S. Lynch. 2021. Management and Monitoring of Invasive Shot Hole Borer in San Diego County: An update. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 27 October 2021 (virtual meeting).

Richmond, J. Q. 2020. Prioritizing the risk and management of introduced species in a landscape with high indigenous biodiversity. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 27 May 2020 (virtual meeting).

Richmond, J. Q. 2021. Non-native Beavers. Presentation to the San Diego Management and Monitoring Program Annual Meeting. 8 December 2021 (virtual meeting).

Fisher, R. N. 2020. Invasive Whiptails, the Red-legged Frog Reintroduction, and the Xenopus Apocalypse. Presentation to the San Diego Management and Monitoring Program Annual Meeting. 9 December 2020 (virtual meeting).

Invasive Plant Coordination

Giessow, J. 2021. Invasive Plant Update. Presentation to the SDMMP Management and Monitoring Strategic Plan Land Managers Meeting. 10 August 2021.

Giessow, J. 2022. Annual Update for San Diego Regional Invasive Plant Control: 1) Eradication: EDRR Program Work Update, 2) Containment: Regional *Oncosiphon* (stinknet) control, and 3) Containment: Arundo re-treatments at the watershed scale. Presentation to the SDMMP Management and Monitoring Strategic Plan Land Managers Meeting. 10 August 2022.

Least Bell's Vireo Surveys

Preston, K. L. 2020. Least Bell's Habitat Suitability Model for California. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 22 July 2020 (virtual meeting).

Mountain Lion

Vicker, W. 2021. Update on the UC Davis Southern California Mountain Lion Project, as well as Results of Recent Research Elsewhere in the State. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 27 January 2021 (virtual meeting).

Vickers, W. and F. Najera. 2023. Update on the UC Davis Mountain Lion Project. Presentation to the San Diego Management and Monitoring Program Annual Meeting. 13 December 2023.

Vickers, W. and J. Dellinger. 2022. Mountain lion study update - combining multiple methods for monitoring the regional population. Presentation to the San Diego Management and Monitoring Program Annual Meeting. 14 December 2022 (virtual meeting).

North County Cactus Nursery and Restoration Projects, Cactus Fungal Pathogen

Dunn, J. 2021. Cactus fungal pathogen. Presentation to the SDMMP Management and Monitoring Strategic Plan Land Managers Meeting. 10 August 2021.

Northern Harrier

Merrill, L. 2022. 2021 Northern Harrier (*Circus hudsonius*) Surveys Across Western San Diego County. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 23 March 2022 (virtual meeting).

Pollinator Monitoring Plan

Marschalek, D. A. 2020. Hermes copper and Harbison's dun skipper: Where we are and where we are going. San Diego Monitoring and Management Program. March 2020 (virtual meeting).

Marschalek, D. A. 2022. Ecological integrity/ecosystem health: recent sampling. Meeting with local wildlife agencies. San Diego, CA (virtual), August 2022.

Marschalek, D. 2023. San Diego Pollinators and a Monitoring Plan. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 26 July 2023 (virtual meeting).

Marschalek, D. 2024. San Diego pollinator monitoring plan. Presentation to be given to the SDMMP Management and Monitoring Coordination Meeting. 23 October 2024 (virtual meeting).

Rare Plant Inspect and Manage Monitoring

Brand-Ramirez, D. 2021. Rare Plant Discovery Surveys & 2021 Rare Plant IMG Monitoring Update. Presentation to the San Diego Management and Monitoring Program Annual Meeting. 8 December 2021 (virtual meeting).

Brand-Ramirez, D. 2022. Assessment of Willowy Monardella Status, Habitat, and Threats on Conserved Lands in San Diego County. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 28 September 2022 (virtual meeting).

Brand-Ramirez, D., J. Vinje, and M. Mulligan. 2024. A summary of the SDMMP Rare Plant Regional Discovery Surveys, post-fire Valley Fire Botanical Surveys, and the Annual

IMG Update. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 28 February 2024 (virtual meeting).

Vinje, J. 2020. Status of *Chloropyron maritimum* ssp. *maritimum*, San Diego County. Presentation to the Salt Marsh Bird's-beak working group meeting, January 6, 2020.

Vinje, J. 2020. 2020 Rare Plant IMG Monitoring Update. Presentation to the San Diego Management and Monitoring Program Annual Meeting. 9 December 2020 (virtual meeting).

Vinje, J. 2022. 2022 Rare Plant Discovery Surveys, Inspect and Manage Monitoring, and Valley Fire Surveys. Presentation to the SDMMP Management and Monitoring Strategic Plan Land Managers Meeting. 16 November 2022.

Vinje, J. and M. Mulligan. 2023. Status of Salt Marsh Bird's-beak in San Diego County, California and Baja California, Mexico in 2022. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 22 February 2023 (virtual meeting).

Sharma, J. 2023. A first look at the range-wide genetic structure of a narrow endemic (*Chorizanthe orcuttiana*). Presentation to the SDMMP Management and Monitoring Coordination Meeting. 28 June 2023 (virtual meeting).

Regional Camera Monitoring Workshop and Strategy

Rochester, C. 2022. Wildlife Photo Processing Tool. Presentation to the SDMMP Management and Monitoring Strategic Plan Land Managers Meeting. 10 February 2022.

South San Diego County Coastal Cactus Wren Habitat Conservation Strategy

Kus, B. and **K. L. Preston**. 2024. Coastal Cactus Wren Habitat Conservation and Management Plan for Conserved Lands in Western San Diego County. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 24 July 2024.

