DESERT CYMOPTERUS
Cymopterus deserticola Brandegee

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Management Status: Federal: USFWS Species of Concern; BLM Sensitive
California: S2.2, G2 (CDFG, 1998)
CNPS: List 1B, RED code 3-2-3 (Skinner and Pavlik, 1994)

General Distribution:

The entire known range of desert cymopterus occurs in the western Mojave Desert within the WMPA.

Distribution in the West Mojave Planning Area:

Desert cymopterus has been reported in widely scattered, generally highly dispersed and small populations in the WMPA. This species ranges from Apple Valley, San Bernardino County, northward approximately 55 mi. (89 km) to the Cuddeback Lake basin, San Bernardino County, and westward approximately 45 mi. (73 km) to the Rogers and Buckhorn lake basins on Edwards Air Force Base, Kern and Los Angeles counties (Bagley, 1995; BLM, 1977; CDFG, 1997; Dames and Moore, 1993). However, the Apple Valley sites are disjunct by at least 28 mi. (45 km) from the nearest known sites and they are known only from historic collections made in 1915, 1920 and 1941. More recent attempts to locate desert cymopterus in areas of the historic Apple Valley collections have been unsuccessful and it appears likely that these sites may have been lost to urban development and off-highway vehicle (OHV) use (Moe, 1988). The known extant portion of the range, not including Apple Valley, occurs in three adjacent areas: the Rogers Lake basin (including the small Buckhorn Lake area to the west and the Kramer Hills to the east), the Harper Lake basin, and the Cuddeback Lake basin. This extant portion of the range extends approximately 40 mi. (65 km) east-west and 35 mi. (56 km) north-south.

The largest of these areas is in the Rogers Dry Lake basin. Desert cymopterus occurs in this area, in sometimes widely separated populations, extending approximately 30 mi. (48 km) east-west, from the Kramer Hills to Buckhorn Lake, and about 19 mi. (30 km) north-south, from Peerless Valley to just south of Rogers Lake. Most of the known desert cymopterus sites in this portion of its range occur on Edwards AFB, in scattered sites near Rogers Lake and Buckhorn Lake, eastward across the Base to the Kramer Hills, including a site in the upper portion of Buckthorn Canyon which drains southeast to the Mojave River. One site occurs east of the Base in the Kramer Hills and five sites occur just north of the Base and south of the Santa Fe Railroad line, in the vicinity of Kramer and Boron. Kramer (the old Kramer Railroad Station located about 2.5 mi. (4 km) west of Kramer Junction) is the type locality for this species, first collected there in 1913 by Mrs. K. Brandegee (Brandegee, 1915). One other known site in the Rogers Lake basin occurs about 6 miles north of Edwards AFB in Peerless Valley (Bagley 1991, 1997; BLM, 1997; CDFG, 1997). Up to 130 plants have been reported from the Peerless Valley site, but fewer than 60 plants from the other six desert cymopterus sites that occur off of Edwards AFB in this area.

Prior to extensive surveys conducted in 1995, desert cymopterus had been reported from 29 sites on Edwards AFB, some of which were poorly documented as to location or source and some which were quite close together (Bagley, 1995). The 1995 surveys relocated 19 of these previously known sites and discovered 57 new locations on Base. This large number of new sites was no doubt due partly to the extensive effort made to search for them, but also partly to the wet winter and spring weather which produced an exceptionally abundant year for Mojave desert wildflowers, including desert cympoterus. Fewer than 1700 plants had previously been reported for the 19 known sites on Base, with one site accounting for 1000 plants and two others together accounting for about 300 plants. In 1995, 10,402 plants were counted at these 19 sites; one site with over 3200 plants, four other sites with over 1000 plants each, and two additional sites with over 500 plants each. In all, 76 desert cymopterus sites were observed on Base in 1995, and there were 14,362 plants counted. Unfortunately, no surveys for desert cymopterus appear to have been conducted off of Edwards AFB in 1995.

