DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[FWS–R6–ES–2010–0080; MO 92210–0–0008–B2]

Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition To List *Astragalus microcymbus* and *Astragalus schmolliae* as Endangered or Threatened

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of 12-month petition finding.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service/USFWS), announce a 12-month finding on a petition to list *Astragalus microcymbus* (skiff milkvetch) and *Astragalus schmolliae* (Schmoll's milkvetch) as endangered or threatened, and to designate critical habitat under the Endangered Species Act of 1973, as amended (Act). After a review of all the available scientific and commercial information, we find that listing *A. microcymbus* and *A. schmolliae* is warranted. However, currently listing of *A. microcymbus* and *A. schmolliae* is precluded by higher priority actions to amend the Lists of Endangered and Threatened Wildlife and Plants. Upon publication of this 12-month petition finding, we will add *A. microcymbus* and *A. schmolliae* to our list of candidate species. We will make any determinations on critical habitat during development of the proposed listing rule. In any interim period, the status of the candidate taxon will be addressed through our annual Candidate Notice of Review.

DATES: The finding announced in this document was made on December 15, 2010.

ADDRESSES: This finding is available on the Internet at *http://www.regulations.gov* at Docket Number FWS–R6–ES–2010–0080. Supporting documentation we used in preparing this finding is available for public inspection, by appointment, during normal business hours at the Western Colorado Ecological Services Office, U.S. Fish and Wildlife Service, 764 Horizon Drive, Suite B, Grand Junction, CO 81506–3946. Please submit any new information, materials, comments, or questions concerning this finding to the above address.

FOR FURTHER INFORMATION CONTACT: Al Pfister, Field Supervisor, Western Colorado Ecological Services Office (*see* **ADDRESSES**); by telephone, 970–243–2778; or by facsimile, 970–245–6933. Persons who use a telecommunications device for the deaf (TDD), call the Federal Information Relay Service (FIRS) at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Background

Section 4(b)(3)(B) of the Act (16 U.S.C. 1531 *et seq.*), requires that, for any petition to revise the Federal Lists of Endangered and Threatened Wildlife and Plants that contains substantial scientific or commercial information that listing the species may be warranted, we make a finding within 12 months of the date of receipt of the petition. In this finding, we will determine that the petitioned action is: (a) Not warranted, (b) warranted, or (c) warranted, but immediate proposal of a regulation implementing the petitioned action is precluded by other pending proposals to determine whether species are threatened or endangered, and expeditious progress is being made to add or remove qualified species from the Federal Lists of Endangered and Threatened Wildlife and Plants. Section 4(b)(3)(C) of the Act requires that we treat a petition for which the requested action is found to be warranted but precluded as though resubmitted on the date of such finding, that is, requiring a subsequent finding to be made within 12 months. We must publish these 12-month findings in the **Federal Register**.

In accordance with the President's memorandum of April 29, 1994, Government-to-Government Relations with Native American Tribal Governments (59 FR 22951), Executive Order 13175, titled Consultation and Coordination with Indian Tribal Governments (65 FR 67249), and the Department of the Interior's manual on Departmental Responsibilities for Indian Trust Resources, at 512 DM 2, we acknowledge our responsibility to communicate meaningfully with recognized Federal Tribes on a government-to-government basis. In accordance with Secretarial Order 3206 of June 5, 1997 (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act), we readily acknowledge our responsibilities to work directly with the Tribes in developing programs for healthy ecosystems, to acknowledge that Tribal lands are not subject to the same controls as Federal public lands, to remain sensitive to Indian culture, and to make information available to Tribes. In fulfilling our trust responsibilities for government-to-government consultation with Tribes, we met with the Ute Mountain Ute Tribe regarding the process we would take to conduct a 12-month status review of *Astragalus schmolliae.* As an outcome of our government-to-government consultation, we recognize the sovereign right of the Ute Mountain Ute Tribe to manage the habitat for *A. schmolliae* on its tribal lands, and acknowledge that right in this 12-month finding.

Previous Federal Actions

Federal action for *Astragalus microcymbus* and *Astragalus schmolliae* (then *A. schmollae*) began as a result of section 12 of the Act of 1973, as amended (16 U.S.C. 1531 *et seq.*), which directed the Secretary of the Smithsonian Institution to prepare a report on plants considered to be endangered, threatened, or extinct in the United States. This report, designated as House Document No. 94–51, was presented to Congress on January 9, 1975. In that document, both species were designated as endangered (House Document 94–51, pp. 57–58). On July 1, 1975, the Service published a notice in the **Federal Register** (40 FR 27823, p. 27847) of its acceptance of the Smithsonian report as a petition within the context of section 4(c)(2) (now section 4(b)(3)) of the Act, and giving notice of its intention to review the status of the plant taxa therein.

As a result of that review, the Service published a proposed rule on June 16, 1976, in the **Federal Register** (41 FR 24523, pp. 24543–24544) to determine endangered status pursuant to section 4 of the Act for approximately 1,700 vascular plant taxa, including *Astragalus microcymbus* and *Astragalus schmolliae.* The list of 1,700 plant taxa was assembled on the basis of comments and data received by the Smithsonian Institution, and the Service in response to House Document No. 94–51 and the July 1, 1975, **Federal Register** publication. General comments received in response to the 1976 proposal are summarized in an April 26, 1978, **Federal Register** publication (43 FR 17909). In 1978, amendments to the Act required that all proposals more than 2 years old be withdrawn. A 1-year grace period was given to proposals already more than 2 years old. On December 10, 1979, the Service published a notice in the **Federal Register** (44 FR 70796) withdrawing the portion of the June 16, 1976, proposal that had not been made final which removed both *A. microcymbus* and *A. schmolliae* from proposed status but retained both species as candidate plant taxa that "may qualify for listing under the Act."

On December 15, 1980, the Service published a current list of those plant taxa native to the United States being considered for listing under the Act where *Astragalus microcymbus* and *Astragalus schmolliae* were identified as a category 2 taxon "currently under review" (45 FR 82479, pp. 82490–82491). On November 28, 1983, *A. schmolliae* was moved to the "taxa no longer under review" list, and given a 3C rank indicating the species was proven to be more abundant or widespread than previously believed or not subjected to an identifiable threat (48 FR 53640, pp. 53641, 53662). The two species also were included as a category 2 species (*A. schmolliae* was not included as a 3C species despite the conclusions of the 1983 review) on September 27, 1985 (50 FR 39525, p. 39533–39534), February 21, 1990 (55 FR 6184, p. 6190), and September 30, 1993 (58 FR 51144, pp. 51151–51152). The category 2 species designation was defined as having enough information to indicate that listing the species as an endangered or threatened species was possibly appropriate.

On October 22, 1993, we received a petition dated October 19, 1993, from the Biodiversity Legal Foundation and Lee Dyer requesting that *Astragalus microcymbus* be listed as endangered under the Act, and that critical habitat be designated (Carlton *et al.* 1993, pp. 1–11). The petition included biological information regarding the species and several scientific articles in support of the petition. After careful consideration, we did not issue a 90-day finding on the petition because the species was already included as a category 2 species (Spinks 1994, pp. 1–8).

On February 28, 1996, we proposed removing all category 2 species, including *Astragalus microcymbus* and *Astragalus schmolliae,* from our candidate species notice of review (61 FR 7596). This policy change was finalized on December 5, 1996, stating that the list was not needed because of other lists already maintained by other entities such as Federal and State agencies (61 FR 64481).

On July 30, 2007, we received a petition dated July 24, 2007, from Forest Guardians (now WildEarth Guardians) requesting that the Service: (1) Consider all full species in our Mountain Prairie Region ranked as G1 or G1G2 by the organization NatureServe, except those that are currently listed, proposed for listing, or candidates for listing; and (2) list each species as either endangered or threatened (Forest Guardians 2007, pp. 1–37). The petition incorporated all analyses, references, and documentation provided by NatureServe in its online database at *http://www.natureserve.org/* into the petition. We acknowledged the receipt of the petition in a letter to the Forest Guardians, dated August 24, 2007 (Slack 2007, p. 1). In that letter we stated that, based on preliminary review, we found no evidence to support an emergency listing for any of the species covered by the petition, and that we planned work on the petition in Fiscal Year (FY) 2008.

On March 19, 2008, WildEarth Guardians filed a complaint (1:08–CV–472–CKK) indicating that the Service failed to comply with its mandatory duty to make a preliminary 90-day finding on their two multiple species petitions—one for the Mountain-Prairie Region, and one for the Southwest Region (*WildEarth Guardians* v. *Kempthorne* 2008, case 1:08–CV–472–CKK). We subsequently published two 90-day findings on January 6, 2009 (74 FR 419), and February 5, 2009 (74 FR 6122), identifying species for which we were then making negative 90-day findings, and species for which we were still working on a determination. On March 13, 2009, the Service and WildEarth Guardians filed a stipulated settlement in the District of Columbia Court, agreeing that the Service would submit to the **Federal Register** a finding as to whether WildEarth Guardians' petition presents substantial information indicating that the petitioned action may be warranted for 38 Mountain-Prairie Region species by August 9, 2009 (*WildEarth Guardians* v. *Salazar* 2009, case 1:08–CV–472–CKK).

On August 18, 2009, we published a partial 90-day finding for the 38 Mountain-Prairie Region species, and found that the petition presented substantial information to indicate that listing of *Astragalus microcymbus* may be warranted based on threats from off-road vehicle use and drought; and that listing *Astragalus schmolliae* may be warranted based on threats from fire, nonnative species invasions, road construction, grazing, and drought; and went on to request further information from the public pertaining to both species (74 FR 41649, pp. 41655–41656).

This notice constitutes the 12-month finding on the July 24, 2007, petition to list *Astragalus microcymbus* and *Astragalus schmolliae* as threatened or endangered. Given that we are doing 12-month findings for 38 species from this petition, and 67 species from the Southwest Region multiple species petition (74 FR 419, January 6, 2009; 74 FR 66866, December 16, 2009), and given the amount of resources that it takes to complete a 12-month finding, we are unable to complete 12-month findings for all these species at this time.

Species Information—Astragalus Microcymbus

Species Description and Taxonomy

Astragalus microcymbus is a perennial forb (a plant that can live to more than 3 years of age and without grass-like, shrub-like, or tree-like vegetation) that dies back to the ground every year. The plant has slender stems that are sparsely branched with dark green pinnate leaves, with 9–15 leaflets arranged in an evenly spaced fashion along either side of a central axis. It is in the pea (Fabaceae) family. The spindly red to purple branches grow from 30–60 centimeters (cm) (12–24 inches (in.)) long to 30 cm (12 in.) high, and may trail along the ground, arch upwards, or stand upright, often being supported by neighboring shrubs. Flowers are small (0.5 cm (0.2 in.)), pea-like, are found at the end of branches in clusters of 7–14 flowers, and have white petals that are tinged with purple. Fruits are boat-shaped (hence the common name "skiff" and the Latin name *microcymbus* meaning "small boat"), grow to less than 1 cm (0.4 in.), are triangular in cross-section, and hang abruptly downward from the branches. These characteristics, particularly the plant's diffuse branching, small white-purple pea-like flowers, and boat-like fruit pods distinguish this species from other *Astragalus* species in the area (description adapted from Peterson *et al.* 1981, pp. 5–7; Heil and Porter 1990, pp. 5–6; Isley 1998, p. 349).

Astragalus microcymbus was discovered in 1945 by Rupert Barneby roughly 6 kilometers (km) (4 miles (mi)) west of Gunnison, Colorado (Barneby 1949, pp. 499–500). The species was not located again until 1955 by the Colorado botanical expert William Weber, who originally considered it to be nonnative because of its dissimilarity to the other numerous *Astragalus* species in the region (Barneby 1964, p. 193). Both of these early collections were from alongside Highway 50 near Gunnison, Colorado, at a location that has likely been destroyed. The plant was not located in its more intact and native habitat along South Beaver Creek until Joseph Barrell rediscovered the species in 1966 (Barrell 1969, p. 284; Colorado Natural Heritage Program (CNHP) 2010a, p. 14).

The *Astragalus* genus is large, with over 1,500 species that are found on all continents except Antarctica and Australia, and with almost 600 species in the United States, primarily in the West (Isley 1998, p. 149). The genus is divided into many sections. *A. microcymbus* is not similar in appearance to other *Astragalus* species in the region. Its presumed closest relative (from the *Strigulosi* section of *Astragalus*) is found in New Mexico, with other relatives extending southward, and being found mostly in Mexico (Barneby 1964, p. 193; Isley 1998, pp. 349–350). The taxonomic status of *A. microcymbus* has not been disputed, although the monophyly (all members descended from a single common ancestor) of the *Strigulosi* section, and the placement of *A. microcymbus* within the section has been debated (Spellenberg 1974, pp. 394–395; Heil and Porter 1990, pp. 12–13). For the purposes of this finding, we consider *A. microcymbus* to represent a valid species and, therefore, a listable entity.

Biology and Life History

Astragalus microcymbus individuals live on average 2.2–3 years (with a range of 1–14 years). Most frequently, plants are alive for only 1 year (DePrenger-Levin 2010a, pers. comm.). The plant flowers from mid to late May into July (Heil and Porter 1990, p. 18; Japuntich 2010a, pers. comm.). There are more flowering plants in early June than at any other time, and flowering then drops off or stops, with a second bloom occurring in July (Japuntich 2010a, pers. comm.). The earlier flowering plants are reportedly larger and more vine-like, and later flowering plants are much smaller sized and less vine-like (Japuntich 2010a, pers. comm.).

Little is known of how *Astragalus microcymbus* reproduces. For example, we do not know if the plant requires pollinators, or what pollinators are important for reproduction. A single plant that was caged in 1980 did not produce fruit (Heil and Porter 1990, p. 18). Although this was suggested as evidence that the plant may require pollinators, we believe that this speculation is premature, because the study was completed for only one individual. Studies of other *Astragalus* species have found some species to be totally reliant on pollinators, and others to be somewhat self-compatible (able to produce seed without pollen from a different plant) but still relying on pollinators to some degree (Karron 1989, p. 337; Kaye 1999, p. 1254). *Astragalus* species with limited ranges are somewhat more self-compatible than wider ranging relatives (Karron 1989, p. 337).

Several pollinators have been observed visiting *Astragalus microcymbus,* suggesting that pollinators may be important for reproduction, but little is known about what pollinators these are (with the exception of the two listed below) and which are most important. Two insects that regularly visit the flowers of *A. microcymbus* were collected in 1989 (Heil and Porter 1990, pp. 18–19). One visitor was a small, black carpenter bee, *Ceratina nanula* that was collected from 3 sites (Heil and Porter 1990, pp. 18–19), and is known from at least 11 western States (Discover Life 2009, p. 1). The other visitor was a small, yellow and brown satyr butterfly, *Coenonympha ochracea* ssp. *ochracea,* a species of the Rocky Mountains (Heil and Porter 1990, p. 19). We expect there are more pollinators than these two species, based on the limited number of observations and collections to date (Heil and Porter 1990, pp. 6, 18–19; Sherwood 1994, p. 12), and because other *Astragalus* species are visited by many different pollinator species (Karron 1989, p. 322; Kaye 1999, pp. 1251–1252; Sugden 1985, p. 303).

Fruits of *Astragalus microcymbus* have been observed as early as late-May, are always present by mid-June, with peak fruiting occurring in mid-July, and all fruits falling off the plants by late-August (Heil and Porter 1990, p. 18). Fruit production varies greatly. For example, during a life-history study (discussed in further detail in Distribution and Abundance below), no fruits were counted in 2002, and 33,819 fruits were counted in 2008 (Denver Botanic Gardens [DBG] 2010a, p. 5). In the same 14-year life history study (1995–2009), fruit production was high in only 3 years: 1995, 1997, and 2008 (DBG 2010a, p. 5). This type of synchronous seeding is sometimes referred to as mast seeding or mast years. Mast seedings may be a strategy to release enough seeds to feed seed predators, that are kept at lower numbers in years with little or no seed production, and still allow other seeds to germinate. Alternatively, it may be a product of increased pollination success (Crone and Lesica 2004, p. 1945). We are unsure of the conditions that lead to good seed and fruit set; overall annual precipitation does not explain the variability (DBG 2010a, p. 12).

Seed dispersal mechanisms have not been researched, but wind and rain are considered candidates (Heil and Porter 1990, p. 19). Seed dormancy, seed survival, and seed longevity in the soil are unknown. We do not know if specific cues (*e.g.,* temperature, precipitation, or seed coat alterations) are needed to break seed dormancy. Seed bank studies for other *Astragalus* species indicate that the group generally possesses hard impermeable seed coats with a strong physical germination barrier. As a result, the seeds are generally long-lived in the soil, and only a small percentage of seeds germinate each year (summarized in Morris *et al.* 2002, p. 30). Conversely, the DBG looked at soil cores taken from *A. microcymbus* monitoring sites and found only one seed. The authors concluded that *A. microcymbus* does not have an active seed bank (DBG 2010a, p. 6). More research is needed to better understand the seed bank's role in the life history of the species.

Astragalus microcymbus individuals may exhibit prolonged dormancy (remaining underground throughout a growing season). This trait may help a species better cope with drought or resource-limiting conditions (Lesica and Steele 1994, pp. 209–210). Between 6 and 90 percent of *A. microcymbus* individuals are dormant in a given year (DBG 2008, pp. 6, 13, 18). Dormancy varies significantly from year to year and between plots (DBG 2010a, p. 15). Of the individuals that exhibited prolonged dormancy, 54 percent remained dormant for 1 year, 10 percent were dormant for 2 years, with a decreasing percentage of individuals remaining dormant for each successively longer time period to 11 years (DBG 2008, p. 6). These numbers for prolonged dormancy are not definitive because researchers are unable to say with certainty if a plant returning to a spot where an individual was previously found is a new individual or an individual returning from prolonged dormancy (DePrenger-Levin 2010a, pers. comm.).

Distribution and Abundance

We use several terms to discuss various sizes or groupings of *Astragalus microcymbus* individuals: Element Occurrence, site, polygon, point, and units. We consider the term Element Occurrence synonymous with population and it is further defined below. Within a population, various smaller "sites" have been hand drawn on maps between 1955 and 1994, and counted or tracked by site. To distinguish these older sites from more recent Global Positioning System (GPS) mapping efforts, we have used the term "polygon" (circles around clusters of individuals) or "point" (points representing one or a few plants within the immediate area) to describe data that was collected after 2003 with a GPS unit. Finally, we have taken the polygons and points and created "units" on which to conduct our spatial analyses for this 12-month finding. The reasons for creating these units are described in further detail below.

The CNHP, the agency that tracks rare plant species in the State of Colorado, operates within the national NatureServe network and follows NatureServe protocols. NatureServe guidelines on designating Element Occurrences state they are to be designated to best represent individual populations, and are typically separated from each other by barriers to movement or dispersal (NatureServe 2002, p. 11). The CNHP assigns overall species ranks for rare plants within the State of Colorado. *Astragalus microcymbus* has a Global rank of G1 indicating the species is critically imperiled across its range, and a State rank of S1 indicating the species is critically imperiled within the State of Colorado (CNHP 2010b, pp. 1, 5). Since the species is known only from the State of Colorado, the State (S) and Global (G) ranks are the same.

Astragalus microcymbus has a very limited range. It is found in an area roughly 5.6 km (3.5 mi) from east to west and 10 km (6 mi) from north to south with a small, disjunct (widely separated) population found 17 km (10.5 mi) to the southwest on Cebolla Creek (Figure 1). The species is known primarily from Gunnison County with one site located in Saguache County. The majority of sites and individuals are along South Beaver Creek just southwest of Gunnison, Colorado. The species occurs on lands managed by the Bureau of Land Management (BLM) Gunnison Resource Area and adjacent private lands. Within known areas, *A. microcymbus* has a spotty distribution, most likely linked to the habitat being spotty on the landscape (Heil and Porter 1990, p. 16). Using the highest counts across years and across all sites, we estimate the total maximum historic population to be around 20,500 individuals in 5 populations (Table 1; USFWS 2010a, pp. 1–4). However, more recent counts indicate there are substantially fewer individuals than this today (DBG 2010a, p. 7; BLM 2010, p. 3). We estimate *A. microcymbus* occupied roughly 34 hectares (ha) (83 acres (ac)) in 2008 (BLM 2010, pp. 8–10). In previous hand-drawn estimates, *A. microcymbus* occupied roughly 131 ha (324 ac) (CNHP 2010a).

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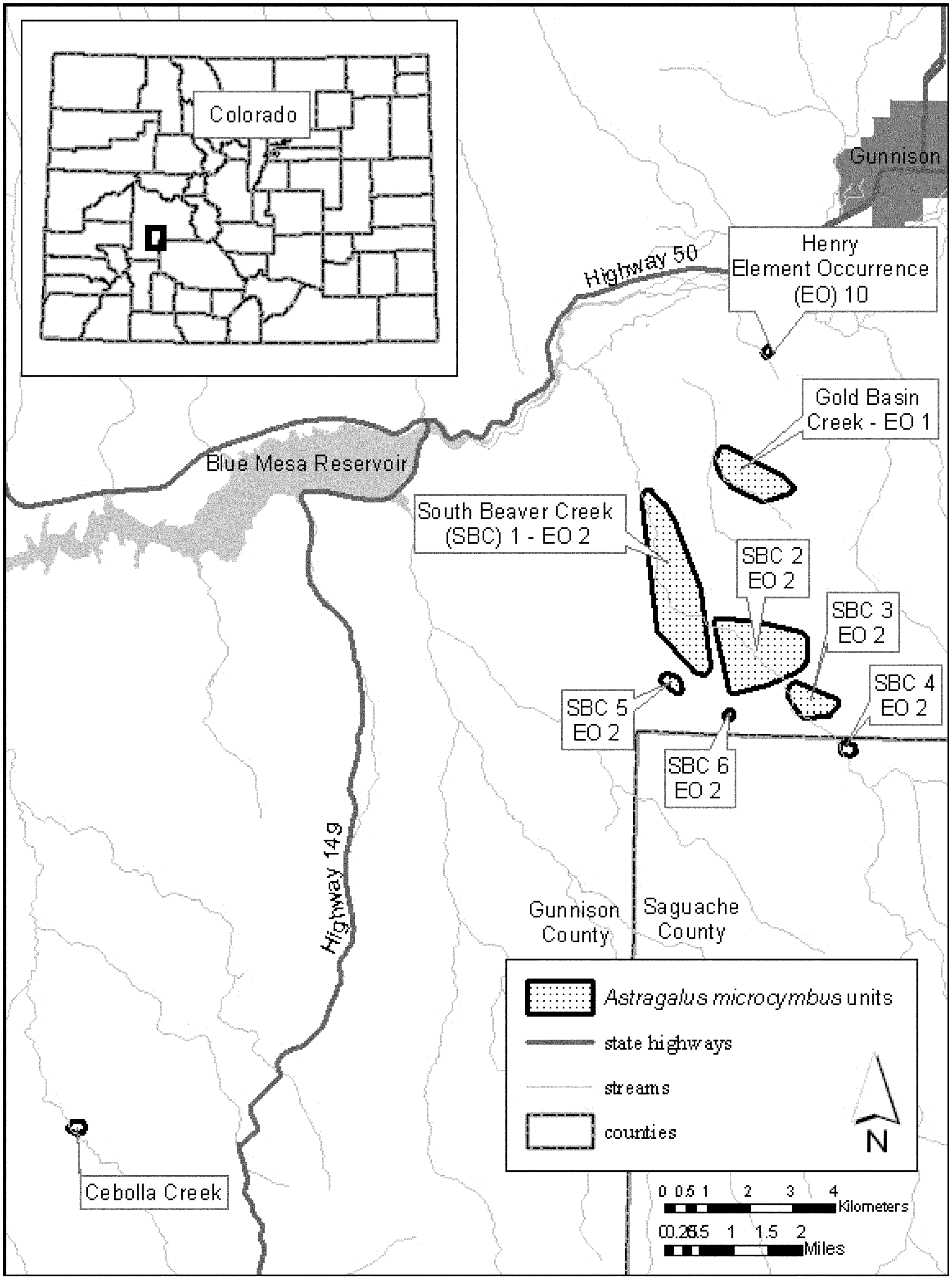

FIGURE 1. Current distribution of *Astragalus microcymbus* (BLM 2010, pp. 7-10; DePrenger-Levin 2010b, pers. comm.; 2010c, pers. comm.; 2010d, pers. comm.).

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TABLE 1—SUMMARY OF ASTRAGALUS MICROCYMBUS POPULATIONS (ELEMENT OCCURRENCES) (USFWS 2010a, PP. 1–4)

Population name	Population No.	Number of sites (pre-2004)	Estimated number of individuals	Ownership	Population rank
Beaver Creek SE	9	unknown	25	private	Historic
Henry	10	1	513	BLM	B
Gold Basin Creek	1	4	5,618	BLM	A
South Beaver Creek	2	39	14,317	BLM/private	A
Cebolla Creek	none	1	unknown	private	C or D
Total		45	20,473		

Population rankings are categorized from A through D, with "A" ranked occurrences generally representing higher numbers of individuals and higher quality habitat, and "D" ranked occurrences generally representing lower numbers of individuals and lower quality (or degraded) habitat. A historic rank (H) indicates an occurrence that has not been visited for more than 20 years.

The CNHP defines an Element Occurrence of *Astragalus microcymbus* as any naturally occurring population that is separated by a sufficient distance or barrier from a neighboring population. More specifically, for *A. microcymbus,* a population is separated by 1.6 km (1 mi) or more across unsuitable habitat, or 3.2 km (2 mi) across apparently suitable habitat (CNHP 2010b, p. 1). Given this definition, the CNHP has four populations of *A. microcymbus* in its database (CNHP 2010b, p. 2). Of these four populations, one (likely the type locality) has not been relocated since 1985 and is considered historic. This site was partially searched (because of private land access) in 1994 and not relocated, although there have not been subsequent visits. It is considered historic because it has not been seen in 20 years. The site along Cebolla Creek has not yet been incorporated into the CNHP's database, but when incorporated will comprise a separate population based on the separation distances described above.

While individuals of the species have been lost, we are unaware of the loss of any *Astragalus microcymbus* populations, although we are unsure of the status of Beaver Creek Southeast population. Two *A. microcymbus* populations comprise multiple sites (Gold Basin Creek and South Beaver Creek), and a few of these sites may have been extirpated (locally extinct). Site revisits using more accurate GPS mapping equipment from 2004–2008 generally re-located historical sites but decreased the overall footprint of most sites into smaller polygons and points. We roughly estimate the new mapping of polygons and points generally represents a reduction of about 75 percent in aerial extent from the original sites. We are unsure if the reduction of the site footprints is because of an actual contraction in the size of the sites, if the sites moved over time, or if it is an artifact of mapping efforts using improved technology. We expect it may be a combination of all three. At three sites in the South Beaver Creek area, no plants were re-located despite several survey efforts; these sites may have been extirpated (USFWS 2010a; pp. 1–4; BLM 2010, pp. 7–10; DePrenger-Levin 2010b, pers. comm.). In an extreme example, one site along South Beaver Creek (023–033–31975), was reduced from a larger 4-ha (10-ac) site to two small polygons that are 97 percent smaller than previously mapped (USFWS 2010a; pp. 1–4; BLM 2010, pp. 7–10).

The lumping of multiple sites into populations makes sense biologically because it generally represents areas where genetic exchange is possible (e.g., populations). However, past mapping efforts, site assessments, and count data have often been collected for smaller sites within a population (USFWS 2010a, pp. 1–4). The information gathered for these smaller sites is essential for tracking the status of the species but is somewhat problematic for an over-arching analysis for several reasons. First, the confusion between numbering protocols makes it difficult to ensure that particular counts, habitat specifics, or threats discussed by different sources are from the same sites. Second, mapping methodologies have resulted in varying delineations, especially with the advent of GPS technology.

For our analyses in this 12-month finding, we evaluated the sites, polygons, and points within *Astragalus microcymbus* populations, and created what we call units from which to conduct our analysis. We did this for several reasons: (1) To simplify the problems associated with tracking sites (i.e., different sources used different descriptors, making it difficult to ensure that they were talking about the same site); (2) to more broadly characterize and analyze the threats to the species' habitat (we believe that sites, polygons, and points are too fine scale); (3) because the polygons mapped in 2008 were on average much smaller than the original hand-drawn sites, we wanted to include more of the potential or previously occupied habitat rather than restricting our analysis to the 2008 mapped polygons; and (4) to provide for a more detailed analysis than would occur if we were to look at populations. To designate the units, we drew a perimeter around all GPS-derived polygons and points that were within 200 m (656 ft) of one another, and then buffered each perimeter by an additional 100 m (328 ft) (Figure 1; Table 2). This 100-m (328-ft) buffer was included so that previously occupied habitat, as drawn on maps, fell within the boundaries of these units. As a result of this exercise, all of the sites within the Gold Basin Creek population were lumped. As shown in Figure 1 above, this methodology divided the South Beaver Creek population into six separate units. The Beaver Creek Southeast population, located entirely on private land, is not included in our units because we are unsure of its exact location and current existence.

