

Recovery Plan for *Astragalus applegatei* (Applegate's milk-vetch)

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RECOVERY PLAN AMENDMENT

We have identified the best available information that indicates the need to amend recovery criteria for *Astragalus applegatei* (Applegate's milk-vetch) since the recovery plan was completed. In this modification, we synthesize the adequacy of the existing recovery criteria, show amended recovery criteria, and describe the rationale supporting the recovery plan modification. The modification is shown as an addendum that supplements the recovery plan, superseding only Part II, page 14 of the recovery plan.

**For
U.S. Fish and Wildlife Service
Region 8
Klamath Falls, Oregon**

September 2019

Approved: 
Acting Regional Director, U.S. Fish and Wildlife Service
Pacific Southwest Region

Date: 10/4/19

METHODOLOGY USED TO COMPLETE THE RECOVERY PLAN AMENDMENT

This amendment was prepared through coordination among several biologists from the Pacific Southwest Region of the U.S. Fish and Wildlife Service. Information used to complete this amendment was assessed through a review of Service office files, literature review, and data solicitation. Office files revealed field notes, survey results, and research grant progress reports. Recent and ongoing research includes a 5-year (2014-2018) study tracking the fate of transplanted individuals at a single site and a 5-year (2016-2020) demographic study monitoring naturally occurring populations at four Applegate's milk-vetch sites. Literature review and data solicitation from partners returned no new peer reviewed papers or new information directly related to the Applegate's milk-vetch species.

ADEQUACY OF RECOVERY CRITERIA

Section 4(f)(1)(B)(ii) of the Endangered Species Act (Act) requires that each recovery plan shall incorporate, to the maximum extent practicable, "objective, measurable criteria which, when met, would result in a determination...that the species be removed from the list." Legal challenges to recovery plans (see *Fund for Animals v. Babbitt*, 903 F. Supp. 96 (D.D.C. 1995)) and a Government Accountability Audit (GAO 2006) have also affirmed the need to frame recovery criteria in terms of threats assessed under the five threat factors (ESA 4(a)(1)).

Recovery Criteria

The current recovery criteria can be found on page 14 in the recovery plan.

Synthesis

Status of the Species:

Many of the unknown details related to Applegate's milk-vetch life stages and resource requirements at the time of the recovery plan remain unknown today, including seed longevity, extent of soil seed bank formation, level of post-dispersal seed mortality, timing and level of seed germination, levels of seedling recruitment, natural rates of plant development, plant longevity, frequency and duration of plant dormancy, outcrossing rates, and to what degree parent and progeny fitness is related to self- versus cross-pollination. These uncertainties and data gaps continue to impede the recovery progress, as do perceived threats.

In order to be classified as threatened or endangered, a species must meet one or more of the five Factors Affecting the Species as described in section 4(a)(1) of the Endangered Species Act, as amended. Potential threats to Applegate's milk-vetch identified in the Federal Register are habitat loss and modification due to agricultural and urban development (Factor A); the possibility of over collection (Factor B); grazing by wildlife and cattle; (Factor C); lack of protection (Factor D); and poor reproductive potential (Factor E) (USFWS 1993). The recovery plan additionally listed competition with exotic weeds, seed predation and limited seed production, and population viability (Factor E), while not mentioning the possibility of over collecting. We believe the threat list from the recovery plan remains relevant and that over-collecting should still be omitted.

The Service's understanding of the Applegate's milk-vetch and its needs have increased substantially since the publication of the 1998 Recovery Plan, based on additional years of data collection. Greenhouse experiments revealed that mycorrhizal fungi and *Rhizobium* bacteria must be present in the soil for plant growth and survival (Gisler and Meinke 2001; Meinke

2011). Through the incorporation of this knowledge, locally propagated seedling mortality decreased and out planting survival rates of the propagated seedlings increased (Gisler 2002a; ORNHIC 2007a, Byrne 2017a), improving efforts to establish new introduced populations. Ongoing demographic monitoring of naturally occurring populations is providing data related to life stages and survival rates (Byrne 2017b). However, additional research is still needed to fully understand the species' needs and population dynamics.

