U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Astragalus anserinus* Atwood et al. 1984

COMMON NAME: (Goose Creek milkvetch)

LEAD REGION: Region 6

INFORMATION CURRENT AS OF: April 2010

STATUS/ACTION

_____Species assessment - determined species did not meet the definition of endangered or threatened under the ESA and, therefore, was not elevated to Candidate status

_____New candidate

__X__Continuing candidate

_____Non-petitioned

__X__Petitioned - Date petition received: **February 3, 2004**

__X__90-day positive – August 16, 2007(72 FR 46023)

__X__12-month warranted but precluded – September 10, 2009 (74 FR 46521)

__X__Did the petition request a reclassification of a listed species? **NO**

FOR PETITIONED CANDIDATE SPECIES

a) Is listing warranted (if yes, see summary of threats below)? **YES**

b) To date, has publication of a proposal to list been precluded by other higher priority listing actions? **YES**

c) Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for the species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The "Progress on Revising the Lists" section of the current CNOR (*http://endangered.fws.gov/*) provides information on listing actions taken during the last 12 months.

_____Listing priority change

Former LP: __5___

New LP: __No Change__

Date when the species first became a Candidate (as currently defined): **September 10, 2009**

___ Candidate removal: Former LP: ___

___ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

___U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.
___ F – Range is no longer a U.S. territory.
___ I – Insufficient information exists on biological vulnerability and threats to support listing.
___ M – Taxon mistakenly included in past notice of review.
___ N – Taxon does not meet the Act's definition of "species."
___ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Flowering Plants, Fabaceae (Bean Family)

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Idaho, Nevada, Utah

CURRENT STATES/ COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Cassia County, Idaho; Elko County, Nevada; Box Elder County, Utah

LAND OWNERSHIP:

The majority (over 80%) of *Astragalus anserinus* sites in Idaho, Utah, and Nevada occur on Federal lands managed by the BLM (U.S. Fish and Wildlife Service (USFWS) 2008a, 17 pp.). The rest of the sites occur as small populations on private and state lands in Utah and on private land in Idaho and Nevada (Baird and Tuhy 1991, p. 14; Morfield 1992, appendix maps, Smith 2007, appendix maps).

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BIOLOGICAL INFORMATION

Species Description

Astragalus anserinus is a low-growing, matted, perennial forb (flowering herb) in the legume (pea) family (Fabaceae). Gray hairs cover the leaves giving the plant a gray-green appearance. *A. anserinus* has pink-purple flowers and brownish-red curved seed pods (Mancuso and Moseley 1991, p. 4). This species is distinguished from *A. calycosus* (Torrey's milkvetch), *A. purshii* (woollypod milkvetch), and *A. newberryi* (Newberry's milkvetch), the three other mat-forming *Astragalus* species found in the Goose Creek drainage, primarily by its smaller leaflets and flowers, and the color and shape of the seed pods (Baird and Tuhy 1991, p. 1; Mancuso and Moseley 1991, pp. 4–5).

Taxonomy

A. anserinus was first collected in 1982 by Duane Atwood from a location in Box Elder County, Utah, and subsequently described in 1984 (Atwood et al. 1984, p. 263).

Habitat and Life History

A. anserinus occurs in a variety of habitats, but is typically associated with dry tuffaceous soils from the Salt Lake Formation that have a silty to sandy texture (Mancuso and Moseley 1991, p. 12). The soil series where *A. anserinus* is located include Bluehill fine sandy loam, Codquin gravelly sandy loam, Cottonthomas fine sandy loam, and Tomsherry fine sandy loam (Hardy 2005, p. 4, Mancuso and Moseley 1991, p. 12). The species grows on steep or flat sites, with soil textures ranging from silty to sandy to somewhat gravelly. These habitats can vary from stable areas with little erosion to washes or steep slopes where erosion is common. It appears that the species tolerates, and may proliferate with, some level of disturbance, based on its occurrence on steep slopes where downhill movement of soil is common, within eroded washes, and along road margins and edges of cattle trails. However, individuals have not been observed where vehicle or livestock travel is frequent or where water flows through washes on a regular basis (Hardy 2005, pp 1-4; Baird and Tuhy 1991, pp. 2-5; Mancuso and Moseley 2-4; Smith 2007, p. 2).

