Results of Rare Plant Surveys

on

Carlsbad Caverns National Park

Rattlesnake Canyon Trail

2005

Prepared by:

Phil Tonne
Natural Heritage New Mexico
Museum of Southwestern Biology
Department of Biology
University of New Mexico
Albuquerque, New Mexico 87131

Prepared for:

National Park Service
3225 National Parks Highway
Carlsbad, New Mexico 88220

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Introduction

In April and May 2005 Natural Heritage New Mexico (NHNM) completed rare plant surveys for Carlsbad Caverns National Park (CCNP). The National Park Service (NPS) was interested in documenting any rare plants that might occur within a 50-foot corridor on either side of the Rattlenake Canyon Trail. This trail was selected for rare plant surveys because improvements have been proposed for it and NPS was interested in obtaining information about biological resources that might be adversely impacted by construction in this area. The 31 target species for the surveys, including their flowering times and agency rankings, are listed in Table 2. Additional information about the target rare plants encountered during surveys has been included in Appendix 1.

Methods

NHNM completed pedestrian surveys within a 50-foot corridor on either side of the existing trail between April 13 and May 17, 2005.

When target species were encountered, I recorded field notes, including plant count, distance from trail (paced or estimated distance from the nearest imprint of the trail), and habitat notes. Field positions were obtained and recorded using both a Trimble Geoexplorer III GPS unit and a Garmin GPS 12 (used for back-up purposes). All relevant field notes were transcribed into a spreadsheet, included as Appendix 2.

GPS locations were saved digitally using CCNP's Trimble Geoexplorer 3. The Trimble points, as mapped, are based on post-processed location data (differentially corrected multiple-waypoint averages). Data was imported into ArcGIS 9.0 for data refinement and mapping. Maps were produced featuring three basic "population" types, point, linear, and polygon. Point "populations" represent individuals, or localized clusters of plants, while linear and polygon "populations" symbolize longer stretches of occupied habitat. At a given point there were often multiple plant species represented, each with identical UTM coordinates and habitat notes. All location and habitat information was delivered to NPS digitally in an ArcGIS personal geodatabase, projected in North American Datum 1927, Zone 13. Metadata will be developed and delivered with the final report.

The target species list was compiled based on information provided by the State of New Mexico, US Fish and Wildlife Service, and the New Mexico Rare Plant Technical Council. The list has evolved over several years of communication between the entities above with inputs by the Carlsbad Caverns Biology Staff and Natural Heritage New Mexico. Further discussion and documentation of the list is included as Appendix 3.

An effort was made to photo voucher each *Coryphantha sneedii** encountered. A fairly complete digital photo collection will be delivered with the final report. This collection could be used to monitor individual cacti currently growing in the project area.

* Taxonomic note: a recent treatment of the genus *Coryphantha* (synonym of *Escobaria*) places *E. sneedii* var. *leei* and var. *sneedii* under synonymy using the resurrected name, *Coryphantha sneedii*, a federally endangered species. I will follow this nomenclature here though these taxa are likely to be split out again in the future (USFWS lists both still).

Species Name	Family	Federal Status	State Status	NHNM-State Rank	NMRPTC	Flwr-Start	Flwr-Finish
*Amsonia tharpii**	Apocynaceae	SC	E	S1	R	April	May
*Aquilegia chrysantha var.. chaplinei**	Ranunculaceae		S	S2	R	April	October
*Astragalus gypsodes**	Fabaceae		S	S2	R	March	May
*Chaetopappa hersheyi**	Asteraceae	SC	S	S3	R	May	May
Ericameria nauseosa var.. texensis	Asteraceae	SC	S	S2	R	September	October
Coryphantha scheeri var. scheeri+	Cactaceae		E	S2?	R	June	September
Echinocereus fendleri var. kuenzleri+*	Cactaceae	E	E	S1	R	May	May
Eriogonum gypsophilum+*	Polygonaceae	T	E	S1	R	May	June
Escobaria guadalupensis+	Cactaceae		S	SR	R	April	May
Coryphantha sneedii var. leei+	Cactaceae	T	E	S2?	R	April	April
Coryphantha sneedii var. sneedii+	Cactaceae	E	E	S2	R	April	September
Hedeoma apiculata	Lamiaceae		S	S3	R	July	August
Hexalectris nitida	Orchidaceae	SC	E	S1	R	August	(late summer)
Justicia wrightii+*	Acanthaceae	SC	S	S1	R	April	July/August
Lilium philadelphicum +	Liliaceae		E	S3	D	June	August
Muhlenbergia villiflora var. *villosa*	Poaceae			S2?	R	August	September
*Nama xylopodum**	Hydrophyllaceae			S4?	R	May	September
Peniocereus greggii var. greggii+	Cactaceae	SC	E	S1	R	June	June
*Penstemon cardinalis ssp. regalis**	Scrophulariaceae		S	S2	R	May	June
*Perityle quinqueflora**	Asteraceae		S	S3	R	April	October
*Polygala rimulicola var. rimulicola **	Polygalaceae		S	S2	R	June	September
*Proboscidea sabulosa **	Martyniaceae		S	S3	D	July	August
*Pseudocymopterus longiradiatus**	Apiaceae		S	S2	D	April	August
*Salvia summa**	Lamiaceae			S3?	R	March	April
Sclerocactus uncinatus ssp. *wrightii**	Cactaceae			S2	D	April	May
Selaginella pilifera +	Selaginaceae			S2	D	n/a	n/a
*Sibara grisea**	Brassicaceae		S	S3?	R	May	June
Sophora gypsophila var. guadalupensis +	Fabaceae		S	S1	R	March - late	April - late
*Stipa curvifolia**	Poaceae			S2	D	April	June - mid
*Streptanthus sparsiflorus**	Brassicaceae	SC	S	S2	R	May	June
*Valeriana texana**	Valerianaceae			S3	R	April	June-July

*** Should be flowering or fruiting for identification**
+ Identifiable based on vegetative characteristics
**** habitat is specific and identifiable**
Federal Status: E=listed endangered; T=listed endangered; SC=species of concern.
State Status: E= endangered; T=threatened; S=sensitive plant; R=review list; D=plant species considered, but not included.
NHNM-State Rank: S1=state critically imperiled-extreme rarity; S2=state critically imperiled-rare; S3= rare or uncommom in state; S4=apparently secure in state.
New Mexico Rare Plant Technical Council (NMRPTC): R=Rare; D=dropped from list.

Table 1. Target plant species.

Results and Discussion

Surveys of the target areas revealed the presence of five of the 31 target species. The species located, and the number of individuals of each, are listed in Table 2. A general map of rare plant occurrences within the project area is included as Map 1. Notes compiled at each positive location are included in spreadsheet form in Appendix 2. Appendix 2 contains information about the location, including UTM coordinates (NAD83, Zone 13), distance from trail, number of individuals, and associated species. This information has also been made available to NPS in digital format.

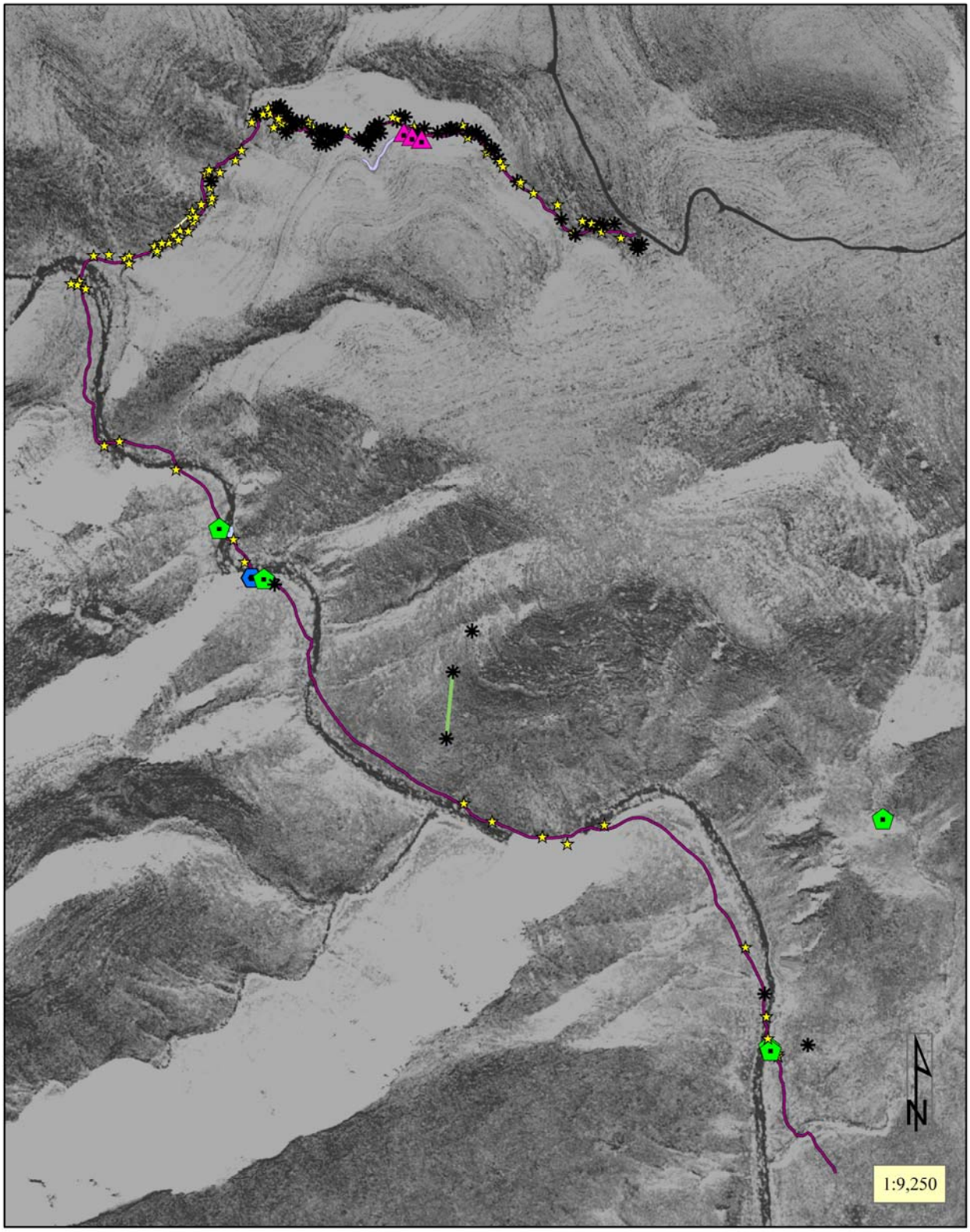
Species	**Vernacular**	**Number of Occurrences**	**Number of Plants**
Coryphantha sneedii	Lee's pincushion cactus	70	151
Nama xylopodum	Cliff nama	95	612
Perityle quinqueflora	Five-flowered rock daisy	1	47
Salvia summa	Supreme sage	4	41
Streptanthus sparsiflorus	Guadalupe jewelflower	4	6
Total		174	857

Table 2. Rare plant observation totals.

The survey site will be discussed in general, followed by more detailed maps of occupied areas. Given the broken terrain and heavy brush in most of the survey area, it is quite likely that individual target plants went undetected. I will discuss anticipated conflicts and possible means of avoiding plants as I introduce each map. As I do not know what exactly is planned for trail maintenance and/or construction I can only make general statements based on what I was able to observe in the field.

The majority of the rare plants occurring within the Rattlesnake Canyon survey site are associated with trailside limestone outcrops and cliffs (regional endemics are not uncommon in this habitat within the park). Occurrences of rare plants on rock fragments and boulders, especially those lining arroyos and cliff bases, account for most of the remaining target plant locations. Additionally, the Guadalupe jewelflower occurs periodically within the survey area, often occurring in organic soils below more rocky areas.

The Rattlesnake Canyon Trail descends through a variety of habitats, but can be characterized in very general terms as Chihuahuan Desert Scrub and Mixed Arroyo Shrubland descending from Pinchot Juniper-Oak Shrubland to a varied Arroyo-riparian zone. The Rattlesnake Canyon arroyo ranges from Desert Willow Arroyo Riparian Shrubland to barren rock/cliff wash habitat. Curlyleaf Muhly, Lechuguilla, Mariola, Goldeneye, and Sotol are common components of the mixed shrub and grassland communities of the survey area. Other community types are represented in varying degrees. For more species assemblages present within the survey area see the associated species field of Appendix 2, or refer to Muldavin et al. 2003.



SPECIES

Rattlenake_Canyon_Trail

Coryphantha sneedii

Nama xylopodum

Perityle quinqueflora

Salvia summa

Streptanthus sparsiflorus

Map 1. Overview Map of target plant species encountered on the Rattlesnake Canyon Trail 2005.

The five target species encountered on the entrance road will be discussed below:

1) *Coryphantha sneedii*
2) *Nama xylopodum*
3) *Perityle quinqueflora*
4) *Salvia summa*
5) *Streptanthus sparsiflorus*

Coryphantha sneedii is a small cactus (Figure 1), and will likely not fare well if subjected to any disturbance, including transplantation. This cactus is listed as endangered by the US Fish and Wildlife Service (USFWS) and endangered by the state of New Mexico (NM). It occurs in high density on the Rattlesnake Canyon Trail (observed at seventy locations). Every effort should be made to avoid this plant. There are a few plants that occur right in the trail proper.

