San Diego Management and Monitoring Program
Work Accomplished 2015-2019
and Recommendations for Future Work

Report Prepared by Kristine Preston, Emily Perkins, Sarah McCutcheon, Christopher Brown, and Annabelle Bernabe

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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. 5004507. SDMMP staff completed work described in Agreement Tasks 1, 2, and 3 for 2015-19 and Task 24 in 2019. 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 that task. From 2015-2018, the Program Administrator, an independent contractor, provided program oversight and contributed to work described by these tasks as well as to other independent tasks. 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

Task Description: The task provides science support to the San Diego Management and Monitoring Program (SDMMP) and will provide biological input for: updating the 5-year horizon monitoring and adaptive management program documents; organizing workshops to obtain input from scientists on priority monitoring and adaptive management needs; conducting literature review and synthesis; analyzing existing and new data sets, designing monitoring strategies/protocols (including cost analyses), developing predictive models to facilitate monitoring and management activities; developing prioritized research needs list, preparing grant proposals to help implement elements of the adaptive management and monitoring programs; preparing synthesized and analyzed data sets utilizing the MTX and other resources; working with preserve managers to design monitoring and management projects and analyze the results; and work as a member of the SDMMP team to further the goals of the program. Goals and work priorities will be established by SDMMP in collaboration with USGS and SANDAG leads. The SDMMP Biologist will develop work plans and timelines to meet identified goals and priorities in collaboration with SDMMP representatives and USGS leads.

Science Products Produced:

Publications

- Barr, K. R., B. E. Kus, K. L. Preston, S. Howell, E. Perkins, and A. G. Vandergast. 2015. Habitat fragmentation in coastal southern California disrupts genetic connectivity in the cactus wren (*Campylorhynchus brunneicapillus*). *Molecular Ecology* 24:2349-2363.

- Tracey, J. A., C. J. Rochester, S. A. Hathaway, K. L. Preston, A. D. Syphard, A. G. Vandergast, J. E. Diffendorfer, J. Franklin, J. B. MacKenzie, T. A. Oberbauer, S. Tremor, C. S. Winchell, and R. N. Fisher. 2018. Prioritizing conserved areas threatened by wildfire and fragmentation for monitoring and management. *PLoS ONE* 13 (9): e0200203 https://doi.org/10.1371/journal.pone.0200203
- Vandergast, A. G., B. E. Kus, K. L. Preston, and K. R. Barr. 2019. Distinguishing recent dispersal from historical genetic connectivity in the coastal California gnatcatcher. *Nature Scientific Reports* 9:1355|https://doi.org/10.1038/54198-018-37712-2

Reports

- The Nature Conservancy (TNC) and SDMMP. 2015. *South San Diego County Coastal Cactus Wren (Campylorhynchus brunneicapillus) Habitat Conservation and Management Plan*. Report prepared for SANDAG.
- Brown, C., A. N. Aguilar Duran, E. Perkins, L. Grolle, E. Watson, and R. N. Fisher. 2016. *USGS 2015 Arroyo Toad Monitoring and Management*. U.S. Geological Survey Data Summary prepared for SANDAG, San Diego, CA,126 pp.
- Brown, C., E. Perkins, A. N. Aguilar Duran, O. Guerra Salcido, E. Watson, and R. N. Fisher. 2016. *Threat and Stressor Management 2015, Urban Aseasonal Flow*. U.S. Geological Survey Data Summary prepared for SANDAG, San Diego, CA, 138 pp.
- SDMMP and TNC. 2017. *Management and Monitoring Strategic Plan for Conserved Lands in Western San Diego County – Strategic Habitat Conservation Roadmap* (MSP Roadmap). Report prepared for SANDAG. https://sdmmp.com/msp_doc.php
- San Diego Zoo Institute for Conservation Research (ICR)/SDMMP. 2017. *Burrowing Owl Conservation and Management Plan for San Diego County.*
- Conservation Biology Institute (CBI), AECOM, and SDMMP. 2017. *2016 Rare Plant Monitoring Report*. Report prepared for SANDAG.

State and National Conference Presentations

- Perkins, E. 2015. *2014-2016 MSP Priorities Online Viewer*. Poster at ESRI User's Conference. July 2015.
- Preston, K. L. 2016. *Working Together to Implement the MSP: Example of the Coastal Cactus Wren*. Invited Presentation at the Association of Environmental Professionals Annual Conference, San Diego California, March 15, 2016.
- Perkins, E., D. Holmes, D, Nyguen, and E. Watson. 2016. *Management and Monitoring Program Online Spatial Search Tools*. Poster presented at National ESRI Conference, San Diego, California, July 2016.
- Perkins, E., K. Preston, and B. Kus. 2016. *GIS to Develop a Regional Survey Design for Coastal California Gnatcatcher*. Poster presented at National ESRI Conference, San Diego, California, July 2016.

- Preston, K., D. Kamada, K. Moore, T. Smith, M. Mitrovich, and B. Kus. 2016. *Using Science to Inform Coastal Cactus Wren Management in Southern California.* Presentation at the North American Ornithological Conference. Washington, DC, August 16-20, 2016.
- Perkins, E. 2017. *Using Survey123 to identify trends in rare plant occurrences in San Diego County*. Poster at ESRI User's Conference. July 2017.
- Preston, K., D. Kamada, K. Moore, T. Smith, M. Mitrovich, and B. Kus. 2017. *Conserving Coastal Cactus Wrens: A Fragmentation Sensitive Species Facing Multiple Threats in an Urbanizing Landscape*. Presentation at the Wildlife Society Urban Wildlife Conference. San Diego, California, June 5-7, 2017
- Preston, K., J. Vinje, P. Gordon-Reedy, E. Perkins, S. Strahm, S. Allen, and B. Miller. 2018. *San Diego County Regional Rare Plant Management and Monitoring Program*. Presentation at California Native Plant Society, February 1, 2018, Los Angeles, California
- Perkins, E., K. Preston, J. Vinje, P. Gordon-Reedy, S. Strahm. *Developing Data Collection and Analysis Tools for Rare Plant Surveys in Western San Diego County*. 2018. Presentation at California Native Plant Society, February 1, 2018, Los Angeles, California
- Perkins, E. *Mapping Ecological Integrity using LIDAR and high-resolution imagery*. 2018. Presentation at American Society for Photogrammetry and Remote Sensing Annual Meeting.
- Perkins, E. 2018. *Evaluating Ecological Integrity using Lidar and High-resolution Imagery*. Poster at ESRI User's Conference. June 2018.
- Perkins, E. 2019. *Assessing Urban Aseasonal Flow and its Effects on Invasive Aquatic Species*. Poster at ESRI User's Conference. July 2019.
- K. Preston. 2019. *Models of Science Support for Multiple Species Habitat Conservation Plans*. Invited Presentation at the National HCP Coalition Meeting, November 13-15, 2019, Shepherdstown, West Virginia
- K. Preston. 2019. *Regional Monitoring of Species, Habitats and Threats to Inform Management Across Multiple Species Habitat Conservation Plans*. Invited Presentation at the National HCP Coalition Meeting, November 13-15, 2019, Shepherdstown, West Virginia

Synopsis of monitoring and management activities based on MSP Roadmap objectives:

General MSP Roadmap Implementation 2015-19

- The SDMMP team created the original Management Strategic Plan (MSP; 2013) with 2014-16 management objectives for species and a subset of vegetation communities and threats. The team enlarged the plan in 2015-16 to include a Strategic Monitoring Plan for species, vegetation communities, and threats. It was expanded to include management objectives for additional types of threats, and vegetation communities. The MSP Area

(MSPA) was extended east to the peaks of the Peninsular Range to include a larger portion of the range for many MSP Species. Species, vegetation community and threat profiles were created along with other supporting data and documents. The final plan, "*Management and Monitoring Strategic Plan for Conserved Lands in Western San Diego County: A Strategic Habitat Conservation Roadmap"* (MSP Roadmap), was posted on SDMMP's MSP WebPortal in January 2017 (https://sdmmp.com/msp_doc.php.) This document covers 111 species, 11 vegetation communities and 13 types of threats providing 2017-21 regional monitoring and management goals and objectives.

- SDMMP coordinated with wildlife agencies, USGS, universities, landowners and land managers, non-profit organizations, biological consulting firms, and other partners to implement MSP Roadmap management and monitoring objectives. Coordination and oversight were accomplished by organizing and attending meetings and workshops, giving presentations, preparing scopes of work, participating in field site visits, developing management and monitoring plans, preparing and reviewing reports, providing science support, and managing projects. SDMMP prioritized staff tasks based upon MSP Roadmap objectives, reviews of objective implementation status, and alignment with EMP annual workplans and milestones. We also prepared and recommended annual tasks, funding needs, and implementing entities for EMP Budget Ad Hoc Subcommittees. SDMMP staff reviewed land manager proposals submitted to the EMP TransNet Grant Program and provided recommendations relative to MSP Roadmap priorities. We also helped prepare annual USGS Task Orders to implement monitoring and research objectives to inform management.

SDMMP MSP Roadmap Project Specific Coordination. 2015-19

- *American Badger Monitoring, 2015-19*: SDMMP met periodically with USGS to discuss badger surveys, creation and maintenance of a hotline for the public and partners to report badger detections, and development of recommendations for further research and monitoring.
- *Bat Surveys, 2015-17*: SDMMP coordinated with USGS and the San Diego Natural History Museum (SDNHM) survey plans for pallid and Townsend's big-eared bats, roost site evaluations, bat diversity documentation across sites, habitat modeling, and recommendations for a management plan.
- *Coastal Cactus Wren Monitoring 2015-19*: SDMMP worked closely with USGS to facilitate implementation of MSP Roadmap monitoring and research objectives to inform cactus wren management. This project included cactus wren surveys, sampling to track changes in genetic diversity, reproductive monitoring, habitat assessments, and a wren foraging study to document arthropod and plant associations and nestling diet composition.
- *California Regional Gnatcatcher Monitoring and Fire Recovery, 2015-16:* SDMMP participated with USGS, U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Wildlife (CDFW) to design, organize and develop a Regional California Gnatcatcher Monitoring Program and a California Gnatcatcher Post-Fire Recovery Study.

- *Camera Monitoring, 2018-19:* SDMMP coordinated with USGS to organize and prepare materials for 2 camera monitoring workshops with land managers, wildlife agencies, scientists and other partners. The purpose of these workshops was to solicit partner input to identify goals and objectives for regional camera monitoring studies and to identify ways USGS could assist land managers with camera monitoring study design, software evaluation, database management, and data analyses.
- *Coastal Sage Scrub, Chaparral and Grassland Vegetation Monitoring, 2015-19*: SDMMP collaborated with biologists from Marine Corps Base Camp Pendleton (MCBCP), Naval Facilities Engineering Command (NAVFAC), TNC and USGS to develop a long-term vegetation monitoring approach based upon ecological integrity. We prepared a preliminary landscape-scale Ecological Integrity model using Lidar and remote imagery and designed a 2020 vegetation sampling pilot study to calibrate and evaluate the model.
- *Golden Eagle, 2015-19*: SDMMP organized with USGS on a research study investigating eagle movement patterns, occupancy, habitat use, urbanization and recreation threats, genetics, and nesting status. We will use results and recommendations from this study to develop a management plan.
- *Grazing Monitoring Plan, 2017-19*: SDMMP brought together land managers, grazing practitioners, scientists, and members of U.S. Department of Agriculture Natural Resource Conservation Service (USDA NRCS) and San Diego Resource Conservation District (RCD) to develop goals and objectives for a monitoring program. The purpose is to evaluate the effectiveness of grazing as a large-scale management tool to reduce invasive plant species to reduce fire risk and improve habitat quality of grasslands and coastal sage scrub. We are developing a scope of work for a contractor to develop a grazing monitoring plan in close collaboration with SDMMP and partners. SDMMP and CDFW staff collected preliminary vegetation data at Hollenbeck Canyon Wildlife Area to characterize vegetation prior to opening up the lands for grazing in 2020.
- *Least Bell's Vireo Surveys, 2016-17*: SDMMP coordinated with USGS on vireo surveys in the Tijuana River Valley. This area was recently infested by invasive nonnative shot hole borer beetles and symbiotic *Fusarium* fungal pathogens (*Fusarium* Dieback). *Fusarium* Dieback is causing massive tree die-off and survey results were compared with previous survey efforts to evaluate potential impacts to vireo populations.
- *Mountain Lion, 2015-19*: SDMMP coordinated with University of California Davis (UCD) on a mountain lion research study to identify and prioritize infrastructure crossing improvements along highways in western San Diego County and to develop BMPs to reduce mortality from depredation permits. We collaborated with UCD, TNC, wildlife agencies, conservation plan implementing organizations from Orange and Riverside counties, California Department of Transportation, land managers and other partners to increase connectivity and mountain lion movement across I-15 in northern San Diego and southern Riverside counties. We are supporting partners to improve crossing infrastructure, provide fencing, and conserve habitat in the linkage.
- *North County Cactus Nursery and Restoration Projects, 2016-19*: SDMMP worked closely with ICR, City of San Diego Public Utilities District, and San Dieguito River

Park to grow cactus and restore cactus wren habitat at Lake Hodges and San Pasqual Valley. Most of this work is funded by TransNet Land Manager Grants. SDMMP conducted cactus wren surveys and habitat assessments to identify and prioritize new restoration sites.

