

TRIPLE-RIBBED MILKVETCH

Astragalus tricarinatus Gray

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Management Status: Federal: Endangered (listed October 6, 1998)
California: S1.2, G1 (CDFG, 1998)
CNPS: List 1B, R-E-D code 3-1-3 (Skinner and Pavlik, 1994)

General Distribution:

Triple-ribbed milkvetch is endemic to California and is restricted to the dry slopes and canyons around the head of the Coachella Valley (Spellenberg, 1993; Munz, 1974; Barneby, 1964). It is primarily known from the vicinity of Whitewater Canyon (the type locality) and from Dry Morongo Canyon along Hwy. 62, as well as from scattered occurrences farther east in the Little San Bernardino Mountains, including an anomalous, relatively high elevation, site at Key's Ranch in Joshua Tree National Park (JTNP). Relatively recently, the species has been collected in the Martinez Canyon area in the Santa Rosa Mountains on the SW side of the Coachella Valley (*J. Stewart 8507, 16 March 1985, UCR*). This collection suggests the possibility that this plant also occurs in the rugged canyons of the San Jacinto and Santa Rosa Mountains between Whitewater Canyon and Martinez Canyon. However, extensive botanical survey of the Deep Canyon watershed above Palm Desert in the Santa Rosa Mountains has not revealed the species (Zabriskie, 1979).

There is one uncertain location that cannot be found on current maps. The problem is a collection in the Pomona College Herbarium (POM) with the following label data: "29 Palms Canyon, 1300 ft., *Hulda Crooks 352*, 15 April 1946". This probably refers to the vicinity of the mouth of Dry Morongo Canyon as the elevation is about right and the highway to Twentynine Palms from the coast (Crooks was a Loma Linda resident) passes through this canyon. It is possible that some people called this canyon leading to Twentynine Palms by the name used by Crooks. It is also remotely possible, however, that "29 Palms Canyon" was used to refer to a canyon closer to the town of Twentynine Palms and hence closer to the anomalous Key's Ranch locality. For example, this could have been an error based on Fortynine Palms Canyon. Strong evidence against this possibility is the given elevation of 1300 ft. (400 m), which is several hundred to more than a thousand feet lower than any possible site near Twentynine Palms. The city itself is at 2000 ft. (610 m) and all the canyons are in the mountains above that.

Distribution in the West Mojave Planning Area:

Most of the populations of this species appear to be just south of the WMPA boundary in the eastern end of the San Bernardino Mountains and at the western end of the Little San Bernardino Mountains, but some populations do occur at three locations in the WMPA: Little San Bernardino Mountains in JTNP (perhaps at Key's Ranch only), Big Morongo Canyon at the Riverside/San Bernardino counties line (several collections and observations), and in Dry Morongo Canyon just N of the San Bernardino County line

(several collections). Much of the suitable habitat along the southern margin of the WMPA is rugged and poorly explored and so it is possible that additional populations occur within the planning area in the upper reaches of Mission, Dry Morongo and Big Morongo Creeks, as well as in the western lobe of JTNP.

Natural History:

Triple-ribbed milkvetch is a somewhat bushy herb, generally described as a perennial, but apparently more commonly behaving as an annual. At best, it is a short-lived perennial persisting for about 3-5 years.

Mature plants are usually 12-20 in. (30-50 cm) tall and the stems are erect or ascending. Older perennating plants show a somewhat woody lower stem and tap root. The leaves are ca. 6-8 in. (15-20 cm) long and are markedly bicolored with the lower leaflet surfaces green and the upper surfaces distinctly whitened by dense, flattened, appressed hairs ca. 0.012 in. (0.3 mm) long. The leaflets vary from 0.1-0.56 in. (4-14 mm) long and from 0.1-0.26 in. (2.5 -6.5 mm) broad and are elliptical or ovate (larger leaflets) to almost circular (smaller leaflets) in outline. They typically number between 15 and 31 per leaf. Leaflet tips are commonly slightly notched (emarginate). The leaflets are quickly deciduous, but the petioles and rachis are persistent on the plant; on older plants the old leaf bases from last year generally clothe the bases of the stems bearing the leaves of the current year.

The erect racemose inflorescence bears 10-15 widely spaced flowers, which are ochroleucous to light yellow and dry to a light brown. The inflorescence is ca. 8-14 in. (20-35 cm) long. The pedicels are 0.08-0.12 in. (2-3 mm) long in flower and elongate to ca. 0.16 in. (4 mm) in fruits. Based on specimen records, the species flowers from 12 Feb. through 6 April, but the true range doubtless extends a few days beyond these dates. The flowers are ca. 0.5 in. (12 mm) long and the banner and wings are about equal in length. The calyx is ca. 0.25 in. (6 mm) long and about half of that length consists of the slender lobes. The hairs on the calyx are generally like those of the leaves and stems, but are generally dark brown in color, rather than whitish. A small percentage of them are the same color as the leaf hairs. The hairs of the supporting pedicel are the same color as those of the calyx. The hairs of the stem are like those of the leaves, but are sparse and so the stems appear green.

