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

Scientific Name:

Astragalus anserinus

Common Name:

Goose Creek milkvetch

Lead region:

Region 6 (Mountain-Prairie Region)

Information current as of:

03/01/2015

Status/Action

___ Funding provided for a proposed rule. Assessment not updated.

___ Species Assessment - determined species did not meet the definition of the endangered or threatened under the Act and, therefore, was not elevated to the Candidate status.

___ New Candidate

___ Continuing Candidate

_X_ Candidate Removal

> ___ 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
> _X_ 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
> ___ Range is no longer a U.S. territory
> ___ Insufficient information exists on biological vulnerability and threats to support listing
> ___ Taxon mistakenly included in past notice of review
> ___ Taxon does not meet the definition of "species"

___ Taxon believed to be extinct
_X_ Conservation efforts have removed or reduced threats
_X_ More abundant than believed, diminished threats, or threats eliminated.

Petition Information

___ Non-Petitioned

_X_ Petitioned - Date petition received: 02/03/2004

90-Day Positive: 08/16/2007

12 Month Positive: 09/10/2009

Did the Petition request a reclassification? **No**

For Petitioned Candidate species:

Is the listing warranted (if yes, see summary threats below) **No**

To Date, has publication of the proposal to list been precluded by other higher priority listing? **N/A**

Explanation of why precluded: **N/A**

Historical States/Territories/Countries of Occurrence:

- **States/US Territories**: Idaho, Nevada, Utah
- **US Counties**: Cassia, ID, Elko, NV, Box Elder, UT
- **Countries**: United States

Current States/Counties/Territories/Countries of Occurrence:

- **States/US Territories**: Idaho, Nevada, Utah
- **US Counties**: Cassia, ID, Elko, NV, Box Elder, UT
- **Countries**: United States

Land Ownership:

Ninety-three percent of Goose Creek milkvetch (*Astragalus anserinus*) habitat in Idaho, Utah, and Nevada occurs on Federal lands managed by the Bureau of Land Management (BLM) (Table 1). The remaining habitat occurs on private and state lands in Utah and Idaho and on private land in Nevada (Baird and Tuhy 1991, p. 14; Morefield 1992, appendix maps; Service 2014a, pp. 1 – 4 in Table 1; Smith 2007, appendix maps).

Table 1. Percent Land Ownership by Population for Goose Creek milkvetch.

Population	Percent Land Ownership		
	BLM	State	Private
1	100%	0%	0%
2	84%	11%	5%
3	95%	1%	4%
4	100%	0%	0%
5	100%	0%	0%
Total	**93%**	**3%**	**4%**

Lead Region Contact:

OFC OF THE RGNL DIR, Justin Shoemaker, 309-757-5800 ex 214, Justin_Shoemaker@fws.gov

Lead Field Office Contact:

UT ESFO, Jennifer Lewinsohn, 801-975-3330 x 138, jennifer_lewinsohn@fws.gov

Biological Information

Species Description:

Goose Creek milkvetch is a low-growing, mat-forming perennial plant in the bean family (Fabaceae) with grey hairy leaves, pink-purple flowers, and brownish-red curved seed pods (Mancuso and Moseley 1991, p. 4). It has numerous stems, with five to fifteen leaflets per leaf, with each leaflet 0.13 to 0.26 inches (in) (3.2 to 6.5 millimeters (mm)) long (Welsh *et al.* 2008, p. 416). In May and June, a single Goose Creek milkvetch plant will produce many flowering stalks, with each stalk bearing 3 to 7 flowers (Welsh *et al.* 2008, p. 416). Plants can also flower in late fall (Collins 2013b, p. 4), presumably induced by late summer moisture. The species is distinguished primarily by its smaller leaflets and flowers, and the color and shape of the seed pods from the three other mat-forming *Astragalus* species found in the Goose Creek drainage (Baird and Tuhy 1991, p. 1; Mancuso and Moseley 1991, pp. 4–5).

Taxonomy:

Goose Creek milkvetch 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). Goose Creek milkvetch has not undergone any taxonomic revisions since it was originally described and is currently accepted as a distinct species (Barneby 2006, p. 135; Welsh *et al.* 2008, p. 416).

Habitat/Life History:

Goose Creek milkvetch is a narrow endemic that typically occurs on sparsely vegetated outcrops of highly weathered volcanic-ash (tuffaceous) soils from the Salt Lake Formation (Mancuso and Moseley 1991, p. 12). Soils at these tuffaceous outcrops are a mixture of volcanic rock fragments and fine sand that are moderately cemented by silica below the surface, but are soft and very friable at the soil surface (Natural Resource Conservation Service (NRCS) 2014, p. 3). These tuffaceous outcrops appear to constitute the optimal habitat for the species throughout its range. Goose Creek milkvetch also occurs in the sandy loam and gravelly sandy loam soils surrounding some of the tuffaceous outcrops in Nevada and Utah (Hardy 2005, p. 4; Mancuso and Moseley 1991, p. 12).

Goose Creek milkvetch is associated with a suite of species similarly adapted to the growing conditions of the tuffaceous outcrop soils, including Indian ricegrass (*Achnatherum hymenoides)*, Douglas' dustymaiden (*Chaenactis douglasii*), roundspike cryptantha (*Cryptantha humilis*), slender buckwheat (*Eriogonum microthecum*), cushion buckwheat (*Eriogonum ovalifolium*), ballhead gilia (*Ipomopsis congesta* (= Gilia congesta), whitestem blazingstar (*Mentzelia albicaulis*), and silverleaf phacelia (*Phacelia hastata*) (Baird and Tuhy 1991, pp. 2–3). The dominant native species within the general surrounding plant community include: Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), Utah juniper (*Juniperus osteosperma*), green rabbitbrush (*Chrysothamnus viscidiflorus*), needle and thread grass (*Hesperostipa comata*), and Sandberg's bluegrass (*Poa secunda*).

Goose Creek milkvetch is generally found on southeastern, southwestern, and west-facing slopes within sparsely vegetated areas in sagebrush and juniper habitats (Mancuso and Moseley 1991, p. 9; Morefield 1992, p. 8). The species does not appear to tolerate the "hottest" sites on southerly facing slopes, and generally is not found on north-facing slopes (Hardy 2005, p. 6). The habitat can vary from stable areas with little erosion to washes or steep slopes where erosion is common. The species is sometimes abundant along trail margins, suggesting that plants are able to tolerate moderate levels of disturbance (Service 2006b, p. 1). However, plants are not found in areas of concentrated disturbance such as vehicle or livestock trails or where water flows through washes on a regular basis (Baird and Tuhy 1991, pp. 2–5; Hardy 2005, pp 1–4; Mancuso and Moseley 1991, p. 2–4; Mancuso 2010, p. 12; Smith 2007, p. 2).

Goose Creek milkvetch appears to be a short-lived perennial, but additional studies are needed to determine the species growth, reproduction, and lifespan. Of the limited life history information currently available, one study indicated there is a 50% mortality by the beginning of the second year and found that plants begin to flower in their second year (Feldhausen 2007, pp. 8 – 9). Another study documented 100% survival of adult plants after 4 years and 100% mortality after 7 years (Hardy 2010, p. 2). The wide-ranging annual fluctuation in plant abundance from census counts is another indication the species is short-lived, although it is also possible that adult plants may remain dormant during some growing seasons. Studies to determine if adult plants exhibit dormancy have not been conducted; however, a number of *Astragalus* species exhibit adult plant dormancy with no above-ground presence during one or more consecutive years as a response to drought conditions (Baskin and Baskin 1974, p. 11; Breinholt *et al.* 2009, p. 661; DePrenger-Levin *et al.* 2013, p. 265; Lesica 1995, p. 147; Martínez-Sánchez *et al.* 2011, p. 427; Van Buren and Harper 2004, p. 4).

Goose Creek milkvetch seedling germination and survival is likely correlated with precipitation amount and timing. Spring precipitation during January through April was strongly correlated with seedling density of another milkvetch, *Astragalus holmgreniorum* (Van Buren and Harper 2003; p. 239); however, we do not have sufficient seedling data for Goose Creek milkvetch seedlings to assess this relationship (Davis 2014a, p. 4). There is some indication that spring moisture is important for Goose Creek milkvetch germination because thousands of seedlings were observed at one monitoring site during the wet spring of 2011 (Hardy 2014, p. 7).

Species in the bean family typically have persistent seed banks with at least some proportion of the seed bank being long-lived because the seeds are physically dormant for long periods of time (Orscheg and Enright 2011, p. 186; Segura *et al.* 2014, p. 75). Physically dormant seeds have a seed coat that imposes a physical barrier between water and the embryo, and this type of dormancy provides an ecological advantage by staggering germination over a long period of time, protecting the embryo from microbial attack, and increasing the longevity of seeds within the soil (Fulbright 1987, p. 40). Species with physically dormant seeds typically have seeds germinating over many years, which increases the probability of the species persistence in an unpredictable environment and has been termed a "bet-hedging strategy" (Simons 2009, pp. 1990 - 1991; Williams and Elliott 1960, pp. 740 – 742). This strategy buffers a population against catastrophic losses and negative effects from environmental variation (Tielbörger *et al.* 2014, p. 4). Goose Creek milkvetch can be dormant and not detectable for some years, but later detected in the same area given favorable precipitation conditions (Hardy 2005, p. 6; Hardy 2014b, entire). This pattern provides some evidence the species has a persistent seed bank and possibly other life stages that remain dormant during drought conditions. As a result, multiple years of surveys may be necessary to determine if Goose Creek milkvetch is present within suitable habitat.

The breeding system and specific pollinators of Goose Creek milkvetch are not known at this time. At least two different bumblebee species (*Bombus* spp.) were observed pollinating Goose Creek milkvetch (Shohet and Wolf 2011, p. 12). We assume that pollinators are important to support maximum reproduction for the species based upon research of other milkvetches (Tepedino 2005, p. 2). Specifically, solitary bees are likely the most important pollinators because they are common pollinators for the entire *Astragalus* genus (Geer *et al.* 1995, p. 20; Watrous and Cane 2011, p. 237). Pollinators generally need a diversity of native plants for foraging throughout the seasons, nesting and egg-laying sites, and undisturbed places for overwintering (Shepherd *et al.* 2003, pp. 49 – 50). Thus, it is important to protect vegetation diversity within and around Goose Creek milkvetch populations to maintain a diversity of pollinators. We have no information regarding the genetic diversity of Goose Creek milkvetch.

Historical Range/Distribution:

The species was historically known from 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).

Current Range/Distribution:

Because Goose Creek milkvetch was first documented in 1984, it does not have an extensive historical record. Based upon survey information since 1984, the current range and distribution of Goose Creek milkvetch has expanded to include the southern-most population (Figure 1), but otherwise has not changed significantly. The current range of Goose Creek milkvetch is similar, but slightly larger than what we reported in our 2009, 12-month finding (Jorgensen 2014, entire). Goose Creek milkvetch occurs at elevations ranging between 4,900–5,885 feet (ft) (1,494–1,790 meters (m)) (Idaho Conservation Data Center (ICDC) 2007b, p. 2; Smith 2007, Table 1; Shohet and Wolf 2011, Figure 2). Most known locations are within an area that is approximately 35 miles (mi) (56 kilometers (km)) long by 6 mi (10 km) wide, oriented in a northeast to southwesterly direction along Goose Creek and extending to Rock Spring Creek (see Figure 1). The distribution of Goose Creek milkvetch is identified by element occurrences (EOs), sites, and populations (Figure 1; also see Population Estimates/Status below for more information). These terms are defined as follows:

- Sites: locations where the species occurs which were mapped as points, lines, or polygons;

- Element Occurrences (EOs): plant sites that are grouped together based on geographic proximity (NatureServe 2004, p. 6) within 0.6 mi (1 km) of each other (IDCDC 2007b, p. 4). Goose Creek milkvetch EOs defined by Idaho, Nevada, and Utah Heritage Programs follow this criteria within State borders only.

- Population: equivalent to an EO that is defined by NatureServe and IDCDC criteria based on geographic proximity throughout the species' range and does not consider State borders.

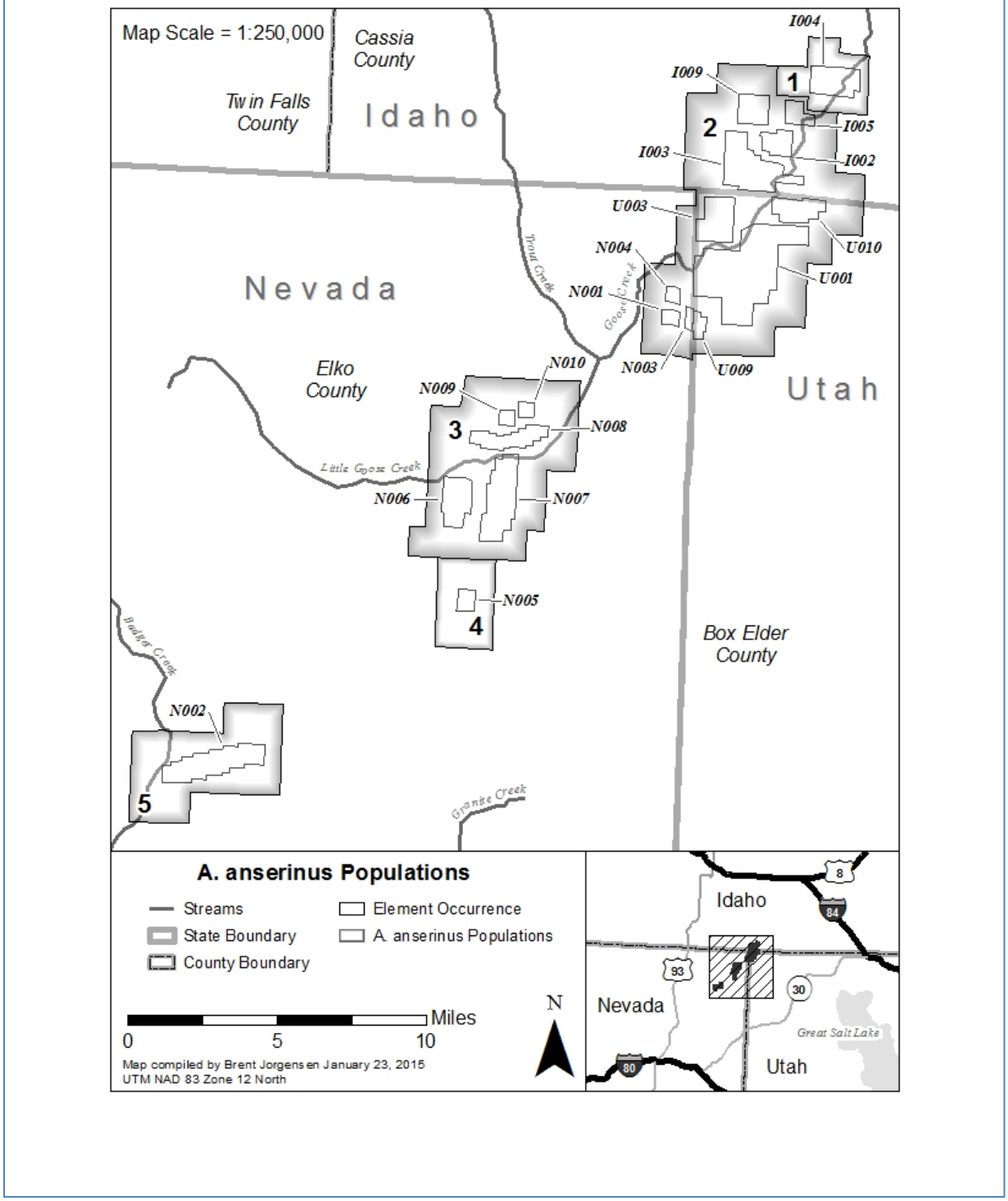

Figure 1. Goose Creek milkvetch current range and populations.

Goose Creek milkvetch occupies an estimated 2,117 acres (ac) (857 hectares (ha)) within its range. The acreage is considerably larger than the previously reported 400 ac (164 ha) in the 2009 12-month finding and previous CNORs for the species. This is because we digitized areas of past survey information in Nevada to be consistent with the final survey report (see p.1 and Appendix 3 *in* Smith 2007) rather than using our previous area estimate (3.14 square meters) around the GPS points provided by the surveyor. We consider this method to be a better representation of the habitat extent based on the survey method employed. In addition, we included newly identified habitat from recent surveys (Shohet and Wolf 2011, entire).

As previously described, Goose Creek milkvetch is found on BLM lands, State of Utah School and Institutional Trust Lands Administration (SITLA) lands, State of Idaho lands and private lands (see Table 1). Approximately 86% of the total known population and 93% of the total acres of known habitat of Goose Creek milkvetch is on BLM-managed lands, with the remainder on non-federal lands with State and private ownership (see Table 1). Approximately half of the total population occurs in the State of Utah, while the majority of the habitat occurs in Nevada (see Table 2).

Table 2. 2014 Plant abundance and Habitat by State for Goose Creek milkvetch.

State	2014 Plant Abundance		2014 Habitat	
	Number	Percent	Acres (ac)	Percent
Idaho	5,354	17%	47	2%
Nevada	9,388	30%	1,718	81%
Utah	16,906	53%	352	17%
Total	**31,648**	**100%**	**2,117**	**100%**

Areas of potential habitat remain unsurveyed in Idaho and Nevada, so it is possible that Goose Creek milkvetch is more continuous across its range or occurs outside of our identified population areas (see Figure 1). The species is sparsely distributed across the landscape on sandy soils in Nevada and Utah (see *Habitat/Life History*, above). Because unsurveyed, potential habitat occurs between known sites, we anticipate the known populations and EOs in Nevada may be linked by contiguous habitat and may either be one large population or a series of populations within a metapopulation.

Population Estimates/Status:

Estimated Population

The methods for deriving the number of populations for Goose Creek milkvetch includes an evaluation of sites and EOs. We mapped all known sites and grouped them into EOs following the standard methods used by the IDCDC as our definition of a population (see Figure 1). Overall, we documented five populations of Goose Creek milkvetch using this methodology. Because the latest Heritage Program records identify 19 EOs for Goose Creek milkvetch (5 in Idaho, 10 in Nevada, 4 in Utah), and their delineation stops at State boundaries, we do not

consider State identified EOs to be synonymous with our populations (IDCDC 2007b, p. 4; Fitts 2008, entire). Hereafter, we will use the term "populations" based upon our methods and "EO" based upon existing State Heritage Program designations (see Table 3). In addition, we refer to individual plant sites by name in this document where more specificity is necessary.

Table 3. Goose Creek milkvetch habitat acreage and abundance by population for 2004/2005, 2008, 2009, and 2014 (Collins 2013b, entire; Shohet and Wolf 2011, excel data summary ; Mancuso 2015, Table 2; Service 2014a, entire; Theodozio 2014a, attachment). NS = No Survey performed that year; [a] = abundance estimated based on partial resurvey of population.

Population	Number of EOs	Total Population Size				2014 Percent of Total Population	2014 Total Acreage for Population (ac)
		2004 - 2006	2008	2009	2014		
1	1	1,271	NS	NS	NS	4%	13
2	10	45,716 [a]	17,189 [a]	15,575 [a]	22,368 [a]	71%	484
3	6	8,752	5,395 [a]	NS	5,811 [a]	18%	1,365
4	1	240	2	NS	56	0%	55
5	1	4,219	1,728	NS	2,141 [a]	7%	200
Total	**19**	**60,198**	**25,585**	**23,971**	**31,648**	**100%**	**2,117**

Limited survey efforts from 1990 to 1992 estimated the population of Goose Creek milkvetch to range between 9,000 and 10,500 individuals in 67 occupied sites in Idaho, Utah, and Nevada (Baird and Tuhy 1991, p. 3; Mancuso and Moseley, pp. 12 – 16; Morefield 1992, p. 9). More comprehensive range-wide surveys from 2004 to 2006 identified 206 occupied sites (occupied points, lines, or polygons) across Goose Creek milkvetch's known range, and the species' total population size was estimated at 61,198 individuals (74 FR 46521; Service 2014a, entire). Survey results from 2007 to 2014 identified an additional 71 new sites for the species across its range (Service 2014b; see Monitoring Efforts 5, 6, and 7 in *Description of Monitoring*, below). Although the overall number of known sites has increased with additional surveys, this does not mean the total population or the species' range is increasing.

Of the five populations, Population 2 is the largest population of Goose Creek milkvetch; it occurs in all three states, and represents 71 percent of the total population (see Table 3). This population includes EO U001 in Utah which is the largest known EO for the species, as well as 9 other EOs in Idaho, Nevada, and Utah. Population 4 is the smallest population and was identified as having 2 plants in 2008 following a wildfire (74 FR 46535). This population increased in size to 56 plants as of 2013 (Collins 2013b, p. 2). Plants were found to the north of this population but plant abundance counts or estimates were not provided (Collins 2013b, p. 2). It is likely there is suitable habitat between Populations 4 and 3, but this area has not been surveyed (74 FR 46535; Collins 2013b, p. 2).