- *North County Linkages Evaluation, 2016-18*: SDMMP and TNC identified linkages and provided guidance to USGS for a linkage connectivity evaluation project using GIS data layers and aerial photography.
- *Purple False Brome, 2015-16:* SDMMP provided technical support for CBI and City of San Diego to develop a sampling design and data collection protocol to test Best Management Practices (BMPs) for controlling this invasive nonnative grass species.
- *Rapid Assessment Monitoring, 2015-17*: SDMMP met periodically with USGS about developing and testing monitoring protocols for various taxa.
- *Rare Butterflies, 2015-19*: SDMMP joined forces with butterfly experts from San Diego State University (SDSU), University of Missouri, USFWS, Creekside Center for Earth Observation, and other partners to implement MSP Roadmap monitoring, research and management objectives for three rare butterfly species: Harbison Dun Skipper; Hermes Copper; and Quino Checkerspot.
- *Rare Plant Genetics, 2015-18*: SDMMP worked closely with USGS to provide input on their rare plant genetics project to determine population structure and genetic diversity for 6 rare plant species. The results of this research project informed development of management strategies and actions.
- *Rare Plant Inspect and Manage Monitoring, 2015-19*: SDMMP oversaw MSP Roadmap 2015-19 "Inspect and Manage" (IMG) objectives for 30 rare plant species. We worked closely with CBI and AECOM to prepare annual monitoring workplans and prioritize species and occurrences for monitoring. SDMMP prepared rare plant protocols and data forms and managed the rare plant geodatabase. We coordinated frequently with land managers and organized and gave presentations at rare plant pre-season, training, and post-season wrap up workshops.
- *Rare Plant Management and Seed Plans, 2019:* SDMMP oversaw collaboration with CBI, AECOM, ICR, USGS, land managers and scientists to develop a MSP Framework Rare Plant Management Plan and MSP Seed Collection, Banking and Bulking Plan. These plans will be completed in 2020 with chapters for four species. This project involved extensive outreach and solicitation of input from the San Diego County Rare Plant Management Steering Committee and species working groups. The plans prioritize management objectives for occurrences and recommend BMPs.
- *South County Grassland Project, 2015-17*: SDMMP participated in this collaborative project between CBI, TNC, Land IQ, and land managers, such as CDFW, Bureau of Land Management (BLM), and USFWS. The purpose of the project was to develop BMPs for large scale management of invasive nonnative forbs and grasses in grasslands of south San Diego County.
- *South San Diego County Coastal Cactus Wren Habitat Conservation and Management Plan, 2015*: TNC and SDMMP developed a cactus restoration implementation plan for

south San Diego County. We developed restoration criteria and site prioritization concepts based on cactus wren occurrences, previous cactus restoration experience, and 2014 USGS habitat assessments. We used habitat assessments and the SDMMP's cactus wren habitat model to identify cactus restoration sites to enhance existing populations and restore greater connectivity between occupied sites. The plan is being implemented through TransNet Land Management grants to restore cactus scrub in the Otay River Valley, Salt Creek and Lower Otay Lake.

- *Southwestern Willow Flycatcher, 2015-19*: SDMMP coordinated with USGS a project to conduct reproductive monitoring of flycatchers at key populations and to conduct surveys at formerly occupied sites.
- *SR-67 Infrastructure Implementation Plan, 2015-18*: SDMMP participated in meetings to provide input and review deliverables for a SDSU project to evaluate SR-67 culvert infrastructure and develop management recommendations to facilitate wildlife movement.
- *Stinknet, 2017-19*: SDMMP collaborated with ICR, land managers, Cooperative Extension personnel, scientists, and weed control experts to map this invasive non-native plant and develop BMPs. The mapping is being used to develop a management strategy to control infestations near sensitive resources and limit the spread of this invasive plant into new areas.
- *Ward's Weed, 2017-19*: SDMMP is collaborating in a project initiated by land managers and involving Cooperative Extension personnel, weed control experts and other partners to map this invasive nonnative plant and develop and implement a management strategy to eradicate it.
- *Western Burrowing Owl, 2015-18*: SDMMP coordinated with ICR, wildlife agencies, land managers, and other partners to develop a burrowing owl management plan. We met annually with partners to prioritize implementation of monitoring and management objectives.

Recommendations regarding modifications of the MSP Roadmap to improve conservation outcomes

- In 2020, we will update the MSP-Roadmap for the 2022-26 planning cycle. This entails updating goals and objectives for species, vegetation communities and threats in order to prepare the 2021-2022 EMP workplan, milestones, and budget. We recommend reviewing the MSP Species List and Management Categorizations to see if changes are warranted. We will update existing management categorization criteria with research and monitoring data collected during 2017-20. We will also consider adding new sensitive species to the list, such as species that are declining, species previously outside the 2013 MSPA (i.e., Laguna Mountain skipper), or recently re-introduced into the MSPA (i.e., California red-legged frog, pacific pocket mouse). We will prepare management categorization criteria for these additional species to determine the most imperiled species that could benefit from regional monitoring and management. These determinations will incorporate recommendations from

scientists, species experts, and wildlife agencies. In the MSP Roadmap update we will also review and update supporting materials on the MSP WebPortal.

- We recommend compiling information on the implementation status of 2017-21MSP Roadmap objectives. In 2022, we will assess our progress in successfully completing these objectives; considering timeliness, effectiveness, and measurable outcomes. In 2022, we may make some modifications to the 2023-26 MSP Roadmap objectives depending on assessment of actions that are effective and achievable within budget and time constraints.
- We also recommend continuing to work with partners in a SANDAG EMP led effort to develop metrics to assess the state of the Preserve System in the MSPA. This information should also be considered in developing or modifying 2022-26 MSP Roadmap management and monitoring objectives.

Data analyses completed and recommendations for future analyses

- *Cactus Wren Regional Population Status and Change Over Time, 2019*: Analyzed data on wren population sizes over time (1980s to present) at sites in coastal southern California. This analysis was prepared for the 2019 Regional Cactus Wren Symposium. Used multiple data sources to identify current and past wren distribution patterns. Evaluated current status of sites with aerial photography to determine status of development, intact habitat and potential habitat for cactus restoration to expand and/or connect populations. Developed some preliminary population targets for each site and identified areas where conservation acquisitions and restorations might increase populations. These analyses will be used by SDMMP in collaboration with the Cactus Wren Working Group to inform development of a regional cactus wren conservation and management strategy.
- *Cactus Wren Reproductive Analyses, 2016*: Completed analyses and gave a presentation to the 2016 North American Ornithological Conference. We recommend preparing a paper to document these results and submit for publication.
- *Rare Plant Analyses, 2016-19*: Summarized and calculated descriptive statistics and prepared graphs for rare plant species based on IMG data on plant population size, climate and level of threats. Modeled plant population responses for a few plant species. Analyses should be updated in 2020 as more data is available reflecting changing environmental conditions and threat levels. These results should be applied to management recommendations and published as a report or journal article.
- *San Diego Thornmint "Boom vs Bust" Modeling, 2015 and 2019:* Developed San Diego thornmint "boom vs bust" models with 2015 population data and weather covariates. Used an information theoretic approach to compare models relating "boom vs bust" population years to different hypothesized climate conditions and then selected the best approximating model. Identified climate variables with the strongest associations to population fluctuations. Repeated these analyses in 2019 with a larger dataset and also analyzed a subset of data with threat covariates. The results show the importance of the amount and timing of growing season precipitation and winter temperatures on

population sizes. These analyses should be completed periodically to better understand the influence of changing weather climate and other threat levels to population growth.

- *Vegetation Analyses, 2018-19*: Conducted preliminary analyses with 2 coastal sage scrub, chaparral and grassland vegetation datasets to evaluate ecological integrity classifications based upon percent of native shrubs and nonnative herbaceous cover. These analyses provide insight into developing category cut-off values for the landscape-scale ecological integrity model being developed with Light Detection and Ranging (Lidar) and remote imagery. Expanded these analyses to include several more datasets with vegetation cover and diversity collected over time in San Diego County. The results and recommended ecological integrity categories should be published as a report or journal article.

Recommendations for monitoring protocol modifications based on data analyzed and independent science review

- *California Regional Gnatcatcher Monitoring and Fire Recovery 2015-16*: SDMMP worked closely with USGS and USFWS collaborators to develop a Regional California Gnatcatcher Monitoring Program and a California Gnatcatcher Post-Fire Recovery Study. We developed a revised protocol based on comparing methods and results from a study by USFWS and Nature Reserve of Orange County comparing monitoring methods. The revised protocol achieved greater efficiency and lower cost. SDMMP developed a habitat model to identify the sampling areas, created fire history scenarios to guide sampling, developed a spatially balanced sampling design, and determined sample sizes based on power to detect specified levels of change in percent area occupied. Helped devise and test a vegetation sampling protocol to provide covariates for modeling occupancy and habitat relationships. Participated in regular meetings to plan the program, identify next steps, and identify information gaps. Helped organize three Regional California Gnatcatcher Monitoring Workshops and gave presentations on the habitat model and proposed sampling design. Participated in evaluating sample plots and coordinating regional monitoring among partners. USGS will analyze data from the 2020 fire study surveys and we will determine if there is sufficient recovery to reduce sampling or to end the study.

- *Coastal Cactus Wren Monitoring, 2015*-19: Worked with USGS to develop South San Diego County Cactus Wren Surveys and a Cactus Wren Foraging and Arthropod Study. The 2015-19 study built upon previous work in Orange County with objectives to investigate associations between plant species and food availability (arthropod) and the influence of food availability on fecundity and survival. Recommended improvements to the protocol and sampling design based on experience with the previous study.

- *Rare Plant IMG Monitoring Protocol Development, 2015-19*: SDMMP worked closely with the City of San Diego, CBI, and TNC to develop an "Inspect and Manage" (IMG) protocol in 2014. We expanded upon and modified the City of San Diego's protocol to

also include monitoring of threats and habitat associations. The City's protocol was developed based on peer review recommendations of previous monitoring protocols and sampling designs. We have made incremental improvements to the protocol over time to work out inconsistencies and improve data quality.

Project design and analyses for preserve manager monitoring and management projects

- *Burrowing Owl Habitat Suitability Model, 2015-16*: Provided ICR with technical assistance, model coding, and peer review in developing habitat suitability models for California ground squirrels and burrowing owls in western San Diego County. Provided ICR with a grid of environmental variables for San Diego County developed by SDMMP's GIS Manager.
- *Nuttall's Acmispon, 2017-19*: Analyzed data collected by San Diego Audubon regarding effectiveness of different management treatments on Nuttall's acmispon populations and California least tern habitat quality. Treatments were complex and changed with time, so it was necessary to group similar treatments. Analyzed the effect of management treatments over time on the height and percent cover of Nuttall's acmispon and other sensitive species, and the height, cover, and species richness of nonnative and native forbs and grasses. These results are used to inform BMPs for management of Nuttall's acmispon and least tern breeding habitat.
- *Otay Tarplant Restoration Experiment, 2015-17*: Participated with CBI, TNC and CDFW in an Otay tarplant restoration experiment. Conducted limited fieldwork and calculated descriptive statistics showing the effects of different methods of invasive plant control. Modeled the effectiveness of control methods over time on Otay tarplant cover, native and nonnative forb and grass cover and species richness.
- *Purple Falsebrome Study to Develop Best Management Practices, 2015:* Reviewed an ongoing study by CBI to develop BMPs to control purple falsebrome. Reviewed previous analyses and developed a schematic of the complex sampling design. Recommended changes to the sampling design for 2016.
- *Purple Falsebrome Control Study at San Diego Thornmint Populations, 2015-17*: Developed methods and sampling design for a City of San Diego study of effectiveness of herbicide to control invasive purple falsebrome at San Diego thornmint occurrences. Created a GIS-shapefile of sampling locations for City staff to implement the study in spring 2015. Helped with initial analyses.
- *Rare Plant Monitoring Design, 2015*: Assisted the County of San Diego in selecting species to monitor and developing a sampling design for each rare plant species in their Comprehensive Monitoring Plan.
- *ReWild Mission Bay, 2015-18*: Participated on the Scientific and Technical Committee to review and provide input into restoration alternatives for salt marsh and other natural aquatic habitats in Mission Bay.

- *River Partners Restoration Projects, 2016-17*: Worked with land managers, River Partners staff and wildlife agencies to provide input on BMPs and restoration objectives for several riparian restoration projects in San Diego County.