A. anserinus is generally not found on north-facing slopes, but is found on most other slope aspects within sparsely vegetated areas in sagebrush and juniper habitats. The estimated total plant cover (of all species) at sites where *A. anserinus* occurs is between 10-35% (Hardy 2005, p. 4; Smith 2007, p. 2). The dominant native species within the general surrounding plant community include *Artemisia tridentata* ssp. *wyomingensis* (Wyoming big sagebrush), *Juniperus osteosperma* (Utah juniper), *Chrysothamnus viscidiflorus* (green or yellow rabbitbrush), *Poa secunda* (Sandberg's bluegrass), and *Hesperostipa comata* (needle and thread grass). *A. anserinus* is frequently associated with a suite of native species that reside on the tuffaceous sand (Baird and Tuhy 1991, pp. 2–3) including: *Achnatherum hymenoides* (Indian ricegrass), *Chaenactis douglasii* (Douglas' dustymaiden), *Cryptantha humilis* (roundspike cryptantha), *Eriogonum microthecum* (slender buckwheat), *Eriogonum ovalifolium* (cushion buckwheat), *Ipomopsis congesta* (= Gilia congesta; ballhead gilia), *Mentzelia albicaulis* (whitestem blazingstar), and *Phacelia hastata* (silverleaf phacelia). Several nonnative species also co-occur with *A. anserinus*. Another Goose Creek drainage endemic, *Penstemon idahoensis* (Idaho penstemon), is found near *A. anserinus*, but these species are seldom found immediately adjacent to one another. Other sensitive species in the area include *Arabis falcatoria* (= *Boechera falcatoria*; falcate rockcress), and *Potentilla cottamii* (Cottam's cinquefoil) (Franklin 2005, pp. 9–10, 159–160).

A. anserinus typically flowers from late May to early June. The species is assumed to be insect-pollinated, but the specific pollinators are unknown (Baird and Tuhy 1991, p. 3). Fruit set begins in early June, and fruits remain on the plants for several months. Mechanisms of seed dispersal also are unknown, but may include wind dispersion of seed pods and insect or bird agents (Baird and Tuhy 1991, p. 3). Because *A. anserinus* often grows on slopes and because the seed pods are found close to the ground below the vegetative portions of the plant, water or gravity dispersal also may be a dispersal mechanism. Clusters of seedlings are occasionally observed on abandoned ant hills, which could suggest some ant dispersal (USFWS 2006b, pp. 1-6). Little scientific research specific to *A. anserinus* was conducted beyond a basic species description and various survey efforts. Limited information is available regarding *A. anserinus* longevity.

Historic Range and Distribution

The species' is historically and currently (see Status of Species, below) known from only the Goose Creek drainage in Cassia County, Idaho; Elko County, Nevada; and Box Elder County, Utah (Baird and Tuhy 1991, pp. 5-16; Mancuso and Moseley 1991, pp. 1-14; Smith 2007, pp. 1-5). The Goose Creek drainage occurs within the Northern Basin and Range ecosystem (Bailey et al. 1994, map).

Status of the Species

As previously described, *A. anserinus* is endemic to the Goose Creek drainage in Idaho, Nevada, and Utah. *A. anserinus* is known from 19 Element Occurrence (EO) records (5 in Idaho, 10 in Nevada, and 4 in Utah) (Idaho Conservation Data Center (ICDC) 2007b, p. 4; Smith 2007, p. 1; Utah Conservation Data Center (UCDC) in litt. 2007, map; USFWS 2008b, 17 pp.). The EOs are areas where a species is recorded to be present.

