Mancos milkvetch
(Astragalus humillimus)
5-Year Status Review:
Summary and Evaluation

Photo: Adriano Tsinigine, USFWS

U.S. Fish and Wildlife Service
New Mexico Ecological Services Field Office
Albuquerque, NM
August 2023

5-YEAR REVIEW
Mancos milkvetch (*Astragalus humillimus)*

1.0 GENERAL INFORMATION

1.1 Reviewers:

Lead Regional or Headquarters Office:
Janess Vartanian, Recovery Biologist, Recover and Restoration, Ecological Services, 505-348-6657

Lead Field Office:
Shawn Sartorius, Field Supervisor, 505-761-4781
Chuck Hayes, Supervisory Fish & Wildlife Biologist, 505-761-4754
Adriano Tsinigine, Fish & Wildlife Biologist, 505-564-7755

Cooperating Field Office(s):
Whit Blair, Fish & Wildlife Biologist, 970-628-7191

Cooperating Regional Office(s):
Not Applicable

1.2 Purpose of 5-Year Reviews:

The U.S. Fish and Wildlife Service (Service or USFWS) is required by section 4(c)(2) of the Endangered Species ESA (ESA) to conduct a status review of each listed species 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 as endangered or threatened is based on the species' status considering the five threat factors described in section 4(a)(1) of the ESA. These same five factors are considered in any subsequent reclassification or delisting decisions. 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 including public review and comment.

1.3 Methodology used to complete the review:

In conducting this 5-year review, we relied on the best available information pertaining to historical and contemporary distributions, life histories, genetics, habitats, and threats of this species. This review considers new information from Federal agencies, State and Tribal entities, non-governmental organizations, academia, and the general public. Information used in the preparation of the review includes monitoring reports, surveys, section 6-funded

projects, scientific publications, unpublished documents, personal communications from botanists familiar with the species, and internet web sites. Data sources include the New Mexico Energy, Minerals, and Natural Resources Department; Navajo Nation Department of Fish and Wildlife, Navajo Natural Heritage Program; Ute Mountain Ute Tribal Biologist; and Bureau of Land Management, Farmington Field Office. The Service's New Mexico Ecological Services Field Office and Western Colorado Field Office prepared the final review and recommended classification.

1.4 Background:

1.4.1 FR Notice citation announcing initiation of this review:

87 FR 5834: February 2, 2022

1.4.2 Listing history:

Original Listing
FR notice: 50 FR 26568
Date listed: June 27, 1985
Entity listed: Species, *Astragalus humillimus*
Classification: Endangered, without critical habitat

Revised Listing, if applicable
FR notice: N/A
Date listed: N/A
Entity listed: N/A
Classification: N/A

1.4.3 Associated Rulemakings:

There are no associated rulemaking for this species.

1.4.4 Review History:

A 5-year review was initiated on November 6, 1991, (56 FR 56882) for all species listed before 1991, but no document was prepared for this species. A 5-year review was initiated on April 23, 2007 (72 FR 20134) for this species and was completed in July 2011. This review recommends no change in status (remain as endangered).

1.4.5 Species' Recovery Priority Number at start of 5-year review:

5C

Degree of threat: High
Recovery Potential: Low
Taxonomy: Species

1.4.6 Recovery Plan or Outline

Name of plan or outline: Mancos Milkvetch (*Astragalus humillimus*) Recovery Plan
Date issued: December 20, 1989
Dates of previous plans/amendment or outline, if applicable: N/A

2.0 REVIEW ANALYSIS

Section 4 of the ESA (16 U.S.C. 1533) and its implementing regulations (50 CFR part 424) set forth the procedures for determining whether a species meets the definition of "endangered species" or "threatened species." The ESA defines an "endangered species" as a species that is "in danger of extinction throughout all or a significant portion of its range," and a "threatened species" as a species that is "likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." The ESA requires that we determine whether a species meets the definition of "endangered species" or "threatened species" due to any of the five factors described below.

Section 4(a) of the Act describes five factors that may lead to endangered or threatened status for a species. These include: A) the present or threatened destruction, modification, or curtailment of its habitat or range; B) overutilization for commercial, recreational, scientific, or educational purposes; C) disease or predation; D) the inadequacy of existing regulatory mechanisms; or E) other natural or manmade factors affecting its continued existence.

The identification of any threat(s) does not necessarily mean that the species meets the statutory definition of an "endangered species" or a "threatened species." In assessing whether a species meets either definition, we must evaluate all identified threats by considering the expected response of the species, and the effects of the threats—in light of those actions and conditions that will ameliorate the threats—on an individual, population, and species level. We evaluate each threat and its expected effects on the species, then analyze the cumulative effect of all of the threats on the species as a whole. We also consider the cumulative effect of the threats in light of those actions and conditions that will have positive effects on the species—such as any existing regulatory mechanisms or conservation efforts. The Service recommends whether the species meets the definition of an "endangered species" or a "threatened species" only after conducting this cumulative analysis and describing the expected effect on the species now and in the foreseeable future.

2.1 Distinct Population Segment (DPS) policy (1996):

Not applicable

2.2 Updated Information and Current Species Status

2.2.1 Biology and Habitat

2.2.1.1 New information on the species' biology and life history:

Mancos milkvetch is a diminutive, tufted perennial growing in clumps up to 30 centimeters (cm) (12 inches [in]) across with a dense crown of persistent spiny leaf stalks; no other mat-forming *Astragalus* species has persistent, subspinescent petioles (USFWS 1989). Stems are up to 1 cm (0.4 in) long and are crowded with leaves up to 4 cm (1.6 in) long, with 7-11 oval leaflets (USFWS 1989, p. 3). Flower branches support 1-3 lavender/purplish flowers with a conspicuous lighter-colored spot in the throat of the corolla tube (USFWS 1989, p. 3). Banner is 7-10 millimeters (mm) long, keel and banner petal 6-8 mm in length (USFWS 1989, p. 3). Mancos milkvetch flowers in late April and early May (USFWS 1989, p. 11). Root systems proliferate about 7 cm (3 in) below the surface (USFWS 1989). Larger plants may produce over 100 flowers in a growing season and fruits mature by mid-June (USFWS 1989, p. 11). The fruit is ellipsoid and laterally compressed measuring about 4.5mm (0.2 in) long and 2 mm (0.1 in) in diameter (USFWS 1989, p. 3), and each produces 4 to 9 seeds (USFWS 1989). In New Mexico, monitoring results revealed that it takes two growing seasons for seedlings to mature with flowering into the third or fourth year as compared to other species of *Astragalus*, which typically take one growing season to bloom (New Mexico State Forestry Division 2008).

We recommend referring to the previous 5-year review (USFWS 2011, pp. 6-8) for a complete discussion regarding Mancos milkvetch biology and life history.