Predictive models to guide MSP Roadmap monitoring and management activities

- *Bird Species Habitat Suitability Models, 2015:* Completed Partitioned Mahalanobis D^2 habitat suitability models for 4 coastal sage scrub and chaparral bird species (Costa's hummingbird, California thrasher, Bell's sage sparrow and wrentit). These models were used in an USGS project analyzing fire risk, species diversity and genetic diversity to prioritize management.
- *California Gnatcatcher Habitat Suitability Model, 2015:* Further revised the California gnatcatcher habitat suitability model with additional data and incorporation of *Artemisia californica* model predictions using the Partionted Mahalanobis D^2 modeling approach and selecting the best performing model. This model was used to develop the sampling schemes for the Regional California Gnatcatcher Monitoring Program and for the Fire Recovery Study.
- *Coastal Cactus Wren Habitat Suitability Model, 2015:* Re-ran cholla, prickly pear and cactus wren habitat models with additional data. Compiled calibration and validation datasets to construct and evaluate alternative Partitioned Mahalanobis D^2 habitat suitability models for cactus wren in coastal southern California and selected the best performing model. The cactus wren model was used to inform management objectives in the *South San Diego County Coastal Cactus Wren (Campylorhynchus brunneicapillus) Habitat Conservation and Management Plan*.
- *Edaphic Plants, Habitat Modeling and Climate Change, 2016-18*: Created habitat models for 5 rare edaphic plant species in San Diego County under current climate conditions. Modeled habitat suitability under 5 different global climate models with 3 Representative Concentration Pathways (RCPs) and 3 future time periods. Model-averaged results for each RCP and time period and projected the predictions onto the southern California landscape. These models are included in CBI's Local Assistance Grant: *Enhancing the Resilience of Edaphic Endemic Plants* (2018). This project developed conceptual models, sampled soils and vegetation in the field to refine plant habitat relationships, assessed regional population structure and employed the habitat suitability models to identify areas to survey, manage, potentially translocate populations and acquire land for each species to increase resilience under future conditions.
- *Least Bell's Vireo Wintering Habitat Suitability Model, 2015, 2019:* In 2015, developed alternative habitat suitability models for wintering least Bell's vireos in Baja California. Selected the best performing model to identify sites for USGS to survey for vireos. In 2019, developed vireo habitat suitability models for the current breeding range in southern California and projected into the historic range in central and northern California. Recently there has been limited expansion of vireos into the historic range. This model is being used to prioritize suitable habitat for vireo surveys in the historic range to determine if federal recovery criteria are met for potential downlisting.

Research and monitoring grant proposals to meet MSP Roadmap objectives

- CBI and SDMMP partnered on a CDFW 2015-2016 Local Assistance Grant "*Enhancing the resilience of edaphic endemic plants through refined vegetation and soil characterizations*"
- SDMMP and USGS prepared a 2019 National Fish and Wildlife Foundation proposal and obtained funding for "*Modeling Least Bell's Vireo Habitat in California to Achieve Recovery Criteria*".
- SDMMP assisted USGS in preparing a 2020 Section 6 Proposal and obtaining funding for "*California Gnatcatcher Regional Monitoring Data Collection and Analysis*". This grant provides funds for USGS to conduct regional monitoring at sites not in approved conservation plans and for regional data analysis.
- SDMMP assisted USGS in preparing a 2020 State Wildlife Grant Proposal and obtaining funding for "*Assessing connectivity between coastal and interior cactus wrens in California using population genomics*".

Task 2: SDMMP Database Administration and Management Deliverables:

This task provides data administration and management support to the SDMMP and will provide the lead for: developing databases and managing, organizing, and maintaining a variety of datasets; data mining from paper and electronic reports and field forms; maintaining the SDMMP library of reports; uploading datasets, reports, and meeting information to the SDMMP website; assisting with the migration of data into the SC-MTX database and MSP Portal; developing data entry forms (both electronic and paper) and data entry templates, assisting with developing data standards and use agreements; updating the SC-MTX data dictionary; completing and maintaining SDMMP databases; working with the SDMMP Ecologist and GIS Manager to identify and retrieve datasets from SC-MTX, MSP Portal, and other databases needed for analyses; working with land managers and scientists to obtain datasets and training them on data entry; collaborating with the SDMMP team on scientific projects to ensure data collected fits into the database; providing data output in a format usable for data analysis and GIS display; and working as a member of the SDMMP team to further the goals of the SDMMP. The Data Manager will also help develop tools, queries, etc. that provide benefit to managers and those contributing data to the database, increase the integrity of data, and increase usefulness and lifetime of data. Goals and work priorities will be established by SDMMP in collaboration with USGS leads. The Data Manager will develop work plans and timelines to meet identified goals and priorities.

Databases developed

- Created rare plant database
- Created server based SDMMP GeoDatabase for collection and integration of spatial datasets in a networked server environment (SDE)

Documents of user agreements

Data standards

- Continued to develop and refine data definitions, field types, relationships, and domains (lookup lists) in the SDMMP GeoDatabase to migrate new databases with consistency
  - ✓ Species name standardization
  - ✓ QC of memo fields and special characters in contributed databases

Data entry forms

- Created CBI preserve complex field data collection forms
- Created CBI brachypodium project field data collection forms
- Created rare plant excel (every year) and Survey123 forms (2017-2019)

Data dictionary

The data dictionary is under development and includes all MTX databases

Electronic data entry templates

- Continued iterative development of electronic data entry templates
- Excel templates for:
  - ✓ Study metadata
  - ✓ Incidental observations
  - ✓ Systematically collected species data
  - ✓ Restoration and management actions
- Rare Plant IMG Excel data entry templates

Lists of datasets being mined, maintained, and/or migrated to SC-MTX, MSP Portal, and/or databases

- Overall datasets collected (2016: 150 datasets; 2017: 250 datasets; 2018: 900 datasets; 2019: 200 datasets)
- Migrated datasets into SDMMP GeoDatabase SDE:
- Integrated 5 years of Rare Plant IMG program survey data
  - ✓ Maintenance includes forward migration of older datasets
  - ✓ Integration includes standardizing fields between years, QC of survey data, migration of legacy data
- Migrated contributed/partner databases into SDMMP GeoDatabase for integrated data reduction and analysis, including:

- ✓ Arroyo Toad Critical Habitat FCH (76FR5246)
- ✓ Carlsbad Fish and Wildlife Office Threatened and Endangered Species Occurrences
- ✓ Audubon Mission Bay Least Tern Database
- ✓ Conserved Lands Database
- ✓ FRAP reference layers
- ✓ Rare Plant IMG Database-multiple contributors
- ✓ Master Occurrence Matrix (MOM) MSP plants and animals' databases
- ✓ USGS Arroyo Toad Database
- ✓ USGS Aquatic Index Biological Integrity (IBI) Database (Stream Surveys 1998 to Present)
- ✓ USGS Vegetation Database
- ✓ USGS Western Pond Turtle database
- ✓ Wieslander Vegetation Type Mapping (VTM) individual plot data (UC Berkeley)
- ✓ Wieslander VTM historic vegetation classifications (UC Berkeley)

- These databases are spatially referenced and can be added to SDMMP map projects as needed for data reduction and analysis
- The SDMMP GeoDatabase is currently being migrated to USGS NatWeb which will allow for outside-of-network access to similar query tools

Data entry training materials, including but not limited to any training videos

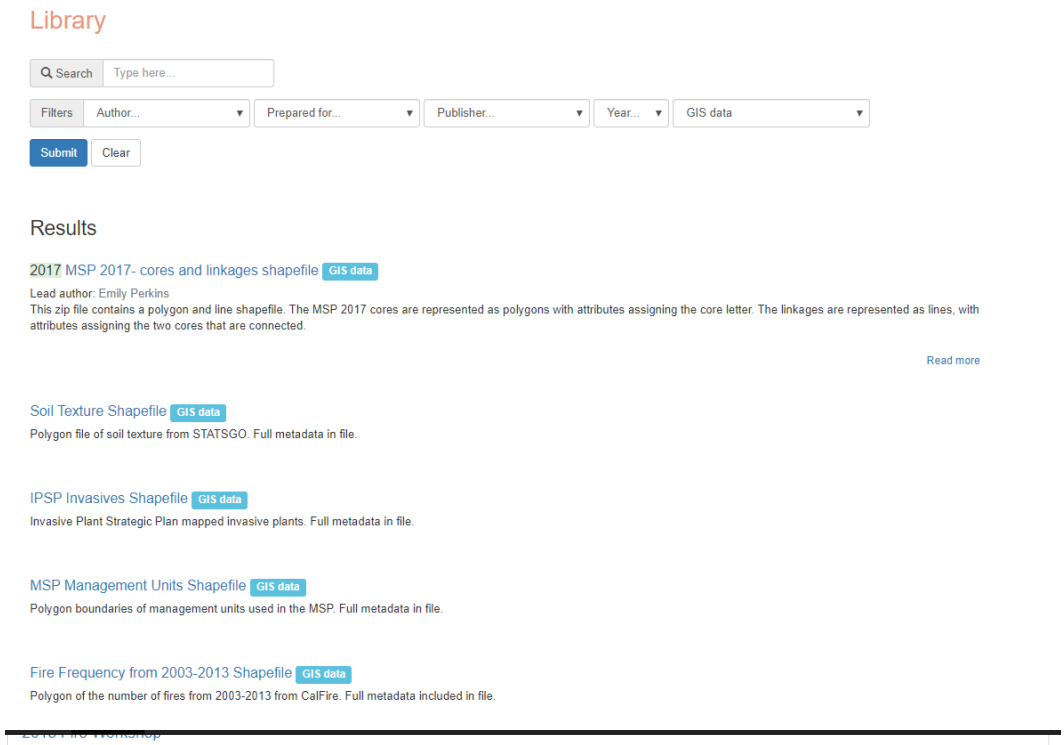
- Central GeoDatabase Graphical User Interface (GUI) training to support data entry, data QC, and data reduction/reporting

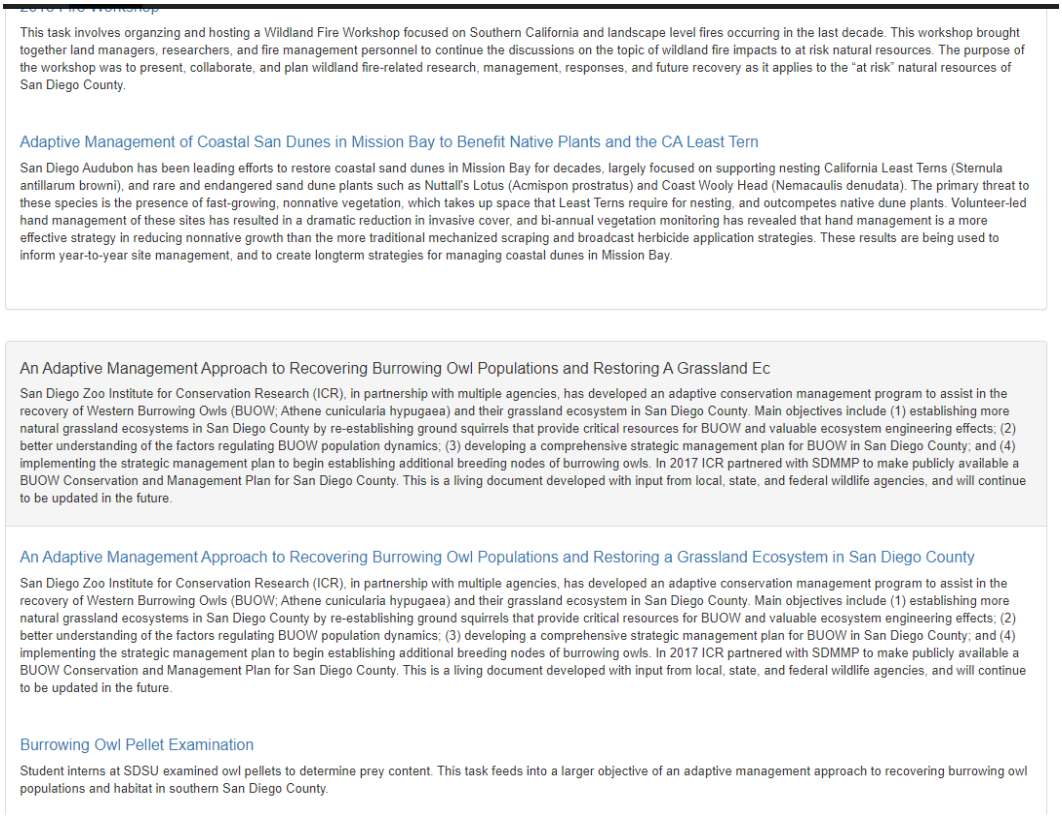
Queries and reports from the SDMMP library showing reports maintained

- Analysis queries for:
  - ✓ Aquatic Species IBI
  - ✓ Audubon Mission Bay Least Tern
  - ✓ Rare Plant Monitoring
  - ✓ Rare Plant Plot Habitat & Threats
  - ✓ Wieslander VTM and USGS Vegetation data