TABLE 2—ASTRAGALUS MICROCYMBUS UNITS FOR OUR SPATIAL ANALYSIS IN THIS 12-MONTH FINDING (USFWS 2010a, PP. 1–4; 2010b, PP. 1–3).

Unit name	Population No.	Est. number of individuals	Acres	Hectares	Ownership
Beaver Creek SE	9	25	Unknown	Unknown	private
Henry	10	513	10.8	4.4	BLM
Gold Basin Creek	1	5,618	315.1	127.5	BLM

TABLE 2—ASTRAGALUS MICROCYMBUS UNITS FOR OUR SPATIAL ANALYSIS IN THIS 12-MONTH FINDING (USFWS 2010a, PP. 1–4; 2010b, PP. 1–3).—Continued

Unit name	Population No.	Est. number of individuals	Acres	Hectares	Ownership
South Beaver Creek 1	2	6,136	918.5	371.7	70% BLM, 30% private
South Beaver Creek 2	2	3,667	684.5	277.0	68% BLM, 32% private
South Beaver Creek 3	2	2,464	163.6	66.2	96% BLM, 4% private
South Beaver Creek 4	2	778	24.1	9.75	70% BLM, 30% private
South Beaver Creek 5	2	1,232	38.3	15.5	BLM
South Beaver Creek 6	2	unknown	11.5	4.6	BLM
Cebolla Creek	none	unknown	24.6	9.9	6% BLM, 94% private
TOTAL		20,433*	2,190.8	886.6	75% BLM, 25% private

*Number is different from Table 1 above because the counts from two historical sites were excluded from the units.

Comprehensive surveys for *Astragalus microcymbus* were conducted in 1989 (BLM 1989a, pp. 1–31) and 1994 (Sherwood 1994, pp. 1–24). In 2008, the BLM conducted a comprehensive mapping effort without counts or population assessments (BLM 2010, p. 3). Several other efforts have counted individuals within certain sites (Japuntich 2010b, pers. comm.; DePrenger-Levin 2010b, pers. comm.; 2010c, pers. comm.; 2010d, pers. comm.; USFWS 2010a, pp. 1–4). Count data from various sites are difficult to compare because there is no way of knowing if two observers, during different years, travelled across similar areas, and if the effort between the two counts were similar. In general, counts in 1994 were higher than 1989 (Sherwood 1994, p. 13; USFWS 2010a, pp. 1–4). Several other observers have subsequently returned to these sites and found that *A. microcymbus* numbers in 2004, 2005, 2007, and 2008 were much lower than those of 1994 and the 1980s, with many sites shrinking from thousands to hundreds of individuals (DBG 2010a, p. 7; BLM 2010, p. 3; USFWS 2010a, pp. 1–4). Site counts and estimates from the 1980s and 1990s often reported the number of *A. microcymbus* individuals as more than 500, and sometimes as more than 2,000 individuals. Most counts in the last 5 years have been far less, generally under 150 individuals with only 1 count over 400 individuals (USFWS 2010a, pp. 1–4).

In 1989, the BLM developed a protocol to provide long-term trend data for selected populations of *Astragalus microcymbus* (BLM 1989b, pp. 1–4). They applied the protocol in select locations in 1990, 1994, and 2008. The number of individuals between 1990 and 2008 was not statistically different, and both years had similar low annual precipitation (20 cm (8 in.)) compared to the average of 25 cm (10 in.) (USFWS 2010c, pp. 1–8; DBG 2010a, p. 12; Western Regional Climate Center [WRCC] 2010a, pp. 1–8). However, there were significantly more plants in 1994 (three to four times) than either 1990 or 2008. Precipitation was higher in 1994, roughly 10 cm (4 in.) more than in 1990 or 2008 (USFWS 2010c, pp. 1–8). We conclude that there are more above-ground plants in years with more precipitation.

The DBG has been monitoring *Astragalus microcymbus* annually since 1995 (Carpenter 1995, pp. 1–7; DBG 2003, pp. 1–23; 2007, pp. 1–16; 2008, pp. 1–20; 2010a, pp. 1–17). The DBG found a decline in the number of *A. microcymbus* individuals from 1995–2009 (Figure 2), especially from 1995–2002 (DBG 2010a, p. 5). When comparing the first year of monitoring to the last, this decline is not statistically significant because of a partial rebound in the last few years (DBG 2010a, pp. 5, 10–11). This decline is apparent, although not significant, when considering only above-ground individuals ($p = 0.11$) as well as when combining above-ground individuals with dormant individuals ($p = 0.19$) (Figure 2). Dormant individuals are unknown for the first and last years of the study (1995 and 2008) because of problems associated with finding dormant individuals in the first year, and because dormant individuals cannot be distinguished from dead individuals in the last year.

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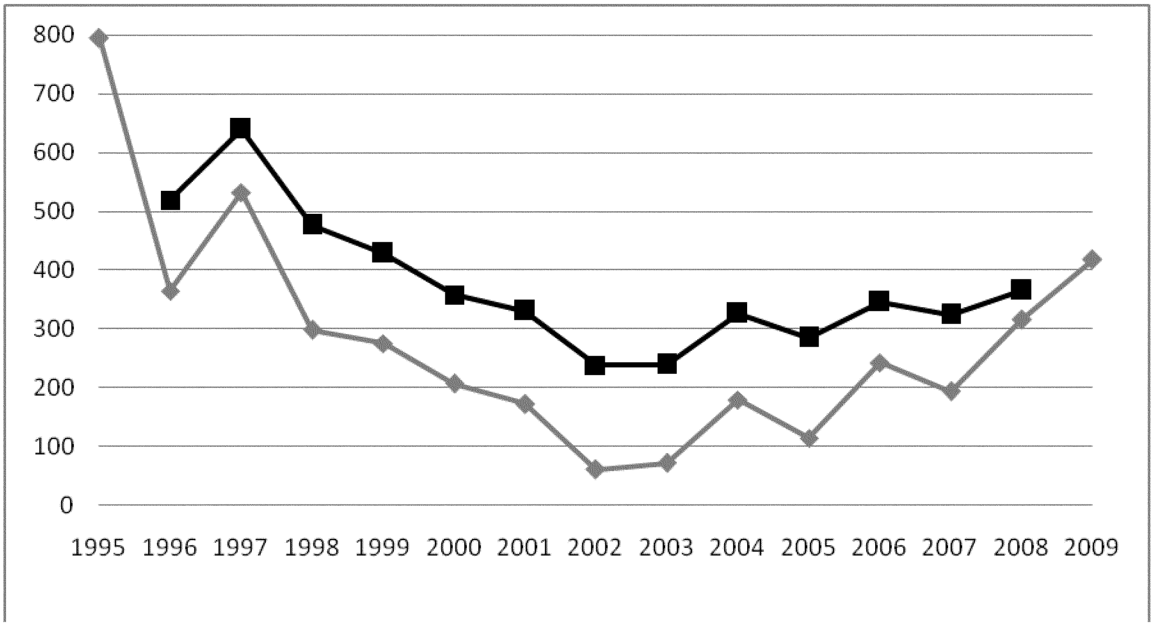

FIGURE 2. Total number of above-ground *Astragalus microcymbus* individuals from 1995-2009, and total number of above-ground and dormant *A. microcymbus* individuals from 1996-2008. Both are summed across four plots (DBG 2010a, p. 15).

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In conjunction with the life-history monitoring, the DBG conducted a population viability analysis using data from 1995–2006. They found that all monitored populations of *Astragalus microcymbus* were in rapid decline, and predicted that all populations will comprise 20 individuals or less—their definition of extinct—by 2030 (DBG 2010a, p. 10). This analysis has not been updated incorporating more recent monitoring data. However, a preliminary review for a subsequent population viability analysis has found still declining trends but with a more gradual decline that would likely delay the predicted extinction date (DePrenger-Levin 2010e, pers. comm.). Unfortunately, the population viability analysis including the 2007 and 2008 data has not been completed. The 2009 data cannot be used because of the problems associated with identifying dead or dormant individuals.

Astragalus microcymbus numbers are positively correlated with precipitation. In a statistical comparison, annual rainfall from August of the previous growing season to July of the current growing season positively influenced the number of *A. microcymbus* individuals, average maximum temperature in May and July negatively influenced the number of individuals, and rainfall in May and July positively influenced the number of individuals significantly (DBG 2010a, p. 6). In addition, rainfall in springtime months during the growing season was statistically correlated with more above-ground growth (DBG 2010a, p. 6).

Survey efforts, trend monitoring, life-history monitoring, and the corresponding population viability analysis all suggest that *Astragalus microcymbus* numbers are declining. In both of the more rigorous monitoring efforts, the decline seems to be correlated with precipitation. The drought in the early 2000s caused a huge decline in numbers, with a rebound in the later 2000s (DBG 2010a, p. 5). However, the very low survey numbers from this decade as compared to the 1980s and 1990s seem less correlated with precipitation (USFWS 2010a, pp. 1–4; WRCC 2010a, pp. 1–8). The reasons for these declines are not fully understood.

Habitat

Astragalus microcymbus is found in the sagebrush steppe ecosystem at elevations of 2,377–2,597 meters (m) (7,800–8,520 feet (ft)). The plant is most commonly found on rocky or cobbly, moderate to steep (9–38 degrees) slopes of hills and draws (Heil and Porter 1990, p. 16), although there are some sites that are flat. Plants are generally found on southeast to southwest aspects, but are occasionally found on northern exposures (Heil and Porter 1990, p. 13). The average annual precipitation is around 25 cm (10 in.) a year, and is fairly consistently spread across the year, except for July and August when roughly twice the precipitation falls compared to the other months (WRCC 2010b, pp. 3, 8). Snow falls in the winter and remains on the ground from November/December through March/April (WRCC 2010a, pp. 3, 8). Winters are cold with an average daily high in January of -3 °C (26.5 °F) and an average daily low of -20 °C (-4.0 °F). Summers are warmer. July is the hottest month with an average daily high of 27 °C (81 °F) and an average daily low of 6 °C (44 °F) (WRCC 2010b, pp. 3–8).

Astragalus microcymbus is found in open park-like landscapes dominated by several sagebrush species, cacti, sparse grasses, and other scattered shrubs. Shrubs are primarily represented by *Artemisia tridentata* ssp. *vaseyana* (mountain big sagebrush), *Artemisia tridentata* ssp. *wyomingensis* (Wyoming sagebrush), *Artemisia frigida* (fringed sagebrush or prairie sagewort), and *Artemisia nova* (black sagebrush); cacti include *Yucca harrimaniae* (Spanish bayonet), and *Opuntia polyacantha* (plains pricklypear); grasses most commonly include *Achnatherum hymenoides* (formerly *Oryzopsis hymenoides*—Indian ricegrass), *Elymus elymoides* (formerly *Sitanion hystrix*—squirreltail), *Hesperostipa comata* (formerly *Stipa comata*—needle and thread grass), and *Poa* sp. (fescue); and the most common forbs include *Cryptantha cinerea* (James' Cryptantha) and *Penstemon teucrioides* (germander beardtongue). Other shrubs and small trees found within *A. microcymbus'* habitat include *Ribes cereum* (wax currant), *Symphoricarpos oreophilus* (mountain snowberry), and *Juniperus scopulorum* (Rocky Mountain juniper).

Soils are well drained and vary from sandy to rocky, but are primarily a thin cobble-clay loam (Heil and Porter 1990, p. 13). The primary soils within *Astragalus microcymbus* units are stony rock land (46 percent), Lucky-Cheadle gravelly sandy loams with 5–45 percent slopes (39 percent), alluvial land (8 percent), and Kezar-Cathedral gravelly sandy loams with 5–35 percent slopes (4 percent) (Natural Resource Conservation Service (NRCS) 2008; USFWS 2010b, pp. 12–13). Geologically, *A. microcymbus* is associated with: (1) Felsic and hornblendic gneiss (metamorphic from igneous) substrates; (2) granitic (igneous) rocks of 1,700 million-year age group; and (3) biotitic gneiss, schist, and migmatite (sedimentary) substrates with 52, 37, and 11 percent, respectively, in each geology (Knepper *et al.* 1999, pp. 21–22; USFWS 2010b, pp. 10–11).

The areas where *Astragalus microcymbus* is found are generally distinct from surrounding habitats. They are more sparsely vegetated, drier than surrounding areas, more heavily occupied by cacti, and appear to have some specific soil properties as described above. This habitat is limited and patchily distributed on the landscape.

Summary of Information Pertaining to the Five Factors

Section 4 of the Act (16 U.S.C. 1533) and implementing regulations (50 CFR 424) set forth procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, a species may be determined to be endangered or threatened based on any of the following five factors:

(A) The present or threatened destruction, modification, or curtailment of its habitat or range;

(B) Overutilization for commercial, recreational, scientific, or educational purposes;

(C) Disease or predation;

(D) The inadequacy of existing regulatory mechanisms; or

(E) Other natural or manmade factors affecting its continued existence.

In making this 12-month finding, we evaluated the best scientific and commercial information available. Our evaluation of this information is presented below.

In considering what factors might constitute threats to a species, we must look beyond the exposure of the species to a factor to evaluate whether the species may respond to the factor in a way that causes actual impacts to the species. If there is exposure to a factor and the species responds negatively, the factor may be a threat and we attempt to determine how significant a threat it is. The threat is significant if it drives, or contributes to, the risk of extinction of the species such that the species warrants listing as endangered or threatened as those terms are defined in the Act.

Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

The following potential factors that may affect the habitat or range of *Astragalus microcymbus* are discussed in this section, including: (1) Residential and urban development; (2) recreation, roads, and trails; (3) utility corridors; (4) nonnative invasive plants; (5) wildfire; (6) contour plowing and nonnative seedings; (7) livestock, deer and elk use of habitat; (8) mining, oil and gas leasing; (9) climate change; and (10) habitat fragmentation and degradation.

Residential and Urban Development

The majority of *Astragalus microcymbus* is located between 3.2 and 11 km (2 and 7 mi) of the town of Gunnison, Colorado, the largest town in Gunnison County (Figure 1). Rapid population growth in the rural Rocky Mountains, including the Gunnison area, is being driven by the availability of natural amenities, recreational opportunities, aesthetically desirable settings, grandiose viewscapes, and perceived remoteness (Riebsame 1996, pp. 396, 402; Theobald *et al.* 1996, p. 408; Gosnell and Travis 2005, pp. 192–197; Mitchell *et al.* 2002, p. 6; Hansen *et al.* 2005, pp. 1899–1901). Gunnison County grew from 5,477 people in 1960 to 15,048 people in 2007, constituting a 300 percent increase in population in less than 50 years (CensusScope 2010, pp. 1–3; Colorado State Demography Office 2008, p. 1). The population of Gunnison County is predicted to more than double by 2050 to approximately 31,100 residents (Colorado Water Conservation Board 2009, p. 53).

Human population growth results in increased fragmentation of habitat (*see* Factor E below) (Theobald *et al.* 1996, pp. 410–412), increased recreation and more roads (*see* Recreation, Roads, and Trails below) (Mitchell *et al.* 2002, pp. 5–6; Hansen *et al.* 2005, p. 1899), more utility corridors (see Utility Corridors below), more nonnative invasive plants (see Nonnative Invasive Plants below) (Hansen *et al.* 2005, p. 1896), and changes to ecological processes (Hansen *et al.* 2005, p. 1901). A recent but common pattern of population growth in the Gunnison area is “exurban” or “ranchette” development. These ranchettes consist of larger lots (generally more than 14 ha (35 ac)) each with an isolated large house. This type of development, because of its location outside of urban footprints, may have more impacts to ecosystems and biodiversity than urban or urban fringe development (Hansen *et al.* 2005, p. 1903). Much of this development occurs on steeper slopes, like those where *Astragalus microcymbus* is found, where views are better.

To the best of our knowledge, residential and urban development (aside from roads) has impacted only one *Astragalus microcymbus* unit: the Beaver Creek Southeast Unit. The original type locality along Highway 50 may have been lost to highway activities, and the nearby private lands where the plant was located in the late 1970s and early 1980s may have been lost to a gravel pit (Sherwood 1994, pp. 18–19). No more than 30 plants were reported from this unit in any given year from 1955–1994 (USFWS 2010a, p. 1). Only two *A. microcymbus* sites are near buildings: There is a cabin near one of the larger *A. microcymbus* sites within the South Beaver Creek 1 Unit (BLM 1989a, p. 31), and there is a house within the Cebolla Creek Unit. We do not know if construction of either of these structures impacted *A. microcymbus.*

Twenty-five percent of the *Astragalus microcymbus* units are on private land, mostly along South Beaver Creek (Table 2). Five parcels of private land (with an additional parcel nearby) are currently within *A. microcymbus* units along South Beaver Creek ranging in size from 17 to 263 ha (43 to 650 ac), only one of which has any housing or agricultural developments. All of these parcels are used primarily for livestock ranching operations that have a much lower impact than urban or residential development.

These private land parcels bisect the South Beaver Creek 1 and South Beaver Creek 2 Units, and clip portions of the South Beaver Creek 3 and South Beaver Creek 4 Units (USFWS 2010b, pp. 2–3). Roughly half of the known *Astragalus microcymbus* individuals are within the South Beaver Creek 1, 2, and 4 Units (Table 2), making them especially important to the conservation of the species. These three units all have at least 30 percent of their area on private lands (Table 2), more than the average across the units of 25 percent. Given their proximity to town, the rapid growth predicted for Gunnison County (Colorado Water Conservation Board 2009, p. 53), the lack of undeveloped parcels in desirable locations (Gunnison County 2005, p. 1), and their appealing views, these parcels are in a likely location for development and could be subdivided in the future. In addition, the Cebolla Creek Unit is located almost entirely on private land and is already partially developed.

Residential or urban development of these parcels would likely lead to the destruction of *Astragalus microcymbus* individuals, as well as fragment and alter the plants' habitat. In 2005, it was estimated that only 30 percent of the private lands in Gunnison County remained undeveloped (Gunnison County 2005, p. 1). Because only 30 percent of the private lands in Gunnison County remain undeveloped, and because the population of Gunnison County is expected to double by 2050, we conclude that the currently undeveloped private lands where *A. microcymbus* occurs are likely to be developed by 2050. The potential loss of up to 25 percent of the area (habitat) and even more of the individuals of *A. microcymbus* is a significant threat for a species with such limited numbers and a limited range (Table 2). This development also would fragment the habitat, potentially isolating small populations from one another leading to the further loss of individuals.

Currently, the impact of development on the species is relatively minor, consisting of the few examples provided above. Although 25 percent of *Astragalus microcymbus* individuals are on private lands with no protective mechanisms in place for the species, little development is currently occurring on these private lands. However, we believe that the threat of development to the species may increase in the foreseeable future based on future human population growth. Future development on these lands is likely, because of the rate of growth in the Gunnison area. Given that Gunnison County has seen a 300 percent increase in population in less than 50 years, that only 30 percent of the private lands remain undeveloped, and *A. microcymbus'* close proximity to the town of Gunnison, we expect that some of these private land parcels will be developed in the next several decades. Based on the population projections presented above, the foreseeable future for development is 40 years, as the population of Gunnison County is predicted to more than double by 2050. Based on the above information, we consider residential and urban development to be a threat to the species in the foreseeable future.

Recreation, Roads, and Trails

It is difficult to separate the effects of roads and trails from the effects of recreation where *Astragalus microcymbus* resides. Most forms of recreation within *A. microcymbus'* range include the use of roads and trails either as a form of recreation (*e.g.,* vehicle use, mountain biking, or hiking) or as a way to access recreation areas (*e.g.,* target shooting and rock climbing areas). For these reasons, we have chosen to address recreation, roads, and trails together in this section.

Roads cause habitat fragmentation because they create abrupt transitions in vegetation; add edge to adjacent patches; are sources of pollutants; and act as filters (allowing some species to cross but not others) and barriers (prohibiting movement) (Spellerberg 1998, pp. 317–333). Road networks contribute to exotic plant invasions via introduced road fill, vehicle transport of plant parts, and road maintenance activities (Forman and Alexander 1998, p. 210; Forman 2000, p. 32; Gelbard and Belnap 2003, p. 426). Many of these invasive species are not limited to roadsides, but also encroach into surrounding habitats (Forman and Alexander 1998, p. 210; Forman 2000, p. 33; Gelbard and Belnap 2003, p. 427).

Aside from the indirect effects discussed above, a road typically removes all vegetation from about 0.7 ha (1.7 ac) per 1.6 km (1 mi), while a single track trail removes all vegetation from about 0.1 ha (0.25 ac) per 1.6 km (1 mi) (BLM 2005a, p. 13). Roads also act as corridors that facilitate human interaction with species and increase the opportunities and the likelihood of travel across undisturbed (non-road) areas. The recreational use of roads is on the rise. From 1991 to 2006, off-highway vehicle registrations increased 937 percent (from 11,744 to 109,994 within the state), with an average annual increase of 16 percent (Summit County Off Road Riders 2009, p. 1). Recreational activities within the Gunnison Basin are widespread, occur during all seasons of the year (especially summer and hunting season), and have expanded as more people move to the area or come to recreate (BLM 2009a, pp. 7–8). Motorized and mechanized use has been increasing within the Gunnison Basin and is expected to increase in the future based on increased population (USFS and BLM 2010, pp. 5, 9, 85, 124–125, 136, 158, 177, 204, 244, 254, 269, 278).

Because *Astragalus microcymbus* generally occurs on slopes, it is somewhat protected from the further development of large roads. And many of the existing roads, although not all, run immediately along the bottom or top of sites instead of through the middle of sites. However, these slopes appear to be the preferred location for dirt bike and mountain bike trails, especially those that were user-created instead of formally designed. Many of the trails within the range of *A. microcymbus* are user-created and run across or up through the slopes where the plant is found (USFWS 2010, pers. comm.). These user-created trails, when redesigned, often require a series of switchbacks, which could increase the opportunity for impacts to the plant. Travel management (the allocation and utilization of motorized and nonmotorized use), and route designation and design, both within the Hartman Rocks Recreation Area and outside that area, are described in further detail below.

Except for the one disjunct population, all of the *Astragalus microcymbus* units are within 11 km (7 mi) of the town of Gunnison, the closest of which is 3.2 km (2 mi) away. This close proximity to an urban area makes the species more susceptible to recreational impacts than if it were located more remotely. The Hartman Rocks Recreation Area is a popular urban interface recreation area and contains roughly 40 percent of the *A. microcymbus* units (BLM 2005a, p. 3; USFWS 2010b, pp. 4–5). The Hartman Rocks Recreation Area is located between 3 and 10 km (2 and 6 mi) from the town of Gunnison on BLM lands (BLM 2005a, p. 3). The Hartman Rocks Recreation Area covers 3,380 ha (8,350 ac), but trails expand out onto adjacent lands. These lands also have *A. microcymbus* plants and habitat that are being impacted by these trails (BLM 2005a, p. 3).

We have no detailed information on how much use occurs, how this use is increasing, or when the use is occurring in the Hartman Rocks Recreation Area. In 2005, it was estimated that the Hartman Rocks Recreation Area received 15,000–20,000 user days each year (BLM 2005a, p. 3). Recreation activities within the Hartman Rocks Recreation Area include mountain biking, motorcycling, all-terrain vehicle riding, 4-wheeling, rock climbing, camping, trail running, horseback riding, cross country skiing, snowmobiling, dog sledding, hill parties, target shooting, hunting, paintball, and more (BLM 2005a, p. 3). We have seen most of these activities occurring adjacent to or within *Astragalus microcymbus* sites (USFWS 2010, pers. comm.).

The BLM's Hartman Rocks Recreation Management Plan closed two trails and rerouted one trail to protect *Astragalus microcymbus* (BLM 2005a, p. 18; Japuntich 2010c, pers. comm.). These closures were for trails that were directly impacting *A. microcymbus* individuals. The Aberdeen Loop trail goes very close to several *A. microcymbus* sites within the South Beaver Creek 1, South Beaver Creek 5, and South Beaver Creek 6 Units. To protect Gunnison sage-grouse brood-rearing habitat, a reroute of this trail is planned in the next few years that will put the trail further from these *A. microcymbus* sites (Japuntich 2010d, pers. comm.). Many trails are open year-round in the Hartman Rocks Recreation Area, but with less use in the winter and early spring when trails are snow covered or muddy. Closures during *A. microcymbus'* growing season (likely late April through August) would benefit the species by reducing impacts to seedlings and plants, and by lessening disruptions to pollinators. The Aberdeen Loop trail that runs through the South Beaver Creek 1, South Beaver Creek 5, and South Beaver Creek 6 occupied *A. microcymbus* habitat is subject to seasonal closures for the Gunnison sage grouse from June 15 until August 31. This closure provides partial protection for *A. microcymbus* in the growing season.

The South Beaver Creek Area of Critical Environmental Concern (ACEC) (also a Colorado Natural Area) was designated in 1993 by the BLM with the intent of protecting and enhancing existing populations of *Astragalus microcymbus* (BLM 1993, pp. 2.18, 2.29; Colorado Natural Areas Program [CNAP] 1997, pp. 1–7). The South Beaver Creek ACEC is 1,847 ha (4,565 ac), and includes 60 percent of the *A. microcymbus* units rangewide (BLM 1993, p. 2.18; USFWS 2010b, pp. 8–9). Seventy percent of the South Beaver Creek ACEC is within the Hartman Rocks Recreation Area, although the South Beaver Creek ACEC was developed at least 8 years prior to the Hartman Rocks Recreation Area (BLM 2005a, p. 44). Because of its designation as a recreation area, the Hartman Rocks Recreation Area draws users to the area, which is in conflict with the ACEC's intent to protect and enhance *A. microcymbus.*

When the South Beaver Creek ACEC was designated, motorized vehicle traffic was limited to designated routes, whereas it had previously been open on all lands (BLM 1993, p. 2.30). Outside the South Beaver Creek ACEC, all lands within the range of *Astragalus microcymbus* remained open to motorized vehicle traffic. In 2001, mechanized travel, including mountain bikes, on all lands within the Gunnison Resource Area including the South Beaver Creek ACEC and the Hartman Rocks Recreation Area was limited to designated routes (U.S. Forest Service (USFS) and BLM 2001a, p. 3; 2001b, pp. 1–2; BLM 2005a, p. 14). This closure resulted in new protections for *A. microcymbus* from mountain bikes and vehicular use on BLM lands outside the South Beaver Creek ACEC, and from mountain bikes within the ACEC.

Enforcement of travel designations and trail closures is difficult given the large area of the BLM's Gunnison Resource Area and limited law enforcement personnel (USFS and BLM 2010, p. 259). Illegal trails are always an issue in well-used recreation areas (BLM 2010, p. 4). Furthermore, the open park-like habitat of *Astragalus microcymbus* makes it difficult to disguise trails that have been closed. Numerous undesignated trails running through *A. microcymbus* habitat are visible on satellite images (*see* below). Law enforcement with the Gunnison Resource Area is provided by the BLM's Montrose Area Office, which is located over 105 km (65 mi) away. Law enforcement within this area is intermittent, and tickets are rarely, if ever, issued for trespass use (USFS and BLM 2010, p. 259).

As an example, the Quarry Drop trail that runs through the South Beaver Creek 1 Unit was closed in 2005 with the Hartman Rocks Recreation Plan, because it ran directly through two *Astragalus microcymbus* sites (BLM 2010, p. 4). Although this trail is posted as closed, it was still in use during the summer of 2009, when rocks were placed to close the trail entrance (BLM 2010, p. 4). The Gunnison Trails group (a local non-profit trail-building group) and the BLM have increased their efforts on finding illegal trails and closing them before they become more established. Continued pressure from the recreation community for new trail construction is likely, as well as trespass use (BLM 2010, p. 4). In an effort to control illegal use, the BLM has put up educational signs where roads enter the South Beaver Creek ACEC explaining what *A. microcymbus* is and why the species and its habitat are important to preserve (BLM 2010, p. 6). Trails that have been closed are planned to be rehabilitated where they meet open trails during the summer of 2011 in an attempt to ensure they will no longer be used (Japuntich 2010d, pers. comm.).

The BLM and the USFS finalized a joint Environmental Impact Statement for a Gunnison Basin Federal Lands Travel Management Plan that includes areas on BLM lands outside the Hartman Rocks Recreation Area (USFS and BLM 2010, pp. 1–288). This plan builds upon the Gunnison Travel Interim Restrictions of 2001 by closing additional routes, mostly for resource-related reasons (USFS and BLM 2010, p. 1). *Astragalus microcymbus* is not considered in detail in this plan, nor does the plan designate roads be closed specifically to protect *A. microcymbus* (USFS and BLM 2010, pp. 47, 78–79). None of the closures proposed in the plan will benefit *A. microcymbus* nor do they address routes within the Hartman Rocks Recreation Area.

