Management and Monitoring Strategic Plan (MSP Roadmap) 2026 Rare Plant Inspect and Manage (IMG) Monitoring Protocol for Occurrences on Conserved Lands in Western San Diego County

Prepared by the San Diego Management and Monitoring Program (SDMMP)
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Introduction

San Diego County is a biodiversity hotspot with many rare, threatened, and endangered plant species conserved under multiple species conservation plans. For successful rare plant conservation, it is important to gather relevant monitoring data to determine management needs and provide prioritized management recommendations for species' populations. The "*Management and Monitoring Strategic Plan for Conserved Lands in Western San Diego County: A Strategic Habitat Conservation Roadmap*" (MSP Roadmap) provides regional monitoring and management goals and objectives for conserved species and vegetation communities (SDMMP 2017, https://sdmmp.com/msp_doc.php).

MSP Rare Plant Inspect and Manage (IMG) Monitoring Objective

The MSP Roadmap includes Inspect and Manage (IMG) objectives for prioritized rare plant species that call for land managers, contracted botanists, and volunteers to inspect occurrences and determine population status, threats, and management needs. Based on this information, land managers can conduct routine management actions or plan and implement more intensive management as funding becomes available. The MSP Roadmap identifies 30 species for IMG monitoring during the 2017-2021 and 2022-2026 planning cycles. Some species are monitored annually and others less often, with the frequency depending on the species status, ecology, and level of threats. AECOM and Mulligan Biological Consulting, under the guidance of the San Diego Management and Monitoring Program (SDMMP), will coordinate land managers and other participants in monitoring 16 species in 2025 (see page 16). Protocols, data forms, monitoring schedules, rare plant IMG datasets, a map viewer with rare plant occurrences, and other information are available at the MSP Web Portal's "Rare Plant IMG 2014-2026" project page:
https://portal.sdmmp.com/view_project.php?sdid=SDID_sarah.mccutcheon%40aecom.com_57cf0196dff76

To ensure consistency in data collection, the IMG protocol and associated data forms provide a standardized basis for documenting occurrence status and assessing habitat and threats for the various species. The SDMMP and partners developed the protocol and data forms based on recommendations from a comprehensive review of rare plant monitoring data collected from 1999 to 2009 under the San Diego Multiple Species Conservation Program (McEachern et al. 2007, 2010a, b, Tracey et al. 2011). The MSP rare plant occurrence monitoring component was adapted from methods used by the City of San Diego since 2006 (City of San Diego Plant Survey Form 2013, City of San Diego Plant Field Form Instructions 2013, B. Miller and K. Roeland pers. comm.). The habitat and threat assessment components incorporate covariates used by the Conservation Biology Institute and The Nature Conservancy in some of their projects (South County Grasslands Data Sheet 2011, Crestridge Qualitative Monitoring Data Sheet 2013, Habitat Assessment Form 2013, P. Gordon-Reedy, T. Smith, and J. Vinje pers. comm.). Other partners provided input including the County of San Diego (M. Hamilton, J. Price, and R. Humphrey); Center for Natural Lands Management (M. Spiegelberg and P. McConnell); US Fish and Wildlife Service (J. Martin); AECOM (J. Dunn, T. Oberbauer, F. Sproul, L. Woolley); and the San Diego Association of Governments (K. Greer). Land managers field tested

the protocol in 2014 and provided feedback for revising the protocol for 2015. Further user feedback has resulted in minor changes to the protocol and data forms between 2016 and 2019.

Rare Plant Occurrence Information

A rare plant occurrence is a unit of management and similar to a "population" but without regard as to whether individuals interbreed. Following the California Natural Diversity Database (CNDDB) definitions of an Element Occurrence (CNDDB 2011), two occurrences are unique if the distance between their closest parts is ≥0.25 mile (Figure 1). In a few cases related to land manager monitoring and management decisions, we consider occurrences within 0.25 mile of each other as separate. Where a CNDDB polygon encompasses an occurrence, the occurrence has the corresponding CNDDB Element Number. An occurrence can include multiple plant locations extending over different landownerships.

MSP Roadmap rare plant occurrences monitored during 2014-2024 IMG surveys have polygon and sample point data for determining specific monitoring locations. These data are available for download as a geodatabase from the MSP Web Portal's Rare Plant IMG 2014-2026 project page (see link on page 1). The Rare Plant IMG geodatabase also includes population status, and habitat and threat assessment data. **Use the Rare Plant IMG geodatabase to locate rare plant occurrences and sample points that have been previously monitored**. However, for unmonitored occurrences you will need to do one of the following: contact SDMMP to obtain an Occurrence ID for new occurrences or use the MSP Roadmap's Master Occurrence Matrix (MOM) database to find an existing occurrence and then establish the sampling points. This database provides general location information for rare plant occurrences (MSP-MOM-Plants) documented since 2000 on Conserved Lands in the MSP Roadmap area (MSPA). You can find the MSP-MOM-Plants GIS shapefile at the SDMMP Library:

https://sdmmp.com/library.php?Search=mom-plants&Author=&PreparedFor=&PublisherID=&Year=&ArticleType=&submit=Submit.

From the "Article Type" menu select "GIS data" and type in "MSP-MOM Plants" into the search bar and download the MSP-MOM Plants shapefile. The shapefile includes spatial location and other information for MSP rare plant species and occurrences.

