Astragalus tricarinatus
(triple-ribbed milk-vetch)

5-Year Review:
Summary and Evaluation

U.S. Fish and Wildlife Service
Carlsbad Fish and Wildlife Office
Carlsbad, CA

August 14, 2009

5-YEAR REVIEW

Astragalus tricarinatus (Triple-ribbed milk-vetch)

I. GENERAL INFORMATION

Purpose of 5-Year Reviews:

The U.S. Fish and Wildlife Service (Service) is required by section 4(c)(2) of the Act to conduct a review of each listed species at least once every 5 years. The purpose of a 5-year review is to evaluate whether or not the species' status has changed since it was listed (or since the most recent 5-year review). Based on the 5-year review, we recommend whether the species should be removed from the list of endangered and threatened species, be changed in status from endangered to threatened, or be changed in status from threatened to endangered. Our original listing of a species as endangered or threatened is based on the existence of threats attributable to one or more of the five threat factors described in section 4(a)(1) of the Act, and we must consider these same five factors in any subsequent consideration of reclassification or delisting of a species. In the 5-year review, we consider the best available scientific and commercial data on the species, and focus on new information available since the species was listed or last reviewed. If we recommend a change in listing status based on the results of the 5-year review, we must propose to do so through a separate rule-making process defined in the Act that includes public review and comment.

Species Overview:

Astragalus tricarinatus (triple-ribbed milk-vetch) is a plant in the Fabacae (pea) family with a distinct three-ribbed fruit. This perennial reaches 2 to 10 inches (5 to 25 centimeters) tall, has white to pale cream-colored flowers, and ranges within transition areas of the Sonoran and Mojave Deserts in San Bernardino and Riverside Counties in California. The abundance of this species fluctuates from year to year and may not be present above ground in drought years. Significant occurrences have been found since listing, resulting in an expansion of *A. tricarinatus* distribution and a recharacterization of known habitat.

Methodology Used to Complete This Review:

This review was prepared by the Carlsbad Fish and Wildlife Office (CFWO), following the Region 8 guidance issued in March 2008. We used survey information from experts who have been monitoring various localities of this species, and the California Natural Diversity Database (CNDDB) maintained by the California Department of Fish and Game (CDFG). Personal communications with species and habitat experts were our primary sources of information used to update the species' status and threats. We received one letter with information from the public in response to our *Federal Register* Notice initiating this 5-year review. The information is addressed in the appropriate section of this review. This 5-year review contains updated information on *Astragalus tricarinatus* biology and threats, and an assessment of that information compared to that known at the time of listing. We focus on current threats to the species that are attributable to the Act's five listing factors. The review synthesizes all this information to evaluate the listing status of *A. tricarinatus* and provide an indication of its

progress towards recovery. Finally, based on this synthesis and the threats identified in the five-factor analysis, we recommend a prioritized list of conservation actions to be completed or initiated within the next 5 years.

Contact Information:

Lead Regional Office: Diane Elam, Deputy Division Chief for Listing, Recovery, and Habitat Conservation Planning, and Jenness McBride, Fish and Wildlife Biologist, Region 8; (916) 414-6464.

Lead Field Office: Todd Archer, Fish and Wildlife Biologist; Bradd Bridges, Recovery Branch Chief; Carlsbad Fish and Wildlife Office; (760) 431-9440.

Cooperating Field Office(s): Brian Croft, Fish and Wildlife Biologist; Ventura Fish and Wildlife Office (VFWO); (805) 644-1766. The VFWO did not provide comments on this 5-year review.

Federal Register (FR) Notice Citation Announcing Initiation of This Review: A notice announcing initiation of the 5-year review of this taxon and the opening of a 60-day period to receive information from the public was published in the *Federal Register* on March 5, 2008 (USFWS 2008b, p. 11945). One letter with information relevant to this 5-year review was received during the 60-day period.

Listing History:

Original Listing
FR Notice: 63 FR 53596
Date of Final Listing Rule: October 6, 1998
Entity Listed: *Astragalus tricarinatus* (triple-ribbed milk-vetch) a plant species
Classification: Endangered

Associated Rulemakings: None

Review History: None

Species' Recovery Priority Number at Start of 5-Year Review: The recovery priority number for *Astragalus tricarinatus* is 2 according to the Service's 2008 Recovery Data Call for the CFWO, based on a 1 to 18 ranking system where 1 is the highest-ranked recovery priority and 18 is the lowest (USFWS 1983, p. 43098). This number indicates that the taxon is a species that faces a high degree of threat and has a high potential for recovery.

Recovery Plan or Outline: No recovery plan or outline has been prepared for this species.

II. REVIEW ANALYSIS

Application of the 1996 Distinct Population Segment (DPS) Policy

The Act defines "species" as including any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any species of vertebrate wildlife. This definition of species under the Act limits listing as distinct population segments to species of vertebrate fish or wildlife. Because the species under review is a plant, the DPS policy is not applicable, and the application of the DPS policy to the species' listing is not addressed further in this review.

Information on the Species and its Status

Species Description

Astragalus tricarinatus is a short-lived erect perennial plant in the Fabacae (pea) family. It reaches 2 to 10 inches (5 to 25 centimeters) in height. Leaves are 1.3 to 2.7 inches (7 to 20 centimeters) long, with 17 to 20 leaflets that are silvery strigose on the upper surface. The flowers are white or pale cream-colored, arranged in loose 6 to 17 flowered racemes. The fruit is narrow, 0.8 to 1.6 inches (2 to 4 centimeters) long, glabrous, and distinctly three-ribbed.

Species Biology and Life History

Astragalus tricarinatus habitat includes dry washes, bases of canyon slopes, and scree slopes (Barrows 1987, p. 2; Sanders and Thomas Olsen Associates 1996, p. 3). The numbers of standing individuals differs from year to year and the species may not be present above ground in drought years (Barrows 1987, p. 3). Specific seed dispersal mechanisms for *A. tricarinatus* are unknown. Seeds likely disperse from standing plants only over short distances. Based on patterns of occurrence known at the time of listing, there is potential for downstream dispersal over several miles based, in part, on patterns of occurrences known at time of listing. Occurrences at the heads of watersheds likely act as sources for waifs (isolated plant that is not self sustaining) or demes (group of waifs that do not persist) downstream.