Attempts were made to locate new populations in 2008 through further refinement of previous habitat maps and models, including the addition of pre-settlement and current vegetation to previous variables. Elevation, salinity, and day-to-day variability in the maximum air temperature were considered the three most important drivers. Eight new locations were identified as highly probable habitat although monitoring efforts of these locations did not return any new observations (Kagan *et al.* 2008).

Additional occupied sites were discovered through opportunistic observation, however, increasing the number from three in 1998 to the current number of eight (Table 1). The sites, while in relatively close proximity to each other, are spatially separated by natural or man-made barriers. With the addition of the new sites, the metapopulation increased from 12,000 plants in 1998 to a 2018 estimate of 91,029 (includes six of the eight sites as the others were not surveyed recently). Unfortunately, one of the eight sites was recently observed to have been cleared of all vegetation, decreasing the metapopulation estimate by about 228 plants. Past and current information were used to evaluate the resiliency, redundancy, and representation (i.e., viability) for Applegate's milk-vetch (Table 2.1). Based on additional years of data collection since the publication of the recovery plan, the Service's understanding of the Applegate's milk-vetch and its needs has similarly increased.

Table 1. Summary of site information at time of listing (1993), recovery plan publication (1998), 5-year review (2009), and SSA (2018)

Site	Documented Discovery Year	Status when Federally Listed 1993	Status at Recovery Plan 1998	Status at 5 year Review 2009	Status at SSA 2019
Keno	1927	Extirpated	Extirpated	Extirpated	Extirpated
Klamath Falls	1983	Extirpated	Extirpated*	Extirpated	Extirpated
Ewauna Flats	1986	<30,000	11,500	2,198	3,390
Miller Island	1993	30-80	<500	112	112
Worden	1997	-	3	9	Unknown
Collins	2002	-	-	10,143	47,516**
Airport	2007	-	-	21,049	30,873**
Washburn RR	2007	-	-	307	228***
Mallard Lane	2009	-	-	625	Unknown
OC&E	2015	-	-	-	8,910

*13 found in 1994. Site has since been developed.

**At least partially censused, which increases the chance of all age classes being observed and included.

***Site and population appear to have been bulldozed after survey.

As described in the 2019 Applegate’s milk-vetch Species Status Assessment (SSA) (USFWS 2019), a self-sustaining population/site¹ contains a minimum of 2,200 reproductive plants² in combination with individuals in younger age classes to suggest population stability or growth. The multiple Applegate’s milk-vetch populations/sites, while sometimes geographically close to one another, are spatially isolated from one another by manmade or natural features. This spatial arrangement greatly restricts the potential for catastrophic events, which could include severe fire, drought, or flooding, to decimate multiple populations; therefore, we believe that the most basic definition of redundancy (greater than one) is applicable to Applegate’s milk-vetch. Additionally, as there have been no genetic studies to date, we do not know what levels of gene flow or difference in genetic signatures, if any, may occur between populations/sites to inform our assessment of representation. We assume that because Applegate’s milk-vetch consists of multiple, spatially isolated populations/sites (See SSA Chapter 3: Range and Distribution) that there may be some variation in genetic diversity between populations/sites. Although stochastic events, such as floods, droughts, and fires may have the most significant short-term effects on small plant populations, it is believed that genetic variability may be crucial for adaption to longer-term changes, including those related to climate.

AMENDED RECOVERY CRITERIA

Recovery criteria serve as objective, measurable guidelines to assist in determining when an endangered species has recovered to the point that it may be downlisted to threatened, or that the protections afforded by the Act are no longer necessary and the species may be delisted.