Figure 1. *Coryphantha sneedii* [Lee's pincushion cactus (Rattlesnake Canyon)] 28 April 2005.

Nama xylopodum (Figure 2) is a locally abundant herb within the boundaries of CCNP. It is considered rare due to its limited distribution in and between the Guadalupe and Franklin Mountains of New Mexico and Texas. Ninety-five occurrences of Cliff nama were identified within the survey area. It grows on rocks and boulders. Any trail maintenance that avoids impacts to boulders, or exposed rock (including arroyo bedrock), or cliff surfaces would likely have little impact on this species' local abundance. It is unclear how long it might take this plant to recolonize areas disturbed during maintenance projects.

Figure 2. *Nama xylopodum* [Cliff nama (Big Hill)] 21 May 2004.

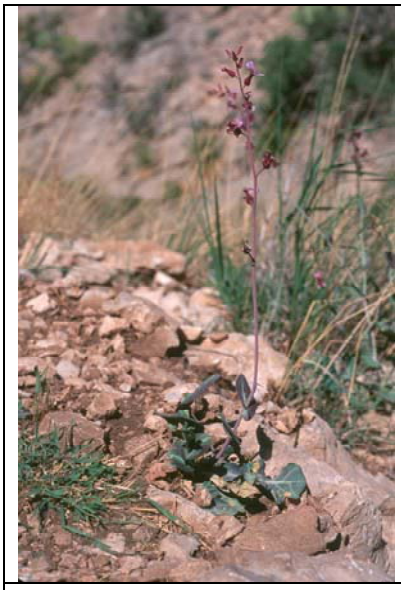
Perityle quinqueflora (Figure 3), a Guadalupe Mountain and Trans-Pecos Texas endemic, was located at only one site within the Rattlesnake Canyon Trail buffer. This plant is present primarily as a cliff inhabitant, but also occurs on large boulders and rock outcrops in the area. While cliff dwellers are generally better protected, any mechanical disturbance of cliff faces would be detrimental to this plant and should be avoided. These plants would likely be slow to or incapable of re-colonizing the trail buffer if accidentally or intentionally removed. Special care should be taken to avoid these plants where possible.

Figure 3. *Perityle quinqueflora* [Five-flowered rock daisy (Big Hill)] 9 May 2002.

Salvia summa (Figure 4) is typically a cliff inhabitant, but can also occur in arroyo bottoms. The four Rattlesnake Canyon occurrences are primarily restricted to cliffs and steep rocky slopes. By avoiding any impact to the cliffs and cliff bases, impacts to this plant could be minimized.

Figure 4. *Salvia summa* [Supreme sage (Rattlesnake Canyon)] 29 April 2005.

Streptanthus sparsiflorus (Figure 5) was observed in only four places within the project buffer. It is quite common in other drainages within the park and likely varies in abundance from year to year in Rattlesnake Canyon While abundant in some portions of the park, this plant appears to be a Guadalupe Mountain endemic. This annual plant grows along the trail corridor in only a few places. *Streptanthus* flowers in April and May of most years, setting seed by June. Monsoon rains, when present and sufficient, germinate the seeds in late summer or fall. The four locations identified should be avoidable, and because it is an annual, any inadvertent disturbance to individuals may be offset by the seed bank in the soil. Avoiding cement or other foreign materials in trail maintenance will help protect the seed bank and ensure the future of this plant along the trail.



Plant Habit

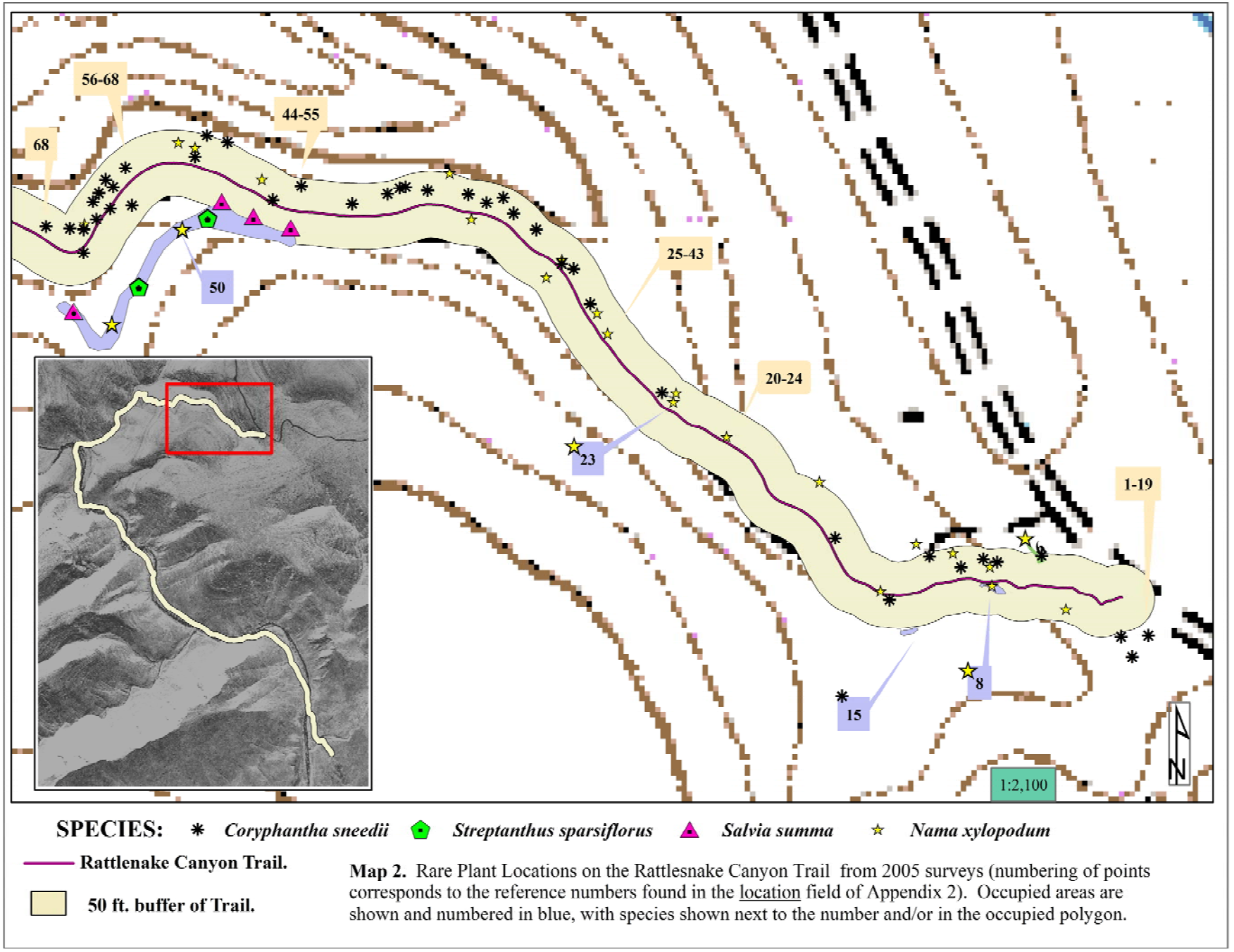
Leaf

Inflorescence

Figure 5. *Streptanthus sparsiflorus* (Guadalupe jewelflower) 1 May 2003.

Rare plant populations occur in relative abundance along the first 1300 meters of trail. Other portions of the trail contain scattered pockets of occupied habitat. Occupied portions of the trail are shown in Maps 2 through 5. Due to the high density of plants encountered on the upper two kilometers of the trail, a separate, larger scale, map is being delivered for this part of the project area. Other target species are not anticipated to occur on the Rattlesnake Canyon Trail.

Map 2 shows the trailhead and first stretch of occupied habitat in the descent toward Rattlesnake Canyon (Map 6, supplied separately with this report, shows this stretch in better detail, especially with regard to point numbering). *Nama xylopodum* and *Coryphantha sneedii* are abundant within the survey corridor. *Salvia summa* and *Streptanthus sparsiflorus* are present on and below the cliffs above the trail towards the western edge of this map. Avoiding the cliffs here will be relatively easy as they are well upslope of the existing trail. *Nama* and *Coryphantha* occur in and along the existing trail, and will likely be more problematic for trail construction and rehabilitation crews. The left side of the trail has lower concentrations of target plants and habitat in this area. However, *Coryphantha* occurs right along the trail especially toward the west end of this portion of the area surveyed, including the left side. While moving cacti is a possible solution for a few individuals, I would not recommend this as a general solution to avoiding this federally threatened species. Lee's pincushion cactus grows in a variety of soils in the project area, but often the roots anchor into limestone cracks and can not be easily removed without damaging the root system. For this reason, transplantation would not be recommended except where no other solution is feasible. Even plants growing in the trail might fare better if well-flagged and avoided during construction (e.g. Location **63** shown in Figure 6). The cactus shown in figure 6 is in relatively thick organic soils and might be a candidate for transplantation, but currently is surviving on a relatively well-used trail. Plants that are seemingly right in the path of disturbance are often protected by rocks and vegetation. They should just be flagged and avoided.

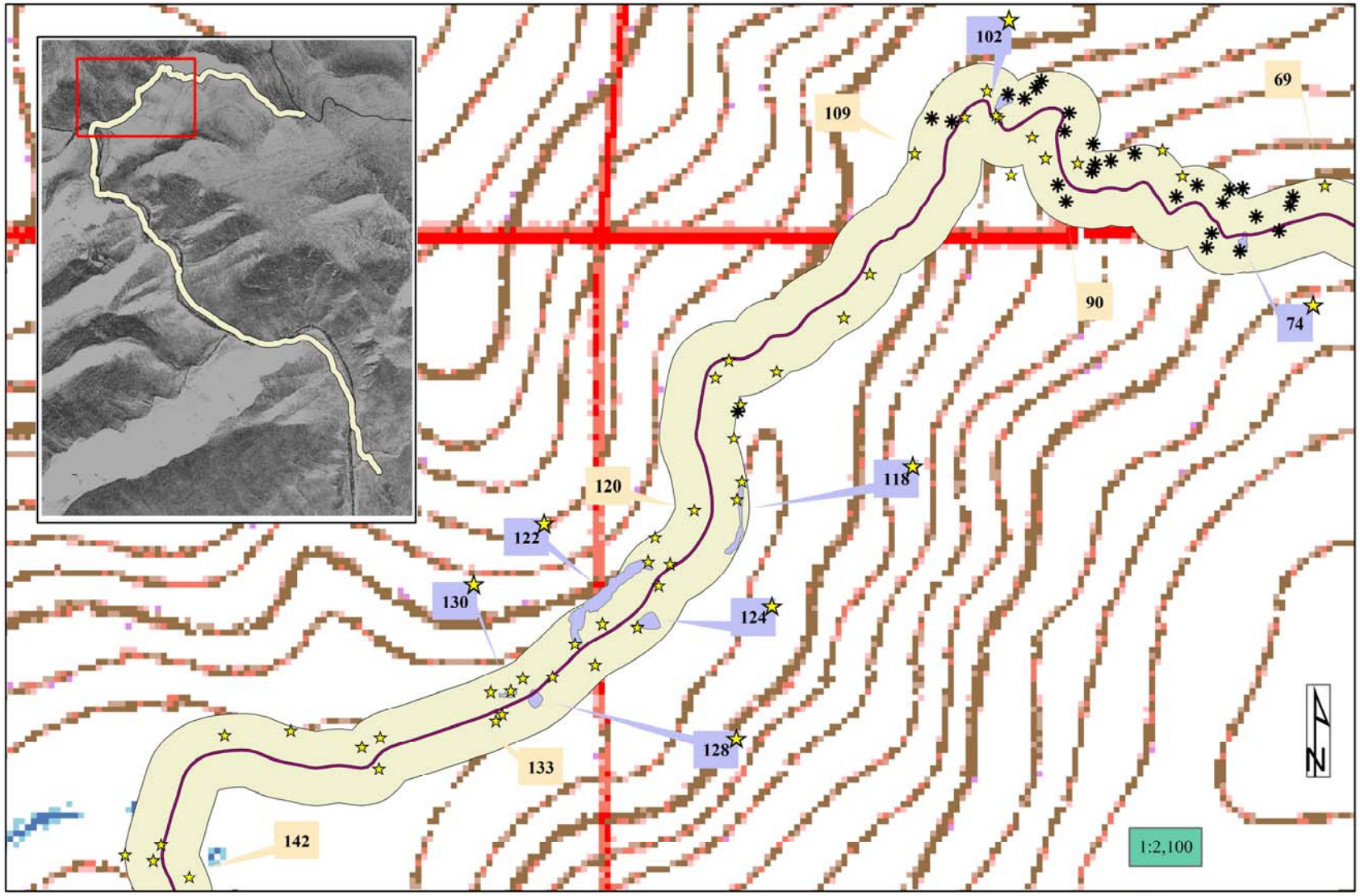


Map 2. Rare Plant Locations on the Rattlesnake Canyon Trail from 2005 surveys (numbering of points corresponds to the reference numbers found in the location field of Appendix 2). Occupied areas are shown and numbered in blue, with species shown next to the number and/or in the occupied polygon.