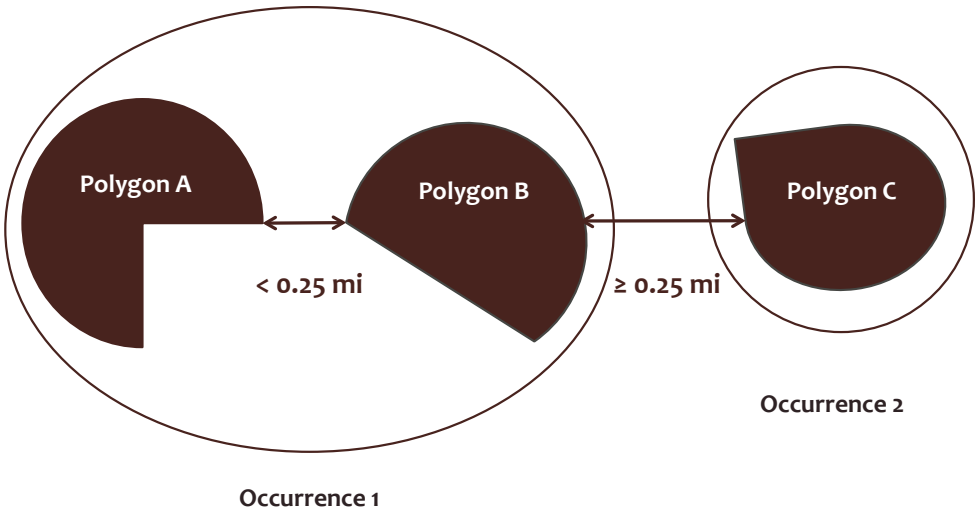


Figure 1. Example of how to determine what is an occurrence. An occurrence is a unit of management and similar to a population without regard to interbreeding. The definition follows a CNDDB Element Occurrence with two occurrences considered unique if their closest parts are ≥ 0.25 mile.

A map viewer is also available at the rare plant monitoring web page (see link on page 1) under the "Project Map URL" link. This viewer allows you to view rare plant occurrence sample points and mapped extents and to make maps with the 2014-2024 Rare Plant IMG geodatabase, MSP-MOM-Plants shapefile, and other spatial datasets.

Initial sources of data for MSP-MOM-Plants are the CNDDB, San Diego Natural History Museum's Plant Atlas (SDNHM), Consortium of California Herbaria (CCH), SANBIOS, and rare plant monitoring reports and GIS shapefiles provided by landowners and land managers (e.g., CBI, City of San Diego, County of San Diego, CNLM, USFWS). We update and add new occurrences as they are reported to the SDMMP.

Each occurrence in the Rare Plants IMG geodatabase has an occurrence identification code (Occurrence ID). It is typically comprised of the USDA plant code for the species or subspecies, followed by an underscored space and the Management Unit (MU) number defined in the MSP Roadmap. The next part of the code is a four-digit letter code representing the occurrence site. Typically, this site code designates the geographic area, feature or preserve where the occurrence is located. The site code is followed by a unique three-digit number for that occurrence. If there are multiple occurrences with the same site name, then each occurrence is assigned a unique number. Following are examples of occurrence IDs and the information embedded in the ID:

ACPR_ 1DUTR005	*Acmispon prostratus*, MU1, Dune Triangle, 005
ACPR_7BALA020	*Acmispon prostratus*, MU7, Batiquitos Lagoon, 020
ARGLC4_6MAMI016	*Arctostaphlyos glandulosa* ssp. *crassifolia*, MU6, Manchester Mitigation Bank, 016
DUBLB2_6CMPR001	*Dudleya brevifolia*, MU6, Carmel Mountain Preserve, 001
LEGA_3OTMT003	*Lepechinia ganderi,* MU3, Otay Mountain, 003
LEGA_3OTMT004	*Lepechinia ganderi,* MU3, Otay Mountain, 004

The last two examples have the same site code as they both occur on Otay Mountain, but they are different occurrences as they are ≥0.25 miles apart. Unique numbers distinguish these as different occurrences.

IMG Monitoring Approach

The purpose of the IMG objective is to provide current information on the status and management needs of rare plant occurrences on Conserved Lands in the MSPA. IMG monitoring identifies occurrences with management needs that land managers can routinely address. More intensive management actions are also determined, which may require more planning by land managers and implementation as local resources or regional funds become available.

IMG monitoring involves:

1. Establishing permanent circular sample plot(s) and estimating or counting the number of plants.
2. Mapping the perimeter of the current extent of the occurrence and estimating or counting the number of plants.
3. Photo-monitoring.
4. Conducting a habitat assessment within the sample plot(s).
5. Conducting a threats assessment within the cumulative maximum extent of the occurrence over time and including an adjacent 10-m buffer.

In many cases, the maximum extent is larger than the sample plot(s). Figure 2 shows the relationship between maximum occurrence extent, current mapped extent, and the sample plot.

Current Mapped Extent and Maximum Extents

The first time a plant occurrence's perimeter is mapped establishes the current extent for that year and represents the initial maximum extent for the occurrence. All suitable habitat near the occurrence should be surveyed. In subsequent survey years, the occurrence may vary in size (depending on environmental conditions and suitable habitat) and the maximum extent expands to include all areas occupied by the plant population across survey years. Thus, the maximum extent is the cumulative area where the plant is mapped over time and is the minimum area searched for the plant during each survey. During each survey, map the current extent of the occurrence so that the distribution of the plant can be tracked over time and areas for management identified. It may not be feasible to survey all suitable habitat and map the entire extent of an occurrence for some widely dispersed species, particularly shrubs and some geophytes, or in situations where a rare plant occurrence population occurs on both conserved and private lands. In these cases, create a survey area shapefile delineating the search area and submit it to the SDMMP with other monitoring data files.

It is important when mapping the current extent to minimize impacts to plants by avoiding trampling or creating trails through the population.