Spatial Distribution

Astragalus tricarinatus is found in transition areas of the Sonoran and Mojave Deserts in southern California. At listing, *A. tricarinatus* was known by historical occurrences from eight areas in the southeastern San Bernardino Mountains and western Little San Bernardino Mountains in Riverside County, and the Orocopia Mountains and Santa Rosa Mountains in Riverside County (Appendix 1). At the north end of the Coachella Valley, occurrences were in Whitewater Canyon (Element Occurrence (EO) 3, 12, and 14), Mission Creek (EO 9, 11, and 15), Dry Morongo Creek and Wash (EO 4 and 5), Big Morongo Canyon (EO 1, 2, 6, 7, and 13), Coyote Hole Spring (no EO), and Key's Ranch (no EO) (Appendix 1). At the southwest corner of the Coachella Valley, a single-plant was documented in Agua Alta Canyon (EO 8) and the Orocopia Mountains (no EO) to the east (Appendix 1). All occurrence records were based on herbarium specimens or reliable sightings and included site observations when available. At listing, the Big Morongo Canyon occurrence was the only one considered to support a population

with multiple plants. In 1995, a single plant was found in Whitewater Canyon, the type locality, and another plant was documented in Mission Creek. The Key's Ranch occurrence is in the north-central section of Joshua Tree National Park (Joshua Tree NP) and is based on a single specimen and a subsequent trip to the Ranch failed to produce another specimen (Sanders 1999, p. 4). The Agua Alta occurrence was established by a single plant documented in 1985 and has not been observed since that discovery (CNDDB 2009, EO 8).

Reference was made in the listing rule to *Astragalus tricarinatus* occurring in the Orocopia Mountains citing Munz and Keck 1959 (USFWS 1998, p. 53600). This reference was incorrectly cited in the listing rule; the proper reference is Barneby (1959, pp. 868–869). Subsequent to this treatment, Barneby (1964, pp. 1030–1031) reaffirmed his statement that this species was found in the Orocopia Mountains. These mountains are east of the north end of the Salton Sea in Riverside County. Unfortunately, no voucher specimens have been located to support the occurrence.

The Cushenberry Canyon occurrence was included in the listing rule as an occurrence location of *Astragalus tricarinatus*. This occurrence was documented in San Bernardino County by Parish in 1895 (no EO; University of California specimen #574635). However, Greenhouse (Greenhouse 2006, UC Berkeley, pers. comm.) later determined this specimen was incorrectly identified *A. bernardinus* (San Bernardino milk-vetch). This specimen continues to be incorrectly listed in the CNDDB as *A. tricarinatus* (CNDDB 2009, EO 10). Therefore, the Cushenberry Canyon occurrence is no longer included as part of *A. tricarinatus'* distribution.

At the time of listing this species was only known from and thought to be restricted to canyon and wash bottom sites where very few individuals were found in any given year and in some years no standing plants were in evidence (USFWS 1998, p. 53600). The distribution of the species known at the time of listing consisted of a few scattered individuals in each of several separate watersheds mostly at the northwest end of the Coachella Valley (USFWS 1998, p. 53600). The persistence of a short-lived perennial plant species based on the existence of a few scattered individuals in ephemerally suitable habitats in widely separated drainages would seem unlikely. A more likely scenario is that it persisted because of source occurrences further upstream from where the occasional plants were found. The presumably larger self-sustaining source occurrences could provide seeds that washed downstream and result in occasional isolated waif plants thought to be the only representatives of the species.