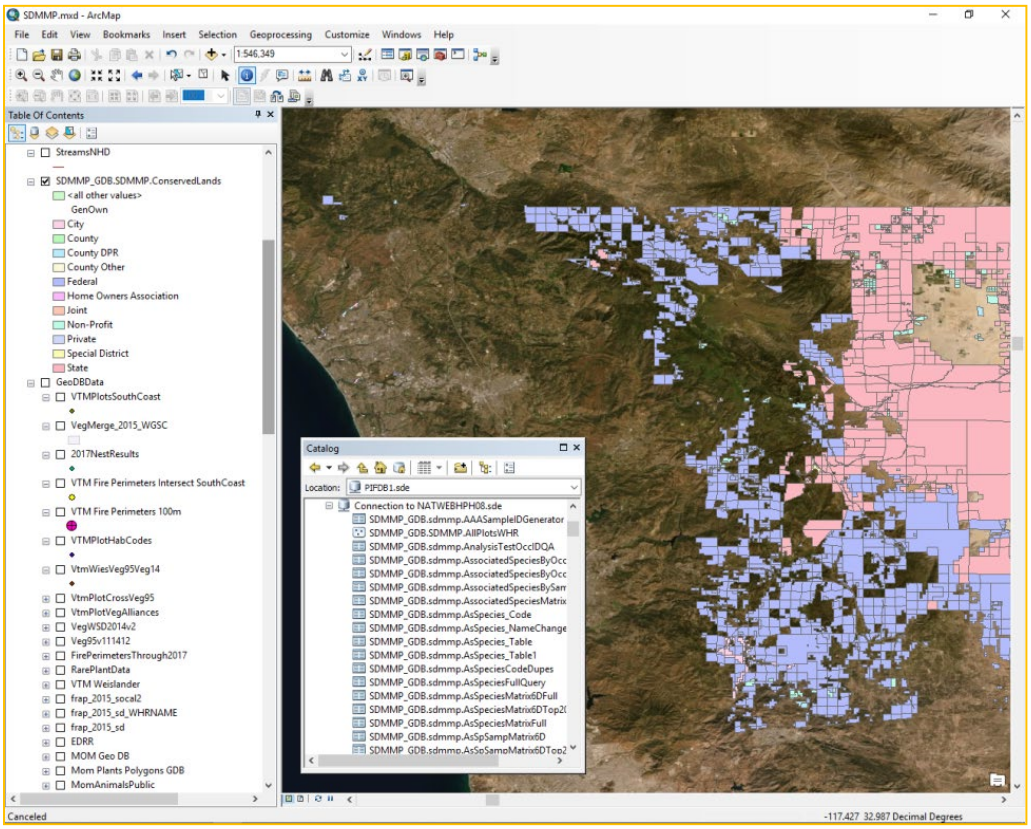
Screenshots of databases and SDMMP website showing datasets uploaded and available to the public1

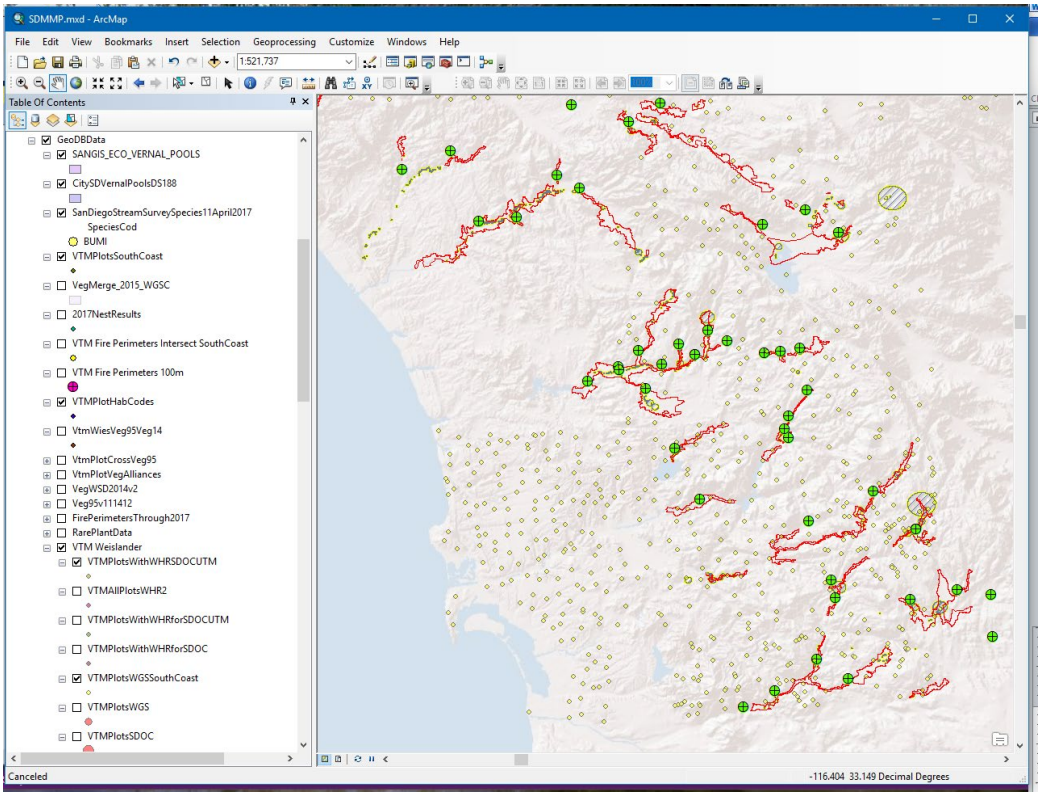
https://sdmmp.com/projects.php?taxaid=&vegcomm=&category=&preserveid=&submit=Submit



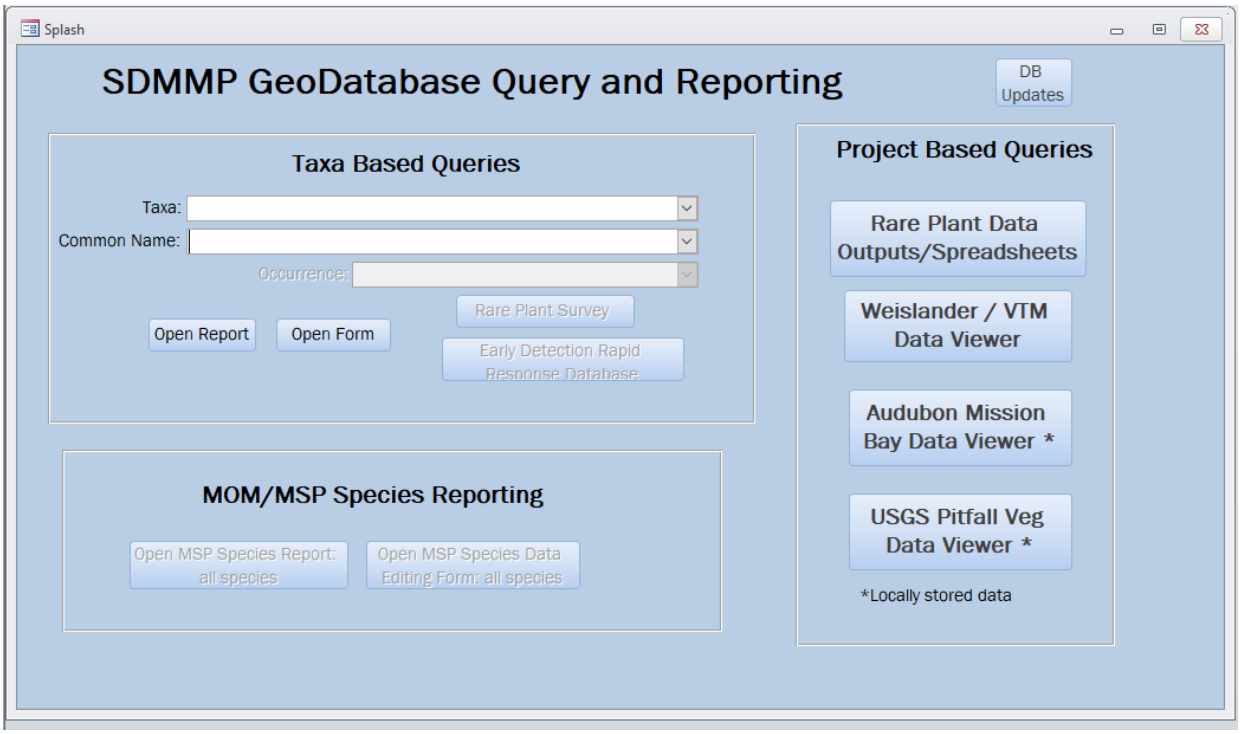


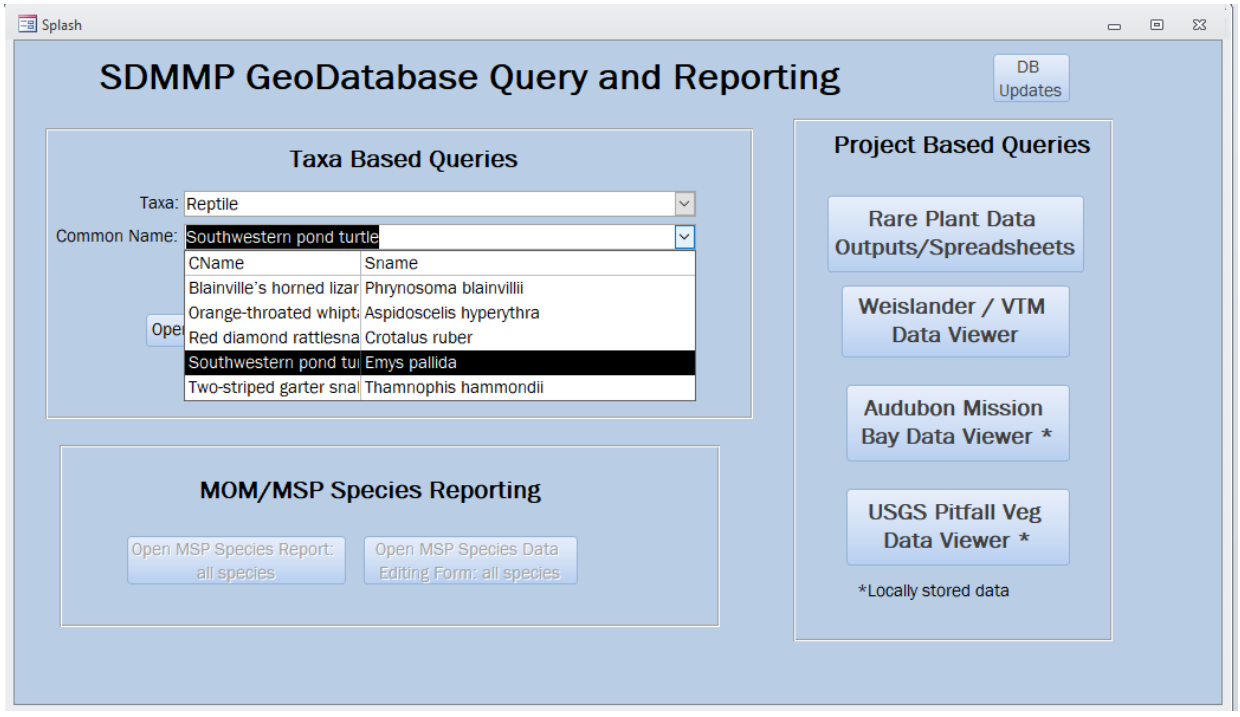
Geodatabase Tools Screenshots:





