

**U.S. Fish & Wildlife Service**  
**Final Post-Delisting Monitoring Plan**  
**for**  
*Astragalus desereticus* (*Deseret milkvetch*)



**July 2018**

## **Acknowledgements**

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## **Anti-Deficiency Act Disclaimer**

Post-delisting monitoring is a cooperative effort between the USWFS, State, and Tribal governments; other Federal agencies; and nongovernmental partners. Funding of post-delisting monitoring presents a challenge for all partners committed to ensuring the continued viability of the Deseret milkvetch (*Astragalus desereticus*) following removal of Endangered Species Act protections. To the extent feasible, the USWFS and our partners intend to provide funding for post-delisting monitoring efforts through the annual appropriations process. Nonetheless, nothing in this Plan should be construed as a commitment or requirement that any Federal agency obligate or pay funds in contravention to the Anti-Deficiency Act, 31, U.S.C. 1341, or any other law or regulation.

## Table of Contents

<b>I. Introduction.....</b>	<b>3</b>
<b>II. Summary of the Roles of all Cooperators in the Post-delisting Monitoring Planning Effort.....</b>	<b>3</b>
<b>III. Summary of Species Status at Time of Delisting.....</b>	<b>4</b>
<b>A. Demographic Parameters.....</b>	<b>4</b>
<b>B. Populations .....</b>	<b>4</b>
<b>C. Residual Impacts.....</b>	<b>7</b>
<b>D. Commitments for Post-Delisting Conservation.....</b>	<b>8</b>
<b>IV. Monitoring Design .....</b>	<b>10</b>
<b>V. Data Compilation and Reporting Procedures.....</b>	<b>13</b>
<b>VI. Thresholds for Monitoring Outcomes .....</b>	<b>13</b>
<b>A. Category I .....</b>	<b>13</b>
<b>B. Category II.....</b>	<b>14</b>
<b>C. Category III .....</b>	<b>14</b>
<b>VII. Estimated Funding Requirements and Sources.....</b>	<b>15</b>
<b>VIII. Post-delisting Monitoring Implementation Schedule .....</b>	<b>16</b>
<b>IX. Literature Cited .....</b>	<b>17</b>
<b>X. Signature Approval.....</b>	<b>19</b>
<b>Appendix A: Example Monitoring Forms.....</b>	<b>20</b>

## **I. Introduction**

Section 4(g) of the Endangered Species Act of 1973, as amended (Act; 16 U.S.C. 1531 et seq.) requires the U.S. Fish and Wildlife Service (Service) to implement a system in cooperation with the States to monitor for not less than five years the status of all species that have recovered and been removed from the list of threatened and endangered plants and animals (list; 50 CFR 17.11, 17.12, 224.101, and 227.4). Section 4(g)(2) of the Act directs the USWFS to make prompt use of its emergency listing authorities under section 4(b)(7) of the Act to prevent a significant risk to the well-being of any recovered species. While not specifically mentioned in section 4(g) of the Act, authorities to list species in accordance with the process prescribed in sections 4(b)(5) and 4(b)(6) of the Act may also be used to reinstate species on the list, if warranted.

The Service and States have latitude to determine the extent and intensity of post delisting monitoring (PDM) that is needed and appropriate. The Act does not require the development of a formal PDM “plan.” However, the USWFS generally desires to follow a written planning document to provide for the effective implementation of section 4(g) by guiding collection and evaluation of pertinent information over the monitoring period and articulating the associated funding needs. Thus, this document was prepared to describe the PDM for *Astragalus desereticus* (Deseret milkvetch). This PDM plan follows the Post-Delisting Monitoring Plan Guidance under the Endangered Species Act (Service and NMFS 2008).

The purpose of this PDM is to verify that *Astragalus desereticus* remains secure from the risk of extinction after it has been removed from the protections of the Act. We have prepared this document in coordination with the Utah Department of Natural Resources (UDNR) and the Utah Division of Wildlife Resources (UDWR), based largely on the methods used by the Utah Natural Heritage Program (UNHP) in 2008 (Fitts and Fitts 2009), with supplemental demographic monitoring as conducted in 1992, 2009, and 2017 (Humphrey 1993; Fitts and Fitts 2010; UNHP 2018). This plan is designed to detect substantial declines in the *Astragalus desereticus* population, beyond normal population fluctuation, with reasonable certainty and precision. It meets the minimum requirement set forth by the Act by effectively monitoring the status of *Astragalus desereticus* using a minimum of 5 annual sampling events.

## **II. Summary of the Roles of all Cooperators in the Post-delisting Monitoring Planning Effort**

In 2006, a 30-year conservation agreement for *Astragalus desereticus* was signed by Service, UDWR, the Utah Department of Transportation (UDOT), and the Utah School and Institutional Trust Lands Administration (SITLA). The purpose of the conservation agreement is to ensure the long-term survival of *Astragalus desereticus*, through implementing cooperative conservation actions by State and Federal partners to abate threats and protect the species habitat (see section III, D, Commitments for Post-Delisting Conservation).

Since the signing of the conservation agreement, inventory surveys were conducted in 2008 and 2009<sup>1</sup>, by the Utah Natural Heritage Program (UNHP) (Fitts and Fitts 2009, 2010) with funding from the UDNR. Additional monitoring after de-listing will ensure that the species status remains stable over the long-term.