We have found roads, trails, and gravel parking areas atop *Astragalus microcymbus* individuals and polygons (USFWS 2010, pers. comm.). These roads, trails, and parking areas have no vegetation. *A. microcymbus* individuals can be found along the margins of these roads, trails, and parking areas, sometimes with tire tracks atop (USFWS 2010, pers. comm.). Cheatgrass is spreading from the old road bed upslope and into the one site where invasion is occurring (USFWS 2010, pers. comm.). Trails sometimes are deeply incised and eroded (USFWS 2010, pers. comm.).

We conducted a spatial analysis overlaying the distribution of *Astragalus microcymbus* units with designated routes within and near the Hartman Rocks Recreation Area. We found 8.8 km (5.5 mi) of roads (3.5 km (2.3 mi)) and trails (5.3 km (3.2 mi)) overlap with *A. microcymbus* units (Table 3) (BLM 2010; USFWS 2010b, pp. 14–15). Through this mapping effort, we found four of the polygons within the Gold Basin Creek Unit are being directly impacted by these roads and trails (USFWS 2010b, p. 16). We also are aware of at least three other polygons that are being directly impacted by roads and trails (USFWS 2010, pers. comm.). Estimating that a road typically removes all vegetation from about 0.7 ha (1.7 ac) per 1.6 km (1 mi) while a single track trail removes all vegetation from about 0.1 ha (0.25 ac) per 1.6 km (1 mi) (BLM 2005a, p. 13), designated roads directly impact 1.6 ha (3.9 ac) and designated trails directly impact 0.3 ha (0.8 ac) of habitat within *A. microcymbus* units.

TABLE 3—ROADS, TRAILS, AND PATHS WITHIN *Astragalus microcymbus* UNITS

[Designated routes are those included in the BLM's geospatial layers, undesignated are those located using satellite imagery]

Unit name	Designated		Undesignated			Total km (mi)
	Roads km (mi)	Trails km (mi)	Roads km (mi)	Trails km (mi)	Paths km (mi)	
Henry	0.1 (0.06)		0.1 (0.06)	0.1 (0.06)		0.3 (0.2)
Gold Basin Creek	2.2 (1.4)	1.4 (0.9)	0.1 (0.06)	0.4 (0.2)	1.3 (0.8)	5.4 (3.4)
South Beaver Creek 1	1.2 (0.7)	3.5 (2.2)	6.3 (3.9)	3.4 (2.1)	1.6 (1.0)	16.0 (9.9)
South Beaver Creek 2			2.4 (1.5)	0.3 (0.2)	3.6 (2.2)	6.3 (3.9)
South Beaver Creek 3			0.7 (0.4)			0.7 (0.4)
South Beaver Creek 4						
South Beaver Creek 5		0.2 (0.1)				0.2 (0.1)
South Beaver Creek 6		0.2 (0.1)				0.2 (0.1)
Cebolla Creek			0.6 (0.4)			0.6 (0.4)
Total (km)	3.5 (2.2)	5.3 (3.3)	10.2 (6.4)	4.2 (2.6)	6.5 (4.0)	29.7 (18.5)

While travel is officially limited to designated routes only on BLM lands, there are numerous roads, trails, and paths that are not designated, with some receiving regular use. Some of these roads have been closed, but their footprint remains. Some of these roads are on private lands along South Beaver Creek, but many are trails or old roads on BLM lands that are undesignated, that either show evidence of use or could be receiving use. We used the NRCS' 2005 National Agriculture Imagery Program satellite imagery to look for roads, trails, and paths in occupied *Astragalus microcymbus* units additional to those BLM roads and trails included in the analysis above. We designated roads, trails, and paths based on the width of the disturbance. Roads were the widest, trails were narrower, and paths were the narrowest. We found almost 21 km (13 mi) of additional roads, trails, and paths, including: 10.2 km (6.3 mi) of roads, 4.2 km (2.6 mi) of trails, 6.5 km (4.0 mi) of paths (Table 3) (USFWS 2010b, pp. 21–22). Using the BLM's estimates of direct impacts (BLM 2005a, p. 13), undesignated roads directly impact 4.4 ha (10.9 ac), undesignated trails directly impact 0.3 ha (0.8 ac), and undesignated paths directly impact less than 0.4 ha (1 ac) of *A. microcymbus* habitat. Because we were using satellite imagery, we cannot say for certain what the level of use is on the trails, or even say if they are still in use. Some of the paths may have been livestock trails. Livestock trails may receive more or less use than other trails, but the effects are likely similar.

All units except the South Beaver Creek 4 Unit have roads and trails. Designated and undesignated roads denude about 5.7 ha (14.1 ac), designated and undesignated trails denude about 0.6 ha (1.6 ac), and undesignated paths denude less than 0.4 ha (1 ac) within *Astragalus microcymbus* units, or less than 0.8 percent (Table 4). To estimate the indirect effects of roads and trails, we used a 20-m (66-ft) buffer on either side of roads and trails. This distance represents the area where invasive nonnative species are most likely to invade, pollinators may be impacted or disturbed by passing vehicles, off-trail use is most likely, and impacts from dust may occur. This distance results in a conservative estimate of impacts, as it is probably more accurate for trails than roads (summarized in DBG 2010b, p. 1). Using this buffer distance, we estimate that roughly 14.5 percent of *A. microcymbus'* total habitat may currently be impacted by roads and trails (Table 4) (USFWS 2010b, pp. 23–25). We expect our 15-percent estimate is low. For example, plumes of dust are known to travel hundreds of meters, especially in arid climates (Gilles *et al.* 2005, p. 2346). Also, we expect that the two known pollinators of *A. microcymbus* travel at least 100 m (328 ft) from their nests, and impacts within this area could impact the nests of these pollinators (Greenleaf *et al.* 2007, pp. 589–596). In the case of the *A. microcymbus* site with cheatgrass, we estimate that the cheatgrass invasion was facilitated by the road and has since moved roughly 20 m (66 ft) upslope into the site (USFWS 2010, pers. comm.). A 100-m (328-ft) buffer (that would better account for indirect dust and invasive nonnative species effects) on either side of these roads and trails would cover roughly 46 percent of the *A. microcymbus* units.

TABLE 4—DIRECT AND INDIRECT (20 METER (66 FOOT)) EFFECTS TO *Astragalus microcymbus* UNITS FROM ROADS, TRAILS, AND PATHS

Unit name	Road km (mi)	Trail and path km (mi)	Direct		20-m (66-ft) buffer	
			Area ha (ac)	% of unit	Area ha (ac)	% of unit
Henry	0.2 (0.1)	0.1 (0.06)	0.1 (0.2)	1.9	1.8 (4.6)	42.0
Gold Basin Creek	2.3 (1.4)	3.1 (1.9)	1.2 (3.0)	1.0	22.7 (56.0)	17.8
South Beaver Creek 1	7.5 (4.7)	8.5 (5.3)	3.8 (9.4)	1.0	69.7 (172.1)	18.7
South Beaver Creek 2	2.4 (1.5)	3.9 (2.4)	1.3 (3.2)	0.5	26.9 (66.3)	9.7
South Beaver Creek 3	0.7 (0.4)		0.3 (0.7)	0.4	3.2 (7.9)	4.8
South Beaver Creek 4						
South Beaver Creek 5		0.2 (0.1)	0.01 (0.02)	0.05	0.9 (2.2)	5.8
South Beaver Creek 6		0.2 (0.1)	0.01 (0.02)	0.2	0.9 (2.2)	19.4
Cebolla Creek	0.6 (0.4)		0.3 (0.7)	2.8	2.7 (6.8)	27.7
Total (km)	13.7 (8.5)	16.0 (9.9)	6.9 (17.1)	0.8	128.7 (318.1)	14.5

Given the numerous roads and trails within *Astragalus microcymbus'* habitat (impacting between 15 and 46 percent of the units), the dispersed and bisecting nature of these roads and trails, the numerous trespass trails, the likely increase in nonnative invasive plants from road and trail use, and the fact that a recreation area was designated on 40 percent of the species habitat, we find the magnitude of the threat from recreation, roads, and trails to be high. The threat is ongoing with a high likelihood that it will continue to increase over time. Given that off-road vehicle use in Colorado is increasing 16 percent annually, that the population of Gunnison County is estimated to double by 2050, and that other recreational impacts also are increasing at a rapid pace, we expect a significant increase in the threat from recreation, roads, and trails in the next 40 years. The Hartman Rocks Recreation Area's Management Plan is applicable for 10–15 years from 1995, although there is no definitive expiration date (BLM 2005a, p. 7). We are unsure if and when an update is planned. The most recent Travel Management Plan (USFS and BLM 2010, entire) for the Gunnison Basin will have a similar lifespan. During this time period travel management is not likely to change while we anticipate use will increase. Based on the above information, we consider recreation, roads, and trails to be a significant threat to the species now and in the foreseeable future.

Utility Corridors

Utility corridors have similar effects to habitats as roads because both are linear disturbances (*see* Recreation, Roads, and Trails above for a review of effects). The impact from a utility corridor is greater than its actual footprint, because utility corridors fragment habitat and facilitate the invasion of nonnative invasive plants. We are aware of one large electrical transmission line in *Astragalus microcymbus* habitat. The Curecanti to Poncha 230-kilovolt electrical transmission line bisects the South Beaver Creek 1 Unit and was built in 1962 (Japuntich 2010e, pers. comm.). A 500-foot right-of-way (ROW) (largely not disturbed) is on both sides of the power line (Japuntich 2010e, pers. comm.), which overlays with about 38 ha (94 ac) or 10 percent of the South Beaver Creek 1 Unit and 4 percent of the total area of all *A. microcymbus* units. Only a small proportion of the 500-foot ROW is disturbed. We estimate 1.2 km (0.75 mi) of transmission line with at least six large structures (power poles) within the unit. Given the close proximity of *A. microcymbus* individuals to the transmission line, we assume some individuals were impacted during construction. At least one access road to a power pole also provides vehicular access to an *A. microcymbus* site where plants are being impacted by vehicles driving on them. This transmission line is used recreationally by snowmobile riders in the winter (BLM 2005a, p. 53). We do not know if there are any impacts to *A. microcymbus* from these snowmobiling activities. Direct impacts seem unlikely from the snowmobiling because the plants are dormant and under snow when the use is occurring. Compaction to the habitat is a possibility.

Future ROW developments are allowed in the South Beaver Creek ACEC provided that the surface disturbance does not impair or degrade *Astragalus microcymbus* sites (BLM 1993, p. 2.30). The one known utility corridor impacts only one *A. microcymbus* unit, representing 4 percent of the total rangewide area within units. Given the population growth in the area, we believe there is a moderate likelihood of additional utility corridors in the future. We are unaware of any plan to develop other utility corridors through *A. microcymbus* habitat. Although an existing utility corridor in *A. microcymbus* habitat may impact a small percentage of the overall range of the species, we have no information to indicate that utility corridors occur at a level that threatens the species now or in the foreseeable future.

Nonnative Invasive Plants

Nonnative invasive plants (weeds) invade and alter all types of plant communities, sometimes resulting in nonnative plant monocultures that support little wildlife or native plants. Many experts believe that, following habitat destruction, nonnative invasive plants are the next greatest threat to biodiversity (Randall 1996, pp. 370–383). Nonnative invasive plants alter different ecosystem attributes including geomorphology, fire regime, hydrology, microclimate, nutrient cycling, and productivity (Dukes and Mooney 2004, pp. 411–437). Nonnative invasive plants can detrimentally affect native plants through competitive exclusion, altered pollinator behaviors, niche displacement, hybridization, and changes in insect predation. Invasive grasses can replace native plants such as *Astragalus microcymbus* by outcompeting them for resources, such as soil nutrients or moisture (Brooks and Pyke 2001, p. 6). Examples are widespread among taxa and locations or ecosystems (D'Antonio and Vitousek 1992, pp. 63–87; Olson 1999, pp. 6–18; Mooney and Cleland 2001, pp. 5446–5451).

The only nonnative invasive plant species that has been documented impacting *Astragalus microcymbus* is cheatgrass or downy brome (*Bromus tectorum*). Cheatgrass has become dominant in many sagebrush areas during the last century, primarily from livestock use, agriculture, and wildfire impacts (Pickford 1932, p. 165; Piemeisel 1951, p. 71; Peters and Bunting 1994, p. 34; Vail 1994, pp. 3–4; Brooks and Pyke 2001, pp. 4–6; Menakis *et al.* 2003, p. 284). Cheatgrass displaces native plants by prolific seed production, early germination, and superior competitive abilities for the extraction of water and nutrients (Pellant 1996, pp. 3–4; Pyke 2007, pp. 1–2). Cheatgrass is capable of modifying ecosystems by altering the soil temperatures and soil water distribution (Pellant 1996, p. 4). In addition, the invasion of cheatgrass increases fire frequency within the sagebrush ecosystem (see Wildfire below) (Zouhar *et al.* 2008, p. 41; Miller *et al.* in press, p. 39).

In the mid to late 1980s, cheatgrass was seen in very small patches in the Gunnison Basin but can now be found in some abundance throughout the Basin (BLM 2009a, pp. 7–8). Cheatgrass is increasing in the South Beaver Creek drainage and has been identified as a major threat to *Astragalus microcymbus.* This threat assessment was made because of how cheatgrass is rapidly expanding elsewhere in the Gunnison Basin (BLM 2010, p. 5). Cheatgrass is moving upslope into *A. microcymbus* areas (BLM 2010, p. 5). In 2009, nine polygons within the South Beaver Creek 1 Unit were discovered with cheatgrass totaling 0.2 ha (0.6 ac) (USFWS 2010b, pp. 16–17). These polygons did not exist 4 years prior to their discovery (Japuntich 2010f, pers. comm.). In 2010, another small site of cheatgrass was mapped immediately adjacent to the South Beaver Creek 5 Unit, and a 9-ha (22-ac) site with cheatgrass was located 250 m (820 ft) away from the South Beaver Creek 4 Unit (Japuntich 2010f, pers. comm.).

Herbicide use to control cheatgrass in the South Beaver Creek is limited by the close proximity of South Beaver Creek, because chemical spraying within the South Beaver Creek ACEC is not allowed, and vegetative treatments in the South Beaver Creek ACEC must not adversely affect *Astragalus microcymbus* (BLM 1993, p. 2.29; BLM 2010, p. 6). In the spring of 2010, the BLM conducted a mechanical removal effort for cheatgrass to protect *A. microcymbus* at the South Beaver Creek 1 Unit at the nine polygons mentioned above (BLM 2010, pers. comm.). A manual hand-pulling effort in 2010 that treated several acres of cheatgrass was partially successful (Japuntich 2010g, pers. comm.). Cheatgrass spread also may be affected by climate change (see Climate Change below).

Other nonnative invasive species known from the Hartman Rocks Recreation Area include: Canada thistle (*Cirsium arvense*), scentless chamomile (*Matriacaria perforata*), yellow toadflax (*Linaria vulgaris*), and Russian knapweed (*Acroptilon repens*) (BLM 2005a, p. 47). These species have not been reported from or near *Astragalus microcymbus* areas and are said to have been controlled (BLM 2005a, p. 47). We expect other nonnative invasive species are likely in the area. Other nonnative invasive species known from the Gunnison Resource Area that are reported to take over large areas include: spotted knapweed (*Centaurea maculosa*), oxeye daisy (*Leucanthemum vulgare),* and field bindweed (*Convolvulus arvensis)* (BLM 2009a, p. 7). The following weeds also are known from the Gunnison Basin, where they are currently limited in extent; however, they are known to cover large expanses in other parts of western North America: diffuse knapweed (*Centaurea diffusa*), and whitetop (*Cardaria draba*). Other invasive plant species present within the Gunnison Basin that are problematic yet less likely to overtake large areas include: musk thistle (*Carduus nutans*), bull thistle (*Cirsium vulgare*), black henbane (*Hyoscyamus niger),* kochia (*Kochia* sp.), common tansy *(Tanacetum vulgare*), and absinth wormwood (*Artemisia biennis*) (BLM 2009a, p. 7; Gunnison Watershed Weed Commission (GWWC) 2009, pp. 4–6).

We believe the invasion of nonnative invasive plants, particularly cheatgrass, is likely to be a threat to *A. microcymbus* in the near future because: (1) Cheatgrass appears to be quickly expanding into the habitat (it was unknown just 2 years ago and there are several cheatgrass sites nearby now); (2) the dry, sparsely-vegetated, south-facing slopes where *A. microcymbus* is found are the warmest sites with little competition from other native vegetation (Japuntich 2010h, pers. comm.) and, therefore, are inherently vulnerable to cheatgrass invasion; (3) cheatgrass likely competes with seedlings and resprouting adult plants for water and nutrients; (4) no landscape-scale successful control methods are available for cheatgrass; and (5) the proven ability of cheatgrass to increase fire frequency, thereby facilitating further rapid spread. We conclude that cheatgrass invasion is currently not a threat but we expect that the existing invasion will increase quickly in the near future, and will likely cause fire frequency to increase.

Wildfire

To date, we are aware of only one recent wildfire near *Astragalus microcymbus* habitat (BLM2009a, p. 6). The wildfire burned in 2007 and was 8.1 ha (20 ac) (BLM 2009a, p. 6) in size. The fire burned at a distance of 2–2.5 km (1.25–1.5 mi) away from two *A. microcymbus* units–Henry and Gold Basin Creek. This wildfire was just outside the northwest edge of the Hartman Rocks Recreation Area, adjacent to private land. Three wildfires have burned within the sagebrush of the Gunnison Basin in the last 15 years, the biggest was 200 ha (500 ac) (Japuntich 2010h, pers. comm.). To date there has not been a demonstrated change in the fire cycle where *A. microcymbus* is found, and fire frequency is low.

A common result of the invasion of cheatgrass is an increase in fire frequency within the sagebrush ecosystem (Whisenant 1990, pp. 4–10; D'Antonio and Vitousek 1992, pp. 63–87; Hilty *et al.* 2004, pp. 89–96; Zouhar *et al.* 2008, p. 41; Miller *et al.* in press, p. 39). Cheatgrass changes historical fire patterns by providing an abundant and easily ignitable fuel source that facilitates fire spread. While sagebrush is killed by fire and is slow to reestablish, cheatgrass recovers within 1–2 years of a fire event (Young and Evans 1978, p. 285). This annual recovery ultimately leads to a reoccurring fire cycle that prevents sagebrush reestablishment (Eiswerth *et al.* 2009, p. 1324). The highly invasive nature of cheatgrass poses increased risk of fire and permanent loss of sagebrush habitat, as areas disturbed by fire are highly susceptible to further invasion and ultimately habitat conversion to an altered community state. For example, Link *et al.* (2006, p. 116) show that risk of fire increases from approximately 46–100 percent when ground cover of cheatgrass increases from 12–45 percent or more. While cheatgrass cover is still very low within *Astragalus microcymbus* habitat, within the Intermountain West, invasion has occurred rapidly, especially after wildfire.

Organisms adapt to disturbances such as historical wildfire regimes (fire frequency, intensity, and seasonality) with which they have evolved (Landres *et al.* 1999, p. 1180), and different species respond differently to wildfire (Hessl and Spackman 1995, pp. 1–90). We do not know what *Astragalus microcymbus'* response to wildfire is at this time because none of the species' habitat has burned. Other *Astragalus* species have demonstrated varying responses to wildfire (see *A. schmolliae* below; and *A. anserinus* in 74 FR 46526–46529, September 10, 2009). If fire frequency increases in the area, we expect it would have deleterious effects to the habitat, given that big sagebrush recovers slowly, which would presumably affect the ecosystem, and cheatgrass tends to thrive after a wildfire.

We have no information to indicate that wildfires currently occur at levels that impact the species. No fires have burned *Astragalus microcymbus* habitat. However, wildfires have occurred in the area. Furthermore, we realize there is a strong relationship between cheatgrass invasions and fire frequency. If cheatgrass invasion continues to expand as discussed above, the threat of wildfire is likely to increase in the future. Given the small population size of *A. microcymbus* and the potential damage a wildfire could cause, we consider future wildfires to be a threat to the species.

Contour Plowing and Nonnative Seedings

Areas within the Hartman Rocks Recreation Areas (but largely outside of the *Astragalus microcymbus* units) have been subject to contour plowing and the subsequent seeding of nonnative species, as well as the development of silt and water impoundment structures (BLM 2005a, p. 57), which can destroy *A. microcymbus* habitat. Contour plowing is the past practice of plowing across a slope following elevation lines and is commonly done to prevent soil erosion. We are unsure why contour plowing and seeding efforts were undertaken near *A. microcymbus* habitat but expect that erosion control and improving livestock forage may have been the primary reasons for these efforts. We have no site-specific data regarding these activities, nor do we know when they occurred. We expect the contour plowing was done to improve range conditions by eliminating sagebrush and increasing grazing and drought-tolerant grasses for forage by livestock. The contour lines from these efforts can be seen through satellite imagery and occur largely on BLM-managed lands. Within the Hartman Rocks Recreation Area, we estimate that roughly 18 percent (617 ha (1,524 ac)) have been contour plowed. Only 1.2 percent (11 ha (27 ac)) of the *A. microcymbus* units have been contour plowed and seeded, all within the Gold Basin Creek (USFWS 2010b, pp. 18–19). These contoured areas surround the Gold Basin Creek Unit, but there is very little overlap. We are unsure the impact that these contour efforts may have had on *A. microcymbus* in the past. We speculate there may have been an impact to the species from these seeding efforts in the past given that there is very little overlap between the Gold Basin Creek Unit and the contoured areas, despite the contoured areas surrounding the unit on the east, north and west sides (USFWS 2010b, p. 19).

These contoured areas were seeded with crested wheatgrass (*Agropyron cristatum*). Most areas where *Astragalus microcymbus* is found do not overlap with sites where crested wheatgrass is found in abundance (USFWS 2010b, pp. 18–19). Crested wheatgrass is commonly found outside the contoured areas at the Gold Basin Creek and Henry Units (USFWS 2010, pers. comm.), and we assume it has spread into these adjacent native habitats from the contoured areas. Crested wheatgrass is often used for rangeland seedings because seed is widely available, it establishes easily, provides suitable forage for livestock, provides some erosion control, and controls competition from other nonnative invasive plants (Walker and Shaw 2005, p. 56). Crested wheatgrass is extremely competitive and can out-compete other vegetation in several ways (Pellant and Lysne 2005, pp. 82–83). Grasses, such as crested wheatgrass, are wind pollinated and, therefore, do not provide resources such as nectar or edible pollen for pollinators.

The contour plowings and seedings of crested wheatgrass affect only a small proportion (1.2 percent) of the *Astragalus microcymbus* units. The likelihood of future seedings is low because vegetative treatments that would adversely affect *A. microcymbus* are no longer allowed (BLM 1993, p. 2.29). Because crested wheatgrass continues to invade native habitats from these seedings, and because the plowed areas may not provide good floral resources for pollinators, we find these continuing effects of past contour plowing and nonnative seeding to impact the species but not to the point where it poses a threat to the continued existence of the species. We expect crested wheatgrass and pollinator impacts to continue into the foreseeable future since it does not appear that the crested wheatgrass is disappearing.

Livestock, Deer, and Elk Use of Habitat

Livestock Use—Potential threats related to livestock, deer, and elk use include the eating of individual plants (included in Factor C below), physical effects from the trampling, and the indirect effects of habitat degradation. We are unaware of any research or monitoring that has evaluated the effects of livestock, deer, or elk use on *Astragalus microcymbus.* However, the deleterious effects of livestock on western arid ecosystems are well documented (Milchunas *et al.* 1992, pp. 520–531; Jones 2000, pp. 155–164). Some of the adverse effects from livestock include changes in the timing and availability of pollinator food plants (Kearns and Inouye 1997, pp. 298–299); changes to insect communities (Kearns and Inouye 1997, pp. 298–299; Debano 2006, pp. 2547–2564); damage to ground-nesting pollinators and their nests (Sugden 1985, p. 309); changes in water infiltration due to soil compaction (Jones 2000, Table 1); disturbance to soil microbiotic crusts (Belnap *et al.* 1999, p. 167; Jones 2000, Table 1); subsequent nonnative invasive plant invasions (Parker *et al.* 2006, pp. 1459–1461); and soil erosion from hoof action (Jones 2000, Table 1).

Without any species-specific research or monitoring of livestock use, our understanding of impacts to *Astragalus microcymbus* is limited and observational in nature. Little livestock grazing has been recorded within *A. microcymbus* areas; most plants are located on steep slopes with little vegetation that do not draw cows to them (BLM 2010, p. 4). We expect that the plant was always found primarily on slopes, but do not know if the current distribution has been influenced by increased livestock use in flatter areas. In 2008, after visiting all *A. microcymbus* sites, only one appeared to have been directly grazed by livestock (BLM 2010, p. 5). Several observers have attributed increased erosion within *A. microcymbus* sites to cattle use, but this impact also could be from deer or elk use (CNHP 2010a, pp. 12, 27, 32). Grazing utilization levels were reportedly low in 1994 but physical damage to *A. microcymbus* individuals from trampling at two sites was noted (Sherwood 1994, pp. 11, 17, 20). In another review, the authors speculated the periodicity and intensity of grazing may influence the success of *A. microcymbus* by the removal of individuals and ground cover, thereby influencing seedling success (Peterson *et al.* 1981, p. 16). Numerous livestock trails, feces, and tracks were found within most *A. microcymbus* sites visited in 2010 (USFWS 2010, pers. comm.). Within the Hartman Rocks Recreation Area, overall plant cover has been reduced by historic excessive livestock grazing, drought, grazing during the extreme drought years of 1990 through 1992, 2000, and 2001, and the physical impacts from roads and trails (BLM 2005a, p. 56).

Although grazing damage is minimal, all *Astragalus microcymbus* areas receive at least some livestock use. Aside from the Cebolla Creek Unit, all units on BLM lands are either in the Gold Basin or Iola grazing allotments and are actively grazed by cattle. Those units with private lands also are grazed on their private portions. In total, 56.1 percent of the *A. microcymbus* units fall within the Gold Basin allotment and 43.9 percent fall within the Iola allotment, with no ungrazed areas (BLM 2010; USFWS 2010b, pp. 6–7). Within the South Beaver Creek ACEC, no additional forage allocations, beyond those already authorized for the allotments will be made and domestic sheep grazing will not be authorized (BLM 2005a, pp. 2–29 to 2–30).

Fences and water developments have been constructed within the range of *Astragalus microcymbus* to help manage livestock grazing activities, increase the number of livestock that the landscape can support, keep animals in specific areas, and distribute grazing more evenly on the landscape (BLM 2005a, p. 12). All of the pastures are fenced, so the four *A. microcymbus* units with multiple pastures or allotments also have fences (Gold Basin Creek, South Beaver Creek 1, South Beaver Creek 2, and South Beaver Creek 3).

Water developments occur across the range of *Astragalus microcymbus* (Japuntich 2010i, pers. comm.). One water development is within 300 m (985 ft) of the Henry Unit: one is within and three are just outside the Gold Basin Creek Unit; and an additional three developments are just outside the unit: one within the South Beaver Creek 1 Unit; and one within 400 m (1,312 ft) of the South Beaver Creek 6 Unit (Japuntich 2010i, pers. comm.). Within the Henry Unit, several livestock trails run through the *A. microcymbus* site. We assume these trails are from livestock travelling to and from the water development 300 m (985 ft) away and expect that similar effects are occurring from the other water developments listed above. Water developments concentrate livestock use in areas near these developments, and fence lines often funnel livestock, and even deer and elk, into certain areas that will receive a disproportionate amount of use. We do not have further information regarding whether the close proximity of water developments or fence lines is causing increased impacts to *A. microcymbus* habitat, but we expect this is the case because there are several fences running through sites and because livestock grazing is found atop all sites.

In addition, salt blocks draw livestock (and deer and elk) to the areas where they are placed. We know of one instance where a salt block has been placed within an *Astragalus microcymbus* site. This area was extensively trampled, there were fewer *A. microcymbus* individuals in trampled areas than surrounding polygons, and those plants that remained were located almost exclusively under shrubs (USFWS 2010, pers. comm.). Trails to and from the salt block were impacting adjacent *A. microcymbus* polygons (USFWS 2010, pers. comm.). We do not know of any protective mechanisms to prevent salt block placement within *A. microcymbus* sites and expect this may be occurring elsewhere.

The Gold Basin allotment is authorized for use between May 16 and September 30 each year, but is used from May 25–July 31, the time when *Astragalus microcymbus* is growing and reproducing, in most years (BLM 2010, p. 5). Pastures used by cow/calf pairs are generally used for 5–15 days a year and those used by yearlings are generally used for 15–30 days each year. Pastures are rested occasionally some years, although when and how often this occurs is unknown. The Gold Basin allotment is permitted for 4,253 animal unit months (AUMs) a year but has averaged 1,405 AUMs over the last 6 years. Approximately 30 percent of the AUMs are within the pastures where *A. microcymbus* units are located (BLM 2010, p. 5). In 2007, this allotment was found to have heavy use in some riparian areas and poor herbaceous cover in the lowest elevation uplands, where *A. microcymbus* would be found. These results were attributed to historic vegetation manipulation and livestock grazing practices (BLM 2009b, pp. 1–2). Given that damage is occurring at lower than permitted stocking rates and shorter than permitted periods of time, the potential for further damage exists.