The known EOs occur at elevations ranging between 4,900-5,885 feet (ft) (1,494-1,790 meters (m)) (ICDC 2007b, p. 2; Smith 2007, Table 1). Most *A. anserinus* EOs are within an approximate 20-mi (32-km) long by 4-mi (6.4-km) wide area, oriented in a southwest to northeasterly direction along Goose Creek. However, one *A. anserinus* EO was documented outside of the Goose Creek watershed approximately 2 mi (3.2 km) south of any other EOs.

Estimating the total *A. anserinus* population size and population trends is complicated because of the variability in the species annual abundance, and the different census and survey methods that are employed. For example, plant abundance at 1 site in Idaho over a 4-year period varied significantly: 138 plants were counted in 2004; 67 plants in 2005; 135 plants in 2006; and 69 plants in 2007 (USFWS 2008a, 17 pp.). In 2007, a significant wildfire went through nine *A. anserinus* sites in Utah and Nevada (see Factor A, below). Generally, the 2004 and 2005 census counts yielded higher numbers than previously estimated (USFWS 2008a, pp. 1–6); however, monitoring efforts have not occurred regularly enough or over a long enough period to allow us to statistically analyze population trends.

Census efforts in 2008 at three sites that were not affected by the significant wildfire in 2007 demonstrated a general decrease in plant counts when compared to survey data from 2004-2005 data (5.4% increase; 76.3% decrease, and 79.0% decrease, respectively) (USFWS 2008b, Table 2). Using the best available data for each *A. anserinus* site, we estimate that there were approximately 60,000 individuals distributed across the three states prior to the 2007 wildfires (10% in Idaho, 25% in Nevada, and 65% in Utah) (USFWS 2008a, 17 pp.; USFWS 2008b, Table 1).

THREATS

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

Our September 10, 2009, final rule (74 FR 46521) evaluated potential threats to *A. anserinus*.

Our discussion below is focused on the primary threats affecting the species.

Wildfire and Wildfire Management

Wildfire was not documented within *A. anserinus* habitat prior to 2000 (A. Feldhausen, in litt. 2007, p. 3; R. Hardy, Salt Lake City BLM, in litt. 2008, p. 1), although undoubtedly fires occasionally occurred in the past. *A. anserinus* habitat is normally sparsely vegetated (e.g., typically 10-30% total vegetative cover), which makes it less vulnerable to wildfires because of the lack of fuels to sustain fire over large areas. However, wildfires occurred in *A. anserinus* habitat in Idaho in 2000, and another wildfire occurred in Nevada and Utah in 2007.

We conducted initial surveys of the species in 2004 and 2005 (USFWS 2008a, 17 pp.). These surveys consequently provided us with a baseline to evaluate the effects of the 2007 wildfire. Based on pre-fire data, the 2007 wildfire in Nevada and Utah completely burned 3 EOs and portions of 5 other EOs containing approximately 53% of all known *A. anserinus* individuals (31,500 of 60,000 individuals). The 2007 wildfire also burned 25% of the known occupied habitat of 400 ac (164 ha) (USFWS 2008c, Table 1). The 2007 wildfire burned between 21-100% of the total acreage at 87 *A. anserinus* sites; 4 sites burned completely and 3 sites were partially burned (USFWS 2008b, Table 1 and Table 2). Populations at these burned sites declined dramatically following the 2007 wildfire (see Table 1) (USFWS 2008b, Table 2). The sites that burned completely experienced the greatest decline in population numbers (see Table 1; USFWS 2008b, Table 2). Surveys from 2009 (Mancuso 2010) show a continuation of the same trends noted in 2008.

TABLE 1. Census results from the 2008 post-wildfire surveys.