Delisting is the removal of a species from the Federal Lists of Endangered and Threatened Wildlife and Plants. Downlisting is the reclassification of a species from an endangered species to a threatened species. The term “endangered species” means any species (species, sub-species, or DPS) which is in danger of extinction throughout all or a significant portion of its range. The term “threatened species” means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Revisions to the Lists, including delisting or downlisting a species, must reflect determinations made in accordance with sections 4(a)(1) and 4(b) of the Act. Section 4(a)(1) requires that the Secretary determine whether a species is an endangered species or threatened species (or not) because of threats to the species. Section 4(b) of the Act requires that the determination be made “solely on the basis of the best scientific and commercial data available.” Thus, while recovery plans provide important guidance to the U.S. Fish and Wildlife Service (Service), States, and other partners on methods of minimizing threats to listed species and measurable objectives against which to measure progress towards recovery, they are guidance and not regulatory documents.

Recovery criteria should help indicate when we would anticipate that an analysis of the species’ status under section 4(a)(1) would result in a determination that the species is no longer an endangered species or threatened species. A decision to revise the status of or remove a species

¹ As described in the SSA, “Site” refers to a property that contains one or more Applegate’s milk-vetch plants. Population is the total of all plants located within a site. The terms “site” and “population” are used interchangeably.

² Due to an inability to track the derivation of 1,500 plants in the Recovery Plan and additional data collected since its publication, the Service believes this updated definition of a resilient population is based on the best available science. Please see the SSA for further explanation.

from the Federal Lists of Endangered and Threatened Wildlife and Plants, however, is ultimately based on an analysis of the best scientific and commercial data then available, regardless of whether that information differs from the recovery plan, which triggers rulemaking. When changing the status of a species, we first propose the action in the *Federal Register* to seek public comment and peer review, followed by a final decision announced in the *Federal Register*.

The Service's understanding of the Applegate's milk-vetch and its needs has greatly increased over the last 20 years. With our increased understanding of Applegate's milk-vetch status and needs, we feel it is appropriate to update the recovery criteria to reflect this knowledge and to address delisting requirements as well, since the 1998 recovery plan does not include criteria related to the delisting of the species.

Therefore, we have amended the Recovery Criteria to reflect our increased knowledge by incorporating the best scientific and commercial data available. We provide both downlisting and delisting criteria for the Applegate's milk-vetch, which will supersede those included in the Recovery Plan for the Applegate's Milk-vetch (*Astragalus applegatei*), as follows:

Downlisting Recovery Criteria

Applegate's milk-vetch may be considered for downlisting to threatened status when the following conditions have been met:

1. A minimum of four self-sustaining populations/sites are under protected management³ for the benefit of the species⁴.

A minimum of four self-sustaining populations is needed to reduce the chance that a single catastrophic event, such as a rare destructive natural event or episode involving many populations at a given point in time, could result in extinction of the species. Potential catastrophic events within the range of Applegate's milk-vetch include fire, drought, or flooding on a scale or with an intensity such that entire populations may be at risk of extirpation. The minimum of four sites was increased from the Recovery Plan (USFWS 1998) criterion of three sites because qualifying sites will be characterized by "protected" management, which is a lower standard than "permanently secure," which was the standard used in the Recovery Plan (USFWS 1998); this target also acknowledges the conservation efforts of landowners where Applegate's milk-vetch occur.

2. For a site to contribute as a self-sustaining population/site, a minimum of 2,200 reproductive plants need to be present at the site over five consecutive years of monitoring. This updated number is derived from additional years of data collection since the publication of the recovery plan (USFWS 1998). For

³ Habitat being managed for Applegate's milk-vetch under the oversight of long-term land ownership that is not expected to change (e.g., the Miller Island recovery area that is owned by the State and managed as a Wildlife Management Area or the Airport property owned and managed by the City).

