Western Riverside County
Multiple Species Habitat Conservation Plan (MSHCP)
Biological Monitoring Program

Rare Plant Survey Report 2005

July 7, 2006
(Revised September 19, 2006)

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NOTE TO READER:

This report is an account of survey activities undertaken by the Biological Monitoring Program for the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP). The MSHCP was permitted in June of 2004. The Biological Monitoring Program monitors the distribution and status of the 146 Covered Species within the Conservation Area to provide information to Permittees, land managers, the public and the Wildlife Agencies (i.e. the California Department of Fish and Game and the U.S. Fish and Wildlife Service). Monitoring Program activities are guided by the MSHCP Species Objectives for each Covered Species, the MSHCP information needs identified in Section 5.3 or elsewhere in the document, and the information needs of the Permittees.

The primary preparer of this report was the Field Crew Leader, Jason Hlebakos. If there are any questions about the information provided in this report, please contact the Monitoring Program Administrator. If you have questions about the MSHCP, please contact the Executive Director of the Western Riverside County Regional Conservation Authority (RCA). For further information on the MSHCP and the RCA, go to www.wrc-rca.org

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INTRODUCTION

Rare plant monitoring efforts in the 2005 field season focused on verifying the presence and distribution of selected Covered plant species within the Western Riverside County MSHCP Conservation Area. These data are necessary to provide a solid foundation for developing the long-term monitoring strategy for the MSHCP. For the 2005 field season, a suite of 29 species were chosen to focus monitoring efforts (Table 1). These species were selected to avoid overlap with a parallel, on-going effort by the University of California, Riverside (UCR) Center for Conservation Biology. Survey objectives were driven by species-specific objectives developed by the MSHCP (DUDEK & Associates 2003). The MSHCP species objectives address the amount of suitable habitat and number of localities to be conserved for each species. These habitats and localities were visited in 2005 for the selected Covered Species (or "Target Species") to determine the status of their populations.

Survey efforts by the Monitoring Program are complicated by the fact that species localities within the MSHCP Planning Area were established using historical data. These data include herbarium records and databases. The objective of these surveys was to verify that Covered Species were indeed present at historical locations. Monitoring efforts must accurately reflect both the presence and absence of the species in question. A lack of success in locating a species may be attributed to 1) having arrived to the site either too early or too late in the season, 2) environmental conditions (especially annual rainfall) being inappropriate in the given year relative to the flowering and development of the plant populations, or 3) the search efforts of the surveyor. For these reasons, except in cases for which the absence of the species is clearly attributable to some disturbance, or drastic alteration of the landscape (e.g., development), monitoring efforts in subsequent years will continue to attempt to locate the occurrences that were not verified initially. For some species, meeting the species objectives may take multiple years.

METHODS

Personnel and Training

Surveyors with a background in plant taxonomy and familiarity with the vegetation in Riverside County were tasked with learning to identify the target species. Local herbaria were queried for their locality information, regional expertise of the curators, and for specimens used for training purposes. Digital photographs were taken of herbarium specimens and were then compiled into a digital herbarium of the Covered Species. The photographs provide a quick reference and will be useful for the training of future field staff. Additionally, a herbarium was compiled in the office of the MSHCP Biological Monitoring Program. Currently the herbarium houses approximately 400 specimens and continues to grow.

Botany field staff was required to become familiar with a great number of species in order to adequately identify species associated with the Covered taxa in the field. Normally, plants that could not be identified to species were collected and identified with the assistance of U.C. Riverside Herbarium Curator, Andrew Sanders. These specimens were subsequently added to the Monitoring Program in-house herbarium, or in certain cases, added to the permanent

collection of the UCR Herbarium. Surveyors conducting surveys for rare plants in 2005 included:

- Jason Hlebakos, Field Crew Leader (Regional Conservation Authority)
- Josh Koepke (Regional Conservation Authority)
- Christine Rothenbach (Regional Conservation Authority)
- Rosina Gallego (California Department of Fish and Game)
- Annie Bustamante (California Department of Fish and Game)

Survey Methods

Surveys for the target species were conducted in the Conservation Area throughout western Riverside County. In accordance with the species objectives of the MSHCP, research was conducted on the specific locations of populations of the species in question before field surveys commenced. In general, the MSHCP stipulates a certain number of general locations where a species is assumed to be extant. The first step in the monitoring effort was to verify that a historical record for the target species existed in each of these areas. In the case of some recent herbarium specimens that were used as reference points, coordinates were included in the record and could easily be mapped. Older data, however, frequently include nothing more than a general site description with varying levels of geographic accuracy. The initial step was to generate maps of localities for each species based on habitat descriptions and habitat suitability using GIS tools. Generally, a literature search beyond the MSHCP and discussion with local experts led to a substantial understanding of the habitat requirements and vegetation associations of each species. Literature that was drawn upon is on file in the offices of the MSHCP Biological Monitoring Program.

Flowering time for the species to be surveyed in a given year is the decisive variable in terms of coordinating field efforts. The flowering time period provides a narrow window of opportunity during which the surveys can be conducted. This window is heavily influenced by the stochasticity of precipitation. Site visits were coordinated based upon flowering time as defined by the herbarium specimens and literature, as well as the availability of field personnel. Availability of personnel became a limiting factor in certain cases for which a high number of localities were to be surveyed within a limited timeframe. Table 1 contains a list of the general flowering times and number of localities for the target plants of the 2005 field season. There were a total of 302 historic localities for the 29 target species.

No target plant species was given any special priority, nor was there a method devised to dictate which plants would be the focus of our surveys. As a general rule, localities that overlapped with other target species in terms of both flowering time and location were chosen initially in an effort to reduce the search time, travel time, and increase the likelihood of encountering a species of interest within the timeframe of the search. Despite these logistical efforts, personnel shortages compromised our ability to visit our projected number of localities. Additional considerations, such as timing (due to rainfall and senescence of the target species) and poor geo-referencing from historical locations, limited our ability to search for localities for all 29 target species.

For each location, a search was conducted for the target species in question. These searches drew upon known ecological parameters for the species. The search area was often quite limited, as in the case of vernal pool endemics. Other species were widely distributed in large ecological features, such as grasslands or pine forests, and required a much greater search effort. If the species was located, a Relevé survey (see description below) was conducted of the area in order to rapidly assess the characteristics of the site. Such characteristics include vegetation affiliations and site impact disturbance variables.

The initial portion of the survey involved searching around the location of the rare plant. If the plant was detected, the coordinates of the population were noted as well as whether or not they matched the original site description or coordinates; this will provide for a more accurate database of locations for future efforts. Additionally, the number of individuals of the population was either counted, or in the case of large populations, estimated. This provides a means of tracking the stability or decline of the populations over time through our subsequent monitoring efforts. Plants that were not located will, except in cases where the landscape has been severely altered, be the subjects of future search efforts.