2.2.1.2 Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, birth rate, seed set, germination rate, age at mortality, mortality rate, etc.), or demographic trends:

The genus *Astragalus* has more than 2,500 species worldwide, making it one of the largest flowering plant families (Lock and Simpson 1991, entire). Mancos milkvetch is a narrow endemic known only from the Four Corners region of San Juan County, New Mexico and adjacent Montezuma County, Colorado. Species distribution closely follows a narrow band of Mesozoic (Point Lookout and Cliff House) sandstone along a 16-km (10-mile) section of the Hogback geologic formation (USFWS 1989, p. 5). Mancos milkvetch occurs primarily on the Navajo Nation, with small populations on Bureau of Land Management (BLM) and New Mexico State Trust lands, and within the Ute Mountain Ute Tribal reservation in southwestern Colorado (Roth 2020a, p. 2).

Prior to 1989, we knew of a total of 13 populations, with three of these located on Ute Mountain Ute Tribal reservation in Colorado (USFWS 1989, p. 6). The Ute Mountain Ute Tribe has been monitoring two of the three populations since 2020, which are the Tribal Park, previously known as “Chimney Rock Mesa” and Tanner Mesa sites. New plots were installed for BLM and State of New Mexico lands starting in 1990. Monitoring has been ongoing within the BLM and State of New Mexico. Currently there have been efforts to locate any new populations within the Hogback Area of Critical Environmental Concern by the

Southwest Conservation Corps Rare Plants Crew. We know of 14 populations on Navajo Nation lands, including previously known and recently discovered populations. Total live percent cover has been measured for Mancos milkvetch individuals occurring at the Navajo Nation demography sites using the formula for the area of an ellipse (area (cm^2) = pi * radius A * radius B), allowing some comparisons to past population numbers (Talkington 2019, p. 6).

Colorado

Ute Mountain Ute Tribal Reservation

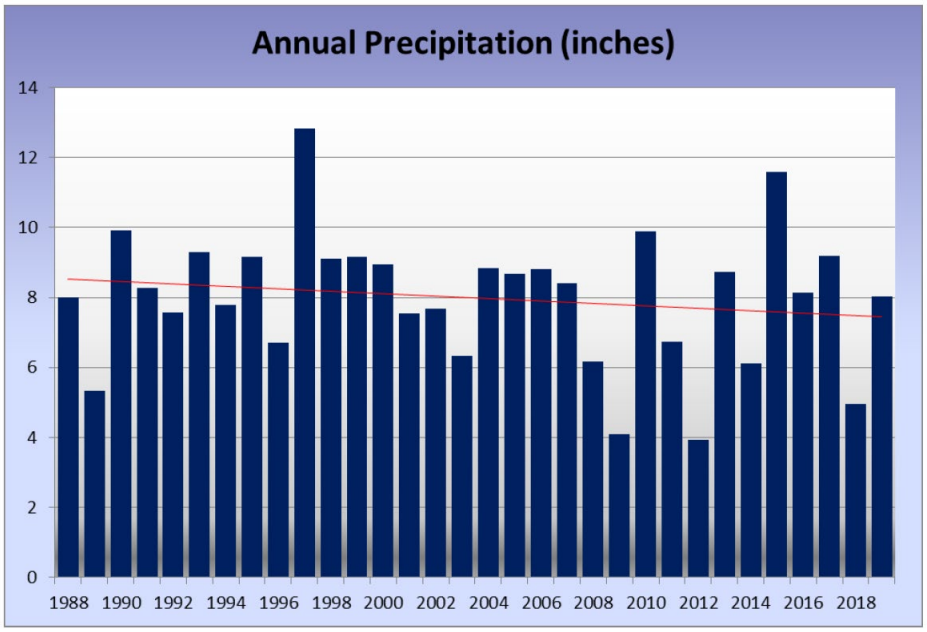
The Ute Mountain Ute Tribe has a total of 11 monitoring plots representing four subpopulations which have been established within the Tribal Park population. However, preliminary analysis lacks statistical power to estimate a long-term trend. A short-term increasing trend in population size and recruitment has been observed following drought recovery in the spring of 2023. There is no evidence of decline in the Tribal Park population since 2020. The Tanner Mesa population lacks sufficient data to draw a conclusion.

New Mexico

State Trust Lands, Sleeping Rocks Plot

Originally in 1990, five monitoring plots were established at the Sleeping Rocks population on State of New Mexico lands within the BLM Farmington Field Office (FFO) Area of Critical Environmental Concern (ACEC). Results from the 30-year review found the overall trend is a long-term slow decline (Figure 2) (Roth 2020a, p. 8). The lack of precipitation is the leading factor of the low rate of recruitment, fecundity, and high mortality. Three of the worst drought years documented since the beginning of the 30-year monitoring period beginning in 1988 occurred in 2009, 2012, and 2018 (Figure 1) (Roth 2020a, p. 8).

Figure 1. Annual precipitation at the AG Science Center near Farmington, NM from 1988 to 2019 (WRCC 2020). The red line is the trend line showing average annual precipitation.



The results of this monitoring site are better compared to the BLM Slickrock monitoring site. Four of the five monitoring transects are in cracks of the sandstone rather than tinajas, suggesting this habitat has a higher rate of success. This Sleeping Rocks site had 482 individuals in 1986 and only 118 individuals in 2020 (Table 1) (Roth 2020a, p. 8). Historic records show this site produced more seedlings than Slickrock Flats site, likely reflecting higher recruitment rates in cracks. Recently the seedling counts have declined at this along with the spring rainfall, which declined from an average of 2.189 inches between 1990-1999 to an average of 0.878 inches since 2002 (Roth 2020a, p. 5). Establishment of a seedling occurs during the spring rainfall and is essential for germination.

Table 1. Number of plants at the Sleeping Rocks site through time.

Sleeping Rocks	**Historic**	**Current**
Totals:	552	118

The Sleeping Rocks site is in the immediate vicinity of a transmission tower and an associated access road (Roth 2020b, pp. 9-10). In 2011, the Department of Energy's Western Area Power Administration (WAPA) consulted on conducting routine road maintenance on existing rights-of-way along WAPA's existing Lost Canyon-Shiprock transmission line. The right-of-way passes through the BLM-FFO Hogback ACEC and New Mexico State Trust land. The transmission lines were installed before the Endangered Species Act was passed in 1973. WAPA made a "may affect, not likely to adversely affect"

determination to Mancos milkvetch. Approximately ten percent of the action area (~20 acres) was considered suitable habitat for Mancos milkvetch (USFWS 2011, pp. 9-14).