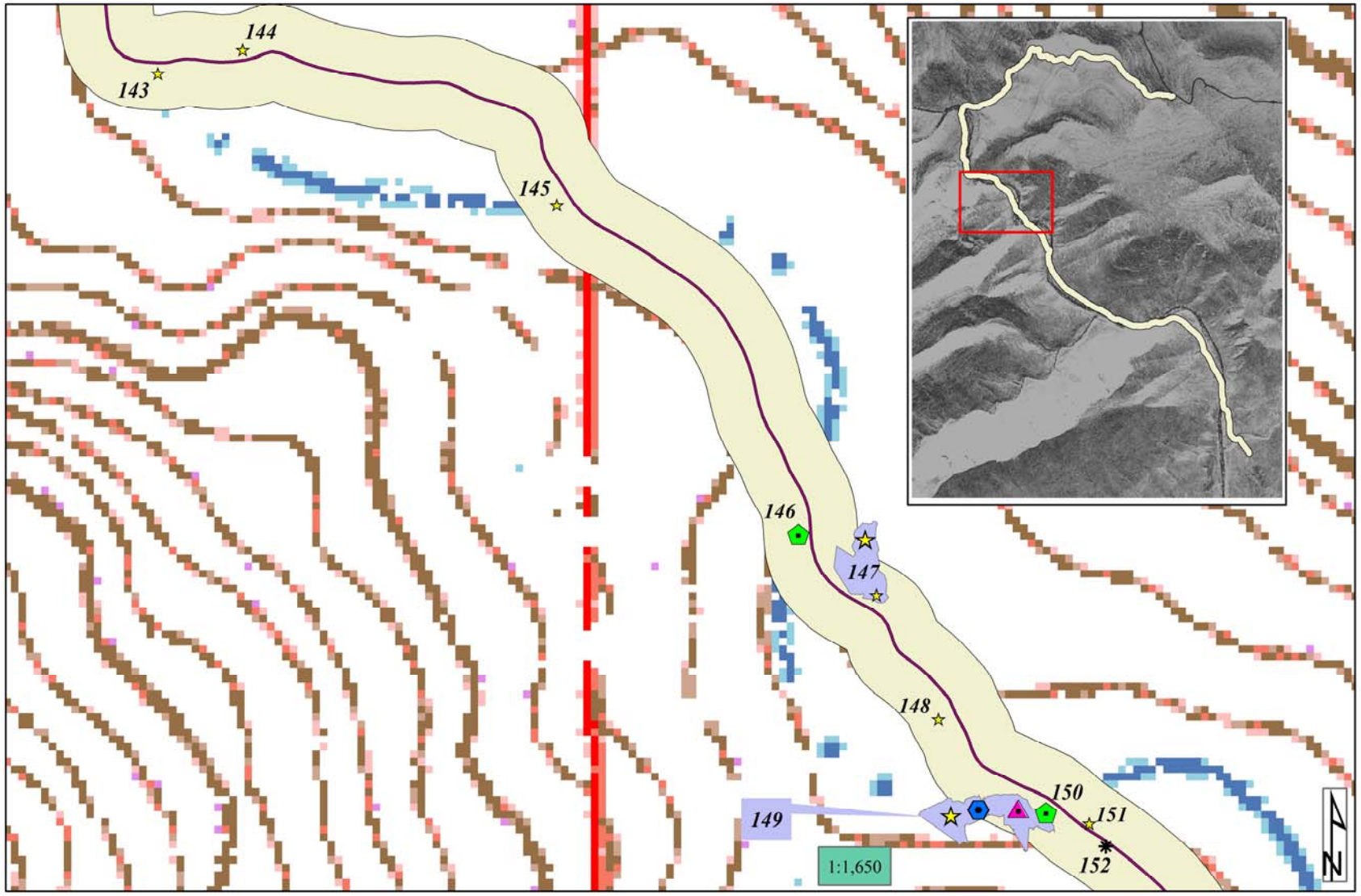
Figure 6. *Coryphantha sneedii* uprooted by trail traffic (Location **63**). This plant could be transplanted, but would likely fare better if shielded by a large rock during and after construction.

Map three shows rare plant locations on the steep descent into the Rattlesnake Canyon arroyo bottom. Rare cacti and Cliff nama are numerous on either side of the trail where it switches back and forth across the slope on the northeast portion of the map. *Coryphantha* occurs just beyond the footprint of the trail here. While all of these may appear problematic when viewed in the map, several of the plants closest to the trail are naturally protected by rocks and vegetation. If impacts to rocks and plants in place can be minimized on this slope, many of the rare endemics will likely survive through the trail maintenance project. It is suggested that plants likely to be impacted be clearly marked prior to any construction and visited by planners and participants in this project. Beyond the steep descent down the slope, there are fewer rare plants to be encountered within such tight proximity to the existing trail. Maintenance in the existing trail may impact a few *Nama* occurrences in the trail. These plants can obviously survive some traffic, and if avoided during construction, will likely survive future trail use.

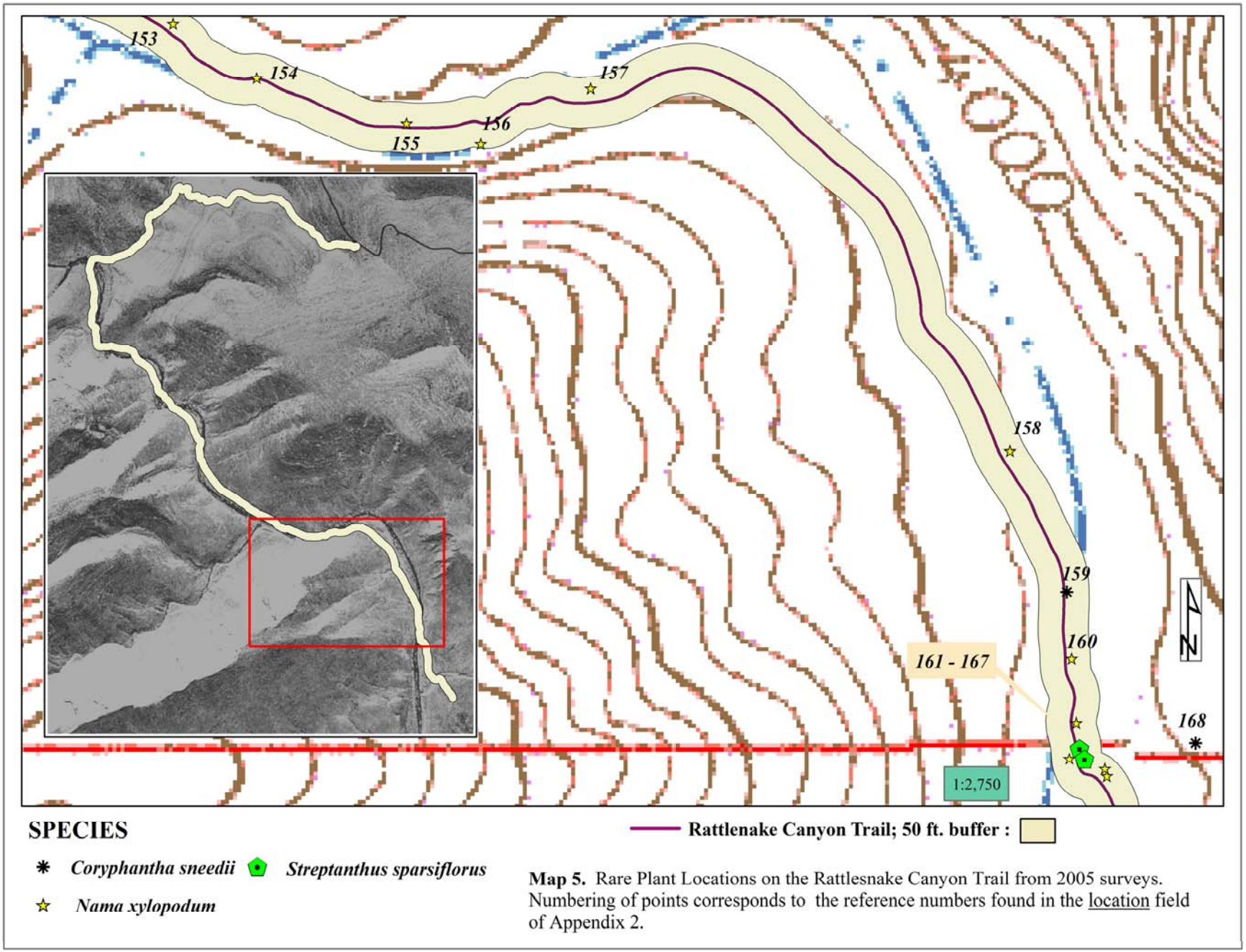
Map 4 covers a section of the Rattlesnake Canyon arroyo. A few scattered points, including *Nama, Streptanthus* and a single *Coryphantha*, contain rare plants on this portion of the project area. Because of the relatively large spacing between these occurrences, it should be easy to avoid these plants. The *C. sneedii*, Location **152,** near the SE extreme of this map is near the existing trail and an old rock cairn. Maintenance crews should take measures to avoid this cactus. If the cairn is reconstructed here, it should not shade this plant. In addition to the point features, there are two large occupied areas that occur in and beyond the survey buffer. The upper area, **147**, is occupied by Cliff nama on and above the existing trail. The trail consists of exposed bedrock at this site and trail maintenance may not be needed, or feasible, here. If no mechanical disturbance is done at this site the *Nama* colony should not be impacted. The lower area, **149**, is mostly confined to cliff and raised rock habitat. While *Streptanthus* is relatively near the trail at this site, most of the



Map 3. Rare Plant Locations on the Rattlesnake Canyon Trail from 2005 surveys. Numbering of points corresponds to the reference numbers found in the location field of Appendix 2. Areas are shown as blue polygons, with the target species shown next to the number and/or within the area. Only some points are numbered due to crowding.



Map 4. Rare Plant Locations on the Rattlesnake Canyon Trail from 2005 surveys. Numbering of points corresponds to the reference numbers found in the location field of Appendix 2. Areas are shown as blue polygons, with the target species shown within the area.



Map 5. Rare Plant Locations on the Rattlesnake Canyon Trail from 2005 surveys. Numbering of points corresponds to the reference numbers found in the location field of Appendix 2.

occupied habitat is naturally protected. Leaving a decent buffer around the rock outcrops here will likely protect this site.

Map 5 covers the remainder of the occupied project area in the Rattlesnake Canyon arroyo. Aside from a few scattered Cliff nama, only point **159** is likely to pose a challenge to trail crews. This single cactus is right in the trail. It should be flagged during construction and avoided. *Nama* and *Streptanthus* are quite common where the trail crosses the Rattlesnake Canyon arroyo for the last time. Confining activities at this site to the existing footprint of the trail should avoid impacts to these plants. The *Streptanthus* appears to do well in the leaf litter, just east of the trail, as it leaves the arroyo. Leaving the litter and soil in place will help ensure the continued presence of the Guadalupe jewelflower along this trail.

Conclusion

Surveys on the Rattlesnake Canyon trail revealed the presence of numerous target plants, including the state and federally listed taxon, *Coryphantha sneedii*. If trail maintenance projects are to take place with minimal impact to rare plants and their habitats, careful consideration will need to be given to plant locations during the planning and construction phase of this project. Habitat for rare plants will be in and near locations identified in field surveys. Additional efforts to avoid impacts to exposed bedrock, boulders and cliffs will serve to protect the park's potential rare plant habitat that may be colonized in the future. It is unclear what impact trail maintenance will have on the rare plant populations in this area. Endemic plants are numerous in and around the site but rates of recolonization would likely be very slow.

This year's survey revealed an abundance of rare plants along the Rattlesnake Canyon Trail. These plants may appear to be quite common based on the numbers observed and the frequency of their occurrence, but even the most common of these plants has quite limited geographical distribution and habitat. Avoiding impacts to plants identified in this survey is the surest way to ensure a rich endemic flora for hikers to enjoy into the future.

Many of the target species were not observed within the project area. Most do not occur here due to a lack of habitat, but others could have gone undetected during surveys. Those plants most likely to occur here, but not observed would likely share habitat already shown as occupied by other rare species. While there is no evidence that they exist within the survey area, potential habitat for these species will be protected if areas occupied by the five target species observed are avoided.

Reference

Muldavin, E, P. Neville, P. Arbetan, Y. Chauvin, A. Browder, and T. Neville. 2003. A Vegetation Map of Carlsbad Caverns National Park, New Mexico. Unpublished Report for Carlsbad Caverns National Park. New Mexico Natural Heritage Program.