Relevé Survey

When the target plant was found, a Relevé survey was conducted to assess certain features of the surrounding vegetation. The elevation, slope, and aspect of the site were measured and recorded. The vegetation was categorized in terms of the dominant layer of vegetation, size of the stand, openness of the structure, and phenology of the stand. These data will aid predictive modeling efforts directed at locating populations in areas where the species is not known to be present. An effort was also made to assess the type and extent of site impacts (Table 2). These include disturbances that may adversely impact the suitability of the site for the continued occupation by the species. An effort was also made to quantify the type and proportion of substrate relative to living vegetation, as many species are substrate specific. This will provide data for modeling efforts, which will be implemented with baseline data, in order to locate more extant populations of Covered Species.

The final component of the Relevé is an itemized list of the species found with the Covered Species, as well as the percent cover of each of these. While these data may prove useful in terms of identifying suitable habitat in other regions of the Plan Area, their true utility will be seen from a management perspective. In concert with other data collected, we will have the ability to monitor population size in relation to the relative abundance of other species, particularly invasive and non-native species that may have an impact on the future survival of the Covered Species. The full rare plant protocol, including data collection sheets, is provided in Appendices A through C.

Data Analysis

The data collected in 2005 is stored in the offices of the MSHCP Biological Monitoring Program. Portions of the data have been entered into a Microsoft Excel table for ease of map making and analysis. Future analyses will rely heavily on subsequent data that will be collected. The preliminary surveys provide baseline data that will be used to assess trends in the populations of the Covered Species and perhaps suggest management alternatives for the better protection of those species. Analyses of presence/absence and population size over time will be used to assess these trends. Additionally, habitat and site specific parameters will be analyzed in an attempt to model habitats and focus our efforts on additional sites within the county that may be localities of Covered Species.

RESULTS

A list of all species for which surveys were conducted, the number of attempts, and the number of successful surveys can be found in Table 3. Of the 29 species selected in 2005, surveys were only conducted for 16 species due to limitations in staffing, and only 38 of the 302 historic localities were visited. Of the 16 target plant species surveyed, 11 species were detected at historic locations by the Biological Monitoring Program. These species were: Palmer's grapplinghook (*Harpagonella palmeri*), California black walnut (*Juglans californica* var. *californica*), long-spined spineflower (*Chorizanthae polygonoides* var. *longispina*), California Orcutt grass (*Orcutti californica*), San Diego button-celery (*Eryngium aristulatum* var. *parishii*), Munz's onion (*Allium munzii*), many-stemmed dudleya (*Dudleya multicaulis*), spreading navarretia (*Navarretia fossalis*), Hall's monardella (*Monardella macrantha* ssp. *hallii*), Santa Ana River woollystar (*Eriastrum densifolium* ssp. *sanctorum*), and San Jacinto Mountains bedstraw (*Galium angustifolium* ssp. *jaciniticum*). One additional Covered Species, lemon lily (*Lilium parryi*), was found incidentally during unrelated field work, and one Covered Species, San Diego ambrosia (*Ambrosia pumila*), was detected in the Conservation Area by the Center for Natural Lands Management (CNLM).

A map of all historic localities for the attempted species in the 2005 field season is shown in Figure 1. A map of the successful site verifications for the 2005 field season is shown in Figure 2. Additional localities were visited by the staff of CNLM. Their efforts detected an additional seven localities (see Table 4).

DISCUSSION

The rare plant survey effort faced considerable logistical challenges in 2005. At this point, we are finding that the majority of Covered Species require directed or species-specific surveys due to their limited distribution in the Conservation Area. Additionally, many of the historical occurrences refer to either outdated or vague information. Finding these populations on the ground can be challenging as well as time consuming. Nevertheless, of 38 site locations visited, 28 extant populations were verified. This represents a 74% success rate. An additional seven localities were verified by the CNLM, for a total of 35 localities in our combined efforts.

Of the species undertaken for monitoring in 2005, the species objective was fully met for only one, San Diego button-celery (*Eryngium aristulatum* var. *parishii*). A portion of the requirements were met for an additional 10 (Table 4). Since historic records are difficult to verify in the field, survey results for the five species not found in 2005 are not indicative of their status in the Conservation Area. We will attempt to fulfill the species objectives for these species during the 2006 field season.

Complications confronting the rare plant monitoring efforts were inevitable during the first season of field work and will be used to guide the program to successful long-term monitoring. The initial attempts at monitoring suggest that more effort needs to be dedicated to the logistical phase. This should include mapping species occurrences and developing a protocol whereby multiple species can be targeted per individual search effort. This approach will be taken in the 2006 field season. Additionally, collaborations are an important component of this work. In the coming year, we will attempt to strengthen relationships with local Reserve Managers to develop a cooperative monitoring program, whereby those most familiar with the reserve lands can inform the Monitoring Program biologists and assist in streamlining the monitoring process. We also plan for the development of an internet-based catalogue of Covered Species, including a data entry form that could be submitted by botanists and naturalists with coordinates to direct us to the precise site of a known rare plant population. Streamlining the process of monitoring and making maximum use of available resources are of paramount importance to the development of a successful rare plant survey effort.

REFERENCES

Dudek & Associates. 2003. Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP). Final MSHCP, Volumes I and II. Prepared for County of Riverside Transportation and Lands Management Agency. Prepared by Dudek & Associates, Inc. Approved June 17, 2003.

California Native Plant Society. 2002. Vegetation rapid assessment protocol. CNPS Vegetation Committee. 11 p. (http://www.cnps.org/vegetation/protocol.htm).

Table 1. General flowering times and number of historic localities for the 2005 target species.