Bureau of Land Management, Slickrock Flats Plot

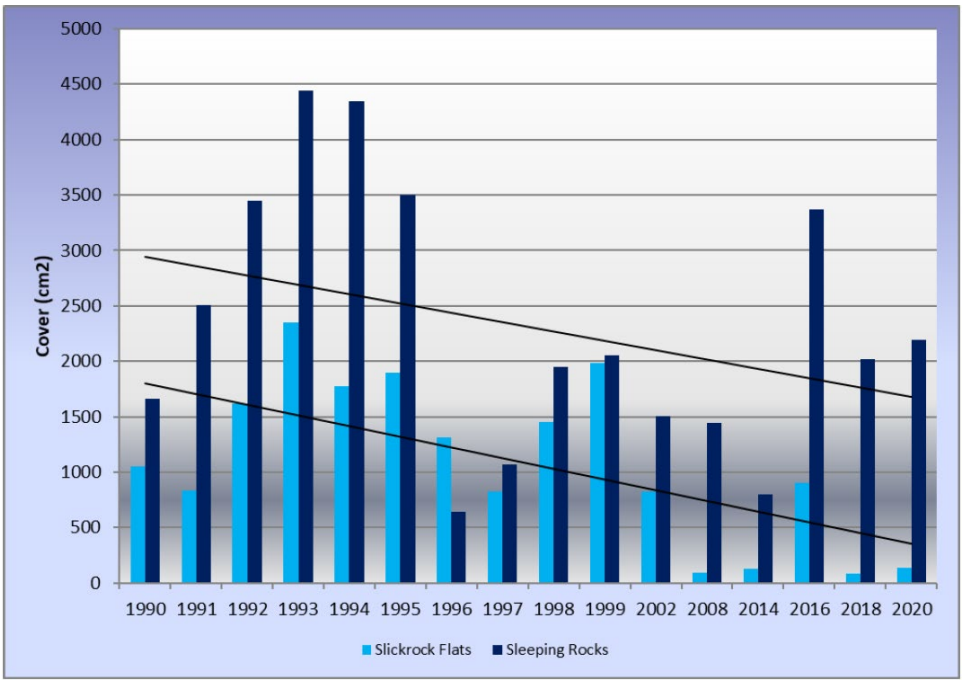
In 1990, five plots were established on a rim of sandstone at Slickrock Flats on the northwest BLM boundary inside the BLM Hogback ACEC. These plots were read annually until 1999, then in 2002 and 2008 with an informal site visit in 2010. In 1989 the individuals within this monitoring plot were estimated to be around 8,700 and in 2020 dropped to 208 individuals (Table 2). Four of the five transects for monitoring were in tinajas versus the cracks of the sandstone substrate (Roth 2020b, p. 4). This supports the expectation that cracks provide a more stable and supportive habitat for Mancos milkvetch.

Table 2. Number of plants at the Slickrock Flats site through time.

Slickrock Flats	**Historic**	**Current**
Totals:	8,699	208

The average annual rainfall amount (Figure 1) was 8.978 inches from 1990-1999 at the Farmington AG Science Center and 7.641 inches from 2000-2019 (Roth 2020a, p. 6). At both Sleeping Rocks and Slickrock Flats, there was a high rate of mortality observed in young plants during the germination and establishment phase. The 30-year monitoring of Mancos milkvetch found a long-term slow decline.

Figure 2. Total cover (cm^2) of Mancos milkvetch plants at the Sleeping Rocks (dark blue) and the Slickrock Flats (light blue) monitoring sites near Waterflow, NM.



The Slickrock Flats and Sleeping Rocks sites are monitored by the State of New Mexico Energy, Minerals, and Natural Resources Department (EMNRD) Forestry Division - Rare and Endangered Plants Program. Results from both plots (Figure 2) show that the Sleeping Rocks site overall had higher cover values throughout the 30-year monitoring period (Roth 2020b, p. 8). The trend line in Figure 2 shows the long-term decline in both populations on the BLM and New Mexico State lands.

Navajo Nation

The Navajo Natural Heritage Program (NNHP) monitors 14 populations of Mancos milkvetch occurring at least partially on the Navajo Nation (Talkington 2019, p. 2). In 2017, NNHP conducted a range wide survey following previous Tribal botanist's survey methods. At the 12 remaining populations, a census was conducted from historical records following standards by NatureServe. Two populations were historic and not able to be relocated, and one population was surveyed in the last 5 years and was not revisited in 2017. Although the population trend varied due to the different survey methods historically and currently, the overall trends indicate a decline in Mancos milkvetch. The difference in surveying were estimations versus counts. The historical data remains important for a ballpark estimation even though it may not be useful for capturing fine-scale population trends (Talkington 2019, p. 8). The reason was the department was not confident in the historical survey methods of estimation

versus counts and cursory versus extensive surveying throughout the known range. Current population counts of Mancos milkvetch have declined by approximately 67-71 percent range-wide since the late 1980's/1990's tallies (Talkington 2019, p. 8). The current estimation of Mancos milkvetch is 2,278 individuals on the Navajo Nation (Table 3).

Table 3. Total acres inhabited and tallies of current & historical data at the 12 populations on the Navajo Nation.

Navajo Nation Wide	**Acres**	**Historic**	**Current**
Totals:	516.42	~7,000-8,000	2,278

The NNHP established seven permanent long-term monitoring sites on the Navajo Nation with collaboration from the previous tribal botanist & New Mexico State botanist Daniella Roth and John Kendall of the BLM-Farmington Field Office. The 3 plots per site were placed in either tinajas or cracks in the sandstone where a minimum of five individuals were observed. Each plot was marked with GPS coordinates and nail markers with tags for future reference. The methodology followed protocols established at the Sleeping Rocks & Slickrock Flats Plots to allow for consistent data comparisons across land management agencies (Talkington 2019, p. 5). The results of the monitoring in June, 2019 were 327 individuals with a total composition of 57% seedlings and 43% adults (Talkington 2019, p. 10). The habitat that supported more seedlings than tinajas were the cracks in the sandstone. In 2019 NNHP documented the life stage of each Mancos milkvetch individual at the long-term monitoring plots to track the trends for the future (Table 4).

Table 4. Aggregate live cover and Mancos milkvetch numbers by life stage at each monitoring site. Phenology (with pods) was recorded.

Site Name	**Adults**	**Seedlings**	**Percent w/ Pods**	**Aggregate Live Cover (cm^2)**
Chimney Rock SE	14	10	35.7%	774
Hogan	25	52	40%	1569
Little Water Hogback	9	18	44.4%	848
Long Point	13	0	61.5%	1326
*West Palmer Mesa**	80	106	76.9%	4221
Totals	141	186	37% (Avg.)	8737

West Palmer Mesa is split into three distinct sites, with three plots established at each site. All the site data is combined into one here shown as "West Palmer Mesa"

2.2.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

A recent genetic analysis of three populations of Mancos milkvetch occurring on the Navajo Nation found low genetic differentiation between populations (Massatti et al. 2018). The genus *Astragalus* is known to have relatively low population-level genetic diversity, suggesting the recent genetic divergence of this group. The continuation of cross pollination of closely related individuals could result in reduced genetic variation, furthermore, lowering the seed viability if outcrossing does not occur.

2.2.1.4 Taxonomic classification or changes in nomenclature:

Currently there are no known changes in the taxonomy of Mancos milkvetch.

2.2.1.5 Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, pollinator availability, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.):

The distributional range of Mancos milkvetch has not changed since the last 5-year review, although there are still large tracts of suitable habitat that have not been thoroughly surveyed.

2.2.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

The Service is currently in the process of constructing a species range map for Mancos milkvetch, which outlines where the species occurs or is suspected to occur. The Service uses known habitat metrics (such as geological formations and elevation data) to construct the species range map. We will discuss habitat metrics that support Mancos milkvetch that are being used in the construction of the updated range map and any new information regarding habitat or ecosystem conditions in this section.