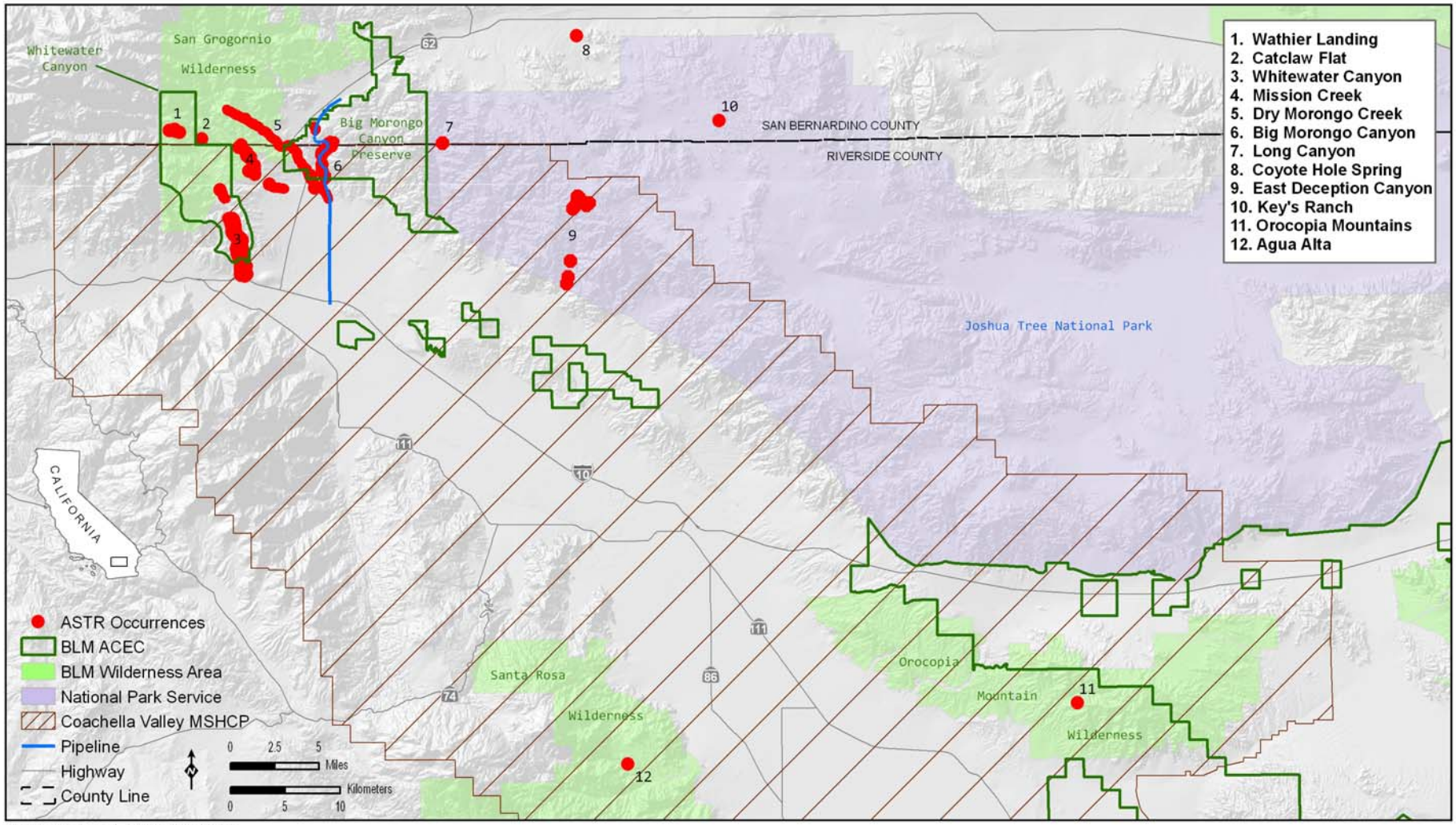

Figure 1. Distribution of *Astragalus tricarinatus* ("ASTR"; triple-ribbed milk-vetch) occurrences.

Since listing, 8 of the original occurrences are considered extant (lower section of Whitewater Canyon, Mission Creek, Dry Morongo Creek and Wash, Big Morongo Canyon, Coyote Hole Spring, Key's Ranch, Orocopia Mountains, and Agua Alta (discounting Cushenberry Canyon); Appendix 1) and 4 additional occurrences (Wathier Landing, Catclaw Flat, Long Canyon, and East Deception Canyon; Appendix 1) have been detected at the northern end of the historical distribution and in Joshua Tree NP. An occurrence of more than 300 plants was found in 2004 near Wathier Landing just east and upslope of Whitewater Canyon in San Bernardino County (White 2004, p. 23). This occurrence supported the same number of individuals in 2005 (Amsberry and Meinke 2007, p. 1). This site is unique because of the high number of individuals present, which is greater than all historical sightings and estimates combined, and because it is an upslope area; this is not a typical collection of waifs in the usual soil types.

In 2005, an occurrence supporting over 100 plants, including dozens of reproductive individuals and seedlings, was discovered east of Wathier Landing at Catclaw Flat in the Mission Creek drainage (Amsberry and Meinke 2007, p. 7). Like Wathier Landing, this occurrence is unique because of the high number of plants, it is located in an upslope area in the same unique soil type, and appears to be a persistent population. Because of these characteristics the Catclaw Flat and Wathier Landing occurrences can be considered source populations rather than deme populations. Since these occurrences appear to function as persistent populations, they were probably in existence at the time of listing as no surveys have been recorded for the areas.

In 2006, two additional new occurrences were found east of the historical occurrences at the northern end of Coachella Valley in Joshua Tree NP (see Figure 1). In Long Canyon, two waif plants were found. Another occurrence was discovered further east in East Deception Creek Canyon. Plants were found near the head of East Deception Creek Canyon on steep slopes and supported 51 individuals. Though this is a significant population, because it is found on scree slopes, it has not proven to be persistent and should be considered a deme population. Additionally, three waifs were found further down East Deception Creek (La Doux 2008, Granite Mountains Desert Research Center, pers. comm.).

Determining the extant range of *Astragalus tricarinatus* is difficult because historically known habitat types within the species' range have been inadequately surveyed. This is due to two factors: 1) the remoteness of occurrence locations and the difficulty of travel in the topography surrounding the occurrences, 2) abundance and detectability can vary significantly on an annual basis and follow-up surveys are not documented at any site for more than a few years (see Abundance section below). Plants have been difficult to locate where they are known to exist because of their life history characteristics (i.e. growing as an annual or short-lived (3 to 5 years) perennial) or the absence of plants during periods of drought). The new occurrences are significant in that they are in remote, upslope locations that may serve as source populations for the downstream occurrences previously thought to characterize extant populations. Additionally, occurrences discovered at Joshua Tree NP support the possibility that the potential distribution is a band around the Coachella Valley represented by the 12 occurrences in 10 watersheds (Wathier Landing and Catclaw flat are in the headwaters of Whitewater River) (see Figure 1). See Appendix 1 for an account of all known occurrences of *Astragalus tricarinatus.*

Abundance

At the time of listing, there were eight occurrences that were presumed extant: Whitewater Canyon (EO 3, 12, and 14), Mission Creek (EO 9, 11, and 15), Dry Morongo Creek and Wash (EO 4 and 5), Big Morongo Canyon (EO 1, 2, 6, 7, and 13), Coyote Hole Spring (no EO), Key's Ranch (no EO), Agua Alta Canyon (EO 8), and the Orocopia Mountains (no EO)(Appendix 1). This species was not known to be abundant, but rather consisted of small groups of plants or single waif individuals. In the listing rule, a year was referenced in which six individuals were found rangewide. Since listing, the number of occurrences has increased to 12. Also abundance has increased since listing with 2 occurrences with greater than 50 plants (Catclaw Flat (no EO), and East Deception Creek Canyon (no EO); Appendix 1) and an occurrence with over 300 plants (Wathier Landing (no EO); Appendix 1). Although the number of occurrences has increased, the total number of individuals known remains low (i.e., less than 500 individuals range-wide).

Surveying of upland areas above waif occurrences resulted in the discovery of source populations with hundreds of plants. The Whitewater occurrence was limited to two plants until the Wathier Landing occurrence of greater than 300 plants. Additionally, the Mission Creek occurrence consisted of five individuals until the upland discovery of the Catclaw Flat occurrence of more than 100 plants (Amsberry and Meinke 2007, p. 7). A similar situation may exist in East Deception Canyon. Waifs exist some 2 miles (3.2 kilometers) and 1,500 feet (450 meters) down the drainage from a substantial population of 51 plants (La Doux 2008, pers. comm.).

No information is available regarding the distribution of age classes of plants or the rate of seedling establishment.