Plant	Species	Abreviation	Flowering time	Number of localities
San Diego button-celery	*Eryngium aristulatum var.parishii*	EAPA	Apr-June	4
San Diego ambrosia	*Ambrosia pumila*	AMPU	June-Sept	2
Wright's trichocoronis	*Trichocoronis wrightii var.wrightii*	TRWR	May-Sept	4
Palmer's grapplinghook	*Harpagonella palmeri*	HAPA	Mar-Apr	24
Johnston's rock-cress	*Arabis johnstonii*	ARJO	Feb-June	17
Payson's jewelflower	*Caulanthus simulans*	CASI	Apr-June	N/A
Hammitt's clay-cress	*Sibaropsis hammittii*	SIHA	Mar-Apr	1
Small-flowered morning-glory	*Convolvulus simulans*	COSI	Mar-June	8
Many-stemmed dudleya	*Dudleya multicaulis*	DUMU	May-June	26
Jaeger's milk-vetch	*Astragalus pachypus* var. *jaegeri*	APJA	Dec-June	18
Brand's phacelia	*Phacelia stellaris*	PHST	Mar-June	2
California black walnut	*Juglans californica* var. *californica*	JUCA	Mar-May	7
Hall's monardella	*Monardella macrantha ssp. hallii*	MMHA	June-Aug	5
San Miguel savory	*Satureja chandleri*	SACH	Mar-May	7
Parish's meadowfoam	*Limnanthes gracilis var. parishii*	LGPA	Apr-June	1
Santa Ana River woollystar	*Eriastrum densifolium* ssp. *Sanctorum*	EDSA	June-Aug	3
Spreading navarretia	*Navarretia fossalis*	NAFO	May-June	13
Long-spined spine flower	*Chorizanthe polygonoides* var.*longispina*	CPLO	Apr-June	32
Slender-horned spine-flower	*Dodecahema leptoceras*	DOLE	Apr-June	11
Cliff cinquefoil	*Potentilla rimicola*	PORI	July-Sept	2
San Jacinto Mountains bedstraw	*Galium angustifolium ssp. Jacinticum*	GAJA	June-Aug	8
Palomar monkeyflower	*Mimulus diffuses*	MIDI	Apr-June	18
California beardtongue	*Penstemon californicus*	PECA	May-June	15
Munz's onion	*Allium munzii*	ALMU	Apr-May	13
Orcutt's brodiaea	*Brodiaea orcuttii*	BROR	May-July	8
Munz's mariposa lily	*Calochortus palmeri var.munzii*	CPMU	May-July	10
Intermediate mariposa lily	*Calochortus weedii* var. *intermedius*	CWIM	May-July	3
Vernal barley	*Hordeum intercedens*	HOIN	Mar-June	4
California Orcutt grass	*Orcuttia californica*	ORCA	Apr-June	3
			Total	**302**

Table 2. List of potential site impacts.

	Site Impacts
1	Development
2	ORV Activity
3	Agriculture
4	Grazing
5	Competition from Exotics
6	Logging
11	Groundwater Pumping
12	Dam
13	Other (Specify)
15	Road/Trail Construction/ Maintenance
17	Pollution
19	Vandalism/Dumping/Litter
20	Foot Traffic/Trampling
23	Erosion/Runoff
26	Degrading Water Quality
27	Wood Cutting
29	Recreational Use (non-ORV)
33	Channelization (anthropogenic)

Table 3. Number of attempts and successful surveys for target species in 2005.

Common Name	Latin Name	Surveys Attempted?	Species Located?	Number of attempts	Successful Surveys
San Diego button-celery	*Eryngium aristulatum var.parishii*	Yes	Yes	5	5
San Diego ambrosia	*Ambrosia pumila*	No	--	0	0
Wright's trichocoronis	*Trichocoronis wrightii var.wrightii*	Yes	No	2	0
Palmer's grapplinghook	*Harpagonella palmeri*	Yes	Yes	1	1
Johnston's rock-cress	*Arabis johnstonii*	No	--	0	0
Payson's jewelflower	*Caulanthus simulans*	No	--	0	0
Hammitt's clay-cress	*Sibaropsis hammittii*	Yes	No	1	0
Small-flowered morning-glory	*Convolvulus simulans*	No	--	0	0
Many-stemmed dudleya	*Dudleya multicaulis*	Yes	Yes	3	2
Jaeger's milk-vetch	*Astragalus pachypus var. jaegeri*	No	--	0	0
Brand's phacelia	*Phacelia stellaris*	Yes	No	1	0
California black walnut	*Juglans californica var. californica*	Yes	Yes	5	4
Hall's monardella	*Monardella macrantha ssp. hallii*	Yes	Yes	4	2
San Miguel savory	*Satureja chandleri*	No	--	0	0
Parish's meadowfoam	*Limnanthes gracilis var. parishii*	No	--	0	0
Santa Ana River woollystar	*Eriastrum densifolium ssp. sanctorum*	Yes	Yes	1	1
Spreading navarretia	*Navarretia fossalis*	Yes	Yes	1	1
Long-spined spine flower	*Chorizanthe polygonoides var.longispina*	Yes	Yes	1	1
Slender-horned spine flower	*Dodecahema leptoceras*	No	--	0	0
Cliff cinquefoil	*Potentilla rimicola*	Yes	No	1	0
San Jacinto Mountains bedstraw	*Galium angustifolium ssp. jacinticum*	Yes	Yes	6	6
Palomar monkeyflower	*Mimulus diffusus*	No	--	0	0
California beardtongue	*Penstemon californicus*	No	--	0	0
Munz's onion	*Allium munzii*	Yes	Yes	2	2
Orcutt's brodiaea	*Brodiaea orcuttii*	No	--	0	0
Munz's mariposa lily	*Calochortus palmeri var.munzii*	No	--	0	0
Intermediate mariposa lily	*Calochortus weedii var. intermedius*	Yes	No	1	0
*Lemon Lily	*Lilium parryi*	*No	*Yes	2	2
Vernal barley	*Hordeum intercedens*	No	--	0	0
California Orcutt grass	*Orcuttia californica*	Yes	Yes	1	1
	Total	**16**	**12**	**38**	**28**

* Lemon lily detected incidentally during surveys for other plant species.

Table 4. MSHCP species objectives addressed by the Monitoring Program for the 2005 target species and results of surveys.

Latin Name	Common Name	Survey Objectives	Survey Result
Family Apiaceae *Eryngium aristulatum* var. *parishii*	San Diego button-celery	Verify four known locations on the Santa Rosa Plateau	Surveys conducted on the Santa Rosa Plateau revealed the presence of five extant populations, all associated with vernal pool habitats. The MSHCP mentions only four populations. The species requirement was met for this species and further surveys will not be necessary until the 8 year interval is reached.
Family Asteraceae *Ambrosia pumila*	San Diego ambrosia	Verify two of three known locations: Alberhill Creek at Nichols Road and Skunk Hollow	No surveys were conducted for this species by the monitoring program staff. The species was detected however by biologists of the Center for Natural Lands Management (CNLM). A total of six separate sites were verified at Skunk Hollow.
Trichocoronis wrightii var. *wrightii*	Wright's trichocoronis	Verify 4 localities along San Jacinto River and northern shore of Mystic Lake	Surveys were conducted for the Wright's trichocoronis, but the field crew did not detect any populations. Two attempts were made in the vicinity of San Jacinto Wildlife Area, but the vegetation was already dry by the time of our surveys. Monitoring efforts will be extended to the 2006 field season to locate the extant populations of this species along the San Jacinto River and near Mystic Lake.
Family Boraginaceae *Harpagonella palmeri*	Palmer's grapplinghook	Verify 24 known occurrences at Temescal Wash, Alberhill, Lake Elsinore, Antelope Valley, Lake Mathews, Hartford Springs, Cleveland National Forest, Skunk Hollow, Lake Skinner and Vail Lake	One survey was conducted for this species, which revealed one extant population at Harford Springs. This is a widely distributed species, with 24 known localities distributed across the Plan Area. An additional population was verified by the CNLM at Warm Springs Preserve. Further surveys will be conducted during the 2006 field season.
Family Brassicaceae *Arabis johnstonii*	Johnston's rock cress	Verify 17 known occurrences in Garner Valley and Mountain Springs, with suitable habitat adjacent	No surveys were conducted for this species. Surveys will be undertaken in the 2006 field season.