Mancos milkvetch is a Four Corners endemic species that occurs on the Mesa Verde Group which is composed of the Point Lookout (Kpl) and Cliff House Sandstone (Kcl). This species is found atop mesas on the sandstone ledges in cracks, fissures, and tinajas, which are small depressions in the sandstone (Talkington 2019, p. 1, Roth 2020b, p. 2). The range of this species is restricted to San Juan County, New Mexico and Montezuma County, Colorado between 1,585 and 1,829 m (5,200 and 6,000 feet) in elevation (USFWS 1989, p. 7). The total range of the species is approximately 48 km (30 miles) x 24 km (15 miles)

(Roth 2020b, p. 2). In New Mexico the majority of Mancos milkvetch are found at least partially on the Navajo Nation, BLM lands, State Trust lands, and in Colorado on the Ute Mountain Ute Tribal Reservation (Talkington 2019, p. 1). The associated communities are pinyon-juniper woodlands and desert scrub.

Table 5. Associated plant species with Mancos milkvetch.

Species Name	**Common Name**	**Relationship**	**Source**
Achnatherum hymenoides	Indian ricegrass	Associate	USFWS 1989
Artemisia tridentata	Big sagebrush	Associate	USFWS 1989
Astragalus calycosus var. *scaposus*	Torrey milkvetch	Associate	USFWS 1989
Astragalus lentiginosus var. *diphysus*	Milkvetch	Associate	USFWS 1989
Astragalus monumentalis var. *cottamii*	Cottam's milkvetch	Associate	USFWS 1989
Brickellia microphylla var. *scabra*	Scabrous bricklebush	Key Associate	USFWS 1989
Bromus tectorum	Downy grass	Associate	USFWS 1989
Calylophus hartwegii	Yellow false primrose	Associate	USFWS 1989
Cercocarpus intricatus	Small-leaf mahogany	Key Associate	USFWS 1989
Cercocarpus montanus	Mountain mahogany	Associate	USFWS 1989
Chrysopsis villosa	Yellow hiddenflower	Associate	USFWS 1989
Cryptantha pterocarya	Wing-fruited hiddenflower	Associate	USFWS 1989
Ephedra viridis	Morman tea	Associate	USFWS 1989

Fraxinus anomala	Single leaf ash	Key Associate	USFWS 1989
Galium coloradense	Colorado bedstraw	Associate	USFWS 1989
Heterotheca villosa	Telegraph plant	Associate	USFWS 1989
Hymenoxys acaulis	Bitterweed	Associate	USFWS 1989
Juniperus osteosperma	Utah juniper	Associate	USFWS 1989
Lepidium montanum	Peppergrass	Associate	USFWS 1989
Penstemon eatonii	Eaton's beardtongue	Associate	USFWS 1989
Penstemon lentus	Beardtongue	Associate	USFWS 1989
Peraphyllum ramosissmum	Squaw apple	Associate	USFWS 1989
Petradoria pumila	Goldenrod	Associate	USFWS 1989
Physaria acutifolia	Twinpod	Associate	USFWS 1989
Physaria fendleri	Fendler's bladderpod	Associate	USFWS 1989
Pinus edulis	Pinyon pine	Associate	USFWS 1989
Poa fendleriana	Mutton grass	Associate	USFWS 1989
Purshia tridentata	Antelope bitterbrush	Associate	USFWS 1989
Rhus trilobata	Skunkbush	Associate	USFWS 1989
Senecio multilobatus	Many lobed senecio	Associate	USFWS 1989
Stanleya pinnata	Desert plume	Associate	USFWS 1989
Stipa comata	Needle and thread grass	Associate	USFWS 1989

Yucca angustissima	Narrow-leaf yucca	Associate	USFWS 1989

2.2.1.7 Other:

None

2.2.1.8 Conservation Measures:

The standard conservation measures for plants apply to the Mancos milkvetch. The following additional conservation measures are often included for projects with impacts to Mancos milkvetch.

- Conduct surveys by a qualified botanist within suitable or occupied habitat of the action area at least once every ten (10) years. Mancos milkvetch locations will be collected via Global Positioning System (GPS) and mapped via Geographic Information System (GIS) to illustrate avoidance areas.
- Within occupied or suitable habitat for Mancos milkvetch, restrict vehicles to existing roads and two-tracks, to the maximum extent possible. To conduct maintenance on rights-of-way, vehicles would park on existing roads and crews will walk to their site.
- For routine vegetation maintenance, conduct work by hand crews walking into identified suitable or occupied habitat for Mancos milkvetch.
- Report any new plants found by maintenance or other project personnel working within suitable or occupied habitat for Mancos milkvetch to the Service.
- Require operators to wash all machinery (trailers, trucks, etc.) before entering the action area and working on the project to prevent transportation of non-native invasive species. To prevent needs for re-washing, keep machinery stationary until the project is completed.
- Require a biological monitor, with appropriate training and all required permits, to be present to observe all ground disturbing activities (vehicular access into right-of-way, mowing, digging, outrigger activities) except in the case of emergency maintenance, within suitable or occupied habitat for Mancos milkvetch or the appropriate species-specific buffers surrounding occupied.
- Immediate notify the Service when emergency vegetation maintenance may occur within suitable or occupied habitat for Mancos milkvetch. The Service will recommend best management practices to minimize impacts to suitable or occupied habitat such as minimizing vehicular traffic, and restricting access to existing roadways when possible, and minimizing disturbances.

2.2.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms):

2.2.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:

Various agencies consulted with the Service on various projects that have taken place in areas with occupied or suitable habitat for Mancos milkvetch since the previous 5-year review. We provide a list of consultations in order to convey the number and diversity of projects with consequences to the species (Table 4). Only consultations that have been completed since the last 5-year review are included in this list.

Table 6. Three (3) Formal and Three (3) informal consultations completed since previous five-year review.

Code	Description
2011-F-0104	In 2011, the Western Area Power Administration proposed the Lost Canyon-Shiprock 230 kilovolt (kV) transmission access road repair and maintenance project in San Juan County, New Mexico. 19 individual plants were observed at 1 location during surveys in 2011. The Service issued a non-jeopardy biological opinion in response to the request for consultation (USFWS 2011a).
2014-F-0064	In 2014, the Office of Surface Mining Reclamation and Enforcement (OSMRE) proposed the Four Corners Power Plant and Navajo Mine Energy Project. The OSMRE made a "may affect, not likely to adversely affect" determination for Mancos milkvetch based upon implementation of conservation measures. The Service subsequently concurred with the determination (USFWS 2014a).
2014-I-0338	In 2014, the Environmental Protection Agency proposed the issuance of a U.S. Environmental Protection Agency (EPA) air quality permit allowing Four Corners Power Plant, in San Juan County, New Mexico, to increase emissions of sulfuric acid mist (SAM). Effects associated with this action were determined to be insignificant and discountable. The Service issued a concurrence letter in response to the request for consultation (USFWS 2014b).