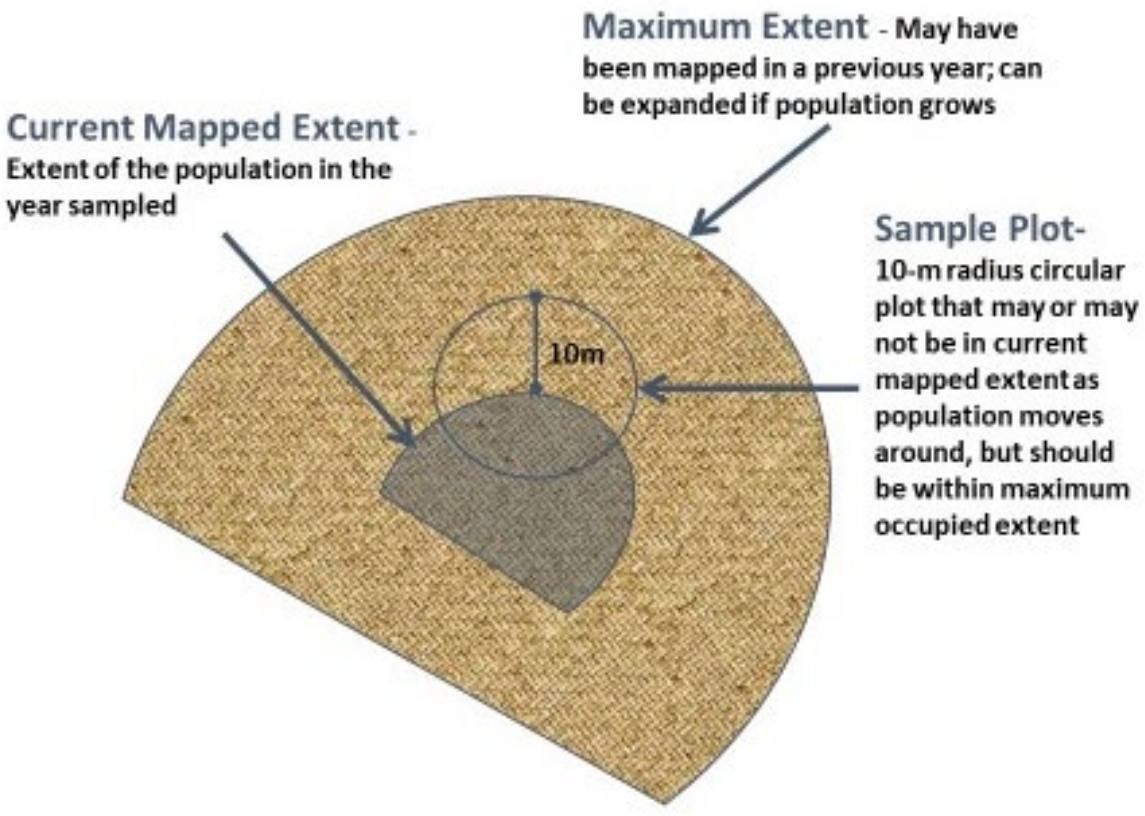


Figure 2. Diagram showing the relationship between an occurrence's maximum extent, current mapped extent, and sample plot.

Sample Plots (Sample Points)
Establish at least one **10-m radius circular sample plot** within the maximum occupied extent for each occurrence. In the 2014-2019 protocols, the sample plot is referred to as a sampling area, habitat plot or sample point. We changed the name to sample plot to reduce confusion and to emphasize that the plot samples habitat characteristics within the rare plant occurrence. We continue to use the term sample point to indicate the location of a sample plot.

For annuals and narrowly distributed perennials, the sample plot can include the entire mapped occurrence or only a portion of the occurrence, depending on the size of the occurrence and annual changes in distribution. For occurrences without previous IMG monitoring, establish a minimum of one permanent sample plot per occurrence. Place sample plots in locations where the plants are most likely to occur each year and that encompasses as much of the population as possible. We recommend establishing one to two additional sample plots for large occurrences (greater than one or two acres) to more completely characterize the habitat and increase accuracy of the population estimate. If possible, add more sample plots for very large occurrences (e.g., 5 to 10 acres) taking into account population heterogeneity, environmental characteristics, and land manager staffing and budget constraints. To minimize impacts to plants, the surveyor can set up the photo-monitoring points outside the mapped extent, at the edge of the sample plot and facing into the plant population. We can assist in establishing sample plots and provide GIS or KML files for making maps showing occurrence perimeters and sample plots.

Because some rare plant species populations (i.e., annuals, geophytes) fluctuate temporally and spatially, there may be times when the sample plot is no longer within the current mapped extent of the occurrence. It is important to continue collecting data at the established sample plot instead of moving it to encompass the current location of the plants. If the sample plot is moved, then differences in habitat attributes cannot be compared over time. The current mapped extent, number of plants, and threat assessment still encompass the plant population. You can also choose to establish an additional sample plot in a new location with plants, while continuing to collect data in the previously established sample plot.

Data Collection Options
We prefer IMG data be entered directly into a Survey123 digital form in the field using a smartphone, tablet or other portable computer. It is quicker for the surveyor to enter data in the field rather than collect data on paper and then enter it into the computer later. Using Survey 123 reduces data collection errors and makes database integration and management more efficient. See instructions for using the Survey123 application at the Rare Plant IMG 2014-2026 webpage (see link on page 1).

Surveyors can also collect data in the field with a tablet or field computer using an Excel data entry form or record data with pen and pencil and enter it into the Excel data form when back in the office. Data entry forms are available at the rare plant IMG monitoring web page. We ask that you submit all rare plant monitoring data to the SDMMP by October 1 of the year in which it is collected. Specific data for submittal includes:

- Completed Survey123 data files or MS Excel files reviewed for errors.
- Clearly labeled photos.
- GIS files with mapped extent polygons and point data (sample plot center and photo monitoring locations).
- Survey area shapefiles if the entire plant extent is not mapped.

Instructions for MSP Rare Plant Monitoring Forms

In preparing for rare plant surveys, surveyors should ensure they have all the required access permits and maps, gate codes, and keys, and training in the data collection protocol. The survey team should include members experienced with identifying the rare plant species being inspected. Ideally, two to three people comprise a monitoring team as this can improve estimates and makes it easier to delineate occurrence perimeters. Time the monitoring events when the target species is flowering and most detectable. Monitor geophytes when they are flowering. There is a calendar on the SDMMP website (rare plant IMG monitoring page) with suggested survey periods for each species. However, it is important to note that inter-annual differences in temperature and precipitation patterns can change species flowering phenology between years. For that reason, we recommend that surveyors visit occurrences early in the season to assess phenology and determine when to conduct surveys.

Specific information for each rare plant occurrence is found in the Rare Plant IMG geodatabases and the rare plant map viewer (see ***Rare Plant Occurrence Information*** section, above). Surveyors should prepare maps that identify access routes to rare plant occurrences. To improve efficiency and reduce data errors, we recommended that the surveyor pre-load information from the rare plant geodatabase that does not change from year to year before going into the field. The Survey123 data entry file already has much of these data pre-populated, whereas you will need to pre-enter data onto paper data forms or into Excel data entry forms for each survey site. This pre-populated information includes scientific and common names, MSP Occurrence ID, preserve, landowner, land manager, and sample plot and photo location coordinates.