The Iola allotment is authorized for use between May 15 and November 14 each year, but is used from late May/early June (sometimes late June/early July) generally 15–20 days in most years (BLM 2009b, pp. 1–2; BLM 2010, p. 5). These times again coincide with the time when *Astragalus microcymbus* is growing and reproducing. The permittee is authorized up to 1,258 AUMs in the pasture, but has used an average of 250 AUMs for the last 6 years (BLM 2010, p. 5). A new allotment management plan and grazing system was developed for this allotment in 2002. During this analysis, grass cover was below potential, and riparian vegetation was being consistently grazed to less than 10 cm (4 in.) (BLM 2009b, pp. 1–2). Again, given that damage is occurring at lower than permitted stocking rates and shorter than permitted periods of time, the potential for further damage exists.

Deer and Elk Use—Livestock impacts to the habitat are similar to those impacts to the habitat caused by excessive deer and elk use (Japuntich *et al.* in press, pp. 1–15). For example, Hobbs *et al.* (1996, pp. 200–217) documented a decline in available perennial grasses as elk densities increased. All *Astragalus microcymbus* areas are within areas that receive deer and elk use. Grazing and browsing by deer and elk occurs primarily during the winter months when there is less snow in the valley than the surrounding hills. Deer numbers have seen a strong increase in the Gunnison Basin since 1999 (Gunnison-Crested Butte 2010, p. 2). *A. microcymbus* is found within the Powderhorn Creek Game Management Unit (deer). In 2005, this unit had between 600 and 1,600 more deer than its objective of 4,500–5,500 individuals (Colorado Division of Wildlife (CDOW) 2006, p. 3). Since 1980, deer numbers within this unit have been as high as 8,000 individuals in 1993 and as low as 4,500 individuals in 1984; and averaging near 7,000 individuals from 2000 to 2005 (CDOW 2006, p. 3). From 1980 to 2000, elk numbers in the Lake Fork Managment Unit (where *A. microcymbus* is found) rose from 5,600 individuals to 9,256 individuals; both numbers are substantially greater than the 3,000–3,500 population objective (CDOW 2001, pp. 3, appendix A). Currently in the Gunnison Basin, deer and elk populations have 8,000 more individuals than the desired population objectives (Japuntich *et al.* in press, p. 4).

Excessive but localized deer and elk grazing has been documented in the Gunnison Basin (BLM 2005b, pp. 17–18). For example, drought and big game were having large impacts on the survivability and size of high-protein shrubs including mountain mahogany (*Cercocarpus utahensis*), bitterbrush (*Pushia tridentata*), and serviceberry (*Amelanchier alnifolia*) in the Gunnison Basin (Japuntich *et al.* in press, pp. 7–9). These shrub species are not the most common within *A. microcymbus* habitat but are generally found nearby. These authors raised concerns that observed reductions in shrub size and vigor will reduce drifting snow accumulation resulting in decreased moisture availability to grasses and forbs during the spring melt, affecting the overall composition of the plant community.

Impacts to *Astragalus microcymbus* habitat from deer and elk are occurring. For example, extensive moderate to severe hedging of shrubs, attributed to fairly heavy concentrations of wintering big game animals, has been documented at one *A. microcymbus* site in the South Beaver Creek 5 Unit (Sherwood 1994, p. 16). Deer and elk feces can be found at most *A. microcymbus* sites (USFWS 2010, pers. comm.). Deer and elk use occurs primarily in the winter when *A. microcymbus* is dormant, which minimizes some of the direct effects to the plants. However, deer and elk are more likely to spend time on steeper slopes than livestock and so may cause more direct trampling impacts to *A. microcymbus* habitat including soils, seed banks, and plant communities.

Summary of Livestock, Deer, and Elk Use—Describing livestock, deer, and elk use is complicated because the management of these animals is complicated. Although we lack good monitoring data, we find livestock, deer, and elk use of *Astragalus microcymbus* habitat to be a threat to the species. We have made this determination based upon observations that suggest moderate use levels from livestock and heavy deer and elk use in the winter. Use from livestock, deer, and elk is virtually ubiquitous across the range of the species, and habitat degradation is occurring, although we recognize that these indirect effects to *A. microcymbus* habitat are difficult to quantify. Authorized AUMs are significantly greater than those currently utilized. If livestock use were to increase, this threat would increase in the foreseeable future. The current number of deer and elk is above population objectives, and past fluctuations suggest that more animals are a possibility, which would also increase this threat in the foreseeable future. In addition, the accompanying habitat degradation with livestock, deer, and elk use makes this an increasing threat especially in light of the cheatgrass invasion.

Mining; Oil and Gas Leasing

The South Beaver Creek ACEC has one active lode claim and one active placer claim for mining. Lode claims are those which generally follow some deposited vein while placer mining is everything else and can include sand and gravel deposits. One of these active claims is within the Gold Basin Creek Unit, and the other is nearby. Neither of these claims have Notices of Intent or Plans of Operation that are required for most disturbances (BLM 2010, pp. 5–6).

On active claims, Notices of Intent are required for disturbances less than 2 ha (5 ac) at least 15 days prior to commencement of operation. A Plan of Operation, required for disturbances greater than 2 ha (5 ac), requires NEPA compliance and can take between 30 and 90 days to process. The transfer of these mineral claims to private entities is prohibited within the South Beaver Creek ACEC (BLM 1993, p. 2–29). A large gravel pit is at the northwest corner of the Hartman Rocks Recreation Area on BLM lands and is within 1.6 km (1 mi) of the Henry and Gold Basin Creek Units. Because of this distance, we expect there are probably no effects to *A. microcymbus* from this gravel operation. A gravel pit was said to be on private lands at the Beaver Creek Southeast Unit, but we have no further information and, based on our maps, do not make a similar conclusion (Sherwood 1994, p. 15).

No lands for oil and gas development have been leased by the BLM within the Gunnison Basin area (USFS and BLM 2010, pp. 272–273). All habitats where *Astragalus microcymbus* is currently found are mapped as having no potential for oil and gas development (Gunnison Sage-Grouse Resource Steering Committee 2005, p. 130). Despite this lack of potential, the entire Federal oil, gas, and geothermal estates in the South Beaver Creek ACEC are open to leasing but with a controlled surface use stipulation (BLM 1993, pp. 2.29, K.5). This stipulation requires that inventories be conducted prior to the approval of operations and relocations of operations. These inventories will be used to prepare mitigative measures to reduce the impacts of surface disturbance to the species (BLM 1993, p. K.5).

Given that there are only two existing active mining claims (but without current activity) within *Astragalus microcymbus* units and that there is no potential for oil and gas development in the area, we do not consider mining or oil and gas leases to threaten the species at this time nor do we expect these factors to pose a threat to the species in the foreseeable future.

Climate Change

According to the Intergovernmental Panel on Climate Change (IPCC), “Warming of the climate system in recent decades is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global sea level” (IPCC 2007, p. 1). Average Northern Hemisphere temperatures during the second half of the 20th century were very likely higher than during any other 50-year period in the last 500 years and likely the highest in at least the past 1,300 years (IPCC 2007, p. 30). Over the past 50 years, cold days, cold nights, and frosts have become less frequent over most land areas, and hot days and hot nights have become more frequent. Heat waves have become more frequent over most land areas, and the frequency of heavy precipitation events has increased over most areas (IPCC 2007, p. 30). For the southwestern region of the United States, including western Colorado, warming is occurring more rapidly than elsewhere in the country (Karl *et al.* 2009, p. 129). Annual average temperature in west-central Colorado increased 3.6 °C (2 °F) over the past 30 years, but high variability in annual precipitation precludes the detection of long-term trends (Ray *et al.* 2008, p. 5). At one weather station in Gunnison, Colorado, temperature has increased roughly 1.8 °C (1 °F) since 1900 (WRCC 2010c, pp. 1–9).

Future projections for the southwestern United States, including the Gunnison Basin, show increased probability of drought (Karl *et al.* 2009, pp. 129–134). Additionally, the number of days over 32 °C (90 °F) could double by the end of the century (Karl *et al.* 2009, p. 34). Annual temperature is predicted to increase approximately 2.2 °C (4 °F) in the southwest by 2050, with summers warming more than winters (Ray *et al.* 2008, p. 29). Projections also show declines in snowpack across the West with the most dramatic declines at lower elevations (below 2,500 m (8,200 ft)) (Ray *et al.* 2008, p. 29). Overall, future projections for the Southwest predict increased temperatures, more intense and longer-lasting heat waves, an increased probability of drought that are worsened by higher temperatures, heavier downpours, increased flooding, and increased erosion (Karl *et al.* 2009, pp. 129–134).

Colorado’s complex, mountainous topography results in a high degree of spatial variability across the State. As a result, localized climate projections are problematic for mountainous areas because current global climate models are unable to capture this variability at local or regional scales (Ray *et al.* 2008, pp. 7, 20). To obtain climate projections specific to the range of *Astragalus microcymbus,* we used a statistically downscaled model from the National Center for Atmospheric Research for a region covering western Colorado. The resulting projections indicate that temperature could increase an average of 2.5 °C (4.5 °F) by 2050 with the following seasonal increases: summer (July through September) 2.8 °C (5.0 °F), fall (October through December) 2.2 °C (4.0 °F), winter (January through March) 2.3 °C (4.1 °F), and spring (April through June) 2.5 °C (4.5 °F) (University Corporation of Atmospheric Research (UCAR) 2009, pp. 1–14). This increase in temperature could be problematic for *A. microcymbus* because the species is negatively affected by warm temperatures during May and July (DBG 2010a, p. 6).

Annual mean precipitation projections for Colorado are unclear; however, multi-model averages show a shift toward increased winter precipitation and decreased spring and summer precipitation by the end of the century (Ray *et al.* 2008, p. 34; Karl *et al.* 2009, p. 30). Similarly, the National Center for Atmospheric Research results show the highest probability of a 7.5 percent increase in average winter (January through March) precipitation, an 11.4 percent decrease in average spring (April through June) precipitation, a 2.1 percent decrease in average summer (July through September) precipitation, and a 1.3 percent increase in average fall precipitation with an overall very slight decrease in 2050 (UCAR 2009, pp. 1–14). Seasonal trends from the past 100 years at a local weather station do not yet match this scenario, and overall precipitation has declined by roughly 2 cm (0.75 in.) or 10 percent (WRCC 2010a, pp. 1–8). This actual data is in contrast to regional maps that show precipitation has increased roughly 5 percent from 1958 to 2008 within the general area where *Astragalus microcymbus* resides (Karl *et al.* 2009, p. 30). *A. microcymbus* responds negatively to declines in overall precipitation and periods of drought, as well as declines in spring precipitation (May and July) (DBG 2010a, p. 6). Given the observed decline in precipitation at a local weather station, predictions of increased drought, and a predicted significant decline in spring precipitation, we expect *A. microcymbus* will be affected negatively by climate change effects to precipitation.

Climate change is likely to alter fire frequency, community assemblages, and the ability of nonnative species to proliferate. Increasing temperature as well as changes in the timing and amount of precipitation will alter the competitive advantage among plant species (Miller *et al.* in press, p. 44), and may shift individual species and ecosystem distributions (Bachelet *et al.* 2001, p. 174). Dominant plant species such as big sagebrush have a disproportionate control over resources in ecosystems (Prevey *et al.* 2009, p. 1). For sagebrush communities, spring and summer precipitation comprises the majority of the moisture available to species; thus, the interaction between reduced precipitation in the spring-summer growing season and increased summer temperatures will likely decrease growth of big sagebrush and could result in a significant long-term reduction in the distribution and composition of sagebrush communities (Miller *et al.* in press, pp. 41–45). In the Gunnison Basin, increased summer temperature was strongly correlated with reduced growth of big sagebrush (Poore *et al.* 2009, p. 558). Although we do not fully understand how changes in plant communities will affect *Astragalus microcymbus,* we expect that a decrease in the dominant plant species will not be a benefit because it could drastically alter the way the ecosystem functions where *A. microcymbus* resides. In addition, changes in the plant community could likely influence wildfire frequency and erosion rates.

Temperature increases may increase the competitive advantage of cheatgrass in higher elevation areas where it is currently limited (Miller *et al.* in press, p. 47), like the Gunnison Basin. Decreased summer precipitation, as predicted in the model, reduces the competitive advantage of summer perennial grasses, reduces sagebrush cover, and subsequently increases the likelihood of cheatgrass invasion (Prevey *et al.* 2009, pp. 1–13). This impact could increase the susceptibility of areas within *Astragalus microcymbus'* range to cheatgrass invasion (Bradley 2009, p. 204). In addition, cheatgrass and other C3 grasses (C3 refers to one of three alternative photosynthetic pathways) are likely to thrive as atmospheric carbon dioxide increases (Mayeux *et al.* 1994, p. 98). An increase in cheatgrass would likely increase wildfire frequency. See Nonnative Invasive Plants above for a discussion of cheatgrass and effects to *A. microcymbus.*

Climate change predictions are based on models with assumptions, and are not absolute. In addition, we do not fully understand how climate change will affect the species or the habitat in which it resides. These factors make it difficult to predict the effects of climate change to *Astragalus microcymbus.* However, endemic species with limited ranges that are adapted to localized conditions, like *A. microcymbus,* are expected to be more severely impacted by climate change (Midgley *et al.* 2002, p. 448) than those considered habitat generalists. Furthermore, we expect the predicted increases in spring temperature, increased drought, and decreased spring precipitation will affect *A. microcymbus* negatively. Climate change has the potential to change the plant community, allow cheatgrass to increase, and potentially increase the risk of wildfire, which would likely have a negative effect to *A. microcymbus.* It is difficult to assess the threat of climate change to *A. microcymbus* given the uncertainties associated with future projections. However, based on the best available information on climate change projections into the next 40 years, we find climate change to be a threat to *A. microcymbus* based on how predicted changes could negatively influence the species. We recognize there are many uncertainties, and projections further into the future become even more uncertain, making it even more difficult to predict how climate change might affect the species.

Habitat Fragmentation and Degradation

Habitat fragmentation can have negative effects on biological populations. Often fragments are not of sufficient size to support the natural diversity prevalent in an area and so exhibit a decline in biodiversity (Noss and Cooperrider 1994, pp. 50–54). Habitat fragments are often functionally smaller than they appear because edge effects (such as increased nonnative species or wind speeds) impact the available habitat within the fragment (Lienert and Fischer 2003, p. 597). Habitat fragmentation has been shown to disrupt plant-pollinator interactions and predator-prey interactions (Steffan-Dewenter and Tscharntke 1999, pp. 432–440), alter seed germination percentages (Menges 1991, pp. 158–164), and result in low fruit set (Cunningham 2000, pp. 1149–1152). Extensive habitat fragmentation can result in dramatic fluxes in available solar radiation, water, and nutrients (Saunders *et al.* 1991, pp. 18–32).

Fragmentation within *Astragalus microcymbus* habitat is largely from linear features such as roads and utility corridors (see Recreation, Roads, and Trails and Utility Corridors above) that are pervasive at every *A. microcymbus* unit except the South Beaver Creek 4 Unit. In addition, past contour plowings and subsequent seeding efforts have created blocks of altered and degraded habitat around *A. microcymbus* units that may affect the overall plant community, nonnative invasive plants, and pollinator habitat and resources. This type of fragmentation does not carry the same negative consequences as that of more highly fragmented habitats impacted by agricultural or urban development because of its more limited extent.

However, the aforementioned type of fragmentation leads to habitat degradation. Habitat degradation, the gradual deterioration of habitat quality, can lead to a species decline, decrease, or loss of reproductive ability. Habitat degradation may be difficult to detect because it takes place over a long time period, and species with long life-cycles may continue to be present in an area even if they are unable to breed (Fisher and Lindenmayer 2007, pp. 268–269).

In the case of *Astragalus microcymbus,* habitat degradation is coming from multiple sources: Development; recreation, roads, and trails; utility corridors; nonnative invasive plants; contour plowing and nonnative seedings; and accentuated by periodic drought. In addition, wildfire and climate change will likely contribute to further habitat degradation. Detailed monitoring is needed to detect population changes and signal the need to implement conservation measures that could counteract habitat degradation, but this monitoring has not been done for *A. microcymbus.*

Habitat fragmentation and habitat degradation is occurring as a result of multiple sources including virtually all the threats and factors previously described in this document. As a result, we find habitat degradation to be a threat to *Astragalus microcymbus.* Habitat fragmentation is currently a lesser threat, but because it is so tightly linked with habitat degradation, we have treated them jointly.

Summary of Factor A

The biggest habitat-related threats to *Astragalus microcymbus* are recreation (including roads and trails); the potential for increases in nonnative invasive plants (especially cheatgrass); potential residential and urban development; livestock, deer, and elk use; and potential effects from climate change. In addition, the habitat degradation and fragmentation occurring from these stressors threatens *A. microcymbus.*

Recreational impacts are not likely to lessen given the close proximity of *Astragalus microcymbus* to the town of Gunnison and the increasing popularity of mountain biking, motorcycling, and all-terrain vehicles. The fact that the Hartman Rocks Recreation Area was designated on 40 percent of the *A. microcymbus* units will only serve to draw more users, and there is little enforcement to control trespass use.

Accordingly, we find the threat from recreation, roads, and trails to be high.

Although the impacts from nonnative invasive plants, and particularly cheatgrass, are low right now, we expect this factor to increase to the level of a serious threat in the near future. Cheatgrass is increasing in the South Beaver Creek drainage and has been identified as a major threat to *Astragalus microcymbus* (BLM 2010, p. 5). In the mid to late 1980s, cheatgrass was seen in very small patches in the Gunnison Basin but can now be found in some abundance throughout the Basin (BLM 2009a, pp. 7–8). *A. microcymbus* is found on warm, sparsely vegetated, and dry, south-facing slopes, which in the Gunnison Basin, are probably more vulnerable to cheatgrass invasion. We know that cheatgrass is already invading *A. microcymbus* sites. Cheatgrass has transformed millions of acres into monocultures in the Great Basin and has dramatically shortened the wildfire return interval. We believe the potential exists for a similar conversion in *A. microcymbus* habitat. Although we find the current invasion of cheatgrass into *A. microcymbus* habitat to be small and possess little threat, because of the high potential for further invasion, we find the overall threat is increasing.

It is difficult to assess the impact of climate change to *Astragalus microcymbus,* but we believe climate change may be a future threat given the predictions of increased springtime temperatures, decreased springtime precipitation, and increased drought.

Because a quarter of the *Astragalus microcymbus* units occur on private land, and given the rapid pace of development in the Gunnison Basin, we believe residential and urban development represent a moderate threat to *A. microcymbus.* Given that livestock, deer, and elk use occurs across the range of *A. microcymbus,* that *A. microcymbus* individuals are being lost from this use, and that this use is causing habitat degradation that could facilitate the spread of cheatgrass, we find this threat to be moderate.

We find the potential impact of future wildfire to be a threat to the species and recognize that wildfire risk may increase with further cheatgrass invasion. We do not find utility corridors to be a threat because they currently impact only 4 percent of the *A. microcymbus* units and we do not know of any further utility corridor plans. We do not find the continuing effects from past contour plowings and nonnative seedings to be a threat because the existing plowings only impact 1.2 percent of the *A. microcymbus* units and we do not expect these treatments to occur in the future. Because of the low potential for oil and gas development and because there are only two other active mining claims within the species' range, we do not find that these factors are threats to the species.

Based on threats from recreation; the potential for increases in nonnative invasive plants; potential residential and urban development; livestock, deer, and elk use; and potential effects from climate change, we find that *Astragalus microcymbus* is threatened by the present or threatened destruction, modification, or curtailment of its habitat or range now and these threats are expected to continue or increase in the foreseeable future.

Factor B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

We are not aware of any threats involving the overutilization or collection of *Astragalus microcymbus* for any commercial, recreational, scientific, or educational purposes at this time. *A. microcymbus* is not particularly showy or of horticultural significance; therefore, we do not expect any overutilization in the foreseeable future. We find that overutilization for commercial, recreational, scientific, or educational purposes is not a threat to *A. microcymbus* now or expected to become so in the foreseeable future.

Factor C. Disease or Predation

Astragalus microcymbus is subject to extensive herbivory, primarily from small mammals (Lyon 1990, pp. 2, 5; Dyer 1993, p. 2; Sherwood 1994, pp. 10–11; Japuntich 2010j, pers. comm.; DBG 2010a, pp. 6–7). On average, 26 percent of the plants have evidence of herbivory (ranging from 13 to 74 percent at a given plot) (DBG 2010a, p. 6). Browsing on the plants is very evident and in some areas, it is hard to find an *A. microcymbus* individual that has not had at least some portion eaten (Japuntich 2010j, pers. comm.). Some species of *Astragalus* are notoriously toxic to livestock, and presumably deer and elk. Often these toxic species are avoided by grazers and browsers. However, the high level of small mammal herbivory to *A. microcymbus* plants suggests the species is not overly toxic. We do not know if this toxicity would vary between livestock and rabbits.

Small Mammal Herbivory

Most herbivory of *Astragalus microcymbus* individuals is attributed to small mammals. Cottontail rabbits (*Sylvilagus audobonii*), small chipmunks (*Tamias* sp.), and ground squirrels (*Citellus lateralis* and others) graze on *A. microcymbus* (Japuntich 2010j, pers. comm.). Mice and voles also have been implicated as herbivores (Sherwood 1994, p. 11). Rabbits are generally considered the primary herbivores of *A. microcymbus,* and numerous observers have suggested they are in abundance within *A. microcymbus* habitat (Lyon 1990, p. 2; Dyer 1993, p. 2; Japuntich 2010j, pers. comm.).

The information we have regarding rabbit herbivory is mostly anecdotal in nature; however, taken in sum, we believe this information leads to a conclusion that rabbit herbivory impacts *Astragalus microcymbus* in years with high rabbit populations. During one survey effort, observers found six rabbits in one of the draws they visited (Lyon 1990, p. 5), and another observer visited 10 *A. microcymbus* sites in a day and said that rabbit damage was heavy at nine of those sites (Dyer 1993, p. 2).

Several observers have suggested that rabbit herbivory can result in the death of *Astragalus microcymbus.* One observer suggested that 2 years of heavy rabbit use was more than *A. microcymbus* could tolerate because of all the dead plants they encountered in a heavy rabbit year (Lyon 1990, p. 5). Those plants that were not dead had only a few green leaves, again attributed to rabbit herbivory (Lyon 1990, p. 2). After 2 years of consecutive transect counts at a site another observer stated that many plants had died and attributed that death to overuse by rabbits (Sherwood 1994, p. 10). Observations of small mammal herbivory being a significant impact to the species occurs across the years (USFWS 2010a, pp. 1–4).

Rabbit and small mammal populations fluctuate widely (Korpimäki and Krebs 1996, pp. 754–764; Hanski *et al.* 2001, pp. 1501–1520). We have little information on how small mammal populations have changed within the range of *Astragalus microcymbus* over time, but the variability in observations from year to year and between sites suggest there are significant fluctuations and spatial variations. For example in 1990, local authorities and those surveying for *A. microcymbus* stated the rabbit population was very large compared with other years; this year, herbivory of *A. microcymbus* was repeatedly observed (Lyon 1990, p. 2). Observations suggest that small mammal herbivory is impacting *A. microcymbus,* especially during years when small mammal populations are high.

Fencing to exclude small mammals was installed at monitoring plots in

2006 and 2007 (DBG 2010a, p. 6). After 2 years, the plants protected by fences were statistically longer at 31.4 cm (12.4 in.) than those outside the fence, which were 19.5 cm (7.7 in.) (DBG 2010a, p. 6). This difference could be related to a decrease in herbivory or increased moisture (from additional snow accumulations within the fence from wind loading) within the exclosures, or a combination of the two. In addition, mammal herbivory was less within the fenced areas, more individuals flowered within fenced areas, and more total fruit was produced per plant within fenced areas (DBG 2010a, p. 7). A weak statistical correlation was found between nonreproductive plants and evidence of mammalian browsing across all plots (DBG 2010a, p. 6). Although we do not understand how small mammal populations have changed over time, these impacts to fruit set are significant. Furthermore, these impacts are consistent with other observations of small mammal herbivory (USFWS 2010a, pp. 1–4).

Rabbit herbivory has been documented at several *Astragalus microcymbus* units, including Gold Basin Creek, South Beaver Creek 1, South Beaver Creek 2, and South Beaver Creek 3 (USFWS 2010a, pp. 1–4). Conversely, at several of the more isolated *A. microcymbus* units, Henry and South Beaver Creek 4, observers specifically mention the lack of rabbit herbivory relative to other areas (USFWS 2010a, pp. 1–4).

We are unsure of the long-term impact to *Astragalus microcymbus* over time from small mammal herbivory. Small mammal herbivory is significantly impacting seed set of *A. microcymbus.* Fewer seeds mean fewer opportunities for seedling and adult recruitment. In addition, small mammal herbivory occurs at most sites across the range of the species, and recent observations indicate that damage to plants is heavy. We have no information to either support or refute that rabbit herbivory levels are higher than historic levels; however, in light of other factors affecting the species and the limited range and small population level, impacts to *A. microcymbus* from herbivory can be large in years of high rabbit populations. Given this, we find small mammal herbivory to be a threat to the species.

Deer and Elk Herbivory

Like livestock use, overgrazing by deer and elk may cause local degradation of habitats (see "Livestock, Deer, and Elk Use of Habitat" above for a more thorough discussion). Here we address the actual eating of *Astragalus microcymbus* individuals as opposed to habitat degradation. We have little information on the impacts of deer and elk herbivory to *A. microcymbus.* Much of the deer and elk use of *A. microcymbus* habitat occurs during winter after the plants are no longer growing, thereby not affecting the plants, unless they are pulled up by the roots, which we assume would happen infrequently. One observer stated that the previous year's dried stalks of larger *A. microcymbus* plants showed almost universal use, and attributed this to wintering big game (Sherwood 1994, p. 17).

Although deer and elk use is high within *Astragalus microcymbus* habitat (see Deer and Elk Use above), most of the use occurs in the winter when *A. microcymbus* is dormant. We expect the effects of winter use to be minimal since, once dried, the previous year's growth is not important to an individual plant's success. We expect that some herbivory does occur since deer and elk will sometimes visit during the growing season. Because most use occurs in the winter when herbivory would not impact *A. microcymbus,* we do not consider deer and elk herbivory to be a threat now or in the foreseeable future.

Livestock Herbivory

Livestock use may cause local degradation of habitats (see "Livestock, Deer, and Elk Use of Habitat" above for a more thorough discussion). Here we address the actual eating of *Astragalus microcymbus* individuals as opposed to habitat degradation. Observations on direct grazing impacts to *Astragalus microcymbus* vary. Heil and Porter (1990, p. 21) state that grazing animals are known to occasionally use this species as a forage plant. One observer reported the plant shows some resistance to grazing (CNHP 2010a, pp. 5–6). Livestock presence is reportedly rare on the steeper slopes where *A. microcymbus* resides (BLM 2010, p. 4). We believe we have seen herbivory of individuals in areas near salt licks, although we cannot be sure this was not small mammal herbivory (USFWS 2010, pers. comm.). Therefore, we do not consider the livestock herbivory to be a threat to the species now or in the foreseeable future.

Insect Herbivory

Grasshoppers (Orthopterans in the Acrididae and Tettigoniidae families) have been implicated as herbivores of *Astragalus microcymbus* (Dyer 1993, p. 2). Aphids have been documented on the plants at one *A. microcymbus* site (CNHP 2010a, p. 22). A small number of *A. microcymbus* individuals have been documented with insect webs within Gold Basin Creek Unit (Sherwood 1994, p. 7). Insect herbivory was measured as part of the life-history monitoring study. This study found no significant effects from insect herbivory on flowering individuals (DBG 2010a, p. 6). Therefore, we find that insect herbivory does not constitute a threat to *A. microcymbus* now or in the foreseeable future.

Disease

A fungus has been documented on less than 10 percent of the *Astragalus microcymbus* individuals at one monitoring transect (Sherwood 1994, p. 11). No other instances of disease are known. Therefore, we find that disease does not constitute a threat to *A. microcymbus* now or in the foreseeable future.

Summary of Factor C

Various herbivores have been documented at *Astragalus microcymbus* sites. Small mammal herbivory, especially from rabbits, has been documented at fairly high levels, and appears to be the only type of herbivory that is impacting the species at a low to moderate level. Exclusion research has found that small mammal herbivory was less, more individuals flowered, and there were more total fruits within fenced areas (DBG 2010a, p. 7). We expect small mammal herbivory to continue into the foreseeable future and fluctuate with small mammal populations. We do not believe that deer and elk herbivory, livestock herbivory, and insect herbivory constitute threats because they are only occasionally or minorly affecting *A. microcymbus* and are not expected to increase into the foreseeable future. Finally, we do not consider disease to be a threat because it is so rare. However, we do find that *Astragalus microcymbus* is threatened by predation now and these threats are expected to continue or increase in the foreseeable future.