2015-I-0244	In 2015, the U.S. Department of Agriculture (USDA) Animal Plant Health Inspection Service (APHIS) proposed to conduct the Suppression Program in New Mexico from 2015-2020. USDA APHIS made a "may affect, not likely to adversely affect" determination for Mancos Milkvetch based upon implementation of conservation measures. The Service issued a concurrent letter in response to the request for consultation (USFWS 2015).
2018-I-0790	In 2018, the Office of Surface Mining Reclamation and Enforcement (OSMRE) proposed the San Juan Coal Company's Deep Lease Extension at the existing underground San Juan Mine, located near Waterflow, New Mexico. OSMRE made a "may affect, not likely to adversely affect" determination for Mancos milkvetch based upon implementation of conservation measures. The Service issued a concurrent letter in response to the request for consultation (USFWS 2018).
2019-F-0206	In 2018, the Western Area Power Administration initiated consultation on operation and maintenance activities in the four corners region of Colorado, New Mexico, Arizona, and Utah. 11 individual plants observed during surveys in 2012, with 1 individual located within the footprint of maintenance roads. The action agency made a “may affect, likely to adversely affect” determination, the Service subsequently issued a non-jeopardy biological opinion (USFWS 2019).

Since no NEPA documentation exists, it is unknown how past impacts from oil and gas activities have impacted plants when the wells were active (Roth 2008).

Energy Infrastructure

In 2007 and 2008, oil and gas drilling by a private company on the Navajo Nation caused damage to Mancos milkvetch individuals (Roth 2008, p. 2). Wells near the West Palmer Mesa site on the Navajo Nation have been plugged and access to those sites has not maintained, hopefully to minimize the impact on Mancos milkvetch. The site near the Hogback ACEC contains abandoned and plugged wells within the Navajo Nation and Indian Allotted Lands.

Right-of-Ways (ROWs) / Off Highway Vehicles (OHV)

Various ROWs such as access roads to abandoned and plugged wells and existing leases of gas lines and transmission lines are factors impacting the survival of Mancos milkvetch. With access from these ROWs, OHV traffic

appears to impact Mancos milkvetch's habitat and through increased disturbances to the tinajas and cracks along the sandstone cliffs. The lack capacity for consistent law enforcement continues to remain problematic for both the Navajo Nation and BLM lands. Utilization of ROWs and OHVs in or near Mancos milkvetch habitat not only has potential for direct impacts, but also brings pedestrian foot traffic closer to the habitat.

Illegal Firewood Harvesting

Firewood harvesting within the BLM-FFO is restricted to designated areas, and the Hogback ACEC is excluded from firewood gathering. There have been observations of illegal harvesting and associated surface impacts within the habitat of Mancos milkvetch inside the ACEC and surrounding area (Roth 2020b, p. 10).

Invasive Species

Through surface disturbance from plugging wells and abandoned wells there is significant introduction of invasive species in the immediate vicinity of Mancos milkvetch habitat. Many plugged wells on the Navajo Nation and BLM lands are hotspots for the establishment of invasive species such as Russian thistle (*Salsola tragus*) and cheatgrass (*Bromus* sp.), these are rarely observed growing in microhabitat of Mancos milkvetch (Roth 2020b, p. 12).

Livestock Grazing

There have been a few observations of livestock grazing in the immediate habitat of Mancos milkvetch. These observations were absent from the historical notes on the Navajo Nation, which contained a notation of "No grazing". Two different sites now have livestock grazing present, as a possible and perceived threat through trampling or other impacts.

2.2.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:

No documentation exists of overutilization for commercial, recreational, scientific, or educational purposes has not been documented for Mancos milkvetch. The species has no known commercial use and illegal collection does not appear to be a threat currently or in the foreseeable future.

2.2.2.3 Disease or predation:

No diseases have been observed on this species at this time but could increase as drought conditions exacerbate plant stressors in the foreseeable future. Herbivory and grazing have been observed but are not considered a major threat.

We recommend referring to the previous 5-year review (USFWS 2011, p. 19) for additional discussion on threats to Mancos milkvetch associated with disease and predation.

2.2.2.4 Inadequacy of existing regulatory mechanisms:

The New Mexico State Forestry Division implemented new prohibitions to protect State endangered plants in 2023. Under New Mexico endangered plant rules (19.21.2 NMAC: Endangered Plant Species List and Collection Permits), the taking of endangered plants, other than pursuant to a permit issued by the state forester, is prohibited in New Mexico. Therefore, it is illegal to remove, harm, kill, destroy, possess, transport, export, sell, or offer for sale any New Mexico endangered plants, or parts thereof, from the places in the State of New Mexico where they naturally grow—including lands under any Federal, State, private, or other non-tribal jurisdiction—other than by Tribal members for religious purposes, as an incidental result of agricultural practices, or by Federal employees working within their lands of jurisdiction for the purposes of scientific study or propagation. The degree of additional of additional conservation benefit for Mancos milkvetch from these new State-level protections in New Mexico is currently uncertain.

We recommend referring to the previous 5-year review (USFWS 2011, pp. 19-21) for additional discussion on threats to Mancos milkvetch associated with any inadequacy of existing regulatory mechanisms.

2.2.2.5 Other natural or manmade factors affecting its continued existence:

Pesticide Use

We recommend referring to the previous 5-year review (USFWS 2011, pp. 21-22) for additional discussion on threats to Mancos milkvetch associated with pesticide use.

Drought and Climate Change

Periods of drought in the southwest are common. However, the frequency and duration of droughts may be altered by climate change. Global warming and associated effects on regional climatic regimes are not well understood, but weather predictions for the southwestern United States include less overall precipitation, longer periods of drought, and increased temperatures. Based on broad consensus among 19 climate models, Seager et al. (2007) predicted that the southwest will become drier in the 21st century and that this change to a drier climate is already occurring. Increased aridity will become the norm for the American southwest within a timeframe of years to decades if the models are correct.

In 2021, the Intergovernmental Panel on Climate Change published a report that outlines several scenarios with a high degree of certainty to occur in the 21st century. These include: 1) an increase in the frequency of warm spells/heat waves over most land areas; 2) an increase in the number of hot days and nights over most land; and 3) more regions will be affected by ecological drought. The 2018 Intergovernmental Panel on Climate Change report found that at a global scale, there has already been an overall increase in the number of warm days and nights, and that there is a high confidence that anthropogenic forcing has contributed to these changes. Additionally, the 2021 Intergovernmental Panel on Climate Change found that there has already been an increase in hot temperature extremes globally, as well as an increase in in agricultural and ecological drought across western North America.

The Intergovernmental Panel on Climate Change makes equally sobering predictions for ecosystems. Conditions are likely to exceed the resilience of many ecosystems during this century by an unprecedented combination of climate change, associated disturbances (e.g., flooding, drought, wildfire, insects), and other global drivers (IPCC 2007). With medium confidence, Intergovernmental Panel on Climate Change predicts that approximately 20 to 30 percent of plant and animal species assessed to date are likely to be at an increased risk of extinction if increases in global average temperature exceed 1.5 to 2.5ºC (IPCC 2007).

At the plant level, adapting to drought involves the ability to balance carbon sequestration (the uptake and storage of carbon), carbon respiration (efflux back into the atmosphere), and maintain sustainable evapotranspiration rates (Huxman and Scott 2007). Adaptation would also require a plant to change its phenology (timing of life cycle events) to coincide successfully with extreme shifts in temperature, precipitation, and soil moisture (Walther et al. 2002) which are all part of the evapotranspiration equation. Rapid climate change could pose significant challenges for plants because they may not be able to adjust their phenology or photosynthetic mechanisms quickly enough, and there may be a temporal mismatch between plants and their pollinators.