Population Size and Trend

In 2014, the total population size was estimated at 31,648 individuals. This estimate is higher than the abundance in 2008 and 2009 but lower than the 2004 - 2006 abundance of 60,198 individuals. To assess population trend between 2004 and 2014, we evaluated monitoring data for two of the five populations as reported for Monitoring Efforts 1 and 2 in *Description of Monitoring*, below and identified in Table 4. The data include plant abundance and density collected in either 2004 or 2005, 2008, 2009, and 2014 from Populations 1 and 2. Population 1 is within unburned habitat and contains one monitoring plot while Population 2 has a mosaic of unburned, partially burned, and completely burned habitat and contains 13 monitoring plots. We compared plant density for all plots between sample years so that we could compare data among plots of various sizes and determine whether plant densities were statistically significant between sample years. The results indicate plant density was significantly higher during 2004/2005 compared to all the later sample years of 2008, 2009, and 2014 (p value less than 0.05) (Davis 2014b, entire; Davis 2014c, entire). However, there was no significant difference in plant density between the three post-fire years (p value greater than 0.05). The results indicate that while the above-ground plant abundance declined between 2005 and 2008 (immediately post-fire) it has remained stable from 2008 to 2014.

Table 4. Plant abundance and density at long-term monitoring plots in Goose Creek milkvetch Populations 1 and 2. Data provided by Monitoring Effort 1 (Theodozio 2014a) and Monitoring Effort 2 (Mancuso 2015, Tables 2 and 4). Plots without data for a given year are marked as n/a.

Plot	Population	Abundance				Density (# plants/square meter)			
		2004-5	2008	2009	2014	2004-5	2008	2009	2014
Burned									
U001-4-12	2	314	6	10	22	1.744	0.033	0.056	0.122
U001-4-34	2	224	0	<10	27	0.103	0	0.005	0.012
U001-NV-1	2	3695	181	155	175	0.172	0.008	0.007	0.008
Partly burned									
U001-4-17	2	7481	772	519	616	0.074	0.008	0.005	0.006
U001-4-30	2	175	13	44	17	0.03	0.002	0.008	0.003
U001-7-3	2	1742	1133	703	331	0.122	0.08	0.049	0.023
U001-4-33	2	349	29	9	193	2.077	0.173	0.054	1.149
N001-1	2	541	168	458	573	0.013	0.004	0.011	0.014
Unburned									
U001-4-35	2	3078	617	118	231	0.154	0.031	0.006	0.012
U001-6-1	2	1458	300	99	92	0.088	0.018	0.006	0.006
N004-1	2	652	602	282	690	0.042	0.039	0.018	0.044
ID-004 subplot	1	176	197	148	102	0.040	0.045	0.034	0.023
ID-003 Big Site #1	2	123	84	**n/a**	26	0.395	0.270	**n/a**	0.084

ID-003 Big Site #7	2	138	72	**n/a**	23	0.910	0.475	**n/a**	0.152

We recognize there are a number of limitations for our analysis. First, we only have census counts of above-ground individuals to assess population size and therefore can only adequately evaluate the non-dormant fraction of the total population (see *Habitat/Life History*, above). We do not know how long-lived the species' seed bank is and the fraction of the total population it represents. Because the seed bank is an important component of the *Astragalus* genera and the bean family in general (see *Habitat/Life History*, above), and adult plants may exhibit dormancy, our reliance on counts of above-ground individuals alone likely overestimates the variability in population size and overestimates documented population fluctuations (Adams *et al.* 2005, p. 433; Brigham and Thompson 2003, p. 149; Kalisz and McPeek 1992, p. 1082; Kery *et al.* 2005, p. 319; Lesica and Steele 1994, pp. 209 - 212). Second, we do not have demographic information to assess the relative influence and importance of different life stages on population growth and how those life stages respond to pulses of resource availability and periods of resource scarcity that are common in arid environments (Goldberg and Novoplansky 1997, p. 410; Noy-Meir 1973, pp. 28 - 33; Verhulst *et al.* 2008, pp. 104 – 105). Third, our small data set limits our knowledge of the plant abundance throughout the species' range.

Despite the limitations of the Goose Creek milkvetch dataset, we conclude that the datasets for Populations 1 and 2 provide a reliable representation of population size for Goose Creek milkvetch for the past decade. Goose Creek milkvetch total population size estimates were 60,198 in 2004/2005, 23,971 in 2009, and 31,648 in 2014. Since the species exhibits substantial year-to-year fluctuations in abundance at monitoring sites (Mancuso 2015, p. 15), we anticipate similar fluctuations in total population size. As we discuss below (*Effects of Climate on Plant Abundance* under Factor E), plant abundance in 2004 and 2005 can be characterized as a spike or peak in the total population size for the species during a period of high precipitation. Because surveys and abundance monitoring was limited prior to this time, these two "peak" years became our de-facto baseline status for the species with which to compare later abundance data. It is not surprising there were fewer above-ground plants following the onset of drier conditions after 2005, and the "peak" baseline in addition to the species short life span and dormant life stages (e.g., seeds and possibly adult plants) likely contributed to the fact that the fluctuation in above-ground plant abundance was statistically significant.

The best indicator of population size for Goose Creek milkvetch during the 2004 – 2014 was the 60,198 plants during 2004 and 2005 when a larger fraction of the population was non-dormant. At this time, we do not consider the decline in abundance between 2004 – 2014 to indicate a negative population trend for Goose Creek milkvetch. There is a common misinterpretation of rarity, declining trend, and local extirpation of species like Goose Creek milkvetch that exhibit dormancy under dry conditions (Lesica and Steele, p. 211), and our limited understanding about the dormant life stages and our small data set both impose serious limitations for an accurate assessment of population trend. Over the past decade, Goose Creek milkvetch appears to have quickly responded to climate factors and shows a population level response that is consistent and compatible with plant adaptations to survive semi-arid environments during periods of drought in order to avoid stressful conditions. We conclude the Goose Creek milkvetch population is likely resilient to these population fluctuations which appear to be the species' normal response to

moisture conditions as described in *Effects of Climate on Plant Abundance* under Factor E. The population has remained stable at all monitored locations for the past 6 years and the Goose Creek milkvetch continues to occupy all monitored locations throughout its range. It is important to note that the BLM will expand future monitoring of Goose Creek milkvetch to include demographic monitoring to determine basic life history information so that we can characterize dormancy and population trend for the species (see *Conservation Measures Planned or Implemented,* below).

Distinct Population Segment (DPS):

Goose Creek milkvetch is a plant, our policy regarding the recognition of DPSs under the Act only applies to vertebrate species, therefore designation of DPSs does not apply to this species.

Threats

Summary of Information Pertaining to the Five Factors— Goose Creek milkvetch

Section 4 of the Act and its implementing regulations (50 CFR 424) set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. A species may be determined to be an endangered or threatened species due to one or more of the five factors described in section 4(a)(1) of the Act:

(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.

A species is an endangered species for purposes of the Act if it is in danger of extinction throughout all or a significant portion of its range, and is a threatened species if it is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. For purposes of this analysis, we first evaluate the status of the species throughout all of its range, and then consider whether the species is in danger of extinction or likely to become so in any significant portion of its range. In making this finding, information pertaining to Goose Creek milkvetch in relation to the five factors provided in section 4(a)(1) of the Act is summarized below.

In considering what factors might constitute threats we must look beyond the mere exposure of the species to the factor to determine whether the species responds to the factor in a way that causes actual impacts to the species. If there is exposure to a factor, but no response, or only a positive response, that factor stressor is not a threat. If there is exposure and the species responds negatively, the factor may be a threat and we then attempt to determine the scope and severity of the potential threat. If the threat is significant, it may drive or contribute to the risk of extinction of the species such that the species warrants listing as endangered or threatened as those terms are defined by the Act. This does not necessarily require empirical proof of a threat. The combination of exposure and some corroborating evidence of how the species is likely

impacted could suffice. The mere identification of factors that could impact a species negatively is not sufficient to compel a finding that listing is appropriate; we require evidence that these factors are operative threats that act on the species to the point that the species meets the definition of an endangered or threatened species under the Act.

A. The present or threatened destruction, modification, or curtailment of its habitat or range:

Our 2009, 12-month finding (74 FR 46521) evaluated multiple threats potentially affecting Goose Creek milkvetch including wildfire, wildfire management, invasive nonnative species, livestock grazing, development, recreation, and mining. Our discussion below reviews the current status of all of the threats identified in the 12-month finding.

Wildfire

Wildfire was considered a threat to the species at the time of the 2009, 12-month finding because we attributed the large losses of individual plants since 2004/5 to the 2007 wildfires. Based upon wildfires that occurred in 2000 and 2007, we stated the wildfire frequency had increased within Goose Creek milkvetch habitat and that a shorter time interval between fires would not allow the species to recover in the interim (74 FR 46521). However, the best available information shows that the species population trend has remained stable for the past six years (see *Population Size and Trend*, above).

Occurrence of Wildfire

Wildfires occurred in Goose Creek milkvetch habitat in 2000, 2006, and 2007 (Collins 2014b, entire; Collins 2014c, entire; Jorgensen 2015, pp. 1 – 2). In 2000, one wildfire in Idaho partially burned Goose Creek milkvetch habitat in EO I009 within Population 2 (Feldhausen 2007, p. 11). We do not have pre-wildfire data for this EO to assess the impacts of the 2000 wildfire to Goose Creek milkvetch, so plant mortality from this wildfire in not known (74 FR 46527). However, field surveys of this area in 2004 (a relatively wet year) found 795 plants, thus demonstrating that the species was able to persist in a previously burned area. Although subsequent observations between 2006 and 2013 determined that species was less abundant (Tharpe 2013, entire), the species continues to persist at this location and this pattern of abundance is consistent with the data we have for other monitoring plots within Population 2 during this time period (See *Population Estimates/Status*, above). This information indicates the species can persist in burned habitat and provides one example that the species can respond favorably during a "wet" year (with higher than average precipitation) following a wildfire. This is likely due to the species' ability to retain a viable seed bank in burned areas (see *Habitat/Life History* section, above).

In 2006, one wildfire in Nevada may have partially burned Goose Creek milkvetch habitat within Population 3 (EO N006). We do not have post-wildfire data for this EO to assess the impacts of the 2006 wildfire to Goose Creek milkvetch so plant mortality from this wildfire in not known. The wildfire perimeter overlaps 134.2 ac (54.3 ha) of the species' habitat which is equivalent to 10% of the population acreage (1,365.5 ac (552.6 ha)), and 46% of the EO acreage (290.22 ac (117.4 ha)). The majority of the identified wildfire polygon was classified as unburned to low

severity (93%) with the remaining habitat in low burn severity areas. No follow up monitoring has been performed and we have no information to assess actual impacts to the species from this wildfire. Due to the unburned to low burn severity of the 2006 wildfire, we anticipate the species persists in burned habitat within the fire perimeter and that the species responded similarly to burned areas that were monitored following the 2007 wildfires.

We previously reported the 2007 wildfires occurred in the species range in Nevada and Utah and completely burned 3 EOs (N003, N005, U009) and portions of 5 other EOs (N001, N002, N006, N007, U001) containing approximately 53 percent of all known Goose Creek milkvetch individuals (Service 2008a, Table 1). The fires resulted in Population 5 completely burning and Populations 2, 3, and 4 being partially burned. In our 2009 analysis, we reported the 2007 wildfires as one wildfire that burned 25 percent of the known occupied habitat for the species (Service 2008a, Table 1). Based upon our updated occupied habitat acreage estimate for the species, we now calculate that 50 percent of the Goose Creek milkvetch occupied habitat burned in 2007 (Jorgensen 2015, p. 2). However, the burn intensity of these wildfires within Goose Creek milkvetch habitat was predominantly unburned or low burn intensity, indicating a low level of habitat alteration by the fire (Jorgensen 2015, p. 2; Monitoring Trends in Burn Severity (MTBS) 2014, p. 1).

The 2007 wildfires did not burn continuously across the landscape but rather as a mosaic with patches of unburned habitat. The optimal habitat for Goose Creek milkvetch is sparsely vegetated which makes it more resistant to wildfire and less likely to burn (Davies and Hulet 2014, p. 7; 74 FR 46526). As a result, 5 of the 9 Goose Creek milkvetch long-term monitoring plots within the burn perimeter only partially burned and Goose Creek milkvetch individuals were found alive within the unburned areas of the partially burned sites (74 FR 46528). However, we could not compare plant density for those unburned and burned portions within the 5 partially burned sites because the pre-fire (2004/2005) data collection was collected at too coarse a scale.

In our 2009, 12 month finding, we assumed that the impact of the 2007 fire was a high loss of individuals (approximately 98% mortality) as compared to pre-fire abundance (74 FR 46529). However, in 2008 post-fire surveys, adult plants and seedlings were documented to have survived the fire and remained present in burned and unburned sites in lower numbers than were previously recorded (Mancuso 2010, p. 9; 74 FR 46528). Adult plant survival within burned habitat suggests that those individuals re-sprouted after the wildfire. An increased number of seedlings were documented within burned and partially burned habitat in 2008 compared to pre-fire numbers, and this may indicate that wildfire stimulates seed germination (74 FR 46528); however, further research is needed to evaluate the species' germination response to fire.

Effects of Wildfire on Plant Abundance

In order to assess whether the 2007 wildfires were responsible for the significant fluctuation in plant abundance reported between 2004/2005 and 2008, we statistically compared plant density between unburned, partially burned, and completely burned habitat (Table 4). Analysis of the 10-year dataset indicates the trends in all three habitats were similar and there is no significant difference in plant density between unburned, partially burned, and completely burned habitat

across the entire time period (the p-value (the probability of an event or outcome in statistical experiment) is greater than 0.05) (Davis 2014b, entire; Davis 2014c, entire). There was also no significant difference in plant density when we analyzed just the post-fire time period of 2008, 2009, and 2014 (p value greater than 0.05) (Davis 2014b, entire; Davis 2014c, entire). These results indicate that, while plant densities were significantly lower after the 2007 wildfires, we cannot attribute this reduction to the wildfires, because an equally significant reduction in plant density also occurred in unburned habitat. Plant densities in burned habitat were lower than partially burned and unburned habitat in 2008 after the wildfires, but they were not significantly lower. Therefore, wildfire does not appear to be a significant contributor to the change in plant density in burned and partially burned habitat.

We now determine that the signficant fluctuation in Goose Creek milkvetch plant abundance between the 2004/2005 and 2008 censuses was not caused by the 2007 wildfires. Goose Creek milkvetch plants and seedlings were found post-fire in all burned sites and the species persists in burned and partially burned areas affected by the 2007 wildfires in similar densities as unburned habitat. Therefore, the occurrence of wildfire did not significantly impact Goose Creek milkvetch. See *Effects of Climate on Plant Abundance* under Factor E for more details on the likely factor that contributed to the fluctuation in plant abundance during this time period.

Wildfire Regime

In the 2009 12-month finding, we stated that the wildfire frequency had increased within Goose Creek milkvetch habitat based upon wildfires that occurred in 2000, 2006, and 2007 (Collins 2014c, entire; Feldhausen 2007, p. 3; Hardy 2008, p. 1; 74 FR 46529), and a lack of known fire occurrence prior to 2000—historic records of the area may go back as far as 1872 (Hardy 2005, p. 1). Another indication of a long fire-return interval for the habitat is dominance of Wyoming big sagebrush in the habitat prior to the 2007 wildfires (Lesica *et al.* 2007, pp. 266 - 267). Collectively this information still supports an estimated 128 year period without a recorded wildfire within the range of the species.

The historic wildfire return interval in sagebrush-steppe is estimated to range between 60 and 100 years (Mensing *et al.* 2006, pp. 74–75; Whisenant 1990, p. 4). Wildfire is a natural occurrence within sagebrush steppe and it undoubtedly occurred in Goose Creek milkvetch habitat in the past; however, there is a concern that a shorter time interval between fires would not allow the species to recover. Our previous conclusion in the 2009, 12-month finding was that two (and now three) wildfires occurred within the species' range between 2000 and 2007, and that this represented evidence of an altered wildfire regime (74 FR 46529). However, we need to clarify that the wildfire return interval (i.e., the time interval between two fires in the same location within the habitat) is the biologically appropriate calculation for our evaluation and not the frequency of wildfire within the range of the species. Since the area of analysis is not the same (i.e., within the same habitat or area vs. within the species' range), fire return interval and fire frequency should not be used interchangeably (Thomas and McAlpine 2010, p. 83). Furthermore, wildfire return intervals within the habitat can be compared to published wildfire return intervals for historic and altered sagebrush steppe, but our previous use of wildfire frequency across the range of the species cannot. As a result, we use the estimated wildfire

return interval to inform our evaluation of wildfire regime, and we no longer consider the recent wildfires within the species' range to provide sufficient evidence of an altered wildfire regime.

When we assessed the perimeters of the 2000, 2006, and 2007 wildfires, no single area or habitat burned repeatedly from these three fires (Jorgensen 2015, entire). Therefore, the wildfire return interval within the habitat is the time between the most recent wildfire (2000, 2006, or 2007) and the last time that area of habitat burned which we conservatively identify as 1872. In summary, the occurrence of three recent wildfires across the species range does not change the estimated 128 year wildfire return interval in the habitat and this interval is consistent with historic wildfire return intervals for Wyoming big sagebrush habitats.

We also evaluated the fire rotation interval, another calculation that is useful for evaluating the wildfire regime for the entire range of a species. The wildfire rotation interval is the time required for the entire range of the species to burn once (United States Forest Service (USFS) 2014, entire). Based upon our wildfire data set, and including the three recent wildfires, we calculated the wildfire rotation interval for the range of the species to be 248 years (Service 2014d, entire). This interval is comparable and consistent with published historic wildfire rotation intervals of 171 – 342 years for Wyoming big sagebrush habitat (Bukowski and Baker 2013, p. 546). Because the wildfire return interval of the habitat and the wildfire rotation interval of the species' range are consistent with historic intervals, we no longer consider that Goose Creek milkvetch has been exposed or is currently exposed to an altered wildfire regime.

Finally, we evaluated the post-fire condition of Goose Creek milkvetch occupied habitat and the surrounding habitat to assess the risk of developing a shorter wildfire return interval (i.e. altered wildfire regime) (Davies and Hulet 2014, entire) because big sagebrush plant communities are at risk of exotic annual grass invasion and the wildfire return interval can be tightly linked with exotic annual grass abundance (Balch *et al*. 2013, pp. 180 – 181; Knapp 1998, pp. 265 - 270; D'Antonio and Vitousek 1992, pp. 74 –75; Link *et al*. 2006, p. 116). The resistance of big sagebrush plant communities to exotic annual grass invasion varies considerably depending upon site characteristics, the pre-disturbance ecological condition of the habitat, and the surviving cover of perennial herbaceous plant species within the habitat after disturbance events (Chambers *et al*. 2007, entire; Davies 2008, pp. 113 – 114; Davies and Hulet, 2014, pp. 1 – 2). The post-fire habitat conditions of Goose Creek milkvetch habitat and surrounding habitat showed a high post-fire resistance to cheatgrass and other exotic annual grasses and the habitat has an overall low risk of a significant exotic annual grass invasion that would lead to an altered wildfire regime (Davies and Hulet 2014, p. 7). Evidence that burned habitat has a high post-fire resistance include the higher canopy cover and density of perennial bunchgrasses and low exotic annual grass cover (3% average canopy cover, range 0 – 15%) in burned habitat compared to unburned habitat (Davies and Hulet 2014, pp.4 - 5). Additional information about cheatgrass abundance in Goose Creek milkvetch habitat is discussed in the *Invasive NonNative Plant Species: Cheatgrass* under Factor A, below. There is no evidence Goose Creek milkvetch habitat or range has experienced, currently is experiencing, or is likely to experience an altered wildfire regime. Therefore, an altered wildfire regime is not occurring now nor is anticipated to occur in the foreseeable future.

Summary

Goose Creek milkvetch persists in burned habitat and is an indication that the species is resilient to wildfire conditions. While the 2007 wildfires likely killed some Goose Creek milkvetch plants, wildfire was not a significant contributor to the reduced Goose Creek milkvetch plant abundance during that time period. Wildfire is a natural occurrence within sagebrush steppe and it undoubtedly occurred in Goose Creek milkvetch habitat in the past. We no longer consider the recent wildfires within the species' range to constitute a departure from the historic fire regime. Furthermore, the post-fire habitat condition throughout the range of the species is at a low risk of altered wildfire regime. Although it is possible that the wildfire return interval and the habitat condition may change in the future, we have no information suggesting that this will happen. Therefore, we determine that wildfire is not a threat to the species now or likely to become so in the foreseeable future. Though our threat evaluation for wildfire is not based on future conservation measures in the 2015 CA, it is important to note that the BLM will prioritize the protection of Goose Creek milkvetch habitat from wildfire in order to reduce future impacts from this stressor (see *Conservation Measures Planned or Implemented*, below). We also evaluate this stressor with other Factors below (see *Cumulative Effects from All Factors*).

Wildfire Management (Firefighting and Post-wildfire Emergency Stabilization and Restoration)

Wildfire management can include prescribed burning, and activities associated with fighting wildfires including construction of fire lines and staging areas, retardant application, and post-wildfire restoration efforts such as disking and seeding. These activities are undertaken to preemptively manage wildfire risk, to control wildfires once ignited, to reduce the spread and extent of fire within the range of Goose Creek milkvetch, and to rehabilitate burned areas after a fire. While these activities are important to prevent or reduce impacts to the species and its habitat from wildfire, they impact the landscape and certain types of activities have the potential to negatively affect Goose Creek milkvetch and its habitat by uprooting and killing established Goose Creek milkvetch plants and rendering habitat unsuitable for re-colonization by new seedlings. Wildfire management activities within Goose Creek milkvetch Population 2 from the 2007 wildfires were documented in the 2009, 12-month finding (74 FR 46529) and are summarized here. In many cases our disturbance estimates are different than those presented in our 12-month finding, due to updated habitat acreages and species location information. Additionally, new information regarding wildfire management activities in Population 3 from the 2006 wildfire is provided and discussed.

