

Recovery Plan for *Astragalus magdalenae* var. *peirsonii* (Peirson's milk-vetch)

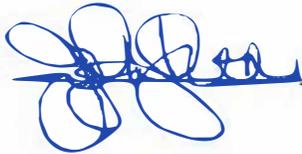


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Astragalus magdalenae* var. *peirsonii
(Peirson's milkvetch)

Region 8
U.S. Fish and Wildlife Service
Sacramento, California

Approved: _____



Regional Director, Pacific Southwest Region, Region 8,
U.S. Fish and Wildlife Service

Date: _____

7/26/19

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An electronic copy of this recovery plan is available at:
<https://ecos.fws.gov/ecp0/profile/speciesProfile?sId=4933>

Additional copies may be obtained from:

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RECOVERY PLAN

Astragalus magdalenae var. *peirsonii*

INTRODUCTION

This document presents the U.S. Fish and Wildlife Service's (USFWS) plan for the conservation and recovery of *Astragalus magdalenae* var. *peirsonii* (Peirson's milk-vetch).

The goal of this recovery plan is to provide guidance on how to control or ameliorate impacts from current and potential future threats to *Astragalus magdalenae* var. *peirsonii*, such that the taxon no longer requires protections afforded by the Endangered Species Act (Act) and therefore, warrants consideration for delisting. Pursuant to section 4(f) of the Act, a recovery plan must, to the maximum extent practicable, include (1) a description of site-specific management actions as may be necessary to achieve the plan's goals for the conservation and survival of the species; (2) objective, measurable criteria which, when met, would support a determination under section 4(a)(1) that the species should be removed from the List of Endangered and Threatened Species; and (3) estimates of the time and costs required to carry out those measures needed to achieve the plan's goal and to achieve intermediate steps toward that goal. This recovery plan provides a description of the overall recovery strategy as well as specific recovery plan elements. In developing these plan elements, we recognize that continued coordination with our partners is needed to ensure long-term protections are afforded to *A. m.* var. *peirsonii* and its habitat.

This recovery plan is based on the Species Biological Report for *Astragalus magdalenae* var. *peirsonii* (USFWS 2019a), which describes the life history and biology of the species, the current status of the species, and the threats that impact the species. The Species Biological Report is summarized below. Specific activities to implement this plan's recovery actions are described in the Recovery Implementation Strategy. Both the Species Biological Report and the Recovery Implementation Strategy are available at <https://ecos.fws.gov> and will be updated as necessary.

SUMMARY OF SPECIES BIOLOGICAL REPORT

Astragalus magdalenae var. *peirsonii* is a sand dune specialist (psammophyte) restricted to the Algodones Dunes, Imperial County, California, in the United States and the Gran Desierto of Mexico. The dune system is managed by Bureau of Land Management (BLM) and is divided into three management areas, which were designated in the 2013 Imperial Sand Dunes Recreation Area Management Plan (ISD-RAMP) (Figure 1).

The taxon is a short-lived perennial in the legume family (Fabaceae). The dormant seeds require scarification (rupture of the seed coat) in order to germinate. Unpredictable rainfall and temperature can lead to high plant mortality across all age classes, and failure of a seedling cohort is not uncommon. The taxon is self-incompatible, and primarily pollinated by a native solitary bee (*Haproboda pallida*).

At the Algodones Dunes, *Astragalus magdalenae* var. *peirsonii* is currently threatened by OHV activities, low reproduction, loss of genetic diversity, and impacts of a changing climate. However, there are uncertainties about future impacts and the taxon's biology and genetics.

Additional investigation is needed to better understand seed dormancy/germination, genetic diversity, and gene flow.

RECOVERY STRATEGY

At the time of listing in 1998, the primary threat to *Astragalus magdalenae* var. *peirsonii* was considered to be the destruction of individuals and dune habitat from OHV use and the associated recreational development (USFWS 1998, p. 53600). Since listing, the designation of critical habitat for the taxon (USFWS 2004, USFWS 2008a), and the implementation of BLM's 2013 Imperial Sand Dunes Recreation Area Management Plan (ISD-RAMP) have ameliorated some threats to the taxon in areas designated as critical habitat (USFWS 2019a). Specifically, BLM has implemented two Peirson's milk-vetch Conservation Measures (CM) in order to comply with the Service's Biological Opinion (BO) (USFWS 2012) on the Imperial Sand Dunes (ISD) Proposed Recreation Area Management Plan (PRAMP). Under CM 1, BLM is implementing a monitoring plan for *A. m. var. peirsonii* which monitors the status of the taxon within and outside of critical habitat (BLM 2018, pp. 5–7). Under CM 2, BLM is implementing four management actions to minimize recreational impacts to Peirson's milk-vetch and its habitat. These actions are: (1) installation and maintenance of signage along the critical habitat boundary; (2) outreach and education activities; (3) critical habitat boundary enforcement, particularly during peak recreation periods; and (4) documentation of noncompliance events (BLM 2018, pp. 7–14). BLM management and monitoring will continue to be critical to the recovery of *Astragalus magdalenae* var. *peirsonii*.

Through ongoing management by BLM, direct OHV impacts to *Astragalus magdalenae* var. *peirsonii* habitat and plants have been largely ameliorated within critical habitat (Figure 1) (USFWS 2019a). OHV use outside of critical habitat within the Open Management Areas (MAs) (Figure 1) is ongoing, and continues to threaten *A. m. var. peirsonii* within the Algodones Dunes (USFWS 2019a). Some OHV trespass into critical habitat also continues to occur. Other threats (low reproduction, loss of genetic diversity, and impacts of a changing climate) need additional study. Continued thinning, isolation, and fragmentation of *A. m. var. peirsonii* within the Open MA could impact the taxon's genetic diversity and reproductive success, but the extent of these impacts is unknown. Environmental events and stressors other than OHV impacts—such as drought, high temperatures, seed predation, and herbivory—may also reduce plant productivity and input to the seed bank. In order for *A. m. var. peirsonii* to be recovered, the taxon should be able to withstand stochastic and catastrophic events and adapt to changing environmental conditions in a setting also impacted by ongoing OHV use and other stressors. Therefore, the highest priority for the recovery of *A. m. var. peirsonii* is to sufficiently ameliorate Factor A threats (the destruction or adverse modification of habitat) and Factor E threats (other natural or manmade factors, such as loss of genetic diversity due to population thinning, and OHV impacts to the taxon). In order to analyze whether those threats have been sufficiently ameliorated, we need to continue monitoring efforts and conduct additional studies of *A. m. var. peirsonii*.

Since listing, research on *Astragalus magdalenae* var. *peirsonii* has provided information about many aspects of the taxon's life history. Studies have also examined the impacts of OHVs to individual plants and to plant density within management areas. However, relative to environmental stressors such as drought, the influence of OHV impacts on long-term population trends is not easy to assess. We need a better understanding of whether OHV use impacts seed germination and seed bank dynamics. We also need additional research to inform gaps in our knowledge of the taxon's life history, genetics, and tolerance to environmental stressors. Large populations of standing individuals, with high genetic diversity at the *S*-locus (the genomic region controlling the self-incompatibility (SI) system), are likely necessary to provide adequate seed production. Therefore, measures of genetic diversity are needed to help assess adequacy of the current population size, structure, and function.