Acknowledgements

I would like to thank the staff at Carlsbad Caverns National Park for supporting these surveys and accommodating my needs while I was there. I wish to thank Renee West and Dave Roemer, for all of their guidance, and support. Rebecca Keeshen, for support throughout the project and editorial assistance. Teri Neville, for GIS support and advice.

Photography by Phil Tonne.

Appendix 1. Additional information about target plants Encountered in Surveys.

These species reports were taken directly from the New Mexico Rare Plant Technical Council (NMRPTC) Web Page:

http://nmrareplants.unm.edu/

New Mexico Rare Plant Technical Council. 1999. New Mexico Rare Plants. Albuquerque, NM: New Mexico Rare Plants Home Page. http://nmrareplants.unm.edu (Version 15 March 2002).

Nama xylopodum
(Cliff nama)

[rare plant list] [photos] [distribution map] [line drawing] [taxon report]

Family: Hydrophyllaceae

Scientific Name: *Nama xylopodum* (Wooton & Standley) C.L. Hitchcock

Synonym: *Marilandium xylopodum* Wooton & Standley

Vernacular Name: Cliff nama

R-E-D Code: 1-1-2

Description: Herbaceous perennial; stems 5-12 cm long, erect or ascending, freely branching from a woody crown; leaves alternate, oblanceolate to spatulate, sharply pointed, weakly revolute, 5-20 mm long and 2-4 mm wide; stem and leaves grayish and strigose-hispid; flowers solitary or in small terminal clusters; corolla tubular-funnelform, 6-8 mm long, blue, pale lavender, or almost white; stamen bases dilated into free-margined, toothed scales much shorter than the free filaments; seeds reticulate, yellow. Flowers May to September.

Similar Species: None

Distribution: New Mexico, Eddy, Otero, and Chaves counties, Guadalupe Mountains; Texas, El Paso and Culberson counties, Franklin and Guadalupe mountains.

Habitat: Partly shaded limestone cliffs and outcrops in montane scrub to piñon-juniper-oak woodland; 1,350-2,000 m (4,500-6,500 ft).

Remarks: The species is a member of the crevice and rockface plant community in the Guadalupe and Franklin mountains.

Conservation Considerations: The cliff habitats and remote locations of this species offer considerable protection from human impacts.

Important Literature (*Illustration):

Hitchcock, C.L. 1933. A taxonomic study of the genus *Nama*. American Journal of Botany 20:415-430.

*New Mexico Native Plants Protection Advisory Committee. 1984. A handbook of rare and endemic plants of New Mexico. University of New Mexico Press, Albuquerque.

Information Compiled By: Richard D. Worthington, 1999

HOME

Coryphantha sneedii

(Escobaria sneedii var. leei;
Lee's pincushion cactus)

[rare plant list][photos][distribution map][line drawing][taxon report]

Family: Cactaceae

Scientific Name: *Escobaria sneedii* Britton & Rose var. *leei* (Rose ex Bödecker) D. Hunt

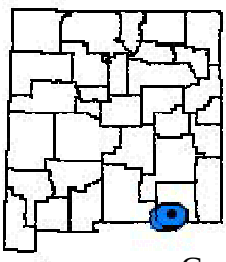
Synonyms: *Escobaria leei* Rose ex Bödecker; *Coryphantha sneedii* (Britton & Rose) A. Berger var. *leei* (Rose ex Bödecker) L. Benson

Vernacular Name: Lee's pincushion cactus

R-E-D Code: 3-3-3

Description: Stems forming small dense clusters, the individual stems mostly 1-2 cm thick and to 8 cm tall; tubercles on mature stems with upper surface grooved; spines about 30-90 per areole, typically white often brown at tip, fading to gray, slender and bristle-like, mostly about 1-2.5 mm long, radiating from areole and appressed against plant, sometimes with one to few short porrect centrals; flowers not opening widely, to 1.5 cm wide (usually smaller); tepals pale yellowish to pinkish or nearly white, usually with midribs darker; stigmas white to pink; fruit elongate, 1-1.5 cm long, green to somewhat reddish; seeds about 0.8 mm long, kidney-shaped, pitted, brown, with hilum lateral. Flowers in April.

Similar Species: The variety *leei* differs from other *Escobaria* in densely clumping habit, small stem size, and tightly pectinate spination.



Distribution: New Mexico, Eddy County, Guadalupe Mountains.

Habitat: Primarily cracks in limestone in areas of broken terrain and steep slopes of Chihuahuan desert scrub; 1,200-1,500 m (4,000-5,000 ft).

Remarks: Intergrades with other forms of *Escobaria sneedii* in the Guadalupe Mountains. This is apparently a neotenic variety of the species in which juvenile spination is retained throughout the life of the plant.

Conservation Considerations: This species is common in its very restricted area of distribution. It is popular with collectors and has been subject to commercial collecting in the past, but is now propagated commercially on a large scale and is readily available.

Important Literature (*Illustration):

*Benson, L. 1982. The cacti of the United States and Canada. Stanford University Press, Stanford, California.

*Britton N.L. and J.N. Rose. 1923. The Cactaceae IV. Carnegie Institution, Washington D.C.

*New Mexico Native Plants Protection Advisory Committee. 1984. A handbook of rare and endemic plants of New Mexico. University of New Mexico Press, Albuquerque.

*Weniger, D. 1970. Cacti of the Southwest. University of Texas Press, Austin.

Information Compiled By: David J. Ferguson, 1998

Agency Status:

Taxon	USFWS	State of NM	USFS	BLM	NM Heritage Program	Global Rank	Navajo Nation
Escobaria sneedii var. leei	LT	E	.	special status	S2?	G2T2	.

Perityle quinqueflora
(Five-flowered rock daisy)

[rare plant list] [photos] [distribution map] [line drawing] [taxon report]

Family: Asteraceae

Scientific Name: *Perityle quinqueflora* (Steyermark) Shinners

Synonyms: *Laphamia quinqueflora* Steyermark; *Pappothrix quinqueflora* (Steyermark) Everly

Vernacular Name: Five-flowered rock daisy

R-E-D Code: 2-1-2

Description: Tufted perennial from a woody base; stems to 30 cm tall; leaves opposite in lower portion, becoming alternate above, the blades 15-25 mm long, 8-20mm wide, thickened and leathery, broadly triangular to kidney-shaped, somewhat toothed to very shallowly lobed on the margins; flower heads cylindrical, in open clusters, rayless, 7-9 mm high; involucral bracts five or six, appearing as a single series; disk florets yellow, 5-6(8); pappus of 25-30 unequal bristles at the summit of the flattened achene. Flowers April to October.

Similar Species: This species grades into *P. rupestris*, which occurs in eastern Jeff Davis County, Texas. *Perityle quinqueflora* can be distinguished by its more fleshy leaves and its five-flowered heads.

Distribution: New Mexico, Eddy County; Texas, Culberson, Hudspeth, Presidio, and western Jeff Davis counties.

Habitat: Crevices of limestone (rarely igneous) bluffs, cliffs in high canyons and caprock, 1,530-1,830 m (5,000-6,000 ft).

Remarks: This species is unique owing to its relative rarity, striking appearance, and restricted habitat.

Conservation Considerations: Relatively inaccessible habitats provide a large degree of protection for this species.

Important Literature (*Illustration):

Everly, M.L. 1947. A taxonomic study of the genus *Perityle* and related genera. Contributions from the Dudley Herbarium of Stanford University 3:377-396.

Niles, W.E. 1970. Taxonomic investigations in genus *Perityle* and *Laphamia* (Compositae). Memoirs of the New York Botanical Garden 21:l-82.

*New Mexico Native Plants Protection Advisory Committee. 1984. A handbook of rare and endemic plants of New Mexico. University of New Mexico Press, Albuquerque.

*Powell, A.M. 1969. Taxonomy of *Perityle* section *Pappothrix* (Compositae - Peritylanae). Rhodora 71:58-93.

Shinners, L.H. 1959. Species of *Lapharnia* transferred to *Perityle* (Compositae: Helenieae). Southwestern Naturalist 4:204-206.

Information Compiled By: Yvonne Chauvin, 1999

HOME

Salvia summa
(Supreme sage)

[rare plant list] [photos] [distribution map] [line drawing] [taxon report]

Family: Lamiaceae

Scientific Name: *Salvia summa* A. Nelson

Synonyms: None

Vernacular Name: Supreme sage

R-E-D Code: 1-1-2

Description: Herbaceous perennial to 30 cm tall; sparingly branched; foliage resinous dotted and finely and densely silky-ciliate and pilose; basal and lower stem leaves pinnately lobed or pinnate; terminal lobe relatively large and coarsely toothed; other leaves ovate to cordate-triangular and variously toothed; flowers short-pedicelled - in axils of leaves, two per node; calyx 2-lipped, divided to near the middle, upper lip three-lobed with the middle lobe triangular and shorter and broader than the lance-linear outer lobes, lower lip with two lance-linear lobes; corolla 35-45 mm long, three times as long as the calyx, pilose, 2-lipped with the nonventricose tube slender but gradually dilated at the spreading lobes, pale lavender or pinkish with red dots in throat; lower corolla lip 3-lobed, noticeably longer than upper lip; stigma lobes unequal and subulate, well-exserted and surpassing stamens. Flowers March and April.

Similar Species: *Salvia henryi* occurs in the same general habitat, but has red flowers with a shorter lower lip and a ventricose corolla tube abruptly dilated just above the calyx. The foliage of the two taxa is very similar.

Distribution: New Mexico, Chaves, Doña Ana and Eddy counties, San Andres, Organ, and Guadalupe mountains; adjacent Texas, El Paso and Culberson counties, Franklin, Guadalupe and Delaware mountains; Mexico, Chihuahua

Habitat: Found almost exclusively on partly shaded limestone cliffs; 1,520-2,140 m (5,000-7,000 ft).

Conservation Considerations: This plant is not significantly threatened by land use within its habitats.

Important Literature (*Illustrations):

Correll, D.S. and M.C. Johnston. 1970. Manual of the vascular plants of Texas. Texas Research Foundation, Renner.

*New Mexico Native Plants Protection Advisory Committee. 1984. A handbook of rare and endemic plants of New Mexico. University of New Mexico Press, Albuquerque.

Walker, J.B. and W.J. Elisens. 2001. A revision of *Salvia* section *Heterosphace* (Lamiaceae) in western North America. Sida 19(3):571-589.

Information Compiled By: Richard D. Worthington, 1999

HOME

Streptanthus sparsiflorus
(Guadalupe jewelflower)

[rare plant list] [photos] [distribution map] [line drawing] [taxon report]

Family: Brassicaceae

Scientific Name: *Streptanthus sparsiflorus* Rollins

Synonyms: None

Vernacular Name: Guadalupe jewelflower

R-E-D Code: 2-1-2

Description: Annual, glabrous throughout; stems and leaves glaucous (bluish); stems 3-6 dm tall, simple below, branched from about 1 dm upward; leaves somewhat fleshy, greenish and minutely punctate above, slate-colored and nonpunctate below; lower stem leaves sessile, auriculate, lyrately pinnatifid to nearly runcinate, 8-12 cm long, 2-4 cm wide; leaves gradually reduced upward; upper stem leaves mostly entire, occasionally sinuate-dentate, ovate to broadly oblong, obtuse, auriculate and clasping the stem; inflorescence racemose, usually fewer than 10 flowers per raceme; flowers slightly zygomorphic; sepals straw-colored to pale purplish, not swollen, narrowly ovate, 9-11 mm long, about 2 mm wide, lateral sepals more narrowly tapered and thicker at tip than upper and lower sepals; petals showy, purplish, 15-18 mm long, blades 3-5 mm wide, reflexed at flowering; stamens 4, upper pair protruding beyond sepals, filaments 7-9 mm long, anthers 2.5-3 mm long, lower pair of stamens with anthers included, filaments 4-5 mm long, anthers 3-4 mm long, single stamens often with anthers longer than filaments; fruiting pedicels stout, terete, divaricately ascending, 5-10 mm long, strongly expanded at the summit; siliques subsessile, divaricately ascending, linear, obtuse to somewhat acute above and below, strongly flattened parallel to the plane of the septum, 4-7 cm long, 5-7 mm wide, valves with a central nerve from base to apex, septum translucent, entire, funicles winged; seeds flattened, widely wing-margined, orbicular, about 5 mm in diameter, wings uniform, 1-1.2 mm wide. Flowers May through June.

Similar Species: This species is unlikely to mistaken for other *Streptanthus* in the area because of its large, showy flowers, sessile, auriculate, and pinnatifid to lobed lower stem leaves and wide siliques.

Distribution: New Mexico, Eddy County; adjacent Texas, Culberson County.

Habitat: Limestone canyon bottoms and montane scrub; 1,500-2,150 m (5,000-7,000 ft).

Remarks: Apparently endemic to the Guadalupe Mountains. This plant can be locally abundant, but is seldom collected. Little is known of its distribution and habitat requirements.

Conservation Considerations: Most habitats for this plant are very rugged and remote. Current land uses of livestock grazing and recreational hiking pose no threat to this species.

Important Literature (*Illustration):

Rollins, R.C. 1970. Notes on *Streptanthus* and *Erysimum* (Cruciferae). Contributions from the Gray Herbarium 200:190-195.