EO # and Site #	Burned or Unburned	YEAR	2004/2005 # of Individuals	2008 # of Individuals	Individuals % Change	% Area Burned
N004–1	Unburned	2004	652	687	+5.4	0
U001–7–3	Part-Burned	2004	1,742	1,134	-34.9	21.3
N001–1	Part-Burned	2004	541	173	-68.0	unknown
U001–6–1	Unburned	2004	1,458	346	-76.3	0
U001–4–35	Unburned	2005	3,081	647	-79.0	0
U001–4–17	Part-Burned	2005	7,486	772	-89.7	94.6
U001–4–33	Part-Burned	2005	349	31	-91.1	unknown
U001–4–30	Part-Burned	2005	175	13	-92.6	81.1
U001–NV–1	Burned	2005	3,695	188	-94.9	100
U001–4–12	Burned	2005	314	6	-98.1	100
U001–NV–2	Burned	2005	1,115	20	-98.2	100
U001–4–34	Burned	2005	224	0	-100.0	100

Despite the significant declines in the number of individuals and occupied acreage detected in the 2008 surveys, some *A. anserinus* individuals survived the effects of the fire. After a wildfire, adults may survive and go dormant, plants may re-sprout from the base, or plants can re-establish from seed (Brown and Smith 2000; USFWS 2008a, 2008b, 2008c; Mancuso 2010, pp. 8-11). Thus, we do not believe that the 2007 wildfire by itself will cause the loss of the species from the

area.

However, we believe that wildfire frequency could increase within *A. anserinus* habitat due to consequent changes in the vegetation community, particularly toward a nonnative monoculture such as *Bromus tectorum (*see Nonnative Species, below; 74 FR 46521, September 10, 2009). *B. tectorum* invasions result in increased fire return intervals (D'Antonio and Vitousek 1992, pp. 74–75). Thus, invasions of *B. tectorum* increase the possibility that another wildfire will occur before *A. anserinus* can recover from the loss of individuals associated with the 2007 wildfire. Future wildfires in the area could further reduce the remaining population, or hinder its recovery.

Wildfire management can include prescribed burning; activities associated with fighting wildfires such as road and fire line construction, staging areas, and retardant application; and post-wildfire restoration efforts such as disking and seeding. Such activities can destroy habitat and kill or injure individual *A. anserinus* plants (74 FR 46521, September 10, 2009).

Nonnative Species

Our September 10, 2009, final rule describes the noxious and nonnative weed locations relative to our EOs (74 FR 46521, September 10, 2009), and potential effects of these species to *A. anserinus*. Invasive nonnative plants (weeds) occupy and alter diverse native communities, often resulting in nonnative plant monocultures that support little wildlife. Many experts believe that following habitat destruction, invasive nonnative plants are the next greatest threat to biodiversity (Randall 1996, p. 370). Invasive nonnative plants alter different ecosystem attributes including geomorphology, fire regime, hydrology, microclimate, nutrient cycling, and productivity (Dukes and Mooney 2004, p. 4). Invasive nonnative plants also can detrimentally affect native plants through competitive exclusion, alteration of pollinator behaviors, niche displacement, hybridization, and changes in insect predation. Examples are widespread among taxa and locations or ecosystems (D'Antonio and Vitousek 1992, pp. 74-75, Olson 1999, pp. 6-18; Mooney and Cleland 2001, pp. 5446–5451).

Nonnative plants that were not intentionally seeded and are known to occur at *A. anserinus* sites include *Alyssum desertorum* (desert madwort), *Bromus tectorum* (cheatgrass), *Descurainia sophia* (flixweed), *Euphorbia esula* (leafy spurge), and *Halogeton glomeratus* (halogeton). In 2008, we also located one *Hyoscyamus niger* (black henbane) individual within one *A. anserinus* site. In previous years, this species was only observed as a few plants along Goose Creek road. The two nonnative species of most concern to *A. anserinus* are *B. tectorum* because of their possible role in altering the wildfire regime (see *Wildfire* above), and *E. esula* because of its invasive capabilities (DiTomaso 2000, p. 255). Both of these nonnative plant species occur within *A. anserinus* populations and are discussed in more detail below.
Bromus tectorum (cheat grass) is an annual grass with a shallow root system that germinates early in the growing season and utilizes soil moisture at the expense of most native plant species (Billings 1990, pp. 301-302). The species dries early in the growing season usually before the dry summers common to the Great Basin. Once dry, *B. tectorum* is highly flammable and often occurs in dense swards that effectively carry wildfire. The net effect of *B. tectorum* invasion is a