Factor D. Inadequacy of Existing Regulatory Mechanisms

Under this factor, we examine whether threats to *Astragalus microcymbus* are adequately addressed by existing regulatory mechanisms. Existing regulatory mechanisms that could provide some protection for *A. microcymbus* include: (1) Local land use laws, processes, and ordinances; (2) State laws and regulations; and (3) Federal laws and regulations. Regulatory mechanisms, if they exist, may preclude listing if such mechanisms are judged to adequately address the threat to the species such that listing is not warranted.

An example of a regulatory mechanism is the terms and conditions attached to a grazing permit that describe how a permittee will manage livestock on a BLM allotment. They are nondiscretionary and enforceable, and would be considered a regulatory mechanism under this analysis. Other examples include city or county ordinances, State governmental actions enforced under State statute regulations, or Federal action under statute or regulation. Actions adopted by local groups, States, or Federal entities that are discretionary or are not enforceable, including conservation strategies and guidance, are typically not regulatory mechanisms. In this section we review actions undertaken by local, State, and Federal entities designed to reduce or remove threats to *Astragalus microcymbus* and its habitat.

Local Land Use Laws and Ordinances

We are aware of no local land use laws or ordinances that offer protection to *Astragalus microcymbus.* Neither the city of Gunnison nor the counties of Gunnison or Saguache have guidelines, zoning, or other mechanisms to protect the species.

State Laws and Regulations

No State regulations in Colorado protect *Astragalus microcymbus.* The State of Colorado has no laws protecting any rare plant species. Plants also are not included in the Colorado Wildlife Action Plan and do not qualify for funding under State Wildlife Grants.

The State of Colorado's Natural Areas Program works to protect special resources in the State, although there are no regulatory enforcement mechanisms associated with the program. In 1997, the Colorado Natural Areas Program designated the South Beaver Creek Natural Area (CNAP 1997, pp. 1–7). The South Beaver Creek Natural Area was designated for all areas within the South Beaver Creek ACEC (CNAP 1997, p. 7). The Colorado Natural Areas Program provides a means by which Colorado's natural features and ecological phenomena can be identified, evaluated, and protected through a statewide system of natural areas (CNAP 1997, p. 1). The purpose of the South Beaver Creek Natural Area is to protect *Astragalus microcymbus* (CNAP 1997, p. 2).

Through this designation, the Colorado Natural Areas Program staff is entitled to visit the area at anytime and convey the results of these visits to the BLM, cooperate with the BLM on updating the Resource Management Activity Plan for the property, and provide a periodic report on the condition of the property (CNAP 1997, p. 3). In essence, this designation allows the Colorado Natural Areas Program to assist the BLM with its management. The Colorado Natural Areas Program has not been actively monitoring *Astragalus microcymbus* at the South Beaver Creek Natural Area. Therefore, this designation has, to-date, afforded little protection to the species. Given that the Colorado Natural Areas Program is increasing its conservation efforts, we expect the Natural Areas Program to become more active in the conservation of *A. microcymbus* in the future but have no way of predicting what this will mean to the species.

The State of Colorado requires private landowners to control noxious (nonnative invasive) weeds. Plants considered noxious by the State of Colorado that are within or near *Astragalus microcymbus'* habitat include: Cheatgrass (List C), Canada thistle (*Cirsium arvense*—List B), scentless chamomile (*Matriacaria perforata*—List B), yellow toadflax (*Linaria vulgaris*—List B), and Russian knapweed (*Acroptilon repens*—List B) (Colorado Department of Agriculture [CDA] 2010, pp. 2–3). List B species are noxious weeds for which management plans are or will be developed and implemented to stop their spread (CDA 2010, p. 2). List C species are noxious weeds for which management plans are or will be developed and implemented to provide additional education, research, and biological control resources but for which the continued spread will not be halted (CDA 2010, p. 2). We have no information on how the noxious weed law is being implemented within the range of *A. microcymbus.* We do know that the Gunnison Watershed Weed Commission has been actively working to control and eradicate noxious weeds in Gunnison County but we have few specifics from this work (GWWC 2010, pp. 1–8). Therefore, we cannot assess the benefits to *A. microcymbus.*

Deer and elk populations are managed by the CDOW. We have no information to suggest that deer and elk use is being regulated to ensure *Astragalus microcymbus* and its habitat is not impacted by this use.

Federal Laws and Regulations

The BLM has promulgated regulations, policies, and guidelines to protect sensitive species on Federal lands, control wildfire and rehabilitate burned areas, and implement rangeland assessments, standards, and guidelines to assess rangeland health.

Astragalus microcymbus is included on the Colorado BLM's sensitive species list (BLM 2009c, p. 3). The management guidance afforded sensitive species under BLM Manual 6840—Special Status Species Management (BLM 2008) states that "Bureau sensitive species will be managed consistent with species and habitat management objectives in land use and implementation plans to promote their conservation and to minimize the likelihood and need for listing under the ESA" (BLM 2008, p. .05V). The BLM Manual 6840 further requires that Resource Management Plans (RMPs) should address sensitive species, and that implementation "should consider all site-specific methods and procedures needed to bring species and their habitats to the condition under which management under the Bureau sensitive species policies would no longer be necessary" (BLM 2008, p. 2A1). *A. microcymbus* has received some protections because of its sensitive status, including the establishment of the South Beaver Creek ACEC and limited money for survey and monitoring efforts. However, part of this ACEC is overlapped by the Hartman Rocks Recreation Area, which is resulting in some habitat loss, fragmentation, and degradation.

The Federal Land Policy and Management Act of 1976 mandates Federal land managers to develop and revise land use plans. The RMPs are the basis for all actions and authorizations involving BLM-administered lands and resources. They establish allowable resource uses, resource condition goals and objectives to be attained, program constraints and general management practices needed to attain the goals and objectives, general implementation sequences, and intervals and standards for monitoring and evaluating the plan to determine its effectiveness and the need for amendment or revision (43 CFR 1601.0–5(k)).

The RMPs provide a framework and programmatic guidance for activity plans, which are site-specific plans written to implement the RMP. Examples of activity plans include Allotment Management Plans that address livestock grazing, or other activity plans for oil and gas field development, travel management, and wildlife habitat management. Activity plan decisions normally require additional planning and National Environmental Policy Act (NEPA) analysis. The Gunnison Resource Area's RMP represents an enforceable regulatory mechanism. *A. microcymbus* is not specifically protected in areas outside the South Beaver Creek ACEC within the RMP but is protected by the

Special Status Species Management guidance and general RMP guidance for the management of special status plants (BLM 1992, pp. 1–13; 1993, p. 2.4). Public scoping for the next RMP for the Gunnison Resource Area is estimated to begin in 2010 (Japuntich 2010d, pers. comm.). We expect that existing protections for the species will remain in place for the next RMP, but cannot predict if additional protections for *Astragalus microcymbus* will be developed.

As discussed above in Recreation, Roads, and Trails, *Astragalus microcymbus* was included in the Gunnison Resource District's RMP when the South Beaver Creek ACEC was designated. This area encompasses 60 percent of the *A. microcymbus* units (BLM 1993, pp. 2.29–2.30). The South Beaver Creek ACEC was designated specifically to protect and enhance existing *A. microcymbus* populations and habitat. Actions outlined for the South Beaver Creek ACEC, and their implementation, are included in Table 5 below.

TABLE 5—ACTIONS IDENTIFIED, WITH NOTES ON IMPLEMENTATION, FOR *Astragalus microcymbus* IN THE SOUTH BEAVER CREEK ACEC IN THE 1993 GUNNISON RESOURCE AREA'S RMP

Action	Implementation
Monitoring to determine population trends	Being done regularly at 4 plots by DBG & intermittently at 4 plots by BLM
Actions to improve habitat conditions	Few—2 trail closures, 1 reroute, cheatgrass control efforts
Minimization of surface disturbing conditions to protect species & its habitat.	Some control of vehicles
Development of management plan for *Astragalus microcymbus*	Not implemented
No chemical spraying	Likely implemented
No vegetative treatments	Implemented
No additional forage allocations	Unknown, especially as related to deer & elk
Controlled surface use stipulation	Implemented
No conflicting erosion control measures	Implemented, unsure about water bars
No domestic sheep grazing	Implemented
Limit motorized vehicular traffic to designated routes	Implemented although enforcement is problematic
Public lands with *A. microcymbus* will not be disposed	Implemented
Acquisition of non-Federal lands if available	Not implemented
ROW permitted without direct impacts to *A. microcymbus*	Implemented
Wildfire suppression	No wildfires to-date

The South Beaver Creek ACEC has resulted in some protections for *Astragalus microcymbus,* specifically: Monitoring, two surveys, two trail closures, one trail reroute, and some restrictions to herbicide use and livestock grazing. These protections are an improvement over more generally managed BLM lands. However, 70 percent of the South Beaver Creek ACEC is within the Hartman Rocks Recreation Area, even though the South Beaver Creek ACEC was developed at least 8 years prior to the Hartman Rocks Recreation Area (BLM 2005a, p. 44). Numerous trails are also designated through *A. microcymbus* units (see Recreation, Roads, and Trails above). The designation of this Recreation Area overlaying *A. microcymbus* demonstrates that these ACEC protections are not adequate to protect the species.

All *Astragalus microcymbus* units on public land are within active livestock grazing allotments. The BLM regulatory authority for grazing management is provided at 43 CFR Part 4100 (Regulations on Grazing Administration Exclusive of Alaska). Livestock grazing permits and leases contain terms and conditions, determined by BLM to be appropriate to achieve management and resource condition objectives and to ensure that habitats are, or are making, significant progress toward being restored or maintained for BLM special status species (43 CFR 4180.1(d)). The State or regional standards for grazing administration must address habitat for endangered, threatened, proposed, candidate, or special status species, and habitat quality for native plant and animal populations and communities (43 CFR 4180.2(d)(4) and (5)). The guidelines must address restoring, maintaining, or enhancing habitats of BLM special status species to promote their conservation, as well as maintaining or promoting the physical and biological conditions to sustain native populations and communities (43 CFR 4180.2(e)(9) and (10). The BLM is required to take appropriate action not later than the start of the next grazing year upon determining that existing grazing practices or levels of grazing use are significant factors in failing to achieve the standards and conform with the guidelines (43 CFR 4180.2(c)).

Livestock use specific to *Astragalus microcymbus* is discussed in further detail in Livestock, Deer, and Elk Use of Habitat above. Within the South Beaver Creek ACEC, no additional forage allocations will be made and domestic sheep grazing will not be authorized (BLM 2005a, pp. 2–29 to 2–30).

Despite management actions undertaken by BLM, grazing is impacting *Astragalus microcymbus* and its habitat. The BLM has no research or monitoring that specifically addresses the impacts to *A. microcymbus* or its habitat and the effects from ubiquitous livestock use. In addition, there is no research or monitoring that addresses how deer and elk utilization is being jointly considered (with livestock use) within the range of *A. microcymbus.* Therefore, we find the management of livestock, deer, and elk to be similar to our assessment of "Livestock, Deer, and Elk Use of Habitat" above and a threat to the species.

As discussed in "Recreation, Roads, and Trails" in Factor A above, based on the combination of the documented impacts resulting from recreational activities atop *Astragalus microcymbus* and its habitat and the designation of the Hartman Rock Recreation Area over the South Beaver Creek ACEC, we believe that existing Federal regulatory mechanisms are inadequate for protecting *A. microcymbus.* Management prescriptions or AUMs for livestock use are three to five times higher than current use levels. Because livestock impacts are occurring to *A. microcymbus* at current stocking rates, we expect if livestock were managed at these higher AUM levels, much more intense impacts would occur to the plant. In addition, the South Beaver

Creek ACEC designation, while providing limited protection for *A. microcymbus,* was not adequate to preclude the designation of a recreation area in the same location (70 percent of the ACEC). We cannot say what will happen with *A. microcymbus* in the upcoming RMP revision, but if we consider conservation efforts since the last RMP revision, we expect *A. microcymbus* and its habitat will continue to decline in the foreseeable future. We find that Federal laws and regulations are currently inadequate to protect the species from being threatened or endangered.

Summary of Factor D

Twenty-five percent of *Astragalus microcymbus* habitat occurs on private lands with no regulatory protections. No State laws protect the species. On Federal lands, the species is managed as a sensitive species but this designation has not adequately protected the species. Over 40 percent of the *A. microcymbus* habitat and 70 percent of the South Beaver Creek ACEC lies within the federally managed Hartman Rocks Recreation Area, which serves to focus human use in this area, a designation that runs counter to the protection of the species. For these reasons, we find the existing regulatory mechanisms to be inadequate because of increasing recreation and development potential on private land. We find that *Astragalus microcymbus* is threatened by the inadequacy of existing regulatory mechanisms now and these threats are expected to continue or increase in the foreseeable future.

Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence

Periodic Drought

Drought is a common occurrence within the range of *Astragalus microcymbus* (Braun 1998, p. 148; WRCC 2010a, p. 8). Infrequent, severe drought may cause local extinctions of annual forbs and grasses that have invaded stands of perennial species, and recolonization of these areas by native species may be slow (Tilman and El Haddi 1992, p. 263). Drought reduces vegetation cover (Milton *et al.* 1994, p. 75; Connelly *et al.* 2004, pp. 7–18), potentially resulting in increased soil erosion and subsequent reduced soil depths, decreased water infiltration, and reduced water storage capacity. Drought also can exacerbate other natural events such as defoliation of sagebrush by insects and the invasion of nonnative invasive plants. *A. microcymbus* responds negatively to declines in overall precipitation and periods of drought, as well as declines in spring precipitation (May and July) (DBG 2010a, p. 6). For example, during the drought of 2001 and 2002, *A. microcymbus* populations declined precipitously (DBG 2010a, p. 6). Because periodic drought will likely continue and could increase (see Climate Change in Factor A above) and because of the decline in population numbers associated with drought, we find drought to be a threat to the species (recognizing the uncertainty with climate change models).

Small Populations

Small populations and species with limited distributions, like those of *Astragalus microcymbus,* are vulnerable to relatively minor environmental disturbances such as recreational impacts, nonnative plant invasions, and wildfire (Given 1994, pp. 66–67), and are subject to the loss of genetic diversity from genetic drift, the random loss of genes, and inbreeding (Ellstrand and Elam 1993, pp. 217–237). Populations with lowered genetic diversity are more prone to local extinction (Barrett and Kohn 1991, pp. 4, 28). Smaller populations generally have lower genetic diversity, and lower genetic diversity may in turn lead to even smaller populations by decreasing the species' ability to adapt, thereby increasing the probability of population extinction (Newman and Pilson 1997, p. 360).

For plant populations that do not reproduce vegetatively, like *Astragalus microcymbus,* pollen exchange and seed dispersal are the only mechanisms for gene flow. Pollen dispersal is limited by the distance the pollinator can travel. Both pollen and seed dispersal can vary widely by species (Ellstrand 2003, p. 1164). We do not understand either pollen or seed dispersal capabilities for *A. microcymbus.* As our understanding of gene flow has improved, the distances scientists believe genes can travel also has increased (Ellstrand 2003, p. 1164). We believe that genetic exchange could be possible, although unlikely, between the Henry, Gold Basin Creek, and South Beaver Creek Units, and expect that genetic exchange does occur occasionally between the South Beaver Creek Units.

Most *Astragalus microcymbus* units comprise multiple sites with many individuals and genetic exchange should not be limited within units. However, two *A. microcymbus* units—Henry and Cebolla Creek—are located over 2.5 km (1.5 mi) away from any other units and have few individuals. For these two units in particular, small population size and a loss of genetic diversity may be a problem. Other *Astragalus* species with small populations have demonstrated lowered genetic diversity (Travis *et al.* 1996, pp. 735–745). The limited range of *A. microcymbus* makes the species more susceptible to being significantly impacted by stochastic (random) disturbances such as wildfire. Because stochastic threats such as wildfire are currently low, and because two *A. microcymbus* units are isolated and small, we find the overall effect from small populations to be low to the point where it is not a threat.

Summary of Factor E

Periodic drought is a threat to *Astragalus microcymbus.* We know that the species decreases during drought conditions, but we do not know how this influences long-term survivorship of the species, especially in light of climate change. We know the species has a limited distribution and two out of nine *A. microcymbus* units are small and isolated, but we do not understand how this is affecting the genetic diversity of the species nor do we consider small population size to be a threat. With such a limited range, the species is at risk from stochastic events but there is no way of predicting these events. Although there are many unknowns, we find the threat from periodic drought to be moderate at this time. Based on this, the overall threat from Factor E is low to moderate. We find that *Astragalus microcymbus* is threatened by other natural or manmade factors affecting its continued existence now and these threats are expected to continue or increase in the foreseeable future.

General Threats Summary

Table 6 below provides an overview of the threats to *Astragalus microcymbus.* Of these threats, we consider recreation, roads, and trails, the overall inadequacy of existing regulatory mechanisms, and habitat fragmentation and degradation to be the most significant threats (Table 6). Recreational impacts are likely to increase given the close proximity of *A. microcymbus* to the town of Gunnison and the increasing popularity of mountain biking, motorcycling, and all-terrain vehicles. Furthermore, the Hartman Rocks Recreation Area draws users and contains over 40 percent of the *A. microcymbus* units. The overall threat from a lack of existing regulatory mechanisms is high given that 25 percent of the habitat has no protections and that Federal protections allowed a recreation area to be developed on the species' habitat. Recreation, as well as most of the other threats to *A. microcymbus,* leads to habitat fragmentation and degradation.

TABLE 6—THREAT SUMMARY FOR FACTORS AFFECTING *Astragalus Microcymbus*

Listing factor	Threat or impact	Scope of threat or impact	Intensity	Exposure (%)	Likelihood of exposure	Species' response	Foreseeable future	Overall threat
A	Residential & Urban Development.	Moderate	Moderate	25	Moderate	Loss of habitat, loss of sites, pollinator impacts.	Development within several decades.	Moderate.
A	Recreation, Roads, & Trails.	High	High	15 (20-m buffer) to 46 (100-m buffer).	High	Loss of sites & habitat, habitat degradation, nonnatives, pollinator impacts.	Significant increase (+20% annually) in users.	High.
A	Utility Corridors.	Low	Low	4	Moderate	Loss of sites & habitat, habitat degradation.	No immediate plans, limited in scope.	None, impact only.
A	Nonnative Invasive Plants.	Low	Low+	0.1+	High	Competition, wildfire, pollinator impacts.	Increasing with rapid increase possible.	None, but increasing quickly.
A	Wildfire	Low	None+	None but nearby.	Low+	Nonnatives, species' response to wildfire unknown.	Difficult to estimate, will relate to cheatgrass invasion.	Low+.
A	Contour Plowing & Nonnative Seedings.	Low	Low	1.2	Low	Presumable loss, habitat degradation, pollinator impacts.	Future seedings unlikely.	None, impact only.
A	Livestock, Deer, & Elk Use of Habitat.	Moderate	Low to Moderate	95+	Moderate	Habitat Degradation, trampling, pollinator impacts.	Permitted AUMs would increase impacts, deer & elk impacts could increase.	Moderate.
A	Mining; Oil & Gas Leasing.	Low	Low	none	Low	Loss if mining occurred.	Little activity, unlikely in the foreseeable future.	None+.
A	Climate Change.	Moderate?	Moderate?	100	Moderate	Unknown but would likely cause a decline.	Climate models predict 40-year changes.	Moderate?
A	Habitat Fragmentation & Degradation.	High	Low	100	High	Habitat degradation, genetic isolation.	A byproduct of other threats.	High.
B	None						not likely to change.	None.
C	Small Mammal Herbivory.	Moderate	Moderate+	~80, likely varies by year.	High	Affecting seed set.	Likely to continue & fluctuate with herbivore population.	Low to Moderate.
C	Deer & Elk Herbivory.	Low	Low	winter	Low	Minimal, could affect seed set.	Winter use makes herbivory less likely.	None+.
C	Livestock Herbivory.	Low	Low	occasional	Low	Could affect seed set.	Steep slopes makes herbivory less likely.	None.
C	Insect Herbivory.	Low	Low	3	Moderate	Could affect seed set.	No measureable impact.	None.

TABLE 6—THREAT SUMMARY FOR FACTORS AFFECTING ASTRAGALUS MICROCYMBUS—Continued

Listing factor	Threat or impact	Scope of threat or impact	Intensity	Exposure (%)	Likelihood of exposure	Species' response	Foreseeable future	Overall threat
C	Disease	Low	Low	trace	Low	Death?	Rare	None.
D	Local Land Use Laws, & Ordinances.	Moderate	Moderate	25	Moderate+	Loss of habitat, loss of sites, pollinator impacts.	Development within several decades.	Moderate.
D	State Laws & Regulations.	Moderate	Moderate	25+	Moderate+	Loss of habitat, loss of sites, pollinator impacts.	Development within several decades.	Moderate.
D	Federal Laws & Regulations.	Moderate	Moderate	75	Moderate+	Influenced by management actions.	Continued course will trend downward.	Moderate.
E	Periodic Drought.	Moderate	Moderate	100	High	Decline	Climate change models predict increasing drought.	Moderate.
E	Small Populations.	Low	Low	7	Low	Loss of genetic diversity.	Increase if wildfires & cheatgrass increase.	None, impact only

Listing factors include: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence.
+ indicates a possible increase in the future.
? indicates significant uncertainty.

Moderate threats to *Astragalus microcymbus* include: Residential and urban development; livestock, deer, and elk use; climate change; and increasing periodic drought. Of these, the threats from climate change are the most likely to increase in the future. In addition, we are particularly concerned about nonnative invasive plants, especially cheatgrass. Cheatgrass is expanding in the Gunnison Basin. Furthermore, the dry south-facing slopes where *A. microcymbus* is found are the warmest and, therefore, the most vulnerable to cheatgrass invasion in the Gunnison Basin.

Although wildfire is ranked as a low threat, this factor may increase in the future. Wildfire is likely to increase because of its link to nonnative invasive plants and habitat degradation. Small mammal herbivory, because of the significant effect to seed set, is considered a low to moderate threat. All other threats to *Astragalus microcymbus* are currently regarded as impacts and not threats to the species' continued existence.

While we have considered all the threats here separately, many are interrelated. For example, many of these threats contribute to habitat degradation. Cheatgrass seldom spreads without some sort of disturbance. Wildfire frequency does not increase without more people to start the fires, more lightning, or increases in nonnative invasive plants (especially cheatgrass) and may be exacerbated by climate change. We find the overall threat to *Astragalus microcymbus* from all of these threats to be moderate; although we carefully considered a high threat ranking when we considered the threats acting together.

Finding

As required by the Act, we considered the five factors in assessing whether *Astragalus microcymbus* is endangered or threatened throughout all or a significant portion of its range. We carefully examined the best scientific and commercial information available regarding the past, present, and future threats faced by the species. We reviewed the petition, information available in our files, other available published and unpublished information, and we consulted with *A. microcymbus* experts and other Federal and State agencies.

Astragalus microcymbus numbers are declining. The most recent population viability analysis predicts that all four life-history monitoring plots will be lost by the year 2030, although more recent data extends this date out into the future (DBG 2008, p. 9). Most counts in the last 5 years have been far less than they were in the 1980s and 1990s, generally fewer than 150 individuals with only 1 count over 400 individuals (USFWS 2010a, pp. 1–4).

We do not fully understand the reasons for the decline in *Astragalus microcymbus* numbers. Some of the variability in population counts can be explained by precipitation and temperature patterns (DBG 2010a, p. 6). However, these patterns do not explain all the variation. For example, we did not see *A. microcymbus* numbers increase substantially in 2005 when there was much more precipitation than average (DBG 2010a, pp. 11–12). Nor do these patterns explain why site counts continue to be much less than they were in the 1980s and 1990s. Sites do not appear to move significantly. Although the footprint of many sites has shrunk, the plants are still located in approximately the same areas as they were in the 1980s, suggesting that *A. microcymbus* locations are fairly static. This is not surprising given that *A. microcymbus* habitat seems to be somewhat limited on the landscape.

This status review identified threats to the *Astragalus microcymbus* rangewide attributable to Factors A, C, D, and E. The primary threats to the species include recreation, roads, and trails; and habitat fragmentation and degradation. Recreational use continues to increase. Habitat degradation, caused by all of the threats interacting together, poses a significant risk to the species. Moderate threats include residential and urban development; livestock, deer, and elk use; climate change; inadequate regulatory mechanisms; and periodic drought. The threat from nonnative invasive plants is increasing quickly. Small mammal herbivory is considered a low to moderate threat, and wildfire is considered a low threat. All of these threats are impacting *A. microcymbus,* and could be contributing to the species' decline. The species' close proximity to the town of Gunnison and the fact that 25 percent of the species rangewide distribution is on private lands subject to development makes future development a very real threat. Cheatgrass will likely invade the hot dry habitats of *A. microcymbus* before any other habitats in the Gunnison Valley. Livestock, deer, and elk use are causing habitat degradation. Because we know *A. microcymbus* responds unfavorably to warmer spring temperatures and less spring precipitation—conditions that climate change models predict—we expect negative impacts similar to the declines we've seen with these climatic conditions in the long-term life history study. Small mammal herbivory affects seed production, and drought negatively affects population numbers. We acknowledge there are uncertainties regarding: (1) The reasons for the decline of *A. microcymbus,* (2) the rate of increase in future recreation and the management direction for the Hartman Rocks Recreation Area; (3) the rate and extent of cheatgrass' spread; (4) when and to what extent development will occur; (5) the return interval of future wildfires; and (6) the effects of increasing temperatures and changing precipitation patterns. Many of these uncertainties are temporal in nature.

On the basis of the best scientific and commercial information available, we find that listing of the *Astragalus microcymbus* as endangered or threatened is warranted. We will make a determination on the status of the species as endangered or threatened when we do a proposed listing determination. However, as explained in more detail below, an immediate proposal of a regulation implementing this action is precluded by higher priority listing actions, and progress is being made to add or remove qualified species from the Lists of Endangered and Threatened Wildlife and Plants.

We have reviewed the available information to determine if the existing and foreseeable threats render the species at risk of extinction now such that issuing an emergency regulation temporarily listing the species as per section 4(b)(7) of the Act is warranted. We determined that issuing an emergency regulation temporarily listing the species is not warranted for this species at this time because the threats acting on the species are not immediately impacting all the species across its range to the point where the species will be immediately lost. However, if at any time we determine that issuing an emergency regulation temporarily listing *Astragalus microcymbus* is warranted, we will initiate this action at that time.

Listing Priority Number

The Service adopted guidelines on September 21, 1983 (48 FR 43098), to establish a rational system for utilizing available resources for the highest priority species when adding species to the Lists of Endangered or Threatened Wildlife and Plants or reclassifying species listed as threatened to endangered status. These guidelines, titled "Endangered and Threatened Species Listing and Recovery Priority Guidelines" address the immediacy and magnitude of threats, and the level of taxonomic distinctiveness by assigning priority in descending order to monotypic genera (genus with one species), full species, and subspecies (or equivalently, distinct population segments of vertebrates).

As a result of our analysis of the best available scientific and commercial information, we assigned *Astragalus microcymbus* a Listing Priority Number (LPN) of 8, based on threats that are of moderate magnitude and are imminent. These threats include the present or threatened destruction, modification, or curtailment of its habitat; predation; the inadequacy of existing regulatory mechanisms; and other natural or man-made factors affecting its continued existence. We consider the threats that *A. microcymbus* faces to be moderate in magnitude because the major threats (recreation, roads, and trails; inadequacy of existing regulatory mechanisms; and habitat fragmentation and degradation), while serious and occurring rangewide, do not collectively rise to the level of high magnitude. For example, the last known populations are not about to be completely lost to development. These threats are not likely to eliminate the species in the immediate future. The threats the species faces are, however, significant. Recreational impacts are likely to increase given the close proximity of *A. microcymbus* to the town of Gunnison and the increasing popularity of mountain biking, motorcycling, and all-terrain vehicles. Furthermore, the Hartman Rocks Recreation Area draws users and was designated atop 40 percent of the *A. microcymbus* "units". The overall threat from the inadequacy of existing regulatory mechanisms is high given that 25 percent of the habitat has no protections and that Federal regulations allowed a recreation area to be developed atop the species. Recreation, as well as most of the other threats to *A. microcymbus,* leads to habitat fragmentation and degradation. These threats are ongoing and, in some cases (such as invasive nonnative species), are considered irreversible because large-scale invasions cannot be recovered to a native functioning ecosystem given current management efforts. Our rationale for assigning *A. microcymbus* an LPN of 8 is outlined below.