Caulanthus simulans	Payson's jewelflower	No specific objective is outlined in the MSHCP document	No surveys were conducted for this species. Surveys will be undertaken in the 2006 field season.
Sibaropsis hammittii	Hammitt's clay-cress	Verify one known location at Elsinore Peak	This is a narrow endemic for which there is only one known locality. Our survey of Elsinore Peak in the Cleveland National Forest did not detect the species. Local experts (Andrew Sanders, UCR Herbarium) suggest that the species is cryptic and easily overlooked, though it is very possible to have misjudged the flowering time of this species given the scant available information. The lack of detection of the plant at its sole locality does not preclude future detectibility. Continued monitoring efforts will be directed at this species in 2006.
Family Convolvulaceae *Convolvulus simulans*	Small-flowered morning-glory	Verify eight localities, including Vail Lake, Lake Skinner, Lake Matthews, Temescal Canyon, Alberhill, Santa Rosa Plateau, and Skunk Hollow	No surveys were conducted for this species.
Family Crassulaceae *Dudleya multicaulis*	Many-stemmed dudleya	Verify 26 known occurrences, including Estelle Mountain, Temescal Canyon, Santa Ana Mountains, Gavilan Hills, Alberhill Creek and Prado Basin	We sought to verify three of 26 known occurrences. Two of our surveys encountered extant populations. Further studies should be conducted during the 2006 field season.
Family Fabaceae *Astragalus pachypus* var. *Jaegeri*	Jaeger's milk-vetch	Verify seven locations, including Aguanga Valley, San Jacinto Mountains, Potrero Creek, Sage, Temecula Canyon, Vail Lake and Agua Tibia Mountains	No surveys were conducted during the 2005 field season.

Family Hydrophyllaceae *Phacelia stellaris*	Brand's phacelia	Verify two known localities: Fairmount Park and Santa Ana Wilderness Area	The Brand's Phacelia is a species of very limited distribution within the plan area. Our attempt to verify one of its two known locations were unsuccessful. We have been informed by local botanist Andrew Sanders that the population along the Santa Ana River is extant and this has been verified in recent years. It is possible that the efforts from last year failed to adequately time the flowering of the species relative to the annual rainfall. As there are only two sites to verify, efforts will be directed at this species in subsequent years.
Family Juglandaceae *Juglans californica* var. *californica*	California Black Walnut	Verify seven occurrences within Santa Ana Mountains, at Lake Skinner and at the Santa Rosa Plateau, and one east of Pedley	Five sites were visited to verify occurrences of the California Black Walnut. Four sites were found to have extant populations of the tree. An additional site was verified by CNLM at Johnson Ranch. The MSHCP calls for the verification of seven known occurrences, so attempts will be made to locate more sites in the 2006 field season.
Family Lamiaceae *Monardella macrantha* ssp. *hallii*	Hall's monardella	Verify five known locations: Cahuilla Mountain, Santiago Peak, the area southeast of Pine Cove, and two at Agua Tibia Mountain	Extant populations of Hall's monardella were verified at two sites, out of four that were visited. Suitable habitat was located at Cahuilla Mountain, which suggests that the populations may be extant. A revisit to this site, as well as an initial visit to the fifth site listed in the MSHCP Species Objective, is scheduled for 2006.
Satureja chandleri	San Miguel savory	Verify seven localities on the Santa Rosa Plateau, Tenaja Guard Station, south of Murrieta (de Luz Road, Santa Ana mountains), and Warner's Ranch	No surveys were conducted during the 2005 field season.
Family Limnanthaceae *Limnanthes gracilis* var. *parishii*	Parish's meadowfoam	Verify one known location on the Santa Rosa Plateau	No attempts were made to verify the one known population in the plan area.

Family Polemoniaceae *Eriastrum densifolium* ssp. *sanctorum*	Santa Ana River woollystar	Verify three localities along the Santa Ana River	One survey was conducted on the Santa Ana River, and the extant population was verified. The species objective suggests that there are three extant populations along the Santa Ana River near the San Bernardino County border. Further research and survey efforts will be directed toward verifying and distinguishing three separate populations.
Navarretia fossalis	Spreading navarretia	Verify 13 known locations including Skunk Hollow, Santa Rosa Plateau, San Jacinto Wildlife Area, San Jacinto River, Salt Creek	Of 13 known locations, a survey was completed for one locality. The population was verified. Historical documentation of a site at the Skunk Hollow may be inaccurate according to Eliza Maher of CNLM. Surveys in the spring of 2005 failed to locate the extant population. Additional survey work was undertaken by the CNLM. The large number of localities warrants substantial effort in focused surveys during the 2006 field season
Family Polygonaceae *Chorizanthe polygonoides* var. *longispina*	Long-spined spine flower	Verify 32 locations including two core locations at Lake Mathews and Agua Tibia Mountain	One survey was conducted for this species in the Elsinore Peak area. The population was verified. Surveys undertaken by CNLM verified three populations at Warm Springs Preserve, Lincoln Ranch Preserve, and Johnson Ranch Preserve. The MSHCP calls for 32 locations for this species. Future efforts will allot considerable resources to focused surveys in order to facilitate the species objective.
Dodecahema leptoceras	Slender-horned spine flower	Verify 11 known locations including Temescal Canyon, Bautista Canyon, San Jacinto River, Agua Tibia Wilderness, Alberhill, Alberhill Creek east of Lake Elsinore, Railroad Canyon, Vail Lake, Kolb Creek, and east of State Street, south of Hemet	No surveys were conducted during the 2005 field season.
Family Rosaceae *Potentilla rimicola*	Cliff cinquefoil	Verify 2 known localities: Dark Canyon and Deer Spring	One survey was conducted in the San Jacinto Wilderness, but the population was not located. Further surveys will focus on this species during the 2006 field season.

