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

Scientific Name:

Boechera pusilla

Common Name:

Fremont County rockcress

Lead region:

Region 6 (Mountain-Prairie Region)

Information current as of:

04/01/2013

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

_X_ Continuing Candidate

___ 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
>
> ___ 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
>
> ___ Conservation efforts have removed or reduced threats

___ More abundant than believed, diminished threats, or threats eliminated.

Petition Information

___ Non-Petitioned

_X_ Petitioned - Date petition received: 07/30/2007

90-Day Positive:08/18/2009

12 Month Positive:06/09/2011

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

For Petitioned Candidate species:

Is the listing warranted(if yes, see summary threats below) **Yes**

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

Explanation of why precluded:

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

Historical States/Territories/Countries of Occurrence:

- **States/US Territories**: Wyoming
- **US Counties**:County information not available
- **Countries**:Country information not available

Current States/Counties/Territories/Countries of Occurrence:

- **States/US Territories**: Wyoming
- **US Counties**: Fremont, WY
- **Countries**:Country information not available

Land Ownership:

Bureau of Land Management

Lead Region Contact:

OFC OF THE RGNL DIR, Sarah Fierce, 303 236-4388, Sarah_Fierce@fws.gov

Lead Field Office Contact:

WY ESFO, Lynn Gemlo, 307-772-2374, lynn_gemlo@fws.gov

Biological Information

Species Description:

Boechera pusilla (Fremont County rockcress or small rockcress) is a perennial herb with several decumbent (lying down), unusually slender stems up to 17 centimeters (cm)(6.7 inches (in.)) long. The plant has basal leaves that are linear (at least 10 times longer than wide) and erect, with relatively sparse forked spreading hairs located on the leaves. Plants generally have three to five stem leaves that are nonclasping (not encircling the stem) and widely spaced. Flowers are small, light lavender, four-petaled, and blossom from May to mid-June. The fruits, which are present from mid-June to July, are hairless linear siliques (narrow elongated seed capsule) that spread at right angles from the drooping main stem on pedicels (small stalks) less than 3 millimeters (mm)(0.12 in.) (Marriott 1986, p. 3; Dorn 1990b, pp. 23; Fertig 1994, unpaginated; Heidel 2005, p. 3).

Taxonomy:

Boechera pusilla is a member of the *Brassicaceae* (mustard) family and was formerly classified as *Arabis pusilla* (Fertig 1994, unpaginated). However, studies in 2003 suggest that most North American *Arabis* species should be placed in the *Boechera* genus (Al-Shehbaz 2003, entire). This determination was based on their distinct chromosome numbers and on molecular data indicating that American and Eurasian species that were classified as *Arabis* have more dissimilarities between them than they do with many other widely recognized genera in the mustard family (Al-Shehbaz 2003, pp. 382383). Although some botanists do not fully support the change (Murray and Elven 2009, unpaginated), reclassification to the *Boechera* genus has been widely accepted (Holmgren *et al*. 2005, p. 537; Flora of North America 2010b, unpaginated). For the purposes of this species assessment, we primarily refer to the species as *Boechera pusilla*, but consider *Arabis pusilla* to be the same species.

Boechera pusilla is genetically closely related to *Boechera demissa* var. *languida* (nodding rockcress), *Boechera pendulina* var. *russeola* (Daggett rockcress), and *Boechera oxylo*bula (Glenwood Springs rockcress) and occurs in a similar geographic area as *B. demissa* var. *languida* and *B. pendulina* var. *russeola* (Dorn 1990b, p. 5; Heidel 2005, p. 2). Five additional species of rockcress occur in or near *B. pusilla* habitat, representing a high amount of diversity within the genus (Heidel 2005, p. 2). *B. pusilla* requires a highly specialized habitat (discussed below under Habitat) that is newly formed, which suggests the species is relatively recently derived from a common ancestor (Dorn 1990b, p. 5). Based on morphological evidence, *B. pusilla* may be a hybrid of *B. pendulina* and *B. lemmonii* (Lemmons rockcress) (Flora of North America 2010b, unpaginated). We recognize *B. pusilla* as a valid species and a listable entity.