Field Equipment Needed for Surveys

☐ Global Positioning System (GPS) submeter unit pre-loaded with occurrence sample plot and photo point location coordinates and polygon perimeters (if available). Alternatively, a smartphone (Android, iphone) is acceptable if no GPS unit is available.
☐ Extra batteries or power rechargers for smartphones, field computers, GPS and cameras
☐ Camera that can attach to monopod or tripod
☐ Tripod or monopod with camera mounting attachment (extendable to 5-6’ and with bubble level, if possible)
☐ Compass (or a smartphone with an app for compass directions, such as Thoedolite)
☐ Survey protocol, field forms (paper or Excel digital entry forms) & pens for entering data or as reference and backup to Survey123 digital data entry
☐ Smartphone, tablet or computer with Excel and/or Survey123 application if plan to enter data digitally
☐ Printed photo point photographs from previous monitoring efforts
☐ Ruler to measure thatch depth
☐ Cover estimate diagram (see page 4 of data form)
☐ Habitat and threat assessment category definitions (see page 4 of data form)
☐ Plant press and/or other plant collecting materials (optional)
☐ Aerial photograph (optional, for mapping population, threats, etc.)
☐ 2 tape measures

Measures to Avoid Impacting Rare Plant Occurrences While Monitoring

It is **very important** to minimize impacts to the plants from monitoring activities. Avoid creating paths or stepping on plants during surveys. Collect as much data as possible from the perimeter of the population and avoid repeated walking through the occurrence.

Undertake biosecurity measures to reduce transmission of invasive plant seed and pathogens, from one occurrence to the next. The California Invasive Plant Council has a manual with biosecurity measures to prevent the spread of invasive plants available for download at:

http://cal-ipc.org/ip/prevention/landmanagers.php.

Surveyors should review the Best Management Practices in this manual prior to going into the field and implement relevant precautions while monitoring rare plant occurrences. At a minimum, surveyors should use standard precautions such as removing weed seeds from field boots and snake chaps in between occurrence monitoring events.

Field definitions and instructions for the MSP - Rare Plant Occurrence Monitoring Form

If collecting data using Survey 123 on a digital device, please refer also to the Survey 123 data entry instructions posted on the rare plant IMG web page (see above).

After arriving at the site, surveyors should go to the occurrence location, determine the current extent, and install the 10-m radius sample plot. If the occurrence was previously monitored, then the sample plot and photo point monitoring locations already exist in the Rare Plant IMG geodatabase. Locate the sample plot and photo points using the pre-loaded spatial data on the GPS unit or smart phone. You can temporarily flag the boundaries of the sample plot to make it easier to determine the habitat assessment area. Do not install permanent sample plot and photo point markers without permission from the landowner or manager. You will need to establish the sample plot if the occurrence is not previously monitored (see pages 2 - 5).

For previously monitored occurrences, much of the following information already exists in the Rare Plant IMG database and does not need to be re-entered into the monitoring forms and if using Survey123, these fields will not show up at all as the data are attached to the pre-loaded occurrence ID and sample plot number. The existing occurrence ID and sample plot number need to be entered onto paper forms and have been pre-loaded in both the Survey123 survey and the Excel data forms.

Instructions for Completing the MSP - Rare Plant Occurrence Monitoring Form, Page 1

Scientific Name: Record the monitored species' scientific name, including subspecies or variety, if applicable. Current scientific names are provided in the Rare Plants IMG/MSP-MOM-Plants databases in the column "SName".

Common Name: The species common name is the "CName" column in the Rare Plants IMG/MSP-MOM-Plants databases.

MSP Occurrence ID: The occurrence ID is obtained from the "OccID" column in Rare Plants IMG database. Please indicate whether this is an existing occurrence or a new occurrence that needs to be assigned an ID number by the SDMMP. If you are unsure, enter "other/unknown".

For example, MOST_3MAVA002 and MOST_3MAVA003 are two different occurrences of *Monardella stoneana* in Marron Valley and their occurrence names are Marron Valley #2 and Marron Valley #3, respectively.

Sample Plot (Sample Point): There can be multiple sample plots for the same occurrence identified by unique sample point identifiers. These are designated in the occurrence name as "-Obs. #X" (e.g., Carmel Mountain - Obs. #1, Carmel Mountain - Obs. #2) or as unique names (e.g., Crest Canyon North, Crest Canyon South). For the sample point, enter an observation number or name only if there are multiple sample plots for that occurrence. The default is sample point 1 if nothing is entered in this field.

New Sample Point?: Check the appropriate category to indicate whether this is an already assigned sample plot (i.e., sample point) or is a newly established point or unknown.

Occurrence Name: Record the occurrence name from the "OccName" field in Rare Plants IMG database. The occurrence name represents the site where the occurrence is found and is often named after a preserve, geographic area or feature, road, etc. If there are two different occurrences with the same site name, then they are differentiated with a number.

CNDDB EO#: If the occurrence has a CNDDB EO#, it is listed in the "OtherID" column in Rare Plants IMG databse as "EOXX" (e.g., EO4, EO15).

Translocated?: Enter if the occurrence is translocated, natural or if you do not know. Rare Plants IMG/MSP-MOM-Plants databases have a "Transloc" field that can help to complete this field.
***Preserve, Landowner, Land Manager*:** Information on the preserve name, owner and manager can be found in Rare Plants IMG/MSP-MOM-Plants databases.

Surveyors & Affiliation: Record names and agencies of all field personnel participating in the monitoring (use full names).

Date, Time Start, Time Finish: When in the field, record the date (MM/DD/YYYY) and time start of data collection at the beginning of the data entry form. **When the survey is completed, enter time finish at the end of the form in the notes section**. This information allows us to track the time it takes to complete surveys for budgeting purposes.