Family Rubiaceae *Galium angustifolium* ssp. *jacinticum*	San Jacinto Mountains bedstraw	Verify 8 known locations: Lake Fulmor, Dark Canyon, and Black Mountain	Six surveys revealed six extant populations in the San Jacinto Mountains. These verifications cover all three of the main locations named in the species objective: Lake Fulmor, Dark Canyon and Black Mountain. Two additional localities are required to meet the objective. These will be surveyed in the 2006 field season.
Family Scrophulariaceae *Mimulus diffusus*	Palomar monkeyflower	Verify 18 known locations including the Santa Rosa Plateau, Sage, French Valley, Lake Skinner and San Jacinto, Agua Tibia and Santa Ana Mountains	No surveys were conducted during the 2005 field season.
Penstemon californicus	California beardtongue	Verify 15 occurrences including Aguanga, Blackburn Canyon, and San Jacinto Mountains.	No surveys were conducted during the 2005 field season.
Family Liliaceae *Allium munzii*	Munz's onion	Verify 13 known locations including Harford Springs Park, Alberhill, DiPalma Road., Estelle Mountain, Domenigoni Hills, Lake Skinner, Bachelor Mountain, Elsinore Peak, Scott Road, North Peak, and Alberhill	Two surveys for Munz's onion were conducted, one at Elsinore Peak, and one at Harford Springs Park. Both populations were found to be extant. Additional surveys were conducted at Bachelor Mountain by Christine Moen and Tom Ash, verifying two additional localities. A total of 13 localities are called for by the species objective. More focused surveys will be undertaken in 2006 to verify the nine additional populations.
Brodiaea orcuttii	Orcutt's brodiaea	Verify one occurrence at Miller Mountain, five at Santa Rosa Plateau, and one along the San Jacinto River	No surveys were conducted during the 2005 field season.
Calochortus palmeri var. *munzii*	Munz's mariposa lily	Verify 10 known locations within San Jacinto Mountains, including Garner Valley	One survey effort in Garner Valley revealed that our efforts had come too late in the season. No population was verified. Surveys in 2006 will take into account an earlier initiation of survey efforts.
Calochortus weedii var. *intermedius*	Intermediate mariposa lily	Verify two known localities (Crown Valley) and possibly a third (Vail Lake)	No surveys were conducted during the 2005 field season.

*Lilium parryi**	Lemon lily	Verify at least six localities (seven occurrences) within the San Jacinto Mountains	Two surveys revealed two extant occurrences in the San Jacinto Mountains. Although this was not a target species for the 2005 season, incidental sightings accounted for the species verifications. A total of six occurrences are called for in the San Jacinto Mountains, so further surveys will be conducted in the 2006 field season to account for the four additional localities.
Family Poaceae *Hordeum intercedens*	Vernal barley	Verify four locations: San Jacinto Wildlife Area, San Jacinto River from Ramona Expressway south to Railroad Canyon, upper Salt Creek drainage west of Hemet, and Nichols Road at Alberhill.	No surveys were conducted during the 2005 field season.
Orcuttia californica	California Orcutt grass	Verify three known locations: Santa Rosa Plateau, Skunk Hollow, Salt Creek Drainage	One survey was conducted at the Santa Rosa Plateau. The population was verified. Additional work was conducted by the CNLM at Skunk Hollow, where the species is reportedly widespread. An additional population along the upper Salt Creek Drainage remains to be verified.

* Lemon lily detected incidentally during surveys for other plant species.

Figure 1. All historic plant localities for target species in 2005. See Table 1 for key to abbreviations.