For the purposes of this PDM effort, monitoring will be a joint effort between UDNR or its designee (such as the UNHP) and the Service, with primary funding provided by the Service (see Section VIII, Estimated Funding Requirements and Sources) and access to the portion of the population on State land provided by UDWR.

### **III. Summary of Species Status at Time of Delisting**

#### **A. Demographic Parameters**

*Astragalus desereticus* is endemic to Utah County in central Utah, with the only known population near the town of Birdseye, Utah (Stone 1992). It occurs on sandy-gravelly soils weathered from the Moroni geological formation, which is limited to an area of approximately 100 square miles (mi<sup>2</sup>) (259 square kilometers (km<sup>2</sup>)) (Stone 1992). The species is known to occur at elevations of 5,400–5,700 feet (ft.) (1,646–1,737 meters (m)) (Stone 1992; Anderson 2016; Fitts 2016).

*Astragalus desereticus* is a perennial herb that reproduces sexually, with flowering and seed set occurring in May and June (Barneby 1989; Stone 1992). Once the seed pods are mature, they fall off the plant and crack open at the tip to release the seeds. Seeds can remain dormant for a considerable time for many *Astragalus* spp. (Stone 1992; Humphrey 1993). Plants begin the active growing season shortly after snowmelt in about mid-April (Stone 1992). Toward the end of summer when it is hot and dry, the leaves closest to the ground die back and new buds form at the soil level (Stone 1992). These buds generally survive the winter because they are protected from severe cold by snow cover (Stone 1992).

#### **B. Populations**

*Astragalus desereticus* occurs in one population (Birdseye) of six major colonies on the Moroni formation soils east of U.S. Highway 89 near Birdseye, Utah (USWFS 2011) (Figure 1, Table 1). The six major colonies on the east side of U.S. Highway 89 will be the focus of this PDM plan because they make up the core of the population.

Additional occurrences of *Astragalus desereticus* occur on private lands on the western side of U.S. Highway 89. However, these occurrences were not included in recent population estimates or surveys and are not part of this PDM plan due to access restrictions.

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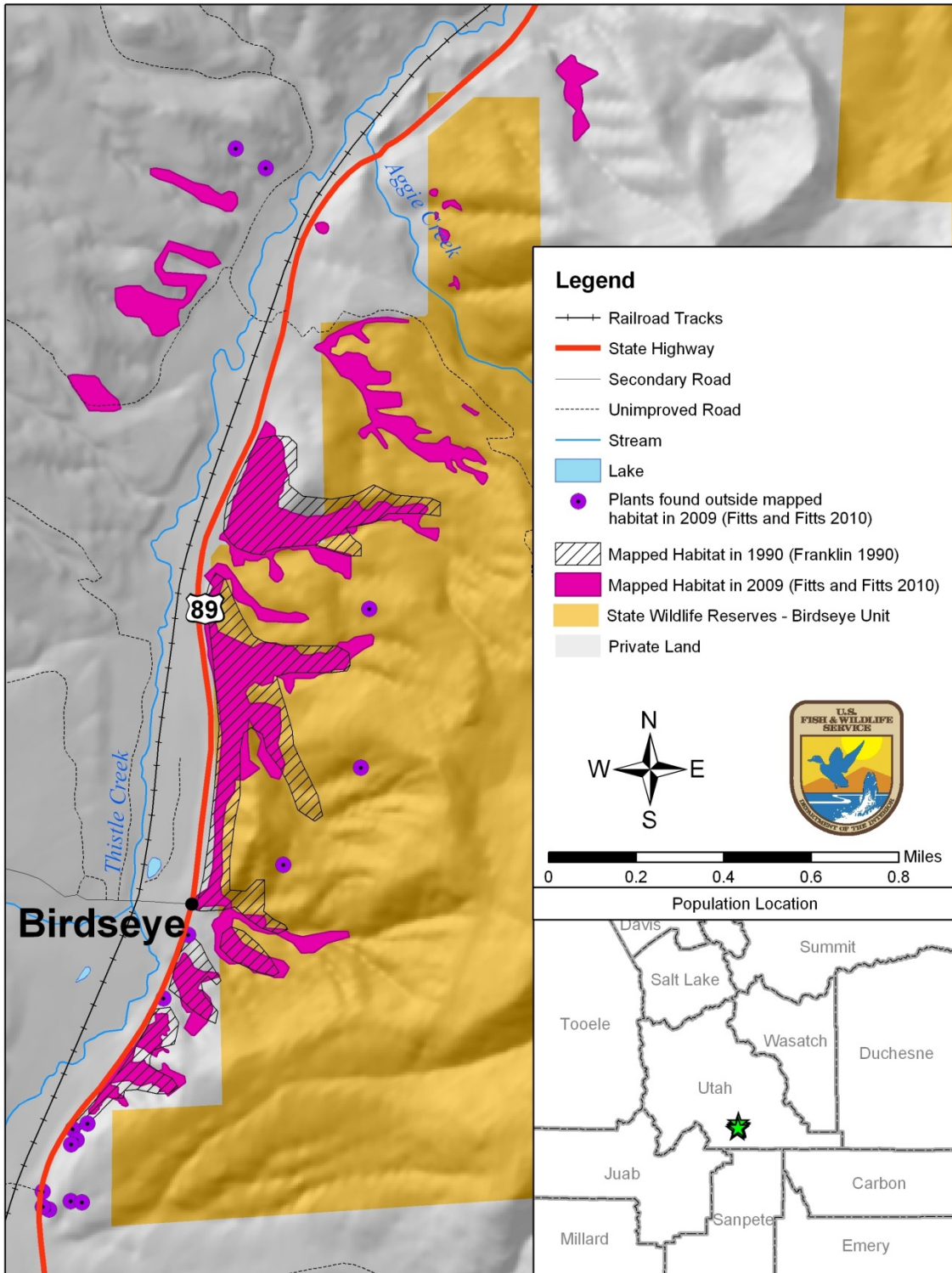
<sup>1</sup> A partial inventory survey was conducted in 2015 by a contractor, but the results were invalidated due to species misidentification.