Firefighting Activities

Firefighting activities impacted Goose Creek milkvetch within Population 2 during the 2007 wildfires in Utah and may have impacted the species within Population 3 during the 2006 wildfire in Nevada. During the 2007 wildfires in Utah, disturbance within Population 2 included a new access road that was created through one site (U001-7-3), tire tracks that crossed one site (U001-4-33), and fire retardant that was applied in one site (U001-4-35). Surveys for Goose Creek milkvetch in 2007 were not conducted prior to initiation of these activities due to the need to immediately respond to the wildfire (Gates 2008a, entire). During the 2006 wildfire in

Nevada, a fire line was constructed along the fire perimeter and within Population 3 (NV EO 006) to contain the wildfire.

The blading of habitat to create a road in Population 2 (EO U001: Site U001-7-3) likely killed plants and created a long-term impact within the habitat. We do not know how many plants were affected because surveys were not conducted prior to initiation of this activity. This site was revisited in 2009 and 2014, and the road was still a prominent feature within the habitat where no plants have established. The disturbance represents a small portion of this site and we estimate the area of impact to be less than 1 acre (0.4 ha), which represents less than 0.01% of the habitat in the EO (190.44 ac (77.1 ha)). Despite this disturbance, the species remains stable in the remaining intact portion of the site and the new road has not resulted in increased invasive plant species in the habitat (Mancuso 2015, p. 13). Based upon the limited extent of the areas impacted by the blading of habitat, we do not anticipate any significant long-term impacts to the EO or the population.

In Population 2, tire tracks were observed at one site (Utah EO 001: Site U001-4-33) in 2008, but were not mentioned in the site description in 2009 (Mancuso 2010, p. 7) and were not visible in 2014 (Mancuso 2015, p. 12). We do not know the impact to the species from the vehicle traffic at the site; however, the species still persists there. No count of crushed or killed plants was included in field reports. This is a small site with an area of 0.04 ac (0.02 ha) and represents less than 0.0001% of the habitat in Population 2. Based upon the limited extent of the area impacted by the vehicle traffic, we do not anticipate any significant long-term impacts to the total population.

Fire retardant was applied in Population 2 at one site (EO U001: Site U001-4-35) that covered an area approximately 10 ft (3 m) in radius. In 2009, residue was evident on woody debris at the site but was not on the soil surface (Mancuso 2010, p. 7). By 2014, there was no evidence of fire retardant stains in the habitat (Mancuso 2015, pp. 12 - 13). Studies of the effects of fire retardant and fire suppressant foam to plants and habitat of the sagebrush steppe are limited. Retardants contain large amounts of nitrogen and phosphorus and a large pulse of nutrients tends to favor annual exotic plants and some native perennial plants that are physiologically capable of using high levels of nitrogen (Besaw *et al.* 2011, p. 1004). Annual exotic plants have increased in abundance following retardant application within the habitat and these areas may become point sources for weed invasion (Besaw *et al.* 2011, p. 998). Another study found the growth and flowering of yellow rabbitbrush (*Chrysothamnus viscidiflorus*) and big sagebrush (*Artemisia tridentata*) were not affected by retardant, and a slight but not significant decline in species richness occurred after its application (Larson *et al.* 1999, p. 115). Based upon the limited extent of the area impacted by fire retardant, and no known increase in weeds at the retardant location, we do not anticipate significant long-term effects to the species or its habitat.

In Population 3 (EO N006), the blading of habitat to create a fire break in 2006 likely killed plants and created a long-term impact within the habitat. We do not know how many plants were affected because surveys were not conducted prior to initiation of this activity. The area in Population 3 has not been revisited since the 2006 wildfire to assess impacts to the species and its habitat. We do not know if retardant was used or if other disturbance-related activities occurred in the habitat (Collins 2014c, p. 5). We estimate the blading of the fire line impacted 2

ac (0.8 ha) of habitat based upon the width of the bulldozer line and the length of the bulldozer line within the habitat (Collins 2014c, p. 5; Jorgensen 2015, p. 2). This acreage represents approximately 0.001% of the habitat in Population 3 and less than 0.01% of the EO (290.22 ac (117.4 ha)). Based upon the limited extent of the areas impacted by the blading of habitat, we do not anticipate any significant long-term impacts to the total population.

Efforts to avoid and minimize impacts to the species from firefighting are ongoing. Since 2005, 2012, and 2014, the Idaho, Utah, and Nevada BLM, respectively, have identified Goose Creek milkvetch populations and habitat as avoidance areas on BLM fire maps and have regularly trained fire crews about these avoidance areas (Sillitoe 2015a, entire; Theodozio 2015b, entire). Since 2005, the Idaho BLM has appointed a resource advisor with knowledge of the species to fires with the potential to spread to its habitat (Theodozio 2015b, entire). These conservation actions were implemented during the 2013 Border fire that was adjacent to Goose Creek milkvetch habitat in Population 2 on the Utah – Idaho border near Utah EO 003 and Idaho EO 003. As a result, fire crews were successful in avoiding the species' habitat during firefighting and preventing the wildfire from spreading to Goose Creek milkvetch habitat. Overall, existing impacts from firefighting activities have been small and isolated throughout the species' range within 45 percent of the species habitat that burned in recent wildfires. Therefore, we determine that the impact from firefighting is not a threat to Goose Creek milkvetch. We have no information to suggest that future impacts would be any greater in size or scope as compared to existing impacts within the remaining 55 percent of the species habitat that did not burn in recent wildfires. Therefore, post-wildfire ES&R activity does not pose a threat to the species in the foreseeable future.

Post-Wildfire Emergency Stabilization and Restoration (ES&R)

Post-wildfire ES&R activities undertaken in burned areas are designed to stabilize soils, rehabilitate burned habitats, and prevent the spread of noxious weeds. These activities typically involve heavy equipment that disk the soil to prepare it for planting (disking) followed by the seeding of plant species with a rangeland drills (drill seeding). While these activities are important to improving the habitat condition after a fire, certain types of ES&R activities may negatively impact Goose Creek milkvetch and its habitat,including: fencing projects; the use of heavy equipment and rangeland drills; and the seeding of highly competitive nonnative plant species like crested wheatgrass *(Agropyron cristatum)*, highly competitive rhizomatous plant species like intermediate wheatgrass (*Thinopyrum intermedium*), and nonnative fire resistant plant species like forage kochia (*Kochia* (= *Bassia*) *prostrata*). Such ES&R activities can uproot and kill established Goose Creek milkvetch plants, render habitat unsuitable for re-colonization by new seedlings, and promote increased competition from highly competitive plants used in soil stabilization seed mixes which may outcompete Goose Creek milkvetch for resources (74 FR 46529).

Post-wildfire ES&R activities impacted Goose Creek milkvetch within Population 2 following the 2007 wildfires in Utah because rangeland drills were used in the habitat and a seed mixture that including crested wheatgrass was seeded in the habitat. The seeding of crested wheatgrass is discussed in *Invasive Nonnative Plant Species* under Factor A, below. The rangeland drills were fitted with disks designed to overturn soil and kill existing vegetation in order to prepare a seed

bed (Stevens and Monsen 2004, p. 66). Additional information describing the post-wildfire ES&R activities in Utah during 2008 can be found in the 2009, 12-month finding (74 FR 46530). Goose Creek milkvetch habitat was flagged for avoidance by the rangeland drills prior to the drill seeding (Gates 2008b, p. 1), but not all of the species' habitat was avoided, because some avoidance areas were not clearly marked and the drill operators did not have mapped avoidance areas on their GPS units. Eleven Goose Creek milkvetch sites were impacted by disking and drilling activities, and these sites contained an estimated 11,000 individual plants (representing 18 percent of the estimated pre-fire total population and 34.5 percent of the pre-fire population within burned areas) (Service 2008b, Table 4). On average, 47 percent of the total occupied area of the site was seeded, with a range of 14 to 100 percent of the occupied acreage at each of the 11 sites affected by disking and drilling activities (Service 2008b, Tables 1, 4). The 11 sites comprise 2.6 percent (54 ac (22 ha)) of the range-wide habitat acreage for the species.

We evaluated the impact of the disking to Goose Creek milkvetch by comparing plant density within disked and burned habitat to plant densities within burned only habitat, using the data from the long-term monitoring plots, described above in *Population Estimates/Status* section (see also Table 4). Despite the soil disturbance from rangeland drills, plant density was not significantly different from burned areas that were not disked (Davis 2015a, p. 7; Davis 2015b, entire). While the limitation of our analysis was a small data set, the best available information indicates the species can tolerate this one-time disturbance and persists at similar densities, despite disturbed conditions. Similar results were observed for other *Astragalus* species following a one-time soil disking disturbance (Alexander *et al.* 2004, p. 2004; Martínez-Sánchez *et al.* 2011, p. 431). We do not have information indicating the species' tolerance to repeated disking in the habitat or to all soil disturbance activities.

Rangeland drills also impacted Goose Creek milkvetch habitat in Population 2 in 2008 by creating a considerable amount of surface disturbance both in the habitat and the surrounding areas. The rangeland drills broke and overturned the soil down to a depth of approximately 5 in (13 cm) over the same area mentioned earlier in this section (54 ac (22 ha) (Service 2008, pp. 4, 5, 12, 14). Rangeland drill furrows were still visible in the habitat one year later in 2009 (Mancuso 2010, p. 6); however, by 2014, the furrows or other evidence of disking in the habitat was no longer obvious on the landscape (Mancuso 2015, pp. 9 - 10). Cheatgrass and other weeds were present, but occurred at low levels in disked habitat in 2014 (Mancuso 2015, p. 10). As of 2014, the post-wildfire and post-drill seeded habitat condition appears to be similar to the pre-wildfire habitat condition. Therefore, we do not anticipate significant long-term effects of this one time range management on Goose Creek milkvetch habitat.

Efforts to avoid and minimize impacts to Goose Creek milkvetch from post-wildfire ES&R activities are ongoing. Since 2000, the Idaho BLM has incorporated the species' habitat into their ES&R planning and maps as avoidance areas, and has prohibited soil drills and drill seeding within the species' habitat; however, Goose Creek milkvetch habitat in Idaho has not burned since this time. These existing measures in Idaho protect 17% of the total population (4,559 plants) and 2% of the total habitat from firefighting impacts and post-wildfire ES&R activities. In Nevada following the 2007 wildfires, the BLM aerially seeded instead of using rangeland drills, thereby eliminating the potential for soil disturbance (Howard 2007, p. 3; Fuell 2008, p.

1). Overall, Goose Creek milkvetch is resilient to the one time post-wildfire ES&R soil disking and drilling event with no population level impact.

Therefore, we determine that post-wildfire ES&R activity is not a threat to Goose Creek milkvetch. We do not have information to indicate that future impacts would be any greater in size or scope as compared to existing impacts, and we do not anticipate a repeat of these impacts to occur in recently burned habitat in the near future based upon the historic wildfire return interval in the habitat (see *Wildfire* under Factor A above). Therefore, post-wildfire ES&R activity does not pose a threat to the species in the foreseeable future.

Summary

Past impacts from wildfire management activities (firefighting and post-wildfire ES&R) have been small and localized within the species range. The best available information indicates the species was not significantly impacted by the rangeland drills and there is no apparent long-term negative impact to the habitat within these areas. The best available information does not indicate that the existing impact from wildfire management activities is a threat to Goose Creek milkvetch at the present time. Past wildfire management activities occurred within 45 percent of the species habitat that burned between 2000 and 2007 and we do not anticipate a repeat of these impacts to occur in recently burned habitat in the near future based upon the historic wildfire return interval in the habitat (see *Wildfire* under Factor A above). Although it is likely that future firefighting and post-wildfire ES&R impacts will occur in the remaining 55 percent of the species habitat that did not burn in recent wildfires, we have no information to suggest that future impacts would be any greater in size or scope as compared to existing impacts. Therefore, we determine that wildfire management is not a threat to the species now or likely to become so in the foreseeable future. Though our threat evaluation for wildfire management is not based on future conservation measures in the 2015 CA, it is important to note that the BLM will implement avoidance buffers for wildfire management in order to reduce future impacts from this stressor (see *Conservation Measures Planned or Implemented*, below). We also evaluate this stressor with other Factors below (see *Cumulative Effects from All Factors*).

Invasive Nonnative Species

The spread of invasive nonnative species is considered the second largest threat to imperiled plants in the United States (Wilcove *et al*. 1998, p. 2), and is second only to habitat loss as factors responsible for biodiversity declines (Randall 1996, p. 370). Invasive nonnative plants alter 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 and involve numerous taxa, locations, and ecosystems (Aguirre and Johnson 1991, pp. 352–353; D'Antonio and Vitousek 1992, pp. 74–75; DiTomaso 2000, p. 257; Melgoza *et al.* 1990, pp. 9–10; Mooney and Cleland 2001, pp. 5446–5451; Levine *et al.* 2003, p. 776; Traveset and Richardson 2006, pp. 211–213).

Several nonnative plants occur at or immediately adjacent to Goose Creek milkvetch populations, including: desert madwort (*Alyssum desertorum*), crested wheatgrass (*Agropyron cristatum*), cheatgrass (*Bromus tectorum*), flixweed (*Descurainia sophia*), leafy spurge (*Euphorbia esula*), halogeton (*Halogeton glomeratus*), and black henbane (*Hyoscyamus niger*). The invasive nonnative plant species of potential concern to Goose Creek milkvetch are cheatgrass, leafy spurge, and crested wheatgrass. Cheatgrass is a potential concern because of its invasive capability and the species' ability to increase the frequency of wildfires. Leafy spurge and crested wheatgrass are potential concerns because of their invasive capabilities (DiTomaso 2000, p. 255). Crested wheatgrass has been used in soil stabilization seed mixes since the 1950s and was directly seeded within a small portion of Goose Creek milkvetch habitat across the species' range both historically and following the 2007 wildfires in Utah.

Cheatgrass

Cheatgrass is an annual grass with a shallow root system that germinates early in the growing season and uses soil moisture at the expense of most native plant species by outcompeting them for soil, nutrients, and water (Aguirre and Johnson 1991, pp. 352 – 353; Billings 1990, pp. 301–302; Melgoza *et al.* 1990, pp. 9 – 10;). Cheatgrass dies back early in the growing season usually before the dry summers common to the Great Basin. Once dry, cheatgrass is highly flammable and can occur in dense stands that effectively carry wildfire. In some sagebrush habitats, cheatgrass increases in abundance after a wildfire and its dominance in the habitat can result in a more frequent fire cycle (D'Antonio and Vitousek 1992, pp. 74–75). In addition, cheatgrass can invade areas in response to surface disturbances (Hobbs 1989, pp. 389, 393, 395, 398; Rejmanek 1989, pp. 381–383; Hobbs and Huenneke 1992, pp. 324–325, 329, 330; Evans *et al.* 2001, p. 1308).

Prior to the 2007 wildfires (see *Wildfire* under Factor A, above), cheatgrass was observed throughout the range of Goose Creek milkvetch, but was generally encountered at low density. During the 2004–2005 surveys, cheatgrass was generally found at less than five percent cover when it occurred with Goose Creek milkvetch. In two of the five populations (Populations 2 and 5), there were a total of 14 sites with either a southern exposure or higher levels of livestock trampling, with a higher percent cover of cheatgrass (see Table 5). For three of these sites (Utah EO 001: sites UT 4-24h, UT UN-1a, and UT UN-1e), cheatgrass cover for the site was low, but the site contained small patches of dense cheatgrass. These 14 sites represent 6% of the total number of sites surveyed in 2004 and 2005 (206 sites total), and 5% of the total number of known sites as of 2014 (277).

Table 5. Goose Creek milkvetch sites where cheatgrass percent cover is equal to or exceeds 10%. Data summarized from 2004 and 2005 surveys (Service 2008a, entire).

Population	EO & Site	Cheatgrass Cover
2	N 004-1	Dense, unquantified
	N 004-1b	Dense, unquantified
	U 001 4-24a	90% cover on south facing slopes
	U 001 4-24h	70% on hillside, 5% elsewhere
	U 001 4-34	15%
	U 001 4-35a	20%

	U 001 4-35b	10%
	U 001 4-35c	10%
	U 001 UN-1a	90% on south slopes but 2% overall for site
	U 001 UN-1e	80% on south slopes but 5% overall for site
	U 001 4-11d	10%
	U 001 4-17c	15%
5	N 002-1a	10%
	N002-1b	10%

After the 2007 wildfires, the level of cheatgrass cover in occupied habitat was similar to the pre-burn condition (74 FR 46521). Only on south-facing, burned slopes did cheatgrass appear to increase in abundance (Mancuso 2010, p. 12). By 2014, cheatgrass was either absent or had declined in cover and was present in trace amounts (<1% cover) in the few monitoring plots in Goose Creek milkvetch habitat where it was previously documented. This outcome is possibly due to an army cutworm infestation that was documented that year (Mancuso 2015, p. 10). These findings are consistent with the low levels of cheatgrass in burned (3% average canopy cover) and unburned (1% average canopy cover) habitat surrounding the tuffaceous outcrops throughout the species' range (Davies and Hulet 2014, p. 4 – 5), with the highest cheatgrass levels occurring on south facing slopes (Davies and Hulet 2014, p. 5). These reports indicate that cheatgrass is present, but occurs at low levels in Goose Creek milkvetch habitat and surrounding areas. One report suggests otherwise because it states that cheatgrass was prevalent and found at high concentrations at many Goose Creek milkvetch sites (Shohet and Wolf 2011, p. 15). However, because the surveyors did not collect data or provide estimates for cheatgrass abundance or cover during their survey, and no description of their methods to evaluate cheatgrass levels in the habitat was provided, we do not consider this statement to be a reliable evaluation of cheatgrass levels in the habitat due to actual data that shows otherwise. We acknowledge that pockets or patches of dense cheatgrass could still exist across the range of the species. However, the latest information shows that these patches are isolated, not common across the landscape where Goose Creek milkvetch occurs, and not representative of the canopy coverage of cheatgrass in Goose Creek milkvetch habitat.

Various environmental factors and ecosystem attributes influence a sagebrush community's resiliency and resistance to cheatgrass invasion, and a careful analysis of the existing integrity of the habitat and its response to disturbance is needed to assess a community's risk of cheatgrass invasion and dominance (Chambers *et al.* 2013, pp. 365 – 366). Goose Creek milkvetch habitat appears to be highly resistant to cheatgrass and other exotic annual grasses, as discussed in the *Wildfire* section under Factor A, above. The low levels of cheatgrass in the habitat that was disked and drill seeded after the 2007 wildfires in Utah provides additional evidence that the habitat is resistant to cheatgrass after two successive disturbance events (see *Wildfire Management: Post-wildfire ES&R* under Factor A, above). The high survival of the perennial bunchgrasses following the 2007 wildfires likely contributed to the habitat resistance to cheatgrass invasion. In well-developed soils, cheatgrass invasion is documented to be lower in habitats that have relatively high cover of perennial herbaceous plants in part because the perennial plants are strong competitors for available resources (such as soil moisture and nutrients) after disturbance events (Chambers *et al.* 2007, pp. 135 – 139; Davis and Pelsor 2001). Based upon the low levels of cheatgrass in Goose Creek milkvetch and the surrounding habitat,

and the habitat's resistance to cheatgrass invasion, the impact of cheatgrass to the species is small and isolated within the species range, and therefore not considered a threat now and in the foreseeable future.

Leafy Spurge

Leafy spurge is a nonnative perennial forb that has the potential to negatively impact Goose Creek milkvetch because of its ability to outcompete small forbs such Goose Creek milkvetch for soil moisture and sunlight and displace them from the habitat (Lym 2015, entire). Leafy spurge is considered a strong invader of native habitats because once established it can spread rapidly to become the dominant plant in the habitat, displace native vegetation (Belcher and Wilson 1989, p. 174; Leistritz *et al.* 2004, p. 1392; Ortega and Pearson 2005, pp. 653 - 654), and reduce native plant species diversity (Butler and Cogan 2004, p. 308; Selleck *et al.* 1962, p. 21). In dense stands of leafy spurge where it is dominant in the habitat, a few grasses and large forbs persist but only if they are strong competitors (Lym 2015, entire). However, small forbs that include legumes do not persist when there is more than 50 percent cover of leafy spurge as a result of soil moisture depletion within their rootzone and reduced light availability from shading of leafy spurge stems which can reach 0.3 – 0.7 m (1 – 2 ft) in height (Lym 2015, entire; Rinella *et al.* 2009, p. 160; Welsh *et al.* 2008, p. 363). As a result of its highly invasive tendencies, by 2005 leafy spurge had invaded approximately 4.6 million acres in the Western United States with a doubling in size every ten years, for the past 30 years (DiTomaso 2000, p. 256; Lym 2005; entire). Leafy spurge is a noxious weed in Idaho, Nevada, and Utah, it poses a serious threat to state lands, and it has a very high priority for eradication (Belliston *et al.* 2009, p. 12; Center for Invasive Species Management 2014, pp. 15, 16, 21, 22).