Habitat/Life History:

Due to the short growing season (approximately 30 days) in the areas that *Boechera pusilla* occupies, the plant only flowers in May and June with fruits maturing several weeks later (Dorn 1990b, p. 9; Fertig 1994, unpaginated; Heidel 2005, pp. 3, 15). Fruits are only evident during the short frost-free period during the middle of summer (primarily July) and shatter thereafter (Heidel 2005, p. 15). Remnant flower stalks persist through the winter and into the next flowering season (Heidel 2005, p. 15).

Not all plants produce fruit in a particular year (Heidel 2005, pp. 1516), which is thought to be caused by freezing conditions in spring or possibly drought (Heidel 2005, pp. 1516). All *Boechera pusilla* reproduction is apparently by seed (Dorn 1990b, p. 9; Heidel 2005, p. 15), and the species is apomictic (i.e., reproduces by seed with no fertilization, resulting in offspring that are essentially clones) (Flora of North America 2010b, unpaginated). However, similar *Boechera* species have variation in the amount of sexual and asexual

reproduction (Roy 1995, pp. 874876), and we are unsure whether *B. pusilla* exhibits a mixed-mating system. We do not have information about how long the species seeds remain viable or under what conditions they germinate. Apomictic species within the *Boechera* genus result from hybridization of sexual *Boechera* species (Flora of North America 2010b, unpaginated). Reproduction of *B. pusilla* is by (nonwinged) seeds that likely drop near the parent plant, with some seeds dispersed via wind or water (Dorn 1990b, p. 9). It has relatively few seeds per fruit compared to some other *Boechera* species (Dorn 1990b, p. 9). Dispersal vector information is unknown at this time (Heidel 2005, p. 15).

Boechera pusilla occupies sparsely vegetated, coarse granite soil pockets in exposed granite-pegmatite outcrops, with slopes generally less than 10 degrees, at an elevation between 2,438 to 2,469 meters (m) (8,000 to 8,100 feet (ft)) (Dorn 1990b, pp. 3, 6). A pegmatite is a very coarse-grained igneous (formed from magma or lava) rock that usually occurs in dikes (sheet-like body of magma) (Heidel 2005, p. 8). The soils are sandy to loamy (mixture of clay, silt and sand), poorly developed, very shallow, and possibly subirrigated by runoff from the adjacent exposed bedrock (solid consolidated rock) (Dorn 1990b, pp. 68). *B. pusilla* is likely restricted in distribution by the limited occurrence of pegmatite in the area (Heidel 2005, p. 8). A distribution model shows potential habitat could occur in an area no greater than two townships (186.5 square kilometers (km^2); 72 square miles (mi^2)) (Heidel 2005, p. 7). The dense nature of pegmatite does not allow for fertile soil, therefore restricting vegetation growth (Heidel 2005, p. 15). The specialized habitat requirements of *B. pusilla* have allowed the plant to persist without competition from other herbaceous plants or sagebrush-grassland species that are present in the surrounding landscape (Dorn 1990b, pp. 6, 8).

Although the surrounding vegetation is sparse (less than 10 percent cover), *Boechera pusilla* is associated with numerous mat-forming perennial herbs (e.g., *Erigeron caespitosus* (tufted fleabane)), perennial grasses (e.g., *Achnatherum hymenoides* (Indian ricegrass)), and shrubs (e.g., *Artemesia arbuscula* (dwarf sagebrush)) (Heidel 2005, p. 9). Rolling hills with a gradual sloping impediment are the predominant landscape features in the area, which is a transition zone between the montane conifer forests and the high sagebrush desert (Heidel 2005, pp. 89). The adjacent vegetation consists primarily of sagebrush-grassland or open *Pinus flexilis* (limber pine) habitat (Dorn 1990b, p. 8).

Annual precipitation in the area averages 30.5 cm (12 in.), with the majority falling in the form of winter snow (Marriott 1986, p. 9). Average minimum and maximum temperatures in this area range between -16.1 and -3.9 °C (3 and 25 °F) in January and 4.6 and 24.4 °C (42 and 76 °F) in July (Dorn 1990b, p. 6), with strong, frequent winds present year-round (Heidel 2005, p. 10). This area has a very short growing season; approximately 30 frost-free days occur between mid-June and mid-July (Marriott 1986, p. 9). *Boechera pusilla* may be adapted to wide fluctuations in available moisture as the soil goes through cycles of rapid drying and saturation (Dorn 1990b, p. 6).