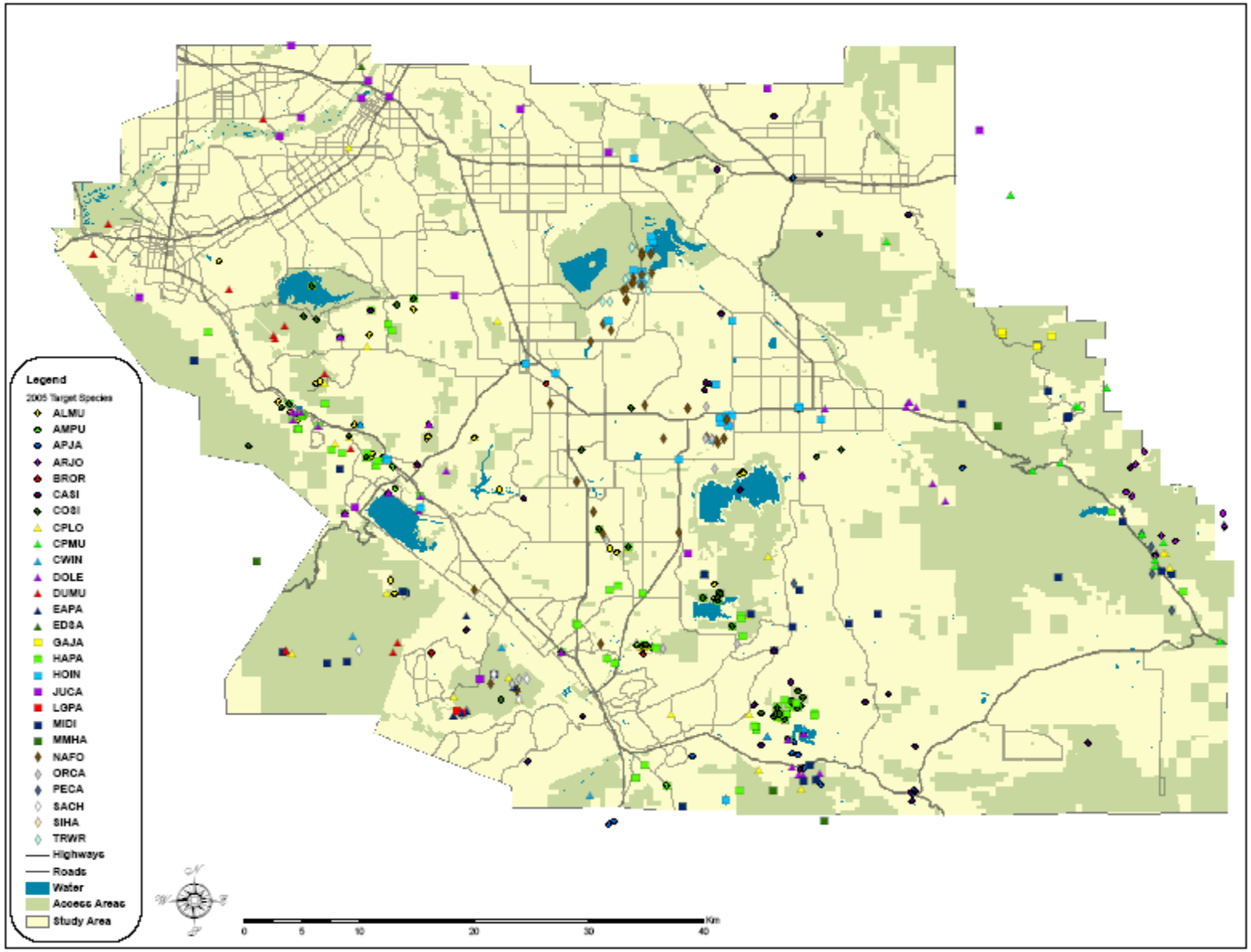
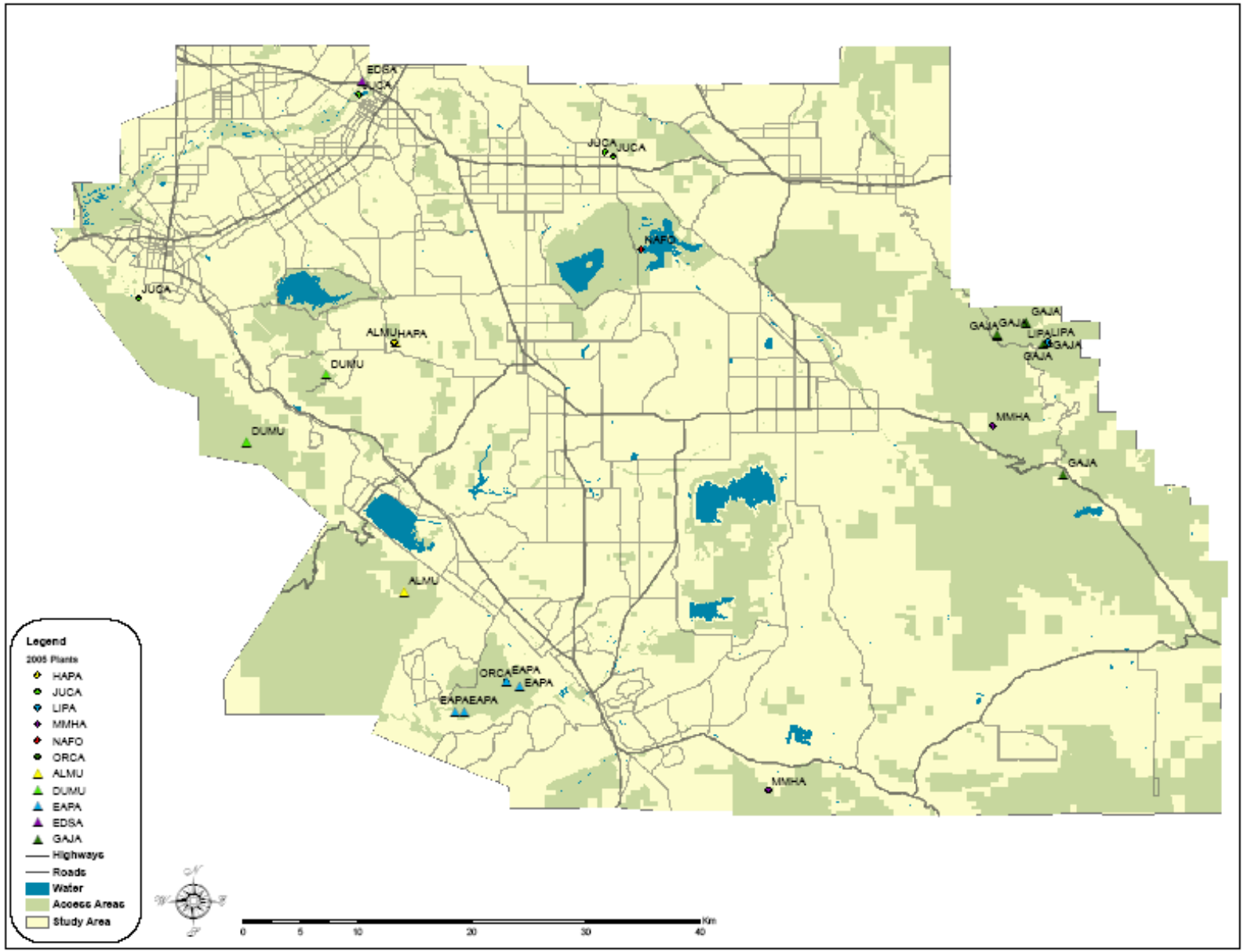


Figure 2. Successful site verifications for Covered plants surveyed in 2005. See Table 1 for key to abbreviations.



APPENDIX A: RARE PLANT SURVEY METHODS

1. Before going to the field, you should:
    a. Gather all relevant descriptions from the site you will be visiting. Take a hard copy of these into the field.
    b. Consult photographs and herbarium specimens of each species you will be looking for.
    c. Be sure you have necessary access to the land you want to survey.

2. Locate the area corresponding to the coordinates. These coordinates will be derived from either historical records or geo-referencing efforts.

3. Coordinates (UTM): Enter these original coordinates on the data sheet, along with the Datum.

4. Coordinates Match Description?: Refer to the description from the historical record. Does it match the description of the site you are at? We are interested in capturing the accuracy of the original coordinates as well as the any changes to the site over time. This is a crucial step. If the description clearly describes another place, there is no need to conduct the Relevé. If the description seems to match, but there have been changes to the vegetation, a Relevé should still be conducted. In this way we will have baseline data should the plant be located on the site in the future. We are interested in all manner of correlations between the presence of the rare plant and other vegetation characteristics, as well as environmental variables. Circle Yes or No on the data form.

5. If no, was the described location located? As long as the coordinates seem to match the place of the description, continue with the protocol. If they are obviously different, search the area for the described location. Enter whether or not it was found. If found, continue with the protocol. If not found, search the area of the coordinates for the target species. If the target species is found, continue with the field form. If not found, Write a brief description of the area searched along with the coordinates of the center of the area searched in the field labeled "Site Description."

6. Area Searched for the Species: Estimate the area that was searched for the species: (i.e. $100m^2$, 1 ha, etc.)

7. Coordinates of Population: If the target species is located, record the coordinates from the estimated center of the population.

8. Photo from Population (N): Take a north facing photograph from this point, and record the photograph number along with a unique identifier (i.e. initials or camera number). Each surveyor will be responsible for the photos staying with the appropriate data.

9. Specimen/Photos taken: If the plant is collected, or if the plant is photographed, as a voucher for the survey effort, record this number along with a unique identifier.

10. Number of Individuals. Count or estimate the number of individuals in the population. As a general rule, if there are greater than 100 individuals, you can estimate. Be sure to record whether the number is an estimate or an exact figure.

11. Site Description: Use this only if neither the site nor the plant is located. In that case there will be no Relevé, so this is the only information that will be gathered about the site. If either site or plant are located, the Relevé will pick up all salient information.