Fruits appear as early as mid March and are present until at least early May. The pods are sharply triangular in cross section, and seem tardily dehiscent; they appear, in fact, to open only toward the tip (distal end) and perhaps the seeds are shaken out gradually by wind or other disturbance after the pods have dried. The pods are 1-1.5 in./mostly 1.2-1.4 in. (25-38/mostly 30-35 mm) long and 0.16-0.2 in. (4-5 mm) broad. Shape varies from almost straight to moderately curved with the dorsal suture on the inside of the curve. The pod walls are tough and leathery and the dorsal suture forms a tough cord-like ridge, while the lower suture is inconspicuous except that it folds inward to form a partition that divides the pod into two longitudinal cells. The base of the pod narrows to a short stipe ca. 0.8-0.12 in. (2-3 mm) long. The seeds are brown, smooth, flattened and rounded-triangular in outline, except for a deep notch at the hylum. There are ca. 25-30 ovules in a typical well-formed ovary (12-15 per cell), but the number that typically mature into seeds is unknown. The pod is similar to that of Morongo milkvetch

(*A. bernardinus*) which occurs in the same general region, but apparently not in the same habitats.

The above description is largely drawn from herbarium specimens and hence is modified from the major published sources (Spellenberg, 1993; Isely, 1986; Barneby, 1964). There has been periodic confusion of this species with *A. bernardinus* Jones (e.g., UC SMASCH database, 1998; Jepson, 1936), and occasionally with other species, making the above amplified description seem warranted.

Triple-ribbed milkvetch appears most closely related to *A. bernardinus*, the only other member of Subsect. Tricarinati (Barneby, 1964), but has been confused (based only on flower similarity) with *A. pachypus* Greene and thus mistakenly reported from the south end of the San Joaquin Valley in Kern Co. (but, see: Barneby, 1964). It may in fact be related to both bush milkvetch (*A. pachypus*) and to the locally endemic Lane Mountain milkvetch (*A. jaegerianus* Munz), of the central Mojave Desert, though it placed in a different Subsection (Barneby, 1964).

Pollinators, germination requirements, seed longevity, and most other aspects of the biology of this species are unknown. The color and form of the flowers suggest that this species may be bee pollinated, as many legumes are, but this appears never to have been observed.

Habitat Requirements:

Triple-ribbed milkvetch is known to be restricted to sandy or gravelly soils in arid canyons at the edge of the desert, but otherwise its habitat requirements are very poorly described. Plants are most commonly found along washes on canyon bottoms and on the alluvial fans below, or as small populations or solitary individuals on decomposed granite slopes in canyons. It appears that no well-established permanent population of any size has ever been found. The largest population recorded was a transitory one on the bottom of Big Morongo Canyon. This numbered ca. 120 individuals in 1991 but had shrunk to a more normal 6-8 by 1997 (G. Helmkamp, pers. comm., 1997). All populations found to date appear marginal or transitory. The species appears to require open soil and is somewhat tolerant of, or may even require, soil disturbance, either natural or man made. It may benefit by the open loose soils left by flooding or construction activities. Labels variously record the habitat as: “gravelly S-slope”, “sandy moist wash”, “desert wash”, “dry sandy wash”, “wash edge at base of hill” and “roadside on canyon bottom”. It is apparent that this species is most commonly collected along washes and on canyon bottoms, but whether this represents the preferred habitat of the species or is simply the place that people collect, and hence find waifs, is yet to be determined. Given the small size of most populations and the instability of the habitats occupied, it is difficult to see how this species can maintain itself if washes truly are its main habitat. With every flood, seeds and plants will be destroyed or washed downstream out of the habitat area. If there is not a substantial population, some of which will escape destruction, or a permanent population in areas not subject to scouring, it is difficult to see how a scarce fugitive can maintain itself at all. Seed longevity should be investigated to determine if seeds are able to survive prolonged burial in sand following a flood so that they might wait for many years until another flood again exposes them and makes open habitat available. There is a great need for careful and thorough surveys of the slopes above the washes where this

species is usually found. If there are no “permanent” populations found there, then it should be concluded that this species is in fact a wash inhabitant and that the plants are few in number and their status precarious indeed.

Populations occur at elevations between 1300 and 4000 ft. (400-1220 m) but, except for the one site at Key’s Ranch, all are below 2000 ft. (610 m). There are many collections at 1500-1800 ft. (450-550 m), and that may be the preferred elevation range of the species. In Big Morongo Canyon, the species occurs in the middle part of the canyon, near the county line, but is rarely or never found above or below this area. The plants there are mostly found on the canyon bottom at the place where a large tributary from the east joins the canyon -- the drainage of this tributary should be searched to determine whether seeds are being carried down into Morongo Canyon from populations above.