I. SAMPLE PLOT INFORMATION:

 # Plants/Sample Plot: Directly count or estimate the total number of plants in the sample plot. A surveyor can estimate the number of plants in the sample plot if the plants are too dense, if it's not feasible to count every individual, or if there is a risk of impacting the population or habitat by trampling. A surveyor can estimate the number of plants in the sample plot by counting a portion of the plants in the plot and then extrapolating to a total number of total plants in the sample plot. Describe the **uncertainty** of your count or estimate as very high, high, medium, low, very low. If the occurrence is so large that a numeric estimate is uncertain, give a "ballpark" estimate and indicate in the "Uncertainty?" field that uncertainty is "very high". If every plant has been counted (i.e., census) then the uncertainty is very low.

Enter the radius (m) of the sample plot area, which should always be 10m but is entered to confirm the area sampled. Indicate whether counts/estimates were of individual plants, or clusters of plants. For species that tend to cluster, indicate how a cluster is differentiated from an individual. For geophytes, indicate whether counts/estimates were made when there were flowering individuals or only vegetative individuals. Select 'Not Applicable' only if you did not detect any individuals when monitoring a geophyte.

Phenological Stages and Evidence of Herbivory, Disease, and Stunted Growth: For each phenological stage (vegetative, flowering, fruiting, dead) and for evidence of herbivory, disease, or stunted growth, enter the number of the category representing the range in % of plants in the sample plot that exhibit that trait. Plants that have unopened buds should be included in the flowering phenology category. If individual plants are both flowering and fruiting, then estimate the percentage of the plants in the plot that are in flower and in fruit and fill out both categories respectively.

Disease applies if a species is visually affected (e.g., abnormal spots, fungus, mold, rust, mildew).

Stunted growth applies when a species appears fully grown and is obviously smaller than in previous years or when compared to other occurrences of the same species during the same growing season. This usually results from drought conditions.

The categories are defined as:

1 (0%) 2 (>0% to <10%) 3 (10% to <25%) 4 (25 to <50%) 5 (50 to <75%) 6 (≥75%)

Record any notes with any additional details on page 3 of the data form.

Is the Sample Plot within Current Mapped Extent? Check yes or no to indicate whether the current distribution of the plant is inside the sample plot.

II. SAMPLE PLOT LOCATION & SITE PHOTOMONITORING

Note: If the location has been previously monitored using the MSP Rare Plant Monitoring Protocol, coordinates for the center or the plot and for the photo point(s) will appear in Survey123 or on the coordinates list provided by SDMMP. Please consult the list to confirm the correct coordinates. If corrections need to be made to the coordinates, record the correct coordinates on the data form.

Sample Plot Location:

GPS /Smartphone Accuracy: Record the accuracy of the GPS unit (or smartphone if GPS unit is unavailable) and specify the units (e.g., meters).

Datum: Record the datum setting for the GPS unit. To standardize data, we ask that surveyors use NAD 83.

Coordinate System: We request that all spatial data be in UTM coordinate systems.

Center of Plot Coordinates: These are the coordinates for the center of the 10m radius sample plot. Indicate "no change" on the form if a surveyor monitored the location previously and the coordinates on the list provided by SDMMP are correct. Indicate "new location" and provide the coordinates for all new monitoring locations. Indicate "correction" and provide the new coordinates if you have reason to believe that the coordinates on the list provided by SDMMP are incorrect. Record the easting and northing coordinates at the center of the sample plot and at the photo point using coordinates from your GPS or Smartphone.

Photo Monitoring:

Take photos from the exact same viewing location during each monitoring visit. The surveyor should place the photo monitoring point in the location that maximizes the rare plant assessment and/or population extent view. Photo point establishment could be on the outside of the sample plot looking in toward the population, from the center of the sample plot looking in one or two different directions or from another appropriate location. Use a tripod or monopod with an elevation/bubble feature if possible and avoid using camera zoom features unless the exact zoom level can be recorded. Ensure that your photograph view lines up to the extent possible with previous monitoring photograph views so that visual changes can be tracked over time. Bring copies of previous monitoring photographs into the field to ensure annual photo monitoring accuracy.

Camera Type: Record the type of camera used for photo monitoring, including make, model, and lens type (if known).

Photo 1 Location: The coordinates for this location are recorded where the photo is taken. If photos are taken from a secondary location, then the coordinates should be entered under "***Photo 2 Location***". Survey123 will provide coordinates if the sample plot has been previously monitored. Indicate "no change" on the form if photos were taken at this location previously and the coordinates on Survey123 or the list provided by SDMMP are correct. For new monitoring locations, indicate "new location" and provide the photo

coordinates. Indicate "correction" and provide new coordinates if you have reason to believe the photo coordinates on the list provided by SDMMP are incorrect.

Direction: Using a compass (or smartphone app), note the direction that photo(s) are taken using either cardinal directions and/or degrees. Be certain that the compass is reading true north and record the declination in the notes.

Height: Measure the height of the camera *in meters* (from ground to bottom of camera body, unless otherwise noted).

Camera Angle: Record the angle that the photo(s) are taken, whether level or at an upward or downward facing angle. Include degree of angle, if possible.

Photo Number: Label photographs using the following protocol: occurrence ID_plot # (numeral only)_photo number (use the word 'photo' along with photo #)_monitoring date (MMDDYYYY) (Example: ACPR_ 1DUTR005_1_photo 1_03292019).

III. HABITAT ASSESSMENT IN SAMPLE PLOT

Conduct the habitat assessment within the 10m radius sample plot.

SANDAG 2012 Vegetation Alliance/Association: Determine the vegetation alliance and association of the sample plot based upon data collected in "Associated Species" and using the key in the *Vegetation Classification Manual for Western San Diego County* posted on the SDMMP Rare Plant Monitoring web page. This is typically done in the office after fieldwork is completed.