12. Access Notes: Record the directions to the site from a major landmark, such as a town, freeway or intersection. Include who owns the land and what special access was required, if any. Be sure to mention any gates, quality of roads etc. This information will allow others to find the site with a minimum of effort.

13. Continue to the Relevé Data Sheet and Protocol.

APPENDIX B: RELEVE PROTOCOL

(Adapted from CNPS Rapid Assessment Protocol)

1. Once the site and/or target species have been located, proceed with the Relevé Protocol.

2. Enter onto the Field Form names of all surveyors, date, USGS Quad, and the appropriate series of the quad you are using (7.5" vs. 15")

3. Relevé Size: Determine Plot Size and enter the dimensions. Follow these guidelines:
   Grasslands and shrublands: 400 sq meter plot
   Forest and woodlands: 1000 sq meter plot

4. Put pin flags in the ground in the four cardinal directions, each 15 m from the center point. This creates a square that is approximately 900 sq. meters

5. Study plot revisit: Has this site been visited before by any of the biologists working for the monitoring effort?

6. UTMs: Enter the coordinates, as well as the error of the GPS unit.

7. Elevation, slope and aspect. Record GPS elevation reading in meters. Record slope in degrees using a compass to estimate or average the slope over the relevé. Record aspect as an average compass reading for the relevé.

8. Dominant Layer: Indicate whether the community is dominated by a low layer (L), mid-layer (M), or tall layer (T). These classes refer to forbs, shrubs, and trees respectively.

9. Stand Size: Estimate the size of the community type.

10. Structure: Characterize the structure of EACH layer.
    a. Continuous: greater than 2/3 (67%) cover; crowns touching.
    b. Intermittent: between 1/3 and 2/3 (33-67%) cover.
    c. Open: less than 1/3 (33%) cover.

11. Phenology: Based upon the vegetative condition of the principle species, characterize the phenology of each layer as early (E), peak (P), or late (L).

12. Photographs: From the center point, take a north facing photograph. This will be the same as that taken in the previous protocol. Record the number here. Record any other photographs taken of the sample area.

13. Site impact codes/intensity: Enter codes for potential or existing impacts on the community. Follow each code by a "/" and a characterization code. Characterization codes are 1. Light, 2. Moderate, 3. Heavy. Refer top list for impact codes.

14. Site Location and Plot Description: A concise, but careful description that makes locating and/or revisiting the vegetation stand and plots possible. It is also helpful to briefly describe the topography, aspect, and vegetation structure of the site. Make note of where the GPS point was taken (generally this will be the center of the site). If you can't get a GPS reading, then spend extra time marking the plot location as precise as possible on a topo map.

15. Site history: Briefly describe the history of the stand, including type and year of disturbance (e.g., fire, landslides or avalanching, drought, flood, or pest outbreak). Also note the nature and extent of land use such as grazing, timber harvest, or mining.

16. Additional comments: Feel free to note any additional observations of the site, or deviations from the standard sampling protocol, as well as any additional data that were recorded.

17. On page two enter names, dates, and UTMs.

18. Surface Coarse Fragments: Estimate the cover class of each size at or near the ground surface averaged over the plot. Always remember to estimate what you actually see on the surface as opposed to what is under organic litter, big rocks, etc. However, rocks, organic litter, or fine material visible under the canopy of shrubs or trees should be included in the cover estimate.
    a. One way to consider this is to assume that all of the components of coarse fragments plus the basal cross-section of living plant stems and trunks (at ground level) will add up to 100%. Thus, estimate the cover value of each of the items in the box on the form for coarse fragments (including the basal area of plant stems) so that they will add up to 100%. Remember that the basal area of plant stems is usually minimal (e.g., if there were 10 trees, each 1 m in diameter at ground level on a 1000 square meter plot, they would cover less than 1% {0.79%} of the plot.
    b. These data are asked for because certain categories of coarse fragments of rock and other materials have been shown to correlate with certain vegetation types and are thus likely influencing the type of vegetation that is growing in a given area. These estimates should be made quickly with the main point being a rough estimate of the relative proportions of different coarse fragments on the plot.

    Fines: Fine mineral fragments including sand, silt, soil, "dirt" < 2 mm in diameter
    Gravel: rounded and angular fragments 0.2-7.5 cm (0.08 -3 in.) diameter
    Cobble: rounded and angular fragments >7.5-25 cm (3 -10 in.) in diameter
    Stone: rounded and angular coarse fragments >25 cm-60 cm (10 -24 in.) in diameter
    Boulder: rounded and angular coarse fragments >60 cm (>24 in.) in diameter
    Bedrock: continuous, exposed, non-transported rock
    Litter: extent of undecomposed litter on surface of plot (this includes all organic matter, e.g., fallen logs, branches, and twigs down to needles and leaves).

19. Continue with Part 2 of the Relevé Data Form.

20. Species List: The collection of vegetation data continues with making a species list of vascular plants within the relevé. This list is achieved by recording each plant species on a different line of the data form and noting in which layer it is represented. Each represented taxon will be entered separately in each layer in which it occurs. Each individual plant is recorded in only one layer, the layer in which the tallest portion of the individual is found. One should reach a point at which new taxa are added to the list only very slowly, or sporadically. When one has reached that point, the list is probably done.

21. Each species within each layer should be assigned a cover class, as well as an estimate of percent cover.

22. Percent Cover: What follows are methods for estimating percent cover.

    Method 1: The invisible point-intercept transect: This method works well in relatively low, open vegetation types such as grasslands and scrubs where you can see over the major stand components. For those who have worked with the original CNPS line intercept methodology it's like counting hits along an imaginary line at regular intervals of the 50 m tape. Here's how it goes: Envision an imaginary transect line starting from your vantage point and running for 50 m (or however many meters you wish, as long as you are still ending up within the same stand of vegetation you're sampling - never keep counting outside of your homogeneous stand). Now "walk" your eye along this tape for 50 m and visually "take a point" every 0.5 m. Don't worry about precision, just try to "walk" your eye along the line and stop every 0.5 m or at any other regular interval until you reach its end and mentally tally what species you hit. Once you come up with a number of hits for each major species in one imaginary transect, take another transect in another direction and estimate the number of hits on that one. Do this several times (usually 3-4 is enough if you are in a homogeneous stand), then average your results.

    This can go quickly in simple environments and in environments where the major species are easily discernable (chaparral, bunch-grassland, coastal scrub, desert scrub). Your average number of hits need not be a total of 100 as in the original transect method, but could be 50 along a 25 m imaginary line (in which case you would multiply by two to get your estimated cover), or 25 along a 12.5 m line (multiply average by 4), etc.