⁴ Includes the development of an Applegate's milk-vetch management plan addressing the mitigation and prevention of stressors and threats including agricultural and urban development (Factor A); wildlife and cattle grazing (Factor C); lack of regulatory protection (Factor D); and poor reproduction, competition with exotic weeds, seed predation, and low population viability (Factor E).

example, data from the Ewauna Flats Preserve population indicate that after reaching a low of 2,200 individuals in 2008, the population was able to rebound. With a total estimated population of 3,395 plants present in 2016, the population appears to be gradually increasing. Although the data are limited, we suggest that to the best of our knowledge, because the population showed a gradual increase in the number of individuals, 2,200 represents the currently-known minimum number of reproductive plants per population needed for resiliency (USFWS 2019). In addition, the site needs to show that there are enough non-reproductive⁵ individuals to suggest population stability or growth, which we estimate to be a minimum of 220 individuals⁶ (USFWS 2019).

Rationale for downlisting criteria

The downlisting criteria address threats from habitat loss/modification, grazing and lack of protection by requiring populations to be protected before qualifying for their recovery contribution. The threat from poor reproductive potential is addressed through the inclusion of multiple age classes and reproductive maturities in populations that qualify as meeting the downlisting criteria. The threats from exotic weeds, seed predation and limited seed production, and population viability are addressed through downlisting requirements for the size of populations. We believe that in meeting these criteria, resilience, redundancy, and representation will have improved such that the species would no longer be in danger of extinction; therefore the species could then be considered for reclassification to threatened.

Delisting Recovery Criteria

Applegate's milk-vetch may be considered for delisting when the following conditions have been met:

1. A minimum of four self-sustaining populations/sites are under secured management⁷ for the benefit of the species or six self-sustaining recovery populations/sites are under protected management for the benefit of the species (See footnote 3).

For delisting, we included mechanisms for both "secured management" and protected management to acknowledge the conservation efforts of landowners where Applegate's milk-vetch occurs while also recognizing the bar for delisting is higher.

2. A minimum of 2,200 reproductive plants occurring over five consecutive years of monitoring at each site that contributes toward the delisting threshold. We feel

⁵ To provide clarity, the Amendment changes the SSA wording of "younger age classes" to that of "non-reproductive," as reproductive status is easier to determine than age class.

⁶ Derived from an assumed 10-year life span for an average number of plants.

⁷ Habitat managed for Applegate's milk-vetch exclusively, whether through purchase or development of legally binding Conservation Agreement between landowners and USFWS, or similar arrangements with other public or private conservation organizations; i.e. Ewauna Flats recovery area purchased and managed by The Nature Conservancy for Applegate's milk-vetch protection and management.

this figure is appropriate given the research used to arrive at the 2,200 number as discussed under the downlisting criteria. The sites included for delisting will also need to show that there are enough non-reproductive individuals to suggest population stability or growth, which is 220 younger individuals (see footnote 5).

Rationale for delisting criteria

The delisting criteria address threats from habitat loss/modification, grazing and lack of protection by requiring populations to be protected or permanently secure before qualifying for their recovery contribution. A greater number of populations or greater level of security is needed for delisting in comparison to downlisting. The threat from poor reproductive potential is addressed through the inclusion of multiple age classes in populations that qualify for the delisting criteria. The threats from exotic weeds, seed predation and limited seed production, and population viability are addressed through delisting requirements for the size and management of populations and documentation of genetic exchange. We believe that in meeting these criteria, resilience, redundancy, and representation will have improved such that the species would no longer meet the criteria of a threatened or endangered species.