Historical Range/Distribution:

Historical range is unknown.

Current Range Distribution:

The only known population of *B. pusilla* is located on lands administered by the Bureau of Land Management (BLM) Rock Springs Field Office in the southern foothills of the Wind River Range (Fertig 2000a, p. 39; Heidel 2005, pp. ii, 6). The species range is approximately 64.8 hectares (ha)(160 acres (ac)), with occupied habitat estimates ranging from 2.4 to 6.5 ha (6 to 16 ac) (Dorn 1990b, p. 8; Heidel 2005, p. 15). Botanists have surveyed for *B. pusilla* systematically in other areas and discovered no additional populations, but some areas with potential habitat have not been surveyed (Marriott 1986, p. 8; Heidel 2005, p. 6).

Population Estimates/Status:

To explain the trend of *Boechera pusilla* numbers, we use the estimates of total flowering plants in the entire population (i.e., total for the species) and the total flowering plants in a plot located in the largest subpopulation. These two indicators are the most consistently documented information we could find. The number of flowering plants is used, at least in part, to ensure identification of the species (Heidel 2010d, pers. comm.). Monitoring was conducted for a total of six years, including consecutive monitoring for the past four years (Heidel 2012, pers. comm.)

In 1988, the total population estimate was 800 to 1,000 flowering individuals (Heidel 2005, p. 14). This was an increase from the 50 plants found in 1986; however, only 1 subpopulation was discovered in 1986 (Marriott 1986, p. 15). Although the 1988 survey indicated no evidence that *B. pusilla* was affected by the 1988 drought (Marriott and Horning in litt. 1988, p. B2), drought impacts (such as reduced seed fecundity or germination) may not be immediately apparent (Heidel 2010c, pers. comm.; 2010d, pers. comm.). In 1990, numbers were down to about 600 flowering plants for the entire population (Dorn 1990b, p. 8), which may be due to a pattern of short-term decline under drought conditions that occurred in this area between 1988 and 1990 (Heidel 2005, p. 14). In 2003, the Wyoming Natural Diversity Database (WYNDD) estimated total flowering plants for the entire population at 150 to 250 (Heidel 2005, p. 14). The mean density of flowering plants derived from the 1988 and 2003 surveys indicate that the density dropped from 1.68 down to 0.33 flowering plants per m^2 (0.156 down to 0.031 flowering plants per square foot) during this 15-year period (Heidel 2005, p. 14). Declines in 2003 may be attributed to severe drought conditions recorded in the Wind River Range between 2000 and 2003 (NOAA 2005 as cited in Heidel 2005, p. 14). Flowering plants for the entire population in 2010 were estimated at approximately 350 individuals (Heidel 2010d, pers. comm.). The most complete census to date was in 2011 with an estimated population at approximately 1,451 individuals (Heidel 2012, p. ii, 5). The increase in plants may be a reflection of the growing season conditions and an expanded scope of census (Heidel 2012, pers. comm.). We have received no updated information on census and population size of *B. pusilla* since that time.

In a plot within the largest subpopulation, 671 individual flowering *Boechera pusilla* plants in were found 1988 (Heidel 2005, p. 14). This area had 87 flowering plants when it was counted again in 2003 (Heidel 2005, p. 14). The plot had 202 plants in 2004, 239 plants in 2008, 91 plants in 2009, 89 plants in 2010, and 615 plants in 2011, which was based on the most complete census to date (Heidel 2012, p. 4). We have no updated information on census since that time. There is no clear trend in the past decade (Heidel 2012, p. 4). The decrease of plants in the plot but increase in the subpopulation over this period suggests the distribution of the subpopulation shifted over that period of time (Heidel 2010c, pers. comm.).

Boechera pusilla has at least eight subpopulations (Amidon 1994, *in litt.*, unpaginated). The largest subpopulation has been surveyed periodically as described above (Heidel 2005, p. 14; Heidel 2012, p. ii, 5). Additional subpopulations are small; in 2003, 1 subpopulation had 30 to 50 flowering plants, another had 10 to 15 flowering plants, and 5 of the subpopulations had less than 5 flowering plants each (Heidel 2005, p. 14).