Leafy spurge is difficult to eradicate once established because it has an extensive spreading root system with vertical roots reaching a depth of 9 m (29.5 ft) or more (Holmgren 1958 in Best *et al.* 1980, p. 655; Selleck *et al.* 1962, p. 18). It is capable of forming new shoots along the majority of its root network as well as from tiny root fragments buried within 2.4 m (9.24 ft) of the soil surface (Best *et al.* 1980, p. 658). Leafy spurge also readily spreads and invades new territory because seeds are spread by water, animals, vehicles, humans, and over long distances by birds (Coulter 2013, p. 1; Goodwin *et al.* 2001, p. 4). Seeds are also dispersed up to 15 ft (4.5 m) by the explosive opening of the species' seed pod upon ripening (Selleck *et al.* 1962, p. 18). Disturbance from fire negatively impacts leafy spurge seed germination, but does not kill established plants and stimulates vigorous sprouting afterwards (Wolters *et al.* 1994, p. 5). Leafy spurge also increases in density following soil disturbance such as tilling (Selleck *et al.* 1962, pp. 7 and 14). We summarize leafy spurge occurrence and treatment efforts by State, below.

Idaho

Leafy spurge initially established in Idaho and regular control efforts have been underway since 1999 to effectively control leafy spurge in the Idaho portion of the Goose Creek drainage. There are two Cooperative Weed Management Areas (CWMAs) in Idaho that coordinate weed control efforts by various agencies and private landowners in order to improve the successful control or eradication of weeds. These two CWMAs (Goose Creek High Country CWMA and Tri-State CWMA) cover the range of the species in Idaho and the Idaho BLM is a cooperating agency that has provided funding since 1998 for leafy spurge control (VonNiederhausern 2014, entire). The

Goose Creek High Country CWMA has implemented quarantine since 1998 on the removal, transport, and distribution of hay grown on private lands in the Goose Creek drainage in Cassia County to reduce and control the spread of leafy spurge. The County also issues a 5-day notice to private landowners to treat spurge and other noxious weeds after they are located before the County treats the infestation to ensure that all located spurge plants are treated (Cassia County Weed Control Board 1998, entire). In Idaho, existing leafy spurge infestations are mapped and treated annually with herbicide, and *Aphthona* flea beetles are released in larger leafy spurge stands as an effective biological control (Edwards 2014, entire). This integration of chemical and biological methods to control leafy spurge is considered to be very effective for leafy spurge control (Lym and Nelson 2002, p. 819; Belliston *et al.* 2009, p. 12). The practice of annually treating known spurge infestations is necessary for the long-term control of leafy spurge (Wolters *et al.* 1994, pp. 1–2). A minimum of eight years of treatment is recommended to eradicate spurge based on seed viability (Selleck *et al.* 1962, p. 8; Wolters *et al.* 1994, pp. 1–2). Because leafy spurge grows in washes and has a high potential to spread after rain events, spray crews travel by horseback to cover the entire drainage known to contain leafy spurge to locate and treat new infestations. In Idaho, documented spurge locations are treated on an annual basis until they are eradicated. Sufficient funding has been provided to revisit all known leafy spurge infestations both in and near Goose Creek milkvetch habitat as well as to survey for new spurge infestations (Edwards 2014, entire).

In Idaho, County-wide control efforts were successful in reducing leafy spurge infestation from 660 ac (267 ha) in 1999 to 14.3 ac (5.8 ha) in 2011 (Feldhausen 2007, pp. 1–2; Theodozio 2013, entire). Leafy spurge is found in both Population 1 (I004) and in all of the EOs that comprise Population 2 in the State (I002, I003, I005, and I009). Control efforts in Goose Creek milkvetch habitat were successful in reducing leafy spurge at over 500 sites (40 percent of the leafy spurge locations within EO I003) in Population 2 between 1999 through 2007 (Feldhausen 2007, pp. 5–6). In addition to control efforts, effectiveness monitoring in Goose Creek milkvetch habitat documented an overall reduction in leafy spurge from 2007 (628 stems) to 2008 (43 stems) as a result of treatment for spurge in the fall of 2007 (Theodozio 2014c, entire). In Idaho, control efforts have been effective in reducing the density of leafy spurge in the habitat thereby preventing the expansion and dominance of leafy spurge in the species habitat. Although leafy spurge has not been eradicated from Goose Creek milkvetch habitat in Idaho, current levels of leafy spurge are small in size and occupy only small portions of Goose Creek milkvetch habitat (Service 2008a, 17 pp.; Service 2013, pp. 35 – 56).

Utah

Leafy spurge spread from Idaho into the Utah portion of the Goose Creek drainage, and regular control of leafy spurge has occurred in Box Elder County since 2004 (Hardy 2005, p. 2). The Utah BLM is a cooperating agency of the Utah – Idaho CWMA and has provided funding since 2004 for leafy spurge control. The chemical and biological control methods used in Idaho to treat leafy spurge are also used in Utah. These methods have been effective in reducing the density of leafy spurge in Goose Creek milkvetch habitat (Mancuso 2010, p. 10, 12; Mancuso 2015, pp. 10–12, 17); however, there is no information to evaluate the effectiveness of leafy spurge control at the County level. Efforts to treat leafy spurge occur on an annual basis in Box Elder County, but treatment locations have not been mapped and it is unclear whether all existing leafy spurge infestations are treated every year. In addition, surveys for new leafy spurge

infestations on BLM land have not occurred on a regular basis (Edwards 2014, entire). There has also not been commitment to prioritize Goose Creek milkvetch habitat for surveys and treatment of leafy spurge and there has been no effectiveness monitoring in the species habitat to monitor the density of leafy spurge before and after treatment.

In Utah, leafy spurge continues to spread within Population 2. In 2009, leafy spurge was documented in one EO in Utah (U001) (74 FR 46531) and has since spread to another EO in Utah (U 010) (Service 2014a, p. X; Shohet and Wolf 2011, p. 15). The last comprehensive survey for Goose Creek milkvetch in Utah indicated that previously known infestations were treated that year, but new leafy spurge infestations were not treated and were growing in drainages with a high potential for spread (Shohet and Wolf 2011, p. 15). Nevertheless, the leafy spurge infestations we are aware of in Utah are currently small in size, occupy only small portions of Goose Creek milkvetch habitat (generally less than < 1 percent canopy cover, and < 10 percent canopy cover at one site), and do not have a population-level effect on the species (Mancuso 2015, p. 17 and Table 2 on p. 31; Service 2008a, 17 pp.; Service 2013, pp. 7 - 8).

Nevada
In Nevada, leafy spurge is not found in or adjacent to Goose Creek milkvetch habitat, but occurs in one drainage to the south of the species' range (Barton 2013, entire). The Nevada BLM is actively treating spurge where it occurs on BLM lands to the south of the species' range (Barton 2013, entire).

Current Leafy Spurge Levels
The information we have indicates leafy spurge is confined to small patches in the habitat because of the implementation of effective control measures. Based on the best available leafy spurge occurrence information and because of successful control measures for known leafy spurge occurrences, the current presence of leafy spurge to Goose Creek milkvetch is small and isolated within the species range. Furthermore, we do not have information that current levels of leafy spurge in the species habitat is negatively impacting Goose Creek milkvetch at the population level. Leafy spurge has not displaced or eradicated Goose Creek milkvetch at any location where they co-occur and we have no information that indicates leafy spurge is negatively impacting the species recruitment, growth, or reproduction to-date. Therefore, leafy spurge is currently not a threat to Goose Creek milkvetch.

Future Leafy Spurge Levels
Leafy spurge is not currently dense or a dominant species in Goose Creek milkvetch habitat habitat, and we do not have any evidence that it has extirpated Goose Creek milkvetch from any areas. However, leafy spurge is expected to spread throughout the species range and increase in density within Goose Creek milkvetch habitat, unless additional commitment to regularly survey and treat new and existing infestations occurs. This scenario of dominance followed by extirpation is likely, primarily because leafy spurge is entirely capable of dominating the habitat on associated soil types, and because there are no biological limitations for leafy spurge's spread and dominance in both the tuffaceous outcrops and the surrounding sandy soils once it is established (Lym 2015, entire). Furthermore, if leafy spurge is not controlled in the early stages of invasion and establishment, control efforts are more likely to negatively impact Goose Creek

milkvetch and be less successful in controlling leafy spurge (Rinella *et al.* 2009, pp. 158, 160–161).

In Idaho, the past commitment by the BLM and Cassia County to survey for and control leafy spurge has been successful for reducing its extent within Goose Creek milkvetch habitat. Future control efforts are anticipated to occur with the same regularity as past control efforts (Theodozio 2015b, entire; GCMCT 2015, entire). These measures have and are anticipated to continue to protect Population 1 and the portion of Population 2 in Idaho which contains 14 percent of the Goose Creek milkvetch population.

In Utah, the past commitment by the BLM and Box Elder County to control leafy spurge has resulted in regular control efforts within the County, but there is no commitment to prioritize Goose Creek milkvetch habitat for regular surveys or control efforts in the foreseeable future. We also have no information about the past and current frequency of control efforts in Goose Creek milkvetch habitat. Additionally, no surveys for new leafy spurge infestations have been performed in recent years by the Utah BLM. This lack of surveys is anticipated to contribute to the spread of leafy spurge throughout the range of the species and its habitat. Given the continued spread of leafy spurge within Population 2 of Goose Creek milkvetch in Utah, the existing control measures are not adequate and leafy spurge will likely continue to spread and expand without additional commitment to regularly survey for and treat new occurences in the foreseeable future. We anticipate leafy spurge will continue to spread and expand within Population 2 in Utah which contains 42 percent of the Goose Creek milkvetch population.

In Nevada, leafy spurge is currently not present within Goose Creek milkvetch habitat, and as such there are no commitments to prioritize Goose Creek milkvetch habitat for surveys or control efforts in the foreseeable future. However, leafy spurge will likely spread to the species' habitat in Nevada from nearby habitat in Utah that currently contains leafy spurge. This area includes the portion of Population 2 that occurs within Nevada containing 4 percent of the Goose Creek milkvetch population, and to nearby Population 3 containing 18 percent of the total population. Leafy spurge also has the potential to spread to remaining Populations 4 and 5.

Without additional protections to control the spread and expansion of leafy spurge in Utah and Nevada on a regular basis, we determine leafy spurge is anticipated to exert a population level effect to Goose Creek milkvetch in the foreseeable future. This is based upon the likely future spread and expansion of leafy spurge in Utah and Nevada for Populations 2 and 3, which contains 64 percent of the total population, and the anticipated negative effects to Goose Creek milkvetch from leafy spurge's rapid spread within the species habitat without detection and treatment at early stages of leafy spurge invasion. Therefore, we initially find that leafy spurge will become a threat in the future such that Goose Creek milkvetch may become in danger of extinction in the foreseeable future due to this threat. However, there are planned conservation measures that will prevent or mitigate this future threat by controlling the spread of leafy spurge within Goose Creek milkvetch habitat throughout its range, as discussed below in *Invasive Nonnative Species Conservation Measures in the 2015 Conservation Agreement* and *Conservation Measures Planned or Implemented*, as well as in the supplemental PECE Evaluation for the Goose Creek milkvetch (July 20, 2015). These conservation measures have led us to a different conclusion, discussed in *Finding*, below.

Crested Wheatgrass

Crested wheatgrass has been directly seeded into Goose Creek milkvetch habitat. It was widely introduced to the Great Basin to improve the condition of degraded rangelands, to stabilize the soil, and to provide forage for livestock. Possible benefits of establishing crested wheatgrass include that it is effective at inhibiting the establishment of cheatgrass (Cox and 2004, p. 209). However, crested wheatgrass has the potential to negatively impact Goose Creek milkvetch because it is able to competitively displace slower-developing native species due to its drought tolerance, fibrous root system, and good seedling vigor (Bunting *et al.* 2003, p. 82; Lesica and DeLuca 1996, p. 408; Pellant and Lysne 2005, pp. 82–83; Pyke and Archer 1991, p. 4). Crested wheatgrass plantings are 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). Increasing plant diversity within crested wheatgrass stands is challenging, and requires the implementation of measures to reduce its competitive ability before native species can be introduced (Fansler and Mangold 2010, p. 22; Hulet *et al.* 2010, pp. 456 – 458; Pellant and Lysne 1995, pp. 84 – 87).

Crested wheatgrass was planted in the Goose Creek drainage before 1970 (Hardy 2005, p. 2; Feldhausen. 2007, pp. 1–2; Howard 2007, p. 3). Prior to the 2007 wildfires, efforts to establish crested wheatgrass by seeding were generally well separated from Goose Creek milkvetch populations, and crested wheatgrass did not appear to be spreading significantly from the areas where it had been intentionally introduced. Historic crested wheatgrass stands occur in 3 of the 5 populations and 4 of the 19 EOs including Population 1 (Idaho EO 004), Population 2 (Utah EO 001; Idaho EO 003) and Population 5 (Nevada EO 002). Crested wheatgrass does not occur in the tuffaceous outcrops that constitute optimal habitat for the species and generally occupies small portions of sites within an EO on flat ground, but is more widespread in Populations 1 and 5. Only in Population 5 does it appear that crested wheatgrass may be affecting Goose Creek milkvetch abundance where the two species overlap (Service 2008a, pp. 7 – 17). Crested wheatgrass does not appear to be affecting Population 1 (Idaho EO 004) because plant abundance is high and it is the most stable of all EOs in Idaho that are monitored (Tharp 2013 pers. comm.; see Monitoring Effort 1 in *Description of Monitoring*, below). Although crested wheatgrass may not be the preferred plant species to establish in the habitat because of its highly competitive qualities, Goose Creek milkvetch has exhibited long-term co-existence in historic stands of crested wheatgrass and we do not have evidence that crested wheatgrass has or is negatively impacting Goose Creek milkvetch recruitment, growth, and abundance where they co-occur.

In 2008, crested wheatgrass was seeded into the largest population of Goose Creek milkvetch, which collectively contained approximately 18 percent of the total pre-fire population of the species (see *Wildfire Management: Post-Wildfire ES&R* under Factor A, above). However, the 2014 monitoring determined the cover of crested wheatgrass was very low, ranging from trace amounts to 1 - 3% canopy cover (Mancuso 2015, p. 10). The absence or low cover of crested wheatgrass and the other plant species included in the seed mixture indicates the 2008 seeding effort failed to successfully establish these species (Mancuso 2015, pp. 17 - 18). Because crested wheatgrass does not appear to be spreading and the native bunchgrass survival is high within the

2008 seeded area, it is not likely that crested wheatgrass will increase in abundance within the seeded area. Therefore, we determine that crested wheatgrass is not negatively affecting the Goose Creek milkvetch within the 2008 seeded area.

Efforts to avoid and minimize impacts to Goose Creek milkvetch from crested wheatgrass have been implemented by the Idaho BLM since 2000 when they prohibited the seeding of crested wheatgrass and other highly competitive nonnative plant species within Goose Creek milkvetch habitat. As mentioned above in *Wildfire Management: Post-Wildfire ES&R* under Factor A, the Nevada BLM declined to seed crested wheatgrass in Goose Creek milkvetch habitat after the 2007 wildfires and instead aerially seeded the native Wyoming big sagebrush (*Artemisia tridentata* var. *tridentata*).

The current impact of crested wheatgrass to Goose Creek milkvetch is small and isolated within the species range and limited to historic crested wheatgrass stands where Goose Creek milkvetch continues to persist. Therefore, we determine crested wheatgrass is not a threat to Goose Creek milkvetch. Based upon the infrequent seeding of crested wheatgrass in the past and the historic wildfire return interval of Goose Creek milkvetch habitat (see *Wildfire* under Factor A above), we anticipate future seeding of crested wheatgrass to occur on a similarly infrequent basis. Therefore, we determine crested wheatgrass is not a threat to Goose Creek milkvetch in the foreseeable future.

Invasive Nonnative Species Conservation Measures in the 2015 Conservation Agreement

In order to control the future spread and expansion of leafy spurge in Goose Creek milkvetch habitat in all three States, the 2015 Conservation Agreement (CA) (See *Conservation Measures Planned or Implemented*, below and Appendix A for more details on the 2015 CA) includes a commitment to: (1) survey for and treat new leafy spurge infestations on an annual or biennial basis; (2) the annual treatment of known leafy spurge infestations, and monitoring the effectiveness of control methods in Goose Creek milkvetch habitat on BLM lands for the 30-year duration of the conservation agreement. These two conservation actions prioritize Goose Creek milkvetch habitat for leafy spurge surveys and control and will ensure leafy spurge remains at low densities and occupies small areas within Goose Creek milkvetch habitat in the future. We evaluated this commitment to these conservation actions for certainty of implementation and effectiveness through our Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE) (68 FR 15100, March 28, 2003) process and we have determined that all of the PECE criteria have been satisfied and this commitment was adequate to reduce the threat to Goose Creek milkvetch such that leafy spurge does not pose a threat in the foreseeable future. We have a high degree of certainty that the measures will be implemented because the 2015 CA signatories have a track record of implementing conservation actions for Goose Creek milkvetch since 2004, and the Idaho BLM has a record of implementating the two conservation actions. We also have a high degree of certainty that the measures will be effective based on the effectiveness of past leafy spurge control efforts. These actions will protect approximately 86% of the total known population and 93% of the total known habitat of Goose Creek milkvetch.

Summary

Invasive nonnative plant species have the potential to negatively impact Goose Creek milkvetch because they are strong competitors for soil moisture and can spread rapidly after disturbance events. We previously determined that invasive nonnative plant species were a threat to Goose Creek milkvetch because of the potential for leafy spurge to spread, the potential for cheatgrass to spread because of the likelihood of an altered wildfire regime, and the population level impact of crested wheatgrass establishment in EO U001 after the 2007 wildfire. However, we no longer consider an altered wildfire regime (see *Wildfire* under Factor A above) and the 2008 seeding of crested wheatgrass as contributing impacts to the species. While the potential exists for continued encroachment of cheatgrass within Goose Creek milkvetch habitat, it is unlikely based upon the resilience of the habitat to cheatgrass invasion and the low risk of an altered wildfire regime. The best available information indicates that cheatgrass, leafy spurge, and crested wheatgrass do not occur in high densities in Goose Creek milkvetch habitat and comprise small areas of impact within the habitat rather than a population-level impact on the species. We determine that invasive nonnative plants are not a threat to Goose Creek milkvetch at the present time.

We determine cheatgrass and crested wheatgrass do not pose a threat to Goose Creek milkvetch in the foreseeable future because both species occur at low levels in Goose Creek milkvetch habitat, impacts are small and isolated, and both species are not anticipated to increase in the species habitat in the future. Though our threat evaluation for cheatgrass and crested wheatgrass is not based on future conservation measures in the 2015 CA, it is important to note that the BLM will implement avoidance buffers for crested wheatgrass and other projects that create surface disturbance in order to reduce the establishment and spread of cheatgrass (see *Conservation Measures Planned or Implemented*, below). However, we determine leafy spurge will be a threat to Goose Creek milkvetch in the future without continuing future survey and treatment of leafy spurge in the habitat on a regular basis because leafy spurge is spreading and likely to continue to spread throughout the species range and increase in density within Goose Creek milkvetch habitat without additional commitment to regularly survey for new infestations and treat existing infestations. Commitments of the 2015 CA include conservation actions to survey and treat new leafy spurge infestations on an annual or biennial basis in Goose Creek milkvetch habitat; annual treatment of known leafy spurge infestations in Goose Creek milkvetch habitat; and monitoring the effectiveness of leafy spurge control in Goose Creek milkvetch habitat on BLM lands for the 30-year duration of the conservation agreement. Through our PECE analysis process we found that these conservation actions in the 2015 CA have a high certainty of being implemented and effective. Based on the commitments of the 2015 CA, we anticipate leafy spurge will remain at low densities and occupy small areas within the habitat in the future and will no longer threaten Goose Creek milkvetch in the future. This stressor could be exacerbated by climate change patterns and we evaluate the cumulative effect of this stressor with other Factors below (see *Cumulative Effects from All Factors*).

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

Livestock grazing may result in the direct loss or damage to plants and their habitat through trampling, soil compaction, increased erosion, invasion of noxious weeds, and disturbance to

pollinators (Kauffman *et al.* 1983, p. 684; Sugden 1985, p. 309; Milchunas and Lauenroth 1993, pp. 327 – 366; Fleischner 1994, entire; Kearns *et al.* 1998, p. 90; DiTomaso 2000, p. 257; Jones 2000, pp. 155 – 164). Livestock trampling and trailing can indirectly impact plants by altering plant community composition (Cole *et al.* 1997, entire); facilitating the spread and establishment of weeds (Davies and Sheley 2007, p. 179); increasing dust (Neff *et al.* 2008, entire); and compacting soils and thereby affecting water infiltration, soil porosity, and root development (Castellano and Valone 2007, entire). Additionally, the location of range management projects such as water tanks and associated pipelines, fencing, and mineral supplements may indirectly affect the species if their placement results in habitat degradation from concentrated livestock use in the habitat. The species does not appear to be palatable to cattle or horses so herbivory from livestock is not a concern at this time (see Factor C, below).