Habitat or Ecosystem

Astragalus tricarinatus is found in transition areas of the Sonoran and Mojave Deserts from 1,300 feet to 4,000 feet (400 to 1,220 meters) (Sanders 1999, p. 4). Historically, *A. tricarinatus* was found in sandy or gravelly disturbed soils often in washes or at the base of canyon scree slopes (Barrows 1987, p. 2; Sanders and Thomas Olsen Associates 1996, p. 4). With the discoveries of the source populations, plants have been found in established soils with developed horizons on undisturbed upslope ridge tops (Avery 2008, USFWS, pers. obs.; Amsberry and Meinke 2007, p. 4). Accounts of the soil at the upland source sites describe the fine soils as white or blue-gray in color though no soil analysis has been performed (Avery 2008, pers. obs.; Sorensen 2008, USFWS, pers. obs.)

Associated plant taxa have not been recorded at all occurrences. However, associated plant taxa at the Wathier Landing occurrence include *Achnatherum coronatum* (giant ricegrass), *Arctostaphylos glauca* (bigberry Manzanita), *Ceanothus greggii* (desert ceanothus), *Condalia globosa* (bitter snakewood), *Dendromecon rigida* (bush poppy), *Erigonum fasciculatum* (California buckwheat), *Eriodictyon trichocalyx* (hairy yerba santa), *Stipa coronata* (giant stipa), and *Yucca schidigera* (Mojave yucca) (Amsberry and Meinke 2007, p. 4; White 2004, p. 23). At East Deception Creek, associated species include *Larrea tridentate* (creosote), *Psorothamnus schottii* (Schott's indigo bush), *Asclepias subulata* (rush milkweed), *Hymenoclea salsola var.*

pentalepsis (burrobush), and *Lotus scoparious* (deerweed) (La Doux 2007, Granite Mountains Desert Research Center, pers. comm.).

Changes in Taxonomic Classification or Nomenclature

There have been no changes in the nomenclature or taxonomic classification of *Astragalus tricarinatus* since it was listed.

Genetics

We are aware of no studies of genetic diversity or breeding system specific to *Astragalus tricarinatus*.

Species-specific Research and/or Grant-supported Activities

Two populations of *Astragalus tricarinatus*, Wathier Landing and Catclaw Flat, were included in a population viability assessment (Amsberry and Meinke 2007, p. 16). The study suggested reproduction and seedling germination occur in most years and *A. tricarinatus* seedlings were more robust when grown in soils inoculated with mutualistic soil fungi (mycorrhizae) and nitrogen-fixing soil bacteria (*Rhizobium*). Suggested research included: germination biology, pollination ecology, edaphic (soil conditions) preferences, seed longevity, disturbance ecology, and mycorrhizal or *Rhizobium* requirements of *A. tricarinatus* (Amsberry and Meinke 2007, p. 16).

Five-Factor Analysis

FACTOR A: Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

At listing, threats to the habitat or range of *Astragalus tricarinatus* included maintenance activities for the crude oil pipeline in Big Morongo Canyon, vehicle use in canyons, and vulnerabilities of small numbers of plants (e.g., pipeline leaks, breaks, or emergency repairs) (USFWS 1998, p. 53606). The listing rule recorded past instances of plants destroyed in road-grading activities and plants impacted in pipeline realignment procedures. No leaks or breaks in pipelines were documented in the range of *A. tricarinatus* at listing. Pipeline ruptures and emergency repairs could result in impacts to the species' habitat through soil disturbance from trenching activities and associated vehicle traffic. The pipeline and vehicle threats pose a potential threat to the occurrences associated with the pipeline in Big Morongo Canyon. Threats associated with small numbers were applicable to all occurrences.

Since listing, threats to *Astragalus tricarinatus* arising from disturbance associated with pipeline maintenance and vulnerabilities to small population numbers are still present. These threats, along with the threat of vehicle use in Big Morongo Canyon will be discussed in Factor E. Potential habitat destruction from residential development is a new threat identified since listing.

Residential development may be an emerging threat to *Astragalus tricarinatus*. The occurrence

in East Deception Canyon is at the edge of Joshua Tree NP and downstream occurrences may be threatened by encroaching development (LaDoux 2007, p. 6). Growth also threatens the occurrences at Lower Mission Creek occurrence (LaDoux 2008, pers. comm.; Amsberry and Meinke 2007, p. 14). Development may destroy habitat downstream of known occurrences and further urbanization associated with development may contribute to illegal OHV use in nearby canyons of Joshua Tree NP.

Summary for Factor A

The only potential habitat threat to *Astragalus tricarinatus* since listing is residential development. Pipeline maintenance and unanticipated pipeline ruptures continue to be a potential threat to *A. tricarinatus* habitat at Big Morongo Canyon. There are no significant range-wide threats to *A. tricarinatus* habitat at this time.

FACTOR B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

It was noted in the 1998 listing rule (USFWS 1998, p. 53606) that the limited number of *Astragalus tricarinatus* plants made them vulnerable to scientific collectors, but it was not recognized as a threat. Overutilization of *A. tricarinatus* for any purpose has not been documented and is not a threat at this time.

FACTOR C: Disease or Predation

Disease and predation were not known to be threats to *Astragalus tricarinatus* in the listing rule (USFWS 1998, p. 53606). Disease and predation are not threats at this time.

FACTOR D: Inadequacy of Existing Regulatory Mechanisms

The listing rule included the following regulatory mechanisms that may provide some protection to the five *Astragalus* taxa in the listing rule included: (1) the California Endangered Species Act (CESA); (2) the California Environmental Quality Act (CEQA); (3) the Endangered Species Act, in cases where this species occurs in habitat occupied by other listed taxa; (4) the Clean Water Act; (5) the Federal Land Policy and Management Act; and (6) regional planning efforts (USFWS 1998, p. 536067). No specific applicability to *A. tricarinatus* was discussed other than to note that no species covered under the Act co-occurred with *A. tricarinatus* (USFWS 1998, p. 53607).

Existing regulatory mechanisms that may provide some protection for these taxa include: (1) CEQA for occurrences on private lands; (2) the Endangered Species Act, in those cases where these taxa occur in habitat occupied by other listed species or where the species occurs on Federal lands; (3) the Federal Land Policy and Management Act in cases of extractive mining; and (4) regional planning efforts. *Astragalus tricarinatus* is not listed by the State of California and therefore is not directly covered by CESA.

State Protections

California Environmental Quality Act (CEQA): CEQA requires review of any project that is undertaken, funded, or permitted by the State or a local governmental agency. If significant effects are identified, the lead agency has the option of requiring mitigation through changes in the project or to decide that overriding considerations make mitigation infeasible (CEQA section 21002). Protection of listed species through CEQA is, therefore, dependent upon the discretion of the lead agency involved. *Astragalus tricarinatus* is not State-listed, but may receive indirect protection where it co-occurs with CESA species.