Based on a limited number of surveys, the plant appears to have an overall pattern of decline documented since estimates were first provided in 1988 (Heidel 2005, p. 17; Heidel 2010c, pers. comm.; Windham 2010, pers. comm.). *Boechera pusilla* numbers increased in 2011 (the most recent year for which survey data is available) compared to 2003, but the overall trend is downward.

Distinct Population Segment(DPS):

N/A (*Boechera pusilla* is a plant, therefore designation of Distinct Population Segments does not apply to this taxonomic group).

Threats

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

range:

Recreational Activities

Boechera pusillas current known range is highly restricted. All known occurrences are on BLM land, which is public land managed for multiple use (Dorn, 1990, p. 10; Heidel 2005, p. 6). Prior to the development of a Habitat Management Plan (BLM 1994, entire) and the closure of vehicle access in 1994 (59 FR 37258), *B. pusilla* was more readily exposed to recreation activity from Off Road Vehicle (ORV) use associated with fishing and camping, unauthorized ORV use, horse boarding and feeding, plant collecting, mountain biking and pedestrian use. In addition, a nearby quarry, that is now inactive, may have destroyed potential habitat (Dorn 1990b, p. 11; Heidel 2005, p. 17). Previously, ORV use had been identified as a potential threat; however, conservation measures, such as the habitat management plan, have been implemented to eliminate this threat. Currently, the only access to the area occupied by *B. pusilla* is by foot, but due to the rocky substrate associated with the habitat, recreational use in the area primarily occurs on adjacent riparian areas, away from occupied habitat (Dana 2010a, pers. comm.). Therefore, recreational activities are not considered a threat now or in the foreseeable future.

Energy Development

The extraction of natural gas occurs in several developments in southwest Wyoming, which could be a potential threat to the habitat of *Boechera pusilla* (USGS 2010, p. 3). However, the area occupied by *B. pusilla* is incorporated into a Special Recreation Management Area (SRMA), which is closed to mineral and energy development (BLM 1997, pp. 1718). Currently the nearest gas development occurs approximately 10.1 km (6.3 mi) from the location of *B. pusilla* (Kile 2012, pers. comm.) and does not appear to be a threat to the plant.

In addition, on February 23, 1998, the Secretary of the Interior issued Public Land Order No. 7312, the Withdrawal of Public Land for the Protection of *Arabis pusilla* Plant Habitat. This order pursuant to Section 204 of the Federal Land Policy and Management Act of 1976, 43 U.S.C. 1714 (1994), withdrew from settlement, sale, location, or entry under the general land laws, including the United States mining laws (30 U.S.C. Ch. 2 (1994)), but not from leasing under the mineral leasing laws on 412.8 ha (1,020 ac) to protect *Boechera pusilla* habitat (63 FR 9012). This withdrawal expires in 50 years (2048) unless the Secretary determines that the withdrawal shall be extended. Therefore, we do not consider energy development to be a threat to *B. pusilla* now or in the foreseeable future.

Nonnative Invasive Plants

The habitat adjacent to the area occupied by *Boechera pusilla* is primarily sagebrush steppe, which is highly vulnerable to nonnative invasive species (Anderson and Inouye 2001, pp. 531532); however, surveys conducted by WNDD in 2003 found the area generally free of nonnative invasive species (Heidel 2005, p. 10). As noted previously, the restrictive habitat occupied by *B. pusilla* may limit the potential for competition from other herbaceous plants (Dorn 1990b, pp. 6, 8). We have no information that nonnative invasive plants are a threat to *B. pusilla*. Therefore, we do not consider nonnative invasive plants to be a threat to *B. pusilla* now or in the foreseeable future.

Climate Change

Our analyses under the Endangered Species Act include consideration of ongoing and projected changes in climate. The terms climate and climate change are defined by the Intergovernmental Panel on Climate Change (IPCC). 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 2007, p. 78). The term climate change thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically

decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2007, p. 78). 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) (IPCC 2007, pp. 814, 1819). In our analyses, we use our expert judgment to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change.

Plant species with restricted ranges may experience population declines as a result of climate change. The habitat for *Boechera pusilla* appears to be exposed to variation in moisture, and *B. pusilla* may be adapted to some variation in moisture availability (Dorn 1990b, p. 6). Climate change has the potential to affect the species habitat, but we lack scientific information on what those changes may ultimately mean for *B. pusilla*. Climate change may affect the timing and amount of precipitation as well as other factors linked to habitat conditions for this species. However, at this time the available scientific information does not indicate that climate change is likely to threaten the species. Therefore, we do not consider climate change to be a threat to *B. pusilla* now or in the foreseeable future.