SDMMP 2015-2019 Work Accomplished





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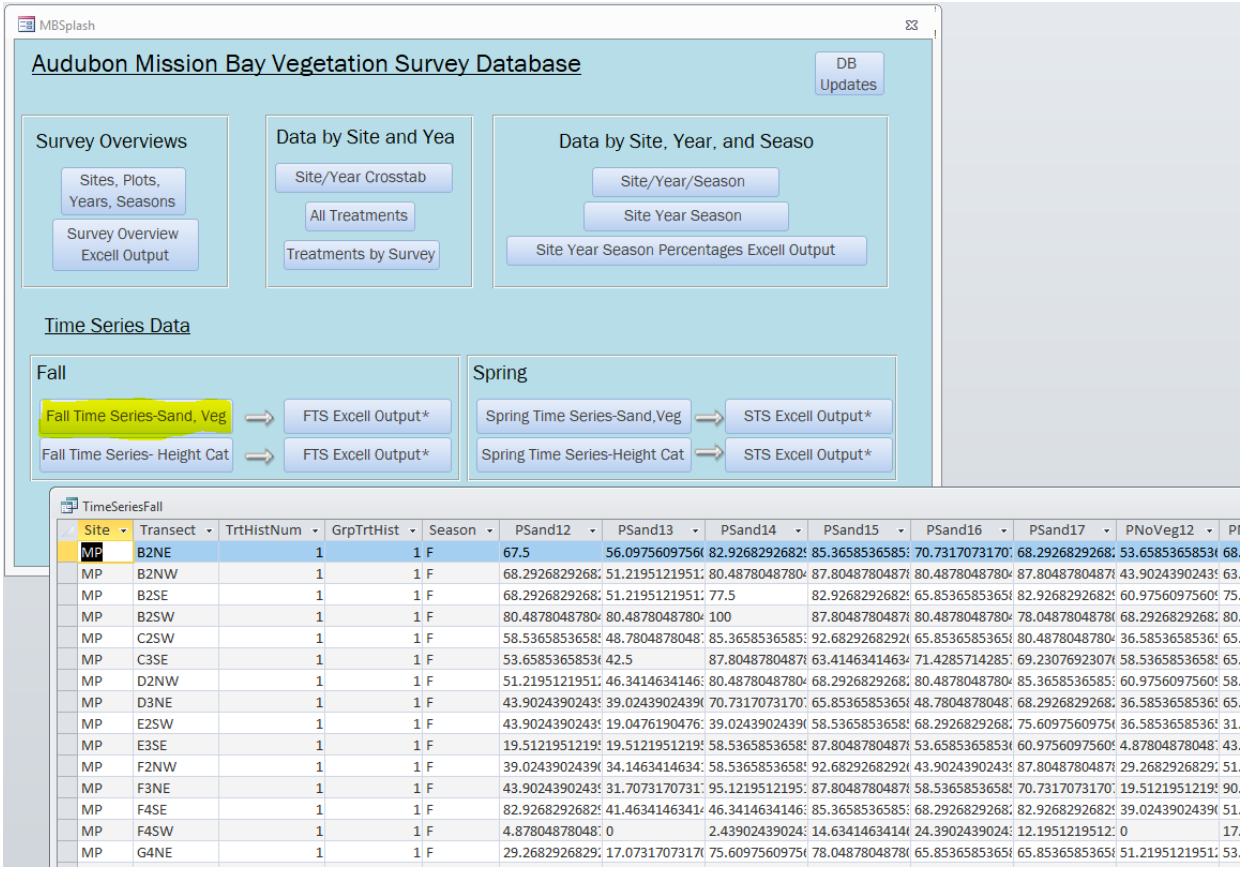
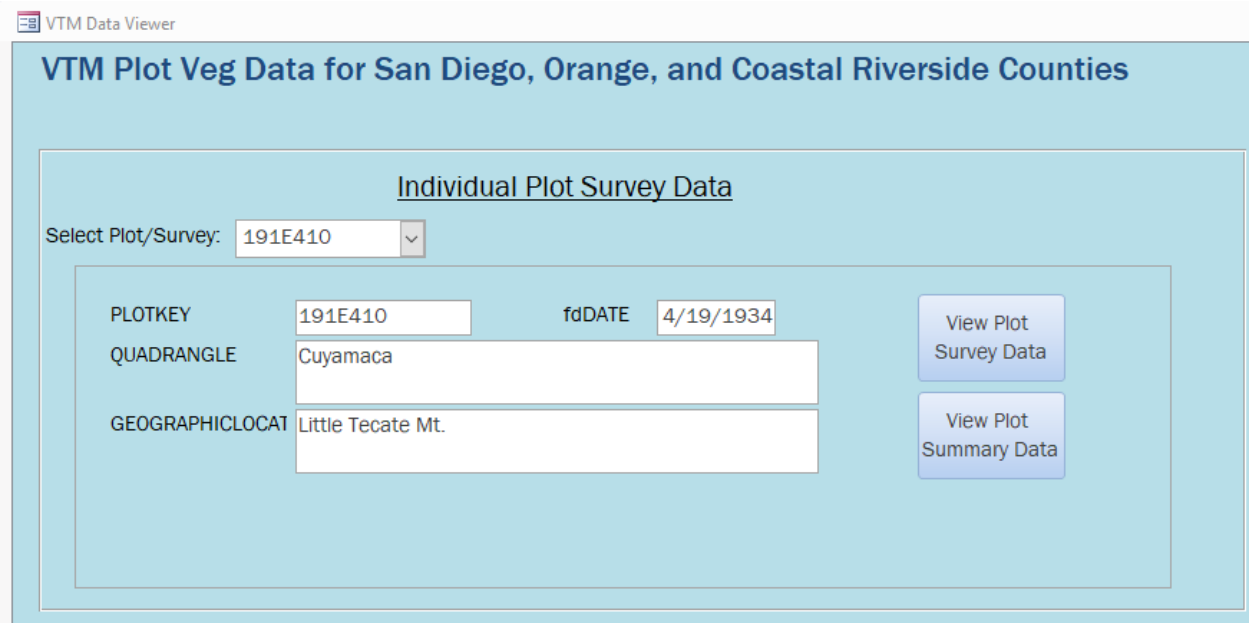
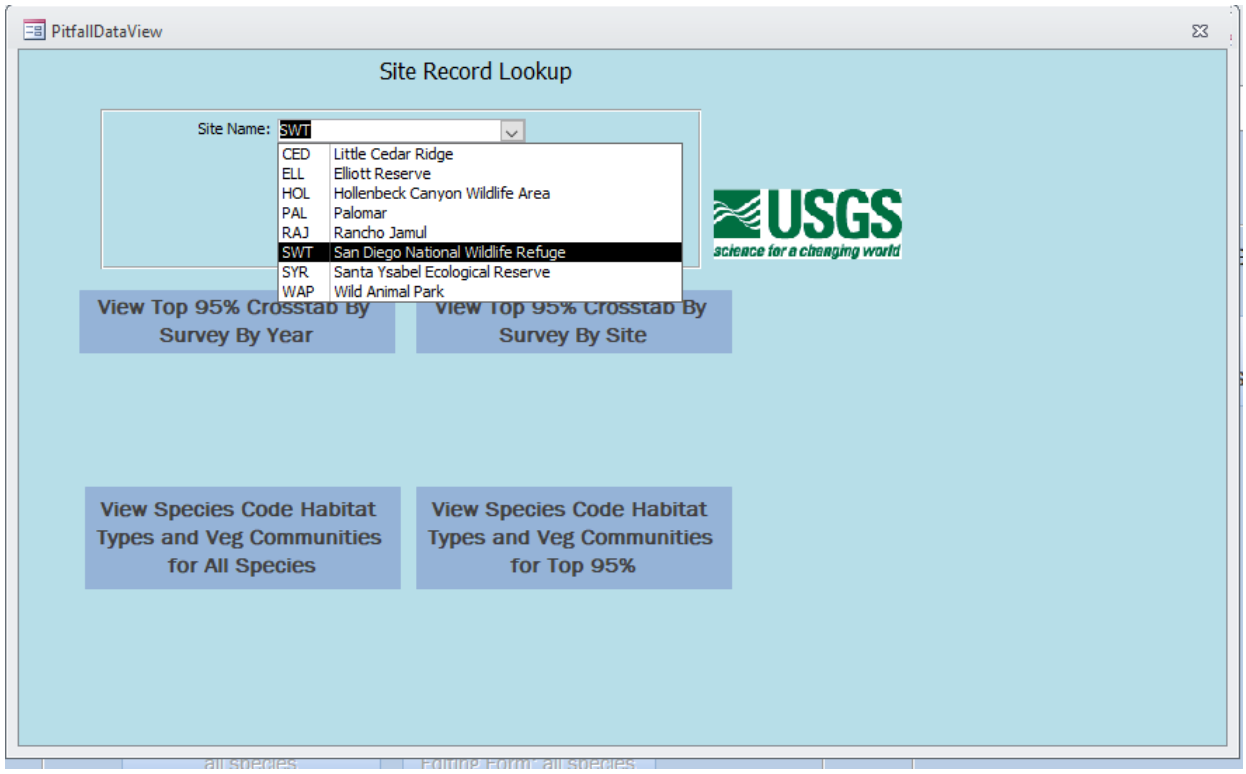
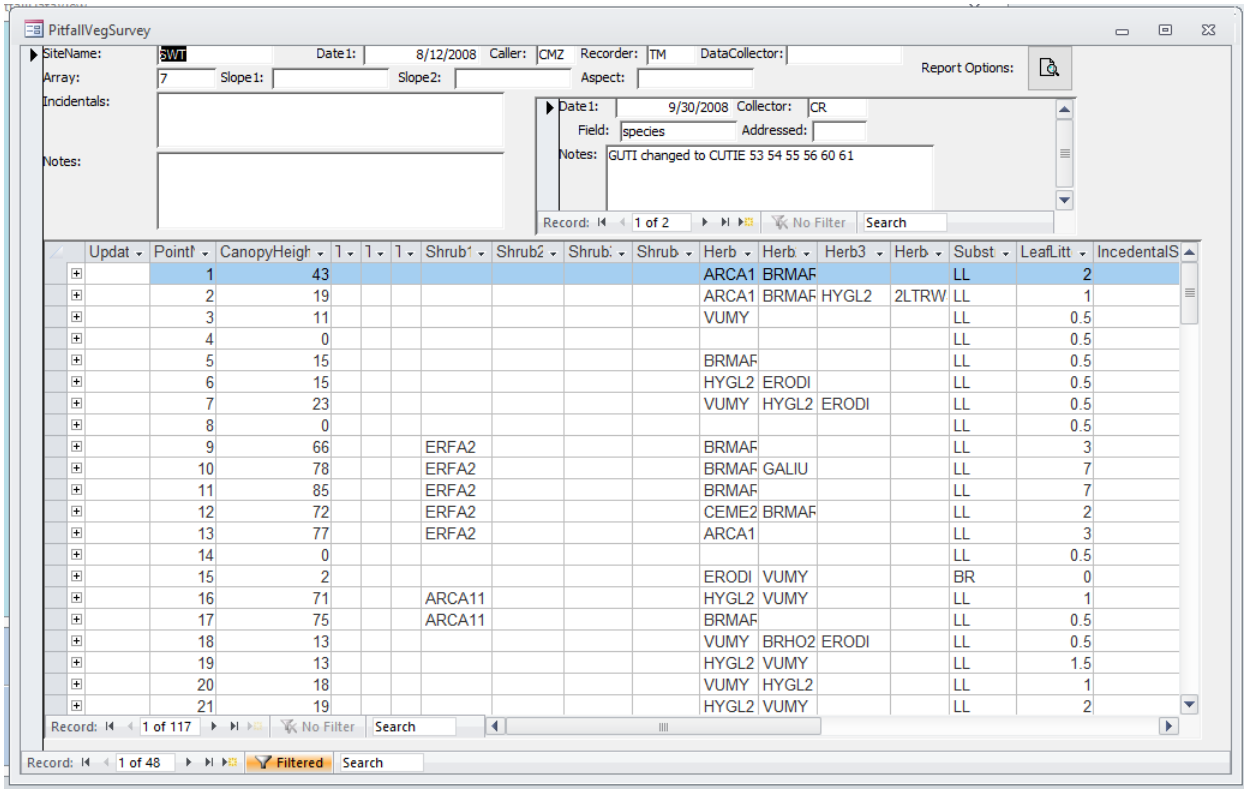


Site	Transect	TrtHistNum	GrpTrtHist	Season	PSand12	PSand13	PSand14	PSand15	PSand16	PSand17	PNoVeg12
MP	B2NE	1	1	F	67.5	56.0975609756	82.9268292682	85.3658536585	70.7317073170	68.2926829268	53.6585365853
MP	B2NW	1	1	F	68.2926829268	51.2195121951	80.4878048780	87.8048780487	80.4878048780	87.8048780487	43.9024390243
MP	B2SE	1	1	F	68.2926829268	51.2195121951	77.5	82.9268292682	65.8536585365	82.9268292682	60.9756097560
MP	B2SW	1	1	F	80.4878048780	80.4878048780	100	87.8048780487	80.4878048780	78.0487804878	68.2926829268
MP	C2SW	1	1	F	58.5365853658	48.7804878048	85.3658536585	92.6829268292	65.8536585365	80.4878048780	36.5853658536
MP	C3SE	1	1	F	53.6585365853	42.5	87.8048780487	63.4146341463	71.4285714285	69.2307692307	58.5365853658
MP	D2NW	1	1	F	51.2195121951	46.3414634146	80.4878048780	68.2926829268	80.4878048780	85.3658536585	60.9756097560
MP	D3NE	1	1	F	43.9024390243	39.0243902439	70.7317073170	65.8536585365	48.7804878048	68.2926829268	36.5853658536
MP	E2SW	1	1	F	43.9024390243	19.0476190476	39.0243902439	58.5365853658	68.2926829268	75.6097560975	36.5853658536
MP	E3SE	1	1	F	19.5121951219	19.5121951219	58.5365853658	87.8048780487	53.6585365853	60.9756097560	4.87804878048
MP	F2NW	1	1	F	39.0243902439	34.1463414634	58.5365853658	92.6829268292	43.9024390243	87.8048780487	29.2682926829
MP	F3NE	1	1	F	43.9024390243	31.7073170731	95.1219512195	87.8048780487	58.5365853658	70.7317073170	19.5121951219
MP	F4SE	1	1	F	82.9268292682	41.4634146341	46.3414634146	85.3658536585	68.2926829268	82.9268292682	39.0243902439
MP	F4SW	1	1	F	4.87804878048	0	2.43902439024	14.6341463414	24.3902439024	12.1951219512	0
MP	G4NE	1	1	F	29.2682926829	17.0731707317	75.6097560975	78.0487804878	65.8536585365	65.8536585365	51.2195121951