California Endangered Species Act (CESA) and Native Plant Protection Act (NPPA): The CESA (California Fish and Game Code, section 2080 *et seq*.) prohibits the unauthorized take of State-listed threatened or endangered species. The NPPA (Division 2, Chapter 10, section 1908) prohibits the unauthorized take of State-listed threatened or endangered plant species. The CESA requires State agencies to consult with CDFG on activities that may affect a State-listed species and mitigate for any adverse impacts to the species or its habitat. Pursuant to CESA, it is unlawful to import or export, take, possess, purchase, or sell any species or part or product of any species listed as endangered or threatened. The State may authorize permits for scientific, educational, or management purposes, and to allow take that is incidental to otherwise lawful activities.

Furthermore, with regard to prohibitions of unauthorized take under NPPA, landowners are exempt from this prohibition for plants to be taken in the process of habitat modification. Where landowners are notified by the State that a rare or endangered plant is growing on their land, the landowners are required to notify CDFG 10 days in advance of changing land use in order to allow salvage of listed plants. CESA generally requires an incidental take permit for activities that would result in take of a State-listed species. Among other requirements for a State incidental take permit, a project proponent must demonstrate that any such take will be fully mitigated. *Astragalus tricarinatus* is not State-listed, but can co-occur with other State-listed species. Therefore, *A. tricarinatus* may receive indirect protection under CESA and NPPA.

Natural Community Conservation Planning Act: The Natural Community Conservation Program is a cooperative effort to protect regional habitats and species. The program helps identify and provide for area wide protection of plants, animals, and their habitats while allowing compatible and appropriate economic activity. Many Natural Community Conservation Plans (NCCPs) are developed in conjunction with Habitat Conservation Plans (HCPs) prepared pursuant to the Federal Endangered Species Act. The Coachella Valley Multiple Species Habitat Conservation Plan is an example and is discussed below.

Federal Protections

National Environmental Policy Act (NEPA): NEPA (42 U.S.C. 4371 *et seq*.) provides some protection for listed species that may be affected by activities undertaken, authorized, or funded by Federal agencies. Prior to implementation of such projects with a Federal nexus, NEPA requires the Federal agency to analyze the project for potential impacts to the human environment, including natural resources. In cases where that analysis reveals significant

environmental effects, the Federal agency must propose mitigation alternatives that would offset those effects (40 C.F.R. 1502.14(f)). These mitigations can provide some level of protection for listed species. However, NEPA does not require that environmental impacts be avoided, only that effects be assessed and the analysis disclosed to the public. Therefore, this regulatory mechanism may not be adequate to fully protect the species.

Endangered Species Act of 1973, as amended (Act): The Act is the primary Federal law providing protection for this species. The Service's responsibilities include administering the Act, including sections 7, 9, and 10 that address take. Since listing, the Service has analyzed the potential effects of Federal projects under section 7(a)(2), which requires Federal agencies to consult with the Service prior to authorizing, funding, or carrying out activities that may affect listed species. A jeopardy determination is made for a project that is reasonably expected, either directly or indirectly, to appreciably reduce the likelihood of both the survival and recovery of a listed species in the wild by reducing its reproduction, numbers, or distribution (50 CFR 402.02). A non-jeopardy opinion may include reasonable and prudent measures that minimize the amount or extent of incidental take of listed species associated with a project.

Under Section 9(a)(2) or the Act, with respect to endangered plant taxa, it is unlawful to remove and reduce to possession (i.e. collect) any such taxon from areas under Federal jurisdiction; maliciously damage or destroy any such taxon on any such area; or remove, cut, dig up, or damage or destroy and such species on any other area in knowing violation of any law or regulation of any State or in the course of any violation of a State criminal trespass law. As noted above *Astragalus tricarinatus* is not State-listed, but it does occur on Federal lands. Therefore, this species is only afforded protections under section 9 of the Act on Federal lands.

With regard to federally listed plant species, section 7(a)(2) requires Federal agencies to consult with the Service to ensure any project they fund, authorize, or carry out does not jeopardize a listed plant species. Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the "take" of federally endangered wildlife; however, the take prohibition does not apply to plants. Instead, plants are protected from harm in two particular circumstances. Section 9 prohibits (1) the removal and reduction to possession (i.e., collection) of endangered plants from lands under Federal jurisdiction, and (2) the removal, cutting, digging, damage, or destruction of endangered plants on any other area in knowing violation of a state law or regulation or in the course of any violation of a state criminal trespass law. Federally listed plants may be incidentally protected if they co-occur with federally listed wildlife species.

Under Section 10(a)(1)(A) of the Act there are provisions for collection of plants or plant parts for scientific purposes or to enhance the propagation and survival of the species. Under section 10(a)(1)(B) the Service may issue "incidental take" (take is defined in section 3(18) of the Act) permits for listed animal species to non-Federal applicants. Take and therefore incidental take protections are not extended to plants. "Incidental take" refers to taking of listed species that results from, but is not the purpose of, carrying out an otherwise lawful activity by a Federal agency or applicant (50 CFR 402.02). To qualify for an incidental take permit, applicants must develop, fund, and implement a Service-approved Habitat Conservation Plan (HCP) that details measures to minimize and mitigate the impact of such taking to listed species including listed plants. Issuance of an incidental take permit by the Service is subject to provisions of section 7 of the Act; thus, the Service is required to ensure that the actions proposed in the HCP are not

likely to jeopardize the animal or plant species or result in the destruction or adverse modification of critical habitat. Therefore, HCPs may provide an additional layer of regulatory protection.