Population Status:

Triple-ribbed milkvetch is known from scattered populations, but the factors that control the distribution and size of these populations are not understood. Known populations are few, small and highly unstable. Plants can flower the first year from seed and resulting populations are very unstable, behaving like annuals and shrinking and growing rapidly in response to rainfall and other environmental conditions. During some seasons, the species is difficult to find, while in other years it may be relatively common at some sites. At the Big Morongo Canyon site, where the species can usually be found, populations have varied from 6-120 individuals over just 6 years (G. Helmkamp, pers. comm.). The year (ca. 1991) when there were 120 was a season following heavy rains when the bottom of the canyon was scoured by floods and the plants appeared on the open canyon bottom. The plants did not persist and such numbers have not appeared in the years since, nor had so many been seen at that locality previously (G. Helmkamp, pers. comm.).

If the species is in fact largely restricted to canyon bottoms and wash margins, then it is an extremely rare species and somewhat vulnerable as a result. Even at two of the localities where it has been most regularly collected, Dry Morongo Canyon and Whitewater Canyon, the plants are extremely scarce and difficult to find. The only place where plants can be found with any regularity is in the middle stretch of Big Morongo Canyon, and even there the plants are few in most years. Generally only a handful of individuals can be found. Since habitat modification within its range has not been extensive, it does not appear likely that human activity has been a significant factor in its present scarcity. It is probable that some individuals were eliminated, along with some habitat, when the highway up Dry Morongo Canyon was constructed. Since that time, however, the highway has probably had only a minimal impact on remaining plants.

The Key’s Ranch area was visited in November of 1997 and no plants of this species were found in the area, despite extensive searching both there and in the nearby Barker Dam area. If the species is still present within that area of JTNP, it must be extremely rare.

Threats Analysis:

Current threats to this species do not appear serious, but are not well documented because the species has never been intensively studied and often cannot be found when

sought. It is fortunate that much of the area occupied is extremely rugged and not subject to much development pressure. If the species is restricted to wash margins, then there is some magnitude of a threat to the species by off highway vehicles, which typically use such washes as access routes in rugged landscapes. There is no significant grazing in the areas occupied, so that is not a threat. In addition, the palatability or possible toxicity of this species appears unknown, though some milkvetches are known to be toxic to livestock (Barneby, 1989). There is some disturbance due to pipeline construction or maintenance, but this is a mixed effect. Some individuals have been destroyed by the maintenance of the pipeline road down Morongo Canyon, but about 6 others appeared on soil freshly disturbed by pipeline construction there (G. Helmkamp, pers. comm., 1997). There is no significant mining activity within the range of the species, but there is a substantial amount of potentially minable gravel in Whitewater Canyon, and the threat of future mining thus exists. There is a small amount of scattered rural residential housing construction in the Morongo Valley area, but this is mostly on ridge and hilltops, and so until it has been demonstrated that this species occurs in those areas, any threats from these activities will remain indirect or theoretical. Road widening along Hwy. 62 could pose a future threat to the population in Dry Morongo Canyon, but such a threat does not appear imminent.

Biological Standards:

The important issues in the maintenance of this species are poorly understood. The range is not well defined and areas of major populations have not been clearly identified. It appears that the one site where the species is more or less continuously present, if only in small numbers, is Big Morongo Canyon. This is one of the most regularly visited sites within the range of the species, because of the presence of the Big Morongo Preserve at the head of the canyon, and hence observations there are expected to be more frequent, even if populations are equivalent to other sites. The immediate need is for extensive surveys throughout the range of the species that clearly delimit the extent and size of populations, as well as the habitat preferences of the species. Obviously, any projects within the general range of the species (e.g., road widening in Dry Morongo Canyon) should be preceded by careful and thorough surveys of the affected areas for the presence of this species in the areas to be disturbed.

Literature Cited:

- Barneby, R.C. 1964. Atlas of North American Astragalus, Mem. New York Bot. Gard. 13:1030-1031.
- Barneby, R.C. 1989. *Fabales* in Intermountain Flora, Vascular Plants of the Intermountain West, U.S.A. Vol. 3, Part B, New York Botanical Garden, New York.
- California Department of Fish and Game (CDFG), Aug. 1997. Special Plants List , Natural Heritage Division, Natural Diversity Data Base, Sacramento, California.
- Isely, D. 1986. Leguminosae of the United States, Astragalus L.: IV. Species Summary N-Z. Iowa State J. Res. 61(2):157-289.
- Jepson, W. L. 1936. A Flora of California, vol 2. California School Book Depository, San Francisco, California.

- Munz, P.A. 1974. A Flora of Southern California. Univ. California Press, Berkeley, California.
- Skinner, M.W. and B.M. Pavlik (eds.). 1994. Inventory of Rare and Endangered Vascular plants of California. Special Pub. No. 1 (5th ed.). California Native Plant Society, Sacramento, California.
- Spellenberg, R. 1993. *Astragalus*. In: J.C. Hickman (ed.), The Jepson Manual: Higher Plants of California, Univ. California Press, Berkeley, California.
- UC SMASCH database, 1998. UC Berkeley Herbarium website containing the Specimen Management System for California Herbaria database of Californian specimens in the UC and JEPS herbaria (<http://ucjeps.berkeley.edu/smasch/index.html>).
- Zabriskie, Jan. 1979. Plants of Deep Canyon and the Central Coachella Valley, California. Philip L. Boyd Deep Canyon Desert Research Center, University of California, Riverside.