Livestock use has occurred within the Goose Creek drainage for more than 150 years, and it was likely much greater during the late 1800s than the present (Hardy 2005, p. 1). The Goose Creek drainage was a stopping area for pioneers traveling the California National Trail because of the availability of water, which increased the presence of livestock in the area (Howard 2007, p. 3). Without pre-livestock baseline population information on Goose Creek milkvetch, it is difficult to assess the effects of this activity to the species over time. Furthermore, we are unaware of any research that has evaluated the effects of livestock use on Goose Creek milkvetch specifically or its pollinators.

Some level of livestock use occurs across the entire range of Goose Creek milkvetch (Howard 2007, p. 3; Feldhausen 2007, p. 4; Service 2008a, entire.; Shohet and Wolf 2011, p. 13). The intensity of livestock use varies throughout the Goose Creek drainage depending on the terrain, location, and proximity to water sources and mineral supplements. Livestock tend to spend more time on flat or gentle slopes rather than the steep or sloping tuffaceous outcrops where Goose Creek milkvetch normally occurs and we determine this habitat preference offers some protection from livestock trampling.

We estimate that livestock trails comprise less than 5 percent of any particular Goose Creek milkvetch site with the exception of one site located approximately 328 ft (100 m) from a water tank (74 FR 46533, September 10, 2009). The species can occur on disturbed soils and is sometimes abundant along livestock trail margins (Feldhausen 2007, pp. 1–2; Hardy 2005, pp. 1–4). Additionally, the species' abundance has remained high and relatively stable at one monitoring site in Idaho (Theodozio 2014, entire) despite the extensive livestock tracks and trails at this location (Kinter *et al.* 2012, p. 3). Thus, it appears that Goose Creek milkvetch tolerates and may proliferate with some level of disturbance, based on its occurrence on steep or sloping hillsides where downhill movement of soil is common, within eroded washes, and along road margins and edges of cattle trails. As mentioned in the *Habitat/Life History* section, above, plants are not found within vehicle or livestock trails (Baird and Tuhy 1991, pp. 2–5; Hardy 2005, pp 1–4; Mancuso and Moseley 1991, pp. 2–4; Mancuso 2010, p. 12; Smith 2007, p. 2), which suggests that plants are lost to or cannot survive in areas with concentrated trampling or scouring.

In general, it appears that livestock grazing is managed appropriately in the habitat surrounding the tuffaceous outcrops based upon the low levels of exotic annual grasses and the relative

abundance of perennial grasses (Davies and Hulet 2014, p. 7). In a few locations we are aware of some range management projects that have concentrated livestock use in and near Goose Creek milkvetch habitat. Range management projects that provide water sources or minerals concentrate livestock and affect livestock movement and forage utilization; their distribution across the landscape can influence how efficiently and evenly the range is used by livestock (Rigge *et al.* 2013, p. 484 - 485; Shahriary *et al.* 2012, pp. 112–113). In arid and semi-arid plant communities, an area of impact known as a piosphere often develops around water sources and mineral licks where the impact radiates outward from the resource along a utilization gradient (Rigge *et al.* 2013, p. 479; Shahriary *et al.* 2012, p. 109–111). One example within the Goose Creek milkvetch range, a piosphere completely devoid of vegetation extended approximately 150 ft (45 m) from a water tank (74 FR 46533, September 10, 2009; Service 2006b, p. 2); however, the site specific topography, distribution of livestock, season and duration of use, number of livestock and number of water sources will influence the area of impact. While it may be impossible to prevent the development of piospheres around these resources, their careful placement can influence grazing patterns to ensure that piospheres do not overlap with ecologically important areas (Rigge *et al.* 2013, p. 479) including Goose Creek milvetch habitat.

We are aware of five livestock water tanks located within 1 mi (1.6 km) of Goose Creek milkvetch sites throughout its range: four in or near Population 2 and one near Population 5 (74 FR 46533, September 10, 2009). We do not have pre-construction survey information for four of the water tanks to know if their installation affected the species. The placement of one water tank within Population 2 in Utah likely impacted one Goose Creek milkvetch site because individuals were observed immediately outside of the piosphere that surrounded the water tank The impact of this water tank is likely localized because another Goose Creek milkvetch site approximately 50 m (450 ft) away from the same water tank had minimal to low impacts; it was located on a steep bluff and was partially protected from livestock use (74 FR 46533, September 10, 2009; Service 2006b, pp. 2–3).

In Population 2, there were no apparent impacts to Goose Creek milkvetch from the 2004 installation of a water tank and associated buried pipeline in Utah (Hardy 2004, p. 1). The species was not located nearby the water tank location and the pipeline portion of the project was re-aligned to avoid 38 Goose Creek milkvetch individuals (Hardy 2004, p. 1; 74 FR 46533, September 10, 2009). There was no plant mortality from the pipeline construction, (Service 2005a, p. 3) and plant abundance at this site increased to 82 plants by 2010 (Hardy 2010, pp. 1–2). Although the population increase between years was insignificant (p value greater than 0.05), the 2010 plots displayed evidence of recruitment (Hardy 2010, p. 2). No conclusions regarding population impacts from the pipeline were stated in reports nor can they be evaluated because of the small sample size. The pipeline right-of-way does provide a corridor for continued use through the habitat and will likely result in some level of ongoing effects via trampling and repeated use. The right-of-way is now used as a cattle trail and a stock driveway (Shohet and Wolf 2011, pp. 14–15) and will likely prevent the species from establishing within the two tire tracks. These multiple uses along the right-of-way will have the potential to crush or kill Goose Creek milkvetch plants, degrade the habitat, contribute to dust impacts on the plants, and serve as a vector to spread nonnative species. At this time, the pipeline right-of-way is not facilitating the establishment of weeds into this site and the revegetation effort along the pipeline was successful (Service 2013, pp. 4 - 7). The impact to the species from the pipeline project is localized and

appears to be limited to this one site, which represents less than 1% of the total population. At this time, there are no future plans by BLM to install new water tanks or water pipelines within Goose Creek milkvetch habitat in Idaho, Nevada, or Utah (Stott 2014, entire; Theodozio 2014b; entire; VonNiederhausern 2014b, entire).

We are aware of two salt licks near Goose Creek milkvetch habitat that increase the livestock use in and near the habitat. We reported one salt lick placed approximately 100 m (330 ft) from EO 004 in Nevada in Population 2, although no impacts to the species or its habitat were documented (74 FR 46533, September 10, 2009). One salt lick in Utah, also in Population 2, was the identified cause of increased livestock use at four Goose Creek milkvetch sites that collectively contain 503 plants (Shohet and Wolf 2011, p. 14). These sites were impacted by livestock trailing and loafing. The placement of the salt licks is generally consistent from year to year throughout the species' range (Sayer 2014c, entire; Stott 2014, entire; VonNiederhausern 2014b, entire) so livestock use that is influenced by these mineral supplements is likely to be consistent in the habitat from year to year. These locations are small and isolated and the species persists at these sites despite disturbed conditions.

We are aware of two fences within the Goose Creek drainage in Utah. One was installed adjacent to Pole Creek in Utah to protect the creek from livestock (Service 2005a, p. 3), although its effects, if any, to Goose Creek milkvetch are unknown. In 2008, another fence was installed east of the 2007 wildfire perimeter in Utah to exclude livestock from burned habitat and was not anticipated to impact Goose Creek milkvetch (Gates 2008c, p. 1; Gates 2008d, p. 1). However, the fence was installed directly through one Goose Creek milkvetch site (U001-6-1/w026) and as a result, livestock trampling and trailing increased at the site (Mancuso 2010, p. 8). The fence is forcing livestock to travel through an area of the tuffaceous outcrop with high numbers of Goose Creek milkvetch (Shohet and Wolf 2011, p. 14). In 2011, this site had the highest plant abundance of all 133 Goose Creek milkvetch sites surveyed in Utah with an estimated 6,000 plants. Seedlings represented half of this estimate and seedling mortality from trampling and trailing is a concern at this site because of the increased livestock use. The BLM removed the existing fence through this site and established a new perimeter fence around the site in the spring of 2015 to exclude livestock; regular annual monitoring of plant abundance is planned (Hardy 2014c, entire). Therefore, the negative impacts to the species from the fence have been eliminated and is no longer a concern. This same 2008 fence borders another Goose Creek milkvetch site to the north and its placement resulted in protection of the site from livestock use following the 2007 wildfires. The fence does not appear to concentrate livestock at this site except during herding between allotments, a practice that occurs 1 time per year and lasts for at least a day (Hardy 2014b; Shohet and Wolf 2011, p. 14 (site w010). Therefore, we conclude that any livestock impacts are negligible at this site. In 2011, this site contained 2,765 plants.

Effects of Livestock Use on Plant Abundance

We previously identified that one possible explanation for why plant densities in unburned habitat were not significantly different than burned and partially burned habitat after the 2007 wildfires was because livestock use increased in unburned habitat. Livestock use was substantially greater in 2009 compared to 2008 after livestock were excluded from burned areas in the fall of 2008 following the new fence installation (Mancuso 2010, p. 8). However, this

explanation does not support a causal relationship because the timing of the increase in livestock use was a full year after the timing of the significant reduction in plant density that occurred in unburned areas. While plant densities in unburned habitat were lower in 2008 compared to 2009, they were not significantly different between the two years (see *Population Estimates/Status, Population Size and Trend*, above). Therefore, livestock use does not appear to be a significant contributor to the change in plant density in unburned habitat.

The best available data limits does not allow us to distinguish the effects of livestock use from other factors (Mancuso 2010, pp. 9–12), particularly when livestock use within the unburned sites ranged from 1–50% of the site (Mancuso 2010, p. 27 and Table 11). Nevertheless, we have not identified any significant differences in plant density between unburned, burned, and partially burned sites despite the return of livestock to burned and partially burned habitat (Mancuso 2015, pp. 15–16 and Table 4). Overall, Goose Creek milkvetch persists in locations that receive a range in intensity and use by livestock; therefore, we conclude that livestock use is not a threat to the species. We are not aware of any future plans that could concentrate livestock in Goose Creek milkvetch habitat. Therefore, we find that livestock use is not likely to become a threat to the species in the foreseeable future. Though our threat evaluation for livestock use is not based on future conservation measures in the 2015 CA, it is important to note that the BLM will implement avoidance buffers for new range management projects (see *Conservation Measures Planned or Implemented*, below).

Summary

We have no information to indicate that livestock use is negatively impacting Goose Creek milkvetch at the population level. Impacts are limited to localized areas across the species range and include the loss of individuals within regularly used livestock trails and habitat degradation from the concentrated use of livestock caused by the placement of range management projects in and near the species' habitat. These areas of concentrated livestock use comprise small areas of impact within the habitat rather than a population-level impact on the species. The existing protection in Utah of additional fencing to remove livestock from one site where they were concentrated following a fence installation will reduce the negative impact to the species and the habitat there. We previously determined that the magnitude of the threat posed by livestock was low to moderate in magnitude. We now conclude that the existing impacts are localized and do not rise to the level of a threat affecting the species and its habitat at the present time. At present, Goose Creek milkvetch populations appear to have sufficient resiliency to recover from existing livestock impacts. We do not have information to indicate future range management projects are likely or anticipated. Therefore, we find that livestock use is not likely to become a threat to the species in the future. This stressor could be exacerbated by climate change patterns and we evaluate the cumulative effect of this stressor with other Factors below (see *Cumulative Effects from All Factors*).

Development (Road Construction and Maintenance, Utilities, Garbage Dumps, Private Properties)

Roads that cross through rare plant habitat can destroy habitat and populations, increase road dust, and disturb pollinators (Trombulak and Frissell 2000, entire). Plants located near unpaved

roads are prone to the effects of dust, habitat fragmentation, and pollinator disturbance. Dust can affect plants up to 1,000 m (3,280 ft) away from the source (Service 2014c, entire). Effects of fugitive dust (particulate matter suspended in the air by wind and human activities) include species composition changes, altered soil properties, blocked stomata, reduced foraging capacity of pollinators, dehydration, reduced reproductive output, and a decline in reproductive fitness (Service 2014c, entire). A 91.4 m (300 ft) buffer is the minimum distance recommended to protect sensitive plant species in Utah (Service 2014c, p. 9). Roads may act as a barrier to pollinator movement, for example by influencing bees to forage on only one side of the road (Bhattacharya *et al.* 2003, pp. 42–43) or within isolated habitat patches (Goverde *et al.* 2002, entire). Although bees and other pollinators are quite capable of crossing roads or other human-disturbed areas, the high site fidelity of bumblebees makes them more apt to remain on one side of a disturbed area (Bhattacharya *et al.* 2003, p. 42). The implications of this type of pollinator behavior for rare plants is that the probability for outcrossing is reduced (Cane 2001, entire), thereby reducing genetic variability and reproductive success. Habitat loss or fragmentation from development can result in higher extinction probabilities for plants because remaining plant populations are confined to smaller patches of habitat that are isolated from neighboring populations (Jules 1998, p. 1; Soons 2003, p. 115). Habitat fragmentation and low population numbers pose a threat to rare plant species' genetic potential to adapt to changing environmental conditions (Matthies *et al.* 2004, pp. 484–486). Smaller and more isolated populations produce fewer seeds and pollen, and thus attract fewer and a lower diversity of pollinators (Paschke *et al.* 2003, p. 1,258; Lienert 2004, p. 62). For a more complete discussion, see *Small Population Size* under Factor E, below.

In general, the Goose Creek drainage in Idaho, Utah, and Nevada where Goose Creek milkvetch is found is sparsely populated by people, and the effects of development are minor. Across the range of the species, we estimated there are fewer than ten human-inhabited areas on private lands (each with fewer than five buildings). Because of the remoteness of the area, development impacts on Goose Creek milkvetch have been few and isolated to date. The unpaved roads in this area have existed for decades and affect small portions of 6 out of the 19 EOs for the species in Populations 1, 2, 3, and 4 (Service 2008a, entire.). However, most Goose Creek milkvetch EOs and populations are made up of several sites within 0.6 mi (1km) of each other and thus are well connected. Resultantly, population-level effects often associated with habitat fragmentation are not anticipated. We are not aware of other road or development projects that have occurred since 2009, or are proposed to occur, in areas where they would impact Goose Creek milkvetch. Overall, impacts from development are historic, small, and isolated and development is not a threat to Goose Creek milkvetch. We do not have information to indicate future development is likely or anticipated and therefore does not pose a threat to the species in the foreseeable future.

In summary, development can destroy habitat and fragment populations, but the impact from development impacts small sites within the populations. We previously evaluated development as a low threat to the species because of the potential for future development (74 FR 46534). We do not have information to indicate future development is likely or anticipated. We now determine that development no longer poses a threat to Goose Creek milkvetch now or in the future. Though our threat evaluation for development is not based on future conservation measures in the 2015 CA, it is important to note that the BLM will implement avoidance buffers for new development projects (see *Conservation Measures Planned or Implemented*, below).

Recreation (Off-Highway Vehicle Use)

Off-highway vehicle (OHV) and recreational trail use (e.g., mountain bikes and motorized bikes) may result in direct loss or damage to plants and their habitat through soil compaction, increased erosion, invasion of noxious weeds, and disturbance to pollinators and their habitat (Eckert *et al.* 1979, entire; Lovich and Bainbridge 1999, p. 316; Ouren *et al.* 2007, entire; BLM 2008a, pp. 4–94; Wilson *et al.* 2009, p. 1).

However, to date, no OHV and recreational trail use has been documented within Goose Creek milkvetch habitat (Mancuso 2010, p. 10; Service 2008a, entire). The range of the species is remote and sparsely populated and there are no recreational trails in or near the species' habitat. We previously evaluated recreation as a low threat to the species because of the potential for future recreational use in the habitat (74 FR 46534). However, we have no information to suggest this stressor will occur in the species' habitat in the future. Therefore, we do not consider recreational use to be a threat to Goose Creek milkvetch now or in the future.

Mining and Oil and Gas Development

The effects of mining and oil and gas development to habitats and landscapes include the removal of soil and vegetation when wells, roads, and associated infrastructure are built and the incidence of vehicle traffic increases (BLM 2008a, pp. 448–449). These disturbances can affect rare plant species through habitat destruction, habitat fragmentation, soil disturbance, spread of invasive weeds, and production of fugitive dust (BLM 2008a, pp. 448–449). Potential impacts from these activities are discussed above in *Development* under Factor A.

Mining activity and oil and gas development in Goose Creek milkvetch habitat have not occurred to date. There has been limited interest in mining and oil and gas development in the habitat, and the volcanic ash deposits do not appear to have any particular practical or valuable use for commercial interests (Lubinski 2014, entire). We know of one expired mineral exploration permit that overlapped with a portion of Nevada EO 002 (Population 5) and we do not have documented impacts to the species from mining activities there. There are currently no mining related activities and no identified mineral deposits within Goose Creek milkvetch habitat in Nevada (Wirthlin 2014, entire). In Idaho, there are no active claims or operations for minerals and no oil and gas development has occurred in the Goose Creek drainage of Idaho (Lubinski 2014, entire). However, an oil and gas lease parcel was nominated in September 2014 for an area that is primarily to the north of the species known range but does overlap a portion of Idaho EO 004 (Population 1) on BLM land (Lubinski 2014, entire). At this time, the BLM does not know the oil and gas potential for this parcel because no exploratory work has begun (Lubinski 2015, entire). A recent analysis identified the range of the species to have a low potential for oil and gas resources (Lubinski 2015, entire; Manier *et al.* 2013, Figure 16B on p. 58). In Utah, there are no active claims or operations for minerals and no oil and gas development in the Goose Creek drainage of Utah (Garahana 2014, entire). Overall, there are no impacts to the species from mining and oil and gas development and there is low potential for future mining and oil and gas development.

In summary, there is currently no mining and oil and gas development within Goose Creek milkvetch habitat. We previously evaluated development as a low threat to the species because of the potential for future mining (74 FR 46534). We now determine that mining and oil and gas development does not pose a threat to the species at the present time. While the commitments in the 2015 CA will provide additional protection from any new mining and oil and gas development, our decision is not based on these conservation efforts for this stressor. Based on the low mineral potential of the habitat, we do not anticipate substantial mining in the future that would significantly impact the species. We now determine that mining and oil and gas development no longer poses a threat to Goose Creek milkvetch now or in the future. Though our threat evaluation for mining and oil and gas development is not based on future conservation measures in the 2015 CA, it is important to note that the BLM will implement avoidance buffers for new mining and oil and gas development (see *Conservation Measures Planned or Implemented*, below).

Summary of Factor A

Based on the best available information, we conclude that wildfire, wildfire management, livestock use, development, recreational activities, mining and oil and gas development do not threaten Goose Creek milkvetch now or in the foreseeable future. We determined that invasive nonnative plant species are not a threat now, but would likely become a threat in the foreseeable future based on the likely spread of leafy spurge throughout the Goose Creek milkvetch range and an increase in leafy spurge density without continuing future treatment of leafy spurge in the habitat on a regular basis. However, based on the commitments of the 2015 CA to annually survey for and treat leafy spurge in Goose Creek milkvetch habitat on BLM lands for the 30-year duration of the conservation agreement, we anticipate leafy spurge will remain at low densities and occupy small areas within the habitat and will not threaten Goose Creek milkvetch in the future.

Wildfire was not a significant contributor to the fluctuation in plant abundance between 2004/2005 and 2008, and the wildfire regime in Goose Creek milkvetch habitat is similar to the historic wildfire regime. Wildfire management is not a threat because past impacts are small and isolated, and future efforts are not anticipated in the foreseeable future based upon the historic wildfire return interval in the habitat. Livestock use is not a threat because Goose Creek milkvetch is generally protected from livestock grazing due to its habitat preference for sloping hillsides with low vegetative cover, its tolerance to disturbance, and future range management projects are not anticipated. Recreational use is not a threat because it is not occurring in Goose Creek milkvetch habitat and is not likely to occur in the future. Development is not a threat because past road development was small and isolated, and we the best available information does not indicate that future development will occur. Mining and oil and gas development is not a threat because there are no current activities or impacts to the species and no active claims or leases in the habitat. It is unlikely that mineral resources are valuable enough to support mining or oil and gas development in this area in the foreseeable future. We use 30 years as a foreseeable future for this analysis. Threats are difficult to reliably forecast beyond this time horizon for the species and stressors evaluated in Factor A that we considered. This time period also represents the duration of the 2015 CA to implement protections that address the majority of

stressors to Goose Creek milkvetch identified here and in the 2009 12-month finding. Thus, the present or threatened destruction, modification, or curtailment of the habitat or range is not a threat to Goose Creek milkvetch now or in the foreseeable future.

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

Goose Creek milkvetch is not a plant of horticultural interest. We are not aware of any instances where Goose Creek milkvetch was collected from the wild other than a limited extent for scientific purposes during the collection of voucher specimens to document occurrences and to study germination requirements (Service 2015, p. 5). The available information does not indicate that this causes a threat to extant populations now or in the future. Therefore, we find that overutilization for commercial, recreational, scientific, or educational purposes is not a threat to the species now or likely to become so in the foreseeable future.

C. Disease or predation:

Information on disease and predation is limited. The only information we have regarding disease impacts to Goose Creek milkvetch is one account following heavy rains in 2005 where several withered plants were found. The cause of the plants' condition is not known but may have resulted from a fungus or caterpillar damage. Very few Goose Creek milkvetch plants have exhibited signs of herbivory. There is only one report of a few that were eaten to ground level possibly by rabbits (Glenne 2006, entire). We are unaware of any herbivory attributable to livestock and the plants may not be palatable to cattle (Howard 2007, pp. 2–3). The only documented insect herbivore is an isolated incident of a green caterpillar that was found on an undocumented number on plants at one site in Idaho in 2004 (Service 2008a, entire). Overall, the available information shows only low levels of disease or herbivory, which we conclude is not a threat to the species now or likely to become so in the foreseeable future.