Rollins, R.C. 1993. The Cruciferae of continental North America. Stanford University Press, Stanford, California.

Information Compiled By: David Bleakly, 1999

HOME

Appendix 2. Field Observations and Locations for Individual Plant Occurrences.

This appendix is a table of field notes with the following fields:
Location – Data ID field corresponding to numbers in report maps;
Occurrence – plant taxon found at location;
Plant Count – number of individuals observed, respectively;
Notes – field notes about site and occurrence;
Length – length of line or area of polygon, or indicates point for small clusters.
Proximity – estimated perpendicular distance from paved lane, shoulder, or drainage gutter.
Associated Species – associated plant species acronyms (the table below is a key to plant acronyms);
X – UTM easting (North American 1983 Map Datum);
Y – UTM northing (North American 1983 Map Datum);

Table of Plant Acronyms in Data Tables (Associates Field).

Acronym	Family	Species	Common Name
AcaNeo	Fabaceae	Acacia neovernicosa	viscid acacia
AcaRoe	Fabaceae	Acacia roemeriana	roundflower catclaw
AgaLec	Agavaceae	Agave lechuguilla	lechuguilla
AloWri	Verbenaceae	Aloysia wrightii	Wright's beebrush
ARIST	Poaceae	Aristida	threeawn
Aristida	Poaceae	Aristida	threeawn
ArtLud	Asteraceae	Artemisia ludoviciana	white sagebrush
AstCoc	Pteridaceae	Astrolepis cochisensis	Cochise scaly cloakfern
Atriplex	Chenopodiaceae	Atriplex sp.	saltbush
BerTri	Berberidaceae	Berberis trifoliolata	Agarito
BouEri	Poaceae	Bouteloua eriopoda	black grama
BouObo	Euphorbiaceae	Bernardia myricifolia	mouse's eye
BriLac	Asteraceae	Brickellia laciniata	splitleaf brickellbush
Cassia sp.	Fabaceae	Senna sp.	Senna
CelRet	Ulmaceae	Celtis laevigata var. reticulata	Netleaf Hackberry
CenMel	Asteraceae	Centaurea solstitialis	Malta starthistle
CerMon	Rosaceae	Cercocarpus montanus	alderleaf mountain mahogany
ChiLin	Bignoniaceae	Chilopsis linearis	desert willow
ChrMex	Asteraceae	Chrysactinia mexicana	damianita
DalBic	Fabaceae	Dalea bicolor	silver prairie clover
DalFor	Fabaceae	Dalea formosa	featherplume
DasLei	Liliaceae	Dasylirion leiophyllum	green sotol
EchCoc	Cactaceae	Echinocereus coccineus	scarlet hedgehog cactus
Ephedra	Ephedraceae	Ephedra sp.	jointfir
Ephedra sp.	Ephedraceae	Ephedra	jointfir
EpiMic	Cactaceae	Epithelantha micromeris	pingpong ball cactus
EpiWis	Scrophulariaceae	Epixiphium wislizeni	balloonbush
Erigeron sp.	Asteraceae	Erigeron	fleabane
Eriogonum sp.	Polygonaceae	Eriogonum	buckwheat
Erioneuron	Poaceae	Erioneuron	woollygrass
EscTub	Cactaceae	Escobaria tuberculosa	whitecolumn foxtail cactus

Acronym	Family	Species	Common Name
FalPar	Rosaceae	Fallugia paradoxa	Apache plume
FenRup	Hydrangeaceae	Fendlera rupicola	cliff fendlerbush
FouSpl	Fouquieriaceae	Fouquiera splendens	ocotillo
Galium sp.	Rubiaceae	Galium	bedstraw
GymGlu	Asteraceae	Gymnosperma glutinosum	gumhead
HedOva	Lamiaceae	Hedeoma drumundii	Drummond's false pennyroyal
HetVil	Asteraceae	Heterotheca villosa	hairy false goldenaster
JugMaj	Juglandaceae	Juglans major	Arizona walnut
JunDep	Cupressaceae	Juniperus deppeana	alligator juniper
JunPin	Cupressaceae	Juniperus pinchotii	Pinchot's juniper
LepDub	Poaceae	Leptochloa dubia	green sprangletop
Lithospermum sp.	Boraginaceae	Lithospermum	stoneseed
MahTri	Berberidaceae	Mahonia trifoliata	algerita
MelLeu	Asteraceae	Melampodium leucanthum	plains blackfoot
MenLon	Oleaceae	Menodora longiflora	showy menodora
MimAcuB	Fabaceae	Mimosa aculeaticarpa var. biuncifera	catclaw mimosa
MimBor	Fabaceae	Mimosa borealis	fragrant mimosa
MorMic	Moraceae	Morus microphylla	Texas mulberry
MuhEme	Poaceae	Muhlenbergia emersleyi	bullgrass
MuhPar	Poaceae	Muhlenbergia parviglumis	Longawn muhly
MuhPau	Poaceae	Muhlenbergia pauciflora	New Mexico muhly
MuhSet	Poaceae	Muhlenbergia setifolia	curlyleaf muhly
MuhTor	Poaceae	Muhlenbergia torreyi	ring muhly
NamXyl	Hydrophyllaceae	Nama xylopodum	yellowseed fiddleleaf
NicObtO	Solanaceae	Nicotiana obtusifolia var. obtusifolia	desert tobacco
Nicotiana sp.	Solanaceae	Nicotiana	tobacco
Nolina	Agavaceae	Nolina sp.	beargrass
NolMic	Agavaceae	Nolina microcarpa	sacahuista
Oenothera sp.	Onagraceae	Oenothera	evening-primrose
OpuEng	Cactaceae	Opuntia engelmannii	cactus apple
OpuImb	Cactaceae	Opuntia imbricata	tree cholla
OpuPha	Cactaceae	Opuntia phaeacantha	tulip pricklypear
ParInc	Asteraceae	Parthenium incanum	mariola
ParJam	Caryophyllaceae	Paronychia jamesii	James' nailwort
PhiHit	Hydrangeaceae	Philadelphus hitchcockianus	Hitchock's mockorange
QueGri	Fagaceae	Quercus grisea	gray oak
QuePun	Fagaceae	Quercus pungens	sandpaper oak
RhuMic	Anacardiaceae	Rhus microphylla	littleleaf sumac
RhuTri	Anacardiaceae	Rhus trilobata	skunkbush sumac
RhuVir	Anacardiaceae	Rhus virens	evergreen sumac
Ruellia sp.	Acanthaceae	Ruellia	wild petunia
RuePar	Acanthaceae	Ruellia parryi	Parry's wild petunia
SapSap	Sapindaceae	Sapindus saponaria	wingleaf soapberry
Sedum	Crassulaceae	Sedum	stonecrop

Acronym	Family	Species	Common Name
SopSec	Fabaceae	Sophora secundiflora	mescal bean
Stipa sp.	Poaceae	Hesperostipa	needle and thread
Tetraneuris sp.	Asteraceae	Tetraneuris	four-nerve daisy
Thelesperma	Asteraceae	Thelesperma sp.	greenthread
ThyAce	Asteraceae	Thymophylla acerosa	pricklyleaf dogweed
Tragia sp.	Euphorbiaceae	Tragia	noseburn
TriMut	Poaceae	Tridens muticus	slim tridens
Tyhmopylla sp.	Asteraceae	Thymophylla	pricklyleaf
UngSpe	Sapindaceae	Ungnadia speciosa	Mexican buckeye
VerPer	Verbenaceae	Verbena perennis	pinleaf vervain
VigSte	Asteraceae	Viguiera stenoloba	skeletonleaf goldeneye
YucBac	Agavaceae	Yucca baccata	banana yucca
YucTor	Agavaceae	Yucca torreyi	Torrey's yucca

Location	Occurrence	Plant Count	Notes	Length/Area	Proximity	Associated	X	Y
1	Coryphantha sneedii	1	Single cactus in fruit.	Point	ca. 15 m from parking pull-out.	AgaLec, DasLei, DalFor, MuhSet	546844	3558881
2	Coryphantha sneedii	1	Single cactus in bud ca. 23 m from parking area to S. Photo	Point	ca. 23 m from parking area to S.	MuhSet, DasLei, AgaLec	546837	3558871
3	Coryphantha sneedii	1	Single cactus in broken limestone/organic soils. Photo.	Point	ca. 18 m from trailhead to S.	MuhSet, DalFor, DalBic, AgaLec	546832	3558880
4	Nama xylopodum	3	Three plants on limestone.	Point	ca. 11 m S of trail	DasLei, MuhSet, DalFor	546806	3558893
5	Coryphantha sneedii	1	Single flowering plant growing under lechuguilla. Photos.	Point	ca. 13m N of trail	AgaLec, MuhSet, VigSte	546795	3558918
6	Nama xlopodum	6	6 Nama ca. 5 m N of trail.	16.9 m	ca. 5 m N of trail.	AgaLec, MuhSet, VigSte	546791	3558920
7	Coryphantha sneedii	1	Single flowering plant on limestone. Photos.	Point	ca. 5 m N of trail	Moss, TriMut, MuhSet, DalFor, Aristida	546774	3558915
8	Nama xylopodum	32	32 Nama on exposed limestone ca. 2 m S of trail.	22.455 m2	ca. 2 m S of trail.	AstCoc, MuhSet, FouSpl, AgaLec	546773	3558902
9	Nama xylopodum	9	Nine plants on exposed limestone.	Point	ca. 3 m N of trail	AgaLec, FouSpl, Aristida, RuePar	546771	3558913
10	Coryphantha sneedii	1	Seedling in moss. Veg. Photos	Point	ca. 5 m N of trail	Moss, AstCoc, FouSpl, MuhSet	546768	3558916
11	Coryphantha sneedii	1	Single cactus in FL. Photos	Point	ca. 5 m N of trail	Sedum, MuhSet, DasLei, PhiHit	546758	3558913
12	Nama xylopodum	3	Three plants on exposed limestone.	Point	ca. 12 m N of trail	RuePar, AstCoc, MimAcuB	546754	3558919
13	Coryphantha sneedii	1	Single vegetative plant under Berberis trifoliolata. Photos taken.	Point	ca. 6 m from trail to N	BerTri, DasLei, AcaRoe, MimAcuB	546743	3558918
14	Nama xylopodum	3		Point	ca. 16 m from trail	AgaLec, MimAcuB, ParInc, DalFor	546737	3558923
15	Coryphantha sneedii		Several flowering C. sneedii growing on large limestone step. At end of side trail. No impact- outside of project buffer.	16.174 m2	ca. 16 m from trail		546733	3558883
16	Coryphantha sneedii	1	On side trail ca. 3 m. from main trail - placed rock cairn in front of it. Shows as polygon, should be a point. Photos.	Point	ca. 3 m from main trail in middle of side trail.	ParInc, AloWri, MuhSet	546725	3558897

Location	Occurrence	Plant Count	Notes	Length/Area	Proximity	Associated	X	Y
17	Nama xylopodum	1	Single Nama on exposed limestone.	Point	.5 m S of trail	OpuEng, AstCoc, MuhSet	546720	3558902
18	Coryphantha sneedii	1	photos taken	Point	ca. 4 m E of trail	DalFor, AloWri, RuePar, JunPin, AcaRoe	546699	3558926
19	Nama xylopodum	3	Growing on exposed limestone. 1 Fl, 2 Veg.	Point	ca. 13 m above trail	MimAcuB, DasLei, QueGri, MuhSet	546692	3558952
20	Nama xylopodum	2	2 veg. plants just below trail toward arroyo channel.	Point	ca. 25 cm below trail		546649	3558973
21	Nama xylopodum	0	supposed to be an area file. added data to F042819A.	Point			546624	3558989
22	Nama xylopodum		supposed to be an area file. added data to F042819A.	Point			546626	3558993
23	Nama xylopodum	32	32 VEG. Nama on arroyo terrace and wash bottom. May extend beyond as some GIS information condensed to point locations.	1.467 m2	ca. 4.5 m NE of trail.	JunPin, AloWri, AgaLec, DasLei, MuhSet	546623	3558991
24	Coryphantha sneedii	3	3 Cacti : 1 in Bud; 1 in FL, 1 Veg. in broken limestone.	Point	ca. 3 m below trail	MuhSet, DasLei, AgaLec	546619	3558993
25	Nama xylopodum	2	2 Nama on limestone bench.	Point	ca. 3.5 m below trail (ENE)	MuhSet, DalFor, AgaLec, JunPin	546594	3559021
26	Nama xylopodum	1	Single Nama on limestone ledge	Point	ca. 4 m below trail	VigSte, DasLei	546589	3559030
27	Coryphantha sneedii	4	4 cacti: 3 FL, 1 Veg. Photos.	Point	ca. 3 m below trail	AstCoc, AloWri, MuhSet, AgaLec	546586	3559034
28	Coryphantha sneedii	3	3 cacti (2 FL, 1 Veg) , 1 Nama (in bud). Photos.	Point	ca. 5 m below trail	DalBic, AgaLec, DasLei, ArtLud,	546578	3559051
29	Coryphantha sneedii	2	1 Fl. & 1 Fr. cactus growing at the trail's edge at base of large rock.	Point	at edge of trail	MuhSet, DasLei, Astrolepis sp.	546573	3559053
30	Nama xylopodum	1	Single Nama in FL.	Point	ca. 3 m below trail	AloWri, GymGlu	546573	3559055
31	Nama xylopodum	3	3 Nama growing on rock above trail.	Point	ca. 5 m above trail.	Hedeoma ovata; ArtLud, AloWri, MuhSet in area but do not share habitat.	546566	3559047