There are only limited survey or monitoring information for this species. At the time of listing, the mapped habitat of *Astragalus desereticus* was approximately 300 acres (ac) (122 hectares (ha)) in an area 1.6 mi (2.6 km) x 0.3 mi (0.5 km) (64 FR 56592, October 20, 1999). The most recent occupied habitat estimate is approximately 345 ac (140 ha) in an area 2.8 mi (4.5 km) x 0.3 mi (0.5 km) (Fitts and Fitts 2010).

Although the range of the species has not increased greatly since the time of listing, the estimated number of individuals has increased from 5,000-10,000 at the time of listing to 86,775–98,818 adult plants as of 2008 (Fitts and Fitts 2009; Service 2011). We do not know if the increase in plants is a population trend or based on increased survey efforts. However, there was not a significant change in the number of individuals from 1992 to 2009 on in previously established demographic plots (Humphrey 1993, Fitts and Fitts 2010). A population estimate based on similar transect work in 2017 returned approximately 36,005 adult plants and 52,422 juveniles. This estimate did not attempt to census all colonies as was done in 2008 (UNHP 2018).

Of the estimated 345 ac (140 ha) of total occupied habitat for *Astragalus desereticus*, 67 percent is in the Birdseye Unit of the Northwest Manti Wildlife Management Area owned by UDWR, 7 percent is owned by UDOT, and 26 percent is privately owned (Service 2011). Additional occurrences may exist in suitable habitat on private lands within or adjacent to the known range that surveyors have not been able to access (Fitts and Fitts 2010). As of 2018, there were no known *Astragalus desereticus* occurrences on Federal lands.

**Figure 1. Deseret Milkvetch Range (Service 2011)**



**Table 1. Colony population estimates (from Service 2011, based on Fitts and Fitts 2009).**

COLONY*	AREA	#Adult	#Juvenile	#Seedling	Total #Plants	Total Plants per m <sup>2</sup>	Total Population Estimate	Adult Plants per m <sup>2</sup>	Adult Only Population Estimate
	acres (m <sup>2</sup> )								
Dense colony	5.96 (24,124)	333	68	173	574	2.08	50,171	1.21	29,106
North Oberhansly	36.62 (148,210)	78	31	29	138	0.18	27,126	0.10	15,332
Long mid	48.63 (196,790)	200	43	33	276	0.27	52,427	0.19	37,990
NW to SE	9.62 (38,950)	8	7	8	23	0.18	6,891	0.06	2,397
Next to S**	14.3 (57,850)	12	9	9	30	0.08	4,875	0.03	1,950
South Elmer***	9.2 (37,230)						12,043		0-12,043
<b>TOTAL</b>	124.33 (503,154)	631	158	252	1,041		153,533		86,775-98,818

\* Colonies are listed from north to south, beginning just south of Aggie Creek (Dense Colony) as shown in Figure 1 and running along to the eastern side of U.S. Hwy 89 to approximately 0.6 miles south of Birdseye, Utah (South Elmer).

\*\* Fitts and Fitts (2009) report this population as having a density of 0.062. However, the density should be the number of plants found (30) divided by the area of the transect (178 meters by 2 meters or 356 meters square), which equals 0.08. This slight difference results in a difference in the total population estimate for the species. Fitts and Fitts (2009) report the total *Astragalus desereticus* population estimate as 152,229.

\*\*\* The South Elmer colony was censused; therefore, this is an exact count of all individual plants within the colony – the distribution of seedlings, juveniles, and adults was not recorded, resulting in the range in the adults-only population estimate.

### C. Residual Impacts

Various stressors were considered at the time of listing *Astragalus desereticus*. These stressors either have not occurred to the extent anticipated at the time of listing, are being adequately managed, or the species is tolerant of the stressor as described below.

- Minimal disturbance from residential development has occurred or is anticipated on the species' habitat because of the steep, rocky, erosive nature of the species' habitat. In addition, 67 percent of the species habitat is protected from development due to its inclusion in a State wildlife management area (Fitts 2016; Jorgensen 2016; Larsen 2016).
- UDOT anticipates no highway widening in occupied habitat, and herbicide use and other disturbances are avoided (UDWR *et al.* 2006; Kisen 2016).



- The steep, rocky, nature of the species' habitat and sparse forage result in minimal livestock grazing, and 67 percent of the species' habitat occurs in a State wildlife management area where grazing was removed from the landscape (Service 2011; Howard 2016).
- There remains a lack of interest in mineral development on SITLA lands (UDWR *et al.* 2016; Wallace 2016).
- The existing transmission line does not threaten the species, and activity associated with the proposed transmission line occurring within the species' occupied habitat will be confined to existing access roads (Service 2016).
- The species and its genus are likely adapted to drought and are able to re-colonize disturbed areas (Stone 1992; Fitts 2016).