SDMMP 2015-2019 Work Accomplished





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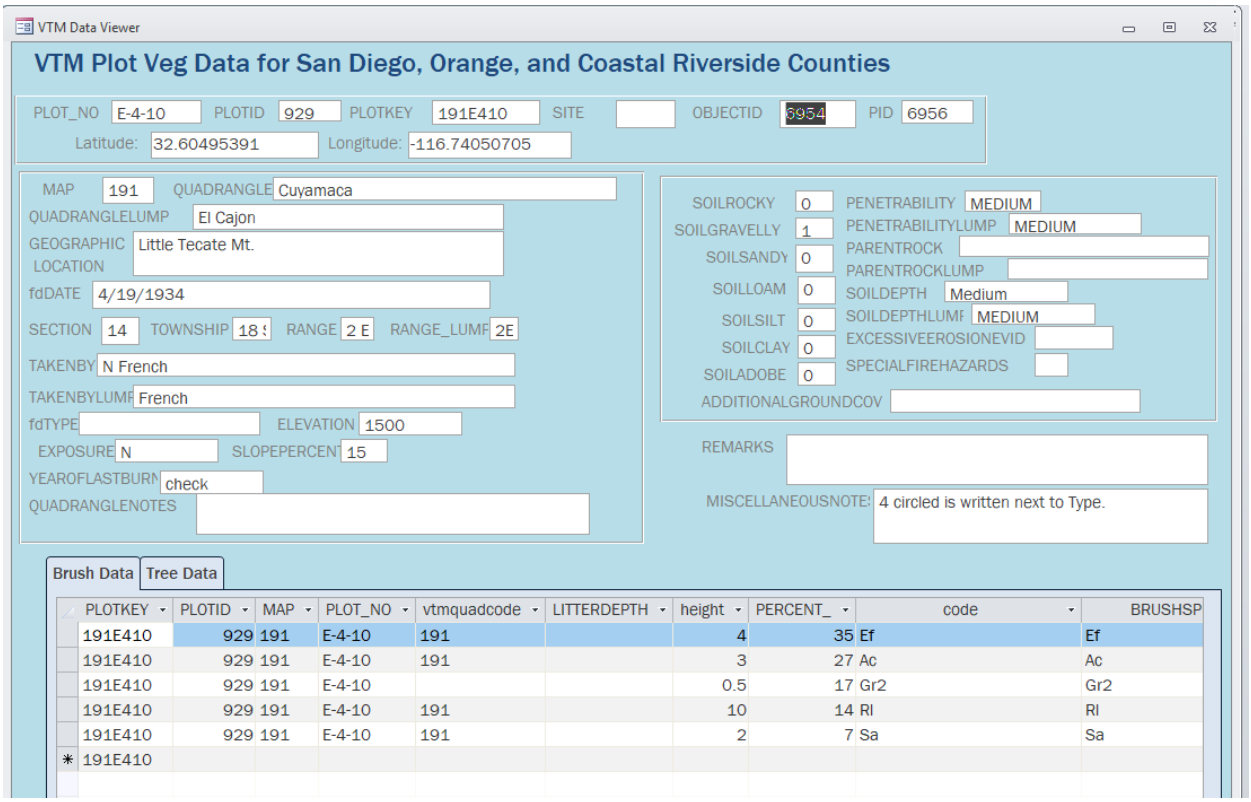
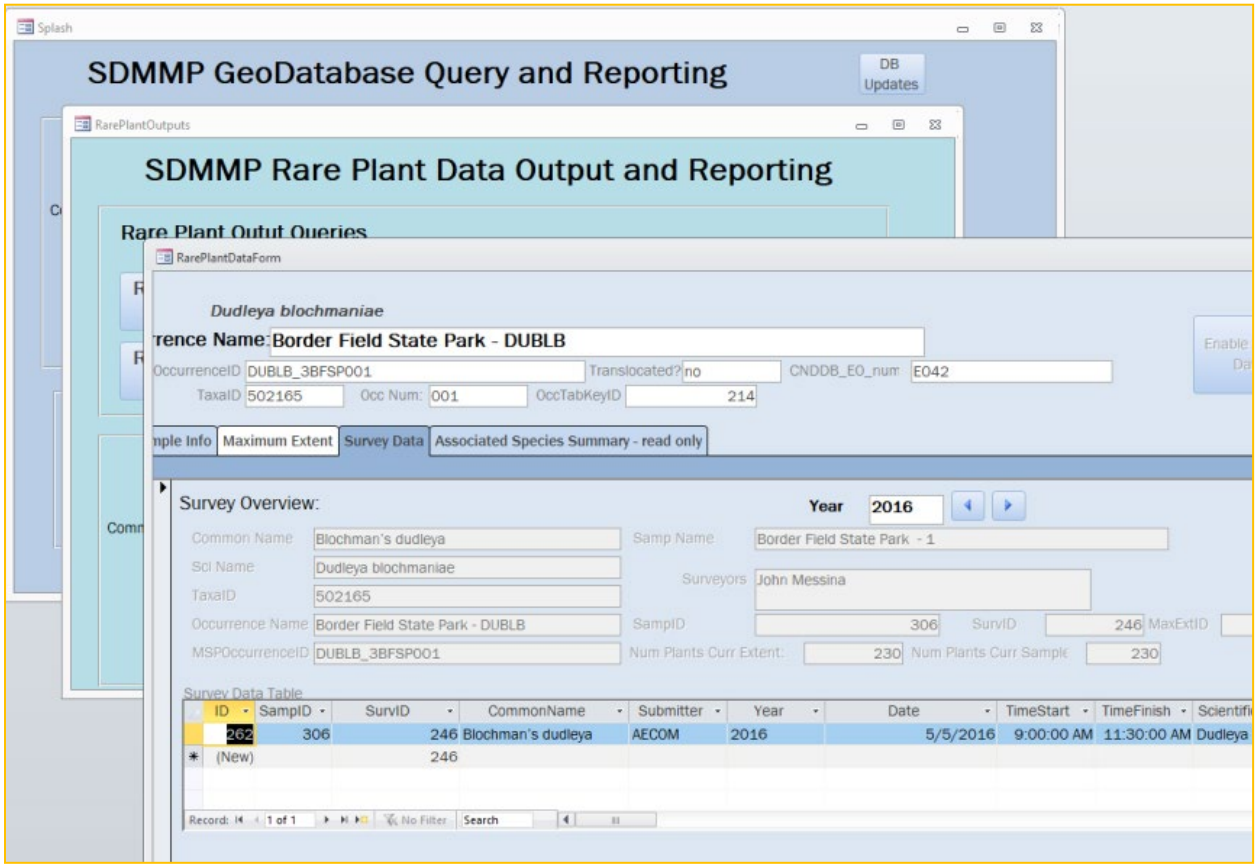
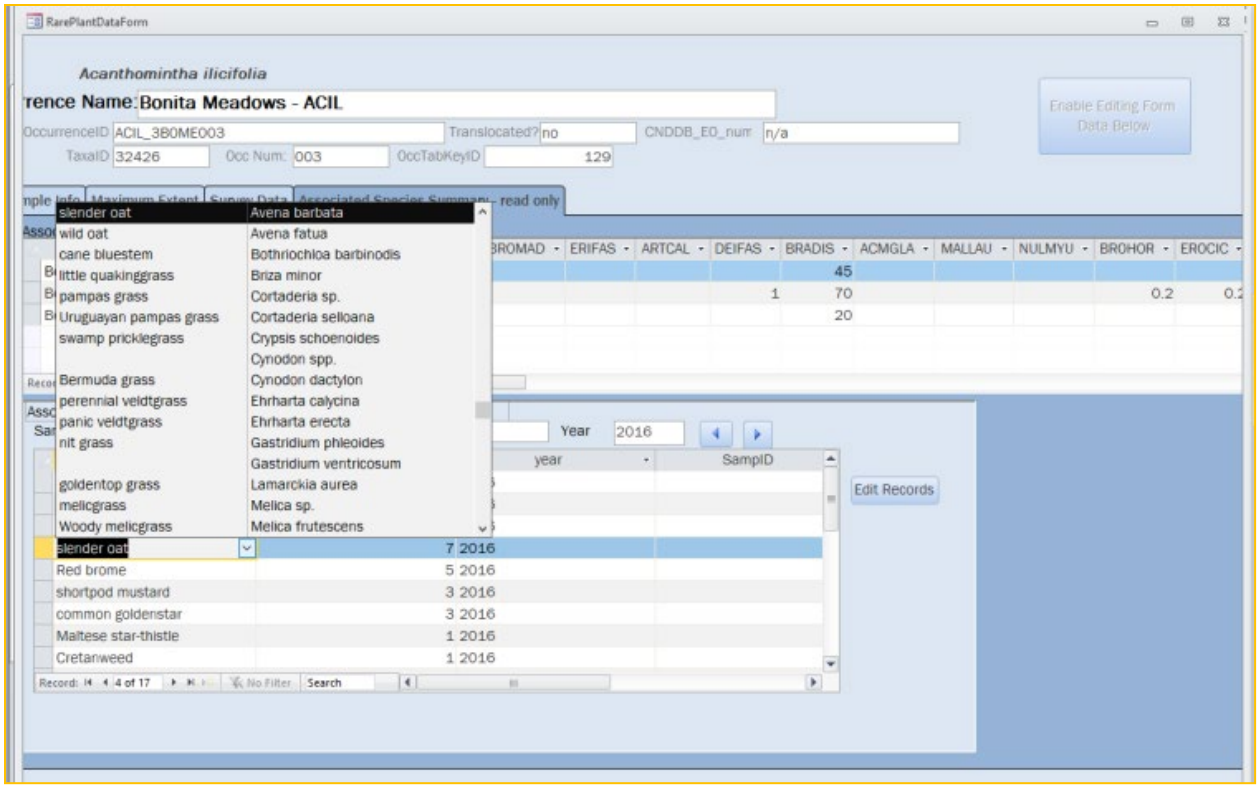




SDMMP 2015-2019 Work Accomplished



PLOTKEY	QUADRANGLE	GEOGRAPHICLOCATION	fdDATE	UTME	utmn	WHR1Wies	WHR1TypeWies	TotalBurnYears	BurnYearsSince2002	RecentBurnYear	YearSinceLastBurn	Years
164DC11	Redlands	W of Brook side	4/5/1930 0:00	479425.3525	3765498.468	CRP	Cropland	2	0	1997	20	1953,
164DC12	Redlands	Smiley Heights	3/29/1930 0:00	482473.0118	3765230.718	CRP	Cropland	0	0	ND	ND	ND
164DC13	Redlands	Redlands Heights	3/29/1930 0:00	484122.8104	3765072.688	CRP	Cropland	0	0	ND	ND	ND
164CC21	San Bernardino	Jurupa Mts.	4/5/1930 0:00	462555.3435	3764681.621	CSC	Coastal Scrub	1	0	1996	21	1996
164DC21	Redlands	SW of Yucaipa Valley	3/29/1930 0:00	487331.4379	3763957.44	CRP	Cropland	0	0	ND	ND	ND
162DC31	Pasadena	[Sycamore Canyon]	2/19/1930 0:00	403159.6065	3762918.066	CSC	Coastal Scrub	0	0	ND	ND	ND
162DC32	Pasadena	South Fk. Sycamore Canon	2/19/1930 0:00	405469.9513	3762801.039	AGS	Annual Grassland	1	0	1967	50	1967
177A31	Corona	Santa Ana Del Chino	3/22/1931 0:00	428683.209	3762088.694	AGS	Annual Grassland	1	0	1947	70	1947
176A11	Riverside	Jurupa Hills	1/20/1931 0:00	458202.745	3761588.62	CSC	Coastal Scrub	0	0	ND	ND	ND
176A51	Elsinore	N of Badlands	4/8/1930 0:00	491062.505	3761571.807	CRC	Chamise-Redshank Chaparral	1	0	1970	47	1970
176A41	Elsinore	N of Reche Canyon	4/8/1930 0:00	481549.0006	3760529.286	CSC	Coastal Scrub	2	0	1967	50	1953,
176A21	Riverside	Mt Ribidoux	1/20/1931 0:00	464013.2246	3760378.995	CSC	Coastal Scrub	0	0	ND	ND	ND
176A31	Elsinore	Box Springs Mt.	4/13/1930 0:00	473338.1677	3760046.844	CRC	Chamise-Redshank Chaparral	3	0	1993	24	1963,
177A32	Corona	Santa Ana Del Chino	3/23/1931 0:00	427200.4687	3759915.992	CRP	Cropland	0	0	ND	ND	ND
176A12	Riverside	Jurupa Hills	1/20/1931 0:00	459285.5583	3759850.955	CSC	Coastal Scrub	0	0	ND	ND	ND
176A52	Elsinore	W end Badlands.	3/27/1930 0:00	486080.1444	3759637.445	CSC	Coastal Scrub	6	3	2013	4	1951,
177A33	Corona	Santa Ana Del Chino	3/23/1931 0:00	426322.3341	3759466.632	AGS	Annual Grassland	0	0	ND	ND	ND
177A12	La Habra	Hudson Road- 1.5 miles NW Hac	2/19/1930 0:00	410984.5135	3759423.091	COW	Coastal Oak Woodland	2	0	1945	72	1939,
176A61	Elsinore	Mile N of Alexis	3/26/1930 0:00	494941.227	3758867.236	CSC	Coastal Scrub	2	0	1988	29	1962,
176A42	Elsinore	Reche Canyon	3/28/1930 0:00	481821.4678	3758375.725	CRC	Chamise-Redshank Chaparral	7	0	1996	21	1953,
177A35	Corona	Santa Ana Del Chino	3/21/1931 0:00	427218.5065	3758018.273	CRC	Chamise-Redshank Chaparral	2	0	1990	27	1980,
176A62	Elsinore	2 miles SE of El Casca	3/27/1930 0:00	492470.8554	3757754.539	CRC	Chamise-Redshank Chaparral	3	1	2005	12	1975,
176A13	Riverside	La Sierra	1/20/1931 0:00	455373.7899	3757681.111	CRP	Cropland	1	0	1989	28	1989
177A37	Anaheim	2 miles N -- 1.5 miles East of Oli	3/13/1931 0:00	424936.3129	3757330.645	AGS	Annual Grassland	3	1	2008	9	1980,
177A36	Corona	N of San Juan hill	3/20/1931 0:00	430431.708	3757163.112	AGS	Annual Grassland	0	0	ND	ND	ND
177A38	Anaheim	1.75 miles N --- 1.5 miles East of	3/13/1931 0:00	425274.2113	3756945.399	COW	Coastal Oak Woodland	3	1	2008	9	1980,
176A32	Elsinore	Box Springs Mtn	4/9/1930 0:00	474631.4835	3756782.601	CSC	Coastal Scrub	4	0	2001	16	1980,
176A54	Elsinore	Mile W of Alexis	3/27/1930 0:00	492150.9488	3756718.558	CSC	Coastal Scrub	2	1	2005	12	1975,
177A41	Corona	N of San Juan Hill	3/21/1931 0:00	432465.2646	3756701.408	CRP	Cropland	1	1	2008	9	2008