Location	Occurrence	Plant Count	Notes	Length/Area	Proximity	Associated	X	Y
32	Coryphantha sneedii	2	2 cacti on limestone rock and soil in crack of slab: 1 veg. & lacking access to soils; 1 in bud. Photos.	Point	ca. 8 m below trail	FenRup, AstCoc, BriLac, JunPin, MuhSet	546561	3559069
33	Coryphantha sneedii	6	6 cacti: 2 FL; 4 veg. Photos.	Point	ca. 3 m below trail	VigSte, MuhSet, AstCoc, AloWri	546551	3559076
34	Coryphantha sneedii	4	4 cacti; all veg. in cracks of limestone and under broken rocks. Photos.	Point	ca. 5.5 m below trail	FouSpl, DalBic, DasLei, AcaRoe	546546	3559083
35	Coryphantha sneedii	8	8 cacti, 1 Nama: 3 in bud; 1 FL; 4 veg.on limestone bench. 2 dead plants ca. 2.7 m N. No Photos or switched with 20A.	Point	ca. 5 m below trail (N).	ParInc, AstCoc, Eriogonum sp., DasLei	546538	3559081
36	Nama xylopodum	14	14 plants growing on limestone boulder	Point	ca 5 m above trail	Erigeron sp. TriMut, ArtLud	546531	3559074
37	Coryphantha sneedii	7	7 plants below trail: 2 in Bud; 1 in FL, 4 veg. Photos.	Point	ca. 5.5 m N of trail	MuhSet, CerMon, AgaLec, GymGlu, BouObo	546530	3559085
38	Nama xylopodum	5	5 Nama on exposed limestone. Nama generally not flowering yet; small buds.	Point	ca. 15 m below trail	DasLei, OpuEng, HedOva	546521	3559095
39	Coryphantha sneedii	3	3 plants: 1 FL.; 2 Veg. In soil-filled crack of limestone slab. Photos.	Point	ca. 3 m below trail	DasLei, VigSte, QueGri	546511	3559087
40	Coryphantha sneedii	1	single cactus in bud on limestone ledge. Photo	Point	ca. 7 m below trail	AgaLec,MuhSet, TriMut, FouSpl	546501	3559088
41	Coryphantha sneedii	4	4 plants (could be a single vegetative clone) all veg, growing in soil above limestone slab under DalFor. Photos.	Point	ca. 5 m below trail	DalFor, TriMut, MuhSet, VigSte	546498	3559088
42	Coryphantha sneedii	1	Single cactus in Bud in broken limestone; In FL. Photos.	Point	ca. 8.5 m N of trail.	VigSte, DalFor, MuhSet.	546492	3559085
43	Coryphantha sneedii	1	single cactus in Bud. Photo.	Point	ca. 1 m below trail	DalFor, TriMut, GymGlu, Erigeron	546476	3559081

Location	Occurrence	Plant Count	Notes	Length/Area	Proximity	Associated	X	Y
44	Coryphantha sneedii	1	Single cactus in Bud sandwiched between two pieces of limestone. Photos.	Point	ca. 11 m. below trail	VigSte, AgaLec	546452	3559089
45	Salvia summa	10	10 Salvia: 1 Fl.; 5 Fr.; 1 Veg. with Nama - up and down cliffs.	Point	ca. 8 m above trail	GymGlu, CerMon, ArtLud	546447	3559070
46	Coryphantha sneedii	1	Single cactus growing above trail under VigSte; in Flower.	Point	ca. 55 cm. above trail.	VigSte, MuhSet, DalFor, DasLei	546439	3559082
47	Nama xylopodum	3	3 Veg. Nama on exposed limestone.	Point	ca. 4 m. below trail.	DasLei, MuhSet, AgaLec.	546434	3559092
48	Salvia summa	1	1 Salvia in fruit, 1 Nama in flower. Nama fairly continuous on cliffs. Salvia spotty but continuse to above P051721B.	Point	ca. 9 m above trail	GymGlu, CerMon, ArtLud	546430	3559075
49	Salvia summa	2	Salvia on cliff above trail (2 in Fr.); 8 Streptanthus in Fruit; 1 Nama in Flower.	Point	ca. 10 m above trail	GymGlu, CerMon, ArtLud, AgaLec	546416	3559082
50	Nama, Salvia summa, Streptanthus sparsiflorus.	No count - Not closely surveyed outside of buffer.	Area occupied by Nama, Salvia, and Streptanthus. Nama common. Salvia and Streptanthus are spotty in distribution.	not surveyed	ca. 12 m from trail		546393	3559052
51	Coryphantha sneedii	1	At edge of buffer. Very large plant in FL. Photos.	Point	ca. 16 m N of trail.		546418	3559109
52	Coryphantha sneedii	2	2 cacti: 1 in Bud; 1 Veg. 2 Nama. on rocks.	Point	ca. 15 m. N of trail.	VigSte, BouObo, DasLei, PhiHit.	546409	3559112
53	Coryphantha sneedii	11	11 cacti: 5 FL; 1 Bud; 4 Veg.. growing in broken limestone. Photos.	Point	ca. 2 m. below trail.	VigSte, MuhSet, DalFor, AgaLec.	546403	3559102
54	Nama xylopodum	3	3 Veg. Nama on exposed limestone.	Point	ca. 8 m below trail.	MuhSet, VigSte, TriMut	546403	3559107
55	Nama xylopodum	8	8 veg. Nama and 1 dead Coryphantha on exposed limestone.	Point	ca. 7 m below trail.	Aristida, DasLei, PhiHit, DalFor.	546395	3559109

Location	Occurrence	Plant Count	Notes	Length/Area	Proximity	Associated	X	Y
56	Coryphantha sneedii	4	4 cacti: 1 Bud; 1 FL; 2 Veg. Growing in rocky soils on and between limestone slabs.	Point	ca. 6 m below trail	AgaLec, MuhSet, VigSte, MimAcuB, ArtLud	546371	3559097
57	Coryphantha sneedii	4	7 cacti: 2 Bud; 1 FL.; 4 Veg. under BouObo. Photos.	Point	ca. 5.5 m below trail (N).	VigSte, BouObo, FouSpl, MuhSet, AgaLec.	546362	3559092
58	Coryphantha sneedii	2	2 cacti; 1 Veg; 1 Bud/FR. growing ca. 40 cm below trail (N) under AgaLec and Rock. Photos.	Point	ca. 40 cm below trail (N).	AgaLec, DasLei, MuhSet, FouSpl.	546365	3559088
59	Coryphantha sneedii	1	Single veg. cactus growing on rock above trail with 13 Nama in flower and 1 veg.	Point	ca. 7 m above trail	AcaRoe, QueGri, VigSte, YucTor	546374	3559080
60	Coryphantha sneedii	2	1 Nama and 2 cacti: 1 Veg; 1 Bud. On exposed limestone. Photos.	Point	ca. 6 m below trail.	Muhlenbergia sp., DasLei, AgaLec, GymGlu, BouObo, PhiHit.	546359	3559086
61	Coryphantha sneedii	1	Single cactus in Fl. growing on large rock above trail.	Point	just above trail.	BouObo, FouSpl, AgaLec, DasLei	546364	3559078
62	Coryphantha sneedii	1	Single cactus, in bud; on and under limestone rock, slab.	Point	ca. 4.5 m below trail.	Muhlenbergia sp., DasLei, AgaLec, GymGlu, BouObo, PhiHit.	546356	3559082
63	Coryphantha sneedii	1	Single cactus @ trail edge (S), in FL. Has been disturbed by trail traffic. Recommend moving to remote location. Photos.	Point	At trail edge (SE)	MuhSet, AgaLec, VigSte	546358	3559073
64	Nama xylopodum	4	4 Nama: 3 in flower; 1 Veg. growing on large boulder. Photos.	Point	ca. 4 m below trail (N).	Tragia sp., MuhSet.	546352	3559071
65	Coryphantha sneedii	1	Single plant, in FL., growing on limestone ledge. Photos.	Point	ca. 3 m below trail (N).	MuhSet, AgaLec, DalFor, MelLeu, JunPin.	546352	3559069
66	Coryphantha sneedii	1	Single cactus in flower.	Point	ca. 2.5 m from trail.	MuhSet, DasLei, AgaLec	546352	3559058

Location	Occurrence	Plant Count	Notes	Length/Area	Proximity	Associated	X	Y
67	Coryphantha sneedii	1	Single cactus, in FL., on limestone slab lining small drainage. Photos.	Point	10 m below per GIS.	MuhSet, CerMon, VigSte, DalFor.	546345	3559069
68	Coryphantha sneedii	1	Single plant in FL. on limestone slab. Photos.	Point	ca. 3.5 m below (N) trail.	AgaLec, MuhSet, DAlFor.	546334	3559070
69	Nama xylopodum	2	2 Veg. Nama growing under a boulder.	Point	ca. 9 m. below (N) trail.	BerTri, GymGlu, CerMon.	546311	3559087
70	Coryphantha sneedii	1	Single cactus on large boulder. Photos.	Point	ca. 10 m. below trail.	FouSpl, BouObo, MuhSet	546297	3559082
71	Coryphantha sneedii	1	Single cactus in FL. and 11 Nama growing on large trailside boulder.	Point		ArtLud, AloWri, VigSte, NamXyl	546296	3559079
72	Coryphantha sneedii	6	5 veg. and 1 flowering cactus on rock opposite trail.	Point	ca. 2 m from trail.	BerTri, Stipa sp., ArtLud, AcaRoe	546292	3559068
73	Coryphantha sneedii	5	5 Cacti (2 in FL. and 3 Veg.), and 1 Nama growing on large boulder. Photos.	Point	ca. 4.5 m E of trail.	DalFor, QueGri, Tyhmopylla sp., AstCoc. Two are off boulder on west side.	546282	3559074
74	Nama xylopodum	11	8 flowering and 3 veg. Nama growing on two boulders south of trail.	31.682 m2	ca. 2 m S of trail.	AgaLec, MuhSet, AstCoc.	546276	3559062
75	Coryphantha sneedii	4	1 Veg. and 3 Fruiting Cacti on boulders above side trail (3 on boulder; 4th below boulder to NW. Photos.	Point	ca. 7-8 m S of trail.	AgaLec, MuhSet, AstCoc; OpuPha, VigSte, BouObo	546276	3559060
76	Coryphantha sneedii	3	3 Cacti: 1 FL; 2 Veg. under AgaLec. One cactus alive but uprooted. Placed below DasLei, above. Photos.	Point	ca. 13 m from trail (NE).	AgaLec, OpuEng, DasLei, MuhSet	546277	3559086
77	Coryphantha sneedii	1	Single cactus in FL. on limestone boulder. Photos.	Point	ca. 13 m NE of trail.	BouObo, HedOva, GymGlu, DasLei	546271	3559085
78	Coryphantha sneedii	4	4 vegetative plants in soils and broken limestone. Photos.	Point	ca. 4 m E of trail.	OpuPha, DasLei, MuhSet, DalFor, VigSte	546269	3559080
79	Coryphantha sneedii	1	Single cactus in fruit.	Point	ca 5 m SE of trail.	GymGlu, MuhSet, ChrMex	546264	3559067