#### **D. Commitments for Post-Delisting Conservation**

The Conservation Agreement outlines the conservation actions to which the Federal and State agencies committed for continued management of *Astragalus desereticus* (UDWR *et al.* 2006). The specific actions committed to by each agency are listed below, as stated verbatim in the conservation agreement (UDWR *et al.* 2006).

1. Maintain *Astragalus desereticus* habitat within the State of Utah Northwest Manti WMA in its natural state.
  - a) The UDWR will maintain the current pinon-juniper woodland vegetation type with its current diverse understory of native shrubs, grasses, and forbs for the long-term conservation of the species and their ecosystem in the occupied habitat of *Astragalus desereticus*. Vegetation manipulations (i.e., chainings, prescribed burns, or herbicide application) will not be conducted in occupied habitat of *Astragalus desereticus*.
  - b) The UDWR will restrict habitat disturbing actions<sup>2</sup>, such as roads, etc., to that essential for managing the site for game and other wildlife, or accessing mineral resources. Habitat disturbing actions will be avoided in occupied *Astragalus desereticus* habitat.
  - c) The SITLA, which manages only the mineral estate in the described lands, will alert energy and mineral developers to the presence of occupied habitat of the *Astragalus desereticus* and the potential for surface use stipulations, on lands described as Township 10 South,

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<sup>2</sup> In suitable *Astragalus desereticus* habitat.

Range 3 East, SLM, Portions of Sections 13, 24 and 25, Utah. If mineral development does occur in the future, to any extent possible, SITLA will encourage its lessees to work to establish surface use agreements among the parties involved to ensure that disturbances to occupied habitat are avoided; that destruction of individual plants does not occur; and that appropriate mitigation is provided for any unavoidable effects to individual plants or their habitat.

- d) The UDWR will work to develop surface use agreements with any prospective energy and mineral developers that avoid and minimize impacts to *Astragalus desereticus* habitat wherever feasible (e.g., directional drilling).
  - e) The UDWR will manage grazing by domestic livestock at a level that maintains the current vegetation composition of the existing native plant community within the occupied habitat of *Astragalus desereticus*.
2. The UDWR will retain the *Astragalus desereticus* habitat on the Birdseye Unit of the Northwest Manti WMA in Utah State ownership under the management of the UDWR
  3. The UDWR and Service will evaluate the feasibility of acquiring conservation easements or fee title purchases of small parcels of private land between U.S. Highway 89 and the existing Birdseye Wildlife Management Area as resources and opportunities become available. These parcels contain important big game habitat as well as *Astragalus desereticus* habitat. Acquisition is to be accomplished on a willing seller, willing buyer basis.
  4. The UDOT will avoid using herbicides where possible in *Astragalus desereticus* habitat. In instances where herbicides must be used, UDOT will not apply by aerial application within 500 feet (152.5 meters) of *Astragalus desereticus* habitat and will maintain a 100 foot buffer for hand application of herbicides around individual plants.
  5. The UDOT will make all efforts to avoid disturbing the plants with widening projects, or construction of accesses. Should disturbing the plants be unavoidable, appropriate mitigation will be coordinated with Service and may include protection of additional occupied habitat, collecting seed, or transplanting individual plants.
  6. The Service will monitor population trends and habitat conditions of *Astragalus desereticus* on lands managed by the UDWR. Monitoring will occur on an annual basis, as needed, in early May.

7. Data collected during monitoring will include at a minimum the number of flowering plants and habitat condition. The UDWR agrees to allow the Service, or their designee, access to the property for monitoring *Astragalus desereticus* populations.
8. The UDWR and Service will maintain cooperative, partnership-based discussions in the development and review of management plans and habitat restoration projects on the Birdseye Wildlife Management Area as affecting the *Astragalus desereticus*.

#### **IV. Monitoring Design**

This section outlines the monitoring design for *Astragalus desereticus* on UDWR and adjacent private lands where accessible<sup>3</sup>. The Service will provide funding to UDNR as available, and UDNR and Service will work cooperatively to ensure that monitoring is completed in accordance with this PDM plan. The UDNR may designate and fund another entity (such as the UNHP or a contractor) to conduct the monitoring. The UDNR or its designee will provide an annual monitoring report to Service. If funding is not available and monitoring is not conducted for one or more years, the duration of PDM will need to be extended so that a total of at least five years of monitoring data is collected and analyzed. If no monitoring is conducted after five years, Service will conduct a status review of *Astragalus desereticus* to determine whether it needs to be re-listed.

Because of the lack of consistent monitoring in the past, we do not know the degree of variability in population numbers that *Astragalus desereticus* may exhibit from year to year. However, many *Astragalus* species are drought-adapted and exhibit natural fluctuations in population levels that are correlated with annual precipitation (Van Buren and Harper 2004; Breinholt *et al.* 2009; Martínez-Sánchez *et al.* 2011; DePrenger-Levin *et al.* 2013).

Monitoring will take place annually at all six colonies identified in Part III, Section C above, for at least five years after *Astragalus desereticus* is delisted. A longer monitoring timeframe may be needed if at that time we are not able to confirm that the population is stable.

Monitoring will take place during the flowering period (late April through June) and be conducted by qualified and trained individuals able to distinguish *Astragalus desereticus* from similar and more common *Astragalus* species in the area, particularly Utah milkvetch (*Astragalus utahensis*), which occupies similar habitat within the range of *Astragalus desereticus* (SWCA 2015).