We envision that when *Astragalus magdalenae* var. *peirsonii* is recovered, there will be sufficient population size, occupancy, and connectivity to withstand stochastic and catastrophic disturbances, and sufficient genetic diversity and gene flow to maintain reproductive output and adapt to changing environmental conditions. To provide sufficient representation, resiliency, and redundancy across the range, populations will be monitored and managed so that *A. m.* var. *peirsonii* will no longer require the protections of the Act. Threats impacting the species will be sufficiently understood and ameliorated to ensure long-term conservation of *A. m.* var. *peirsonii*. A monitoring and adaptive management approach will be implemented to address unforeseen events and threats. We expect that continued partnership with BLM, California Department of Fish and Wildlife (CDFW), and other interested parties will allow us to implement the recovery actions outlined in this recovery plan in order to ameliorate Factor A and E threats and ultimately recover this taxon.

RECOVERY CRITERIA

An *endangered species* is defined in the Act as a species that is in danger of extinction throughout all or a significant portion of its range. A *threatened species* is one that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. When we evaluate whether or not a species warrants downlisting (reclassifying an endangered species to a threatened species) or delisting due to recovery, we consider whether the species meets either of these definitions. A recovered species is one that no longer meets the Act's definitions of a threatened species or an endangered species. Determining whether a species should be downlisted or delisted requires consideration of the same five categories of threats which were considered when the species was listed and which are specified in section 4(a)(1) of the Act. Downlisting and delisting actions are performed through a separate rule-making process, which includes an opportunity for public review and comment.

Recovery criteria are objective, measurable conditions that, when met, indicate that a species may warrant downlisting or delisting. Thus, recovery criteria are mileposts that measure progress toward recovery. Because the appropriateness of delisting is assessed by evaluating the five categories of threats identified in the Act, the recovery criteria below pertain to and are organized by these categories. These recovery criteria are our best assessment at this time of what needs to be completed so that the species may be removed from the list entirely. Because we cannot envision the exact course that recovery may take and because our understanding of the vulnerability of a species to threats is very likely to change as more is learned about the species and its threats, it is possible that a status review may indicate that delisting is warranted before

all recovery criteria are met. Conversely, it is possible that the recovery criteria could be met and a status review may indicate that delisting is not warranted; for example, a new threat may emerge that is not addressed by the recovery criteria below.

Astragalus magdalenae var. *peirsonii* is classified as a threatened species at this time; thus, the criteria in this plan will only address delisting.

Delisting Criteria

Recovery occurs when threats outlined in Factors A and E have been sufficiently ameliorated such that the best scientific and commercial data available indicate that the taxon no longer meets the definition of threatened. We believe that the plan's recovery strategy will be achieved by implementing actions to meet the recovery criteria presented below. Specific activities, timelines, and costs are outlined in the Recovery Implementation Strategy (USFWS 2019b).

Eight management areas (Figure 1) were proposed in the 2003 Imperial Sand Dunes Recreation Area Management Plan (ISD-RAMP): Mammoth Wash, North Algodones Dunes Wilderness, Gecko, Glamis, Dune Buggy Flats, Adaptive Management Area (AMA), Oligby, and Buttercup (BLM 2003, p. 2). This management plan was later remanded. BLM's 2005 Record of Decision for the ISD-RAMP approved the establishment of the same eight management areas (BLM 2005, p. 7). The Service's biological opinion on the 2005 ISD-RAMP was remanded in 2006 (USFWS 2012, p. 3). The 2013 ISD-RAMP designated three OHV Management Areas (Open, Closed, and Limited) (BLM 2013, pp. 192–193). While the eight management areas designated in the 2003 and 2005 plans are not in use under the 2013 ISD-RAMP, those eight areas have been used extensively in research and sampling design for this taxon. They were also referred to in the final revised designation of critical habitat (USFWS 2008a) and in the Service's 2012 Biological Opinion on BLM's proposed RAMP (USFWS 2012). Therefore, we still find discussion of these areas to be necessary in our threats analysis and recovery planning. We refer to these prior-2013 management areas as "occurrences" and display them on the map in Figure 1. *Astragalus magdalenae* var. *peirsonii* is extant in seven occurrences, and five occurrences (Mammoth, Algodones Wilderness, AMA, Oligby, and Buttercup) include critical habitat. The Dune Buggy area is not considered to be occupied by *A. m.* var. *peirsonii*.

Factor A: Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

A.1 Occupancy is maintained within the seven *Astragalus magdalenae* var. *peirsonii* occurrences at the Algodones Dunes. Population connectivity among the seven occurrences is maintained at a level that allows seed bank regeneration and gene flow.

A.2 The level, timing, and duration of permitted OHV use in the Open Management Area occupied by *Astragalus magdalenae* var. *peirsonii* is compatible with the recovery and long-term conservation of the taxon.

Factor B: Overutilization for commercial, recreational, scientific, or educational purposes

No substantial threats have been identified under this Factor; therefore, no delisting criteria are necessary.

Factor C: Predation

Both seed predation and herbivory have been reported for *Astragalus magdalenae* var. *peirsonii* (USFWS 2019a) and are potential stressors that may exacerbate or augment threats to this taxon. However, to date, we have no evidence that *A. m.* var. *peirsonii* is impacted by nonnative predators, or that naturally occurring predators alone are likely to cause a trend towards endangerment or extinction in all or a portion of the taxon's range. Therefore, we do not consider Factor C delisting criteria to be necessary at this time. Should future research conclude that additional activities are needed, we will update the recovery plan as appropriate.

Factor D: The inadequacy of existing regulatory mechanisms

No substantial threats have been identified under this Factor; therefore, no delisting criteria are necessary.

Factor E: Other natural or manmade factors affecting its continued existence

E.1 The life history, genetics, and seed bank dynamics of *Astragalus magdalenae* var. *peirsonii* are sufficiently understood to allow confident scientific conclusions that impacts from OHV use in occupied areas are consistent with the long-term resilience of this taxon.

E.2 Mean population size of *Astragalus magdalenae* var. *peirsonii* at the Algodones Dunes is stable or increasing for 20 years.

(Twenty years represents the time frame over which three full-scale monitoring events are likely to occur. Stable or increasing population size would be demonstrated by analysis of data from at least three additional full-scale monitoring efforts, analyzed in conjunction with previously collected monitoring data and controlled for growing season precipitation.)

E.3 Long-term adaptive management plans have been developed throughout the U.S. range of *Astragalus magdalenae* var. *peirsonii* and are being implemented to ensure the long-term viability of the taxon. Adaptive management plans should be designed in consideration of ongoing management efforts and with post-delisting monitoring requirements in mind.

E.4 Adequate levels of genetic diversity at *S*-loci are maintained and preserved in the U.S. population of *A. m.* var. *peirsonii* to maintain long-term viability of the taxon, and an *ex situ* seed bank representative of the genetic diversity in the population is established at an institution certified by the Center for Plant Conservation.

(At this time, we do not have an estimate of the number, frequency, or distribution of *S*-alleles within the population. Genetic analyses under Recovery Action 2 will allow us to determine whether adequate levels of genetic diversity are present.)

ADEQUACY OF RECOVERY CRITERIA

We have not developed recovery criteria addressing threats to *Astragalus magdalenae* var. *peirsonii* in Mexico. At the time of listing, *A. m.* var. *peirsonii* was known from the Gran Desierto of Sonora, Mexico (USFWS 1998, p. 53599). The listing rule stated that “the status of

A. magdalenae var. *peirsonii* in Mexico is not well documented” (USFWS 1998, p. 53607), and did not discuss any direct threats to *A. m. var. peirsonii* in Mexico. Since the 2008 12-month finding and 5-year review (USFWS 2008b, USFWS 2008c), we have not received any new information about threats to *A. m. var. peirsonii* in Mexico. Additionally, there is uncertainty about the taxonomic placement of *A. m. var. peirsonii* in Mexico (see Porter and Prince 2007, unpublished report, for additional discussion).