Under the Service's guidelines, the magnitude of threat is the first criterion we look at when establishing a listing priority. The guidance indicates that species with the highest magnitude of threat are those species facing the greatest threats to their continued existence. These species receive the highest listing priority. We consider the threats that *A. microcymbus* faces to be moderate in magnitude because the major threats (recreation, roads, and trails; inadequacy of existing regulatory mechanisms; and habitat fragmentation and degradation), while serious and occurring rangewide, do not collectively rise to the level of high magnitude. For example, the last known populations are not about to be completely lost to development.

Under our LPN guidelines, the second criterion we consider in assigning a listing priority is the immediacy of threats. This criterion is intended to ensure that the species facing actual, identifiable threats are given priority over those species facing potential threats or species that are intrinsically vulnerable but are not known to be presently facing such threats. We consider the threats imminent because we have factual information that the threats are identifiable and that the species is currently facing them in many portions of its range. These actual, identifiable threats are covered in great detail in Factors A, C, D, and E of this finding. Almost all of the threats are ongoing and, therefore, are imminent, although the likelihood varies (Table 4). In addition to their current existence, we expect these threats to continue and likely intensify in the foreseeable future.

The third criterion in our LPN guidelines is intended to devote resources to those species representing highly distinctive or isolated gene pools as reflected by taxonomy. *Astragalus microcymbus* is a valid taxon at the species level and, therefore, receives a higher priority than subspecies, but a lower priority than species in a monotypic genus. Therefore, we assigned *Astragalus microcymbus* an LPN of 8.

We will continue to monitor the threats to *Astragalus microcymbus,* and the species' status on an annual basis, and should the magnitude or the imminence of the threats change, we will re-visit our assessment of LPN.

Because we have assigned *Astragalus microcymbus* an LPN of 8, work on a proposed listing determination for *A. microcymbus* is precluded by work on higher priority listing actions with absolute statutory, court-ordered, or court-approved deadlines and final listing determinations for those species that were proposed for listing with funds from FY 2010. This work includes all the actions listed in the tables below under expeditious progress (*see* Tables 9 and 10).

Species Information—*Astragalus schmolliae*

Taxonomy and Species Description

Astragalus schmolliae was first collected in Montezuma County, southwestern Colorado, in 1890. It was formally described as a species in 1945, when C.L. Porter named it after Dr. Hazel Marguerite Schmoll (Porter 1945, pp. 100–102; Barneby 1964, pp. 277–278; Isely 1998, p. 417). *Astragalus schmolliae* is a member of the family Fabaceae (legume family). The perennial plants are upright, 30 to 60 cm (12 to 24 in.) tall with one to several stems branching from an underground root crown. Its leaves are typical of many of the legumes, with 11 to 20 small leaflets on a stem. Leaves and stems are ash-colored due to a covering of short hairs. Flowers are creamy white and borne on upright stalks that extend above the leafy stems. The fruit is a pod, 3 to 4 cm (1 to 1.5 in.) long, covered with flat, stiff hairs, pendulous and curving downward (Barneby 1964, pp. 277–278). The deep taproot grows to 40 cm (16 in.) or more (Friedlander 1980, pp. 59–62).

Biology, Distribution, and Abundance

Astragalus schmolliae plants emerge in early spring and usually begin flowering in late April or early May. Flowering continues into early or mid-June (Friedlander 1980, p. 63, Peterson 1981, p. 14). Fruit set begins in late May and occurs through June, and by late June most fruits have opened and released their seeds, while still attached to the plant. The typical plant lifespan of *A. schmolliae* is unknown, but individuals are thought to live up to 20 years (Colyer 2002 in Anderson 2004, p. 11). During very dry years, as observed in 2002, the plants can remain dormant with no above-ground growth (Colyer 2003 in Anderson 2004, p. 11). Most of the plants produce above-ground shoots and flower profusely during growing seasons following wet winters.

Astragalus schmolliae requires pollination by insects to set fruit. Flowers require a strong insect for pollination, such as a bumblebee, because the insect must force itself between the petals of the butterfly-shaped flowers. Pollinators observed on *A. schmolliae* include several species of bumblebees (*Bombus* spp.) and beeflies (*Bombylius* spp.) (Friedlander 1980, p. 63).

The habitat for *Astragalus schmolliae* is mature pinyon-juniper woodland of mesa tops in the Mesa Verde National Park (MEVE) area at elevations between 1,981 to 2,286 meters (6,500 to 7,500 feet) (Anderson 2004, p. ii). The plants are found in both sunny and shaded locations (Peterson 1981, p. 12), primarily on deep, reddish loess soils, and are generally less common near cliff edges and in ravines where the soil is shallower. No *A. schmolliae* plants are found in the mountain shrublands at the upper elevations on MEVE.

The CNHP prepared a population status survey of *Astragalus schmolliae* in 2004 for MEVE. The report is based on field surveys in 2001 and 2003 of the distribution, density, soil characteristics, seed viability and germinability, and recruitment in burned and unburned areas of MEVE. This study provides the primary source of information for our evaluation of the status and threats to *A. schmolliae,* and is cited throughout this finding as Anderson (2004).

Astragalus schmolliae habitat collectively occupies approximately 1,619 ha (4,000 ac) in MEVE and on the Ute Mountain Ute Tribal Park (Tribal Park). About 809 ha (2,000 ac) are in MEVE on Chapin Mesa including Fewkes and Spruce Canyons, on the West Chapin Spur, and on Park Mesa (CNHP 2010, pp. 12–19; Anderson 2004, p. 25, 30; MEVE 2010, p.1). Occupied habitat on Chapin Mesa in the Tribal Park south of MEVE probably covers another 809 ha (2,000 ac), where surveys have not been done (Anderson 2004, p. 6; Friedlander 1980, p. 53; CNHP 2010, pp. 20–21). Abundant plants were observed on the tribal land in 1987 (Colyer 2002, in Anderson 2004, p. 4; CNHP 2010, p. 21). The total number and average density of plants on the Tribal Park are not known, because no inventories have been completed (Clow 2010, pers. comm.).

TABLE 7—*Astragalus schmolliae* OCCURRENCES

[CNHP 2010, pp. 1–21; Anderson 2004, p. 6, 30]

Occurrence	Ha (Ac)	Plants 2001	Plants 2003	Density 2001	Density 2003	CNHP Rank*
Chapin Mesa, Fewkes & Spruce Canyons (MEVE).	785 (1,939)	454,733	277,462	.06 per sq meter	.037 per sq meter	A
Park Mesa (MEVE)	3.3 (8)	3,605	2,199	.110	.067	B
West Chapin Spur (MEVE).	21 (52)	24,448	14,913	.117	.071	B
MEVE totals	809 (2,000)	482,786	294,499			
Ute Mtn. Ute Tribal Park	809 (2,000) est.	NA	NA	NA		H
Total range	1,619 (4,000)					

* Occurrence rankings are categorized from A through D, with "A" ranked occurrences generally representing higher numbers of individuals and higher quality habitat, and "D" ranked occurrences generally representing lower numbers of individuals and lower quality (or degraded) habitat. A historical rank (H) indicates an occurrence that has not been visited for more than 20 years.

The distribution of *Astragalus schmolliae* is typical of narrow endemics, which are often common within their narrow range on a specific habitat type (Rabinowitz 1981 in Anderson 2004, p. 3). However, *A. schmolliae* is unusual because similar habitat is widespread on nearby mesas where the species has not been found. Thus, the causes of its rarity are unknown. Its distribution may be limited by habitat variables that are not yet understood (Anderson 2004, p. 8).

Astragalus schmolliae is considered critically imperiled globally (G1) by the CNHP, a rank used for species with a restricted range, a global distribution consisting of less than five occurrences, a limited population size, or significant threats (CNHP 2006, p. 1).

Summary of Information Pertaining to the Five Factors

Section 4 of the Act (16 U.S.C. 1533) and implementing regulations (50 CFR 424) set forth procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, a species may be determined to be endangered or threatened based on any of the following five factors:

(A) The present or threatened destruction, modification, or curtailment of its habitat or range;

(B) Overutilization for commercial, recreational, scientific, or educational purposes;

(C) Disease or predation;

(D) The inadequacy of existing regulatory mechanisms; or

(E) Other natural or manmade factors affecting its continued existence.

In making this 12-month finding, we evaluated the best scientific and commercial information available, including information acquired during the status review. Our evaluation of this information is presented below.

In considering what factors might constitute threats to a species, we must look beyond the exposure of the species to a factor to evaluate whether the species may respond to the factor in a way that causes actual impacts to the species. If there is exposure to a factor and the species responds negatively, the factor may be a threat and we attempt to determine how significant a threat it is. The threat is significant if it drives, or contributes to, the risk of extinction of the species such that the species warrants listing as endangered or threatened as those terms are defined in the Act.

Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

The following potential factors that may affect the habitat or range of *Astragalus schmolliae* are discussed in this section, including: (1) Wildfire; (2) invasive nonnative plants; (3) post-fire mitigation; (4) wildfire and fuels management; (5) development of infrastructure; (6) drought and climate change.

Wildfire

Six large wildfires burned within MEVE between 1989 and 2003, and extensive portions of those burned areas have been invaded by nonnative plant species (weeds) (Floyd *et al.* 2006, p. 247). Small, lightning-caused fires are frequent in MEVE. The annual average number of fire starts between 1926 and 1969 was 5 per year, which increased to 18 per year between 1970 and 1997. Most of the fires started in the pinyon-juniper woodlands and burned less than 1 ha (2.5 ac). The southern half of MEVE was covered with dense, old-growth pinyon-juniper woodlands that had not burned for several centuries. However, the 20th century has seen several spectacular wildfires that burned extensive portions of these pinyon-juniper woodlands (Floyd *et al.* 1999, p. 149). Best estimates for "natural" fire turnover times in MEVE are about 100 years for shrubland vegetation and about 400 years for pinyon-juniper vegetation. Although the disturbance regime for this system apparently remains within the historical range of variability, the recovery processes following fire have been dramatically altered from historical processes (Floyd *et al.* 2006, p. 248). Recurrent fires favor clonal, resprouting shrub species such as *Quercus gambelii* (gambel oak), *Amelanchier utahensis* (Utah serviceberry), *Symphoricarpos oreophilus* (mountain snowberry), *Fendlera rupicola* (cliff fendlerbush), and *Rhus trilobata* (three-leaf sumac), and gradually eliminate the fire-sensitive pinyon and juniper (Floyd *et al.* 2000, p. 1667, 1677). *A. schmolliae* does not grow in the shrub-dominated areas of MEVE now, and we cannot predict the long- term success of the species following removal of the pinyon-juniper overstory.

Landscape modeling of the effects of projected cheatgrass increase on fire frequency in MEVE indicates the potential for frequent reburning. Projections show a fire rotation of about 45 years for MEVE. Such a frequent disturbance regime would be far outside the historical range of variability for the pinyon-juniper, and would likely impact or eliminate many native plant species (Turner *et al.,* p. 40). We have no data to indicate whether *Astragalus schmolliae* will successfully adapt to a post-fire habitat of open clearings between shrubs, and competition from cheatgrass, thistles, and native grasses versus a pinyon-juniper dominated community.

From July 29 to August 4, 2002, the Long Mesa Fire burned 1,053 ha (2,601 ac) on Chapin and Park Mesas, which included about 306 ha (756 ac) of *Astragalus schmolliae* habitat (Anderson 2004, p. 28). Between 1996 and 2008, 308 ha (762 ac) of habitat were burned by wildfires, and 6 ha (15 ac), by prescribed burns (MEVE 2010, pers. comm.). On Tribal Park habitat, several small fires appear to have burned a total of about 23 ha (57 ac) (Glenne 2010, map). Altogether these recent fires have impacted about 21 percent of the total habitat for the species.

The average density per square meter of *Astragalus schmolliae* plants on monitoring plots in MEVE decreased 39 percent from 2001 to 2003 (Anderson 2004, p. 30, 37). Density declined in both burned and unburned transect segments between 2001 and 2003. The decline in density was slightly lower in burned transect segments than in unburned, but the difference in density in 2003 between burned and unburned transect segments was not statistically significant, suggesting that burning did not significantly impact plant mortality, nor did it result in any benefit to the species. The 39 percent decline in density in MEVE was attributed to the 2002 drought and prolonged dormancy, because the plants do not send up new growth during very dry years (Anderson 2004, p. 37).

No seedlings were observed in 2001 on burned or unburned habitat, but they were observed in 2003 throughout the range of *Astragalus schmolliae* in MEVE, except at the population on northern Park Mesa that was severely burned in 1996 (Anderson 2004, p. 39). There were no clear differences in seedling success between burned and unburned areas during early summer surveys, but survivorship of seedlings through their first summer could not be determined (Anderson 2004, p. 48). Viability of seeds collected in 2003 was between 94 and 100 percent (Anderson 2004, p. 49). The patterns of seed germination are suggestive of a species that maintains a persistent seed bank (Anderson 2004, p. 47). The longevity of seeds of *A. schmolliae* is not known, but many legumes, including members of *Astragalus,* have seeds as long-lived as

97 years (Anderson 2004, p. 48). Recruitment appears to be highly episodic and is probably greatest in years that are moist in March through May (Anderson 2004, p. iv). Plants in areas burned in 2002 displayed higher reproductive effort and vigor, and produced approximately 241 times more seeds per plant than did plants in unburned areas. It is likely that this resulted in part from depletion of pollinator resources in unburned areas. Plants in areas burned in 1996 on Park Mesa had very high vigor in 2003 (possibly due to high soil nitrate levels after fire) but did not set fruit although flowers were produced and insect visitation was observed (Anderson 2004, p. iv).

Seed bank studies for other *Astragalus* species indicate that the group generally possesses hard impermeable seed coats with a strong physical germination barrier. As a result, the seeds are generally long-lived in the soil and only a small percentage of seeds germinate each year (Morris *et al.* 2002, p. 30). However, we do not know if the seed germination strategy for other *Astragalus* species is comparable to that employed by *A. schmolliae.*

The growth habit of *Astragalus schmolliae* suggests that it is tolerant of fire, with its deep taproot and shallowly buried root crown, to which the plant dies back during winter months. Plants can resprout following a low-intensity fire if the root crown is not damaged (Floyd-Hanna *et al.* 1997, 1998). Reproductive effort and fecundity were clearly higher in areas burned in 2002, and vigor also appeared to be greater. However, net reproductive success in post-fire environments has not been monitored, so it is unclear whether fire effects have a negative or beneficial initial impact on *A. schmolliae.* While fire may confer some short-term benefits to plants in burned areas (possibly at the expense of reproductive success in unburned areas if depletion of pollinator resources is responsible for poor fecundity), it may have long-term detrimental impacts (Anderson 2004, p. 64).

We conclude that the direct effects of fire on *Astragalus schmolliae* are both positive and negative. Plants burn to the ground and then resprout the following spring if the fire is not too intense, but then have competition from weeds and grasses. We do not know whether net reproduction after fire is positive. Given the high frequency and volume of fires in the area it is highly likely that new fires will burn more of the habitat for *A. schmolliae.* All of the burned and remaining unburned habitat on MEVE and the Tribal Park is at risk of burning within the foreseeable future. Although we remain concerned about the potential impacts of recurring fires, the best available information indicates that the direct effects of wildfires do not pose a threat to *A. schmolliae.* The indirect effect of facilitating invasion of the habitat by cheatgrass does pose a significant threat to the species.

Invasive Nonnative Plants

As discussed above, the main threat to the species is the indirect effect of invasion by nonnative plant species (weeds). This invasion is facilitated by the increased frequency of burns as well as the clearing of areas within occupied *Astragalus schmolliae* habitat (CNHP 2006, p. 4). In MEVE, large wildfires that occurred earlier in the twentieth century (1934, 1959, 1972) were not associated with weed invasion (Floyd *et al.* 1999, p. 148), but the pinyon-juniper forests that have burned extensively in the past two decades are being replaced by significant invasions of weedy species, especially *Bromus tectorum* (cheatgrass), *Carduus nutans* (musk thistle), and *Cirsium arvense* (Canada thistle) (Floyd *et al.* 2006, p. 1).

Since 1996, MEVE has seen more large fires and more cumulative area burned than occurred during the previous 200 years (Romme *et al.* 2006, p. 3). This recent increase in fire activity is a result of severe drought conditions preceded by wet climatic conditions and increasing fuel load due to fire suppression in the pinyon-juniper woodlands, all coinciding with the natural end of a long fire cycle (Floyd *et al.* 2006, p. 247). A recent development in the post-fire habitat response is the remarkably rapid spread of cheatgrass. This weedy winter annual germinates in the fall, grows slowly during the winter, and then grows rapidly in the early spring. By early summer it has set seed and died, creating a continuous fuel bed of quick-drying, flashy fine fuel that can readily carry fire, even without wind. Cheatgrass has been in MEVE for many years. However, it was never widespread until 2000, when unusually warm dry summers and winters, coupled with heavy fall rains, have allowed cheatgrass to rapidly expand its range, especially in places where fire or other disturbances have created bare ground (Romme *et al.* 2006, p. 3). Mature pinyon-juniper woodlands are highly vulnerable to post-fire weed invasion (Floyd *et al.* 2006, p. 254). Cheatgrass is now a dominant species in much of the area burned in MEVE (Romme *et al.* 2006, pp. 2–3) and it has inundated the burned and disturbed portions of *Astragalus schmolliae* habitat on Chapin Mesa (Hanna *et al.* 2008, p. 18). The highest infestation occurred in an area that had burned both in the 1996 and the 2002 fires on Park Mesa. This had been an old-growth pinyon-juniper woodland before the 1996 fire and was seeded with native grasses. After re-burning in 2002, this area has been inundated by cheatgrass (Hanna *et al.* 2008, p. 9). Given the seasonal overlap of *A. schmolliae* seedling growth with the peak growth of cheatgrass, it is likely that the presence of cheatgrass in populations of *A. schmolliae* compromises its viability (Anderson 2004, pp. 60–61).

In 1980, cheatgrass was found in 8 percent of survey samples in picnic grounds and 0 percent of undisturbed samples (Friedlander 1980, pp. 75–76). *Carduus nutans* was not found in either disturbed or undisturbed ground in 1980, but it was particularly invasive in burned areas of MEVE by 1999 and was aggressively invading areas occupied by *Astragalus schmolliae* (Floyd-Hanna *et al.* 1999, Romme *et al.* 2003).

We consider the invasion of nonnative weedy plants, particularly cheatgrass, to be a threat of high magnitude to *Astragalus schmolliae* because: (1) Cheatgrass has invaded all of the burned and disturbed habitat of *A. schmolliae in* MEVE, covering at least 40 percent of its entire range; (2) it competes with seedlings and resprouting adult plants for water and nutrients; (3) no landscape scale successful control methods are available; and (4) the proven ability of cheatgrass to increase fire frequency, thereby facilitating further rapid spread, threatens both burned and previously unburned occupied habitat. We conclude that cheatgrass invasion is likely to cause fire frequency to increase, with the result that only small patches of undisturbed habitat will remain for *A. schmolliae* within MEVE. The extent of cheatgrass invasion on the Tribal Park is unknown, because no surveys have been completed.

Post-Fire Mitigation

Various post-fire mitigation actions (aerial seeding of native grasses, mechanical removal, herbicides, and bio-control) have been effective in reducing the density of weeds after fire, but none of these techniques has prevented the weeds from becoming major components of the post-fire plant community. Post-fire mitigation activities were conducted in MEVE under the Burned Area Emergency Rehabilitation program in 1996 to 1997, to prevent weed invasion and severe erosion, and to encourage native plant species. Aerial seeding of native grasses was applied intensively in the old-growth pinyon-juniper community. The density of *Carduus nutans* was significantly reduced by seeding in burned areas. There has been no evidence that the diversity of native forbs has declined by introducing native perennial grasses (Floyd *et al.* 1999, p. 155), but *Astragalus schmolliae* was not specifically monitored. Therefore, we are unsure if these efforts to prevent weed invasion negatively affect *A. schmolliae.*

Seeding of native grasses has not prevented the spread of cheatgrass into burned areas; instead, cheatgrass invasion has increased (Floyd *et al.* 2006, p. 254). If cheatgrass continues to spread into recently burned areas in MEVE, it is likely to alter the previous regime of infrequent fires occurring during extremely dry periods to a new regime of frequent fires. Because the native flora is adapted to the historical fire regime, a change of this kind could produce rapid and irreversible degradation of native vegetation in the park (Floyd *et al.* 2006, p. 257). We believe this could be the case in *Astragalus schmolliae* habitat.

Releases of two biological control weevils on *Carduus nutans* have been highly effective in reducing the density, vigor, and net fecundity of the thistle plants in *Astragalus schmolliae* habitat on MEVE. Aerial seeding with native grass species has provided effective competition for some of the weeds and improved the proportion of native to invasive plants (Nelligan 2010, p. 2).

Post-fire weed control by aerial seeding of native grasses, mechanical removal, herbicides, and bio-control has reduced competition by invasive weeds other than cheatgrass, and there is little documentation of negative effects on *Astragalus schmolliae.* We consider the impacts of these activities to be low, not rising to the level of a threat to the species.

Wildfire and Fuels Management

Wildfire management at MEVE includes the creation of fire breaks, fire lines, and staging areas, all of which remove the mature pinyon-juniper woodland habitat for *Astragalus schmolliae.* A cattle fence 4.2 km (2.6 mi) long separates the northern half of the species' habitat on MEVE from the southern half on the Tribal Park. MEVE created a fire break about 30 m (100 ft) wide along this fence by cutting all vegetation to ground level. The break covers about 14 ha (34 ac), or 0.9 percent of the species total habitat, at the center of distribution for *A. schmolliae.* On the Tribal Park side of the fence, the pinyon-juniper woodland is cut in a mosaic pattern, leaving trees and clumps of trees standing with cleared areas around them. This fire break covers about 189 ha (467 ac), or 12 percent of the species' total range. Response of *A. schmolliae* to the two different treatments has not been compared. Fire breaks also are created by prescribed burns. Mechanical removal and prescribed burning together have altered about 19 percent of the species total range, including the fenceline fire breaks described above (MEVE 2010, pers. comm.).

The ecological conditions for *Astragalus schmolliae* within the cleared areas are different from its typical pinyon-juniper woodland habitat. Cleared areas are exposed to more sun and wind that dry the soil and the *A. schmolliae* seedlings. In addition to invasion by cheatgrass, removal of woody vegetation appears to result in competitive release of native grasses. In sites where no seeding has been done, removal of woody vegetation favors *Poa fendleriana* (muttongrass), the most common grass species on Mesa Verde (Anderson 2004, p. 73). This response is seen in mechanical fuels reduction areas on Chapin Mesa, where cover of *P. fendleriana* can approach 75 percent (Anderson 2004, p. 60). Density, reproductive effort and vigor of *A. schmolliae* appears low in these areas, although there are few quantitative data with which to compare density. Plants were growing among large, crowded bunches of *P. fendleriana* and appeared small and unhealthy (Anderson 2004, p. 73). This effect is probably due to competition with *P. fendleriana* for water and nutrients. On unburned Chapin Mesa south of MEVE, density of *A. schmolliae* was second only to *P. fendleriana,* as a dominant understory plant (Colyer 2002, in Anderson 2004, p. 7). This may indicate that *A. schmolliae* can recover from the initial impact of native grass competition following removal of the overstory woodland.

Fuels management activities have had some direct and indirect impacts to *Astragalus schmolliae* plants and habitat. Fuels management activities occur in the summer and fall when impacts to mature *A. schmolliae* plants are diminished or negligible because the seeds have matured and plants are dying back for the season. Direct impacts to the plants, such as trampling during the cutting and hauling out of wood and slash and scorching during prescribed burns, are short-term because the plants will be able to resprout the following spring. Impacts to juvenile plants are not documented. Mechanical fuels reduction activities result in a low to moderate level of surface disturbance, which we believe results in little direct impact to *A. schmolliae.* However, the effects of fuels management activities tend to facilitate nonnative species invasion. In addition to cheatgrass, *Carduus nutans* appears to thrive on the disturbance created by fuels management, and to outcompete *A. schmolliae* (Floyd-Hanna *et al.* 1999). Numerous *C. nutans* plants were found in all areas visited where mechanical fuels reduction activities took place (Anderson 2004, p. 73). The canopy of *A. schmolliae* can act as a seed trap for *C. nutans,* which greatly increases the likelihood of negative impacts to *A. schmolliae* from competition (Anderson 2004, pp. 63, 70).

Clearing for fuel reduction impacts *A. schmolliae* in the following ways: (1) Above-ground stems are directly removed; (2) plants that resprout the following spring have less water available because the soil dries due to exposure to sun and wind; and (3) invasive weeds, the native grass *P. fendleriana,* and seeded native grasses provide increased competition. However, we have no data that indicates the degree to which these impacts are occurring or will occur in the future. Because clearing and prescribed burns affect 19 percent of the range of *A. schmolliae,* we believe that clearing or burning for fire management may have a detrimental effect on the species. As with wildfire, the indirect effect of facilitating invasion of the habitat by cheatgrass poses a threat to the species because it increases the likelihood of more frequent fires.

Development of Infrastructure

As of 1980, about 17.7 ha (44 ac) of *Astragalus schmolliae* habitat was graded or paved for roads within MEVE, which was 1.7 percent of the habitat known in the park at that time (Friedlander 1980, p. 78). As of 2010, about 36 ha (90 ac) or 4.5 percent of the known range of *A. schmolliae* within MEVE is classified as hardened surfaces, i.e., roads, buildings, parking lots, water tanks, trails, etc. (MEVE 2010, p. 1). A recent impact was the installation of thousands of meters of underground fiber optic cables throughout the developed areas of the park (Anderson 2004, p. 70; Nelligan 2010, p. 2). Information on the number of plants destroyed or new recruits that appeared following the installation is not available (San Miguel 2010a, pers. comm.).

It is likely that a small percentage of the *Astragalus schmolliae* population has been eliminated during the development of visitor facilities in

MEVE. Regular maintenance and construction projects at MEVE will continue to result in a small amount of plant mortality. Trampling of plants by people using trails, roads, and picnic areas in the developed portion of MEVE also eliminates a small number of plants (Nelligan 2010, p. 2). Likewise on the Tribal Park, most foot traffic is limited to routes used by escorted tour groups and, therefore, likely to have a very small impact on the species.

Trampling of plants by visitors and staff is an ongoing impact that does not rise to the level of a threat because it affects plants in a very limited portion of the species range in MEVE and in the Tribal Park. *Astragalus schmolliae* may recover from this kind of disturbance if the below-ground parts are not damaged, or if undamaged plants remain nearby to provide a seed source and the disturbance is not constantly repeated or followed up with additional disturbances. One attempt to transplant mature plants that were growing in a planned construction area was unsuccessful because the taproots were severed (Nelligan 2010, p. 2).

Construction of new roads, a visitor center, and campground are ongoing in MEVE. Most of the new construction is outside of *Astragalus schmolliae* habitat. Most of the disturbance in occupied habitat is related to a water pipeline, and because it is directionally drilled from one pad of about 4 by 24 m (14 by 80 ft) alongside the park road, the impact on the plants is negligible (San Miguel 2010b, pers. comm.).

The habitat for *Astragalus schmolliae* on tribal land is within the Tribal Park, which is managed for protection of its cultural and natural resources. It is an undeveloped area without surfaced roads or permanent facilities. We are not aware of any development activities on the Tribal Park that would impact *A. schmolliae* (Mayo 2010, pers. comm.).

Overall, the impact of existing development appears low, impacting about 2.3 percent of the species' entire range. MEVE will likely continue to locate major facilities outside of *Astragalus schmolliae* habitat, and minimize infrastructure within the habitat in the future. Most of the habitat within MEVE is protected from development, being within a National Park. Likewise, the Tribal Park is likely to remain undeveloped (Mayo 2010, pers. comm.). Therefore, development does not appear to constitute a threat to *A. schmolliae,* now nor is it likely to in the foreseeable future.

Drought and Climate Change

Drought may affect *Astragalus schmolliae.* In 2002, severe drought caused most *A. schmolliae* individuals to remain dormant (Anderson 2004, p. 4). The total annual precipitation measured at MEVE in 2002 was 28 cm (11 in.), well below the average of 44 cm (17.5 in.) for 1948 to 2003. However, there were 5 years between 1948 and 1989 in which MEVE received less than 28 cm (11 in.). Tree ring analysis indicates that droughts were as common during the Ancestral Puebloan occupation of MEVE, from approximately A.D. 600 to A.D. 1300, as they are today. It is likely that drought is common enough that *A. schmolliae* can recover from its effects (Anderson 2004, p. 35), provided that severity and duration of drought does not exceed historical levels, or that threats such as weed invasion do not increase significantly as a result. Periodic drought causes *A. schmolliae* plants and seedlings to dry out during a given year, and contributes to increased fire frequency and weed invasion. We believe that drought has a low-level direct impact on the species. It also facilitates cheatgrass invasion and increased fire frequency and therefore is a threat to the species.