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<sup>3</sup> If access to portions of colonies on private lands is not obtainable, site selection for transects may have be altered from that described below and some colonies (Next to S and South Elmer) may have to be excluded from monitoring entirely.

The UDNR will develop detailed monitoring protocols, for approval by Service, based on those used in the 2008 population survey (Fitts and Fitts 2009). These protocols will be primarily focused on population trends in each colony, and be used to produce a total annual population estimate. Separate trends and population estimates will also be completed for the State WMA as those lands provide conservation value to the species because development and grazing no longer occur in this area. In the first and fifth year of the post-delisting monitoring, existing demographic plots established in 1992 (Humphrey 1993) and read again in 2009 (Fitts and Fitts 2010) will also be monitored, to provide additional historical context for the population trend. Monitoring will also include habitat assessments, in order to capture any disturbance events or new stressors that may be impacting the population.

This section outlines our general procedure for conducting population trend monitoring using transects, which has been used successfully in the past to estimate the *Astragalus desereticus* population (Fitts and Fitts 2009).

### **Plot selection**

Permanent transects, two meters wide and spaced approximately 400 meters apart will be laid out so that at least one transect passes completely through each of the six monitored colonies (Dense Colony, North Oberhansly, Long Mid, NW to SE, Next to S, and South Elmer). The ends of transects will be permanently marked and the entire length of the transect will be recorded using a Global Positioning System (GPS).

Transects will be oriented southwest to the northeast where possible, in order to incorporate a wide range of slopes in the habitat. Additional one-meter square plots will be located along each transect, for the purposes of double-checking transect seedling counts (Fitts and Fitts 2009). For the demographic plots to be read in the first and fifth year of monitoring, the existing plots established in 1992 will be used (Humphrey 1993).

### **Methodology**

The total number of adult, juvenile, and seedling *Astragalus desereticus* individuals within each two-meter-wide transect will be recorded. Close-up photographs of plants in each of the three monitored life history stage classes will be provided to the surveyors prior to field monitoring. Life history stage classes are:

Seedling – First-year plant with cotyledons

Juvenile – Individual without cotyledons or any sign of reproductive effort (buds, flowers, or fruits).

Adult – Individual with buds, flowers, or fruits

The surveyors will walk transect lines through the monitoring plot to collect population trend monitoring data. All seedlings within the one-meter-square transect subplots will be pin-flagged and counted in order to double check transect counts (Fitts and Fitts 2009).

Surveyors will complete a modified standardized site visit account forms for each transect (Appendix A). Recorded information must include the total number of seedling, juvenile, and adult individuals as well as any observed threats or disturbance to the habitat.

In the first and fifth year, data will also be collected from demographic monitoring plots that were established in 1992. Survey protocol and data collection should follow the methods outlined in Humphrey 1993 and include spatial distribution, reproductive effort, and associated species information. Site visit accounts forms will also be completed for these plots (Appendix A).

### **Data analysis**

The data collected will be analyzed annually to determine trends. Each year, the data will be entered into a database maintained by the UDWR and shared with Service via an annual report.

1. Density and percentage by life history stage class will be calculated for each transect. Using this density and percentage information, we will calculate a population estimate for the colony.
2. Annual rainfall from the nearest recording station will be recorded and compared with population estimates to determine if population fluctuations are tracking precipitation amounts.
3. Average colony densities will be calculated and applied to the total occupied habitat to determine a total population estimate.
4. In the first and fifth year, data collected from the additional demographic plots will be analyzed and compared to previous collections from those plots and population trends from the annual transects. If demographic plot data conflicts with overall trend data from transects, additional analysis will be conducted.

5. After five years of data are available, we will plot the number of plants in each life history stage class by colony to create a graph depicting population change over the monitoring period. If population trends or levels raise concerns, we may develop more specific monitoring questions and apply more rigorous monitoring methods.

## **V. Data Compilation and Reporting Procedures**

Annual reports summarizing the activities, data collected, and results of each component of the PDM plan will be submitted by the UDNR or its designee to the Utah Field Office of the USWFS by the 31<sup>st</sup> of December each year. Each annual report will synthesize all monitoring data including population trend and comment on the status of the *Astragalus desereticus*. Information on any recorded disturbance or stressors within the population will be included so that we can determine if new factors may be negatively affecting the species. After five years of data are available, we will review the field collection data to determine overall population change and apply the appropriate thresholds for the monitoring outcomes and conclusions (see section VII, Thresholds for Monitoring Outcomes).

## **VI. Thresholds for Monitoring Outcomes**

Effective PDM requires timely evaluation of data and responsiveness to observed trends. In order to assure timely response to observed trends, it is necessary to identify possible outcomes from monitoring that could be anticipated and general approaches for responding to these scenarios.

After five years of monitoring, all years of data will be analyzed for trend information and factors that may be influencing population trend (e.g., drought). From this analysis, it will be possible to categorize observations into one of the following three possible PDM outcomes.

### **A. Category I**

*Astragalus desereticus* remains secure without ESA protections. This would be true if:

- (1) The population trend is stable or increasing over five years;

and

- (2) No new or increasing stressors to the species are observed.

For this category, the PDM would be concluded at the end of the five-year timeframe specified in this plan.