    Method 2: Subdivision of sample plot into quadrants: Many plots, whether they are square, circular, or rectangular, may be "quartered" and have each quadrant's plant cover estimated separately. If the plot is given an even number of square meters (such as 100, 400, or 1000 m^2) then you know that a quarter of that amount is also an easily measurable number. If you can estimate the average size of the plants in each of the quarters (e.g, small pinyon pines may be 5 m^2 (2.2m x 2.2m), creosote bush may be 2m^2 (or 1.41 m x 1.41 m), burrobush may be 0.5 m^2) then you simply count the number of plants in each size class and multiply by their estimated size for the cover in a given quadrant. Then average the four quadrants together for your average cover value.

This method works well in vegetation with open-to-dense cover of low species such as grasses or low shrubs, in open woodlands, and desert scrubs.

Method 3: "Squash" all plants into a continuous cover in one corner of the plot: Another way to estimate how much of the plot is covered by a particular species is to mentally group (or "march", or "squash") all members of that species into a corner of the plot and estimate the area they cover. Then calculate that area as a percentage of the total plot area. This technique works well in herb and shrub dominated plots but is not very useful in areas with trees.

Method 4: How to estimate tree cover: Cover estimates of tall trees are one of the most difficult tasks in a relevé. However it is possible to do this with consistency and reliability using the following guidelines.

1. Have regular sized and shaped plots that you can easily subdivide.
2. Estimate average crown spread of each tree species separately by pacing the crown diameter of representative examples of trees of each species and then roughly calculating the crown area of each representative species.
3. Add together the estimated crown area of each individual of each species of tree on the plot for your total cover.

Method 5: The process of elimination technique: This method is generally good for estimating cover on sparsely vegetated areas where bare ground, rocks, or cobble cover more area than vegetation. In such a situation it would be advisable to first estimate how much of the ground is not covered by plants and then subdivide the portion that is covered by plants into rough percentages proportional to the different plant species present. For example, in a desert scrub the total plot not covered by plants may be estimated at 80%. Of the 20% covered by plants, half is desert sunflower (10% cover), a quarter is California buckwheat (5% cover), an eighth brittlebush (2.5% cover), and the rest divided up between 10 species of herbs and small shrubs (all less than 1% cover).

General Considerations:

Any of these techniques may be used in combination with one another for a system of checks and balances, or in stands that have characteristics lending themselves to a different technique for each layer of vegetation.

In a relevé, cover estimates using the techniques described above, are made for each taxon as it is recorded on the species list. Estimates are made for each layer in which the taxon was recorded. For example, if individuals of coast live oak occur in the tall, the mid, and the low layer, an estimate is made for Tall CLO, for mid CLO, and for low CLO.

23. Percentages: Estimates of percentages should also be made for each species. This optional step allows the data to be compared more easily to data collected using different methods, such as a line or point intercept. It also instills confidence in the cover estimate

of borderline species that are close calls between two cover classes (e.g., a cover class 2 at 5% as opposed to a cover class 3 at 6%).

24. Total Vegetation Cover by Layer: In addition to cover of individual taxa described above, total cover is also estimated for each vegetation layer (e.g., tall, medium, low). This is done using the same cover classes as described above but combines all taxa of a given category. They can be calculated from the species percent cover estimates, but make sure to disregard overlap of species within each layer. These estimates should be absolute aerial cover, or the "bird's eye view" of the vegetation cover, in which each category cannot be over 100%.

APPENDIX C: RARE PLANT DATA SHEETS

Rare Plants

Target Species:	Date
Name(s):	

Coordinates (UTM):	Datum:	
Coordinates match description?:	Y	N
If no, was the described location located?	Y	N
Species located?:	Y	N
Area searched for species? Approximate		

Coordinates of Population

GPS Datum:	Elevation:
Photo from Population Center:	
Specimens/Photos taken:	
Number of individuals in Population:	Exact / Estimate

Site description: (If no Relevé)

Access Notes:
Continue to Releve.

RELEVÉ FIELD FORM

Date:	USGS Quad: 7.5"/15"
Releve Size: _____x_____m	
Study Plot Revisit? Yes or No (Circle one)	GPS Datum (from GPS setup) (e.g. WGS 84, NAD 27)
UTMN ___ ___ ___ ___ ___ ___ ___	UTME ___ ___ ___ ___ ___ ___ Error ±_____ ft/m
Elevation:_____m	Slope:_____° Aspect:_____°

VEGETATION DESCRIPTION:

Dominant Layer ___ 0-0.5 m, ___ 0.5-4 m, ___4 m (check one)

Stand Size:_____ <1 acre_____ 1-5 acres_____ >5 acres (check one)

Structure: Ground _____ Shrub _____ Tree _____(Continuous, intermittant,or open)

Phenology: Ground _____Shrub _____Tree _____ (Early, Peak, or Late)

Photographs: N:_____ Others:

Site Impact Codes/Intensity:_____,_____,_____,_____,_____(See list)

Site Location and Plot Description:

Site History – (include evidenct offire scars, insect/disease damage, grazing/browsing, human disturbance):

Additional Comments – (Including animal observations, anthropological observations, abiotic features)

Surface Coarse Fragments and Soils Information (see cover class intervals-below ⇓)		
Type:	Cover Class	Percent Cover
Fines: Including sand, mud		
Gravel: 2mm-7.5cm		
Cobble: 7.5-25 cm		
Stone: 25-60 cm		
Boulders: >60 cm		
Bedrock: Including outcrops		
Litter: Organic matter covering ground		
Water: Standing or running		
Living stems: at ground surface		
Other: (specify)		
*note all surface fragments, non-vegetation, living stems, etc., should add up to 100%		
Cover Class Intervals: 1 (<1%), 2 (1-5%), 3a (>5-15%), 3b (>15-25%), 4 (>25-50%), 5 (>50-75%), 6 (>75%)		

CALIFORNIA PLANT COMMUNITIES RELEVÉ FIELD FORM (PART 2)
SPECIES SHEET (Revised 5/17/01)

Page_____ of Relevé # _____

Cover Class Intervals: 1 (<1%), 2 (1-5%), 3a (>5-15%), 3b (>15-25%), 4 (>25-50%), 5 (>50-75%), 6 (>75%)

L=Low herbs and subshrubs (<0.5 m.), M=Medium height (0.5 m.-4.0 m.), T=Tall height (>4.0 m.)

L	M	T	Vascular plant name or moss/lichen cryptogamic crust cover	Final species determination or Tree dbh	Cover Class	%

Total Vegetation Cover (Class): _____ Total Tall_____ Total Medium _____ Total Low _____ Total Non-Native _____

percent cover of above: _____ _____ _____ _____ _____