The United States Geological Survey maintains the National Climate Change Viewer (USGS 2022, entire). The National Climate Change Viewer includes historical (1981-2010) as well as future (2025-2099) climate and water balance projections to model climate change effects based on increasing atmospheric carbon dioxide (CO2) concentration over time. The National Climate Change Viewer uses 20 different climate models to predict atmospheric temperature and 6 precipitation variables as they are affected by a lower carbon dioxide (CO_2) emissions scenario and a higher CO_2 emissions scenario. The lower emissions scenario is identified as Representative Concentration Pathway 4.5, where atmospheric CO_2 concentrations are expected to equal approximately 650 ppm after the year 2100. The higher emissions scenario is identified as Representative Concentration Pathway 8.5, where atmospheric CO_2

concentrations aggressively increase to approximately 1,370 ppm after the year 2100. For comparison, current atmospheric CO_2 concentrations are around 419 ppm (NOAA 2022b).

We assessed future climate scenarios for San Juan County, New Mexico and Montezuma County, Colorado using the National Climate Change Viewer Mean Model for Representative Concentration Pathway 4.5. Climate projections under Representative Concentration Pathway 4.5 for San Juan County, New Mexico and Montezuma County, New Mexico. Projections include increased monthly temperatures, and an overall increase in mean precipitation.

In the southwest region of the United States, the average annual temperature is predicted to rise by about 2.5 to 3.9 ºC (4.5 to 7 ºF) during this century (IPCC 2007). Since 2000, the southwestern United States has experienced higher than the long-term average temperatures. Compared to the mean temperature in New Mexico between 1901-2000, New Mexico was 2.5 ºF warmer in 2021, and 3.2 ºF warmer in 2020 (NOAA 2022a). Hydrologic trends are less clear and the southwestern states show a long-term trend of increased precipitation since the 1970s (Parmesan and Galbraith 2004; Udall and Bates 2007; Enquist and Gori 2008). However, droughts throughout the southwestern United States are expected to increase in severity (Cook et al. 2015).

New Mexico precipitation changes show more variation than temperature changes, with increases in precipitation anticipated in summer and autumn and decreases in precipitation anticipated in winter and spring. The spatial heterogeneity of drought is extremely variable in the state of New Mexico (Enquist and Gori 2008). Since 2000, there have been four instances of Exceptional Drought Conditions in portions of San Juan County, New Mexico, and four instances of Exceptional Drought Conditions in portions of Montezuma County, Colorado (NDMC 2023). The most recent instance of Exceptional Drought Conditions to occur in San Juan County, New Mexico and Montezuma County, Colorado occurred between October 2020 and August 2021. Exceptional Drought Conditions (D4 Drought) surpass Extreme Drought Conditions (D3 Drought) and are considered to be 25 to 50 year recurrence events. Impacts from notable drought conditions anticipated by the 2005 Potential Effects of Climate Change on New Mexico report (Agency Technical Work Group 2005) include decreases in soil moisture availability, increases in evapotranspiration, and decreases in plant productivity.

Mancos milkvetch is a spring flowering species. Growing seasons are becoming longer and warmer in many regions (Parmesan 2007) including the southwest (Cayan et al. 2001; Easterling 2002; Lenart et al. 2007; Enquist and Gory 2008). Earlier soil moisture stress, which we anticipate (see Table 7 and Table 8), would result in decreased flowering and reproduction, and because Mancos milkvetch has a limited distribution restricted to certain geologic features, we

would predict a substantial population reduction with a long-term warming trend.

Increases in predatory insects are also predicted with climate change (Enquist and Gori 2008). With prolonged drought conditions and a decrease in soil moisture, there is a possibly of insect infestations and other threats that potentially will impact the longevity of Mancos milkvetch.

Table 7. Historical (1981-2010) mean soil storage (inches) and projected changes in monthly soil storage for three future time periods under Representative Concentration Pathway 4.5 for San Juan County, New Mexico.

Month	1981-2010 mean (in)	2025 – 2049 change (in)	2050 - 2074 change (in)	2075 – 2099 change (in)
January	1.38	+ 0.17	+ 0.15	+ 0.11
February	2.17	- 0.05	- 0.21	- 0.30
March	2.30	- 0.42	- 0.64	- 0.74
April	1.58	- 0.42	- 0.57	- 0.65
May	0.65	- 0.25	- 0.32	- 0.37
June	0.14	- 0.07	- 0.09	- 0.10
July	0.06	- 0.03	- 0.03	- 0.03
August	0.05	- 0.02	- 0.02	- 0.02
September	0.06	- 0.01	- 0.01	- 0.01
October	0.13	- 0.02	- 0.04	- 0.03
November	0.64	- 0.18	- 0.29	- 0.31
December	1.04	- 0.04	- 0.13	- 0.14

Table 8. Historical (1981-2010) mean soil storage (inches) and projected changes in monthly soil storage for three future time periods under Representative Concentration Pathway 4.5 for Montezuma County, Colorado.

Month	1981-2010 mean (in)	2025 – 2049 change (in)	2050 - 2074 change (in)	2075 – 2099 change (in)

January	2.51	+ 0.43	+ 0.52	+ 0.52
February	3.33	+ 0.40	+ 0.32	+ 0.40
March	4.14	- 0.20	- 0.37	- 0.46
April	3.69	- 0.52	- 0.74	- 0.85
May	2.42	- 0.60	- 0.81	- 0.94
June	0.95	- 0.38	- 0.46	- 0.51
July	0.49	- 0.19	- 0.21	- 0.24
August	0.42	- 0.12	- 0.14	- 0.15
September	0.51	- 0.10	- 0.12	- 0.12
October	0.89	- 0.12	- 0.17	- 0.14
November	1.86	- 0.18	- 0.36	- 0.37
December	2.23	+ 0.07	- 0.02	- 0.02

2.3 Synthesis

Mancos milkvetch is a narrow endemic species known only from the Four Corners region in San Juan County, New Mexico and Montezuma County, Colorado. Species distribution closely follows a narrow band of Mesozoic (Point Lookout and Cliff House) sandstone along a 16-kilometer (10-mile) section of the Hogback geologic formation (USFWS 1989).

Current population numbers have not returned to the earliest field estimations (Table 1, 2, and 3), and long-term, monitoring indicates slow declines across the range on BLM, Navajo Nation, and New Mexico State Trust lands. The overall population trend is decreasing in San Juan County, New Mexico and remains unknown for Montezuma County, Colorado on the Ute Mountain Ute Tribal Reservation.

Although some level of regulatory protection exists for all known populations, these protective measures have not been applied sufficiently to adequately ameliorate all threats to Mancos milkvetch, and unfavorable climate conditions have hindered recovery of the species. Most of the negative impacts to this species likely occurred due to lack of on-the-ground implementation of mitigation and conservation measures before, during, and after implementation of energy and transmission line projects. Future collaboration with various governmental agencies and entities will ensure continued protection of the plant in its suitable or occupied habitat. Currently, a seed banking and seed longevity study is being

conducted by the Desert Botanical Garden on Threatened and Endangered Species in Arizona, New Mexico, and Texas, including Mancos milkvetch.