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.” Based on the lack of information about threats to *Astragalus magdalenae* var. *peirsonii* in Mexico, we find that it is not practicable to develop recovery criteria for *A. m. var. peirsonii* in Mexico at this time. Research across the range of the taxon could allow us to develop criteria in the future, if warranted. We have developed recovery criteria for the known population of *A. m. var. peirsonii* within the United States (at the Algodones Dunes).

RECOVERY ACTIONS

Some recovery actions for *Astragalus magdalenae* var. *peirsonii* should be implemented in the near term to inform management questions addressing long-term goals. Comprehensive long-term actions must also begin soon and should be flexible enough to address a number of possible changes in the future, including agencies’ abilities to fund and participate in recovery actions. The actions listed below may be used to guide recovery planning, minimize impacts from projects that may affect the taxon or its critical habitat, and plan for future restoration.

1. **Continue monitoring of *Astragalus magdalenae* var. *peirsonii* at the Algodones Dunes, and ensure that the monitoring protocol informs management of the taxon and allows us to accurately assess population trends.** Evaluate and adjust the monitoring protocol as needed.
2. **Conduct additional research to inform management actions throughout the range of *Astragalus magdalenae* var. *peirsonii*.** There are gaps in our knowledge of the taxon’s life history, genetics, and seed bank dynamics. This additional information will help to inform management and recovery of this taxon.
3. **Ameliorate Factor A threats associated with threatened destruction, modification, or curtailment of habitat within the United States.** Incorporate research and analysis from Action 2 into an adaptive management plan, and maintain critical habitat closures.
4. **Ameliorate Factor E threats associated with other natural or manmade factors affecting the continued existence of *Astragalus magdalenae* var. *peirsonii* within the United States.** Incorporate research and analysis from Action 2 in order to address any loss of genetic diversity or effective pollination, address OHV impacts as needed, and evaluate the potential impacts of climate change.

Table 1. Recovery actions and estimated costs. A portion of each action includes costs that could not be reasonably estimated at this time. Priority number definitions are below.

Recovery Action	Estimated Cost	Priority Number
1. Continue monitoring at the Algodones Dunes and evaluate and adjust the monitoring protocol as needed.	\$415,000	2
2. Conduct additional research to inform management actions throughout the range of the taxon.	\$1,290,000	2
3. Ameliorate Factor A threats associated with threatened destruction, modification, or curtailment of the habitat within the United States.	\$4,400,000 + TBD	2
4. Ameliorate Factor E threats associated with other natural or manmade factors affecting the continued existence of <i>Astragalus magdalenae</i> var. <i>peirsonii</i> within the United States.	\$80,000 + TBD	3
Total estimated cost	\$6,185,000 + TBD	

ESTIMATED TIME AND COST OF RECOVERY ACTIONS

We estimate that the cost of completing the recovery actions such that the criteria have been met and *Astragalus magdalenae* var. *peirsonii* may be considered for removal from the list of threatened taxon is \$6,185,000 plus additional costs to be determined. We estimate that completions of these actions could be accomplished by 2044, assuming effective coordination and cooperation among necessary partners.

Priority numbers were assigned to each action under the Service’s 1983 guidance (48 FR 43098, “Endangered and threatened species listing and recovery priority guidelines”).

Priority 1: An activity that must be taken to prevent extinction or to prevent a species from declining irreversibly.

Priority 2: An activity that must be taken to prevent a significant decline of the species population/habitat quality, or some other significant negative impact short of extinction.

Priority 3: All other activities necessary to provide for full recovery of the species.

Because situations change over time, priority numbers must be considered in the context of past and potential future actions at all sites. Assigning priorities does not imply that some recovery actions are of low importance; instead, it implies that those actions may be deferred while higher priority recovery actions are being implemented. Moreover, because situations change over time, priority numbers must be considered in the context of current conditions and in light of past and potential future activities at all sites. Therefore, the priority numbers assigned are intended to guide, not to constrain, the allocation of limited conservation resources.