Desert cymopterus was first discovered in the Harper Lake basin by Mark Bagley in 1989 (ENSR, 1989). There are now seven reported sites, all within 4.5 mi. (7 km) of the Harper Lake playa. Six of these sites are along an east-west utility corridor that lies about one mile south of the playa. The seventh site lies about one mile to the north of the playa. Approximately 160 plants have been reported from these seven sites (CDFG, 1997; Dames and Moore, 1993). Approximately 7.5 mi. (12 km) separates the westernmost desert cymopterus site in the Harper Lake basin from the nearest Rogers Lake basin site in the Kramer Hills.

In the Cuddeback Lake basin, just north of the Harper Lake basin and northeast of the Rogers Lake basin, desert cymopterus populations are known from three sites. These sites all lie to the northeast, within 1.25- 2.5 mi. (2-4 km) of the playa. These were first discovered by Mary Ann Henry in 1988 (CDFG, 1997). A total of about 25 plants has been reported at these sites. Approximately 17 mi. (27 km) separates the Cuddeback Lake sites from the nearest Harper Lake site, and about 25 mi. (40 km) separates them from the nearest Rogers Lake basin site at Kramer.

Natural History:

Desert cymopterus is an early-spring flowering herbaceous perennial in the carrot family (Apiaceae). A detailed description of this species is found in Mathias (1930), and subsequent descriptions in floras appear to be based on this work. Desert cymopterus is an acaulescent plant, generally to about 6 in. (15 cm) high. It has long, slender, deep, tap roots with one or more leaves arising below ground from a short combined stem-root crown. Typically, there are one to several leaves per plant (pers. obs.; Charlton 1993; Smithsonian Institution, 1978). Petioles are about as long or longer than the leaf blades, but typically much of the petiole is hidden underground. Leaf blades are oblong-ovate in outline, highly dissected, grayish-green, and hairless. Purple flowers are clustered in a compact globe at the end of each leafless peduncle that rises above the leaves.

Mathias (1930) reports petole length as 1.5-3.9 in. (4-10 cm), leaf blade length as 0.8-2.6 in. (2-6.5 cm), and blade width as 1-3.5 in. (2-9 cm). A slightly longer blade length, 1.5-3.2 in. (4-8 cm), was reported in a 1977 study on Edwards AFB (Smithsonian Institution, 1978). However, in a 1995 Edwards AFB study during an exceptionally wet year, desert cymopterus plants were much larger and more vigorous than these descriptions indicate (Bagley, 1995). In that study, where the largest leaf was measured on more than 1,000 plants in three separate populations, the mean petole length (above ground only) was 2 in. (5.0 cm), with a maximum of 6

in. (15.2 cm); mean leaf blade length was 2.5 in. (6.3 cm), with a maximum of 4.2 in. (10.7 cm); and mean blade width was 2.4 in. (6.0 cm), with a maximum of 4.4 in. (11.1 cm). Instead of the one to several leaves per plant usually observed, or the mean of 2.6 and maximum of 14 leaves per plant reported in a 1992 study at the same sites (Charlton, 1993), the 1995 study plants had a mean of 5.2 and maximum of 28 leaves per plant.

Desert parsley *(Lomatium mohavense)* is the only other member of the carrot family within the range of desert cymopterus that might be confused with it. This species has similar highly dissected leaves in a basal cluster, but is readily distinguished from desert cymopterus by the dense, short covering of fine hairs on the leaves and by the flowers arranged in distinct compound umbels. Good illustrations and descriptions of desert cymopterus are found in Abrams (1951), Constance (1993), Jaeger (1941), and Smithsonian Institution (1978).

Desert cymopterus is a long-lived perennial geophyte, with perennating buds located underground at the top of the root crown (Charlton 1993; Smithsonian Institution, 1978). This species typically grows in the cool, moist conditions of winter and spring. The rainy season normally ends by early spring and plants quickly dry out and go dormant with the onset of hot weather, usually in April or May (pers. obs). Thus, there is a long period of dormancy when the plants are not visible above ground.