Coachella Valley Multiple Species Habitat Conservation Plan

Coachella Valley Multiple Species Habitat Conservation Plan (CVMSHCP) is a habitat conservation plan developed under section 10(a)(1)(B) of the Act. The plan includes provisions to create a reserve system to conserve and manage populations of covered species, including *Astragalus tricarinatus*, following certain criteria. The CVMSHCP conserves 2,838 of the 3,007 modeled acres of *A. tricarinatus* habitat (CVAG 2007, p. 9-35). This *A. tricarinatus* habitat acreage is distributed over several habitat areas: Whitewater Canyon—1,295 acres; Mission Creek and Big Morongo Canyon—819 acres; Whitewater floodplain—866 acres; Santa Rosa and San Jacinto Mountains—1 acre. Two Mission Creek populations, the Wathier Landing occurrence (EO 14), Catclaw Flat (no EO), are on property owned by the Wildlands Conservancy (TWC). TWC also leased a nearby 40,032 acre BLM grazing allotment that has since been relinquished and grazing is no longer permitted (BLM 2007, p. 3; Doran 2009, BLM, pers. comm.). These private parcels are operated with the same goals as the encompassing BLM San Gorgonio Wilderness Area. The preservation offered by TWC is significant and provides continuity in protection for the two most abundant occurrences of *A. tricarinatus*.

National Park Service (NPS) Organic Act: The NPS Organic Act of 1916 (39 Stat. 535, 16 U.S.C. 1, as amended), states that the National Park Service "shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations … to conserve the scenery and the national and historical objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." The National Park Service Management Policies indicate that the Park Service will "meet its obligations under the National Park Service Organic Act and the Act to both pro-actively conserve listed species and prevent detrimental effects on these species." This includes working with the Service and undertaking active management programs to inventory, monitor, restore, and maintain listed species habitats, among other actions. Joshua Tree NP is aware of the recently discovered occurrences and is in the process of writing a management plan for the Park's *Astragalus tricarinatus* occurrences (La Doux 2009, Granite Mountains Desert Research Center, pers. comm.).

Federal Land Policy and Management Act of 1976 (FLPMA): The Bureau of Land Management is required to incorporate Federal, State, and local input into their management decisions through Federal law. The FLPMA (Public Law 94-579, 43 U.S.C. 1701) was written "to establish public land policy; to establish guidelines for its administration; to provide for the management, protection, development and enhancement of the public lands; and for other purposes". Section 102(f) of the FLPMA states that "the Secretary [of the Interior] shall allow an opportunity for public involvement and by regulation shall establish procedures … to give Federal, State, and local governments and the public, adequate notice and opportunity to comment upon and participate in the formulation of plans and programs relating to the management of the public lands". Therefore, through management plans, the Bureau of Land Management is responsible for including input from Federal, State, and local governments and the public. Additionally,

Section 102(c) of the FLPMA states that the Secretary shall "give priority to the designation and protection of areas of critical environmental concern" in the development of plans for public lands. Although the Bureau of Land Management has a multiple-use mandate under the FLPMA which allows for grazing, mining, and off-road vehicle use, the Bureau of Land Management also has the ability under the FLPMA to establish and implement special management areas such as Areas of Critical Environmental Concern, wilderness, research areas, etc., that can reduce or eliminate actions that adversely affect species of concern, such as *Astragalus tricarinatus.*

In addition to the protections offered by Federal statutes, there is a significant amount of Federal property managed to preserve native species. The San Gorgonio Additions Wilderness Area is 39,215 acres between San Bernardino National Forest and the Morongo Valley (BLM 2009). The Wilderness Area includes significant portions of the Mission Creek and Whitewater drainages and EO 9 in the Mission Creek drainage. Wilderness Area lands preclude all vehicle traffic and preserve significant contiguous area of *Astragalus tricarinatus* occurrences and habitat.

The Big Morongo Canyon Preserve is 31,000 acres the BLM has designated an Area of Critical Environmental Concern (BLM 2009b). It includes portions of Big Morongo Canyon and serves as a wildlife corridor between Joshua Tree NP, the San Gorgonio Additions Wilderness Area and San Bernardino National Forest. The Preserve has been responsible for significant restorative work following Wildland fire in 2005. It is not known if occurrences were directly affected by this fire. EOs 1, 2, and 7 are found within the Preserve.

Summary for Factor D

In summary, all regulatory mechanisms in place at listing are still operating today. Since listing, the Act is the primary law that provides protection for *Astragalus tricarinatus* on Federal lands or in instances where there is a Federal nexus. Other Federal and State regulatory mechanisms provide discretionary protections for the species based on current management direction, but do not guarantee protection for the species absent its status under the Act. Significant regional protections include the CVMSHCP. This plan provides long-term protections, management, and monitoring of *A. tricarinatus* occurrences. Additionally, many threats are mitigated because most occurrences are in areas of Federal or private preservation. Therefore, we believe that the Act still provides the most extensive protection for *A. tricarinatus*.

FACTOR E: Other Natural or Manmade Factors Affecting Its Continued Existence

The listing rule identified effects associated with small populations and off-highway vehicle (OHV) activity as threats affecting *Astragalus tricarinatus* under this factor. New threats to *A. tricarinatus* since listing include unanticipated pipeline events and maintenance, wildland fire suppression activities, flooding, and climate change.

Moreover, we consider the source occurrences at or near the headwaters of watersheds that support *Astragalus tricarinatus* vital to the persistence of the species in a watershed and for the species as a whole. There may be fewer source population sites than were previously known from downstream occurrences. This is because a source population may sustain several

downstream watershed reaches. As an example, the occurrence east of Wathier Landing received an application of fire retardant during the 2006 Millard fire. The extent and significance of this impact in not known. However, if it proves to be significant, not only could this source population be impacted but the potential for downstream plants for watershed gene flow could be eliminated. The likelihood of impacts to these remote source populations may be low; however, any such impacts may result in a high-magnitude threat because they could potentially impact all of the occurrences in the watershed.

Small Population Size

Astragalus tricarinatus faces rangewide threats from isolation and small population size. At the time of listing, low numbers of individuals at the only occurrence known to be extant was cited as a threat to the species (USFWS 1998, p. 53606). At listing we considered that linear reaches of several watersheds constituted the only suitable habitat. Any single impact to a portion of any of the reaches presumed to be occupied was thought to likely impact only nearby individuals.