Threats to the Mancos milkvetch interact, can act cumulatively on the species, and are not fully abated at this time. We recommend the status of the Mancos milkvetch remain endangered due to the long-term slow decline throughout the range of the species and the long-term effect of threats to the plant. We also recommend that the plant be closely monitored for future population trends, new discoveries, and potential new threats. We recognize that human caused disturbance remains a serious threat, and further analyses are needed to better understand the genetic variation of the species along with its response to continued drought across the southwestern United States.

3.0 RESULTS

3.1 Recommended Classification:

No change is needed

3.2 New Recovery Priority Number (indicate if no change; see 48 FR 43098):

No change, remain at 5C

Brief Rationale:

This indicates that Mancos milkvetch is a full species with a high degree of threat and a low recovery potential. No change is recommended at this time.

3.3 Listing and Reclassification Priority Number, if reclassification is recommended (see 48 FR 43098):

Reclassification (from Threatened to Endangered) Priority Number: N/A
Reclassification (from Endangered to Threatened) Priority Number: N/A
Delisting (Removal from list regardless of current classification) Priority Number: N/A

Brief Rationale:

N/A

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

- Maintain visible and prominent signage at ACEC boundaries to make wood cutters aware of applicable prohibitions**.**
- Actively control or prohibit OHV traffic in areas unauthorized for their travel.
- Retire existing oil and gas leases, including inactive leases, when they expire within areas impacting Mancos milkvetch habitat.

- Consider fencing the remaining populations of Mancos milkvetch in the vicinity of the transmission lines and other infrastructure, or otherwise block unauthorized access to habitat.
- Improve coordination of management between State Trust and BLM lands within the Hogback ACEC via land exchanges or developing a management agreement among land managers.
- Sample soils to determine current soil chemistry and pH.
- Maintain fences and lock access gates to prevent unauthorized travel in Mancos milkvetch habitat.
- Determine whether certain populations of Mancos milkvetch, or the species itself, is a pollinator-limited, or if there are other factors limiting seed-set in this species.
- Develop a propagation protocol from seed collections for potential population augmentation in the future.
- Expand monitoring sites by increasing the number of monitoring plots at each site.
- Monitor and control invasive species.
- Increase monitoring frequency and document reproductive effort in the data gathering.
- Conduct and utilize genetic analyses across the species range to best guide translocation and population augmentation efforts by pinpointing populations with high genetic diversity.
- Strengthen regulatory mechanisms and associated enforcement capacity for oil and gas activities occurring on the Navajo Nation in Mancos milkvetch habitat to help ensure damage to this species is minimized to the greatest extent possible.

5.0 REFERENCES

Agency Technical Work Group, State of New Mexico. 2005. Potential of Climate Change on New Mexico, December 30, 2005. Report prepared by state agency personnel pursuant to Governor Richardson's Climate Change and Greenhouse Gas Reduction Executive Order 05-033, issued June 9, 2005.

Bureau of Land Management. 2003. Farmington Resource Management Plan with Record of Decision. Farmington Field Office, Farmington, New Mexico.

Bureau of Land Management. 2008. Bureau of Land Management Manual – 6840 Special Status Species Management. Rel. 6-125, 12/12/2008.

Cook, B., T. Ault, and J. Smerdon. 2015. Unprecedented 21st century drought risk in the American Southwest and Central Plains. Science Advances 1:1-7.

Cayan, D., S. Kammerdiener, M. Dettinger, J. Caprio, and D. Peterson. 2001. Changes in the onset of spring in the western United States. Bulletin of American Meteorological Society 82:399-415.

Easterling, D. 2002. Recent changes in frost free days and the frost-free season in the United States. Bulletin of American Meteorological Society 83:1327-1332.

Enquist, C. and D. Gori. 2008. A climate change vulnerability assessment for biodiversity in New Mexico, Part I: Implication of recent climate change on conservation priorities in New Mexico. The Nature Conservancy and Wildlife Conservation Society. http://nmconservation.org/dl/NMClimateChange_report1_527.pdf

Global Climate Change Impacts in the United States. 2009. T. R. Karl, J.R. Melillo, and T.C. Peterson (eds). Cambridge University Press, 189 pp.

Huxman, T. and R. Scott. 2007. Climate change, vegetation dynamics, and the landscape water balance. Southwest Hydrology, January/February 2007:28-29, 37.

IPCC (Intergovernmental Panel on Climate Change). 2007. Summary for policymakers. In: Climate change 2007: the physical science basis. Contribution of working group one to the fourth assessment report of the intergovernmental panel on climate change (Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor and H. L. Miller, eds.) Cambridge University Press, New York, New York. http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_wg1_report_the_physical_science_basis.htm

IPCC (Intergovernmental Panel on Climate Change). 2021. Weather and Climate Extreme Events in a Changing Climate. In Climate Change 2021: The Physical Science Basis. Contribution of Working Group 1 to Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Available at: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter11.pdf

Lenart, M., G. Garfin, B. Colby, T. Swetnam, B.J. Morehouse, S. Doster, and H. Hartmann. 2007. Global warming in the southwest: projections, observations, and impacts. Climate Assessment for the Southwest, University of Arizona. http://www.climas.arizona.edu/files/climas/GWSouthwest.pdf.

Lock, J.M., K. Simpson. 1991. Legumes of West Asia. *Kew Royal Botanic Gardens*, 43-85.

Manning, M.R., J. Edmonds, S. Emori, A. Grubler, K. Hibbard, F. Joos, M. Kainuma, R.F. Keeling, T. Kram, A.C. Manning, M. Meinshausen, R. Moss, N. Nakicenovic, K. Riahi, S.K. Rose, S. Smith, R. Swart, & D.P. van Vuuren. 2010. Misrepresentation of the IPCC CO_2 emission scenarios. Nature Geoscience 3:376-377.

Massatti, R., M.T. Belus, S. Dowlatshahi, and G.J. Allan. 2018. Genetic analyses of *Astragalus* sect. *Humillimi* (Fabaceae) resolve taxonomy and enable effective conservation. American Journal of Botany, 105(10): 1703-1711. Doi:10.1002/ajb2.115

Mineau, P., K.M. Harding, M. Whiteside, M.R. Fletcher, D. Garthwaite, and L.D. Knopper. 2008. Using reports of bee mortality in the field to calibrate laboratory-derived pesticide risk indices. Environmental Entomology 37:546-554.

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.0. NatureServe. Arlington, VA. Available at: http://www.natureserve.org/explorer/.

Navajo Nation Department of Fish and Wildlife. 2009. Letter summarizing status regarding the 5-year review of Mancos Milkvetch (*Astragalus humillimus*). May 13, 2009. Navajo Nation, Window Rock, Arizona.