## B. Category II

*The Astragalus desereticus population may be lower than anticipated after five years of post-delisting monitoring. This would be true if:*

(1) The population trend is negative over five years, but may be correlated with precipitation levels;

and

(2) The population estimate remains above 20,000<sup>4</sup> adult and juvenile individuals on the State WMA;

or

(3) There are new or increasing stressors that are considered to be of a magnitude and imminence that may threaten the continued existence of *Astragalus desereticus* within the foreseeable future.

For this category, the PDM period will be extended for an additional three to five years, depending on the degree of decline, fluctuation, and presence of stressors, as agreed to by UDWR and Service. If necessary, sampling intensity will be increased to provide greater precision in detecting trends. Existing data will be analyzed to determine if any management interventions are available that would be expected to reverse declines and stabilize or improve trends.

## C. Category III

*The PDM yields substantial information indicating that stressors may be causing a decline in the status of Astragalus desereticus since the time of delisting. This would be true if:*

(1) The population trend is negative over the monitoring period (five + years) and does not appear to be correlated with precipitation levels;

and

(2) The population estimate is less than 20,000 adult and juvenile individuals on State lands;

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<sup>4</sup> We do not know the minimum viable population of Deseret milkvetch - no population viability analysis has been conducted. A population viability analysis of another listed narrow endemic Astragalus species (*Astragalus cremnophylax* var. *cremnophyla*), which likely has a shorter dispersal range and less persistence in the seed bank than Deseret milkvetch, found a 90 percent probability of persistence over 100 years with a population of only 350 individuals (Machinski *et al.* 1997). The recovery plan for that species recommended delisting when the total population reached 8,000 individuals (8 populations of 1,000 each) (Service 2006). The number 20,000 (20x the recommended population size for *A. cremnophylax*) was chosen for this PDM plan as a conservative trigger level for Deseret milkvetch, despite its documented ability to go dormant in times of stress and rebound when conditions are more favorable (Fitts 2016), as there is only a single population of the species and potential population problems need to be detected well before a loss of viability is approached.

or

- (3) There are new or increasing stressors that are contributing to declining population numbers or trends.

For this category, if any one of these conditions is true, then the Service should initiate a formal status review to assess changes in the status of the species to determine whether a proposal for relisting is appropriate.

## VII. Estimated Funding Requirements and Sources

Field work for annual monitoring is estimated at approximately 80-140 person/hours per year (\$2,890-\$3,980 per year), plus transportation and equipment costs equal to approximately \$540. The cost range for field work depends on whether the demographic plots are included in that year's work. Data entry, analysis, and report writing are estimated at approximately 40 person/hours per year (\$1,800). The Service may provide up to \$6,320 amount of funding per year to the UDNR for monitoring, if funds are available, and may provide limited Service staff time for monitoring assistance, as needed.

**Table 2. Estimated Costs for Monitoring Activities (over five years)<sup>5</sup>.**

Action	Service
Conduct Population Trend Monitoring Studies	\$19,330
Data Entry, analysis and Report Writing	\$9,000
<b>TOTAL</b>	<b>\$28,330</b>

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<sup>5</sup> This represents an estimate of costs at the time of this writing and may be subject to change. All actions are funding dependent. If the Service is unable to provide funding for the monitoring program and no monitoring occurs, the status of Deseret milkvetch will need to be re-evaluated after five years to determine if re-listing is necessary.



## VIII. Post-delisting Monitoring Implementation Schedule

**Table 3. Monitoring Implementation Timeline.**

Action	FY18	FY19	FY20	FY21	FY22
Conduct Population Trend Monitoring Studies	■	■	■	■	■
Database Maintenance and Report Writing	■	■	■	■	■
Analyze Cumulative Data and Produce Final Report					■

## IX. Literature Cited

- Anderson, K.T. 2016. U.S. Forest Service. Email to J. Lewinsohn. May 31, 2016.
- Barneby, R.C. 1989. In A. Cronquist, A.H. Holmgren, N.H. Holmgren. J.L. Reveal, and P.K. Holmgren. 1989. Intermountain Flora, Vol. 3, Part B. Fables. Columbia University Press, New York, NY. 279 pp.
- Breinholt, J.W., R. Van Buren, O.R. Kopp, C.L. Stephen. 2009. Population genetic structure of an endangered Utah endemic, *Astragalus ampullarioides* (Fabaceae). *American Journal of Botany* 96 (3): 661 – 667.
- DePrenger-Levin, M.E., J.M. Ramp Neale, T.A. Grant III, C. Dawson, Y.E. Baytok. 2013. Life History and Demography of *Astragalus microcymbus* Barneby (Fabaceae). *Natural Areas Journal* 33(3): 264 – 275.
- Fitts, R. 2008. Summary of *Astragalus desereticus* field survey. Conducted spring 2008. The Utah Natural Heritage Program, Utah Division of Wildlife Resources. 2 pp.
- Fitts, R.D., and S.G. Fitts. 2009. Inventory of the rare endemic plant *Astragalus desereticus* (Deseret milkvetch). Preliminary Report. 2008 Project. Utah Natural Heritage Program, Utah Division of Wildlife Resources. February 2009. 9 pp.
- Fitts, R.D., and S.G. Fitts. 2010. Survey and monitoring the rare endemic plant *Astragalus desereticus* (Deseret milkvetch). Utah Division of Wildlife Resources, February 2010 Draft Report. 10 pp.
- Fitts, R.D. 2016. Utah Natural Heritage Program. Comments submitted on [www.regulations.gov](http://www.regulations.gov). May 12, 2016.
- Howard, M. 2016. Utah Division of Wildlife Resources. Email to J. Lewinsohn. May 2, 2016.
- Humphrey, L.D. 1993. *Astragalus desereticus* (Deseret milkvetch) population monitoring project. The Nature Conservancy, Great Basin Field Office, Salt Lake City. 18 pp + appendices.
- Jorgensen, B. 2016. GIS contractor for U.S. Fish and Wildlife Service. Email to J. Lewinsohn. May 9, 2016.
- Kisen, N. 2016. Utah Department of Transportation. Email to J. Lewinsohn. June 6, 2016.
- Larsen, B. 2016. Utah County. Email to J. Lewinsohn. April 18, 2016.