With the exceptions of two source populations, all present and historical occurrences are comprised of waif individuals or demes. These small population sizes of *A. tricarinatus* make them particularly vulnerable to extinction from random natural events (e.g., large flood events and climate change) or other potentially calamitous anthropogenic events (e.g., wildfire suppression activities and pipeline leaks or repairs). Five categories of small population vulnerability are outlined: (1) species with a very narrow geographic range; (2) species with only one or a few populations; (3) species in which population size is small (identified as one of the best predictors of species extinction rate); (4) species in which population size is declining; and (5) species that are hunted or harvested by people (Primack 2006, p.159). Three of these categories apply to *Astragalus tricarinatus* (#2–4). Additionally, demographic fluctuations, environmental variation, and loss of genetic variability and related problems of inbreeding depression and genetic drift; and/or to natural catastrophes are cause for greater vulnerability to extinction of small populations (Barrett and Kohn 1991, p. 3). By these measures, the species is at increased risk of extinction. Though the threats associated with low abundance remain, the known expanded distribution and recent discoveries of source populations have reduced the magnitude of this threat since listing.

Calamitous Anthropogenic Events

Potential threats associated with pipelines affect Big Morongo Canyon (EO 1, 2, 6, 7, and 13) where a natural gas pipeline extends the length of the canyon. Since the pipeline carries natural gas, leaks and/or ruptures present the increased threat of fire. The pipeline is still in use though specific impacts have not been recorded since listing. Additionally, maintenance activities may crush existing plants. Although the magnitude of these threats has the potential to be high, the immediacy is low.

OHV Use

Impacts from illegal OHV use have been identified as a threat to occurrences in Joshua Tree NP. In 2006, a solitary *Astragalus tricarinatus* plant in Long Canyon was found crushed by an OHV

(LaDoux 2007, pers. comm.). All OHV use in Joshua Tree NP is illegal. The threat of OHV traffic is currently limited to lower Long Canyon in Joshua Tree NP, accessible from Desert Hot Springs. This threat is not rangewide and does not appear significant.

Wildland Fire and Suppression Activities

Wildland fires have impacted occurrences of *Astragalus tricarinatus* in recent years. The Wathier Landing occurrence burned in the Verbenia Fire in 1995 and again in the Millard fire in 2006. Also, sections of Big Morongo Canyon Preserve and Dry Morongo Wash were burned in the 2005 Paradise Fire. In 2006, the Sawtooth Complex burned the upper half of Dry Morongo Wash. Fire can burn existing plants and possibly affect seeds in the soil.

Additionally, response to wildland fires can affect the species. For example, 6 miles (9.7 kilometers) of bulldozer lines were cut in the 2006 Millard Fire which followed an abandoned road and were within a few hundred yards of the Wathier Landing, Catclaw Flat occurrences and EO 9 in lower Mission Creek. Areas known to support *Astragalus tricarinatus* were subsequently treated with fire retardant (Bennett 2008, USFWS, pers. obs.). Post-fire monitoring was not undertaken; however, a subsequent trip to the area in 2008 found almost 30 plants, though none were seedlings (Avery 2008, pers. obs.). In 2008, we issued a biological opinion regarding the aerial application of fire retardants (USFWS 2008, p. 2). The opinion stated that retardant would be expected to promote the spread or increase the density of nonnative invasive plants, and result in negative physiological effects to the *A. tricarinatus*. It also stated that retardant drops are likely to jeopardize the continued existence of *Astragalus tricarinatus*. At a minimum, the Service required consultations in instances of fire retardant use. Direct physiological impacts to a source population or a floral bloom of competing nonnative invasive plants from a phosphate-rich fire retardant drop are very realistic scenarios. Considering there are only two known source populations, such a threat may impact all subsequent waif populations, and could contribute greatly to the extirpation of the occurrence.

Wildland fires are possible throughout the range of *Astragalus tricarinatus*. Suppression activities including fire retardant drops and bulldozer use threaten populations in small areas. This potential threat of control activities is most significant for the source populations of Wathier Landing (no EO) and Catclaw Flat (no EO).

Climate Change

Since listing, it has become apparent that there is potential for threats to biota from ongoing, accelerated climate change (IPCC 2007). Current climate change predictions for terrestrial areas in the Northern Hemisphere indicate warmer air temperatures, more intense precipitation events, and increased summer continental drying (Field et al. 1999, Cayan et al. 2005, IPCC 2007). However, predictions of climatic conditions for smaller sub-regions such as California remain uncertain. It is unknown at this time if climate change in California will result in a warmer trend with localized drying, higher precipitation events, or other effects. One study predicted that 5 to 10 percent of California's native plant species would no longer find suitable habitat within the state, and thus be vulnerable to extinction, if average temperatures warmed 5–6° F (Morse et al. 1995, p. 393). Impacts to the species under predicted future climate change are unclear. A trend

of warming in the mountains of western North America is expected to decrease snowpack, hasten spring runoff, and reduce summer stream flows, and increased summer heat may increase the frequency and intensity of wildfires (IPCC 2007).

While it appears reasonable to assume *Astragalus tricarinatus* may be affected, we lack sufficient certainty regarding how and when climate change will affect the species, the extent of average temperature increases in California, or potential changes to the level of threat posed by fire and increased fire frequency. We have no knowledge of more detailed climate change information specifically for this species' range.

Summary of Factor E

With exception of climate change, Factor E threats to *Astragalus tricarinatus* have changed little since listing. The species continues to be potentially affected by potential increased fire from pipelines ruptures, illegal OHV activity, and wildfire suppression. Threats associated with small population size persist rangewide.

III. RECOVERY CRITERIA

No recovery plan or outline has been prepared for this species.

IV. SYNTHESIS

At the time of listing an occurrence at Big Morongo Canyon was the only one considered to support a population with multiple plants. Since listing, additional multi-plant populations have been found. The occurrences of single individuals are now generally thought to be waifs; seeds washed down from upstream populations. Despite the detection of additional populations, the species is still only represented by a few known populations of small size. Based on the rangewide continued threats associated with the few, small, isolated source populations and the waif occurrences they sustain, *Astragalus tricarinatus* continues to be threatened with extinction across all or a significant portion of its range and therefore meets the definition of endangered under the Act.

V. RESULTS

Recommended Listing Action:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist (indicate reason for delisting according to 50 CFR 424.11):
    ____ *Extinction*
    ____ *Recovery*
    ____ *Original data for classification in error*
__X__ No Change

New Recovery Priority Number and Brief Rationale: This plant species continues to face a high degree of threat. Because the species' biology is poorly understood and the threats are pervasive, the species has a low potential for recovery. It is also in conflict with construction or other development projects or other forms of economic activity. Therefore, the new recovery priority number is 5C.