Location	Occurrence	Plant Count	Notes	Length/Area	Proximity	Associated	X	Y
80	Coryphantha sneedii	1	growing in organic soils in cracks of limestone ca. 9 m from trail under large limestone rock.	Point	ca. 9 m S of trail	AstCoc, MuhSet, VigSte, GymGlu	546262	3559061
81	Coryphantha sneedii	7	6 cacti: 1 FL; 1 Bud; 4 Veg. growing below boulder with another individual ca. 1 m. beyond. Photo.	Point	ca. 1.5 m below (NE) trail.	DalFor, AgaLec, MuhSet, MelLeu, VigSte	546258	3559087
82	Nama xylopodum	2	2 veg. Nama growing on boulders.	Point	ca. 13 m below (NE) trail.	VigSte, AstCoc, DasLei	546252	3559091
83	Coryphantha sneedii	2	2 flowering cacti @ switchback. Photos.	Point	ca. 1.5 m below (NE) trail.	AgaLec, VigSte, DasLei, DalFor, MuhSet	546249	3559082
84	Nama xylopodum	1	Single vegetative Nama on exposed limestone.	Point	ca. 12 m NE of trail.	AgaLec, CerMon, BouObo	546244	3559102
85	Coryphantha sneedii	1	Single vegetative cactus. 3 veg. Nama. Photos.	Point	ca. 12 m N of trail.	JunPin, DalFor, MuhSet	546232	3559100
86	Coryphantha sneedii	1	Single veg. cactus on broken limestone slab. Photos.	Point	ca. 8 m. N of trail.	OpuPha, Aristida, GymGlu, AloWri, EpiMic	546222	3559097
87	Coryphantha sneedii	1	Single Plant in flower growing in boulder. no photos	Point	ca. 10 m N of trail.	QueGri, ParInc, DasLei, MuhSet	546216	3559096
88	Coryphantha sneedii	1	Single cactus in crack of rock.	Point	ca. 5 m from trail	VigSte, ParInc, MuhSet, DasLei	546215	3559093
89	Coryphantha sneedii	1	Single cactus in bud on exposed limestone. Photos.	Point	ca. 13 m E of trail.	Ruellia, DasLei, AgaLec, MuhSet	546215	3559104
90	Coryphantha sneedii	1	Single plant in FR. under Agave and Dalea, on rock fragments and soil atop limestone bedrock.	Point	ca. 10 m S of trail.	AgaLec, DalFor, ParInc, Ruellia sp.	546204	3559080
91	Nama xylopodum	7	2 flowering and 5 vegetative Nama growing on large rock bench. Trail wraps around ca. 7 m. from plants.	Point	ca. 7 m. E of trail.	AgaLec, FouSpl, DasLei, SopSec, DalFor, Aristida.	546209	3559096
92	Coryphantha sneedii	1	Single veg. plant under large Ocotillo and small feather dalea, on soils atop limestone steps.	Point	ca. 4 m SW of trail.	FouSpl, DalFor, ParInc, Ruellia sp.	546200	3559087

Location	Occurrence	Plant Count	Notes	Length/Area	Proximity	Associated	X	Y
93	Nama xylopodum	3	2 FL. and 1 Veg. plant frowing on rock.	Point	ca. 4 m below trail	AgaLec, Ruellia sp., BouObo, DasLei.	546195	3559098
94	Nama xylopodum	6	4 veg. and 2 flowering plants.	Point	well below trail.	BerTri, ParInc, MuhSet, AstCoc	546181	3559091
95	Coryphantha sneedii	1	Single flowering cactus and single veg. Nama on exposed bench. Photos.	Point	just above trail ca. 30 cm.	DalFor, Ruellia, MuhSet, ArtLud	546203	3559109
96	Coryphantha sneedii	2	1 FL. and 1 Veg. cactus just above switchback on gravelly limestone bench. 2nd. plant below (NE) under rocks. Photos.	Point	ca. 4 m E of trail.	MuhSet, DasLei, ArtLud, DalFor, AgaLec.	546205	3559117
97	Nama xylopodum	2	1 veg and 1 flowering plant on steep rock face.	Point	ca. 7 m S of trail.	DasLei, GymGlu, AcaRoe, DalFor, Morus microphylla	546190	3559107
98	Coryphantha sneedii	1	Single, large-stemmed, many flowered cactus growing under Sotol near cliff edge.	Point	ca. 7-8 m N of trail	DasLei, DalFor, MuhSet, OpuPha, AgaLec	546194	3559130
99	Coryphantha sneedii	1	Single fruiting plant under GymGlu and AgaLec	Point	ca. 8 m. N of trail.	GymGlu, AgaLec, MuhSet, DasLei, MelLeu	546192	3559127
100	Coryphantha sneedii	1	Single cactus under rock.	Point	ca. 7 m N of trail.	AgaLec, MuhSet, VigSte, Ruellia sp.	546187	3559123
101	Coryphantha sneedii	1	Single cactus in flower.	Point	ca. 9 m. NE of trail.	SopSec, BriLac, BerTri	546180	3559124
102	Nama xylopodum	9	5 veg. and 4 FL. Nama growing on limestone ca. 5 m NE of trail.	31.359 m2	5 m NE of trail	ArtLud, DasLei, AcaRoe, FouSpl,	546179	3559122
103	Nama xylopodum	4	4 veg. Nama at trail edge above rock cairn at switchback.	Point	within 30 cm of trail.	DasLei, Ruellia sp., MuhSet, MelLeu	546176	3559115
104	Nama xylopodum	1	Single Nama growing in trail.	Point	1 m S of rock cairn, growing in trail.	AgaLec, MuhSet, GymGlu	546175	3559116
105	Nama xylopodum	2	2 flowering plants on boulder.	Point	ca. 4-5 m N of bend in trail.	QueGri, DasLei	546171	3559126

Location	Occurrence	Plant Count	Notes	Length/Area	Proximity	Associated	X	Y
106	Nama xylopodum	3	1 FL. and 1 veg. Nama growing on boulder above trail. Additional plant ca. 3 m further up slope on rock face in flower.	Point	on boulder just above trail.	AcaRoe, MimAcuB, VigSte, MuhSet	546162	3559115
107	Coryphantha sneedii	1	Single cactus in flower on broken limestone above trail, ca. 4 m past a large Sotol.	Point	ca. 4 m. past large Sotol growing near trail.	MimAcuB, ParInc, DalFor, MuhSet, Tetraneuris sp., DasLei, OpuPha.	546157	3559113
108	Coryphantha sneedii	2	1 flowering cactus under a rock, and 1 fruiting cactus under Lechuguilla.	Point	ca. 10 m W of trail.	AgaLec, MuhSet, ChrMex, Astrolepis sp.	546149	3559115
109	Nama xylopodum	2	2 Nama in flower on bedrock slab.	Point	ca. 12 m W of trail.	DasLei, VigSte, GymGlu.	546142	3559100
110	Nama xylopodum	1	Single flowering plant in wash below trail.	Point	ca. 6 m SE of trail.	QueGri, Lithospermum sp.	546123	3559051
111	Nama xylopodum	8	4 veg. + 4 FL. plants on large boulder-like rock in wash.	Point	ca. 6 m SE of trail.		546112	3559032
112	Nama xylopodum	7	7 flowering Nama on rock lining arroyo	Point	ca. 10 m E of trail.	VigSte, ArtLud, UngSpe	546085	3559010
113	Nama xylopodum	1	Single Nama in bud on raised rock fragment.	Point	ca. 3 m from trail.	VigSte, ParInc, ArtLud, OpuImb	546065	3559015
114	Nama xylopodum	1	Single Nama on rock ca. 1 m from trail, in flower.	Point	1 m from trail.	DasLei, VigSte, ParInc	546059	3559008
115	Nama xylopodum	5	5 flowering and 1 vegetative Nama growing on large rock island along arroyo channel.	Point	ca. 15 m E of trail.	Oenothera sp., Cassia sp., DasLei, OpuEng, EscTub, DasLei	546070	3558997
116	Coryphantha sneedii	1	Single cactus in flower on large rock island in arroyo channel.	Point	ca. 15 m E of trail.	Oenothera sp., Cassia sp., DasLei, OpuEng, EscTub, DasLei	546069	3558994
117	Nama xylopodum	3	2 vegetative and 1 flowering Nama in arroyo bottom	Point	At edge of survey buffer, East of trail.	DasLei, ParInc, MuhSet	546067	3558983
118	Nama xylopodum	27	Area with Nama: 16 flowering; 9 vegetative; 2 fruiting.	28.449 m2	ca. 10 m from trail	DasLei, SopSec, GymGlu, MuhSet, UngSpe, BouObo	546069	3558947

Location	Occurrence	Plant Count	Notes	Length/Area	Proximity	Associated	X	Y
119	Nama xylopodum	8	2 Nama in Bud plus 6 in flower on large rock.	Point	ca. 8 m W of trail.	BerTri, AloWri, BouObo, Nicotiana sp.	546051	3558953
120	Nama xylopodum	1	Single Nama in Fruit at edge of buffer zone NW of trail	Point	ca. 14 m NW of trail	BerTri, VigSte, ParInc	546035	3558942
121	Nama xylopodum	5	4 flowering and 1 vegetative Nama on cliff-break just above arroyo.	Point		FouSpl, VigSte, DalFor, BouObo	546041	3558931
122	Nama xylopodum	20	10 veg. and 10 flowering Nama on cliff face ca. 6 m above trail.	184.014 m2	6 m above trail.	Ruellia sp., ParInc, BouObo	546013	3558917
123	Nama xylopodum	1	Single vegetative Nama on large rock below trail.	Point	just below trail.	OpuEng, ParInc, BouObo	546036	3558922
124	Nama xylopodum	18	11 flowering and 7 vegetative Nama ca. 8 m from trail on large rocks in and aligning arroyo.	48.574 m2	8 m from trail.	VigSte, UngSpe, OpuEng, DasLei	546032	3558907
125	Nama xylopodum	2	1 veg. and 1 flowering Nama at trail edge.	Point	ca. 20 cm, and 75 cm. NW of trail.		546013	3558906
126	Nama xylopodum	6	1 flowering, 1 fruiting, and 4 veg. Nama on rock of arroyo terrace.	Point	ca. 8 m below trail	BouObo, BouEri, DasLei	546010	3558889
127	Nama xylopodum	1	Single Nama, in flower, growing in the middle of the trail on exposed bedrock.	Point	trail center	ParInc, DalFor	545992	3558884
128	Nama xylopodum	5	2 flowering and 3 vegetative Nama on slope between trail and arroyo ca. 3-10 m from trail.	25.047 m2	3-10 m from trail.		545985	3558875
129	Nama xylopodum	2	2 Veg. Nama on small boulder above trail.	Point	ca. 5 m. above trail.	OpuEng	545980	3558884
130	Nama xylopodum	5	5 Fl. Nama growing in trail on bedrock.	12.51 m2	in trail.	AgaLec, DasLei, ArtLud	545974	3558877
131	Nama xylopodum	4	1 flowering and 3 veg. Nama on large rock fragment below trail.	Point	ca. 2-3 m below trail		545972	3558869
132	Nama xylopodum	4	3 flowering and 1 veg. Nama on boulder above trail.	Point	ca. 7 m above trail.	DasLei, VigSte, AloWri, MuhSet	545967	3558878

Location	Occurrence	Plant Count	Notes	Length/Area	Proximity	Associated	X	Y
133	Nama xylopodum	3	3 veg. Nama on arroyo bedrock terrace.	Point	ca. 9 m below trail	Ruellia, VigSte, DalFor, Lithospermum sp.	545969	3558866
134	Nama xylopodum	3	1 flowering and 2 vegetative Nama on trailside boulder @ base of rock cairn.	Point	plants and trail separated by1 m thick rock	ArtLud, VigSte	545921	3558860
135	Nama xylopodum	2	1 flowering and 1 veg. Nama on large rock linining arroyo below trail.	Point	ca. 5 m S of trail.	RhuVir, JunPin, SopSec, MuhSet	545921	3558847
136	Nama xylopodum	1	Single Nama in Fl. growing on boulder ca. 6 m above trail.	Point	ca. 6 m above trail.	ParInc, GymGlu, AcaRoe	545914	3558856
137	Nama xylopodum	2	2 flowering Nama.	Point	ca. 8 m N of trail.	OpuEng, MimAcuB	545884	3558862
138	Nama xylopodum	10	6 flowering and 4 vegetative Nama growing on large rock slab.	Point	ca. 2 m. N of trail.	OpuEng, BerTri, VigSte, MimAcuB	545857	3558861
139	Nama xylopodum	3	3 Nama under rocks lining trail on arroyo bedrock	Point	at trail edge.	AgaLec, MuhSet	545831	3558815
140	Nama xylopodum	1	Single vegetative Nama.	Point	ca. 10 m W of trail	AgaLec, MimAcuB, MuhSet	545816	3558811
141	Nama xylopodum	1	Single vegetative plant.	Point	ca. 4.5 m W of trail	DasLei, AgaLec, MuhSet	545828	3558809
142	Nama xylopodum	12	Nama growing on bedrock lining arroyo (9 Veg., 3 Fl.).	Point	E of trail.	Crataegus (or Amelanchier), DasLei, MuhSet, JunPin	545843	3558802
143	Nama xylopodum	3	2 FL. and 1 veg. Nama growing on rock in wash.	Point	ca. 5 m S of trail	BriLac, ChiLin, GymGlu	545876	3558518
144	Nama xylopodum	2	1 FL. and 1 Veg. plant on rock off to side of trail. Site of rock cairn.	Point	1 m from trail	VigSte, DasLei, DalFor	545904	3558526
145	Nama xylopodum	1	Single nama growing on limestone bedrock.	Point	ca. 7 m from trail	CerMon, PhiHit, DalFor, TriMut	546005	3558476
146	Streptanthus sparsiflorus	1	Single plant in fruit.	Point	ca. 2 m from trail	BriLac, HetVil, JugMaj, ArtLud.	546083	3558369
147	Nama xylopodum	125	ca. 125 Nama in and above trail at rock cairn growing on bedrock. Perityle and Nama further up arroyo on cliffs.	261.645 m2	in trail.	DasLei, GymGlu, SapSap, BriLac, HetVil, ArtLud	546104	3558359