Limited data are available on population fluctuations in desert cymopterus. In dry years, it appears that some plants in a population may produce one or a few small leaves, but many plants (or possibly all plants in a very dry year) stay dormant throughout the normal growing season (pers. obs; Bagley, 1995). Like desert annuals, observable population numbers appear to fluctuate widely from year to year, apparently in response to the amount and timing of winter and spring rainfall (Bagley, 1995; Charlton, 1993; CDFG, 1997). This makes it very difficult to determine population trends. Nothing is known of the physiology of dormancy in this species or how long a dormant period plants can endure.

The highly dispersed, low density nature of many desert cymopterus populations may indicate that establishment of new individuals in a population is infrequent (Constance, 1979; Smithsonian Institution, 1978). The actual populations may also be larger than have been observed, due to high dormancy in drier years, as suggested by the results of the 1995 surveys on Edwards AFB. Very little is known about reproduction and recruitment in this species and nothing is known about pollination. Flowering occurs from March to early May, depending on the year (pers. obs.; Bagley, 1995; Constance, 1979; Moe 1988). If establishment is infrequent, poor seed production or seed survival may be a factor. Little or no seed production has been observed in several different years at a number of sites (pers. obs.; Charlton, 1993; Moe 1988). Moe found desert cymopterus at five sites in 1988 and at all sites reported that the inflorescences dried up and aborted before setting fruit. In a 1992 study at three sites on Edwards AFB, Charlton reported that only a small portion of the plants flowered and that only 37 inflorescences out of a total of 424 produced were observed to successfully produce seed (n=1084 plants). However, in the exceptional year for desert cymopterus in 1995, observations at the same sites on Edwards AFB showed that most plants (95%) produced inflorescences during the growing season, with an average of 1.8 inflorescences per plant and a maximum of 19 (Bagley, 1995). Near the end of the growing season 51.3% of the plants had set fruit (n=1129 plants). Seed viability, longevity in the soil, and predation on the rather large seeds has never been studied.

Successful reproduction is critical to the long-term survival of any population. Because of the annual variability in rainfall, the underground parts of herbaceous desert perennials, including

desert cymopterus, must be able to survive prolonged periods of low soil moisture and entire years without above-ground photosynthetic activity. These plants must also have the ability to maintain their populations over time with frequent years of reproductive failure (Beatley 1976). In dry years they may grow a few leaves, but not produce flowers or fruit. In very dry years they may endure drought by remaining dormant underground during the usual growing season. And, in very wet years they may produce flowers and fruits abundantly. The 1995 observations clearly demonstrated that desert cymopterus on Edwards AFB survived the 1988-1994 drought in large numbers and with great vigor and reproductive potential. It is most likely that populations of desert cymopterus are maintained by periodic recruitment only after these years of exceptionally favorable conditions.

Habitat Requirements:

Desert cymopterus is known to occur in deep, loose, well drained, fine to coarse sandy soils of alluvial fans and basins, often in swales or stabilized low sand dune areas and occasionally on sandy slopes. The known elevation range of this species is 2060-3060 ft (692-933 m), although Constance (1993) erroneously reports it at ± 4875 ft. (1,00 m) (Bagley, 1995; CDFG, 1997). It occurs in Mojave creosote bush scrub, desert saltbush scrub, and Joshua tree woodland with creosote bush scrub or desert saltbush scrub understory (Holland 1986). Common perennial associates growing with desert cymopterus include creosote bush *(Larrea tridentata)*, Joshua tree *(Yucca brevifolia)*, saltbush (*Atriplex polycarpa, A. canescens, A. spinifera, A. confertifolia)*, burro bush *(Ambrosia dumosa)*, goldenhead *(Acamptopappus sphaerocephalus)*, winter fat *(Krascheninnikovia lanata)*, peachthorn *(Lycium cooperi)*, cheesebush *(Hymenoclea salsola)*, desert croton *(Croton californicus* var. *mohavensis)*, and Indian rice-grass *(Oryzopsis hymenoides)*. The latter four species, in particular, are indicators of sandy habitats. A few sites occur in areas lacking creosote bush or saltbush as common species (Bagley, 1995); these areas are dominated by cheesebush and peachthorn with goldenhead and spiny hopsage (*Grayia spinosa*) and may fit better in the Mojave mixed woody scrub community type (Holland 1986). Desert cymopterus plants typically are widely scattered, usually growing in openings between shrubs. A diversity of annual species typically also occurs in these sandy habitats.