D. The inadequacy of existing regulatory mechanisms:

State and Private Land Protections

There are no laws protecting Goose Creek milkvetch on private or State lands in Idaho, Nevada, and Utah. Each of these states have regulatory mechanisms to control noxious weeds which provides an indirect protection for Goose Creek milkvetch and its habitat from leafy spurge. Private property owners, municipalities, and state agencies are subject to the provisions of the State noxious weed Acts or laws in Idaho (Title 22, Chapter 24), Nevada (Nevada Revised Statute 555 and Nevada Administrative Code 555), and Utah (Title 4, Chapter 17, Rule R68-09). Although invasive weeds are not considered a threat to the species in the foreseeable future, administration of noxious weed control authorities by the states will continue to provide our ability to control any other noxious weeds that may become a problem in the future.

Federal Protections

The majority of Goose Creek milkvetch individuals are found on BLM land which is subject to the Federal Land Policy and Management Act (FLPMA) (Pub.L. 94–579), a law that requires the BLM to manage land for "multiple use," including protecting and preserving land for fish and wildlife resources (BLM 2011, p. 1). Under FLPMA, the BLM is required to develop resource management plans (RMPs) to ensure compliance with FLPMA (BLM 2011, p. 1). Goose Creek milkvetch is listed as a BLM sensitive plant in all three States. Some policy-level protection by the BLM is afforded through the Special Status Species Management Policy Manual # 6840, which forms the basis for special status species management on BLM lands (BLM 2008b, entire). According to BLM sensitive species management policy, the "special status" designation is intended to afford protection at least comparable to (if not greater than) the treatment of candidates for Federal listing (BLM 2008b, p. 43). Therefore, BLM policy affords some protection to Goose Creek milkvetch so long as it is retained as a special status species by the BLM. The BLM through the 2015 CA has committed to maintain Goose Creek milkvetch as a special status species and to continue management and protection of Goose Creek milkvetch and its habitat on BLM lands (GCMCT 2015, p. 29). Although conservation agreements are not regulatory mechanisms, signatories can implement conservation measures via regulatory mechanisms, and the BLM has used its regulatory authority to implement the specific protections for Goose Creek milkvetch as outlined in the 2015 CA (see *Conservation Measures Planned or Implemented*, below).

The BLM resource management plans and any specific protections that are included for Goose Creek milkvetch are described below for each state. In Utah, the Box Elder Resource Management Plan (1986, entire) is the regulatory framework for the management of BLM lands where Goose Creek milkvetch occurs (BLM 1986, entire). A draft Salt Lake Fire Management Plan (Salt Lake FMP) was developed in 2005 (BLM 2005, entire) to specify the BLM's decisions on wildland fire suppression and use of fire and non-fire vegetation treatments including ES&R activities. While the draft Salt Lake FMP has no specific protections identified for Goose Creek milkvetch, it does provide for the review of appropriate management, conservation, and recovery plans for federally threatened, endangered, and candidate species as well as BLM sensitive species and the incorporation of existing conservation agreement protections (BLM 2005, pp. 3–9 and Appendix E-2). The draft Salt Lake FMP also provides indirect protection for Goose Creek milkvetch from an altered wildfire regime because it recommends suppression of unplanned wildfires within the area where the species occurs in order to maintain the existing habitat condition (BLM 2005, pp. 4-12, 4-14, 4-17). These draft provisions are consistent with the Final FMP (BLM 1999, entire) and are currently being implemented by the Utah BLM (Sillitoe 2015b, entire).

In Idaho, the Cassia Resource Management Plan (1985) is the regulatory framework for the management of public lands where Goose Creek milkvetch occurs (BLM 1985a). This plan was amended in 2008 through the Fire, Fuels and Related Vegetation Management Direction Plan Amendment (FMDA). The FMDA amended the plan to specify the BLM's decisions on wildland fire suppression and use of fire and non-fire vegetation treatments including ES&R. The FMDA provides direction to prioritize use of native species in vegetation treatments in native species habitats. The FMDA also provides restrictions for the protections and conservation measures for federally threatened, endangered, and candidate species and the BLM sensitive species. The July 2008 addendum to the FMDA includes the following protections for

Goose Creek milkvetch: (1) Suppress wildland fire in identified habitat for Goose Creek milkvetch; (2) no dozer use; and (3) follow minimum impact suppression tactics (MIST) guidelines where appropriate. Additionally, the FMDA Record of Decision stated "Threatened, endangered, and candidate species with recovery plans, conservation agreements, and conservation strategies will be protected as specified in their respective plans/agreements/strategies" (BLM 2008c, p. 33).

Protections for Goose Creek milkvetch are incorporated into two planning documents of the Idaho BLM: a Final Programmatic Emergency Stabilization and Rehabilitation Plan (PESRP) (BLM 2013a, entire) and a draft Noxious Weed and Invasive Plant Treatment Plan (BLM 2013b, entire). The draft PESRP includes the following protections for Goose Creek milkvetch (BLM 2013a, p. 26): (1) ground disturbing activities would not occur unless it is clearly beneficial for Goose Creek milkvetch; (2) only aerial seeding or hand plantings would occur in Goose Creek milkvetch habitat; (3) potentially invasive nonnative plant materials would not be used in Goose Creek milkvetch habitat, an exception may be in areas where such plants are needed to stabilize the site following wildfire; (4) if competitive nonnative plants are used, their presence would be monitored to determine if adverse effects are occurring and removed as needed to conserve Goose Creek milkvetch and its habitat; and (5) only hand treatment methods would be used to control invasive plants or noxious weeds in occupied Goose Creek milkvetch habitat. The Idaho BLM's draft Noxious Weed and Invasive Plant Treatment Plan (BLM 2013b, p. 35) includes the following protections: (1) only hand treatment methods, including spot herbicide treatment, would be used to control noxious weeds or invasive plants in occupied Goose Creek milkvetch habitat; and (2) herbicide treatments would be applied in a manner that avoids application to Goose Creek milkvetch. While our threat evaluation for inadequacy of regulatory mechanisms is not based on the measures identified in these two planning documents, it is important to note that these specific measures will provide additional protections for the Goose Creek milkvetch in Idaho for wildfire management and invasive nonnative plants.

In Nevada, the Wells Resource Management Plan (1985) is the regulatory framework for the management of public lands where Goose Creek milkvetch occurs (BLM 1985b). This plan was amended in 2003 through the Elko/Wells Fire Management Amendment (Elko/Wells FMA) (BLM 2003, entire) to specify the BLM's decisions on wildland fire suppression and use of fire and non-fire vegetation treatments including ES&R activities. The Elko/Wells FMA developed Standard Operating Procedures for listed and candidate species to guide wildfire response activities in areas where these species occur. The Elko/Wells FMA identifies Goose Creek milkvetch as a species of concern and provides indirect protection for Goose Creek milkvetch from an altered wildfire regime because it recommends moderate suppression of wildfires within the area where the species occurs in order to maintain the existing habitat condition (BLM 2003, pp. 2-23, 2-31, 2-31).

As part of Federal efforts to regulate activities near Goose Creek milkvetch and its habitat, several monitoring actions have occurred throughout the species range and are managed by individual BLM offices. Since 2001, the Idaho BLM office established monitoring plots in each EO within the state and has implemented a monitoring program for the species and a schedule that includes annual and periodic monitoring (at least once every three years) of plots (See *Monitoring Effort 1 in Description of Monitoring*, below). Since 2004, the Utah BLM

established monitoring plots in one of the four EOs in the state and has implemented an monitoring program that includes irregular monitoring schedule (at least once every six years) of plots and field assistance with the 2004 and 2005 censuses (See *Monitoring Effort 3 in Description of Monitoring*, below).

Finally, the Federal Noxious Weed Act provides the Secretary of Agriculture with the authority to prevent the spread of noxious weeds and to cooperate with other Federal, State, and local agencies to control noxious weeds (Public Law 93-629 (7 U.S.C. 2801 et seq.; 88 Stat. 2148), enacted January 3, 1975). This Act provides indirect protection for Goose Creek milkvetch and its habitat from leafy spurge and other noxious weeds by requiring treatment of noxious weeds on BLM lands.

There are no other threats that are currently impacting Goose Creek milkvetch (see Factors A, B, C, and E) that require regulatory mechanisms to protect the species. Therefore, the existing regulatory mechanisms are adequate to address the control of leafy spurge in Goose Creek milkvetch habitat and leafy spurge does not pose a threat to Goose Creek milkvetch at the present time. We anticipate leafy spurge will pose a threat to Goose Creek milkvetch in the foreseeable future (see *Invasive Nonnative Plant Species* under Factor A); however, because leafy spurge is a noxious weed, regulatory mechanisms are adequate to protect Goose Creek milkvetch from leafy spurge under existing State and Federal regulations and do not pose a future threat.

Summary

In the 2009, 12-month finding we previously considered the inadequacy of regulatory mechanisms a moderate to low threat to the species that was non-imminent. We determined that the native vegetation and habitat condition was relatively intact and that the livestock standards and guidelines were likely protective of the species. We were concerned that range-wide trend monitoring was not conducted and we had no information that the BLM was following specific management guidelines for Goose Creek milkvetch (74 FR 46535).

Since 2009, no new BLM regulated or implemented actions have resulted in significant, additional impacts to the species, and no other threats are currently impacting Goose Creek milkvetch (see Factors A, B, C, and E) that require regulatory mechanisms to protect the species. Existing regulatory mechanisms are adequate to address the future threat of leafy spurge to Goose Creek milkvetch and therefore, we do not consider existing regulatory mechanisms to pose a threat to Goose Creek milkvetch in the foreseeable future. Though our threat evaluation for inadequacy of regulatory mechanisms is not based on future conservation measures in the 2015 CA or the draft management plans discussed above, it is important to note that the BLM in Idaho, Nevada, and Utah will continue to provide adequate protection through the existing regulatory mechanisms for the species in the future (see *Conservation Measures Planned or Implemented*, below).

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

Natural and manmade factors affecting Goose Creek milkvetch include small population size and climate change.

Small Population Size

We lack information on the population genetics of Goose Creek milkvetch, and as a probable outcrosser, this species could potentially be subject to the negative effects of small population size. Plants that are obligate outcrossers cannot fertilize themselves and rely on other individual plants of differing genetic make-up to reproduce (Stebbins, 1970, p. 310). Therefore, the fewer plants that are located at a site (i.e., small population size), the less chance exists for sufficient cross-fertilization.

Small populations and species with limited distributions can be vulnerable to relatively minor environmental disturbances (Given 1994, pp. 66–67). Small populations also are at an increased risk of extinction due to the potential for inbreeding depression, loss of genetic diversity, and lower sexual reproduction rates (Ellstrand and Elam 1993, entire; Wilcock and Neiland 2002, p. 275). 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 (Barrett and Kohn 1991, pp. 4, 28; Newman and Pilson 1997, p. 360).

At least four of the five Goose Creek milkvetch populations (Populations 1, 2, 3, and 5) are comprised of multiple sites that are within 0.6 mi (1 km) of each other, and genetic exchange is likely with the appropriate pollination vectors. Additional surveys and monitoring of population 4 (EO N005) will be needed to determine its overall size and connectivity—only 2 plants were observed in 2008 after the wildfire completely burned the population, but the population size increased to 56 plants as of 2013 (Collins 2013b, p. 2). Suitable habitat occurs between Populations 3 and 4, but it has not been surveyed. These habitat patches may support gene flow between the two populations if they are occupied or provide source patches for dispersal and colonization if they are unoccupied (74 FR 46535; Collins 2013b, p. 2). Additional surveys are needed to determine the species distribution between the two populations.

Although the species exists in a relatively narrow range (known distribution is 216 mi^2 (559 km^2), it occurs across its range in a scattered but continuous distribution. Because there are large areas of suitable habitat that remain unsurveyed in Idaho and Nevada, the species may be more widely distributed than its current known distribution.

Goose Creek milkvetch's scattered distribution in Nevada and Utah may contribute to its overall viability and potential resilience. For example, small-scale stochastic events, such as the erosion of a hillside during a flood event, would probably destroy only a small portion of the known individuals of Goose Creek milkvetch. It is possible that a landscape-level event, such as a wildfire could negatively impact large numbers Goose Creek milkvetch individuals, but the sparseness of the vegetation, the lack of fine fuels in Goose Creek milkvetch habitat, and the likelihood of a persistent seed bank makes this event unlikely (see *Wildfire* under Factor A,

above). The lack of other surface-disturbing threats (see Summary of Factor A, above) also leads us to conclude that the species' current distribution and population size will remain intact.

In the absence of information identifying threats to the species and linking those threats to the rarity of the species, we do not consider rarity alone to be a threat. A species that has always been rare, yet continues to survive, could be well equipped to continue to exist into the future. This may be particularly true for Goose Creek milkvetch which is adapted to recolonize disturbed sites. Many naturally rare species have persisted for long periods within small geographic areas, and many naturally rare species exhibit traits that allow them to persist, despite their small population sizes. Consequently, the fact that a species is rare does not necessarily indicate that it may be in danger of extinction in the future. We have no information to conclude that small population size is a concern for Goose Creek milkvetch.

Summary

Small populations and species with limited distributions can be vulnerable to relatively minor environmental disturbances; however, the Goose Creek milkvetch has exhibited population stability following multiple disturbances. Its scattered distribution, connectivity among its individual populations, and lack of other existing threats has allowed it to maintain genetic viability and resilience. We conclude that small population size is not a threat to this species now or in the future.

Climate Change

Our analyses under the Act include consideration of observed or likely environmental changes resulting from ongoing and projected changes in climate. As defined by the Intergovernmental Panel on Climate Change (IPCC), the term ''climate'' refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2013a, p. 1450). The term ''climate change'' thus refers to a change in the mean or the variability of relevant properties, which persists for an extended period, typically decades or longer, due to natural conditions (*e.g.,*solar cycles) or human-caused changes in the composition of atmosphere or in land use (IPCC 2013a, p. 1450). Scientific measurements spanning several decades demonstrate that changes in climate are occurring. In particular, warming of the climate system is unequivocal, and many of the observed changes in the last 60 years are unprecedented over decades to millennia (IPCC 2013b, p. 4). The current rate of climate change may be as fast as any extended warming period over the past 65 million years and is projected to accelerate in the next 30 to 80 years (National Research Council 2013, p. 5).

Scientists use a variety of climate models, which include consideration of natural processes and variability, as well as various scenarios of potential levels and timing of greenhouse gas (GHG) emissions, to evaluate the causes of changes already observed and to project future changes in temperature and other climate conditions. Model results yield very similar projections of average global warming until about 2030, and thereafter the magnitude and rate of warming vary through the end of the century depending on the assumptions about population levels, emissions of GHGs, and other factors that influence climate change. Thus, absent extremely rapid

stabilization of GHGs at a global level, there is strong scientific support for projections that warming will continue through the 21st century, and that the magnitude and rate of change will be influenced substantially by human actions regarding GHG emissions (IPCC 2013b, 2014; entire). Global climate projections are informative, and, in some cases, the only or the best scientific information available for us to use. However, projected changes in climate and related impacts can vary substantially across and within different regions of the world (*e.g.,* IPCC 2013c, 2014; entire) and within the United States (Melillo et al. 2014, entire). Therefore, we use ''downscaled'' projections when they are available and have been developed through appropriate scientific procedures, because such projections provide higher resolution information that is more relevant to spatial scales used for analyses of a given species (see Glick et al. 2011, pp. 58–61, for a discussion of downscaling).

Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (e.g., habitat fragmentation) (for examples, see Franco *et al.* 2006; Forister *et al.* 2010; Galbraith *et al.* 2010; Chen *et al.* 2011). In addition to considering individual species, scientists are evaluating potential climate change-related impacts to, and responses of, ecological systems, habitat conditions, and groups of species (*e.g.,* Deutsch et al. 2008; Berg et al. 2010; Euskirchen et al. 2009; McKechnie and Wolf 2010; Sinervo et al. 2010; Beaumont et al. 2011; McKelvey et al. 2011; Rogers and Schindler 2011).

Climate change effects present substantial uncertainty regarding the future environmental conditions in the range of Goose Creek milkvetch and may place an added stress on the species and its habitat. Observed changes in temperature in the southwestern United States already show an increase of approximately 1.5 degrees Fahrenheit (°F) compared to a 1960 to 1979 baseline (Karl *et al.* 2009, p. 129). Climate modeling is not currently forecasting at a level of detail at which we can predict the amount of temperature and precipitation change precisely within the limited range of Goose Creek milkvetch. Therefore, we generally address what could happen under current climate projections based upon what we know about the biology of the species.

Both the Intergovernmental Panel on Climate Change and the U.S. Global Climate Change Program conclude that changes to climatic conditions, such as temperature and precipitation regimes, are occurring and are expected to continue in western North America over the next 100 years (Smith *et al.* 2000, p. 220; Solomon *et al.* 2007, p. 70, Table TS.76; Trenberth *et al.* 2007, pp. 252-253, 262-263). By the end of this century, temperatures are expected to warm a total of 4 to 10 °F (2 to 5 °C) in the Southwest (Karl *et al.* 2009, p. 129). Annual mean precipitation levels are expected to decrease in western North America and especially the southwestern States by mid-century (IPCC 2007, p. 8; Seager *et al.* 2007, p. 1181). These changes are likely to increase drought in the area where Goose Creek milkvetch occurs. An increase in the intensity and frequency of drought conditions may lead to a decline in abundance or range adjustments for the species. Some estimate that approximately 20 to 30 percent of plant and animal species are at increased risk of extinction if increases in global average temperature exceed 2.7 to 4.5 °F (1.5 to 2.5 °C) (IPCC 2007, p. 48).

We do not have a clear understanding of how Goose Creek milkvetch responds to precipitation changes, although generally plant numbers decrease during drought years and recover in subsequent seasons that are less dry, see *Population Estimates/Status*, above. Plants growing in high-stress landscapes are adapted to stress, and drought-adapted species may experience lower mortality during severe droughts (Gitlin *et al.* 2006, pp. 1477, 1484). As discussed in the *Habitat/Life History*, above, Goose Creek milkvetch seedling establishment is probably correlated with rainfall; therefore, reduced precipitation may reduce seedling establishment. Additionally, the relatively localized distribution of Goose Creek milkvetch may make this species more susceptible to landscape-level stochastic extinction events. Despite these potential vulnerabilities, Goose Creek milkvetch appears well-adapted to a dry climate and can quickly colonize after disturbance. Furthermore, plants and plant communities of arid and semi-arid systems may be less vulnerable to the effects of climate change if future climate conditions are within the historic natural climatic variation experienced by the species (Tielbörger *et al.* 2014, p. 7). Goose Creek milkvetch likely experienced multiple periods of prolonged drought conditions in the past as documented from reconstructed pollen records in sagebrush steppe lands (Mensing *et al.* 2007, pp. 8–10).

Accelerating rates of climate change of the past two or three decades indicate that the extension of species' geographic range boundaries toward the poles or to higher elevations by progressive establishment of new local populations will become increasingly apparent in the relatively short term (Hughes 2005, p. 60). We currently do not have evidence of a range contraction for the Goose Creek milkvetch, but surveys have not been performed at higher elevations since 2004 to determine if the species is now occupying those sites. We also do not know if the species can occupy different slope aspects on the tuffaceous outcrops that are cooler and wetter. As mentioned in *Habitat/ Life History* section, above, the species rarely occurs on north-facing slopes, but may have the potential to move to this slope aspect if the habitat is within reasonable seed dispersal distance.

Effects of Climate on Plant Abundance

Climate is an important factor affecting plant abundance in arid and semi-arid environments. Drought conditions are believed to be the primary cause of declines in abundance of other rare plant species in the Southwest (Anderton 2002, p. 1; Clark and Clark 2007, pp. 6–8; Hughes 2005, entire; Roth 2008a, entire; Roth 2008b, pp. 3–4; Van Buren and Harper 2002, p. 3; Van Buren and Harper 2003, p. 240). Large declines have also been reported for common plant species that include short-lived and long-lived perennial plants in response to drought conditions (Miriti *et al.* 2007, p. 35). Goose Creek milkvetch and other short-lived plants have the potential to respond to climate conditions within a relatively short time owing to their short life span (Tielbörger *et al.* 2014, p. 2). They can employ adaptations in order to survive periods of resource limitation (i.e., drought), and can respond strongly to available water (Alexander *et al.* 1994; p. 2004; Salguero-Gómez *et al.* 2012, p. 3100; Schwinning and Sala 2004, entire).