Drought

Limited evidence shows there may be some response of *Boechera pusilla* to drought conditions, but those effects may be delayed (Heidel 2010c, pers. comm.). In the Population Estimates/Status section above, the 1988 survey, conducted during a drought year, found increased abundance of plants from 1986 (Marriott and Horning *in litt.* 1988, p. B2), but surveys conducted in 1990 found reduced numbers (Dorn 1990b, p. 8) that may have been caused by continued drought conditions (Heidel 2005, p. 14). Reproductive success may vary considerably from year to year depending on climate conditions, leading to wide fluctuations in populations (Dorn 1990b, p. 10). Overall reductions in population size since 1988 may be linked to periods of drought conditions that have occurred between 1988 and 2010, but *B. pusilla* monitoring efforts were not sufficient during this period to understand the role of drought in population decline. We do not have any updated information on potential effects of drought since that time. Therefore, because of lack of evidence, we do not consider drought to be a threat to *B. pusilla* now or in the foreseeable future.

In summary, we found that numerous management actions taken previously by the BLM alleviated several potential threats to *Boechera pusilla* and its habitat. These potential threats included ORV use, heavy foot traffic, and mining. The ORV use and mining are no longer permitted in the area due to the implementation of numerous regulatory mechanisms (see *Factor D. Inadequacy of existing regulatory mechanisms* below) in addition to the construction of an exclosure. We have no information that nonnative invasive plants are a threat to the species. Other activities in the area, such as limited foot traffic, are not considered threats. Although climate change may be a potential long-term stressor to *B. pusilla*, the limited information available regarding climate change impacts on *B. pusilla* and the species adaptations to an already-variable climate do not suggest that climate change currently, or in the foreseeable future, will threaten this species existence. We do not fully understand the response of *B. pusilla* to drought conditions, but limited evidence indicates that drought may be contributing to this species reduced population size (see *Factor E. Other Natural Or Manmade Factors Affecting Its Continued Existence* discussion below). However, we do not have sufficient information to say that drought alone, or in combination with other factors, threatens the species currently or is likely to do so in the foreseeable future.

We conclude that the best scientific and commercial information available indicates that *Boechera pusilla* is not in danger of extinction or likely to become so within the foreseeable future because of the present or threatened destruction, modification, or curtailment of its habitat or range.

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

Field notes from 1993 suggest that some *Boechera pusilla* seed had been collected and sent to the Denver Botanic Gardens; however, they do not have a record of receiving any *B. pu*silla seeds (Neale 2010b, pers.

comm., Heidel 2012, p. 3). However, because of high fruit production in 2011, *B. pusilla* seeds, which represented 1-3 percent of the 2011 fruit production, were collected in 2011 and sent to the Denver Botanic Gardens (Heidel 2012, p. 3, Skora 2012, pers. comm.). Further, *B. pusilla* seeds were approved by the board of the Center for Plant Conservation National Collection for inclusion in their storage (Skora 2012, pers. comm.). Some specimens collected in the 1980s were provided to the Gray Herbarium of Harvard University, the New York Botanical Garden, and the Rocky Mountain Herbarium at the University of Wyoming (Dorn 1990b, p. 5, 14). We have no other indication that any collections or utilization have been made of *B. pusilla*. In summary, we find that *B. pusilla* is not in danger of extinction or likely to become so within the foreseeable future because of overutilization for commercial, recreational, scientific, or educational purposes.

C. Disease or predation:

Disease

Boechera pusilla is not specifically known to be affected or threatened by any disease. Systemic rust disease is known to affect many *Boechera* species (Ladyman 2005, p. 26), but we have no information that it occurs in *B. pusilla*. Therefore, we do not consider disease to be a threat to *B. pusilla* now or in the foreseeable future.