Projections for changes in climate within *Astragalus schmolliae* habitat are similar to those discussed above for *Astragalus microcymbus.* Overall, future projections for the Southwestern United States include increased temperatures, more intense and longer-lasting heat waves, and an increased probability of drought, that are worsened by higher temperatures, heavier downpours, increased flooding, and increased erosion (Karl *et al.* 2009, pp. 129–134). Projections for western Colorado indicate that temperature could increase an average of 2.5 °C (4.5 °F) by 2050 (UCAR 2009, pp. 1–14).

The increasing frequency of large-scale fires is largely due to periodic drought conditions preceded by years of wet climatic conditions that allowed heavy fuel loads to accumulate (Floyd *et al.* 2006, p. 247). The specific combination of a wet season followed by drought, which is likely to be exacerbated by climate change, is unpredictable at this time. We expect that *A. schmolliae* will be affected negatively by climate change effects on precipitation, but the available information is too speculative to conclude that climate change now threatens the species.

Summary of Factor A

The highest threat to *Astragalus schmolliae* habitat is the invasion of nonnative cheatgrass following wildfires, prescribed fires, and fire break clearings. Recent wildfires have burned 21 percent of the pinyon-juniper woodland habitat for the species. Another 19 percent has been burned and/or cleared to discourage further spread of wildfires within MEVE. Dense stands of cheatgrass have invaded all of these areas, which cover 53 percent of the habitat on MEVE, 40 percent of the entire range of the species. Cheatgrass is highly flammable and greatly increases fire frequency on both burned and nearby unburned but disturbed habitat. Although mature *A. schmolliae* plants recover strongly after fire, cheatgrass competes with seedlings for water and nutrients, and we are unsure of their long-term reproductive success in open areas exposed to drying sun and wind. Frequent fires are likely to prevent recovery of the pinyon-juniper woodland. There are no landscape-scale methods known to be effective in controlling cheatgrass. Therefore, we consider the dominance of cheatgrass in occupied *A. schmolliae* habitat to be a significant threat to the long-term survival of the species. Wildfires, prescribed fires, and clearings for fire breaks are considered a moderate threat to the species because they modify the habitat and facilitate the invasion of cheatgrass.

Drought facilitates increased fire frequency and, therefore, is found to be a threat to the species. Climate change may exacerbate the threat of cheatgrass invasion and more frequent wildfires, but we cannot foresee whether its effects are likely to threaten the continued existence of *Astragalus schmolliae.*

The impact of infrastructure development and visitor use is low. About 36 ha (90 ac) of *Astragalus schmolliae* habitat on MEVE have been used for roads, buildings, parking lots, etc., which is 2.3 percent of the species' entire range. No permanent development has occurred on the Tribal Park. Existing and foreseeable future development is considered a minor impact that does not threaten the continued existence of the species.

Post-fire weed control by aerial seeding of native grasses, mechanical removal, herbicides, and bio-control has reduced competition by invasive weeds other than cheatgrass, and there is little documentation of negative effects on *Astragalus schmolliae.* We consider the impacts of these activities to be low, not rising to the level of a threat to the species.

We find that *Astragalus schmolliae* is threatened by the present or threatened destruction, modification, or curtailment of the species' habitat or range, and these threats are expected to continue or increase in the foreseeable future.

Factor B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

We are not aware of any threats involving the overutilization or collection of *Astragalus schmolliae* for any commercial, recreational, scientific, or educational purposes. Therefore, we do not consider overutilization to be a threat to the species now, nor is it expected to become so in the foreseeable future.

Factor C. Disease or Predation

No diseases are known to affect *Astragalus schmolliae.* Therefore, we do not consider disease to be a threat to the species now, nor is it expected to become so in the foreseeable future.

Herbivory

Seed predation by snout beetles or weevils caused loss of seeds in about 12.5 percent of *Astragalus schmolliae* plants in plots sampled in 1980 (Friedlander 1980, p. 64). Beetle predation has not been observed again since 1980, and is not considered a threat to the species. Anderson (2001, p. 11) reported severe defoliation of *A. schmolliae* by larvae of the clouded sulfur butterfly (*Colias philodice*). Aphids also appeared to have an impact on reproductive output for this species (Anderson 2001, p. 11). These events were unusual, and insect predation is considered a low-level impact that does not rise to the level of a threat.

Herbivores such as mule deer (*Odocoileus hemionus*) and cottontail rabbits (*Sylvilagus audubonii*) browse on *Astragalus schmolliae* foliage, flowers, seed pods, and seedlings. Seedling mortality due to herbivory by rabbits or deer may be 1 to 10 percent (Anderson 2004, p. 40). Feral horses and stray cattle graze within the species' range, including the burned areas, but there is no evidence that they consume many *A. schmolliae.* Mature plants usually resprout the following spring after browsing by animals (Nelligan 2010, p. 1). Because the most abundant grass (*Poa fendleriana*) associated with *A. schmolliae* on the Tribal Park is highly palatable to cattle, grazing does not appear to be an issue in the southern portion of its range. Grazing by livestock is not permitted in MEVE. We consider herbivory an ongoing low-level impact to the species that does not rise to the level of a threat.

Summary of Factor C

No diseases are known to affect *Astragalus schmolliae.* With very little herbivory observed or documented, predation does not appear to pose a threat to *A. schmolliae.* Herbicide use occurs in a small portion of the species' habitat and is conducted so as to minimize impacts to the species. Accordingly, we find no evidence that predation or disease are a threat to *A. schmolliae* now, nor are they expected to become so in the foreseeable future.

Factor D. Inadequacy of Existing Regulatory Mechanisms

No local, State, or Federal laws or regulations specifically protect *Astragalus schmolliae.* The National Park Service Organic Act (1916, p. 1) states that wildlife are to be conserved and left unimpaired for future generations to enjoy. The MEVE mission is to preserve and protect more than 4,000 archeological sites and also to protect wildlife, birds, and other natural resources from willful destruction, disturbance, and removal (National Park Service 2010, p. 1). The plants are protected from visitor impacts in undeveloped areas of MEVE by regulations that restrict visitor access to designated trails, roads, and campgrounds to protect cultural resources. Visitors found hiking off developed areas or designated trails when not accompanied by a uniformed National Park Service employee are subject to penalties provided for in title 36 of the Code of Federal Regulations (maximum fine of $500 and 6 months imprisonment). The MEVE does not have a management plan specific to *A. schmolliae,* nor do their draft fire management plans or draft weed management plans specifically mention management for this species (San Miguel 2010a, pers. comm.). The draft fire management plan does not have any specific mention of managing for this species because “it would be expected to respond to fuels treatments and fire much the same as most other native perennial forbs” (Nelligan 2010, p. 3). We believe that this approach is inadequate because cheatgrass invasion will lead to more frequent and recurrent fires. These draft plans include rare plant surveys and avoidance (Nelligan 2010, p. 4.), but the plans are not finalized. The MEVE gives *A. schmolliae* special consideration when planning park projects in an effort to minimize impacts to the species (Nelligan 2010, p. 3). In 2010, MEVE will begin developing a specific management/conservation plan for *A. schmolliae* (Nelligan 2010, p. 3).

The habitat for *Astragalus schmolliae* on the Tribal Park is maintained as part of a 50,586-ha (125,000-ac) undeveloped area to protect cultural and environmental resources. Visitors are allowed only on guided tours. The management goal for *A. schmolliae* occupied habitat is for no ground-disturbing activities. Grazing is allowed (Clow 2010, pers. comm.), but we do not believe it substantially impacts the species. The Ute Mountain Ute Tribe is drafting a management plan for species at risk that will include monitoring of *A. schmolliae* plants and habitat. The final draft plan may be completed in 2010 or 2011 (Clow 2010, pers. comm.). The management plan will assist us in better understanding the extent to which the Tribe plans to conserve the species and its habitat.

Despite the positive management for *Astragalus schmolliae* that occurs within MEVE and the Tribal Park, no formal plans are in place for mitigation of threats from cheatgrass and other fire effects.

Summary of Factor D

We expect that *Astragalus schmolliae* habitat on the Tribal Park is generally protected from human disturbance by tribal regulations that do not allow public access or unauthorized activities. Human impacts in undeveloped areas of MEVE are minimized by regulations that restrict visitor access to designated trails, roads, and campgrounds to protect cultural resources. While currently needed management actions are ongoing and management plans have been drafted, no plans, policies, or regulations have been signed and implemented for the specific purpose of monitoring and protecting *A. schmolliae* from cheatgrass invasion and recurrent fires. We anticipate that MEVE and the Ute Mountain Ute Tribe will formalize their management plans within the near future.

The existing suite of local, State, and Federal laws that we evaluated do not address the primary threat to *Astragalus schmolliae* of cheatgrass invasion following fire. Additionally, the existing plans rely on the resilience of the plants and their ability to resprout after impacts, which is insufficient to provide for their recovery post-fire. Therefore, we find that the existing regulatory mechanisms for the species are inadequate and do not address the threats to the continued existence of the species.

Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence

Restricted Range

The global range of *Astragalus schmolliae* is restricted to pinyon-juniper woodlands on about 1,619 ha (4,000 ac) on 3 adjacent mesas. It does not grow in grasslands below the mesas or in adjacent shrublands at higher elevation on the mesas, nor has it been found in pinyon-juniper woodlands on nearby mesas. Such a restricted range makes the species vulnerable to habitat modification caused by wildfire, cheatgrass invasion, increased drought, and climate change, but is not considered a threat in itself.

Herbicides

Less than 10 percent of *Astragalus schmolliae* habitat on MEVE has been sprayed with herbicide to control identified high-density stands of *Cirsium canadense.* These herbicide applications have been performed carefully to minimize overspray that might land on native species (Nelligan 2010, p. 2). We are not aware of any use of herbicides on the tribal land habitat. Because we have no information indicating that herbicide use has affected *A. schmolliae,* we do not consider herbicide use to be a threat to the species now or in the foreseeable future.

Summary of Factor E

The small range of *Astragalus schmolliae* makes it vulnerable to existing and future threats, but does not constitute a threat in itself. Herbicide is used within the habitat, but is not known to affect the species. We are not aware of any other natural or manmade factors affecting the species' continued existence that present a current or potential threat to *A. schmolliae.* Therefore, we do not consider other natural or manmade factors affecting the continued existence of the species to be a threat now or within the foreseeable future.

General Threats Summary

Table 8 below provides an overview of the threats to *Astragalus schmolliae.* Of these threats, we consider degradation of habitat by fire followed by cheatgrass invasion and subsequent increase in fire frequency to be the most significant threats (Table 8). Cheatgrass is likely to increase given its rapid spread and persistence in habitat disturbed by wildfires, fire and fuels management and development of infrastructure, and the inability of land managers to control it on a landscape scale. Threats to *A. schmolliae* and its habitat from nonnative plant invasion following wildfires and fire and fuels management currently affect about 53 percent (431 ha (1,066 ac)) of the species' range on MEVE and 26 percent (212 ha (524 ac)) on the Tribal Park for a total of 40 percent of the species entire known range (Table 8). Fires, fire break clearings, and drought are considered moderate threats to *A. schmolliae.* Inadequate regulations are a low-level threat to the species. Other impacts not considered threats include post-fire native grass seeding, thistle invasion, infrastructure development, trampling, herbivory, weed treatments, and pollinator availability.

TABLE 8—THREAT SUMMARY FOR FACTORS AFFECTING *Astragalus schmolliae*

Listing factor	Threat or impact	Scope of threat or impact	Intensity	Exposure (%)	Likelihood of exposure	Species' response	Foreseeable future	Overall threat
A	Nonnative Invasive Cheatgrass.	Moderate	High	40	High	Increased fire frequency.	Increasing with rapid increase possible.	High.
A	Wildfires	Moderate	Moderate	21	High	Strong regrowth, unknown net reproduction, Increased cheatgrass & fire frequency.	More frequent	Moderate.
A	Prescribed burns completed + proposed.	Low	Moderate	0.37 + 0.34	High	Strong regrowth, unknown net reproduction, Increased cheatgrass & fire frequency.	Continue	Moderate.
A	Fire break clearing completed + proposed.	Low	Low	18 + 0.25	High	Outcompeted by grasses, decline of growth, increased cheatgrass.	Continue	Moderate.
A	Nonnative Invasive thistles.	Low	Moderate	5	High	Competition	Decline	None.
A	Periodic Drought.	Moderate	Moderate	100	Moderate	Plants fail to sprout, or seedlings dry up. Increased cheatgrass & fire frequency.	Unpredictable but likely to increase.	Moderate.
A	Climate Change.	Moderate?	Moderate?	100	Moderate	Increased fire frequency.	Climate models predict 40-year changes.	Moderate?
A	Infrastructure Development.	Low	Low	2.3	Moderate	Loss of habitat, loss of plants.	Small increase	None.
A	Trampling	Low	Low	1	Moderate	Loss of plants	Small increase	None.

TABLE 8—THREAT SUMMARY FOR FACTORS AFFECTING ASTRAGALUS SCHMOLLIAE—Continued

Listing factor	Threat or impact	Scope of threat or impact	Intensity	Exposure (%)	Likelihood of exposure	Species' response	Foreseeable future	Overall threat
A	Native Grass Seeding Post-fire.	Moderate	Low	21	High	Competition	Continue	None.
B	None			0			Not likely to change.	None.
C	Herbivory	Low	Low	?	Low	Plants re-sprout, seedlings destroyed.	Likely to continue & fluctuate with herbivore population.	None.
C	Chemical & Mechanical Weed Treatment.	Low	Low	7	Moderate	Some mortality, strong regrowth by survivors.	Continue	None.
D	National Park Laws & Regulations.	Moderate	Low	50	Moderate	No management plan for species.	Stronger protection.	Low.
D	Tribal Laws & Regulations.	Moderate	Low	50	Moderate	No management or monitoring.	Increase management actions.	Low.
E	Limited Range	High	Low	100	High	No range expansion.	Increased effect with drought & climate change.	None.
E	Pollinator Availability.	Low	Low	22	Low	Decreased seed production.	Increase with fire.	None.

Listing factors include: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence.
? indicates significant uncertainty.

Finding

As required by the Act, we considered the five factors in assessing whether *Astragalus schmolliae* is endangered or threatened throughout all or a significant portion of its range. We carefully examined the best available scientific and commercial information regarding the past, present, and future threats faced by the species. We reviewed the petition, information available in our files, other available published and unpublished information, and we consulted with *A. schmolliae* experts and other Tribal, State, and Federal agencies.

Threats to *Astragalus schmolliae* and its habitat from nonnative cheatgrass invasion following wildfires and management of fire and fuels currently affect about 40 percent of the species entire known range. Drought is a threat that facilitates cheatgrass invasion and increased fire frequency. Frequent wildfires, and at more frequent intervals than historically, have burned the pinyon-juniper forest habitat of *A. schmolliae* in the past two decades. Burned areas and fire breaks are being invaded by weedy species, especially cheatgrass. We consider the invasion of nonnative weedy plants, particularly cheatgrass, to be a threat of high magnitude to *A. schmolliae* because: (1) Cheatgrass has invaded all of the burned and disturbed habitat of *A. schmolliae;* (2) it competes with seedlings and resprouting adult plants for water and nutrients; (3) no landscape-scale successful control methods are available; and (4) the proven ability of cheatgrass to alter fire frequency, thereby facilitating further rapid spread, threatens both burned and previously unburned occupied habitat. We conclude that cheatgrass invasion is likely to cause fire frequency to increase, with the result that only small patches of undisturbed habitat will remain for *A. schmolliae* within the foreseeable future.

Because no regulations exist that address the primary threat to the species of cheatgrass invasion following wildfires, fire and fuels and management, and drought, we find that the existing regulatory mechanisms for the species are inadequate, and represent a threat of low magnitude.

On the basis of the best scientific and commercial information available, we find that listing of the *Astragalus schmolliae* as endangered or threatened is warranted. We will make a determination on the status of the species as endangered or threatened during the proposed listing process. As explained in more detail below, an immediate proposal of a regulation implementing this action is precluded by higher priority listing actions, and progress is being made to add or remove qualified species from the Lists of Endangered and Threatened Wildlife and Plants.

We have reviewed the available information to determine if the existing and foreseeable threats render the species at risk of extinction now, such that issuing an emergency regulation temporarily listing the species, as per section 4(b)(7) of the Act, is warranted. We determined that issuing an emergency regulation temporarily listing the species is not warranted at this time, because the threats acting on the species are not immediately impacting all of the species across its range to the point where the species will be immediately lost. However, if at any time we determine that issuing an emergency regulation temporarily listing *Astragalus schmolliae* is warranted, we will initiate this action at that time.

Listing Priority Number

The Service adopted guidelines on September 21, 1983 (48 FR 43098) to establish a rational system for utilizing available resources for the highest priority species when adding species to the Lists of Endangered or Threatened Wildlife and Plants or reclassifying species listed as threatened to endangered status. These guidelines, titled “Endangered and Threatened Species Listing and Recovery Priority Guidelines” address the immediacy and magnitude of threats, and the level of taxonomic distinctiveness by assigning priority in descending order to monotypic genera (genus with one species), full species, and subspecies (or equivalently, distinct population segments of vertebrates).

As a result of our analysis of the best available scientific and commercial information, we have assigned *Astragalus schmolliae* a Listing Priority Number (LPN) of 8, based on our finding that the species faces threats that are of moderate magnitude and are imminent. These threats include the present or threatened destruction, modification or curtailment of its habitat and the inadequacy of existing regulatory mechanisms. These threats are ongoing and, in some cases (such as nonnative species), are considered irreversible because large-scale invasions cannot be recovered to a native functioning ecosystem. Our rationale for assigning *A. schmolliae* an LPN of 8 is outlined below.

Under the Service's guidelines, the magnitude of threat is the first criterion we look at when establishing a listing priority. The guidance indicates that species with the highest magnitude of threat are those species facing the greatest threats to their continued existence. These species receive the highest listing priority. We consider the threats that *Astragalus schmolliae* faces to be moderate in magnitude because the major threats (weed invasion facilitated by fire, management of fire and fuels management, and drought, plus inadequacy of existing regulatory mechanisms), while serious and occurring rangewide, do not collectively rise to the level of high magnitude. For example, the last known populations are not about to be completely lost due to the effects of wildfires.

The magnitude of threat Factor A is considered moderate because about 40 percent of *Astragalus schmolliae* habitat has been modified by fires and fire-related activities, followed by unprecedented invasion by cheatgrass, facilitated by drought. Factor A is shown to have occurred in the past, and it is clearly a threat today and into the future. These impacts affect the competitive ability and reproductive success of *A. schmolliae* individuals, and increase the likelihood of more frequent fire intervals in the future.

The magnitude of threat Factor D is considered low. While no plans, policies, or regulations have been signed and implemented for the specific purpose of monitoring and protecting *Astragalus schmolliae* from cheatgrass invasion and recurrent fires, we anticipate that MEVE and the Ute Mountain Ute Tribe will formalize and implement their management plans within the near future.

Under our LPN guidelines, the second criterion we consider in assigning a listing priority is the immediacy of threats. This criterion is intended to ensure that the species facing actual, identifiable threats are given priority over those for which threats are only potential or that are intrinsically vulnerable but are not known to be presently facing such threats. We consider all of the threats to be imminent because we have factual information that the threats are identifiable and that the species is currently facing them in many portions of its range. These actual, identifiable threats are covered in greater detail in Factors A and D of this finding. All of the threats are ongoing and, therefore, imminent, although the likelihood varies (Table 8). In addition to their current existence, we expect these threats, except for inadequate regulations, to continue and likely intensify in the foreseeable future.

The third criterion in our Listing Priority Number guidance is intended to devote resources to those species representing highly distinctive or isolated gene pools as reflected by taxonomy. *Astragalus schmolliae* is a valid taxon at the species level and, therefore, receives a higher priority than subspecies, but a lower priority than species in a monotypic genus. Therefore, we assigned *A. schmolliae* an LPN of 8.

We will continue to monitor the threats to *Astragalus schmolliae* and the species' status on an annual basis, and should the magnitude or the imminence of the threats change, we will revisit our assessment of the LPN.

While we conclude that listing *Astragalus schmolliae* is warranted, an immediate proposal to list this species is precluded by other higher priority listings, which we address in the Preclusion and Expeditious Progress section below. Because we have assigned *A. schmolliae* an LPN of 8, work on a proposed listing determination for *A. schmolliae* is precluded by work on higher priority listing actions with absolute statutory, court-ordered, or court-approved deadlines and final listing determinations for those species that were proposed for listing with funds from fiscal year (FY) 2010. This work includes all the actions listed in the tables below under expeditious progress (see Tables 9 and 10).

Preclusion and Expeditious Progress

Preclusion is a function of the listing priority of a species in relation to the resources that are available and the cost and relative priority of competing demands for those resources. Thus, in any given fiscal year (FY), multiple factors dictate whether it will be possible to undertake work on a listing proposal regulation or whether promulgation of such a proposal is precluded by higher-priority listing actions.

The resources available for listing actions are determined through the annual Congressional appropriations process. The appropriation for the Listing Program is available to support work involving the following listing actions: Proposed and final listing rules; 90-day and 12-month findings on petitions to add species to the Lists of Endangered and Threatened Wildlife and Plants (Lists) or to change the status of a species from threatened to endangered; annual "resubmitted" petition findings on prior warranted-but-precluded petition findings as required under section 4(b)(3)(C)(i) of the Act; critical habitat petition findings; proposed and final rules designating critical habitat; and litigation-related, administrative, and program-management functions (including preparing and allocating budgets, responding to Congressional and public inquiries, and conducting public outreach regarding listing and critical habitat). The work involved in preparing various listing documents can be extensive and may include, but is not limited to: Gathering and assessing the best scientific and commercial data available and conducting analyses used as the basis for our decisions; writing and publishing documents; and obtaining, reviewing, and evaluating public comments and peer review comments on proposed rules and incorporating relevant information into final rules. The number of listing actions that we can undertake in a given year also is influenced by the complexity of those listing actions; that is, more complex actions generally are more costly. The median cost for preparing and publishing a 90-day finding is $39,276; for a 12-month finding, $100,690; for a proposed rule with critical habitat, $345,000; and for a final listing rule with critical habitat, the median cost is $305,000.

We cannot spend more than is appropriated for the Listing Program without violating the Anti-Deficiency Act (*see* 31 U.S.C. 1341(a)(1)(A)). In addition, in FY 1998 and for each fiscal year since then, Congress has placed a statutory cap on funds which may be expended for the Listing Program, equal to the amount expressly appropriated for that purpose in that fiscal year. This cap was designed to prevent funds appropriated for other functions under the Act (for example, recovery funds for removing species from the Lists), or for other Service programs, from being used for Listing Program actions (*see* House Report 105–163, 105th Congress, 1st Session, July 1, 1997).

Since FY 2002, the Service's budget has included a critical habitat subcap to ensure that some funds are available for other work in the Listing Program ("The critical habitat designation subcap will ensure that some funding is available to address other listing activities" (House Report No. 107—103, 107th Congress, 1st Session, June 19, 2001)). In FY 2002 and each year until FY 2006, the Service has had to use virtually the entire critical habitat subcap to address court-mandated designations of critical habitat, and consequently none of the critical habitat subcap funds have been available for other listing activities. In some FYs since 2006, we have been able to use some of the critical habitat subcap funds to fund proposed listing determinations for high-priority candidate species. In other FYs, while we were unable to use any of the critical habitat subcap funds to fund proposed listing determinations, we did use some of this money to fund the critical habitat portion of some proposed listing determinations so that the proposed listing determination and proposed critical habitat designation could be combined into one rule, thereby being more efficient in our work. In FY 2011 we anticipate that we will be able to use some of the critical habitat subcap funds to fund proposed listing determinations.

We make our determinations of preclusion on a nationwide basis to ensure that the species most in need of listing will be addressed first and also because we allocate our listing budget on a nationwide basis. Through the listing cap, the critical habitat subcap, and the amount of funds needed to address court-mandated critical habitat designations, Congress and the courts have in effect determined the amount of money available for other listing activities nationwide. Therefore, the funds in the listing cap, other than those needed to address court-mandated critical habitat for already listed species, set the limits on our determinations of preclusion and expeditious progress.

Congress identified the availability of resources as the only basis for deferring the initiation of a rulemaking that is warranted. The Conference Report accompanying Public Law 97–304, which established the current statutory deadlines and the warranted-but-precluded finding, states that the amendments were "not intended to allow the Secretary to delay commencing the rulemaking process for any reason other than that the existence of pending or imminent proposals to list species subject to a greater degree of threat would make allocation of resources to such a petition [that is, for a lower-ranking species] unwise." Although that statement appeared to refer specifically to the "to the maximum extent practicable" limitation on the 90-day deadline for making a "substantial information" finding, that finding is made at the point when the Service is deciding whether or not to commence a status review that will determine the degree of threats facing the species, and therefore the analysis underlying the statement is more relevant to the use of the warranted-but-precluded finding, which is made when the Service has already determined the degree of threats facing the species and is deciding whether or not to commence a rulemaking.

In FY 2010, $10,471,000 is the amount of money that Congress appropriated for the Listing Program (that is, the portion of the Listing Program funding not related to critical habitat designations for species that are already listed). Therefore, a proposed listing is precluded if pending proposals with higher priority will require expenditure of at least $10,471,000, and expeditious progress is the amount of work that can be achieved with $10,471,000. Since court orders requiring critical habitat work will not require use of all of the funds within the critical habitat subcap, we used $1,114,417 of our critical habitat subcap funds in order to work on as many of our required petition findings and listing determinations as possible. This brings the total amount of funds we had for listing actions in FY 2010 to $11,585,417.

The $11,585,417 was used to fund work in the following categories: Compliance with court orders and court-approved settlement agreements requiring that petition findings or listing determinations be completed by a specific date; section 4 (of the Act) listing actions with absolute statutory deadlines; essential litigation-related, administrative, and listing program-management functions; and high-priority listing actions for some of our candidate species. For FY 2011, on September 29, 2010, Congress passed a continuing resolution which provides funding at the FY 2010 enacted level. Until Congress appropriates funds for FY 2011, we will fund listing work based on the FY 2010 amount. In 2009, the responsibility for listing foreign species under the Act was transferred from the Division of Scientific Authority, International Affairs Program, to the Endangered Species Program. Therefore, starting in FY 2010, we use a portion of our funding to work on the actions described above as they apply to listing actions for foreign species. This has the potential to further reduce funding available for domestic listing actions. Although there are currently no foreign species issues included in our high-priority listing actions at this time, many actions have statutory or court-approved settlement deadlines, thus increasing their priority. The budget allocations for each specific listing action are identified in the Service's FY 2011 Allocation Table (part of our administrative record).

Based on our September 21, 1983, guidance for assigning an LPN for each candidate species (48 FR 43098), we have a significant number of species with a LPN of 2. Using this guidance, we assign each candidate an LPN of 1 to 12, depending on the magnitude of threats (high or moderate to low), immediacy of threats (imminent or nonimminent), and taxonomic status of the species (in order of priority: Monotypic genus (a species that is the sole member of a genus); species; or part of a species (subspecies, distinct population segment, or significant portion of the range)). The lower the listing priority number, the higher the listing priority (that is, a species with an LPN of 1 would have the highest listing priority).

Because of the large number of high-priority species, we have further ranked the candidate species with an LPN of 2 by using the following extinction-risk type criteria: International Union for the Conservation of Nature and Natural Resources (IUCN) Red list status/rank, Heritage rank (provided by NatureServe), Heritage threat rank (provided by NatureServe), and species currently with fewer than 50 individuals, or 4 or fewer populations. Those species with the highest IUCN rank (critically endangered), the highest Heritage rank (G1), the highest Heritage threat rank (substantial, imminent threats), and currently with fewer than 50 individuals, or fewer than 4 populations, originally comprised a group of approximately 40 candidate species ("Top 40"). These 40 candidate species have had the highest priority to receive funding to work on a proposed listing determination. As we work on proposed and final listing rules for those 40 candidates, we apply the ranking criteria to the next group of candidates with an LPN of 2 and 3 to determine the next set of highest priority candidate species. Finally, proposed rules for reclassification of threatened species to endangered are lower priority, since as listed species, they are already afforded the protection of the Act and implementing regulations. However, for efficiency reasons, we may choose to work on a proposed rule to reclassify a species to endangered if we can combine this with work that is subject to a court-determined deadline.

We assigned both *Astragalus microcymbus* and *A. schmolliae* an LPN of 8. For *A. microcymbus,* this is based on our finding that the species faces immediate and moderate magnitude threats from the present or threatened destruction, modification or curtailment of its habitat; predation; the inadequacy of existing regulatory mechanisms; and other natural or man-made factors affecting its continued existence. In the case of *A. schmolliae,* this is based on our finding that the species faces immediate and moderate magnitude threats from the present or threatened destruction, modification or curtailment of its habitat and the inadequacy of existing regulatory mechanisms. These threats are ongoing and, in some cases (*e.g.,* nonnative species), considered irreversible. Under our 1983 Guidelines, a "species" facing imminent moderate-magnitude threats is assigned an LPN of 7, 8, or 9 depending on its taxonomic status. Because both *A. microcymbus* and *A. schmolliae* are species, we assigned an LPN of 8 to each. Therefore, work on a proposed listing determination for *A. microcymbus* and *A. schmolliae* is precluded by work on higher priority candidate species (*i.e.,* species with LPN of 7); listing actions with absolute statutory, court ordered, or court-approved deadlines; and final listing determinations for those species that were proposed for listing with funds from previous FYs. This work includes all the actions listed in the tables below under expeditious progress.