Maschinski, J., Frye, R. and Rutman, S., 1997. Demography and population viability of an endangered plant species before and after protection from trampling. *Conservation Biology*, 11(4), pp.990-999.

Martínez-Sánchez, J.J., F. Segura, M. Aguado, J.A. Franco, M.J. Vicente. 2011. Life history and demographic features of *Astragalus nitidiflorus*, a critically endangered species. *Flora* 206: 423 – 432.

SWCA Environmental Consultants (SWCA). 2015. Deseret Milkvetch Survey Report for the TransWest Express Transmission Projects. Prepared for TransWest Express LLC, August 2015. 48 pp.

Stone, R.D. 1992. *Astragalus desereticus* element stewardship abstract. The Nature Conservancy, Great Basin Field Office, Salt Lake City.

U.S. Fish and Wildlife Service and National Marine Fisheries Service (Service and NMFS). 2008. Post-Delisting Monitoring Plan Guidance Under the Endangered Species Act. Guidance document, 24 pp.

U.S. Fish and Wildlife Service. 2006. Sentry Milkvetch (*Astragalus cremnophylax* Barneby var. *cremnophylax* Barneby) Recovery Plan. U.S. Fish and Wildlife Service, Albuquerque, New Mexico. i-vi +44 pp.

U.S. Fish and Wildlife Service (Service). 2015. U.S. Fish and Wildlife Service Species Assessment and Listing Priority Assignment Form: *Astragalus anserinus*. 84 pp.

U.S. Fish and Wildlife Service (Service). 2016. Biological opinion and informal consultation for the TransWest Express transmission line right-of-way project—Carbon and Sweetwater Counties, Wyoming; Moffat and Rio Blanco Counties, Colorado; Duchesne, Sanpete, Uintah, Utah, Wasatch, Juab, Millard, Beaver, and Iron Counties, Utah; and Lincoln and Clark Counties, Nevada. 118 pp.

Utah Department of Wildlife Resources, Utah Department of Transportation, Utah School and Institutional Trust Lands Administration, U.S. Fish and Wildlife Service. 2006. Conservation Agreement for Deseret milkvetch (*Astragalus desereticus*). 15 pp.

Utah Natural Heritage Program (UNHP). 2018. *Astragalus desereticus* (Deseret milkvetch) monitoring update, 2017 data. 5 pp.

Van Buren, R. and K.T. Harper. 2004. Two year Annual Monitoring Report 2003 and 2004 for *Astragalus ampullarioides*. Submitted to BLM St. George Field Office, St. George, Utah. Prepared by Utah Valley State College, Orem, Utah. 28 pp.

Wallace, S. 2016. Utah School and Institutional Trust Lands Administration. Email to J. Lewinsohn. April 18, 2016.

**X. Signature Approval**

Approve: for Amy S DeFreese  
Field Supervisor, Utah Ecological Services Field Office

Date: 7/13/18

## Appendix A: Example Monitoring Forms

### REPEAT INVENTORY MONITORING FORM

DB# \_\_\_\_\_ entered into database on \_\_\_\_\_

by \_\_\_\_\_

#### (SITE VISIT ACCOUNT (SVA))

Verified DB on \_\_\_\_\_ by \_\_\_\_\_

New Site? yes no

Entered into GIS on \_\_\_\_\_ by \_\_\_\_\_

Revisit? yes no

Verified GIS on \_\_\_\_\_ by \_\_\_\_\_

If revisit, plants found again? yes no

Photo files renamed on \_\_\_\_\_ by \_\_\_\_\_

Site Name/Transect #: \_\_\_\_\_ Date: \_\_\_\_\_

Time: \_\_\_\_\_

Source of lead: \_\_\_\_\_  
\_\_\_\_\_

Species Found: \_\_\_\_\_ Species Code: \_\_\_\_\_  
\_\_\_\_\_

Surveyor(s): \_\_\_\_\_  
\_\_\_\_\_

Quad Name(s): \_\_\_\_\_ State: \_\_\_\_\_ County(ies): \_\_\_\_\_  
\_\_\_\_\_

Township(s): \_\_\_\_\_ Range(s): \_\_\_\_\_ Section(s): \_\_\_\_\_  
\_\_\_\_\_

UTM North: \_\_\_\_\_ UTM East: \_\_\_\_\_ UTM Zone: \_\_\_\_\_ Datum: \_\_\_\_\_  
\_\_\_\_\_

UTM Precision (Circle one):  Corrected GPS  Field Recorded GPS  
 Determined from map