Preston, K. and B. Kus. 2024. Coastal Cactus Wren (*Campylorhynchus brunneicapillus*) Habitat Conservation and Management Plan for Conserved Lands in Western San Diego County. Presentation given to the Western Field Ornithologists meeting. 12 October 2024.

Southwestern Willow Flycatcher Status and Demography

Kus, B. E. and S. Howell. 2021. Demography of Southwestern Willow Flycatchers in San Diego County, California. Presentation to the Riparian Birds Working Group biennial meeting. 14 December 2021 (virtual meeting).

Kus, B. E. and S. Howell. 2022. Demography of Southwestern Willow Flycatchers in San Diego County, California. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 26 January 2022 (virtual meeting).

Howell, S. and B. E. Kus. 2021. Abundance and distribution of Southwestern Willow Flycatchers in San Diego County. Presentation to the Riparian Birds Working Group biennial meeting. 14 December 2021 (virtual meeting).

Howell, S. and B. E. Kus. 2022. Abundance and distribution of Southwestern Willow Flycatchers in San Diego County. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 26 January 2022 (virtual meeting).

State of the Preserve Report

Preston, K. 2020. Preserve metrics. Presentation to the SANDAG Environmental Mitigation Program meeting. 9 June 2020.

Preston, K. 2021. Preserve Metrics Update, San Diego Management and Monitoring Program. Presentation to the SANDAG Environmental Mitigation Program meeting. 12 January 2021.

Preston, K. 2022. Management Strategic Plan 2022- 2026 Objectives and State of the Preserve Update. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 27 April 2022 (virtual meeting).

Preston, K., E. Perkins, C. Brown, A. Bernabe, S. McCutcheon, E. Luciani, B. Kus and S. Wynn. 2022. State of Preserve Report and Metrics Dashboard, San Diego Management and Monitoring Program. Presentation to the SANDAG Environmental Mitigation Program meeting. 13 December 2022.

Preston, K., E. Perkins, S. McCutcheon, C. Brown, and **A. Bernabe**. 2020. Pandemic to Preserve Metrics: 2020 Recap and 2021 Plans. Presentation to the San Diego

Management and Monitoring Program Annual Meeting. 9 December 2020 (virtual meeting).

Preston, K., E. Perkins, S. McCutcheon, C. Brown, and **A. Bernabe**. 2021. SDMMP Preserve Metrics. Presentation to the SDMMP Management and Monitoring Strategic Plan Land Managers Meeting. 2 March 2021.

Preston, K., E. Perkins, S. McCutcheon, C. Brown, and **A. Bernabe**. 2022. Evaluating the State of the Preserve System in western San Diego County. Presentation for USFS Briefings to USFWS Carlsbad Field Office. 22 September 2022.

Preston, K., E. Perkins, S. McCutcheon, C. Brown, and **A. Bernabe**. 2022. State of the Preserve report and Metrics Dashboard. Presentation at Environmental Mitigation Program Working Group. 13 December 2022.

Perkins, E. 2022. Preserve Metrics Dashboard. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 28 September 2022 (virtual meeting).

Perkins, E. 2022. State of the Preserve Dashboard Overview and Ecological Integrity Update. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 27 April 2022 (virtual meeting).

Threats and Stressors

Fisher, R., A. Backlin, C. Brehme, **C. Brown**, D. Clark, K. DeLaney, L. Kats, R. Dajit, S. Riley, E. Gallegos, S. Hathaway, T. Matsuda, J. Mulder, B. Packard, E. Perkins, C. Rochester, J. Tracey, and E. Watson. 2020. Synthesis of 20 years of southern California stream survey data into a Macrofaunal Index of Biological Integrity for identifying management options across watersheds. Presentation to the SANDAG Environmental Mitigation Program meeting. 9 June 2020.

Tricolored Blackbird

Fisher, A. 2022. 2021 Tricolored Blackbird (*Agelaius tricolor*) Surveys Across Western San Diego County. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 23 March 2022 (virtual meeting).

Miscellaneous

Becker, C. and **S. McCutcheon**. 2021. Regional Habitat Conservation Vision. Presentation at the SANDAG Environmental Mitigation Program Working Group Meeting. 8 June 2021. (Virtual meeting).

Fisher, R.N. 2022. USGS Western Ecological Research Center Project Updates. Presentation to the San Diego Management and Monitoring Program Annual Meeting. 14 December 2022 (virtual meeting).

McCutcheon, S., K. Preston, E. Perkins, A. Bernabe, C. Brown, and **J. Ochoa**. 2023. 2023 Review and 2024 Plans. Presentation to the San Diego Management and Monitoring Program Annual Meeting. 13 December 2023.

Perkins, E., A. Bernabe, and **C. Brown**. 2023. Overview and training of tools and information available through the SDMMP website and other software available for partners. Presentation to the SDMMP Management and Monitoring Coordination Meeting. 26 April 2023 (virtual meeting).

Preston, K. 2020. Habitat suitability modeling – conservation, monitoring, and management. Presentation for USFS Briefings to USFWS Carlsbad Field Office. 20 August 2020.

Preston, K. L. 2020. Important MSP Resources for Prioritizing, Planning, and Funding Rare Plant Management Projects. Presentation to the SDMMP Management and Monitoring Strategic Plan Land Managers Meeting. 17 September 2020.

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