With our workload so much bigger than the amount of funds we have to accomplish it, it is important that we be as efficient as possible in our listing process. Therefore, as we work on proposed rules for the highest priority species in the next several years, we are preparing multi-species proposals when appropriate, and these may include species with lower priority if they overlap geographically or have the same threats as a species with an LPN of 2. In addition, we take into consideration the availability of staff resources when we determine which high-priority species will receive funding to minimize the amount of time and resources required to complete each listing action.

As explained above, a determination that listing is warranted but precluded must also demonstrate that expeditious progress is being made to add and remove qualified species to and from the Lists of Endangered and Threatened Wildlife and Plants. As with our "precluded" finding, the evaluation of whether progress in adding qualified species to the Lists has been expeditious is a function of the resources available for listing and the competing demands for those funds. (Although we do not discuss it in detail here, we are also making expeditious progress in removing species from the list under the Recovery program in light of the resource available for delisting, which is funded by a separate line item in the budget of the Endangered Species Program. During FY 2010, we have completed two proposed delisting rules and two final delisting rules.) Given the limited resources available for listing, we find that we made expeditious progress in FY 2010 in the Listing Program and are making expeditious progress in FY 2011. This progress included preparing and publishing the following determinations:

FY 2010 AND FY 2011 COMPLETED LISTING ACTIONS

Publication date	Title	Actions	FR Pages
10/08/2009	Listing *Lepidium papilliferum* (Slickspot Peppergrass) as a Threatened Species Throughout Its Range.	Final Listing Threatened	74 FR 52013–52064
10/27/2009	90-day Finding on a Petition To List the American Dipper in the Black Hills of South Dakota as Threatened or Endangered.	Notice of 90-day Petition Finding, Not substantial.	74 FR 55177–55180
10/28/2009	Status Review of Arctic Grayling (*Thymallus arcticus*) in the Upper Missouri River System.	Notice of Intent to Conduct Status Review for Listing Decision.	74 FR 55524–55525
11/03/2009	Listing the British Columbia Distinct Population Segment of the Queen Charlotte Goshawk Under the Endangered Species Act: Proposed rule.	Proposed Listing Threatened	74 FR 56757–56770
11/03/2009	Listing the Salmon-Crested Cockatoo as Threatened Throughout Its Range with Special Rule.	Proposed Listing Threatened	74 FR 56770–56791
11/23/2009	Status Review of Gunnison sage-grouse (*Centrocercus minimus*).	Notice of Intent to Conduct Status Review for Listing Decision.	74 FR 61100–61102
12/03/2009	12-Month Finding on a Petition to List the Black-tailed Prairie Dog as Threatened or Endangered.	Notice of 12-month petition finding, Not warranted.	74 FR 63343–63366
12/03/2009	90-Day Finding on a Petition to List Sprague's Pipit as Threatened or Endangered.	Notice of 90-day Petition Finding, Substantial	74 FR 63337–63343
12/15/2009	90-Day Finding on Petitions To List Nine Species of Mussels From Texas as Threatened or Endangered With Critical Habitat.	Notice of 90-day Petition Finding, Substantial	74 FR 66260–66271
12/16/2009	Partial 90-Day Finding on a Petition to List 475 Species in the Southwestern United States as Threatened or Endangered With Critical Habitat.	Notice of 90-day Petition Finding, Not substantial and Substantial.	74 FR 66865–66905

FY 2010 AND FY 2011 COMPLETED LISTING ACTIONS—Continued

Publication date	Title	Actions	FR Pages
12/17/2009	12-month Finding on a Petition To Change the Final Listing of the Distinct Population Segment of the Canada Lynx To Include New Mexico.	Notice of 12-month petition finding, Warranted but precluded.	74 FR 66937–66950
1/05/2010	Listing Foreign Bird Species in Peru and Bolivia as Endangered Throughout Their Range.	Proposed Listing Endangered	75 FR 605–649
1/05/2010	Listing Six Foreign Birds as Endangered Throughout Their Range.	Proposed Listing Endangered	75 FR 286–310
1/05/2010	Withdrawal of Proposed Rule to List Cook's Petrel.	Proposed rule, withdrawal	75 FR 310–316
1/05/2010	Final Rule to List the Galapagos Petrel and Heinroth's Shearwater as Threatened Throughout Their Ranges.	Final Listing Threatened	75 FR 235–250
1/20/2010	Initiation of Status Review for *Agave eggersiana* and *Solanum conocarpum*.	Notice of Intent to Conduct Status Review for Listing Decision.	75 FR 3190–3191
2/09/2010	12-month Finding on a Petition to List the American Pika as Threatened or Endangered.	Notice of 12-month petition finding, Not warranted.	75 FR 6437–6471
2/25/2010	12-Month Finding on a Petition To List the Sonoran Desert Population of the Bald Eagle as a Threatened or Endangered Distinct Population Segment.	Notice of 12-month petition finding, Not warranted.	75 FR 8601–8621
2/25/2010	Withdrawal of Proposed Rule To List the Southwestern Washington/Columbia River Distinct Population Segment of Coastal Cutthroat Trout (*Oncorhynchus clarki clarki*) as Threatened.	Withdrawal of Proposed Rule to List	75 FR 8621–8644
3/18/2010	90-Day Finding on a Petition to List the Berry Cave salamander as Endangered.	Notice of 90-day Petition Finding, Substantial	75 FR 13068–13071
3/23/2010	90-Day Finding on a Petition to List the Southern Hickorynut Mussel (*Obovaria jacksoniana*) as Endangered or Threatened.	Notice of 90-day Petition Finding, Not substantial.	75 FR 13717–13720
3/23/2010	90-Day Finding on a Petition to List the Striped Newt as Threatened.	Notice of 90-day Petition Finding, Substantial	75 FR 13720–13726
3/23/2010	12-month Findings for Petitions to List the Greater Sage-Grouse (*Centrocercus urophasianus*) as Threatened or Endangered.	Notice of 12-month petition finding, Warranted but precluded.	75 FR 13910–14014
3/31/2010	12-Month Finding on a Petition to List the Tucson Shovel-Nosed Snake (*Chionactis occipitalis klauberi*) as Threatened or Endangered with Critical Habitat.	Notice of 12-month petition finding, Warranted but precluded.	75 FR 16050–16065
4/5/2010	90-Day Finding on a Petition To List Thorne's Hairstreak Butterfly as Threatened or Endangered.	Notice of 90-day Petition Finding, Substantial	75 FR 17062–17070
4/6/2010	12-month Finding on a Petition To List the Mountain Whitefish in the Big Lost River, Idaho, as Endangered or Threatened.	Notice of 12-month petition finding, Not warranted.	75 FR 17352–17363
4/6/2010	90-Day Finding on a Petition to List a Stonefly (*Isoperla jewetti*) and a Mayfly (*Fallceon eatoni*) as Threatened or Endangered with Critical Habitat.	Notice of 90-day Petition Finding, Not substantial.	75 FR 17363–17367
4/7/2010	12-Month Finding on a Petition to Reclassify the Delta Smelt From Threatened to Endangered Throughout Its Range.	Notice of 12-month petition finding, Warranted but precluded.	75 FR 17667–17680
4/13/2010	Determination of Endangered Status for 48 Species on Kauai and Designation of Critical Habitat.	Final Listing Endangered	75 FR 18959–19165
4/15/2010	Initiation of Status Review of the North American Wolverine in the Contiguous United States.	Notice of Initiation of Status Review for Listing Decision.	75 FR 19591–19592
4/15/2010	12-Month Finding on a Petition to List the Wyoming Pocket Gopher as Endangered or Threatened with Critical Habitat.	Notice of 12-month petition finding, Not warranted.	75 FR 19592–19607
4/16/2010	90-Day Finding on a Petition to List a Distinct Population Segment of the Fisher in Its United States Northern Rocky Mountain Range as Endangered or Threatened with Critical Habitat.	Notice of 90-day Petition Finding, Substantial	75 FR 19925–19935
4/20/2010	Initiation of Status Review for Sacramento splittail (*Pogonichthys macrolepidotus).*	Notice of Initiation of Status Review for Listing Decision.	75 FR 20547–20548

FY 2010 AND FY 2011 COMPLETED LISTING ACTIONS—Continued

Publication date	Title	Actions	FR Pages
4/26/2010	90-Day Finding on a Petition to List the Harlequin Butterfly as Endangered.	Notice of 90-day Petition Finding, Substantial	75 FR 21568–21571
4/27/2010	12-Month Finding on a Petition to List Susan's Purse-making Caddisfly (*Ochrotrichia susanae*) as Threatened or Endangered.	Notice of 12-month petition finding, Not warranted.	75 FR 22012–22025
4/27/2010	90-day Finding on a Petition to List the Mohave Ground Squirrel as Endangered with Critical Habitat.	Notice of 90-day Petition Finding, Substantial	75 FR 22063–22070
5/4/2010	90-Day Finding on a Petition to List Hermes Copper Butterfly as Threatened or Endangered.	Notice of 90-day Petition Finding, Substantial	75 FR 23654–23663
6/1/2010	90-Day Finding on a Petition To List *Castanea pumila* var. *ozarkensis*.	Notice of 90-day Petition Finding, Substantial	75 FR 30313–30318
6/1/2010	12-month Finding on a Petition to List the White-tailed Prairie Dog as Endangered or Threatened.	Notice of 12-month petition finding, Not warranted.	75 FR 30338–30363
6/9/2010	90-Day Finding on a Petition To List van Rossem's Gull-billed Tern as Endangered or Threatened.	Notice of 90-day Petition Finding, Substantial	75 FR 32728–32734
6/16/2010	90-Day Finding on Five Petitions to List Seven Species of Hawaiian Yellow-faced Bees as Endangered.	Notice of 90-day Petition Finding, Substantial	75 FR 34077–34088
6/22/2010	12-Month Finding on a Petition to List the Least Chub as Threatened or Endangered.	Notice of 12-month petition finding, Warranted but precluded.	75 FR 35398–35424
6/23/2010	90-Day Finding on a Petition to List the Honduran Emerald Hummingbird as Endangered.	Notice of 90-day Petition Finding, Substantial	75 FR 35746–35751
6/23/2010	Listing *Ipomopsis polyantha* (Pagosa Skyrocket) as Endangered Throughout Its Range, and Listing *Penstemon debilis* (Parachute Beardtongue) and *Phacelia submutica* (DeBeque Phacelia) as Threatened Throughout Their Range.	Proposed Listing Endangered Proposed Listing Threatened.	75 FR 35721–35746
6/24/2010	Listing the Flying Earwig Hawaiian Damselfly and Pacific Hawaiian Damselfly As Endangered Throughout Their Ranges.	Final Listing Endangered	75 FR 35990–36012
6/24/2010	Listing the Cumberland Darter, Rush Darter, Yellowcheek Darter, Chucky Madtom, and Laurel Dace as Endangered Throughout Their Ranges.	Proposed Listing Endangered	75 FR 36035–36057
6/29/2010	Listing the Mountain Plover as Threatened	Reinstatement of Proposed Listing Threatened.	75 FR 37353–37358
7/20/2010	90-Day Finding on a Petition to List *Pinus albicaulis* (Whitebark Pine) as Endangered or Threatened with Critical Habitat.	Notice of 90-day Petition Finding, Substantial	75 FR 42033–42040
7/20/2010	12-Month Finding on a Petition to List the Amargosa Toad as Threatened or Endangered.	Notice of 12-month petition finding, Not warranted.	75 FR 42040–42054
7/20/2010	90-Day Finding on a Petition to List the Giant Palouse Earthworm (*Driloleirus americanus*) as Threatened or Endangered.	Notice of 90-day Petition Finding, Substantial	75 FR 42059–42066
7/27/2010	Determination on Listing the Black-Breasted Puffleg as Endangered Throughout its Range; Final Rule.	Final Listing Endangered	75 FR 43844–43853
7/27/2010	Final Rule to List the Medium Tree-Finch (*Camarhynchus pauper*) as Endangered Throughout Its Range.	Final Listing Endangered	75 FR 43853–43864
8/3/2010	Determination of Threatened Status for Five Penguin Species.	Final Listing Threatened	75 FR 45497–45527
8/4/2010	90-Day Finding on a Petition To List the Mexican Gray Wolf as an Endangered Subspecies With Critical Habitat.	Notice of 90-day Petition Finding, Substantial	75 FR 46894–46898
8/10/2010	90-Day Finding on a Petition to List *Arctostaphylos franciscana* as Endangered with Critical Habitat.	Notice of 90-day Petition Finding, Substantial	75 FR 48294–48298
8/17/2010	Listing Three Foreign Bird Species from Latin America and the Caribbean as Endangered Throughout Their Range.	Final Listing Endangered	75 FR 50813–50842
8/17/2010	90-Day Finding on a Petition to List Brian Head Mountainsnail as Endangered or Threatened with Critical Habitat.	Notice of 90-day Petition Finding, Not substantial.	75 FR 50739–50742

FY 2010 AND FY 2011 COMPLETED LISTING ACTIONS—Continued

Publication date	Title	Actions	FR Pages
8/24/2010	90-Day Finding on a Petition to List the Oklahoma Grass Pink Orchid as Endangered or Threatened.	Notice of 90-day Petition Finding, Substantial	75 FR 51969–51974
9/1/2010	12-Month Finding on a Petition to List the White-Sided Jackrabbit as Threatened or Endangered.	Notice of 12-month petition finding, Not warranted.	75 FR 53615–53629
9/8/2010	Proposed Rule To List the Ozark Hellbender Salamander as Endangered.	Proposed Listing Endangered	75 FR 54561–54579
9/8/2010	Revised 12-Month Finding to List the Upper Missouri River Distinct Population Segment of Arctic Grayling as Endangered or Threatened.	Notice of 12-month petition finding, Warranted but precluded.	75 FR 54707–54753
9/9/2010	12-Month Finding on a Petition to List the Jemez Mountains Salamander (*Plethodon neomexicanus*) as Endangered or Threatened with Critical Habitat.	Notice of 12-month petition finding, Warranted but precluded.	75 FR 54822–54845
9/15/2010	12-Month Finding on a Petition to List Sprague's Pipit as Endangered or Threatened Throughout Its Range.	Notice of 12-month petition finding, Warranted but precluded.	75 FR 56028–56050
9/22/2010	12-Month Finding on a Petition to List *Agave eggersiana* (no common name) as Endangered.	Notice of 12-month petition finding, Warranted but precluded.	75 FR 57720–57734
9/28/2010	Determination of Endangered Status for the African Penguin.	Final Listing Endangered	75 FR 59645–59656
9/28/2010	Determination for the Gunnison Sage-grouse as a Threatened or Endangered Species.	Notice of 12-month petition finding, Warranted but precluded.	75 FR 59803–59863
9/30/2010	12-Month Finding on a Petition to List the Pygmy Rabbit as Endangered or Threatened.	Notice of 12-month petition finding, Not warranted.	75 FR 60515–60561
10/6/2010	Endangered Status for the Altamaha Spinymussel and Designation of Critical Habitat.	Proposed Listing Endangered	75 FR 61664–61690
10/7/2010	12-month Finding on a Petition to list the Sacramento Splittail as Endangered or Threatened.	Notice of 12-month petition finding, Not warranted.	75 FR 62070–62095
10/28/2010	Endangered Status and Designation of Critical Habitat for Spikedace and Loach Minnow.	Proposed Listing Endangered (uplisting)	75 FR 66481–66552
11/2/2010	90-Day Finding on a Petition to List the Bay Springs Salamander as Endangered.	Notice of 90-day Petition Finding, Not substantial.	75 FR 67341–67343
11/2/2010	Determination of Endangered Status for the Georgia Pigtoe Mussel, Interrupted Rocksnail, and Rough Hornsnail and Designation of Critical Habitat.	Final Listing Endangered	75 FR 67511–67550
11/2/2010	Listing the Rayed Bean and Snuffbox as Endangered.	Proposed Listing Endangered	75 FR 67551–67583
11/4/2010	12-Month Finding on a Petition to List Cirsium wrightii (Wright's Marsh Thistle) as Endangered or Threatened.	Notice of 12-month petition finding, Warranted but precluded.	75 FR 67925–67944

Our expeditious progress also includes work on listing actions that we funded in FY 2010 and FY 2011 but have not yet been completed to date. These actions are listed below. Actions in the top section of the table are being conducted under a deadline set by a court. Actions in the middle section of the table are being conducted to meet statutory timelines, that is, timelines required under the Act. Actions in the bottom section of the table are high-priority listing actions. These actions include work primarily on species with an LPN of 2, and, as discussed above, selection of these species is partially based on available staff resources, and when appropriate, include species with a lower priority if they overlap geographically or have the same threats as the species with the high priority. Including these species together in the same proposed rule results in considerable savings in time and funding, as compared to preparing separate proposed rules for each of them in the future.

ACTIONS FUNDED IN FY 2010 AND FY 2011 BUT NOT YET COMPLETED

Species	Action
Actions Subject to Court Order/Settlement Agreement	
6 Birds from Eurasia	Final listing determination.
Flat-tailed horned lizard	Final listing determination.
Mountain plover [4]	Final listing determination.

ACTIONS FUNDED IN FY 2010 AND FY 2011 BUT NOT YET COMPLETED—Continued

Species	Action
6 Birds from Peru	Proposed listing determination.
Pacific walrus	12-month petition finding.
Wolverine	12-month petition finding.
Solanum conocarpum	12-month petition finding.
Desert tortoise—Sonoran population	12-month petition finding.
Thorne's Hairstreak butterfly [3]	12-month petition finding.
Hermes copper butterfly [3]	12-month petition finding.
Utah prairie dog (uplisting)	90-day petition finding.
Actions with Statutory Deadlines	
Casey's june beetle	Final listing determination.
7 Bird species from Brazil	Final listing determination.
Southern rockhopper penguin—Campbell Plateau population	Final listing determination.
5 Bird species from Colombia and Ecuador	Final listing determination.
Queen Charlotte goshawk	Final listing determination.
5 species southeast fish (Cumberland darter, rush darter, yellowcheek darter, chucky madtom, and laurel dace) [4].	Final listing determination.
Ozark hellbender [4]	Final listing determination.
Altamaha spinymussel [3]	Final listing determination.
3 Colorado plants (*Ipomopsis polyantha* (Pagosa Skyrocket), *Penstemon debilis* (Parachute Beardtongue), and *Phacelia submutica* (DeBeque Phacelia)) [4].	Final listing determination.
Salmon crested cockatoo	Final listing determination.
Loggerhead sea turtle (assist National Marine Fisheries Service) [5]	Final listing determination.
2 mussels (rayed bean (LPN = 2), snuffbox No LPN) [5]	Final listing determination.
Mt Charleston blue [5]	Proposed listing determination.
CA golden trout [4]	12-month petition finding.
Black-footed albatross	12-month petition finding.
Mount Charleston blue butterfly	12-month petition finding.
Mojave fringe-toed lizard [1]	12-month petition finding.
Kokanee—Lake Sammamish population [1]	12-month petition finding.
Cactus ferruginous pygmy-owl [1]	12-month petition finding.
Northern leopard frog	12-month petition finding.
Tehachapi slender salamander	12-month petition finding.
Coqui Llanero	12-month petition finding/Proposed listing.
Dusky tree vole	12-month petition finding.
3 MT invertebrates (mist forestfly (*Lednia tumana*), *Oreohelix* sp.3, *Oreohelix* sp. 31) from 206 species petition.	12-month petition finding.
5 UT plants (*Astragalus hamiltonii, Eriogonum soredium, Lepidium ostleri, Penstemon flowersii, Trifolium friscanum*) from 206 species petition.	12-month petition finding.
2 CO plants (*Astragalus microcymbus, Astragalus schmolliae*) from 206 species petition.	12-month petition finding.
5 WY plants (*Abronia ammophila, Agrostis rossiae, Astragalus proimanthus, Boechere* (*Arabis*) *pusilla, Penstemon gibbensii*) from 206 species petition.	12-month petition finding.
Leatherside chub (from 206 species petition)	12-month petition finding.
Frigid ambersnail (from 206 species petition) [3]	12-month petition finding.
Platte River caddisfly (from 206 species petition) [5]	12-month petition finding.
Gopher tortoise—eastern population	12-month petition finding.
Grand Canyon scorpion (from 475 species petition)	12-month petition finding.
Anacroneuria wipukupa (a stonefly from 475 species petition) [4]	12-month petition finding.
Rattlesnake-master borer moth (from 475 species petition) [3]	12-month petition finding.
3 Texas moths (*Ursia furtiva, Sphingicampa blanchardi, Agapema galbina*) (from 475 species petition).	12-month petition finding.
2 Texas shiners (*Cyprinella* sp., *Cyprinella lepida*) (from 475 species petition).	12-month petition finding.
3 South Arizona plants (*Erigeron piscaticus, Astragalus hypoxylus, Amoreuxia gonzalezii*) (from 475 species petition).	12-month petition finding.
5 Central Texas mussel species (3 from 475 species petition)	12-month petition finding.
14 parrots (foreign species)	12-month petition finding.
Berry Cave salamander [1]	12-month petition finding.
Striped Newt [1]	12-month petition finding.
Fisher—Northern Rocky Mountain Range [1]	12-month petition finding.
Mohave Ground Squirrel [1]	12-month petition finding.
Puerto Rico Harlequin Butterfly [3]	12-month petition finding.
Western gull-billed tern	12-month petition finding.
Ozark chinquapin (*Castanea pumila* var. *ozarkensis*) [4]	12-month petition finding.
HI yellow-faced bees	12-month petition finding.
Giant Palouse earthworm	12-month petition finding.
Whitebark pine	12-month petition finding.

ACTIONS FUNDED IN FY 2010 AND FY 2011 BUT NOT YET COMPLETED—Continued

Species	Action
OK grass pink (*Calopogon oklahomensis*) [1]	12-month petition finding.
Ashy storm-petrel [5]	12-month petition finding.
Southeastern pop snowy plover & wintering pop. of piping plover [1]	90-day petition finding.
Eagle Lake trout [1]	90-day petition finding.
Smooth-billed ani [1]	90-day petition finding.
32 Pacific Northwest mollusks species (snails and slugs) [1]	90-day petition finding.
42 snail species (Nevada & Utah)	90-day petition finding.
Red knot *roselaari* subspecies	90-day petition finding.
Peary caribou	90-day petition finding.
Plains bison	90-day petition finding.
Spring Mountains checkerspot butterfly	90-day petition finding.
Spring pygmy sunfish	90-day petition finding.
Bay skipper	90-day petition finding.
Unsilvered fritillary	90-day petition finding.
Texas kangaroo rat	90-day petition finding.
Spot-tailed earless lizard	90-day petition finding.
Eastern small-footed bat	90-day petition finding.
Northern long-eared bat	90-day petition finding.
Prairie chub	90-day petition finding.
10 species of Great Basin butterfly	90-day petition finding.
6 sand dune (scarab) beetles	90-day petition finding.
Golden-winged warbler [4]	90-day petition finding.
Sand-verbena moth	90-day petition finding.
404 Southeast species	90-day petition finding.
Franklin's bumble bee [4]	90-day petition finding.
2 Idaho snowflies (straight snowfly & Idaho snowfly) [4]	90-day petition finding.
American eel [4]	90-day petition finding.
Gila monster (Utah population) [4]	90-day petition finding.
Arapahoe snowfly [4]	90-day petition finding.
Leona's little blue [4]	90-day petition finding.
Aztec gilia [5]	90-day petition finding.
White-tailed ptarmigan [5]	90-day petition finding.
San Bernardino flying squirrel [5]	90-day petition finding.
Bicknell's thrush [5]	90-day petition finding.
Sonoran talussnail [5]	90-day petition finding.
2 AZ Sky Island plants (*Graptopetalum bartrami* & *Pectis imberbis*) [5]	90-day petition finding.
I'iwi [5]	90-day petition finding.
High-Priority Listing Actions	
19 Oahu candidate species [2] (16 plants, 3 damselflies) (15 with LPN = 2, 3 with LPN = 3, 1 with LPN =9).	Proposed listing.
19 Maui-Nui candidate species [2] (16 plants, 3 tree snails) (14 with LPN = 2, 2 with LPN = 3, 3 with LPN = 8).	Proposed listing.
Dune sagebrush lizard (formerly Sand dune lizard) [4] (LPN = 2)	Proposed listing.
2 Arizona springsnails [2] (*Pyrgulopsis bernadina* (LPN = 2), *Pyrgulopsis trivialis* (LPN = 2)).	Proposed listing.
New Mexico springsnail [2] (*Pyrgulopsis chupaderae* (LPN = 2)	Proposed listing.
2 mussels [2] (sheepnose (LPN = 2), spectaclecase (LPN = 4))	Proposed listing.
8 Gulf Coast mussels (southern kidneyshell (LPN = 2), round ebonyshell (LPN = 2), Alabama pearlshell (LPN = 2), southern sandshell (LPN = 5), fuzzy pigtoe (LPN = 5), Choctaw bean (LPN = 5), narrow pigtoe (LPN = 5), and tapered pigtoe (LPN = 11)) [4].	Proposed listing.
Umtanum buckwheat (LPN = 2) [4]	Proposed listing.
Grotto sculpin (LPN = 2) [4]	Proposed listing.
2 Arkansas mussels (Neosho mucket (LPN = 2) & Rabbitsfoot (LPN = 9)) [4].	Proposed listing.
Diamond darter (LPN = 2) [4]	Proposed listing.
Gunnison sage-grouse (LPN = 2) [4]	Proposed listing.
Miami blue (LPN = 3) [3]	Proposed listing.
4 Texas salamanders (Austin blind salamander (LPN = 2), Salado salamander (LPN = 2), Georgetown salamander (LPN = 8), Jollyville Plateau (LPN = 8)) [3].	Proposed listing.
5 SW aquatics (Gonzales Spring Snail (LPN = 2), Diamond Y springsnail (LPN = 2), Phantom springsnail (LPN = 2), Phantom Cave snail (LPN = 2), Diminutive amphipod (LPN = 2)) [3].	Proposed listing.
2 Texas plants (Texas golden gladecress (*Leavenworthia texana*) (LPN = 2), Neches River rose-mallow (*Hibiscus dasycalyx*) (LPN = 2)) [3].	Proposed listing.
FL bonneted bat (LPN = 2) [3]	Proposed listing.
Kittlitz's murrelet (LPN = 2) [5]	Proposed listing.
Umtanum buckwheat (LPN = 2) [3]	Proposed listing.

ACTIONS FUNDED IN FY 2010 AND FY 2011 BUT NOT YET COMPLETED—Continued

Species	Action
21 Big Island (HI) species [5] (includes 8 candidate species—5 plants & 3 animals; 4 with LPN = 2, 1 with LPN = 3, 1 with LPN = 4, 2 with LPN = 8).	Proposed listing.
Oregon spotted frog (LPN = 2) [5]	Proposed listing.
2 TN River mussels (fluted kidneyshell (LPN = 2), slabside pearlymussel (LPN = 2) [5].	Proposed listing.
Jemez Mountain salamander (LPN = 2) [5]	Proposed listing.

[1] Funds for listing actions for these species were provided in previous FYs.
[2] Although funds for these high-priority listing actions were provided in FY 2008 or 2009, due to the complexity of these actions and competing priorities, these actions are still being developed.
[3] Partially funded with FY 2010 funds and FY 2011 funds.
[4] Funded with FY 2010 funds.
[5] Funded with FY 2011 funds.

We have endeavored to make our listing actions as efficient and timely as possible, given the requirements of the relevant law and regulations, and constraints relating to workload and personnel. We are continually considering ways to streamline processes or achieve economies of scale, such as by batching related actions together. Given our limited budget for implementing section 4 of the Act, these actions described above collectively constitute expeditious progress.

Astragalus microcymbus and *Astragalus schmolliae* will be added to the list of candidate species upon publication of this 12-month finding. We will continue to monitor the status of these species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

We intend that any proposed listing action for *Astragalus microcymbus* and *Astragalus schmolliae* will be as accurate as possible. Therefore, we will continue to accept additional information and comments from all concerned governmental agencies, the scientific community, industry, or any other interested party concerning this finding.

References Cited

A complete list of references cited is available on the Internet at *http://www.regulations.gov* and upon request from the Western Colorado Ecological Services Office (see **ADDRESSES** section).

Author(s)

The primary authors of this notice are the staff members of the Western Colorado Ecological Services Office.

Authority

The authority for this action is section 4 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Dated: December 6, 2010.

Paul R. Schmidt,

Acting Director, Fish and Wildlife Service.

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