Population Status:

Desert cymopterus was formerly a federal Category 1 candidate for listing. It was removed from candidate status in February of 1996 by the U.S. Fish and Wildlife Service solely on the basis that it "occurs within the area being addressed by the West Mojave Coordinated Management Plan, which will function as a multi-species habitat conservation plan and this action will alleviate many of the threats to the species" (USFWS, 1996).

Until 1977 desert cymopterus was known from fewer than a dozen herbarium collections that probably represented no more than seven populations located near Kramer, Rogers Lake (formerly Muroc Dry Lake), Peerless Valley, and Apple Valley (CDFG, 1997). Observations since 1977 have substantially increased the number of known sites in the Rogers Lake basin and adjacent Kramer Hills. And, in the late 1980's, populations were discovered in Cuddeback and Harper Lake basins, extending the known range about 25 mi. (40 km) to the north and 10 mi. (16 km) east.

Historic Apple Valley collections, last made in 1941, were probably all from near Highway 18. This area is all private land and heavily developed now. Desert cymopterus was searched for,

but not seen, in this area in 1986 and 1988; it was reported that little suitable habitat remains due to commercial and residential development and ORV use (CDFG, 1997; Moe, 1988). The Natural Diversity Data Base considers this occurrence to be "possibly extirpated" (CDFG, 1997). Other surveys for this species in the Victorville-Apple Valley area have not been reported and surveys conducted in a wet year are needed to determine the status of desert cymopterus in this area.

With a number of sites very close together, and similar habitats connecting these to each other, it appears likely that desert cymopterus on Edwards AFB forms one highly dispersed population, with several areas of very favorable habitat where population densities are relatively high (Bagley, 1995). The five sites just north of the base near Boron and Kramer, on private land, and the Kramer Hills site, on BLM land, would be part of this dispersed population. The desert cymopterus site in Peerless Valley, on private land, appears to be an outlier to the north separated by several miles of unfavorable habitat. In this Rogers Lake basin-Kramer Hills area, approximately 14,300 desert cymopterus have been reported on Edwards AFB, about 180 plants on private land, and two plants on BLM land.

The distribution of this species on private versus BLM land in the Harper Lake basin in not known because of the patchwork of BLM and private land and the fact that the precise locations of some of the sites are not well documented. However, at least three of the seven reported sites in this area are on BLM land (one only partially) and these account for 104 of the approximately 160 desert cymopterus reported in this basin.

In the Cuddeback Lake basin, two of the three known sites occur on BLM land, the other is private. Only one of the approximately 25 desert cymopterus plants reported in this basin occurred on private land.

Over all, approximately 97% of the reported desert cymopterus plants are known to occur on Edwards AFB, about 2% on private land, and 1% on BLM land. This distribution is likely due in part to the fact that extensive efforts have been made to inventory this species on Edwards AFB and that similar efforts have not been made off Base. It also reflects the fact that extraordinarily large numbers of desert cymopterus were found on Base in 1995, an exceptionally wet year when apparently no surveys were conducted for this species off Base. There are many sandy sites outside of Edwards AFB that may provide suitable habitat for this species on both public and private lands within the Rogers, Harper and Cuddeback lake basins and surrounding areas (pers. obs.). Surveys in these areas, and in the intervening areas south to the historic sites in Apple Valley, need to be conducted in order to improve our understanding of the distribution and abundance of desert cymopterus. Given the lack of past efforts to search for this species outside of Edwards AFB, the amount of potentially suitable habitat within its known range, its relatively short season of growth and disappearance underground during its dormant periods, and the apparent population fluctuations between wet and dry years, it seems quite possible that desert cymopterus could be more widespread and abundant than we now know.

Threats Analysis:

Current threats to desert cymopterus are not obvious. The California Native Plant Society indicates that this species is threatened by sheep grazing, vehicles, and urbanization (Skinner and Pavlik, 1994). In addition, the Cuddeback Lake sites are located within the BLM Pilot Knob grazing allotment and cattle grazing has been reported as a threat to these populations (CDFG, 1997), however the Pilot Knob allotment is being retired from grazing.