NDMC (National Drought Mitigation Center). 2022. U.S. Drought Monitor: Time Series. Retrieved on August 10, 2022 from https://droughtmonitor.unl.edu/DmData/TimeSeries.aspx

NOAA (National Oceanic and Atmospheric Administration). 2022a. National Centers for Environmental information, Climate at a Glance: Statewide Mapping. https://www.ncei.noaa.gov/cag/.

NOAA (National Oceanic and Atmospheric Administration). 2022b. Trends in atmospheric carbon dioxide. Global Monitoring Laboratory. Earth Systems Research Laboratories. https://gml.noaa.gov/ccgg/trends/global.html

Parmesan, C. and H. Galbraith. 2004. Observed impacts of global climate change in the U.S. Pew Center on Global Climate Change, Arlington, VA. Prepared for the Pew Center on Global Climate Change, November 2004.

Parmesan, C. 2007. Influences of species, latitudes and methodologies on estimates of phenological response to global warming. Global Change Biology 13:1860-1872.

Pielke Jr., R., T. Wigley, and C. Green. 2008. Dangerous assumptions. Nature 452:531-532.

Roth, D. 2008. Mancos Milk-vetch (*Astragalus humillimus*) Trend/Status Assessment. Navajo Natural Heritage Program, Navajo Nation Department of Fish and Wildlife, Window Rock, Arizona.

Roth, D. 2020a. 30-Year Monitoring Report, Mancos milkvetch (*Astragalus humillimus*: Fabaceae). BLM Hogback Area of Critical Environmental Concern, San Juan County, New Mexico, 1990-2020. Submitted to the U.S. Fish and Wildlife Service, Region 2, Albuquerque, NM. New Mexico Energy, Minerals, and Natural Resources Department-Forestry Division, Santa Fe, New Mexico.

Roth D. 2020b. Status Report, Mancos milkvetch (*Astragalus humillimus*). BLM Hogback ACEC. Submitted to the U.S. Fish and Wildlife Service, Region 2, Albuquerque, NM. New Mexico Energy, Minerals, and Natural Resources Department-Forestry Division, Santa Fe, New Mexico.

Seager, R., M. Ting, I. Held, Y. Kushnir, J. Lu, G. Vecchi, H. Huang, N. Harnik, A. Leetmaa, N. Lau, C. Li, J. Velez, and N. Naik. 2007. Model projections of an imminent transition to a more arid climate in southwestern North America. Science 316:1181.

Talkington, N. 2019. Mancos Milkvetch (*Astragalus humillimus*) Status Assessment and Monitoring Report. Navajo Natural Heritage Program, Navajo Nation Department of Fish and Wildlife, Window Rock, Arizona.

Talkington, N., D. Mikesic, and D. Roth. 2020. Navajo Nation Endangered Species List (Ver. 4.20). D. Mikesic, D. Roth ,and N. Talkington, authors. Resources Committee Resolution No. RCS-41-08. Navajo Natural Heritage Program, Navajo Nation Department of Fish and Wildlife, Window Rock, Arizona.

Udall, B. and G. Bates. 2007. Climatic and hydrologic trends in the Western U.S.: A review of recent peer-reviewed research. Intermountain West Climate Summary 3(1): 2-8.

USFWS (U.S. Fish and Wildlife Service). 1985. Endangered and threatened wildlife and plants; final rule to determine *Astragalus humillimus* to be endangered. Federal Register. 50 (124):26568-26572.

USFWS (U.S. Fish and Wildlife Service). 1989. Mancos milkvetch (*Astragalus humillimus*) recovery plan. P. Knight and D. House, authors. New Mexico Ecological Services Field Office, Albuquerque, New Mexico.

USFWS (U.S. Fish and Wildlife Service). 2011a. Final biological opinion for Western Area Power Administration's (WAPA) proposed Lost Canyon-Shiprock 230kV Transmission Access Road Repair and Maintenance project in San Juan County, New Mexico. New Mexico Ecological Services Field Office, Albuquerque, New Mexico. Cons. # 22420-2011-F-0104.

USFWS (U.S. Fish and Wildlife Service). 2011b. Mancos Milkvetch (*Astragalus humillimus*) 5-Year Review, Summary and Evaluation. New Mexico Ecological Services Field Office, Albuquerque, New Mexico.

USFWS (U.S. Fish and Wildlife Service). 2014a. Final biological opinion for the Office of Surface Mining Reclamation and Enforcement (OSMRE) proposed Four Corners Power Plant and Navajo Mine Energy Project in San Juan County, New Mexico. New Mexico Ecological Services Field Office, Albuquerque, New Mexico. Cons. # 02ENNM00-2014-F-0064.

USFWS (U.S. Fish and Wildlife Service). 2014b. Final biological opinion for the U.S. Environmental Protection Agency (EPA) air quality permit allowing for Four Corners Power Plant (FCPP), in San Juan County, New Mexico. New Mexico Ecological Services Field Office, Albuquerque, New Mexico. Cons. # 02ENNM00-2014-I-0338.

USFWS (U.S. Fish and Wildlife Service). 2015. Final biological opinion for the U.S. Department of Agriculture (USDA) Animal Plant Health Inspection Service (APHIS) proposed to conduct the Suppression Program in New Mexico from 2015 to 2020, including San Juan County, New Mexico. New Mexico Ecological Services Field Office, Albuquerque, New Mexico. Cons. # 02ENNM00-2015-I-0244.

USFWS (U.S. Fish and Wildlife Service). 2018. Final biological opinion for the Office of Surface Mining, Reclamation and Enforcement (OSMRE) proposed Deep Lease Extension at the existing underground San Juan Mine located in Waterflow in San Juan County, New Mexico. New Mexico Ecological Services Field Office, Albuquerque, New Mexico. Cons. #02ENNM00-2018-I-0790.

USFWS (U.S. Fish and Wildlife Service). 2019. Final biological opinion for Western Area Power Administration's (WAPA) Biological Assessment (BA) "Programmatic Biological Assessment For Operation and Maintenance in the Four Corners Region of Colorado, New Mexico, Arizona, and Utah", which evaluates impacts to the Mancos milkvetch in San Juan County, New Mexico. New Mexico Ecological Services Field Office, Albuquerque, New Mexico. Cons. # 02ENNM00-2019-F-0206

USGS (U.S. Geological Survey). 2022. National Climate Change Viewer. https://www2.usgs.gov/landresources/lcs/nccv/maca2/maca2_counties.html.

Walther, G., E. Post, P. Convey, A. Menzel, C. Parmesan, T. Beebee, J. Fromentin, O. Hoegh-Guldberg, and F. Bairlein. 2002. Ecological responses to recent climate change. Nature 416:389-395.

Western Regional Climate Center (WRCC). 2020. Monthly Total Precipitation (inches) at the Farmington AG Science Center, Farmington, NM. https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?nm3142

U.S. FISH AND WILDLIFE SERVICE

5-YEAR REVIEW of Mancos milkvetch (*Astragalus humillimus*)

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

No change needed

Appropriate Listing/Reclassification Priority Number, if applicable: N/A

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service, New Mexico Ecological Services Field Office

Approve SHAWN SARTORIUS Digitally signed by SHAWN SARTORIUS Date: 2023.08.31 13:48:36 -06'00'