PredationGrazing and Herbivory

Prior to conservation measures taken by the BLM, the habitat of *Boechera pusilla* was grazed by cattle. Prior to 1982, cattle grazing may have formed a threat, but the establishment of an Area of Critical Environmental Concern (ACEC) that covers all known locations of *B. pusilla* (BLM 1997, p. 34) and the presence of an exclosure fence that encloses all of the occupied habitat (Dunder 1984, unpaginated; Marriott 1986, p. 14) have resolved this potential threat. These protections are described in additional detail under *Factor D. Inadequacy of Existing Regulatory Mechanisms* below. Insects, such as caterpillars, do not appear to favor *B. pusilla* over other vegetation (Heidel 2005, p. 10), and no known observations suggest that herbivory from wild ungulates or small mammals is a threat. Therefore, we do not consider predation to be a threat to *B. pusilla* now or in the foreseeable future.

In summary, we do not have any information to suggest that disease or predation are a threat to this species. We conclude that the best scientific and commercial information available indicates that *Boechera pusilla* is not in danger of extinction or likely to become so within the foreseeable future because of disease or predation.

D. The inadequacy of existing regulatory mechanisms:

Federal Laws and Regulations

Bureau of Land Management

Several regulatory mechanisms are in place to protect *Boechera pusilla*, some of which were mentioned under *Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range* above. The BLM has excluded grazing from the habitat area, developed a habitat management plan for the species, designated the habitat area as an ACEC, incorporated the habitat area into a SRMA, and designated *B. pusilla* as a sensitive species. Additionally, the Secretary of the Interior removed essentially the entire area with occupied habitat from mineral development. The Service previously published a notice of review in 2000 removing *B. pusilla* as a candidate species, largely based on protections provided by these regulatory mechanisms and land management approaches.

The BLM designated the Pine Creek Special Management Area in 1978 (Heidel 2005, p. 16) and built an exclosure fence in 1982 to keep cattle out of the 35.6-ha (88-ac) area where recreational activities occur

(Dunder 1984, unpaginated). *Boechera pusilla* occurs within this management area (Marriott 1986, p. 14). The fenced portion of the area is smaller than that of the known species range, but protects much of the occupied habitat. As described under *Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range* above, the BLM provided a Habitat Management Plan for *B. pusilla* (BLM 1994, entire) and processed an emergency closure of vehicle access to 202.3 ha (500 ac) in a Habitat Management Area for the species in 1994 (59 FR 17718).

The BLM 6840 Manual requires that Resource Management Plans (RMP) should address sensitive species, and that implementation should consider all site-specific methods and procedures needed to bring species and their habitats to the condition under which management under the Bureau sensitive species policies would no longer be necessary (BLM 2008, p. 2A1). The Federal Land Policy and Management Act of 1976 mandates Federal land managers to develop and revise land use plans. The RMPs are the basis for all actions and authorizations involving BLM-administered lands and resources (43 CFR 1601.0-5(n)). The 1997 RMP for the area that includes *Boechera pusilla* habitat provided designation of a Special Status Plant ACEC that closed the area to: (1) direct surface-disturbing activities, (2) mining claims, (3) surface occupancy and surface-disturbance activities, (4) mineral material sales, and (5) use of explosives and blasting (BLM 1997, p. 34). *B. pusilla* habitat also fits within an SRMA designated in the RMP, which: (1) prohibited major facilities (e.g., power lines), (2) closed the area to mineral leasing, (3) closed the ACEC to ORV use, and (4) required avoidance and extensive planning of long, linear facilities (e.g., roads) (BLM 1997, pp 1718). All activities concerning *B. pusilla* in the RMP have been implemented (Glennon 2010b, pers. comm.). The next RMP revision for the area is currently underway, with an estimated completion date of 2014 (Glennon 2012, pers. comm.). Existing protections for the species will likely remain in place in the revised RMP as a no-action alternative under NEPA, but we are uncertain whether additional protections for *B. pusilla* will be developed.

National Environmental Policy Act

The entire known population of *Boechera pusilla* occurs on Federal land. All Federal agencies are required to adhere to the NEPA for projects they fund, authorize, or carry out. The Council on Environmental Qualitys regulations for implementing NEPA (40 CFR 15001518) state that agencies shall include a discussion on the environmental impacts of the various project alternatives, any adverse environmental effects which cannot be avoided, and any irreversible or irretrievable commitments of resources involved (40 CFR 1502). Additionally, activities on non-Federal lands are subject to NEPA if there is a Federal nexus. The NEPA is a disclosure law, and does not require subsequent minimization or mitigation measures by the Federal agency involved. Although Federal agencies may include conservation measures for sensitive species as a result of the NEPA process, any such measures are typically voluntary in nature and are not required by the statute.