"positive feedback from the initial colonization in the interstices of shrubs, followed by fire, to dominance by *B. tectorum* and more frequent fire" (D'Antonio and Vitousek 1992, pp. 74–75).

Prior to the 2007 wildfire which affected 4 of the 19 EOs, *B. tectorum* was observed throughout the range of *A. anserinus*, but was generally encountered at low density. *Bromus tectorum* was generally found at less than 5% cover when it occurred with *A. anserinus*, based on estimates from the 2004 and 2005 census efforts. At *A. anserinus* sites with either a southern slope exposure or where livestock trampling was observed to be more prevalent, the *B. tectorum* percentage cover was generally higher (e.g., between 10-20%, although as high as 70-80% in a few cases) (USFWS 2008b, 17 pp.).

We do not yet know how the 2007 wildfire may have affected *Bromus tectorum* abundance. Field observations during the 2008 re-census effort suggest that *B. tectorum* infestations were generally similar to what they were before the 2007 fire within and outside of areas burned, although these observations were not well quantified. However, we are aware that the species often proliferates as a result of wildfire (D'Antonio and Virtuosic 1992, pp. 74–75). Additional years of monitoring are necessary to determine if the 2007 wildfire results in an increase in nonnative, invasive plant species such as *B. tectorum*.

Euphorbia esula (leafy spurge) is a perennial forb with a deep and extensive spreading root system, and seeds that are effectively dispersed by violent opening of the species' seed pod and easily dispersed by wind (Selleck et al. 1962 pp. 1-290). *E. esula* reduces native plant species diversity (Selleck et al. 1962, p. 21; Butler and Cogan 2004, p. 308). We do not have specific information on the overlap of *E. esula* with *A. anserinus*. However, *E. esula* is known to form monocultures in the Goose Creek drainage, and as such it could out-compete *A. anserinus* in some locations (Feldhausen 2007, pp. 1-2; Hardy 2005, p. 2; Belcher and Wilson 1989, p. 174).

Some nonnative species were intentionally introduced as rangeland plants. These species include *Agropyron fragile* (Vavilov Siberian wheatgrass), *Elymus junceus* (Russian wild rye), *Elymus lanceolatus* ssp. *lanceolatus* (Critana thickspike wheatgrass), *Linum perenne* (Apar blueflax), *Medicago sativa* (Ladak alfalfa), and *Thinopyrum ponticum* (= *Agropyron elongatum*, tall wheatgrass) (M. Gates, in litt. 2008e, p. 1; R. Hardy, in litt. 2008, p. 1). The most commonly seeded nonnative rangeland species is Agropyron cristatum (crested wheatgrass).

Agropyron cristatum was planted in the Goose Creek drainage before 1970 (Hardy 2005, p. 2; Feldhausen. 2007, pp. 1-2; Howard 2007, p. 3). However, the seedings of *Agropyron cristatum* that were conducted prior to the 2007 wildfire were generally separated from *A. anserinus* areas, and did not appear to be spreading significantly from the areas where the species was planted. Because of this separation, populations of *Agropyron cristatum* established due to the pre-2008 seeding activities were not considered to be a threat to *A. anserinus*.
The Utah BLM disked and seeded approximately 6% of the total *A. anserinus* habitat range-wide during restoration activities associated with the 2007 wildfire (USFWS 2008c, Table 4); much of this was within the largest EO, and *A. cristatum* was included in the seed mix. We do not fully understand the effects of the seeding efforts on occupied *A. anserinus* areas because of the short time that has elapsed since the restoration activities. However, the post-2007 wildfire seeding