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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 input 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 (CLD); 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.

Updated and QA/QC'd Conserved Lands Database

- Quarterly updates of the Conserved Lands Database provided to SanGIS
- New land acquisitions recorded from SANDAG, County of San Diego, City of San Diego, Endangered Habitats Conservancy, military, Habitrak, numerous individual nonprofits and local governments

List of spatial datasets being mined, maintained, and/or migrated to SC-MTX, the MSP portal, and other GIS viewers

- California gnatcatcher regional monitoring site selection, model covariates, survey data
- Rare plants survey data 2014-2019
- Imagery-
  - ✓ LANDSAT images for 1990, 1993, 1997, 2004, 2005, 2007, 2010, 2011, 2012, 2013, 2014, 2015, 2017, 2018
  - ✓ Natural Agricultural Imagery Program (NAIP) images for 2012, 2014, 2016, 2018
  - ✓ San Diego high resolution images for 2012, 2015, 2018
  - ✓ From Light Detection and Ranging (LiDAR) ~3300 tiles from 2014, 2015, 2016
- Golden eagle nest sites survey data and detection data hexagons
- Land use, vegetation, roads for southern California for 2016 and 2018
- MOM plants and animals updated multiple times a year with survey data- 81 total sources for animals, 52 total sources for plants
- Climate scenarios from Basin Characterization Model (BCM) climate model (monthly layers for 5 variables for 10 scenarios)

Spatial analyses conducted at the request of the SDMMP

- Created habitat model covariate geodatabase
  - ✓ ~3.5 million points in southern California, ~13 million points across the state with ~50 variables each
- Normalized Difference Vegetation Index (NDVI) calculated on LANDSAT images, NAIP images, and San Diego high resolution images for multiple years
- USGS Stream Temperature, Intermittency, and Conductivity (STIC) location survey design, site selection
- STIC aseasonal flow watershed delineation, percent cover calculated per watershed, scatterplots, histograms, and write up prepared
- Calculated size of patches across southern California in 2011 and 2001
- From LiDAR data, calculated Digital Elevation Model, Digital Surface Model, height of objects off natural surface, height of vegetation, ecological integrity at 3km and 1km grids
- Average NDVI of every tree in western San Diego County
- California gnatcatcher regional survey site selection
- Argentine ant survey design and site selection

Draft data sharing agreements

- Data sharing approved for all datasets and documents available on the library from the original source

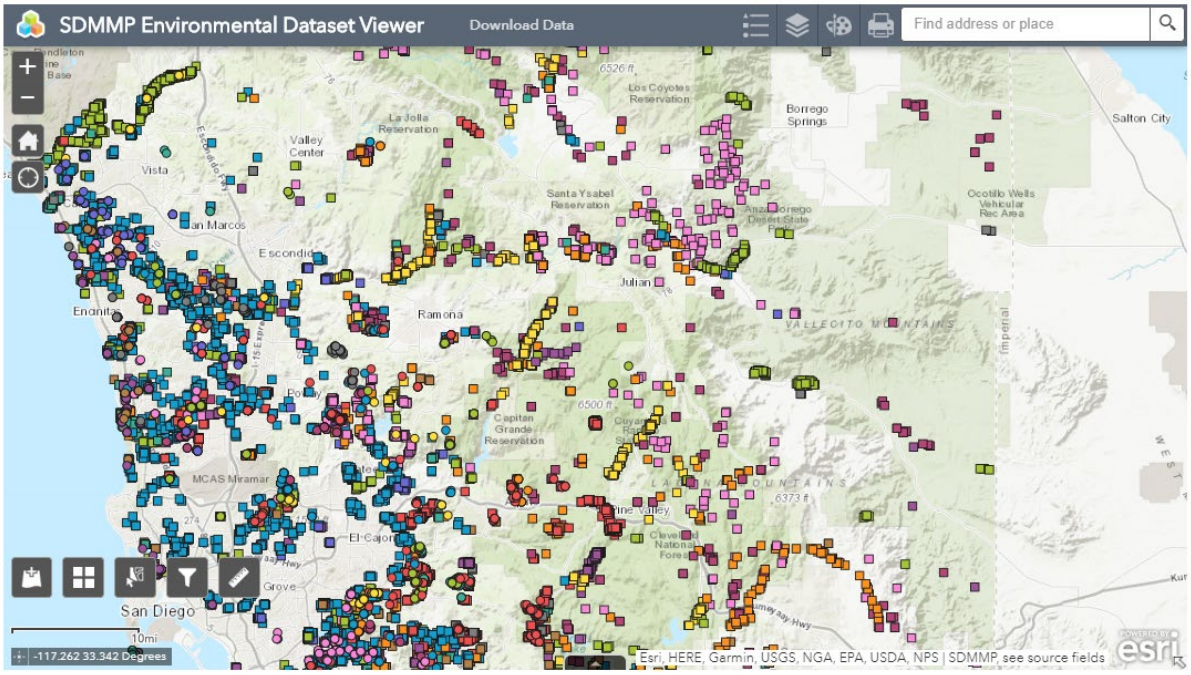
Draft spatial products prepared for SDMMP partners

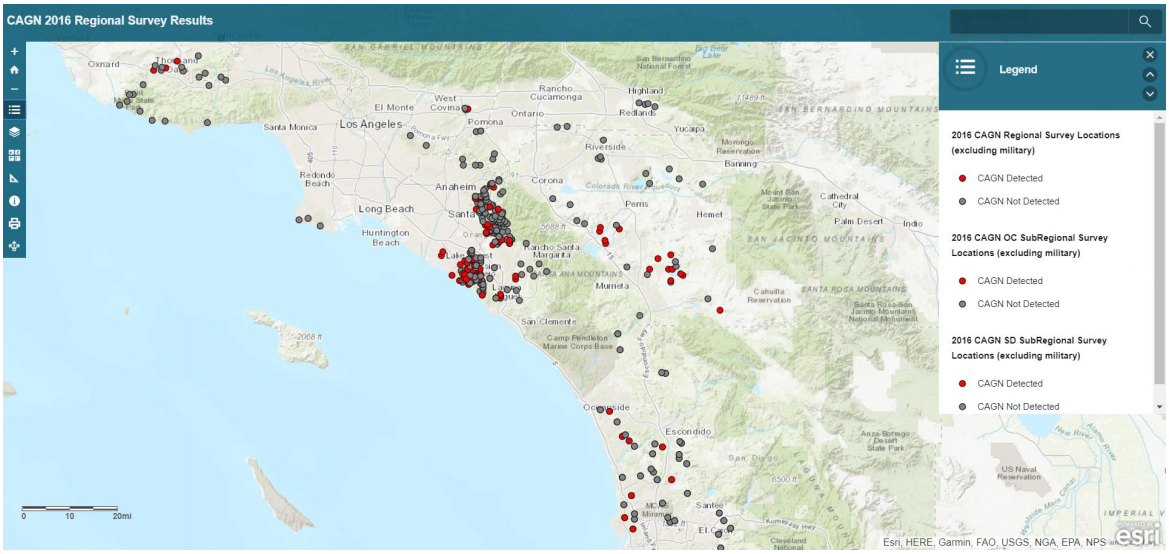
- MSP Roadmap Priorities map viewer
- Environmental dataset map viewer
- Rare plant survey data map viewer
- Connectivity Strategic Plan linkage and land use maps
- Fire Strategic Plan map viewer
- Framework management plan field data QAQC and report maps (~50 maps)
- Tracker online interactive database on website
- Hermes report maps and table for land acquisition
- Edaphic plants project report maps and GIS layers for Databasin
- SR-94 report and presentation maps for CBI connectivity study
- Southern California patches for 2001 and 2011 with write up
- Conserved lands for southern California
- Updated website with project pages, metadata module, tracker search, spatial search, topics pages
- Vegetation for southern California, San Diego, and state of California
- MSP document, online maps, GIS layers for land use, vegetation, conserved lands, covered species
- Connectivity core and linkage updates
- Golden eagle maps for Cleveland National Forest and USGS
- Habitat model variables for San Diego, southern California, and State of California
- Presentations for numerous SDMMP partners and EMP working group
- Sinknet mapping
- DEM accuracy map
- Climate scenarios maps
- Survey123 forms and instructions
- Least Bell's Viroe habitat model
- Grids for field collection in southern California

Screenshots of work products posted on the SDMMP website, GIS Viewers, and MSP web portal