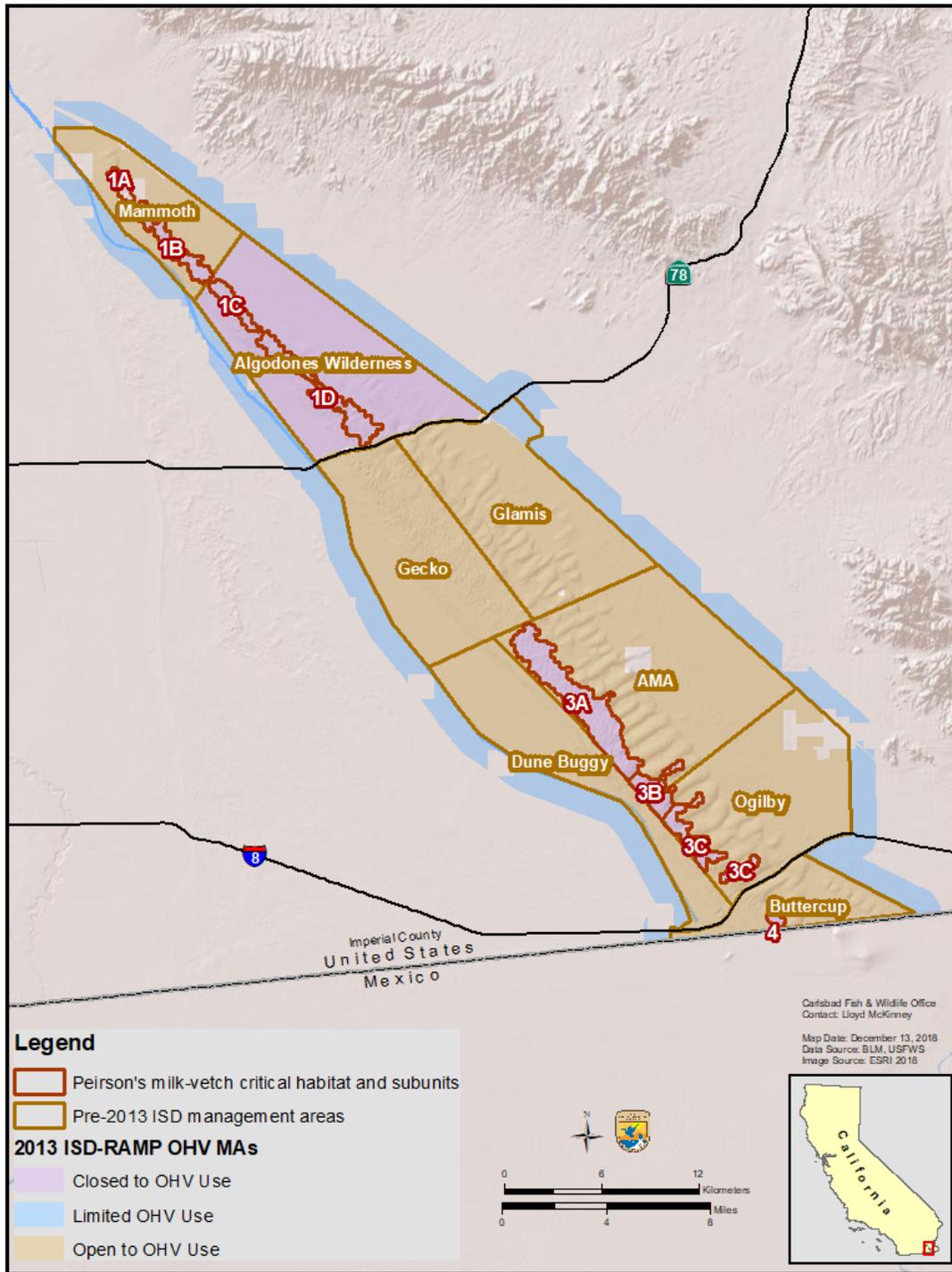


Figure 1. The majority of lands in the Algodones Dunes are managed by the Bureau of Land Management (BLM) as the Imperial Sand Dunes Recreation Area (ISDRA). The ISDRA is currently composed of three management areas which BLM uses to manage resources and recreational activities within the dune system. These three management areas (Open, Limited, and Closed Management Areas (MAs)) were designated in the 2013 Recreation Area Management Plan (RAMP). The older management areas are no longer in use by BLM, but they are extensively referenced in reports and sampling design research, and we refer to them as “occurrences” in this Recovery Plan. This map does not display camping restrictions within the Limited and Open MAs, land ownership within or outside of the ISDRA.

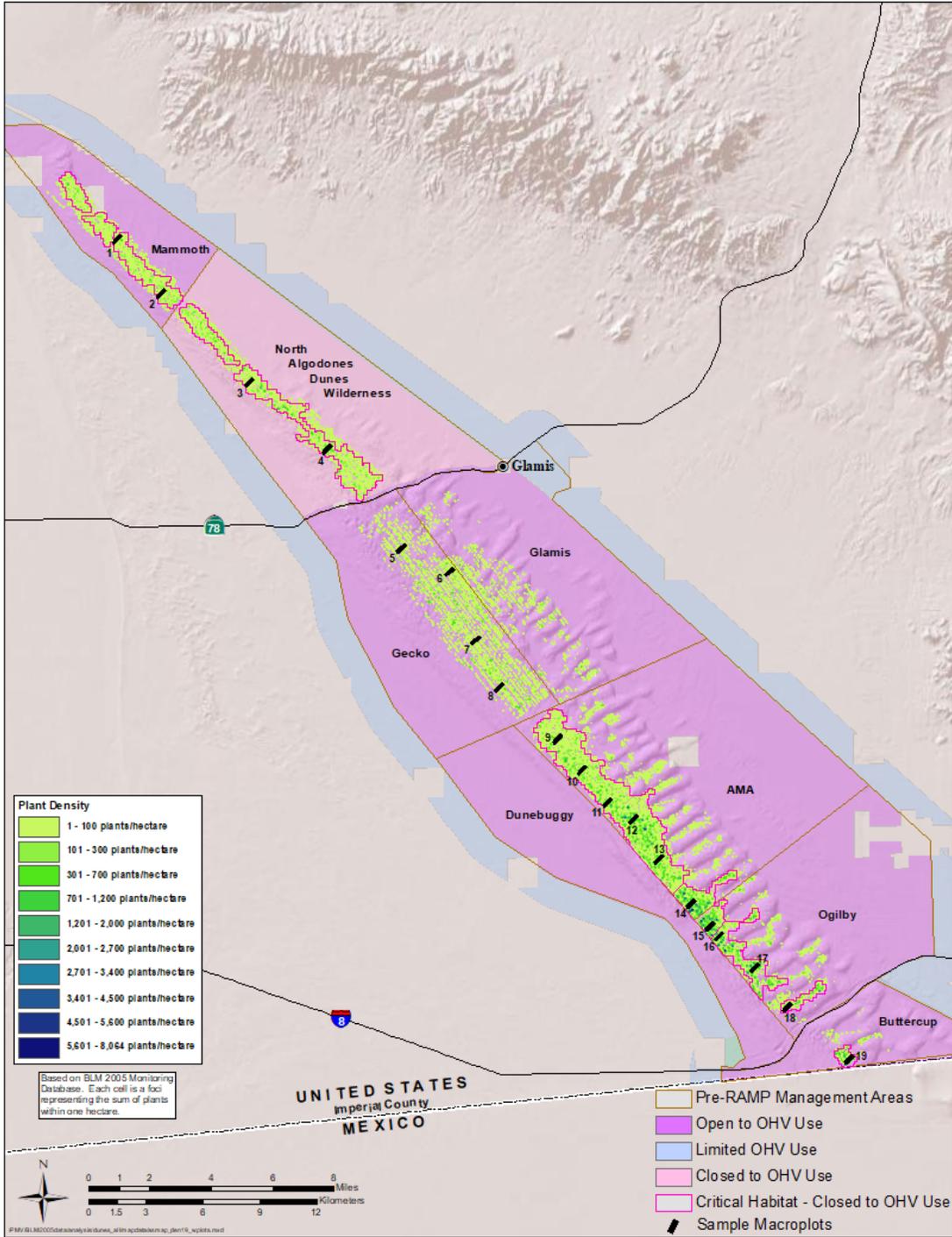


Figure 2. *Astragalus magdalenae* var. *peirsonii* plant density and macroplot locations within the ISDRA, based on 2005 survey data collected by BLM. These data provide our best estimate of the distribution of the taxon within the ISDRA. This map does not display camping restrictions within the Limited and Open MAs, or land ownership within or outside of the ISDRA.

LITERATURE CITED

- BLM. [Bureau of Land Management]. 2003. Final Environmental Impact Statement for the Imperial Sand Dunes Recreation Area Management Plan and proposed amendment to the California Desert Conservation Plan 1980. El Centro Field Office. Department of the Interior. 35 pp.
- BLM. [Bureau of Land Management]. 2018. Annual Implementation Report for the Imperial Sand Dunes Recreation Area Management Plan. El Centro Field Office. Department of the Interior. 23 pp.
- Porter, J.M. and L.M. Prince. 2007. Phylogenetic and genetic relationships within *Astragalus* sect. *Inflatii*, subsect. *Proriferi*: position of Peirson's milkvetch. 23 pp. Unpublished report.
- USFWS. [U.S. Fish and Wildlife Service]. 1998. Endangered and threatened wildlife and plants; determination of endangered or threatened status for five desert milk-vetch taxa from California. Federal Register 63:53596–53615.
- USFWS. [U.S. Fish and Wildlife Service]. 2004. Endangered and threatened wildlife and plants; designation of critical habitat for *Astragalus magdalenae* var. *peirsonii* (Peirson's milk-vetch). Federal Register 69:47330–47351.
- USFWS. [U.S. Fish and Wildlife Service]. 2008a. Endangered and threatened wildlife and plants; revised designation of critical habitat for *Astragalus magdalenae* var. *peirsonii* (Peirson's milk-vetch); final rule. Federal Register 73:8748-8785.
- USFWS. [U.S. Fish and Wildlife Service]. 2008b. Endangered and threatened wildlife and plants; 12-month finding on a petition to delist *Astragalus magdalenae* var. *peirsonii* (Peirson's milk-vetch). Federal Register 73:41007-41022.
- USFWS. [U.S. Fish and Wildlife Service]. 2008c. 5-year review, short form summary, *Astragalus magdalenae* var. *peirsonii* (Peirson's milk-vetch). Carlsbad Fish and Wildlife Field Office. Department of the Interior. 5 pp.
- USFWS. [U.S. Fish and Wildlife Service]. 2012. Endangered Species Act Consultation on the Effects of the Proposed Imperial Sand Dunes Recreation Area Management Plan/California Desert Conservation Area Plan Amendment and Final Environmental Impact Statement, Imperial County, California [(1610, 1150) P CA 670.36]. Carlsbad Fish and Wildlife Field Office. Department of the Interior. 1-59 pp.
- USFWS. [U.S. Fish and Wildlife Service]. 2019a. Species Biological Report for *Astragalus magdalenae* var. *peirsonii* (Peirson's milk-vetch). U.S. Fish and Wildlife Service, Pacific Southwest Region, Sacramento, California. v + 37 pp.