activities directly overlapped approximately 10% of the pre-wildfire *A. anserinus* individuals. *Agropyron cristatum* is generally able to outcompete slower-developing native species because of its drought tolerance, fibrous root system, and good seedling vigor (Lesica and DeLuca 1998, p. 1; Pyke and Archer 1991, p. 4; Bunting et al. 2003, p. 82; Pellant and Lysne 2005, pp. 82–83; USDA 2006, p 1). *A. cristatum* plantings are very stable and persistent, and may inhibit or retard the development of a native plant community (Hull and Klomp 1966, p. 7; 1967, p. 227; Marlette and Anderson 1986, p. 173).

Livestock Use (Trampling, Water Developments, and Habitat Degradation)

Livestock use was documented at every *A. anserinus* EO, and all sites on public land are within active grazing allotments (Hardy 2005, pp. 1-4; Feldhausen 2007, pp. 1-2). Livestock can trample plants; however, many of the *A. anserinus* sites are on sloping hillsides that livestock generally avoid. In addition, *A. anserinus* individuals are often observed along the margins of livestock trails, suggesting the species can persist at low levels of livestock disturbance (Hardy 2005, pp. 1-4; Feldhausen 2007, pp. 1-2).

Summary of Factor A

The 2007 wildfire burned 53% of the known *A. anserinus* individuals. We do not yet fully understand the long-term impacts of fire to *A. anserinus.* The threat of the 2007 wildfire may be exacerbated in the future if nonnative plants such as *Bromus tectorum* invade the ecosystem and increase the area's fire return.

The threat presented from competition by seeded and unseeded nonnative plant species will likely add to the negative wildfire effects on the *A. anserinus* population, further reducing its ability to recover. The mechanical damage to *A. anserinus* individuals from construction activities and the disking and seeding efforts related to wildfire management activities also were detrimental to several affected *A. anserinus* populations.

Overall, we consider the present or threatened destruction, modification, or curtailment of its habitat or range to be high in magnitude and non-imminent.

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

We are not aware of any threats involving the overutilization or collection of *A. anserinus* for any commercial, recreational, scientific, or educational purposes at this time.

C. Disease or Predation

Herbivory does not appear to be a threat to the species. We are unaware of any herbivory attributable to livestock, native ungulates, or birds. Some plants show signs of being eaten near the ground, possibly by rabbits (G. Glenne, Idaho Fish and Wildlife Office, in litt. 2006. Fungus and caterpillars also occur on some plants, and may cause some withering, but it is not known if this is a widespread occurrence (USFWS 2008a, 17 pp.). In addition, several plants were observed withering, particularly after the heavy rains in May of 2005 (ICDC 2007a, p.3).

D. The Inadequacy of Existing Regulatory Mechanisms

No Federal, state, county or local laws or regulations specifically protect *A. anserinus*. Approximately 20% of the species range occurs on non-Federal lands; there are no regulations protecting the species on non-Federal lands.

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. The Federal Land Policy and Management Act requires the BLM to develop and revise land-use plans when appropriate (43 U.S.C. 1712 [a]). The BLM Resource Management Plans for Idaho (Cassia) (BLM 1985a), Nevada (Wells) (BLM 1985b), and Utah (Box Elder) (BLM 1986 p. 9, 13, 20, 31, 32) do not address *A. anserinus* nor provide any special management provisions for this species.

After the wildfire that occurred in 2007, the Utah BLM disked and seeded approximately 6% of the total area rangewide (see Factor A) (USFWS 2008c, Table 4). As the species was not listed as a candidate species at the time, there were no protections afforded *A. anserinus*. However, the species was a Special Status Species and as such should have been afforded plan consideration for BLM actions according to BLM's 6840 Manual, which mandates protection of these species so they do not trend toward endangerment.