***Cryptogamic Crust Cover, Thatch Cover*:** Record the number of the % cover class for cryptogamic crust and thatch (i.e., non-native grass) cover within the sample plot. Cover classes are defined as:

1 (0%) 2 (>0 to <10%) 3 (10% to <25%) 4 (25% to <50%) 5 (50 to <75%) 6 (≥75%)

Thatch Depth: Thatch is defined here as dry, dead, nonnative grasses (lying on the ground or attached and standing up) within a site that are from the previous year. Any dry, dead grass from the current year should be included in the associated species section and not included as thatch. Estimate average thatch depth using the following categories: 1 (no thatch); 2 (<1 cm); 3 (1 to <5 cm); 4 (5 to <10 cm); 5 (10 to <15 cm); 6 (15 to < 20 cm); 7 (≥ 20 cm). Estimate maximum thatch depth in cm within the sample plot.

Dead Standing Biomass: Standing dead biomass is typically larger dead nonnative forbs, such as fennel, mustard, curly dock and star thistle, that are attached to the ground. Standing dead biomass does not include dead, native shrubs. Record whether there is dead standing biomass and if it is present, record the dominant species and cover class (above) and average height in cm.

Mammal Species Activity Categories: Assign the number of the appropriate activity category for feral pigs, ground squirrels, and pocket gophers. Activity categories numbered from 1-4 are defined as:

Feral pig activity within sampling area:

1 = No feral pig activity (rooting, wallowing, vegetation destruction, tracks, scat, pig) detected.

2 = Signs of pig activity (rooting, wallowing, vegetation destruction) in sample plot appear months old.

3 = Signs of recent pig activity (rooting, wallowing, vegetation destruction, tracks, scat, pig) in adjacent areas but not within sample plot.

4 = Recent signs of pig activity (rooting, wallowing, vegetation destruction, tracks, scat, pigs) within sample plot.

Ground squirrel activity within sampling area:

1 = No ground squirrel burrows detected.

2 = Burrows and/or ground squirrels observed in adjacent areas but not within sample plot.

3 = Single squirrel or burrow seen within sample plot.

4 = Multiple burrows and/or squirrels seen within sample plot.

Gopher activity within sampling area:

1 = No pocket gopher mounds detected.

2 = Mounds or gophers observed in adjacent areas but not within sample plot.

3 = <10 mounds observed within sample plot.

4 = ≥10 mounds or one or more gophers seen within sample plot.

Sample Plot Representative of Maximum Extent? Indicate whether the sample plot appears representative of the maximum extent. If the sample plot encompasses the entire maximum extent of the occurrence, then enter yes. If the sample plot appears to differ substantially from the maximum extent, then enter no and note the differences in the notes section on page 3 of the data form. Be sure to specify which covariates differ and how they differ.

IV. VEGETATION COVER/ASSOCIATED SPECIES IN SAMPLE PLOT

List all *native* and *nonnative* plant species, bare ground, litter, rock, water, dead shrubs, and cryptogamic soil crusts with estimates of percent cover within the sample plot. **Cover is estimated as a specific value** and should be equal to or slightly greater than 100%. Avoid recording plant overlap to the extent possible since we use the 'bird's eye' or vertical view to record cover. Record *all* non-native plant species in order to identify if management actions are needed. The preferred reference for species names is "*Checklist of the Vascular Plants of San Diego County*, *5th Edition*" (2014) by Jon P. Rebman and Michael G. Simpson. It can be downloaded from the San Diego Natural History Museum's website (http://www.sdnhm.org/science/botany/projects/checklist/).

Total cover in the sample plot is defined as total surface cover + total vegetation cover. Total cover must equal at least 100% of the plot. To collect total cover, visually (bird's eye view) estimate and record the percent of the plot occupied by the associated species, bare ground, litter, rock, water, dead shrubs and cryptogamic soil crusts and then add up all values. Do not record occupied area as a cover class (e.g., 1-5%, 10-25%). If total cover is less than 100%, adjust cover for the various substrates or vegetation to reach at least 100%. Always use the diagram of Percent Cover Categories from the California Native Plant Society (CNPS) (see below) for this analysis; estimates without such guidance tend to be inflated. It is recommended you copy the diagram onto a clear plastic sheet (like an overhead) for field use. Additionally, it helps to have two surveyors make individual estimates, then compare estimates and come to agreement on a final cover estimate.

To estimate total cover within the sample plot:

1. Walk around the entire sample plot and look down at the surface and vegetation cover (i.e., bird's eye view). View the plot from a higher vantage point if possible.
2. Estimate and record percent of the sample plot occupied by each surface cover category. Litter includes any non-living material on the ground surface, such as dead leaves, grass thatch (from the previous year), sticks, logs and even scat that can decompose and disappear from the surface. Rock includes all pebbles, cobbles and boulders and also includes sea shells, which are more permanent. Bare ground includes pebbles smaller than 2mm in size. Water may or may not be present. Lump together and record the combined cover of all dead, native shrubs that are upright, still attached to the ground, and not lying on the ground surface. Lump and record the cover of all non-vascular cover (lichens, mosses, cryptobiotic crusts) in the cryptogamic soil crusts location.

3. To calculate vegetation cover:
    - Create a comprehensive species list for the sample plot. Record species' scientific name. If plants cannot be identified in the field with certainty, collect the species for later identification and/or verification. If you submit a specimen to an herbarium, note the collector, collection number and the herbarium name at the bottom of page 2 of the data form.
    - Estimate percent cover for each species on the list using the CNPS cover categories figure as a guide. Enter cover values using whole numbers (i.e., 2%, 6%, 12%, 22%) except for any species with cover less than 1%. Enter the numeric value of 0.2% for species with cover less than 1%, which is equivalent to 'trace cover'.
    - Add all species percentages together to obtain a single vegetation cover estimate value (e.g. 27.2%). Collect plant species cover as absolute cover values (**do not record overlap**) and include cover estimates for target rare plant species.
4. Calculate total percent cover for the sample plot by adding up percent cover estimates from all cover categories (Total cover = % bare ground + % litter + % rock + % water + % vegetation + % dead shrubs + % cryptogamic soil crusts).
5. Verify that total cover equals at least 100%. If total cover is less than 100%, adjust surface and/or vegetation cover values to reach at least 100% so that the entire area of the sample plot is accounted for.

Nonnative: Check this column for known nonnative species if using paper forms (this option is not included in Excel or Survey123 data forms where it is automatically entered).