LITERATURE CITED

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- USFWS [U. S. Fish and Wildlife Service]. 1998. Recovery Plan for the Applegate's Milk-vetch (*Astragalus applegatei*). 41 pp.
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Summary of Public Comments

We published a notice of availability in the *Federal Register* on August 6, 2019 (84 FR 38288) to announce that the Draft Amendment for the Recovery Plan for *Astragalus applegatei* (Applegate's milk-vetch) was available for public review, and to solicit comments by the scientific community, State and Federal agencies, Tribal governments, and other interested parties on the general information, base assumptions, and conclusions presented in the draft revision. An electronic version of the Draft Amendment was posted on the Service's Species Profile website

(https://ecos.fws.gov/docs/recovery_plan/Draft%20RP%20Amendment%20Applegates%20MV_1.pdf). We also developed and implemented an outreach plan that included (1) publishing a news release on our national webpage (<https://www.fws.gov/news/>) on August 6, 2019, (2) sending specific notifications to Congressional contacts in Districts OR-2, and (3) sending specific notifications to key stakeholders in conservation and recovery efforts. These outreach efforts were conducted in advance of the *Federal Register* publication to ensure that we provided adequate notification to all potentially interested audiences of the opportunity to review and comment on the Draft Amendment.

We received three responses. These included comments from State and federal agencies and non-governmental organizations. Comments ranged from providing minor editorial suggestions to specific recommendations on plan content. We have considered all substantive comments; we thank the reviewers for these comments and to the extent appropriate, we have incorporated the applicable information or suggested changes into the final recovery plan amendment. In general, the comments did not lead to significant changes in the draft plan. Below, we provide a summary of the public comments received; however, some of the comments that we incorporated as changes into the revised recovery plan amendment did not warrant an explicit response and, thus, are not presented here. We also provided copies of all comments received during the formal public comment period to all relevant Federal agencies for their consideration prior to implementation of the Draft Amendment, in accordance with section 4(f)(5) of the Endangered Species Act (Act).

Comments and responses

Comment 1): Self-sustaining sites. Concern was expressed related to the definition of self-sustaining populations/sites and how the minimum number of such sites was reached.

Response 1): As discussed under Downlisting Criteria 1, a minimum of four self-sustaining populations is needed to reduce the chance that a single catastrophic event, such as a rare destructive natural event or episode involving many populations at a given point in time, could result in extinction of the species. The Species Status Assessment (SSA) for the Endangered Applegate's milk-vetch (USFWS 2019) defines a self-sustaining or resilient Applegate's milk-vetch population as one containing a minimum of 2,200 reproductive plants in combination with individuals in younger age classes to suggest population stability or growth. To provide clarity, we changed "younger age classes" to "non-reproductive," as reproductive status is easier to determine than age class. For more detail related to self-sustaining populations, please refer to pages 17 and 24 of the SSA under the "Needs" and "Range and Distribution" sections.

Comment 2): Minimum population size. Concern was expressed related to how the minimum population size was derived and if this standard is cautionary enough for all populations.

Response 2): We lack specific quantitative data regarding Applegate’s milk-vetch needs across its range at the species level but as noted under Downlisting Criteria 2, the currently known minimum number of reproductive plants needed per population for resiliency is 2,200. Enough non-reproductive individuals must also be present to suggest population stability or growth. The Criteria also requires that the minimum population must be maintained for five consecutive years of monitoring.

For more detail on how the minimum numbers were derived please refer to pages 17 and 24 of the SSA under the “Needs” and “Range and Distribution” sections.

Comment 3): Genetics. We received two comments related to the requirement that we have at least one genetic study (Delisting #3).

Response 3): In further consultation with the primary investigator of an ongoing Applegate’s milk-vetch study, there is substantial uncertainty whether genetic exchange between sub-populations/sites would be positive or negative. Therefore, we have removed this requirement for delisting. However, we remain very interested in increasing our understanding of genetic exchange and between populations/sites and other dynamics between populations/sites such as shared pollinators.

Comment 4): Change in Service research funding availability. There is concern that a change in Applegate’s milk-vetch status may affect the amount and availability of funding from the Service for much-needed additional Applegate’s milk-vetch research.

Response 4): The need for additional research is addressed in the SSA and the Applegate’s milk-vetch 5 Year Review: Summary and Update (USFWS 2019b). Additional research is needed to support either downlisting or delisting of the species.

LITERATURE CITED

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