The BLM has established range management facilities to control livestock grazing within the species occupied habitat. These include: fencing and water lines which will avoid populations of *A. anserinus* and direct livestock away from areas inhabited by the species (Hardy 2005, pp. 1-4; Feldhausen 2007, pp. 1-2).

We consider the threat presented by inadequate regulatory mechanisms to be high in magnitude, but non-imminent. Existing regulations do not mandate specific protective measures for the species; however, BLM in future land use planning and associate documents (RMPs) should consider specific management goals and direction for this species.

E. Other Natural or Manmade Factors Affecting its Continued Existence

We have no information concerning pollinators, genetic diversity, or germination that is specific to *A. anserinus.* As such, we are unable to determine whether these or any other presently unknown natural or manmade factors could potentially affect the ability of this species to survive

into the foreseeable future. With regard to climate change, *Bromus tectorum* and other C3 grasses (C3 refers to one of three alternative photosynthetic pathways) are likely to thrive as atmospheric carbon dioxide increases, likely influencing wildfire frequency (Mayeux et al. 1994, p. 98; Winslow et al. 2003, pp. 168-170). Further, as the climate changes, the abundance and distribution of native flora and fauna also will likely change. While the extent to which climate change may affect *A. anserinus* habitat is not fully understood, those effects could result in physiological stress or the loss or alteration of habitat. In addition, an increased occurrence of extreme events, such as fire and drought, also could impact the remaining populations. Endemic species with limited ranges and adapted to localized conditions would be expected to be more severely impacted by climate change (Midgley et al. 2002, p. 448) than those considered habitat generalists. Because the specific effects of probable climate change are unknown at this time, we are not able to predict the foreseeable magnitude of this potential threat with confidence.

Since most EOs are comprised of many sites that are within 0.6 mi (1 km) of each other, genetic exchange should still be possible given appropriate pollination vectors, although the scale at which it occurs may be reduced because of a reduced number of individuals. One exception may be an EO in Nevada, which was small and isolated to begin with and burned in 2007. Our 2008 field inspection observed only two plants, so the genetic bottleneck effects typically relevant to small populations may be evident in this EO. However, the surrounding area has not been thoroughly searched for additional plants.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED

The BLM has established range management facilities to control livestock grazing within the species occupied habitat. These include: fencing and water lines which will avoid populations of *A. anserinus* and direct livestock away from areas inhabited by the species.

SUMMARY OF THREATS

Ongoing threats to remaining *A. anserinus* individuals include future habitat degradation and modifications to the sagebrush-steppe ecosystem in which it occurs because of an altered wildfire regime (i.e., fires are increasing in frequency, size, and duration); diminished recruitment capacity resulting from the 2007 wildfire that eliminated 53% of the known individuals and burned 25% of the known occupied habitat; loss of additional individuals and diminished recruitment capacity from future wildfires; and ongoing effects of habitat competition from both seeded and unseeded nonnative plant species. Other factors that may threaten *A. anserinus* to a lesser extent include livestock use and the inadequacy of regulatory mechanisms. Climate change effects to Goose Creek drainage habitats are possible, but we are unable to predict the specific impacts of this change to *A. anserinus* at this time.

The continuing effect of the 2007 wildfire to the species' recruitment capabilities, and the potential for similar effects to remaining populations from future fires present the greatest threats to *A. anserinus* at this time. Based on the best available information, the species' capacity to replace the number of individuals lost to the 2007 wildfire will likely depend on recruitment, which we believe occurs slowly based on the average number of seedlings that were observed

during our post-wildfire surveys. Given what we believe to be an increasing fire frequency, it is possible that recruitment will not restore these populations before the next fire event. In addition to the threats related to increased fire frequency, wildfires now tend to be larger and burn more uniformly across the landscape, leaving fewer unburned areas, which affects the post-fire recovery capacity of native sagebrush-steppe vegetation (Whisenant 1990, p. 4; Knick and Rotenberry 1997, pp. 287, 297; Brooks et al. 2004, pp. 682–683). These cascading effects increase the likelihood that the species will become endangered within the foreseeable future throughout all or a significant portion of its range.