V. CURRENT MAPPED EXTENT INFORMATION

This section involves collecting information on the status of the occurrence within the current mapped extent.

 # Plants/Current Mapped Extent: **If the mapped occurrence perimeter falls entirely within the sample plot, then this number is the same as that entered for "# Plants/Sample Plot"**. If this is the case, enter the number in both places. If the occurrence perimeter is larger than the sample plot, then count or estimate the number of plants within the entire mapped perimeter of the occurrence. **If there are multiple sample plots per occurrence, the # Plants/Current Mapped Extent should be the total number of plants in the entire occurrence and the same number should be entered for each sample plot.**
Counting individuals is preferred, with estimation used only when occurrences are too large to reasonably count or you would impact the plant by trying to obtain a count. Provide only numeric values and do not add modifiers like < or > or use non-numeric descriptors such as 1000s, instead estimate a specific number of plants (e.g., 1,000 or 2,500). Round off estimates to the order of magnitude that you are most comfortable estimating. Describe the **uncertainty** of your count or estimate as very high, high, medium, low, very low. If the occurrence is so large that a numeric estimate is uncertain, give a "ball park" estimate and indicate in the "Uncertainty?" field that uncertainty is "very high". If every plant has been counted (i.e., census) then uncertainty is very low. Indicate whether the counts/estimates were of individual plants, or clusters of plants. For geophytes, designate whether the counts/estimates were of flowering individuals or of vegetative individuals. Select 'Not Applicable' only if you did not detect any individuals when monitoring a geophyte.

Area of Current Mapped Extent: Map the perimeter of the occurrence using a GPS and enter the size of the area and specify units (e.g., square meters). The size of the area is usually calculated in the office using GIS. If you do not have access to GIS, the SDMMP can calculate this variable once the GPS points are received. If the occurrence perimeter is not delineated with GPS, then record an estimate of the occurrence size. This can be done by mapping onto an aerial photo and then calculating the area in GIS or Google Earth in the office.

Indicate whether the area was GPS mapped or estimated based on methods such as mapping onto an aerial photo. Specify whether the perimeter of the current extent was determined by walking it and recording with a GPS unit, or determined by other means.

Species Found in Maximum Extent? Check off whether or not the species was located within the cumulative mapped extent for this occurrence. If the species is not found, note if there are potential or obvious explanations for why the species wasn't detected.

Is the Current Mapped Extent different from previous years due to variation in survey efforts from previous years? In some cases, the current maximum extent changes significantly from one year to the next due to a change in the survey effort, not a change in the actual species fluctuations. This may be because an occurrence is split between multiple owners and access to one or more properties varies from year to year. This could also occur when a new location of the species is found in an area that was not previously monitored (i.e. there is no negative data associated with the new location). This would mean that the extent appears to grow or shrink between years but it is not reflective of the actual conditions. If this is the case, indicate "yes". In the follow up questions, specify the reason for this change. A note field is available to explain further.

VI. THREATS ASSESSMENT IN MAXIMUM EXTENT

The threats assessment includes the maximum extent of the occurrence plus a 10-m buffer. The maximum extent is the **cumulative area over which the species has been mapped over time**. This area may be substantially larger than the current mapped extent or the sample plot, depending on the size of the occurrence.

Surrounding Land Use/Activity: Record the land use or human activities adjacent or surrounding the preserve (e.g., residential, road, open space, etc.) and indicate the distance to the sample plot.

Disturbances: There are a number of disturbances that may threaten rare plant populations, such as invasive plants, soil disturbance from a number of activities, altered hydrology, etc. For all disturbances detected within the occurrence's maximum extent and adjacent 10-m buffer, rank the level of disturbance and enter the numeric category code (1- 7) using the following criteria:

Disturbance categories within maximum extent:

1 = No sign of disturbance within maximum extent or in adjacent 10 m buffer.

2 = Disturbance does not occur within maximum extent but is detected within the surrounding 10 m buffer area.

3 = Disturbance present in >0% to <10% of area within maximum extent.

4 = Disturbance occurs in 10% to <25% of area within maximum extent.

5 = Disturbance occurs in 25% to <50% of area within maximum extent.

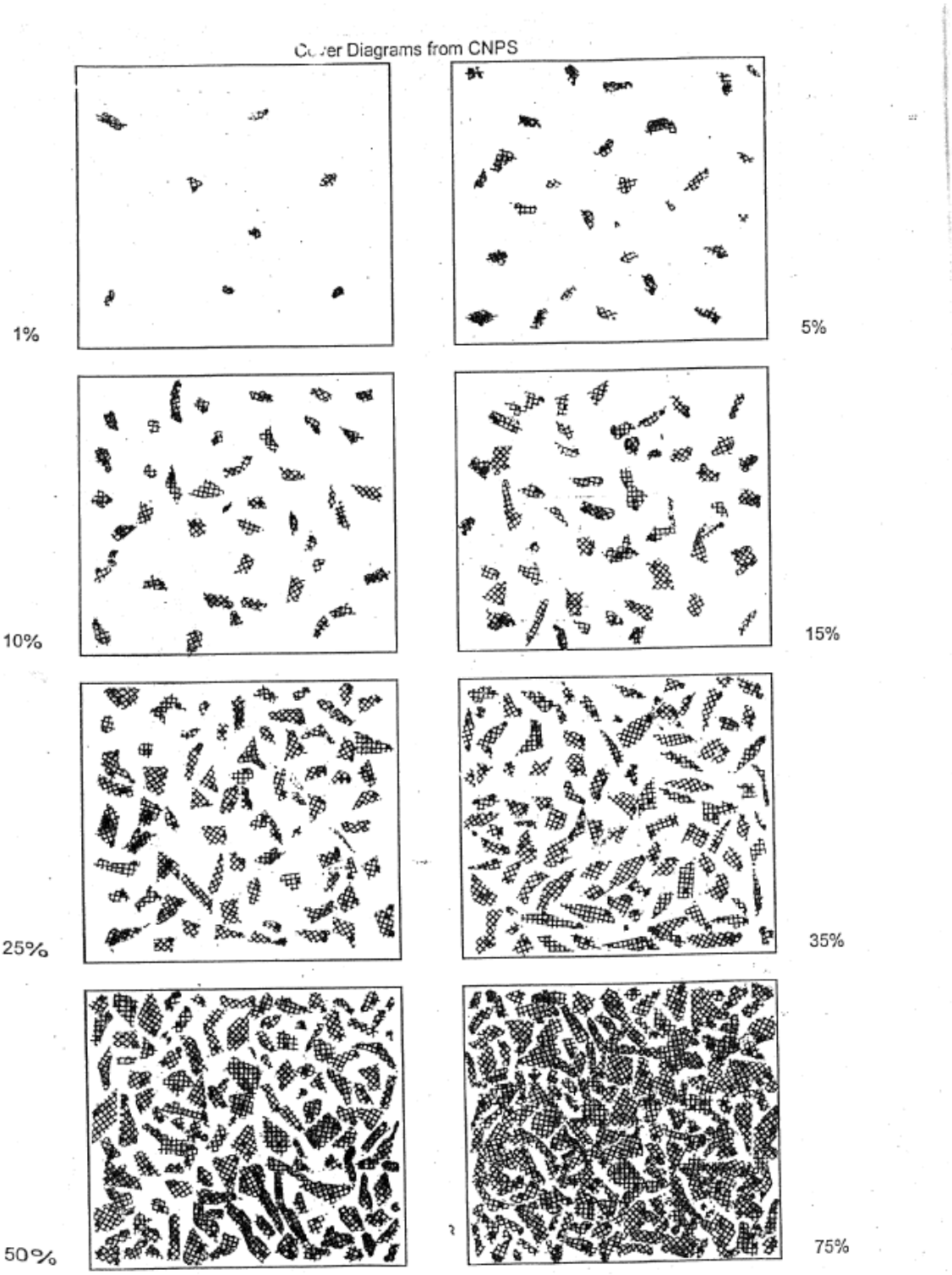
6 = Disturbance occurs 50% to <75% of area within maximum extent.