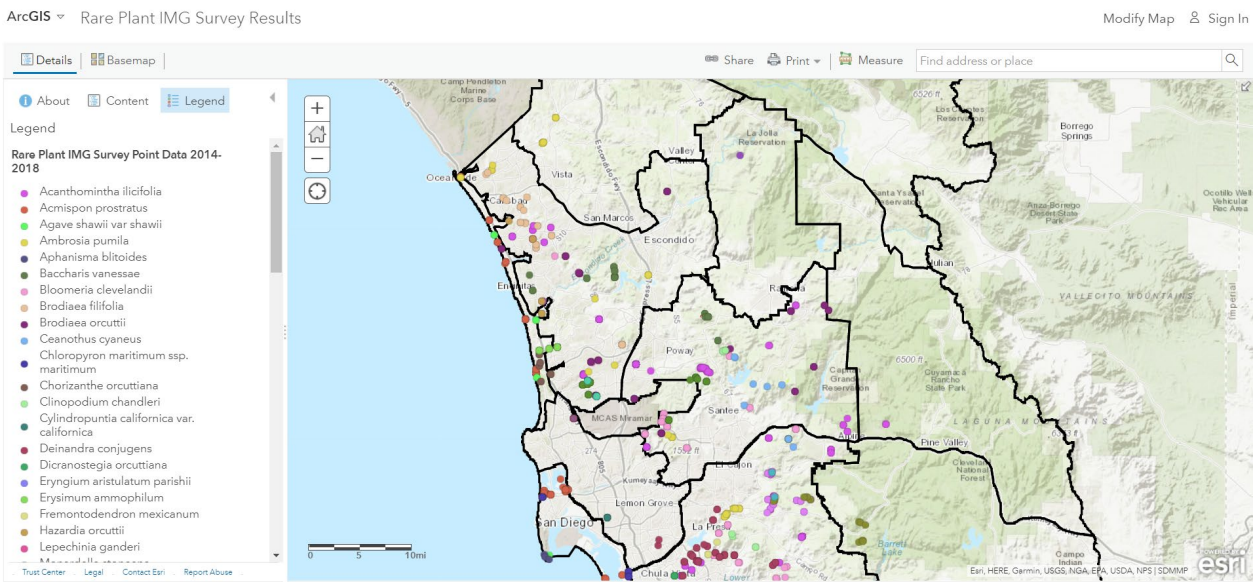
ArcGIS Map viewer

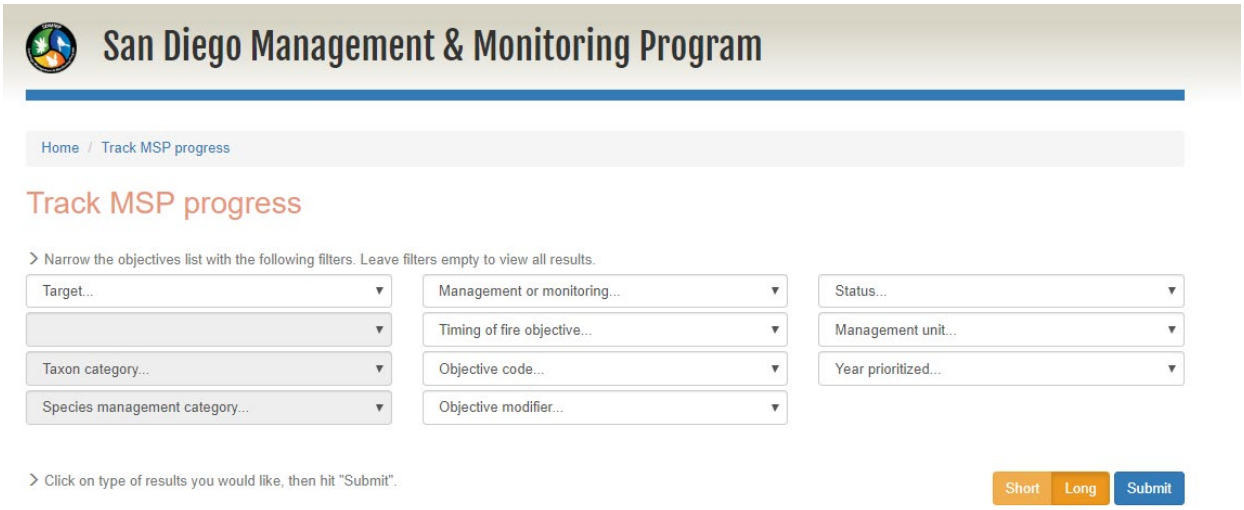
SDMMP provides access to spatial information through an ArcGIS online map viewer. There are roughly 30 layers available on this viewer, so loading time may be several minutes depending on your internet connection type and speed. This viewer provides a number of tools for users to query layers, turn layers on and off, draw unique shapes, change the basemap, view layer attributes, and create static maps. Click on the map to display a pop-up with more information about the object selected. Use the links across the top to download the original layers, in a vector or raster format, and all layers' metadata. For detailed instructions for this specific map, download a help sheet here. This map does not include MSP 2014-2018 Priorities. To view the full screen map, click here.

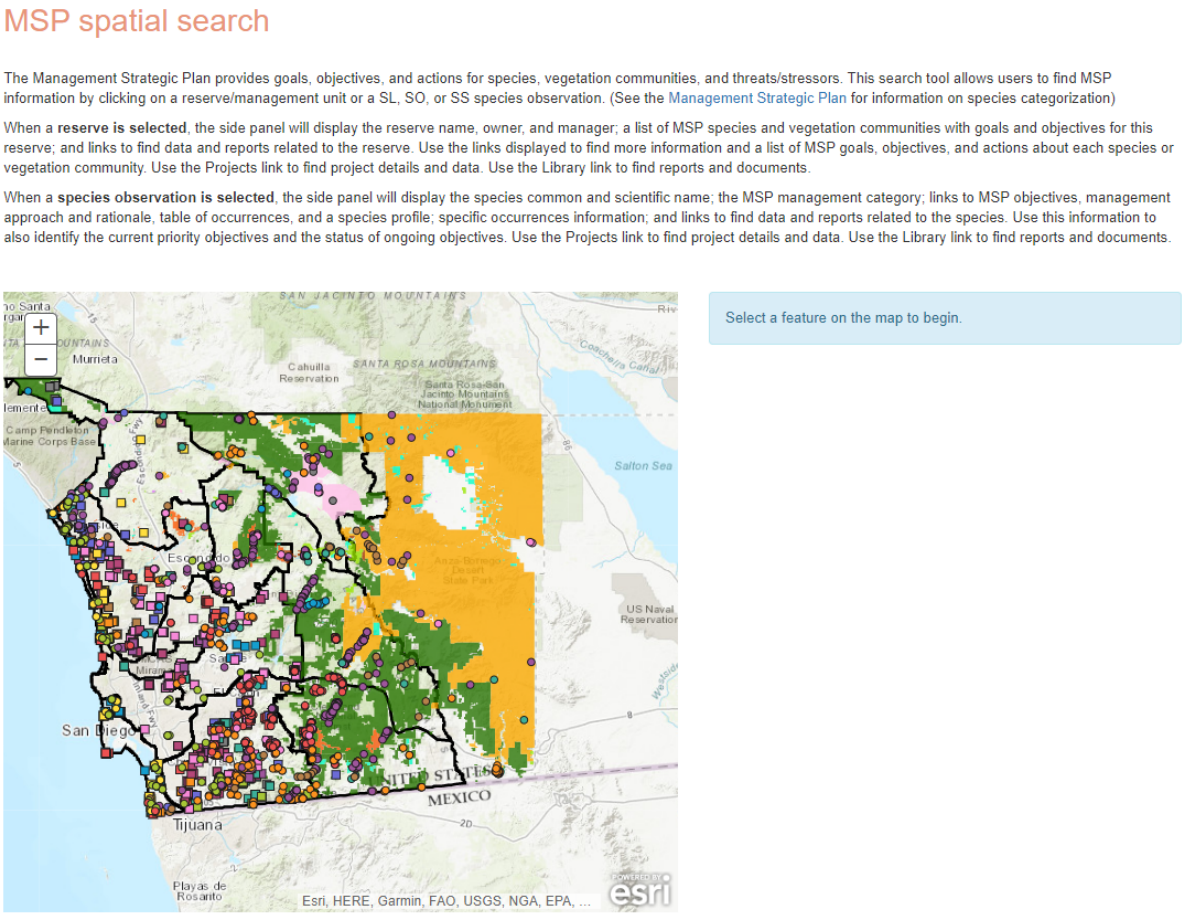




SDMMP 2015-2019 Work Accomplished







Description of training materials created

- Instructions to use projects and library functions of website
- In-person annual training for rare plant survey forms and protocol
- In-person training for new website features (4 trainings)
- In-person training at Land Manager Grant information meeting for Priorities Viewers
- Survey123 instruction sheets
- Website project and library instruction handouts

Recommendations for SDMMP Program Improvement

- Unify data collection methods - Add a requirement to any TransNet EMP Land Manager Grant project that the grantee identify the list of variables that they will be collecting and discuss with SDMMP if there are set methods for collecting each data field that could be used by the individual project. This would tie into the data dictionary for MTX and allow for better integration of datasets. Currently, project datasets are entered into MTX largely independently and it is not as straightforward (or often impossible) to look across studies because data collection methods are incompatible.

- Plan for data management up front - Projects receiving SANDAG funding would need to supply a general data management plan before the project begins. This would help SDMMP suggest changes to data relationships and variables that would better integrate into the existing system.

Task 24: SDMMP Coordinator Deliverables:

This task provides coordination support to the SDMMP and will be 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 (create meeting materials, reserve rooms and IT support, identify and coordinate 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 database; assisting SANDAG in facilitating the TransNet Land Management Grants by providing input on the MSP priorities, the application process, and review of submitted applications, and working with land managers to develop proposals; developing technical support tools and training materials and with training stakeholders; and developing status reports on the program and projects to provide to SANDAG and the EMP Working Group. The SDMMP Coordinator will develop work plans and timelines to meet identified goals and priorities in collaboration with SDMMP representatives and USGS leads.

Facilitating coordination and implementation of MSP Roadmap objectives with SDMMP partners and SANDAG contractors

- SDMMP staff attend monthly meetings with SANDAG, frequently meet internally, and meet with USGS scientists to coordinate implementation of MSP Roadmap objectives.
- SDMMP staff attend quarterly EMP Working Group meetings to provide updates and ensure alignment of SDMMP activities with working group directives and priorities.
- SDMMP, SANDAG, and Wildlife Agency representatives meet monthly to coordinate implementation of MSP Roadmap objectives and to discuss other relevant issues.
- SDMMP staff attend quarterly Fire Safe Council meetings to keep informed in fire management and preparedness for the region. This helps with implementation of MSP Roadmap fire management objectives, particularly in creating Resource Area Avoidance Maps for preserves in the County.

- SDMMP staff attend Ward's weed meetings with land managers to support regional invasive plant management actions.
- SDMMP staff attend quarterly San Diego Weed Management Area Steering Committee meetings to keep informed and to provide coordination in regional invasive plant management.
- SDMMP staff are developing a grazing monitoring study scope of work with land managers and other partners. Nineteen different organizations are involved with this informal working group. SDMMP organized four grazing meetings to obtain land manager input into prioritizing objectives and identifying pilot study sites. Based upon this input, the top priorities of this project are to assess grazing effectiveness at reducing fire risk and controlling non-native herbaceous species to restore native grasslands, forblands and coastal sage scrub. SDMMP implemented pilot vegetation data collection at Rancho Jamul Ecological Reserve prior to introduction of cattle to document existing conditions.
- SDMMP staff organize periodic stinknet meetings with land managers to map known infestations and develop a regional management strategy to control this invasive plant, especially in areas with priority MSP Species. The team is developing a SANDAG scope of work to contract for management actions.

Coordinating meetings and workshops for partners

- Coordinates Monthly Management and Monitoring Coordination meeting for partners. From March 2018 through December 2019 attended by 195 different people representing 77 organizations. Meetings averaged 31 attendees in 2018 and 39 in 2019. End of year meetings and luncheons are attended by between 60 and 100 people.
- Coordinates quarterly MSP Land Manager Meetings. Attendance at these meetings averaged 32 people in 2017, 42 people in 2018, and 45 people in 2019. Meetings are held at various locations across western San Diego County and include presentations on resource management and round table updates by all participants.
- Assisted with preparations for Invasive Animal Strategic Plan Workshop held in August 2019. SDMMP team attended this workshop to gather input and prioritization on species to create an Invasive Animal Strategy for San Diego County.
- Organized Shot-hole Borer Identification Training Workshops taught by researchers from the University of California. The first workshop in October 2017 was attended by 38 people and the second in May 2018 was attended by 31 people.

Presentations and outreach to partners

- Coordinator organizes and hosts meetings and workshops and provides SDMMP updates and makes frequent presentations on topics of interest to partners. The SDMP coordinator reaches out regularly to partners through emails, conference calls, and one on one meetings.

Support SDMMP website and MSP Portal

- Working with the SDMMP team and USGS, the coordinator supports the current SDMMP website, MSP Portal, and databases. This includes adding new documents to the library, new events to the calendar, and new announcements and grant opportunities. Coordinates with SANDAG, scientists, landowners/managers, and other SANDAG contractors to create project pages to track progress and ensure data and project documents are updated on the web portal.

Assist SANDAG with facilitating TransNet Land Management Grants

- Creating database to track Land Management Grant management activities in relation to habitats and species.
- For the next round of Land Management Grants, it would be beneficial if the grant recipients, as a requirement for receiving funds, created a project page on the SDMMP Website reflecting their LMG-funded project. SDMMP staff can lead a workshop showing the grantees how to set up a project and add materials to the page as the project progresses. Then, the grantees can upload any data, photos, reports, etc. that evolve from the project. It has been a time-consuming and difficult task to locate material from previously awarded grants, especially in early 2000s.

Developing technical support tools and training materials for partners

- Creating a Help Page on the SDMMP website to assist users with navigating the the SDMMP Website, including the MSP Portal. A static document of instructions currently exists and was distributed to Land Managers seeking assistance, but the new web-available instructions are in production and will soon be available under the "About" section of the SDMMP website.

Developing status reports on the program for SANDAG and EMPWG

- Calculating grant program metrics using deliverables from Land Management Grants. Some of the calculations included are total feet of fencing installed, habitat types benefitted, total acreage enhanced through invasive control or other measures, total acreage created through habitat restoration, species planted, and species benefitted. These metrics can be combined with the metrics from other EMP contracts to estimate the total amount of funded habitat enhancement benefitting MSP species.
- Prepared a SDMMP fact sheet highlighting program accomplishments and projects.

Recommendations for SDMMP Program Improvement

- We recommend SDMMP create an MSP WebPortal site that showcases preserve metrics developed by SANDAG, EMP Working Group, SDMMP and many partners. These metrics can help raise awareness about the benefits and accomplishments of the regional monitoring and management program. These metrics can tell a story focused on the public, decision makers and collaborators about the many activities

and combined efforts of partners to achieve high levels of conservation, monitoring and management. The metrics can illustrate the importance of managing sensitive species, their habitats and multiple threats for conservation success in a global biodiversity hotspot with many rare, threatened and endangered species.