USFWS. [U.S. Fish and Wildlife Service]. 2019b. Recovery Implementation Strategy for *Astragalus magdalenae* var. *peirsonii* (Peirson's milk-vetch). U.S. Fish and Wildlife Service, Pacific Southwest Region, Sacramento, California. ii + 15 pp.

APPENDIX I – SUMMARY OF PUBLIC, PARTNER, AND PEER REVIEW COMMENTS RECEIVED

A. Summary of Public Comments

On June 7, 2019, we published a notice in the *Federal Register* announcing the availability of the draft recovery plan for *Astragalus magdalenae* var. *peirsonii*. We received seven responses in response to the notice; we received no public comments from Federal, State, or local agencies, or Native American Tribes. We conferred with staff from the Bureau of Land Management multiple times during development of this recovery plan.

Public comments ranged from minor editorial comments to specific recommendations on plan content. Below, we summarize comments received from the public, and we provide our response. We considered all substantive comments and, to the extent appropriate, we incorporated the information or suggested changes into the Recovery Plan. Where comments were incorporated as changes into the final Recovery Plan, we have not necessarily provided an explicit response below.

Comment (1): Delisting criteria should include a specific number of plants that need to be present for recovery.

Response: *Astragalus magdalenae* var. *peirsonii* has high annual mortality, and plant abundance between years can be variable, depending on weather conditions during the growing season. Therefore, we developed Criteria E.2 to measure population trends over time to demonstrate recovery, rather than a specific number of plants. We acknowledge that there is uncertainty regarding the minimum viable population size for this taxon, and we have included research actions to better model population size and demographics.

Comment (2): The American Sand Association has provided resources and data about *Astragalus magdalenae* var. *peirsonii*, should be listed as a partner, and should be an active participant in the recovery process. [This comment was not from the American Sand Association].

Response: We recognize the American Sand Association and other recreational groups as important stakeholders and partners in recovery of this taxon, and we recognize the contribution of the ASA to our knowledge of Peirson's milk-vetch. As a result, we have added them as a partner. More generally, in the Recovery Implementation Strategy, we state "The identification of partnering agencies for specific tasks in the Implementation Strategy is not intended to limit involvement by other parties or to require the involvement of the party identified." We welcome the participation of all interested parties, and we will include additional partners in the Implementation Strategy as requested by those partners.

Comment (3): The North Algodones Dunes Wilderness area has had a long period of no vehicle activity and should be compared to areas that have been continually used by OHVs. Perhaps it could be used as a baseline for normal distribution of Peirson's milk-vetch.

Response: We agree that research under Action 2 should sample or include areas across the dunes, including within the wilderness area. However, dunes-wide surveys by BLM in 2005 found that plant density varied across the dunes, with higher plant densities in the southern portion of the dunes. Therefore, plant density and distribution within the wilderness is not necessarily representative of density and distribution in other parts of the dunes, and should not be used as a baseline for the normal distribution of Peirson's milk-vetch.

Comment (4): Some areas that have historically been open to OHV use have higher densities of *Astragalus magdalenae* var. *peirsonii* than the North Algodones Dunes Wilderness area, and the final recovery plan should include research to investigate why plant densities are different in areas with historically different uses.

Response: 2005 dunes-wide surveys by BLM found the highest densities of plants in one of the Adaptive Management sampling areas (Figure 2). While we agree that the causal factors behind plant density are interesting, it can be difficult to determine why some areas have higher plant densities (especially considering the history of different use levels, closure locations over the years, and differences in weather patterns across the dunes). While it could be informative, we do not believe that this research is necessary for recovery.

Comment (5): The recovery plan should include monitoring of the North Algodones Dunes Wilderness.

Response: Monitoring of Peirson's milk-vetch at the Algodones Dunes is being implemented under the 2013 ISD-RAMP, and the protocol includes plots in the North Algodones Dunes Wilderness. This monitoring is also included in Action 1 in the Recovery Plan and Activities 1.1 and 1.2 in the Recovery Implementation Strategy. The 2014 monitoring protocol by BLM and USFWS established 19 macroplots across the Algodones Dunes. We have included a map of the macroplot locations in the final Recovery Plan. All 19 macroplots are monitored when October 1 through December 31 precipitation is greater than 1.82 inches. A subset of six macroplots are monitored in years when the October 1 through December 31 precipitation is less than 1.82 inches. The two macroplots (numbers 3 and 4) within the North Algodones Dunes Wilderness are not among the six macroplots monitored in years under the 1.82 inch precipitation threshold. Since 2014, the 1.82 inch rainfall threshold (which triggers a full-scale monitoring event) has not been met, and so monitoring of the macroplots within the wilderness has not occurred.

Comment (6): Table 2 in the Species Biological Report does not include seed bank sampling data from the North Algodones Dunes Wilderness.

Response: Table 2 uses data from the 2007 BLM pilot seed bank study. The wilderness area was not sampled as part of this study and so could not be included.

Comment (7): One possible research project would be to study the genetics of Peirson's milk-vetch in the North Algodones Dunes Wilderness, and the extent to which there is gene flow from the wilderness to areas outside the Imperial Sand Dunes Recreation Area.

Response: Study of gene flow falls under Action 2 in the final Recovery Plan, and as Activity 2.3.2 in the revised Recovery Implementation Strategy. This study would sample Pierson's milk-vetch across the dunes, including within the North Algodones Dunes Wilderness.

Comment (8): No study cited by the Service has determined that Peirson's milk-vetch plant or seed abundance in the Open and Limited Management areas has declined substantially, or at all, since the species was listed in 1998.

Response: The boundaries of the Open, Closed, and Limited OHV Management Areas were established in the 2013 ISD-RAMP. As we discussed in the Species Biological Report (page 8), comparing plant abundance over time is difficult because of high annual variation in rainfall (and therefore in plant abundance), and the use of different study protocols over the years. Please refer to the 2008 12-month finding (pp. 41010–41014) for a detailed discussion of study methodologies. In the 2008 12-month finding, we determined that the 14 population estimates of *Astragalus magdalenae* var. *peirsonii* between 1977 and 2007 could not be compared to one another due to differences in scale and methodology. The history of temporary closures (with different boundaries) also complicates the comparison of plant abundance between currently closed and open areas.

Comment (9): During the 13 years in which the Adaptive Management Area was closed the entire area east of the Sand Highway between the Patton Valley route and Test Hill was open to OHV use without restriction. There was no evidence of a decrease in Peirson's milk-vetch (apart from annual variation).