Location	Occurrence	Plant Count	Notes	Length/Area	Proximity	Associated	X	Y
148	Nama xylopodum	1	Single Nama in flower on large boulder.	Point	ca. 3 m from trail	HetVil, OpuImb, Galium sp.	546129	3558310
149	Nama xylo.., Perityle quinqueflora, Salvia summa	32 Nama, 47 Perityle, 28 Salvia	Perityle, Nama and Salvia growing on cliff and dyke-like rock lining and above arroyo.	367.12 m2	ca. 3 m from trail.	JugMaj, QueGri, HetVil, AcaRoe, BriLac, ArtLud	546144	3558278
150	Streptanthus sparsiflorus	3	3 fruiting Streptanthus under rock overhang.	Point	ca. 5 m from trail	JugMaj, ArtLud	546164	3558279
151	Nama xylopodum	1	Single nama on rock under QueGri	Point	ca. 3 m NE of trail.	QueGri, JunPin, DasLei, DalFor	546178	3558276
152	Coryphantha sneedii	1	Single cactus in bud at base of old cairn (pile collapsed). Photos.	Point	ca. 5 m from trail to S	QueGri, EchCoc, ParInc, DalFor, EscTub	546183	3558268
153	Nama xylopodum	5	3 Veg., 2 Fl. Nama growing above trail on bedrock.	Point	NE of trail.	FalPar, OpuEng, DalFor	546524	3557874
154	Nama xylopodum	3	Nama on boulder at base of large rock mass (1 FL., 2 Veg.)	Point	ca. 4 m from trail	ParInc, OpuEng, BerTri, AcaRoe	546574	3557842
155	Nama xylopodum	3	3 Nama in flower on rock beneath cairn at side of trail.	Point	at trail edge.	JunPin, DasLei, VigSte, ParInc, Ephedra sp.	546665	3557814
156	Nama xylopodum	6	4 Nama in flower and 2 Veg. on large rock mass in arroyo.	Point	ca. 10 m from trail	PhiHit, AloWri, ArtLud, GymGlu	546710	3557802
157	Nama xylopodum	4	3 Veg. and 1 Fl. Nama on bedrock lining arroyo.	Point	ca. 5 m from trail.	DalFor, GymGlu, Aristida sp., DasLei	546777	3557835
158	Nama xylopodum	12	9 Fl., 3 Veg. Nama on boulder	Point	ca. 4 m from trail.	EchCoc, AgaLec	547031	3557616
159	Coryphantha sneedii	1	Single cactus in flower at trail edge in cracks of rock.	Point	at trail edge.	BouObo, ParInc, AcaNeo, VigSte	547065	3557530
160	Nama xylopodum	9	5 FL., 4 Veg. Nama growing on large rock at base of rock cairn.	Point		DasLei, SapSap, UngSpe	547068	3557490
161	Nama xylopodum	2	2 Veg. Nama on large exposed bedrock of arroyo terrace.	Point	ca. 4 m from trail	UngSpe, PhiHit, JunPin, QueGri	547071	3557451
162	Streptanthus sparsiflorus	1	Single Streptanthus growing in soil/oak litter of bedrock lining arroyo	Point	ca. 2 m from trail to E.	AloWri, SopSec, GymGlu, QueGri	547073	3557436
163	Nama xylopodum	4	2 Veg. and 2 Fl. Nama on large rock in arroyo.	Point	ca. 2.5 m from trail.	Aristida sp., DasLei, BriLac, DalFor	547067	3557430

Location	Occurrence	Plant Count	Notes	Length/Area	Proximity	Associated	X	Y
164	Streptanthus sparsiflorus	1	Single streptanthus on rocks/soil at base of slope of arroyo terrace.	Point	ca. 2 m from trail		547076	3557429
165	Nama xylopodum	2	2 Veg. Nama on large boulder.	Point	ca. 3 m from trail.	AcaNeo, SopSec, DasLei	547077	3557427
166	Nama xylopodum	4	2 Veg. and 2 Fl. Nama on exposed bedrock slab	Point	ca. 3 m from trail	DalFor, EscTub, Ruellia sp.	547088	3557423
167	Nama xylopodum	4	2 Fl. and 2 Veg. Nama	Point	ca. 3.5 m from trail.	YucTor, DalFor, Ruellia sp.	547089	3557419
168	Coryphantha sneedii			Point	well out of survey buffer - No Impact.		547143	3557439
169	Streptanthus sparsiflorus			Point	well out of survey buffer - No Impact.		547278	3557846
170	Coryphantha sneedii		see P051121G & P051122A IN POINT DATASET.	121 m	No Impact - well above survey area.		546498	3558051
171	Coryphantha sneedii		Far from project area - no impact anticipated.	Point	far above trail on slope - no impact		546538	3558184
	Nama xylopodum	-	See Polygon F042622H - 32 plants on exposed limestone	Point	ca. 2m S of trail	AstCoc, MuhSet, FouSpl, AgaLec	546821	3558703
	Nama xylopodum	-	see polygon F051221B	Point			546157	3558149
	Perityle quinqueflora	0	see polygon P051116G	Point			546191	3558079
	Coryphantha sneedii	13 between PO51122A and 21G	Out of survey area, but occupied by cacti. Ends below nice assembly of Perityle. Nama throughout.	Point	far above trail on slope - no impact	Nama xylopodum, Perityle quinqueflora	546541	3557790
	Coryphantha sneedii	13 between PO51122A and 21G	Transect between two points contains ca. 13 cacti and ends below cliff habitat Perityle populaiton. Nama common on slope.	Point	far above trail on slope - no impact	Nama xylopodum, Perityle quinqueflora	546553	3557910
	Nama xylopodum		see polygon P051716B	Point			546080	3558731
	Nama xylopodum		see polygon P051716B	Point			546050	3558697

Location	Occurrence	Plant Count	Notes	Length/Area	Proximity	Associated	X	Y
	Nama xylopodum	0	5 Fl. Nama growing in trail on bedrock. See also polygon P051717C.	Point	in trail.	AgaLec, DasLei, ArtLud	546024	3558678
	Nama xylopodum		see polygon P051719H	Point			546076	3558704
	Nama xylopodum		see polygon P051720B	Point			546117	3558757
	Nama xylopodum		see polygon P051720B	Point			546119	3558764

Appendix 3. Supporting information for the list of target taxa (Table 1 of main report). This appendix includes:

1) A copy of the USFWS listed species for Eddy County, New Mexico, as available, December 2005. The USFWS no longer distributes dated lists.
2) A copy of the New Mexico Rare Plant Technical Council county list.

This list has been reviewed and approved by Bob Sivinski of the State Forestry Division (Energy Minerals and Natural Resources Department). Bob is responsible for maintaining the state of New Mexico's Endangered Species List.

Listed and Sensitive Species in Eddy County

Total number of species: 42

Print

Common Name	Scientific Name	Group	Status
Lesser prairie chicken	*Tympanuchus pallidicinctus*	Bird	Candidate
Texas hornshell (mussel)	*Popenaias popei*	Mollusc - Invertebrate	Candidate
Sand dune lizard	*Sceloporus arenicolus*	Reptile	Candidate
Least Tern (Interior Population)	*Sterna antillarum*	Bird	Endangered
Northern aplomado falcon	*Falco femoralis septentrionalis*	Bird	Endangered
Pecos gambusia	*Gambusia nobilis*	Fish	Endangered
Black-footed ferret	*Mustela nigripes*	Mammal	Endangered
Kuenzler hedgehog cactus	*Echinocereus fendleri var. kuenzleri*	Plant	Endangered
Sneed pincushion cactus	*Coryphantha sneedii var. sneedii*	Plant	Endangered
Bald eagle	*Haliaeetus leucocephalus*	Bird	Threatened
Mexican spotted owl Designated Critical Habitat	*Strix occidentalis lucida*	Bird	Threatened
Pecos bluntnose shiner Designated Critical Habitat	*Notropis simus pecosensis*	Fish	Threatened
Gypsum wild-buckwheat Designated Critical Habitat	*Eriogonum gypsophilum*	Plant	Threatened
Lee pincushion cactus	*Coryphantha sneedii var. leei*	Plant	Threatened

Species of Concern

Species of Concern are included for planning purposes only.

Common Name	Scientific Name	Group	Status
Limestone tiger beetle	*Cicindela politula petrophila*	Arthropod - Invertebrate	Species of Concern
American peregrine falcon	*Falco peregrinus anatum*	Bird	Species of Concern
Arctic peregrine falcon	*Falco peregrinus tundrius*	Bird	Species of Concern
Baird's sparrow	*Ammodramus bairdii*	Bird	Species of Concern
Black tern	*Chlidonias niger*	Bird	Species of Concern
Northern goshawk	*Accipiter gentilis*	Bird	Species of Concern
Western burrowing owl	*Athene cunicularia hypugea*	Bird	Species of Concern
Yellow-billed cuckoo	*Coccyzus americanus*	Bird	Species of Concern
Blue sucker	*Cycleptus elongatus*	Fish	Species of Concern
Gray redhorse	*Scartomyzon congestum*	Fish	Species of Concern
Greenthroat darter	*Etheostoma lepidum*	Fish	Species of Concern
Headwater catfish	*Ictalurus lupus*	Fish	Species of Concern
Pecos pupfish	*Cyprinodon pecosensis*	Fish	Species of Concern
Rio Grande shiner	*Notropis jemezanus*	Fish	Species of Concern
Black-tailed prairie dog	*Cynomys ludovicianus*	Mammal	Species of Concern
Guadalupe southern pocket gopher	*Thomomys umbrinus guadalupensis*	Mammal	Species of Concern
Pecos River muskrat	*Ondatra zibethicus ripensis*	Mammal	Species of Concern
Swift fox	*Vulpes velox*	Mammal	Species of Concern
Townsend's big-eared bat	*Corynorhinus townsendii*	Mammal	Species of

			Concern
Western red bat	*Lasiurus blossevillii*	Mammal	Species of Concern
Ovate vertigo (snail)	*Vertigo ovata*	Mollusc - Invertebrate	Species of Concern
Pecos springsnail	*Pyrgulopsis pecosensis*	Mollusc - Invertebrate	Species of Concern
Few-flowered jewelflower	*Streptanthus sparsiflorus*	Plant	Species of Concern
Glass Mountain coral-root	*Hexalectris nitida*	Plant	Species of Concern
Guadalupe rabbitbrush	*Chrysothamnus nauseosus var. texensis*	Plant	Species of Concern
Mat leastdaisy	*Chaetopappa hersheyi*	Plant	Species of Concern
Tharp's blue-star	*Amsonia tharpii*	Plant	Species of Concern
Wright's water-willow	*Justicia wrightii*	Plant	Species of Concern

Endangered	Any species which is in danger of extinction throughout all or a significant portion of its range.	**Threatened**	Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
Candidate	Candidate Species (taxa for which the Service has sufficient information to propose that they be added to list of endangered and threatened species, but the listing action has been precluded by other higher priority listing activities).	**Proposed**	Any species of fish, wildlife or plant that is proposed in the Federal Register to be listed under section 4 of the Act. This could be either proposed for endangered or threatened status.
Species of Concern	Taxa for which further biological research and field study are needed to resolve their conservation status OR are considered sensitive, rare, or declining on lists maintained by Natural Heritage Programs, State wildlife agencies, other Federal agencies, or professional/academic scientific societies. Species of Concern are included for planning purposes only.		

Foot Notes:

D Designated Critical Habitat.

P Proposed Critical Habitat.

1 Introduced population.

3 Extirpated in this county.

2 Survey should be conducted if project involves impacts to prairie dog towns or complexes of 200-acres or more for the Gunnison's prairie dog (*Cynomys gunnisoni*) and/or 80-acres or more for any subspecies of Black-tailed prairie dog (*Cynomys ludovicianus*). A complex consists of two or more neighboring prairie dog towns within 4.3 miles (7 kilometers) of each other.

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Results of County Search

EDDY	
Scientific name	County-NM
Amsonia tharpii	Eddy
Anulocaulis leiosolenus var. gypsogenus	Chaves, Eddy
Aquilegia chrysantha var. chaplinei	Eddy, Otero
Astragalus gypsodes	Eddy
Chaetopappa hersheyi	Eddy
Coryphantha scheeri var. scheeri	Chaves, Eddy
Echinocereus fendleri var. kuenzleri	Chaves, Eddy, Lincoln, Otero
Ericameria nauseosa var. texensis	Eddy, Otero
Eriogonum gypsophilum	Eddy
Escobaria guadalupensis	Eddy
Escobaria sneedii var. leei	Eddy
Hedeoma apiculatum	Eddy
Hexalectris nitida	Eddy, Otero
Justicia wrightii	Eddy
Muhlenbergia villiflora var. villosa	Eddy, Otero
Nama xylopodum	Chaves, Eddy, Otero
Penstemon cardinalis ssp. regalis	Eddy, Otero
Perityle quinqueflora	Eddy
Polygala rimulicola var. rimulicola	Eddy
Salvia summa	Chaves, Dona Ana, Eddy
Sibara grisea	Chaves, Eddy, Otero
Sophora gypsophila var. guadalupensis	Eddy, Otero
Streptanthus sparsiflorus	Eddy
Valeriana texana	Eddy, Lincoln, Otero