GPS unit(s) used: \_\_\_\_\_ GPS File Name(s): \_\_\_\_\_  
\_\_\_\_\_

**Site Location/Directions to site:** Start directions from a specific known location and describe in detail the roads, trails, and routes taken to get to general area, then refer to nearby landmarks to concisely describe the site's location. Also describe the location of plants within the site, especially if plants would be difficult for someone not familiar with the site to relocate using only attached maps.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Written Description** (Describe the site, including such things as vegetation, significant species, aquatic features, notable landforms, natural disturbances, natural hazards, etc):

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**Transect**

**Width:** \_\_\_\_\_

**Landowner** (Circle one):      BLM      USFS      NPS      State of Utah      Private      Other:

**Owner unit** (Circle one):      CARE      Dixie NF      Fishlake NF      Richfield BLM      Price BLM  
Other:

**USFS subunit** (Circle one):      Beaver RD      Escalante RD      Fillmore RD      Fremont River RD  
Richfield RD

Current use of site:  
\_\_\_\_\_

**Surrounding land use** (Describe physical structures and land use practices in the surrounding area, such as housing, agricultural, recreational, etc.):

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**HABITAT**

(Circle appropriate categories)

ASPECT		SLOPE (degrees)	LIGHT	TOPOGRAPHIC POSITION	MOISTURE
W	NW	flat	Open	Crest	Inundated (hydric)
E	NE	0-10	Partial	Upper slope	Intermittently flooded
S	SW	10-35	Filtered	Mid-slope	Saturated (wet-mesic)
N	SE	35+	Shade	Lower slope	Moist (mesic)
none		vertical		Bottom	Dry-mesic
multiple				All	Dry (xeric)

**Elevation Range:** \_\_\_\_\_ ft /m to \_\_\_\_\_ ft /m      **Elevation at GPS Points:**  
\_\_\_\_\_ ft /m

**Associated plant community:**

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**Associated plant species (list in order of dominance):**

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**Soil/Geologic Formation:**

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**Full extent of occurrence mapped?** (Circle one): yes no

**Estimated # of acres of potential habitat in the immediate area:**

(Check only one category)

< 1 acre	6 – 20 acres	41 – 80 acres	121-160 acres
1 - 5 acres	21- 40 acres	81 – 120 acres	> 160 acres

**BIOLOGY**

<b>XI. PHENOLOGY</b> (Optional estimate, must sum to 100%)	<b>XII. POPULATION ESTIMATE</b> (for whole colony, check one)	<b>XIII. ACTUAL PLANT COUNT</b>	
%in leaf	1-10	<b>In Transect</b>	<b># seedling:</b>
%in bud	11-50		<b># juvenile:</b>
%in flower	51-100		<b>#adult:</b>
%immature fruit	101-1000		
%mature fruit	1001-10,000		
%seed dispersing	10,000-50,000		
%dormant	> 50,000		

<b>AGE STRUCTURE</b> (must sum to 100%)	<b>VIGOR</b> (check one)
%seedlings	very feeble
%immature	feeble
%mature	normal
%senescent	vigorous
%unknown	exceptionally vigorous

**Comments on biology:**

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**Evidence of reproduction** (Circle one): yes no

**Explain:** \_\_\_\_\_

**Evidence of disease, predation, etc** (Circle one): yes no

**Explain:** \_\_\_\_\_

### IDENTIFICATION

**Do other members of the same genus occur at this site? If yes, list species, any hybridization, etc.?**

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**Identification problems? If yes, explain:**

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**Specimen(s) collected?** (Circle one): yes no

### PHOTOGRAPHS

**Photograph(s) taken?** (Circle one): yes no

**Camera(s) used:**

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**Describe photographs** (Use photo #'s. State if it's a close-up or habitat view, direction or bearing faced, etc.):

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**CONSERVATION**

Site Risk Category	Yes
High Risk	
Moderate Risk	
Low Risk	

(see definitions below)

Check the box or boxes that apply as justification for selection of risk category. Write comment in notes section below if further explanation is needed.

High Risk:		Moderate Risk:	Low Risk:
Adjacent to an actively used OHV play area or trail (designated or undesignated)	<b>Within ¼ mile of livestock concentration area:</b> (circle which) *Stockpond or other water source *Corral * Mineral supplements * Livestock trail * High value forage area * Shaded area	More than ¼ mile from livestock concentration area.	Area inaccessible to livestock and OHV's due to topography or geology.
Within ¼ mile of maintained primary road (collection issues)	Currently or recently occupied by livestock	Evidence of past livestock use in the area	Area within protective fencing
Visitor use; Hikers (trampling or collection issues)	Evidence of recent ATV use in the area	Evidence of past ATV use in the area	Lack of vegetation to attract livestock

**Evidence of disturbances** (describe any unnatural on-site disturbances):

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**NUMBER OF SURVEYORS:** \_\_\_\_\_ **SURVEY TIME FOR SITE:** \_\_\_\_\_ hours

**SURVEY TIME FOR ENTIRE SURVEY AREA** (including time at site): \_\_\_\_\_ hours

You **MUST** attach a map showing the site location, the area occupied by the plants (if able to determine this), and the area surveyed. Use some facsimile (copy machine or GIS-generated) of the appropriate portion of the standard USGS topographic quadrangle as your base. The site name, date, species name, and number of plants found should be indicated on the map. You may also draw a sketch of the site on the back of this sheet to show finer detail.