Response: The commenter did not provide any additional scientific information or data to support the assertion that during the entire 13 year period that the AMA was closed, no decline in Peirson's milk-vetch (apart from natural variation) was observed in this area. Please also refer to our response to comment 8 above, and to our discussion of Peirson's milk-vetch population studies in the 2008 12-month finding (p. 41010–41014); because of different study methodologies over the years, data collected between 1977 and 2007 are not necessarily comparable between years.

Comment (10): The draft Recovery Plan assumes that OHV use is detrimental to Peirson's milk-vetch survival, but there is no scientific evidence to support this. The plan should assume that OHV activity is compatible with the healthy existence of Peirson's milk-vetch.

Response: The best available scientific information (Groom *et al.* 2007) has demonstrated that OHV impact harms Pierson's milk-vetch plants. As discussed in the Species Biological Report (p. 18), relative to plants in the control group that were not struck, Groom *et al.* 2007 reported that the probability of survival of large and small plants struck by OHVs was reduced by 16 and 33 percent, respectively (p. 130). Between OHV-open and -closed

study areas, Groom *et al.* 2007 documented a four- to fivefold difference in *A. m. var. peirsonii* density. In the 2008 12-month finding on a petition to delist (p. 41017) and also in the Species Biological Report (pp. 18–19), we discussed the benefits of experimental studies over observational studies. To the extent that future research further addresses this subject, we will continue to update and refine the recovery plan as necessary to ensure consistency with the best available data.

Comment (11): Studies cited by the Service do not prove that OHV use is a cause of differences in plant abundance and density between areas closed and open to OHV use. Differences in plant densities between open and closed areas can be explained by many other reasons (for example, if an area was closed because it contained more Peirson's milk-vetch initially).

Response: We cited Groom *et al.* 2007 as the best available scientific information regarding OHV impacts to plant density. The study by Groom *et al.* 2007 suggested that "OHV activities were associated with the observed four- to fivefold difference in *A. m. var. peirsonii* density between the OHV-open and -closed study area" (p. 130), although these difference could not be extrapolated to the entire dunes. We agree that there are limitations and uncertainties involved in all the studies, and that there are other causal factors for differences in plant density in different areas. Please also refer to the 2008 12-month finding (pp. 41010–41014, 41016–41017) for detailed discussion of uncertainties and limitations of each study or report of Peirson's milk-vetch density and abundance.

Comment (12): The Service should avoid implying that OHV use in the ISDRA is causing impacts to Peirson's milk-vetch that have not been studied or proved.

Response: Under the ESA, the Service uses the best scientific or commercial data available. In discussing OHV impacts to Peirson's milk-vetch, we consider Groom *et al.* 2007 the best scientific data available, although studies and reports by other authors have also provided valuable information. We discuss limitations, weakness, and uncertainties in studies. In many cases, no data are available for a species or particular impact, and so we use studies on surrogate species when discussing those impacts. Communicating these uncertainties in our discussion and conclusions is very important, and our choices of modifiers (i.e., "could," "may," "potential") in these situations is deliberate. We have reviewed the Species Biological Report and the Recovery Plan to ensure that we are accurately communicating uncertainties about OHV impacts to Peirson's milk-vetch.

Comment (13): We received three comments suggesting that corridors through areas of critical habitat could be established to avoid Peirson's milk-vetch habitat and populations, and to improve visitor experience and provide a safety crossing for access when accidents or breakdowns occur. One commenter suggested that alternative closure boundaries and routes of travel through currently closed areas could be established without disturbing Peirson's milk-vetch plants or habitat, and that closure boundaries could be adjusted with no net loss of closed area. Additionally, one commenter recognized that OHV incursion into the critical habitat closure areas is a problem.

Response: Peirson's milk-vetch critical habitat closures were established under BLM's 2013 Imperial Sand Dunes Recreation Area Management Plan, based on the critical habitat boundaries established in the 2008 revised final designation of critical habitat. Under the ISD-RAMP, one of the Peirson's milk-vetch goals and objectives (PMV-03) is to "Ensure no adverse modification of critical habitat, as mandated by the Endangered Species Act" (p. 2-47). One of the management actions (PMV-08) is to "Provide for recovery of Peirson's milk-vetch through critical habitat protection." This recovery plan is a guidance document only. Revisions to critical habitat boundaries are a separate rule-making process. Revisions to BLM's ISD-RAMP also occur under a separate decisional process. However, the development of an adaptive management plan (under criteria E.2 and Action 3 in the Recovery Plan) could include alternative closure boundaries, which could be implemented if Peirson's milk-vetch warranted delisting at a future time.

Comment (14): Under Criteria A.1, the Service should define "maintenance of occupancy" and mention climate variation. Also, the current monitoring protocol does not sample all of these occurrences.

Response: In the final Recovery Plan, Criteria A.1 has been revised to state that "Occupancy is maintained within the seven *Astragalus magdalenae* var. *peirsonii* occurrences at the Algodones Dunes, to provide population connectivity that allows seed bank regeneration and gene flow." By "occupancy is maintained," we mean that Peirson's milk-vetch continues to be extant (i.e., does not become extirpated) within each of the seven occurrences. Growing season precipitation is discussed under the stable/increasing population size (Criteria E.2). We agree that the current monitoring protocol does not sample within the Glamis occurrence. Recovery Action 1 is, in part, to ensure that monitoring "allows us to accurately assess population trends," and the monitoring protocol can be evaluated and adjusted as needed. Also, other research under Action 2 (to answer questions about gene flow and connectivity, for example) can be stratified by occurrence.

Comment (15): One commenter agreed with Criteria A.2 and E.1 through E.4, but the phrasing of the comment suggested that the criteria had been interpreted in the present tense (as conditions that have already been achieved), not as statements of a desired condition.

Response: Additional recovery actions are needed in order to meet recovery criteria. Future status assessments will analyze whether recovery criteria have been met.

Comment (16): The assumption has been that the 2008 critical habitat designation included a viable population of *Astragalus magdalenae* var. *peirsonii*, and that additional locations of the plant were peripheral and were not essential to conservation and recovery. The Service should clarify whether other areas need to be included in critical habitat.

Response: The Recovery Plan does not propose critical habitat revisions or that other areas be included in critical habitat. However, the designation of critical habitat does not mean that other areas are not important for recovery. In the Service's 2008 revised final designation of critical habitat for Peirson's milk-vetch, we excluded one proposed subunit

(Unit 2) in the Gecko and Glamis areas based on the disproportionate economic and social impacts associated with the designation. The initial inclusion of this unit in the proposed rule indicated that these areas are important for recovery. In our 2008 revised final designation of critical habitat, we stated that the "exclusion of Unit 2 [within the Gecko and Glamis areas] would not result in the extirpation of *A. m. var. peirsonii* in the area, and plants could persist at sufficient densities to contribute to genetic diversity and maintain gene flow between adjacent units to the northwest and southeast." Then in our 2012 Biological Opinion on the proposed RAMP, we cited the critical habitat rule: "Also, while Peirson's milk-vetch occupying the middle portion of the ISD (Gecko/Glamis MA) would continue to be impacted by OHV use since no critical habitat occurs in that area, the taxon will persist at sufficient densities to contribute to genetic diversity and maintain gene flow over the long-term between adjacent populations to the north and south (Service 2008a)." In both documents, we assumed that the taxon would continue to persist in the Gecko and Glamis areas "at sufficient densities," despite continued OHV use. In the time since the critical habitat closures were implemented under the 2013 RAMP, we do not have enough new information to conclude whether plants have persisted "at sufficient densities to contribute to genetic diversity and maintain gene flow" over the long term. We have included actions and activities to answer these questions in the Recovery Plan and Recovery Implementation Strategy, respectively. Recovery Plans are guidance documents, and critical habitat is designated and revised through separate processes.