There is no hard evidence about the affects of sheep or cattle grazing on desert cymopterus populations. Sheep grazing in sandy Mojave Desert soils typically results in extensive trampling and disturbance of the top several inches of the soil and the removal of the above ground parts of almost all herbaceous plants in the area grazed (pers. obs.). However, at the current time livestock grazing is not a factor over most of the range of desert cymopterus. Sheep grazing has been eliminated from BLM lands east of Highway 395 because of its impacts to the listed desert tortoise (Glen Harris, BLM Ridgecrest, pers. com.). Grazing is not permitted on Edwards AFB, although some sheep trespass has occurred on some desert cymopterus habitat on base. Additionally, cattle grazing is not currently occurring on the Pilot Knob allotment. The Desert Tortoise Preserve Committee and the Wildlands Conservancy have purchased the core property for that allotment and requested a permanent reservation from grazing which could be granted through the West Mojave Plan. The desert cymopterus populations on private land in the vicinity of Boron and Kramer Junction may be subject to sheep grazing and the site in Peerless Valley was grazed and trampled by sheep at least in 1991 and 1996 (pers. obs.). As long as grazing is not permitted on Edwards AFB, the Pilot Knob allotment, and east of Highway 395, grazing will potentially impact only a small portion of the known range of desert cymopterus.

In addition to potential grazing impacts, high levels of leaf predation in desert cymopterus have been observed in two studies on Edwards AFB in areas not grazed by livestock (Bagley, 1995; Charlton, 1993). More limited observations of high predation have been recorded off Base (pers. obs.; CDFG, 1997). This predation is presumably by native mammals (such as rabbits, hares, ground squirrels, mice, and kangaroo rats), insects (caterpillars and beetles), and desert tortoise. This predation may limit the reproductive potential and vigor of the plants, and contribute to the low density, dispersed nature of most of the reported desert cymopterus populations.

A number of roads go through desert cymopterus populations and no doubt the creation of these reduced the habitat for this species to a small extent. In the Apple Valley, where this species may be extirpated, OHV use has been cited as seriously impacting potential desert cymopterus habitat (Moe, 1988). In all other reported sites, vehicle use has been confined for the most part to existing roads (pers. obs.; M.A. Henry, pers. com.). Vehicle use therefore does not appear to be a current threat to this species.

Urbanization has apparently extirpated this species from the Apple Valley, although additional searches should be made to confirm this. Recent development pressures in the extant portion of the range of desert cymopterus have not been extensive; they include development along several existing utility right-of-way corridors, some expansion of facilities at Edwards AFB, and in the late 1980's and early 1990's development of solar power plants in the Harper Lake and Kramer Junction areas. There is the potential for further development, including increased facility expansion at Edwards AFB, additional utility and solar power development, and urbanization, particularly in the Peerless Valley, North Edwards, Boron, and Kramer Junction areas. If this species does not receive some protection, the urbanization of the Mojave Desert which is

occurring to the south (as in the Antelope Valley, Apple Valley, Victorville, and Adelanto areas) could spread northward over the next 20-50 years and have very significant impacts to desert cymopterus. Protections for the desert tortoise may provide some protection for desert cymopterus. Although desert cymopterus may be more abundant than previously thought, its known range occupies a very restricted portion of the western Mojave Desert, that portion which is adjacent to a very fast growing part of California.

Biological Standards:

Currently, the known areas where desert cymopterus are most dense occur on Edwards AFB just south of Rogers Lake, west of Leuhman Ridge, and south of Leuhman Ridge. At a minimum, significant portions of these areas should be protected to maintain these populations. Protection of habitat corridors between these populations may also be essential for their long term viability. However, our knowledge of the distribution and abundance of desert cymopterus off of Edwards AFB is too poor for proposal of protective efforts off Base. Focused surveys for this plant should be conducted outside of Edwards AFB to determine if high density sites exist and how any such areas could be protected.

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