The effects of climate likely contributed to the consistent pattern observed in unburned, burned, and partially burned habitat between 2004 and 2014. The fluctuation in plant density between 2004/2005 and 2014 is likely the species' inherent response to periods of reduced precipitation and drought. The high plant abundance and density documented in 2004 and 2005 occurred

during an extremely wet period when the annual precipitation was well above average. In 2005, annual precipitation was 150% above normal (Service 2014b, entire) and plant abundance during this time can be characterized as a spike or peak in population size when compared to previous levels at known sites. Low plant abundance and density was documented in 2008 and 2009 when precipitation levels were lower than normal since 2007 (Service 2014b, entire; Hardy 2013, pp. 4 - 8). This response would also be consistent for an earlier reported reduction in plant abundance at select occurrences in Idaho between 1991 and 2001 prior to the 2004/2005 censuses (Mancuso 2001, p. 1). We did not include the 1991 and 2001 plant abundance data in our statistical analysis because the 1991 estimates were too broad and are not reliable for our comparison (Mancuso 2014, entire) and the 2001 abundance data was for the entire occurrence and cannot be compared to future abundance within smaller monitoring plots. However, abundance estimates were higher in 1991, a "wet" year, compared to the "dry" year of 2001 (Service 2014b, entire). The drought between 1999 and 2003 was severe and likely contributed to the species' first observed decline (Hardy 2005, p. 6). Additional data, in particular seedling recruitment data, is needed to develop a better understanding of the species' response to precipitation levels and population trend (see *Habitat*/*Life History* section, above).

Despite the limitations of the best available scientific and commercial information, we conclude the fluctuation in plant abundance between 2004/2005 and 2008 was a response to drier conditions, perhaps in conjunction with the availability of other resources under various moisture conditions (Schwinning and Sala 2004, pp. 211–219), and we do not consider the change to indicate a negative population trend for Goose Creek milkvetch (see *Population Estimates/Status,* above). Moreover, Goose Creek milkvetch's ability to respond quickly to precipitation levels is a response that is consistent and compatible with plant adaptations to survive semi-arid environment periods of drought and is advantageous to avoid stressful conditions (Lesica and Crone 2007, p. 1367; Schwinning *et al.* 2004, entire; Schwinning and Sala 2004, entire; Verhulst *et al.* 2008, pp. 104–105). Therefore, climate change and drought are not a threat to Goose Creek milkvetch now and are not likely to pose a threat in the foreseeable future.

Summary

Climate change is affecting and will affect temperature and precipitation events in the future. We expect that individual Goose Creek milkvetch plants may be negatively affected by climate change related drought. However, we determine that Goose Creek milkvetch's adaptation to growing in high-stress environments renders this species less susceptible to negative effects from climate change. Although we anticipate climate change will impact individual plants in the future, the available information is too speculative to determine this potential threat to Goose Creek milkvetch at the population level. However, we further evaluate the potential cumulative effects associated with Climate Change and other stressors below (see *Cumulative Effects from All Factors*, below).

Summary of Factor E

We assessed the potential risks of small population size, climate change, and related drought to Goose Creek milkvetch. There is no evidence that the species' small population size is a threat

to Goose Creek milkvetch. Rather, small, scattered sites within a population are likely an evolutionary adaptation of the species. Climate change and resulting drought may affect Goose Creek milkvetch germination, growth and reproductive success. However, Goose Creek milkvetch is adapted to a landscape where drought naturally occurs and has demonstrated its ability to withstand historic climatic variability, including droughts. In addition, as described in Summary of Factor A, there are no threats to the species that would result in significant loss or fragmentation of available habitat. We currently lack sufficient information that other natural or manmade factors rise to the level of a threat to Goose Creek milkvetch now or for the foreseeable future.

Cumulative Effects from All Factors

We did not evaluate the cumulative effects of all factors in the 2009, 12-month finding. We now assess whether Goose Creek milkvetch may be affected by a combination of factors. The stressors discussed above pertain to the 5 listing factors described in the Act:

A. The present or threatened destruction, modification, or curtailment of habitat or range (wildfire, wildfire management, invasive nonnative plants, livestock use, development, recreation, mining and oil and gas development);
B. Overutilization for commercial, recreational, scientific, or educational purposes (unauthorized collection);
C. Disease or predation;
D. The inadequacy of existing regulatory mechanisms; and
E. Other natural or manmade factors affecting the species' continued existence (climate change, small population size).

All or some of the stressors discussed in this finding (wildfire, wildfire management, invasive nonnative plant species, livestock use, small population size and climate change) could work in concert with one another to increase the vulnerability of Goose Creek milkvetch and cumulatively impact the species beyond the scope of each individual stressor. We identify multiple potential stressors that may have interrelated impacts to rare plants in general followed by a specific evaluation for Goose Creek milkvetch and its habitat.

Example scenarios where multiple potential stressors may interact to rare plants in general include the following: Climate change may exacerbate the impact of invasive nonnative plants and wildfire because higher atmospheric levels of carbon dioxide may increase the dominance of invasive grasses leading to increased fire frequency and severity across western North America (Brooks and Pyke 2002, p. 3; IPCC 2002, p. 32; Walther *et al.* 2002, p. 391). Elevated levels of carbon dioxide may lead to increased invasive annual plant biomass, invasive seed production, and pest outbreaks (Smith *et al.* 2000, pp. 80–81; IPCC 2002, pp. 18, 32; Ziska *et al.* 2005, p. 1328) and could place additional stressors on rare plants already suffering from the effects of elevated temperatures and drought. Climate change is anticipated to augment the ability of invasive nonnative species to out-compete native plant species and also reduce the ability of native plant species to recover in response to perturbations. The presence of additional stressors in the habitat that create surface disturbance such as wildfire, wildfire management, and

livestock use, could aggravate the negative effect to individual plants by facilitating the establishment and spread of invasive nonnative plant species in the species' habitat.

While cumulative effects from multiple stressors have the potential to negatively impact Goose Creek milkvetch, the best available scientific and commercial information currently does not indicate that the stressors of wildfire, wildfire management, invasive nonnative plant species, livestock use, small population size, or climate change are singularly or cumulatively resulting now in a substantial impact to the total extant Goose Creek milkvetch population (see Factors A through E, above). The species currently maintains a robust population in locations where multiple stressors exist and its continued persistence demonstrates that the species has some level of tolerance for less than optimal conditions. Our analysis indicates the species is resilient to the combined effects from wildfire, soil disking, drill seeding of invasive nonnative plants, and livestock use. In addition, the species' habitat is highly resistant to cheatgrass invasion from wildfire and other stressors such as wildfire management and livestock use. Therefore, we do not consider the cumulative impact of these stressors to Goose Creek milkvetch to be a threat at this time. While cumulative effects from multiple stressors have the potential to increase in the future, we lack sufficient data to make reliable projections of future impacts to the species. Though our threat evaluation for cumulative effects is not based on future conservation measures in the 2015 CA, it is important to note that the BLM will implement avoidance buffers for surface disturbing activities (see *Conservation Measures Planned or Implemented*, below). These buffers will ensure that future disturbance within the species' habitat is low enough to maintain the integrity of the natural community, support the habitat's resilience to invasive nonnative species invasion and natural disturbance events such as wildfire, and reduce future negative effects to the species from multiple stressors.

Conservation Measures Planned or Implemented:

On June 14, 2015, a Conservation Agreement and Strategy (2015 CA) for Goose Creek milkvetch was finalized to meet the conservation goals of the species, including conservation measures that have been initiated but have not been implemented long enough to measure effectiveness and are not considered in our decision. Other conservation actions have been planned but not yet implemented. The signatories to the 2015 CA are the BLM and the Service in Idaho, Nevada, and Utah. The 2015 CA includes many of the conservation actions that were independently implemented by the three BLM Field Offices so the implementation of those actions will expand to encompass the majority of the species population (86 percent) and habitat (93 percent). The 2015 CA incorporates the following conservation actions: (1) range-wide incorporation of Goose Creek milkvetch into BLM planning efforts for fire, wildfire management, weed control, and livestock use; (2) range-wide implementation of avoidance buffers for wildfire management activities, livestock range management activities, development, mining and oil and gas development and future federal actions; (3) range-wide commitment to annually treat leafy spurge in and near Goose Creek milkvetch habitat; (4) expansion of existing monitoring effort to include all Goose Creek milkvetch EOs and demographic monitoring; and (5) retention of Goose Creek milkvetch as a BLM sensitive species. These conservation actions are summarized below.

(1) Range wide incorporation of Goose Creek milkvetch into BLM planning efforts for fire, wildfire management, weed control, and livestock use.

Planning efforts to avoid and minimize impacts to Goose Creek milkvetch are ongoing and are designed to ensure the species is considered prior to project implementation and that avoidance measures will be properly implemented. The BLM in all three States has already incorporated Goose Creek milkvetch into fire planning and weed control planning, and will continue to implement this commitment under the 2015 CA. These planning efforts will expand to include range-wide incorporation of the species into wildfire management planning (post-wildfire ES&R activities), and a new commitment to incorporate the species into future livestock use range management planning. As mentioned above in *Wildfire Management: Firefighting* under Factor A, these planning efforts in conjunction with the implementation of other conservation measures resulted in the avoidance of habitat and no impacts to Goose Creek milkvetch from the 2013 Border Fire. As mentioned above in *Invasive Nonnative Plant Species: Leafy Spurge* under Factor A, weed control planning in Goose Creek milkvetch habitat has been effective in prioritizing the regular treatment of leafy spurge in Idaho.

(2) Range wide implementation of avoidance buffers for wildfire management activities, livestock range management activities, development, mining and oil and gas development and future federal actions.

New commitments in the 2015 CA include the use of biologically meaningful avoidance buffers and are designed to avoid future direct impacts to Goose Creek milkvetch and the habitat and to maintain favorable habitat conditions for the species. These buffers will ensure that future disturbance within its habitat is low enough to maintain the integrity of the natural community, support the habitat's resilience to invasive nonnative species invasion and natural disturbance events such as wildfire, and reduce future negative effects to the species. The use of avoidance measures and biologically meaningful buffers is effective because it is recognized as the best strategy for the conservation of endemic plant species such as Goose Creek milkvetch in order to keep their natural habitat as free as possible from any form of unnatural disturbance (Oostermeijer 2003, pp. 28 - 29). BLM activities and corresponding buffers are summarized below.

a. Firefighting & New Development: An avoidance buffer of 91.4 m (300 ft) will be implemented for the use of heavy equipment, fire retardant application, and the creation of fire lines and new access roads, and any new development on BLM lands. This avoidance distance will minimize the effects of disturbance and is the standard avoidance buffer distance recommended to Federal agencies in the Service's Section 7 consultations on nontribal lands for listed plants within Utah (Service 2014a).

b. Post-fire ES&R: An avoidance buffer of 500 m (1,640 ft) will be implemented for the seeding of crested wheatgrass (*Agropyron cristatum*), intermediate wheatgrass (*Thinopyrum intermedium*), and kochia species. The 500 m (1,640.4 ft) distance is the recommended buffer for pollinators by BLM discussed in detail in BLM (2012), and is recommended to protect the nesting and foraging requirements of ground nesting bees so that Goose Creek milkvetch's reproductive output is not limited by a decline in bee

abundance. The use of a pollinator buffer for avoiding the seeding of highly competitive, nonnative plant species is based on research that documented lower bee diversity in crested wheatgrass dominated habitats compared to other habitats in the Great Basin (Johnson 2008) and a decline in pollinator diversity in habitats dominated by invasive grasses (Havens *et al.* 2006). Since crested wheatgrass and other nonnative grasses are identified as highly competitive plant species and will be excluded from the pollinator buffer, this restriction will be effective in maintaining pollinator diversity in the Goose Creek milkvetch pollinator buffer so that the species' seed production and genetic diversity are maximized and not limited by the introduced plants.

An ongoing commitment to avoid post-wildfire ES&R disking and drill seeding in Goose Creek milkvetch habitat in Idaho will expand to include range-wide implementation of this restriction.

c. Mining and Oil and Gas Development: An avoidance buffer of 500 m (1,640 ft) will be implemented for future mining and oil and gas development. This distance is considered the pollinator buffer, as discussed in the above paragraph. In addition, this distance exceeds the 91.4 m (300 ft) standard avoidance buffer distance recommended to Federal agencies in the Service's Section 7 consultations on nontribal lands for listed plants within Utah (Service 2014a).

d. Livestock Range management: An avoidance buffer of 402.3 m (1,320 ft) will be implemented for new range management projects such as water tanks and associated pipelines, new fencing, and the placement of mineral supplements. The avoidance buffer exceeds the distance of 100 m (328 ft) identified in the 12-month finding and subsequent CNORs where existing range management resulted in concentrated livestock use within the habitat, and therefore should prevent the creation of new livestock trails or piospheres within Goose Creek milkvetch habitat.

Additional conservation actions are designed to ensure compliance with the restrictions and avoidance buffers and include the flagging of habitat prior to soil disking, the use of GPS polygons delineating the species' habitat for avoidance by equipment operators, and the presence of a biological monitor during soil disking and drilling. These conservation actions are consistent with applicant committed conservation measures for listed plant species in Utah, and have been successfully implemented by the Idaho BLM for avoiding other sensitive resources (Theodozio 2015a, entire).

(3) Range wide commitment of annual survey and treatment of leafy spurge in Goose Creek milkvetch habitat.

This commitment in the 2015 CA is discussed earlier in the CNOR, see see *Invasive Nonnative Plant Species: Leafy Spurge* under Factor A, above.

(4) Expansion of existing monitoring efforts to include all Goose Creek milkvetch EOs and demographic monitoring.

This commitment in the 2015 CA will expand the existing BLM monitoring effort to include regular monitoring of all 5 Populations and 19 EOs for the species. Included in the expanded monitoring commitment is the incorporation of demographic monitoring to determine basic life history information for the species and population trends over time, and to monitor habitat condition. This information will allow the conservation team to adaptively manage for the species' conservation over the duration of the 2015 CA.

(5) Retention of Goose Creek milkvetch as a BLM sensitive species.

The BLM in all three States will retain Goose Creek milkvetch as a BLM sensitive species for the 30-year duration of the 2015 CA. This conservation action will ensure Goose Creek milkvetch habitat will be prioritized for leafy spurge treatment and that the species is afforded protection under FLPMA, which is at least comparable to (if not greater than) the treatment of candidates for Federal listing (see Factor D, above).

In summary, the 2015 CA will support the future resiliency, redundancy, and representation of the species by protecting adequate habitat and an adequate percent of the population across the species range. These protections will ensure that future disturbance within its habitat is low enough to maintain the integrity of the natural community associates and attributes, such as pollinators, pollinator nesting sites, and secondary floral resources.

Summary of Potential Impacts:

Goose Creek milkvetch continues to occupy its historic range, the population trend has been stable for the past 6 years, and the species persists at all monitored sites. The species exhibits substantial year-to-year fluctuations in abundance at monitoring sites which is likely the result of its short life span, dormant life stages (e.g., seeds and possibly adult plants), and its response to climate factors. The population fluctuated in size between 2004 to 2014 which is reflected in our estimates of the total population size of 60,198 in 2004/2005, 23,971 in 2009, and 31,648 in 2014. The best indicator of population size for Goose Creek milkvetch during the 2004–2014 was the 60,198 plants during 2004 and 2005 when a larger fraction of the population was non-dormant. We do not consider the fluctuation in abundance between 2004–2014 to indicate a negative population trend for Goose Creek milkvetch, but rather the species response to climate. Goose Creek milkvetch appears to quickly respond to climate factors and shows a response that is consistent and compatible with plant adaptations to survive semi-arid environments during periods of drought in order to avoid stressful conditions.

In the 2009, 12-month finding, we identified the threats to Goose Creek milkvetch to be wildfire, wildfire management (firefighting and post-wildfire ES&R activities), invasive nonnative plant species (cheatgrass, leafy spurge, crested wheatgrass), livestock use, development, recreation, mining, inadequacy of regulatory mechanisms, and small population size. New information since that time has found that the species is resilient to the majority of these stressors and that the impacts to the species are not as robust or imminent as previously believed. Other new

information since the 2009, 12-month finding includes the protections that will be implemented under the 2015 CA to prevent or reduce future impacts to the species from leafy spurge so that it does not become a threat to Goose Creek milkvetch in the future.

The best available information shows that Goose Creek milkvetch tolerates habitat disturbances from wildfire, wildfire management, invasive nonnative plant species (crested wheatgrass), and livestock use. Other stressors affecting Goose Creek milkvetch—including wildfire, wildfire management, livestock use, nonnative invasive species (cheatgrass), and small population size—are either limited in scope, or we do not have evidence that supports these factors adversely impacting the species as a whole. Leafy spurge (nonnative invasive species) is not a current threat to the species but poses a future threat based upon its anticipated spread in the habitat. However, the commitment in the 2015 CA to annually treat leafy spurge in Goose Creek milkvetch habitat in conjunction with existing regulatory mechanisms will provide effective and sufficient protection so that leafy spurge no longer poses a future threat to the species. The evidence we have at this time does not indicate that any of the stressors were significant contributors to the fluctuation in plant abundance between 2005 and 2008. In fact, our analysis concludes that the species was likely responding to dry or drought conditions by going dormant. We have no evidence that overutilization, disease, or predation is affecting this species. Although climate change has the potential to impact plants in the future, we do not have enough information to determine that climate change will elicit a species-level response from Goose Creek milkvetch. We do not consider the existing regulatory mechanisms to pose a threat to Goose Creek milkvetch now or in the future because there are no other threats that are currently impacting Goose Creek milkvetch (Factors A, B, C, and E) that require immediate regulatory mechanisms to protect the species and existing regulatory mechanisms are adequate to treat leafy spurge. Finally, because none of these factors rises to the level of a threat, the cumulative effect of these stressors is not a significant threat to Goose Creek milkvetch. The commitments in the 2015 CA that were not considered in this listing decision will provide additional protections to conserve Goose Creek milkvetch throughout its range and will permit the BLM to effectively manage the species on their lands. The commitments in the 2015 CA will protect approximately 86 percent of the total known population and 93 percent of the total known habitat of Goose Creek milkvetch.

As a result of new information and analysis, the originally identified threats in the 2009, 12-month finding are no longer considered an immediate or near-term risk for the following reasons: (1) the population is stable, the species is persisting at all monitored sites despite disturbance events, and is occupying its historic range; (2) new information indicates that Goose Creek milkvetch was not as significantly affected by wildfire and wildfire management (post-wildfire ES&R activities) than previous information indicated; (3) an expanded protection from the 2015 CA to annually or biennially survey and treat leafy spurge infestations within Goose Creek milkvetch habitat on BLM lands will be effective in controlling the future spread of this noxious weed; and (4) the species occurs over 216 mi^2 (559 km^2), and appears to have adequate representation, resiliency, and redundancy throughout its range (Shaffer and Stein 2000, pp. 301–321).

The evidence we have indicates that while wildfire, wildfire management, invasive nonnative plant species, livestock use, and small population size may have some impact on Goose Creek

milkvetch, these effects singly and in combination do not rise to the level of significantly affecting the species and its habitat. We expect the two conservation measures for leafy spurge identified in the conservation agreement and the PECE analysis to be implemented and effective in the foreseeable future. We do not have any information to indicate that other stressors are likely to increase in the future. We use 30 years as a foreseeable future for this analysis. Threats are difficult to reliably forecast beyond this time horizon for the species and the Factors being considered. This time period also represents the duration of the 2015 CA to implement protections that address the majority of stressors to Goose Creek milkvetch identified here and in the 2009 12-month finding.

Finding

As required by the Act, we considered the five factors in assessing whether Goose Creek milkvetch meets the definition of a threatened or endangered species. We examined the best scientific and commercial information available regarding present and future threats to the species. Based on our review of the best available scientific and commercial information, we find that the current and future threats are not of sufficient imminence, intensity, or magnitude to indicate that Goose Creek milkvetch is in danger of extinction (endangered), or likely to become endangered within the foreseeable future (threatened), throughout all or a significant portion of its range. In our initial finding, above, we found that without effective conservation measures designed to control the spread of leafy spurge, leafy spurge will become a threat in the future such that listing Goose Creek milkvetch may be warranted. However, in our PECE analysis, we determined that the two conservation measures for leafy spurge identified in the 2015 CA will be implemented and effective in mitigating this threat for the foreseeable future, such that it no longer threatens the milkvetch. Therefore, at this time, we find that the petitioned action is not warranted and are removing Goose Creek milkvetch from the candidate list.

Significant Portion of the Range Analysis:

Having determined that Goose Creek milkvetch does not meet the definition of a threatened or endangered species, we must next consider whether there are any significant portions of the range where Goose Creek milkvetch is in danger of extinction or is likely to become endangered in the foreseeable future.

Under the Act and our implementing regulations, a species may warrant listing if it is in danger of extinction or likely to become so throughout all or a significant portion of its range. The Act defines "endangered species" as any species which is "in danger of extinction throughout all or a significant portion of its range," and "threatened species" as any species which is "likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." The term "species" includes "any subspecies of fish or wildlife or plants, and any distinct population segment [DPS] of any species of vertebrate fish or wildlife which interbreeds when mature." We published a final policy interpreting the phrase "Significant Portion of its Range" (SPR) (79 FR 37578). The final policy states that (1) if a species is found to be endangered or threatened throughout a significant portion of its range, the entire species is listed as an endangered or a threatened species, respectively, and the Act's protections apply to all individuals of the species wherever found; (2) a portion of the range of a species is

"significant" if the species is not currently endangered or threatened throughout all of its range, but the portion's contribution to the viability of the species is so important that, without the members in that portion, the species would be in danger of extinction, or likely to become so in the foreseeable future, throughout all of its range; (3) the range of a species is considered to be the general geographical area within which that species can be found at the time FWS or NMFS makes any particular status determination; and (4) if a vertebrate species is endangered or threatened throughout an SPR, and the population in that significant portion is a valid DPS, we will list the DPS rather than the entire taxonomic species or subspecies.