Comment (17): The Species Biological Report (p. 18) implies that OHV use in the Gecko/Glamis area is causing declines in Peirson's milk-vetch densities, which could lead to a "disruption of gene flow between populations to the north and south (USFWS 2012, p 41)." Then, USFWS states that Peirson's milk-vetch has continued to persist in these areas, and states that the level of gene flow between critical habitat units north and south of the Gecko/Glamis area is unknown.

Response: Please also refer to our response to comment 16 above. The Service's 2012 Biological Opinion on the proposed RAMP anticipated that *A. m. var. peirsonii* declines in the Gecko/Glamis area could result in disruption of gene flow between areas north and south of Gecko/Glamis (USFWS 2012, p. 41). However, the BO also recognized that despite years of heavy recreational use, *A. m. var. peirsonii* continued to occupy these areas (USFWS 2012, p. 41), and we anticipated that plants would likely persist at sufficient densities to contribute to genetic diversity and maintain gene flow (USFWS 2012, p. 41, citing the 2008 final critical habitat rule). Since the implementation of the 2013 ISD-RAMP, we have no new information about how gene flow is occurring across the length of the dunes. Because Peirson's milk-vetch is an obligate outcrossing species, information about genetic diversity and gene flow is very important for recovery. We agree with the commenter that there is uncertainty, and research under Action 2 in the Recovery Plan would allow us to answer these questions.

Comment (18): The Service should not include activities in Mexico in the Recovery Implementation Strategy, because this will not assist with recovery at the Algodones Dunes.

Response: We reviewed all activities related to Mexico in the Recovery Implementation Strategy. We removed those that are likely not necessary for recovery. We recognize that time and funding for *A. m. var. peirsonii* research and management at the Algodones Dunes is a priority for U.S. stakeholders and partners, over activities in Mexico. While the Service has no jurisdiction to implement actions needed to recover foreign species, we frequently work with international entities to conserve international and transboundary species and habitat. Additionally, knowledge of the taxon's status in Mexico will assist with future status assessments.

Comment (19): Additional monitoring and research are needed to assess potential impacts discussed in the Recovery Strategy, and the current monitoring protocol could be refined to more accurately reflect the distribution of Peirson's milk-vetch.

Response: We agree that additional research and monitoring are needed. Recovery Action 1 is to "Continue monitoring of *Astragalus magdalenae* var. *peirsonii*, and ensure that the current monitoring protocol informs management of the taxon and allows us to accurately assess population trends." Recovery Action 2 is to "Conduct research projects to inform management actions that further *Astragalus magdalenae* var. *peirsonii* recovery." Further activities under these actions are outlined in the Recovery Implementation Strategy. Specifically, Activity 1.1 has been revised to "evaluate and adjust the monitoring protocol as needed."

Comment (20): The Service did not discuss a 2002 seed bank study conducted by Arthur Phillips, which showed that the Peirson's milk-vetch seed bank consists of millions of seeds, that OHV use did not adversely affect the Peirson's milk-vetch seed bank, and that the seed bank has not declined or been depleted such that the reproductive success of the species is impeded. Therefore, the Service has not used the best scientific and commercial data available.

Response: Although 2002 and 2006 studies by A. Phillips and D. Kennedy do provide valuable information regarding the seed bank of *Astragalus magdalenae* var. *peirsonii*, we determined that it was not appropriate to cite either study in reference to specific statements in the Recovery Plan. Please refer to the 2008 12-month finding on a petition to delist (USFWS 2008, pp. 41014–41015) for further discussion of seed bank studies of Peirson's milk-vetch, including studies conducted by Phillips and Kennedy. In the 12-month finding, we discussed the limitations of seed bank studies by BLM and Phillips and Kennedy. We stated that "we do not agree that the work of Phillips and Kennedy (2002, 2003, 2004, and 2006) effectively elucidates the nature, extent, and dynamics of the seed bank for *A. m. var. peirsonii* to the point that we fully understand the seed bank's contribution to the long-term persistence of *A. magdalenae* var. *peirsonii*. We also do not agree that these data provide evidence that *A. magdalenae* var. *peirsonii* will continue to persist because of the extent and nature of its seed bank" (p. 41015).

Comment (21): The Recovery Plan does not incorporate the work of Dr. Arthur Phillips, who was commissioned by the ASA to study Peirson's milk-vetch at the Algodones Dunes over a period of 7 years.

Response: We cited five reports by A. Phillips and/or D. Kennedy (prepared for the American Sand Association) in the Species Biological Report. We acknowledge the work of the ASA in our understanding of Peirson's milk-vetch biology and life-history. We determined that it was not appropriate to cite the work of Phillips and Kennedy in reference to any specific statement in the Recovery Plan. See response to comment 20 above.

Comment (22): Delisting criteria should focus on seed bank counts, not plant counts. Plant counts may vary dramatically from year to year depending on the quantity and timing of rainfall, while seed bank counts are a clear indicator of the taxon's viability. Seed bank counts should be the only type of survey considered.

Response: We agree that plant counts may vary from year to year, based in part on the quantity and timing of rainfall across the dunes. We also agree that the seed bank is a very important aspect of this taxon's viability, and in the Recovery Implementation Strategy, we have included activities related to seeds, the seed bank, and modeling efforts. BLM conducts annual monitoring of Peirson's milk-vetch plants, following a protocol developed by BLM and USFWS in 2014. This monitoring does not include seed bank sampling. Seed bank sampling for Peirson's milk-vetch has been conducted by A. Phillips and D. Kennedy (ASA 2002, 2006) and by BLM (BLM 2007). Seed bank sampling is typically expensive and time-consuming, and large numbers of samples are needed in order to obtain sufficient precision. The size of the seed bank likely varies from year to year, if rates of seed germination are different than rates of input to the seed bank. While variation in seed bank size could be less than the variation in numbers of plants, it is possible that annual monitoring of the seed bank would not significantly reduce the amount of year-to-year variation compared with monitoring numbers of plants. Also, the additional time and expense of seed bank sampling does not make this a cost effective approach to monitor Peirson's milk-vetch across the dunes.

Comment (23): There is no evidence that OHV use can damage *Astragalus magdalenae* var. *peirsonii* seeds, or cause premature or inopportune scarification of seeds; scarification occurs when wind-blown sand passes over seeds lying on the surface, allowing water to penetrate the seed coat, and germination if conditions are right.

Response: We agree that there is no evidence that OHV use causes direct mortality of *Astragalus magdalenae* var. *peirsonii* seeds. In the Species Biological Report, we qualified this hypothesis using the phrases "could" and "potentially." We have revised the discussion of seed banks in the Species Biological Report, and clarified that there is no evidence that OHV use causes mortality of seeds. Wind-driven sand is presumably the scarification mechanism for this taxon. However, whether scarification occurs by other mechanisms is unknown. The exact conditions needed for germination to occur (such as the moisture and temperature conditions and amount of scarification needed) are also unknown, and we have included some related activities in the Recovery Implementation Strategy.

Comment (24): In referring to a 2007 study by BLM which sampled the Peirson's milk-vetch seed bank in areas open and closed to OHVs, the Service discussed uncertainties in the study. The Service then stated that OHV use "could" impact the seed bank, implying that OHV use does impact the seed bank.