The establishment of *Euphorbia esula* and *Bromus tectorum* throughout the Goose Creek drainage represents a potential but not imminent invasive competition threat to *A. anserinus*. *E. esula* represents a potential threat primarily because of its invasive capabilities and its ability to displace native plants. *B. tectorum* represents an additional threat because of its ability to alter and shorten the wildfire return regime. However, infestations for both species are currently localized, limited in size, and do not impact all *A. anserinus* occupied sites. Further, *E. esula* control efforts have increased in recent years, and *B. tectorum* invasion appears to be primarily confined to southern portions of the Goose Creek drainage. Nevertheless, if wildfire frequency is increasing as suggested by the occurrence of two wildfire events in the last 7 years, the threat presented by *B. tectorum* expansion would likely increase in magnitude.

A. anserinus normally occurs in sparsely-vegetated sites, where it is able to tolerate the physiological stresses of living in tuffaceous (volcanic ash) soils that are apparently not conducive to supporting other plant species. The 2008 wildfire response included seeding *Agropyron cristatum* directly over areas that supported approximately 18% of the pre-wildfire *A. anserinus* individuals. *A. cristatum* is known to be an effective competitor with other aggressive introduced plants (USDA 2006, p. 1), and we presume that it may be an even more effective competitor with less aggressive plants. If *A. cristatum* plants which are seeded during fire restoration activities are able to out-compete *A. anserinus*, it may displace the species over time. This threat could increase in magnitude if seeding activities are conducted to respond to future wildfires in *A. anserinus* habitat.

RECOMMENDED CONSERVATION MEASURES

The BLM and USFWS will continue monitoring *A. anserinus* populations throughout the species' range. These parties will conduct additional surveys for unknown populations of the species. The BLM will continue its protection from the effects of any regulated action including livestock grazing within the species range.

LISTING PRIORITY

THREAT			
MAGNITUDE	IMMEDIACY	TAXONOMY	PRIORITY
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	**5***
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

RATIONALE FOR LISTING PRIORITY NUMBER

As a result of our analysis of the best available scientific and commercial information, we have assigned *A. anserinus* a Listing Priority Number of 5, based on our finding that the threats to the species are high in magnitude but not imminent. Approximately 98% of the individual plants that were previously documented in the areas burned by the 2007 wildfire were killed, based on the lack of adult plants as well as seedlings in the burned areas. In addition, it is possible that the fire return interval is increasing in the Goose Creek drainage. We believe the rangewide threat from future wildfires will exacerbate the ongoing effects to the population's recruitment capacity resulting from the 2007 wildfire and is high in magnitude. However, this and other threats to the species are not imminent. While we conclude that listing *A. anserinus* is warranted, an immediate proposal to list this species is precluded by other higher priority listing actions, which we address below.

Magnitude: High.

Imminence: Non-imminent.

Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed? YES.

Is Emergency Listing Warranted? NO. Potential impacts to the species are not likely to destroy occupied habitat throughout all or a significant portion of the species' range within the immediate future. If another wildfire event occurs within a significant portion of the species' range, emergency listing would be reconsidered.

DESCRIPTION OF MONITORING

The BLM with our assistance have established population monitoring studies throughout the range of *A. anserinus*. We will continue these studies and read the associated plots on an annual basis. The information obtained will assist us in future management and regulatory decisions concerning the conservation of this species.

COORDINATION WITH STATES

The Idaho, Nevada, and Utah Natural Heritage programs maintain active databases on the distribution and abundance of *A. anserinus*. Information from those sources were incorporated into this report.

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APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: _____ 5/26/10
Deputy Regional Director, Fish and Wildlife Service — Date

Concur: _____ Date: October 22, 2010
ACTING
Director, Fish and Wildlife Service

Do not concur: _____ _____
Director, Fish and Wildlife Service — Date