The SPR policy is applied to all status determinations, including analyses for the purposes of making listing, delisting, and reclassification determinations. The procedure for analyzing whether any portion is an SPR is similar, regardless of the type of status determination we are making. The first step in our analysis of the status of a species is to determine its status throughout all of its range. If we determine that the species is in danger of extinction, or likely to become so in the foreseeable future, throughout all of its range, we list the species as an endangered (or threatened) species and no SPR analysis will be required. If the species is neither in danger of extinction nor likely to become so throughout all of its range, we determine whether the species is in danger of extinction or likely to become so throughout a significant portion of its range. If it is, we list the species as an endangered or a threatened species, respectively; if it is not, we conclude that listing the species is not warranted.

When we conduct an SPR analysis, we first identify any portions of the species' range that warrant further consideration. The range of a species can theoretically be divided into portions in an infinite number of ways. However, there is no purpose to analyzing portions of the range that are not reasonably likely to be significant and endangered or threatened. To identify only those portions that warrant further consideration, we determine whether there is substantial information indicating that (1) the portions may be significant and (2) the species may be in danger of extinction in those portions or likely to become so within the foreseeable future. We emphasize that answering these questions in the affirmative is not a determination that the species is endangered or threatened throughout a significant portion of its range—rather, it is a step in determining whether a more detailed analysis of the issue is required. In practice, a key part of this analysis is whether the threats are geographically concentrated in some way. If the threats to the species are affecting it uniformly throughout its range, no portion is likely to warrant further consideration. Moreover, if any concentration of threats apply only to portions of the range that clearly do not meet the biologically based definition of "significant" (i.e., the loss of that portion clearly would not be expected to increase the vulnerability to extinction of the entire species), those portions will not warrant further consideration.

If we identify any portions that may be both (1) significant and (2) endangered or threatened, we engage in a more detailed analysis to determine whether these standards are indeed met. The identification of an SPR does not create a presumption, prejudgment, or other determination as to whether the species in that identified SPR is endangered or threatened. We must go through a separate analysis to determine whether the species is endangered or threatened in the SPR. To determine whether a species is endangered or threatened throughout an SPR, we will use the same standards and methodology that we use to determine if a species is endangered or threatened throughout its range.

We have no evidence that any particular population or portion of the range of Goose Creek milkvetch is critical to the species' survival. Although Population 2 has the majority of the known Goose Creek milkvetch individuals, this area has received a fairly complete search effort and the species distribution is confidently known. Goose Creek milkvetch may actually occur continuously across its known range, but range-wide surveys have not been completed. The Population areas delineated in this document were derived from existing data and information; however, information on the species' distribution and numbers may change with more survey effort. Additionally,our review determined that there are no concentration of threats in any part of the range occupied by Goose Creek milkvetch or areas with substantially greater threats than in other portions of its range. Therefore, we find that factors affecting the species are essentially uniform throughout its range, indicating no portion of the range of the species warrants further consideration of possible endangered or threatened status under the Act. We do not find that Goose Creek milkvetch is in danger of extinction now, nor is it likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Therefore, listing Goose Creek milkvetch as threatened or endangered under the ESA is not warranted at this time.

Recommended Conservation Measures:

N/A. See *Conservation Measures Planned or Implemented*, above.

Priority Table

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	Monotype genus	7
		Species	8
		Subspecies/Population	9
	Non-Imminent	Monotype genus	10
		Species	11
		Subspecies/Population	12

Rationale for Change in Listing Priority Number:

Magnitude:

Imminence:

__Yes__ Have you promptly reviewed all of the information received regarding the species for the purpose of determination whether emergency listing is needed?

Emergency Listing Review

__No__ Is Emergency Listing Warranted?

Description of Monitoring:

The following seven survey and monitoring efforts for Goose Creek milkvetch have occurred since the initial surveys in 2004–2005:

1. 2004-2013 - Monitoring plant abundance at a number of sites in Idaho (Feldhausen 2007, entire; Theodozio 2014, entire);
2. 2008-2009- Monitoring of eleven sites in Nevada and Utah to assess the impacts of wildfire and rehabilitation efforts (Mancuso 2010, entire);
3. 2004-2012 - A compilation of 6 monitoring efforts conducted by BLM's Salt Lake Field Office in Utah (Hardy 2010, entire; Hardy 2012, entire);
4. 2011 - Monitoring of Utah sites (Shohet and Wolf 2011, entire);
5. 2011 - Surveying for of new sites in Idaho (Kinter *et al*. 2012, entire; Kinter 2013, entire);
6. 2013 - Documenting plant abundance at 3 EOs in Nevada and surveying potential habitat between EOs (Collins 2013, entire); and
7. 1990-2013 - Monitoring of plant abundance at sites in Utah (Mancuso 2010, p. 18; Shohet and Wolf 2011, p. 18; Hardy 2014, p. 4).

These studies are described in more detail below.

Monitoring Effort 1:

The BLM Burley Field Office in Idaho documented considerable fluctuation in plant abundance at Goose Creek milkvetch sites monitored over a ten-year period (Figure 2) (Feldhausen 2007, pp. 8–9; Service 2008a, entire; Theodozio 2014). Plants were counted at each monitoring site. At this point, we do not know what is causing these fluctuations. Correlations of plant abundance with precipitation is very low and an independent researcher recommended data should be collected by age or size category to assess a relationship with precipitation (Davis 2014a, p. 4).

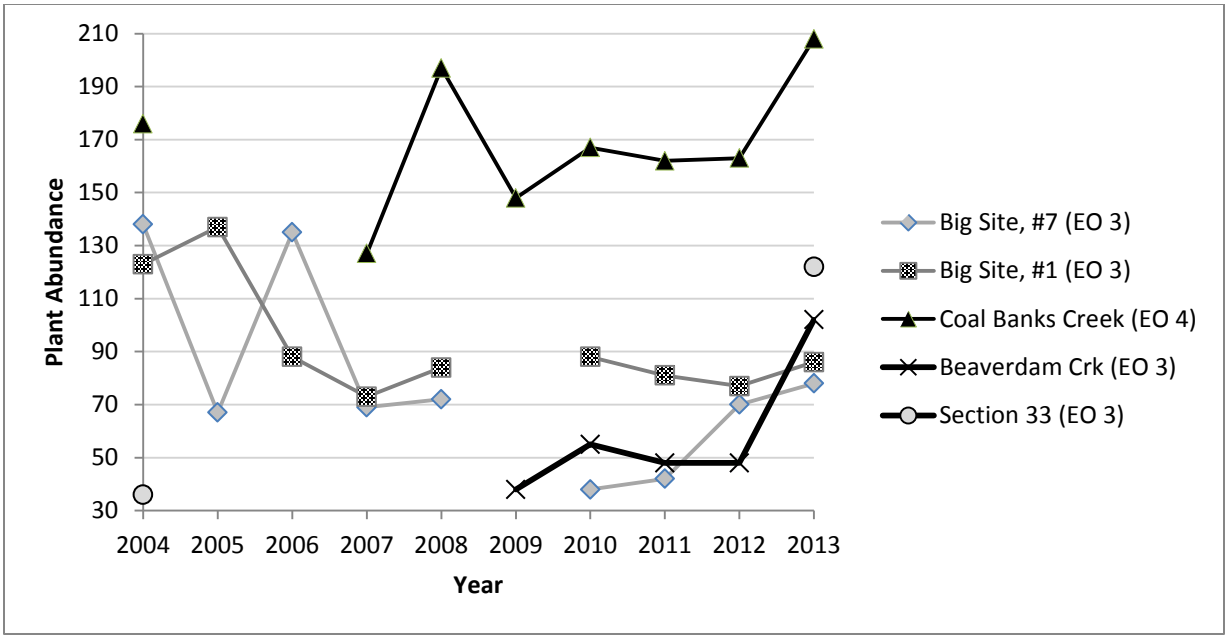

Figure 2. Number of Goose Creek milkvetch plants at select monitoring sites in Idaho by survey year (Feldhausen 2007, pp. 8-9; Theodozio 2014, entire).

Monitoring Effort 2:

Existing monitoring efforts in Nevada and Utah include 11 monitoring sites in Population 2. These sites were established in 2004 or 2005 and have provided pre- and post-fire Goose Creek milkvetch abundance data (Mancuso 2010, entire; Mancuso 2015, entire). These sites were revisited in 2008, 2009, and 2014. Results are identified in Table 4. Monitoring protocols were designed to determine plant abundance, habitat area occupied by Goose Creek milkvetch at each site, habitat and disturbance factors at each site, and included taking photos at established photo points. Repeat photography taken at established photo points will be used to monitor and document site-specific change or stability for landscape features of interest (Hall 2001). Monitoring protocols are fully described in Mancuso (2010, entire; 2014, entire).

Monitoring Effort 3:

Discussed below are six surveys in Utah which focused on two water pipelines, a range study, and a wildfire burn area (Hardy 2010, entire):

1. The first survey was conducted to determine the effects of a water pipeline bisecting a known Goose Creek milkvetch location on BLM lands in Box Elder County (considered the pipeline site). Two plots were established at this site, one on either side of the pipeline and visited twice – once in 2004 and again in 2010 (Hardy 2010, pp. 1–2). Both

plots had more individuals counted in 2010 than in 2004, but the increase was not significant due to the small sample size (p-value = 0.32). Although the population increase between years was insignificant, the 2010 plots displayed evidence of recruitment (Hardy 2010, p. 2). No conclusions regarding population impacts from the pipeline were stated in reports. Additionally, in the same study area, four wire cages were placed over Goose Creek milkvetch plants to protect plants from cattle grazing, but no un-caged control plots were established outside of cages (Hardy 2010, pp. 2–3). The caged plants were visited three times: 2004, 2007, and 2010 (Hardy 2010, pp. 2–3). Due to low numbers of plants monitored, there were no statically significant differences in the number of plants per cage between years (p-value = 0.60). In order to be statistically rigorous, the sample size for this study should have been at least 26 cages, not 4, for 90 percent certainty of detecting a true difference of 20 percent in the number of plants per plot between the years with a false-change error rate of 0.10. Observational data from this effort indicates that the native grasses within the cages appeared to thrive and potentially compete with Goose Creek milkvetch in the absence of grazing (Hardy 2010, p. 2).

2. The second survey was a belt transect placed on top of a 30-year old range study area that was seeded with crested wheatgrass in the 1950s (Hardy 2010, p. 4). The data from the 30-year long range study was not included in Hardy's report for comparison. Surveyors walked the belt transect twice while surveying for Goose Creek milkvetch, once in 2006 and again in 2010. In 2006, the surveyors found two mature plants. In 2010, the surveyors found two seedlings and one young plant. However, due to the small sample size, the survey data provided no inferences other than the multi-year presence of plants within an area previously seeded with crested wheatgrass. Although surveyors observed mature plants, seedlings, and a young plant, the age structure between the individuals over the two time periods was statistically insignificant (p-value = 0.81).
3. The third survey effort established one plot called the Large Hillside Plot, north of the pipeline plot described above in this section (Hardy 2010, pp. 4–5). The plot was visited twice, once in 2007 and again in 2010. In 2007, surveyors counted only the total number of plants and recorded 231 plants (Hardy 2010, pp. 4–5). In 2010, the surveyors also recorded life stages, documenting 160 total plants with 31 seedlings, 40 young plants, and 89 mature plants (Hardy 2010, pp. 4–5). Unfortunately, sample sizes were again too small to show a statistical difference in plot population numbers over time. However, unlike the population increase observed at the nearby pipeline plot, the number of plants counted in this plot decreased. This decrease is similar to the findings of Monitoring Effort 1 in Idaho, described above.
4. The BLM designed the fourth survey effort in Utah to monitor the impacts of the 2007 wildfires on Goose Creek milkvetch. This area was previously inventoried in 2005 and had dense Goose Creek milkvetch populations before the wildfires; however, no population estimate was provided (Hardy 2010, pp. 5–6). The Goose Creek milkvetch population at this site was speculated to contain only 5 percent of what it was before the 2007 wildfire (Hardy 2010, p. 5). The BLM established the first monitoring transects in 2010, but only 3 plants were recorded within the survey quadrats (Hardy 2010, pp. 5–6). This site was revisited in 2012 and there appeared to be half the number of plants observed in 2010; although no plant counts were provided for the site and within the monitoring transects (Hardy 2012, p. 1-site 1). Unfortunately, this study included only

one site. Therefore, its results cannot be compared to other sites, as the type and intensity of threats to the species can vary between sites.

5. The BLM surveyed an unburned site near the burned survey area discussed in number 4, above (Hardy 2012, p. 1-site 2). No post-fire treatments were performed and the density of Goose Creek milkvetch plants appeared to be similar to the density observed in 2005. The plants in 2012 were small in size and brown in color and did not appear vigorous.
6. The BLM surveyed an unburned site in 2012 that was last surveyed in 2002 (Hardy 2012, p. 1-site 3). The population size in 2012 was half of what was documented in 2002, although actual plant counts are not provided. Plants observed at this site in 2012 were small in size and brown in color and did not appear vigorous. The BLM revisited an unburned site in 2012 where a tractor and chain destroyed most of the Goose Creek milkvetch plants in May 2008 (Hardy 2012, p.1-site 4) during post-fire rehabilitation efforts (see *Wildfire Management: Post-wildfire ES&R*, above). A few juvenile Goose Creek milkvetch plants were observed growing in the rills created by the chain; however, the current population size on the site is smaller than it was before the chaining event (Hardy 2013, entire).

Monitoring Effort 4:

Completed in 2011, the fourth monitoring effort focused on Federal and State lands in Box Elder County, Utah. The objectives of this effort were to: (1) resurvey all known Goose Creek milkvetch sites to determine population parameters (site boundaries and population statistics) within Utah; and (2) survey potential Goose Creek milkvetch habitats to identify any previously unknown sites.

The surveyors revisited and found 70 existing sites and 64 new sites (Shohet and Wolf 2011, p. 11). For all existing and new sites, the surveyors found 18,951 individuals on 74.39 ac of occupied habitat (Table 1; Shohet and Wolf 2011, p. 10). The data collected in 2011 by Monitoring Effort 4 cannot be compared directly to previous surveys conducted in Box Elder County because different methods were used to collect the data. However, the data from Monitoring Effort 4 increases our understanding of the species and its distribution.

Monitoring Effort 5:

Conducted in 2011, the fifth monitoring effort focused on identifying suitable habitat for Goose Creek milkvetch sites in Idaho (Kinter *et al*. 2012, p. 1). This effort examined National Agriculture Imagery Program (NAIP) imagery to determine potentially suitable habitats. Based on the analysis, five new, previously unsurveyed sites totaling 46 ha (114 ac) were identified. Qualified botanists referenced local known populations to confirm when flowering of Goose Creek milkvetch was occurring, then surveyed the new sites. However, no new Goose Creek milkvetch populations were discovered within the newly identified habitats (Kinter *et al*. 2012, p. 2). Surveys of potential habitat continued in 2012 on State land, but no new populations were found. Permission to survey potential habitat on private land was denied by the landowner (Kinter 2013, entire).

Monitoring Effort 6:

Conducted in 2013 by the Nevada BLM, the sixth monitoring effort focused on re-surveying three EOs in Nevada (EO 001, 004, and 005) for post-fire plant abundance, and surveying suitable habitat between EOs (Collins 2013, entire). Goose Creek milkvetch plants were flowering during the Fall 2013 surveys and were easily identified at that time of year. The results of the surveys are discussed below:

1. EO 001 was resurveyed in July and October of 2013 and a total of 541 plants were counted. Approximately 75% of the EO burned in 2007. Plant abundance at this EO has returned to the pre-burn abundance of 2004/5 (see Mancuso 2010, p. 18, site N001-1). The survey area included unoccupied areas and therefore density estimates cannot be directly compared to previously collected density calculations.
2. EO 004 was resurveyed in late October/early November of 2013 and a total of 859 plants were counted. This EO did not burn in 2007. Plant abundance at this EO is much higher than past monitoring results that ranged from 282 – 652 (see Mancuso 2010, p. 18, site N004-1). The survey area included unoccupied areas and therefore density estimates cannot be directly compared to previously collected density calculations.
3. EO 005 was resurveyed in October 2013 and a total of 56 plants were counted. This EO burned in 2007. Plant abundance is higher than the 2008 field visit where 2 plants were found (74 FR 46535), but is lower than the pre-burn abundance estimate of 240 plants (see Smith 2007, Appendix 2).
4. New occupied habitat was found between EO 005 and EOs 006 and EO 007, along a ridgeline to the north of EO 005. This new site was partially burned in 2007 and represents an extension of EO 005. This new site indicates EO 005 is less geographically isolated than we previously believed at the time of the 2009, 12-month finding. Plant abundance was not estimated at the new site; additional surveys of the remaining area between EO 005 and EOs 006 and EO 007 are recommended.
5. Surveys adjacent to EO 002 within the 2007 burn perimeter did not locate additional plants.
6. Surveys performed between EO 002 and EO 005 north of the Trout Creek Road intersection did not locate additional plants. Additional surveys are recommended in suitable habitat between these two EOs.

Monitoring Effort 7:

The BLM in Utah documented considerable fluctuation in plant abundance at a Goose Creek milkvetch site (U001-6-1) periodically monitored since 1990. This site is located within Utah EO 001. This site did not burn in 2007, but a fire rehabilitation fence was installed through the north-west portion of the site in 2008, leading to cattle trailing and trampling through the site along the east side of the fence line. The BLM survey data is combined with other survey data at this site (Figure 3) (Mancuso 2010, p. 18; Shohet and Wolf 2011, p. 18; Hardy 2014, p. 4). The large seedling recruitment in 2011 indicates that a well-developed seedbank exists at this site. In 2011, this site (named w026) (Shohet and Wolf 2011) comprised approximately 32 percent of all surveyed plants in Utah and 75 percent of all seedlings (see Table 1, population size class 6,000). At this point, we do not know what is causing these fluctuations, or the effects of livestock use to the species at this site. The BLM plans to remove the fence through the site and establish a

perimeter fence around the site in the spring of 2015 to exclude livestock, and then regularly monitor plant abundance.

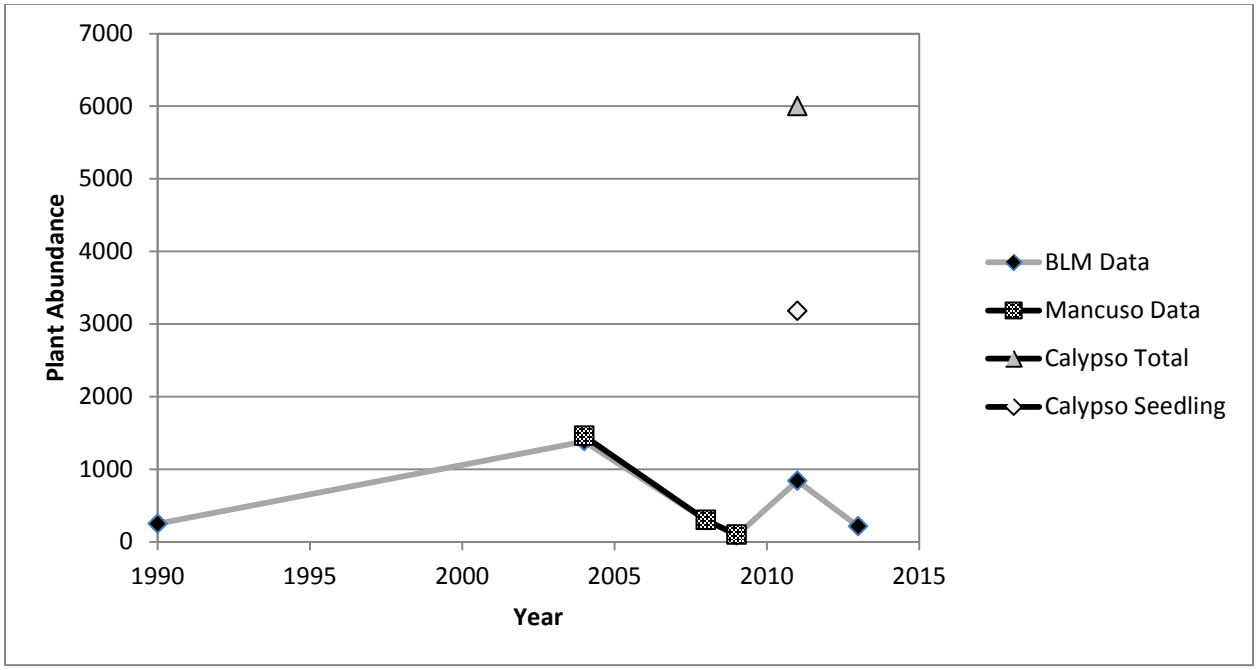

Figure 3. Number of Goose Creek milkvetch plants at Site U001-6-1 in Utah (Mancuso 2010, p. 18; Shohet and Wolf 2011, p. 18; Hardy 2014, p. 4).

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment:

Idaho, Nevada, Utah

Indicate which State(s) did not provide any information or comment:

None

State Coordination:

The Idaho, Nevada, and Utah Natural Heritage programs maintain active databases on the distribution and abundance of Goose Creek milkvetch. Information from Idaho, Nevada, and Utah 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: _____ 7/27/15
Regional Director, Fish and Wildlife Service — Date

Concur: _____ SEP 23 2015
Director, Fish and Wildlife Service — Date
Gary Frazer

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

Director's Remarks: _____