VI. RECOMMENDATIONS FOR ACTIONS OVER THE NEXT 5 YEARS

1.) Perform annual surveys at known extant occurrences to acquire demographic and survival information related to abundance. Also perform predictive GIS modeling involving source soil type in search of new source populations. The Wildlands Conservancy is a potential partner for occurrences under its preservation.

2.) Develop a site-specific plan to coordinate fire-fighting that is available to dispatch authority of interagency fire response. The Forest Service, BLM, and NPS-Joshua Tree National Park may be partners for occurrences in their respective jurisdictions. This plan might contain suggestions regarding areas to avoid when accessing the areas, cutting bulldozer lines, or making aerial retardant drops. These same areas would become areas of post-fire surveys in coordination with a BAER plan.

3.) Surveying all known occurrences (including extralimital sites such as Agua Alta Canyon, Key's Ranch, and the Orocopia Mountains) within the next 5 years. Make use of descriptive parameters of more recently detected upland occurrences to assemble predictive maps of likely habitat.

4.) Coordination with Four Corners Pipeline on protocol to ensure low-impact pipeline maintenance procedures. Vehicles driven along the pipeline and trenching equipment used to maintain the pipeline can minimize their impacts.

5.) Produce a Recovery Plan which would coordinate and direct survey and research actions beneficial to species recovery and that will reduce or eliminate threats to the species. Include occurrence map with risk assessment.

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW

Astragalus tricarinatus
triple-ribbed milk-vetch

Current Classification: Endangered

Recommendation Resulting from the 5-Year Review:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
__X__ No change needed

Review Conducted By: Carlsbad Fish and Wildlife Office

FIELD OFFICE APPROVAL:

ACTING **Lead Field Supervisor, U.S. Fish and Wildlife Service**

Approve _____ Date AUG 1 4 2009

Scott A. Sobiech

Appendix 1: Occurrences of *Astragalus tricarinatus*; prepared for 5-year review, 2009.

Occurrence Group	Occurrence Name	CNDDB Element Occurrence Number	Count	Ownership	Threat	Collection	Conservation and Preservation
San Bernardino County							
1	Wathier Landing	14	300 (2004) - CNDDB	Wildlands Conservancy	Factor E: low populations size; wildland fire suppression activities	Rancho Santa Ana #10150	Private conservation by the Wildlands Conservancy
2	Catclaw Flat	None	100+ (2005) - Amsberry & Meinke 2007	Wildlands Conservancy	Factor E: low populations size; wildland fire suppression activities	Not vouchered	Private conservation by the Wildlands Conservancy
5	Dry Morongo Creek	5(4)	unknown (1941)	BLM/Private	Factor E: low population sizes	Dudley #5196	North half in San Gorgonio Wilderness, S half in ACEC; CVMSHCP
6	Big Morongo Canyon	1	2 (1983)	BLM	Factor A: pipeline maintenance; vehicle use Factor E: low population size; pipeline activities	CNDDB - BAR87F0001	Big Morongo Canyon Preserve; ACEC
		2(7)	<50 (1993)	BLM	Factor A: pipeline maintenance; vehicle use Factor E: low population size; pipeline activities	UC Riverside #18356	Big Morongo Canyon Preserve; ACEC
7	Long Canyon	None	2 (2006) - La Doux 2007	Joshua Tree NP	Factor E: low population size; OHV use "Illegal OHV use is a serious and on-going problem" - La Doux 2007	Joshua Tree NP #1446	Joshua Tree NP
8	Coyote Hole Spring	None	Collection (1926)	Private - 1 mile south of town of Joshua Tree	Factor E: low population size	Pomona - #147781	None
10	Key's Ranch	None	1926 (Sanders 1999)		Factor E: low population size	Not vouchered	Joshua Tree NP

Occurrence Group	Occurrence Name	CNDDB Element Occurrence Number	Count	Ownership	Threat	Collection	Conservation and Preservation
Riverside County							
3	Whitewater Canyon	3	1 immature (1995)	BLM/Private Conservation/Private	Factor E: low population size	UC Riverside #51674	Private Conservation, Friends of the Desert Mountains; CVMV fCH, Arroyo Toad fCH, CVMSHCP
		12	Collection (1987)	BLM/Private Conservation	Factor E: low population size	UC Riverside #50292	Private Conservation, Friends of the Desert Mountains; CVMSHCP, ACEC, edge in San Gorgonio Wilderness
4	Mission Creek	9	2 (1997)	BLM	Factor E: low population size	UC Riverside #120855	CVMSHCP and San Gorgonio Wilderness
		15	Collection (1998)	Wildlands Conservancy	Factor A: residential development Factor E: low population size	UC Riverside #102921	CVMSHCP
		11	Collection (1995)	BLM/Wildlands Conservancy	Factor A: residential development Factor E: low population size	UC Riverside #84218	CVMSHCP
5	Dry Morongo Creek	5(4)	unknown (1941)	BLM/Private	Factor E: low population sizes	Dudley Herbarium #5196	North half in San Gorgonio Wilderness, S half in ACEC; CVMSHCP
6	Big Morongo Canyon	6	8 (1986)	BLM	Factor E: low population size	CNDDB - BAR87F0002	ACEC, CVMSHCP
		13	Unknown (1994)	BLM/Coyote Canyon Group	Factor E: low population size	UC Riverside #37629	ACEC, CVMSHCP

Occurrence Group	Occurrence Name	CNDDB Element Occurrence Number	Count	Ownership	Threat	Collection	Conservation and Preservation
9	East Deception Canyon	None	51 (2008) - La Doux	Joshua Tree NP - North end of East Wide Canyon	Factor E: low population size	Joshua Tree NP #1452	Joshua Tree NP
		None	6 (2008) - La Doux 2008	Joshua Tree NP - Below Upper Covington Flats	Factor E: low population size	Joshua Tree NP #29375	Joshua Tree NP and CVMSHCP
		None	3 (2006) - La Doux 2007	Joshua Tree NP - Lower canyon/ wash	Factor A: residential development Factor E: low population size	Joshua Tree NP #1454	Joshua Tree NP and CVMSHCP
11	Orocopia Mountains	None	1964 Barneby		Factor E: low population size	Not vouchered	Santa Rosa Wilderness
12	Agua Alta Canyon	8	1 (1985)	Private - 1.6 m up from Martinez Canyon	Factor E: low population size	UC Riverside #8507	PBS fCH; CVMSHCP