7 = Disturbance occurs ≥75% of area within maximum extent.

Provide additional information into the designated fields on the data form if trails or recent fire are detected in the occurrence or buffer area. Record and rank if there are other potential threats that are not listed on the form. Please note that the restoration field refers to management actions to improve habitat but that adversely impact rare plants. Other vegetation management activities that are not for habitat restoration or enhancement are covered by fuel modification zone, brush management and vegetation clearing categories. Drought categories are different from other threats and include low, medium, and high severity. Focus on the severity of the drought instead of the percent of the occurrence that is affected by drought. Use objective measures of drought stress to rank severity (e.g., absence or very low numbers of the target plant (for annuals and

geophytes), wilting, dry or dead plants, absence of flowering or fruiting) and record that information on the form. For notes sections, please **avoid the use of special characters** as these symbols cause formatting issues when importing data into the relational database.

Percent Cover Categories from the California Native Plant Society



VI. MANAGEMENT RECOMMENDATIONS

Based on disturbances and threats noted previously, provide management recommendations for the site.

VII. MANAGEMENT ACTIONS IN LAST YEAR

Record any known management actions that have been implemented at the rare plant occurrence over the last year.

VII. CNDDB SPECIES DETECTED & NOTES

Record detailed notes and any other useful field comments **not previously addressed in other sections of the form**. If sensitive or rare species (e.g., MSP Roadmap Species, species in CNDDB database including CDFW Species of Special Concern, state and federally listed species) are detected incidentally, record the observation with coordinates, number of individuals, etc. in this section. Do not record the target rare plant species in this section.

VIII. COLLECTIONS

Collection? Indicate whether a collection of plants within the sampling area was taken during the monitoring event. If there is a collection, complete the section on collector, collection number, and museum/herbarium where the collection was submitted.

Don't forget to record Time Finish in the bottom of Page 3 of the data form or at the end of the Survey123 form.

References

CNDDB. 2009. *California Natural Diversity Database (CNDDB) Data Use Guidelines*. http://www.dfg.ca.gov/biogeodata/cnddb/

McEachern, B. Pavlik, J. Rebman, and R. Sutter. 2007. *San Diego Multiple Species Conservation Program (MSCP) Rare Plant Monitoring Review and Revision*. U.S. Geological Survey Scientific Investigations Report 2007-5016, 68 p..

McEachern, K. and R. Sutter. 2010a. *Assessment of Eleven Years of Rare Plant Monitoring Data from the San Diego Multiple Species Conservation Plan*. USGS-WERC-Channel Islands Field Station. Administrative Report 2010-01. Ventura, California, 146 p.

McEachern, K. and R. Sutter. 2010b. *San Diego MSCP Rare Plant Monitoring Data Review*. Presentation, February 10, 2010, San Diego, CA.

SDMMP. 2017. *Management and Monitoring Strategic Plan for Conserved Lands in Western San Diego County: A Strategic Habitat Conservation Roadmap. Vol. 1-3*. Prepared by the San Diego Management and Monitoring Program and The Nature Conservancy for the San Diego Association of Governments, San Diego. https://portal.sdmmp.com/msp_doc.php

Tracey, J., K. McEachern, and K. Greer. 2011. *San Diego Rare Plant Monitoring Plan: Fiscal Year 2011*.

Management Strategic Plan (MSP) Rare Plant Species Prioritized for 2026"Inspect & Manage" Monitoring
Species
Acanthomintha ilicifolia (San Diego thornmint)
Acmispon prostratus (Nuttall's acmispon)
Agave shawii var. *shawii* (Shaw's agave)
Ambrosia pumila (San Diego ambrosia)
Aphanisma blitoides (Aphanisma)
Atriplex parishii (Parish brittlescale)
Chloropyron maritimum ssp. *maritimum* (Salt marsh bird's-beak)
Chorizanthe orcuttiana (Orcutt's spineflower)
Deinandra conjugens (Otay tarplant)
Dudleya blochmaniae (Blochman's dudleya)
Dudleya brevifolia (Short-leaved dudleya)
Dudleya viscida (Sticky dudleya)
Monardella viminea (Willowy monardella)
Spenopholis interrupta californica (Baja California oatgrass)