Response: Please refer to our response to comment 23, where we agree that there is no evidence that OHV use causes direct mortality of *Astragalus magdalenae* var. *peirsonii* seeds. We have edited the Species Biological Report and clarified the results and assumptions of the 2007 BLM study. Our use of "could" in this sentence was deliberate, meaning that these impacts were possible, but not certain. We have also identified research needs relative to this subject that will help clarify the causal relationships, and we will update or revise the recovery plan as necessary based on any results.

Comment (25): In the Species Biological Report, the Service states that OHV use "can directly crush germinating seeds and seedlings, and may also accelerate soil desiccation." (SBR, p. 18.) The Service also states that "OHV use in the Open Management Area very likely causes mortality at this stage of the taxon's life cycle, and damage to pre- or post-emergent seedlings is likely one reason that plant density is lower in areas open to OHVs" (SBR, p. 18.), but then states that the impacts of OHV use on germinating and emergent *A. m.* var. *peirsonii* seedlings has not been directly studied (SBR, p.18.) There is no evidence that OHVs impact Peirson's milk-vetch seedlings at the ISDRA.

Response: Groom *et al.* 2007 found that OHVs reduce survival probability of small plants of Peirson's milk-vetch (defined as plants with canopy width less than 50 centimeters) by an estimated 33 percent. We also cited Harper (1977) in discussing seed germination and recruitment in general. Harper stated that "[s]light variations in the physical state of a substrate may affect the numbers of seeds that germinate successfully" (pp. 116–117), and that "[t]he size of the recruited population can be altered by either a slight change in soil particle size, or a slight change in water tension, or a slight change in soil water content (p. 117). Given the conclusions of Groom *et al.* 2007 and general studies of the sensitivity of plant seedlings, we believe that OHV use could cause some level of mortality at this stage of the taxon's life cycle. However, we agree this has not been directly studied, and that the relative magnitude of these impacts (compared to other potential causes of pre-emergent seedling mortality, or to mortality at other stages of the life cycle) is unknown. We have edited the Species Biological Report to better reflect these uncertainties.

Comment (26): We support the Service's plan to conduct further studies on OHV impacts, Peirson's milk-vetch genetic diversity, and Peirson's milk-vetch tolerance to environmental changes.

Response: We appreciate the expression of support for further studies of Peirson's milk-vetch at the Algodones Dunes, and look forward to working with partners and stakeholders to recover this taxon.

B. Summary of Peer and Partner Review Comments

We solicited independent peer review of the draft recovery plan and review from Federal and State partners. We requested comments from individuals who have expertise and experience with *Astragalus magdalenae* var. *peirsonii* or similar species. In total, we solicited comment from three peer reviewers and two partner agencies. We did not receive any peer reviewer comments. We received comments from two partner reviewers (BLM and CDFW). Below, we summarize comments received from partner reviewers and provide our response. We considered all substantive comments and, to the extent appropriate, we incorporated the information or suggested changes into the Recovery Plan. Where comments were incorporated as changes into the final Recovery Plan, we have not necessarily provided an explicit response below. We also received comments on the Species Biological Report and the Recovery Implementation Strategy, and we have incorporated suggested changes where appropriate.

Partner review:

Partner Review Comment (1): In criteria A.1, the Service should clarify the term “high-quality” in reference to habitat in the Gecko and Glamis occurrences.

Response: We removed the term “high-quality” in Criteria A.1 and clarified the desired outcome (“Population connectivity among the seven occurrences is maintained at a level that allows seed bank regeneration and gene flow”).

Partner Review Comment (2): In the Recovery Plan and Recovery Implementation Strategy, the Service has focused on the impacts of recreational OHV use, but has not emphasized other stressors such as insects.

Response: At the time of listing, recreational OHV use and associated development was considered the primary threat to *Astragalus magdalenae* var. *peirsonii*. Monitoring, research, and management for this taxon has largely focused on OHV impacts, and OHV use is still considered a threat to this taxon. Therefore, our criteria and actions also focus on OHV impacts. However, we agree that there are other threats and potential stressors to this taxon. We have broadened some activities in the Recovery Implementation Strategy in response to this concern.

Partner Review Comment (3): In the Recovery Implementation Strategy, the Service has included activities that would contribute to the general knowledge of the taxon, but are not necessary for recovery.

Response: We have reviewed all activities in the Recovery Implementation Strategy and removed those that are likely not necessary for recovery. As stated in the Recovery Implementation Strategy, “recovery actions and activities are subject to modification by new information, changes in species status, and completion of other recovery actions.” Additionally, the Recovery Plan and Recovery Implementation Strategy are guidance documents only. There are multiple pathways to recovery, so not all activities in the

Recovery Implementation Strategy will necessarily need to be completed in order to achieve recovery.

Partner Review Comment (4): In the Recovery Implementation Strategy, the Service has included activities in Mexico, but recovery should not require knowledge of populations outside of the United States.

Response: *Astragalus magdalenae* var. *peirsonii* is listed wherever found (i.e., across the range of the taxon), which includes Sonora, Mexico. In the final Recovery Plan (refer to the “Adequacy of Recovery Criteria section”), we discuss why we have not developed recovery criteria for *Astragalus magdalenae* var. *peirsonii* in Mexico. We have identified some activities in Mexico that could be implemented under Action 2 (research across the range of the taxon) in order to better characterize the taxon’s status in Mexico. We recognize that time and funding for *A. m.* var. *peirsonii* research and management at the Algodones Dunes is a priority for U.S. partners and stakeholders over activities in Mexico. While the Service has no jurisdiction to implement actions needed to recover species found outside the United States, we frequently work with international entities to conserve international and transboundary species and habitat. Additionally, knowledge of the taxon’s status in Mexico will assist with future status assessments.

Partner Review Comment (5): Cost estimates in the Recovery Plan are too low.

Response: We have revised the cost estimates in the Recovery Plan based on our best assessment. We also revised the activities and cost estimates in the Recovery Implementation Strategy.

Partner Review Comment (6): A full understanding of the primary pollinator (the white-faced bee, *Haproboda pallida*) across the range of Peirson’s milk-vetch is essential to recovery.

Response: *Astragalus magdalenae* var. *peirsonii* is a self-incompatible taxon, and the white-faced bee is the only known effective pollinator. Actions 2 and 4 in the Recovery Plan address pollination and gene flow. We believe that adequate pollination and gene flow are essential to recovery, but detailed studies of the white-faced bee may not be necessary to demonstrate that adequate pollination is occurring. Rather, studies of gene flow included under Action 2 may be sufficient, unless threats emerge to the primary pollinator or it is demonstrated that gene flow is not occurring in some areas. We have included one activity in the Recovery Implementation Strategy (Activity 2.3.1) to determine the status of the primary pollinator, but this activity may be precluded by other higher-priority activities.

Partner Review Comment (7): Criteria E.2 should be revised to state that mean population size is stable or increasing in four of the seven occurrences, to reduce the probability that increases were localized to only a few areas.

Response: We recognize that plants could decrease within some occurrences, while increasing within others. We believe that the use of a mean population size (controlled for growing season precipitation) will be sufficient to demonstrate stable or increasing population

trends over time. Decreases in some areas would also be reflected in a mean; localized increases would have to be relatively large and sustained in order to overcome long-term declines in other parts of the dunes. This criteria does not preclude us from analyzing Peirson's milk-vetch data within as well as across occurrences.