Public Land Order No. 7312

On February 23, 1998, the Secretary of the Interior issued Public Land Order No. 7312 to withdraw public land from certain uses for 50 years as a measure to protect *Boechera pusilla*. This order withdrew 412.8 ha (1,020 ac) from settlement, sale, location of minerals, or entry under the general land laws, including mining laws; this did not eliminate the area from being leased under the mineral leasing laws (63 FR 9012). In addition to these measures, *B. pusilla* was listed as a BLM sensitive species in 2002 (BLM 2002, p. 9).

In summary, because the entire population of *Boechera pusilla* occurs on BLM lands, this agency has responsibility for the land management decisions that protect *B. pusilla* and its habitat. *B. pusilla* receives adequate protection from the BLM in the form of regulatory mechanisms, designations, and the construction of animal exclosures. These protections greatly limit the amount of disturbance that can occur within the plants limited range. Although these mechanisms do not entirely exclude the area from foot traffic, they have adequately reduced this potential threat. Various regulatory mechanisms are in place to address potential threats over which the BLM has control. We expect that *B. pusilla* and its habitat will be generally protected from direct human disturbance.

We have no evidence of impacts to *Boechera pusilla* from inadequate regulatory mechanisms. We recognize that the existing regulatory mechanisms have not been able to stem the decline of the species, but we are not able to identify that regulatory mechanisms are inadequate. We are uncertain what is causing reduced population levels and consider the reduction to be an indicator that a threat is present; however, we are not able to fully describe this threat at this time (see *Factor E. Other Natural Or Manmade Factors Affecting Its Continued Existence* discussion below). The current small population size creates a vulnerability that may work in combination with the threat that we are not able to explain. Since the primary management tool that implements regulatory mechanisms, the RMP, goes through revisions approximately every 15 years (Dana 2010b, pers. comm.), it will be important for the BLM to ensure that the protective measures are sustained in future revisions to the Green River RMP and that measures be taken to alleviate any potential vulnerabilities created by small population size.

We conclude that the best scientific and commercial information available indicates that *Boechera pusilla* is not in danger of extinction or likely to become so within the foreseeable future because of inadequate regulatory mechanisms. We recognize that the existing regulatory mechanisms do not appear to have protected the species from decline; however, we are unable to conclude that regulatory mechanisms are inadequate since the cause for decline is unidentified.

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

Small Population Size

Boechera pusilla occurs in relatively small numbers as discussed above in Population Estimates/Status section, with the latest total population size of 1,451 flowering plants in 2011 census (Heidel 2012, p. ii, 5). When compared to other years census efforts, 2011 was the most complete census to date with an expanded scope of census which may explain the higher numbers recorded in 2011 (Heidel 2012, pers. comm.). We have no updated information on census since 2011. Plant numbers are at levels that may not ensure this species continued existence over the long term. However, botanists who have studied *B. pusilla* note an overall declining trend of the species (Heidel 2005, p. 14; Heidel 2010c, pers. comm.) This decline has been rapid compared to declines observed in other rare species and has continued after habitat protections were put in place. Concern expressed by Heidl (2012, pers. comm) about *B. pusilla* suggests the species may continue to be vulnerable to periods of prolonged drought or stochastic events.

Boechera pusilla relies on soils formed from a certain type of granitic outcrop that is limited in extent, so the range of the species is not likely to expand beyond this area in the future. The relatively small area that *B. pusilla* occurs within also may predispose the species to be more sensitive to stochastic events that might occur (Menges 1990, p. 53; Boyce 1992, pp. 482484), such as climate shift that the species is not adapted to or factors that lead to reduced reproductive success (Ladyman 2005, pp. 3031). A single unforeseen event in a relatively small area could eliminate the species.

Boechera pusilla is apomictic, so when it uses this reproductive process, the species essentially clones itself. We are uncertain how long the species apomictic seeds remain viable or under what conditions they germinate. This reproductive process may reduce some of the risks associated with small population size for species that only sexually reproduce. If the species reproduces only asexually, risks related to lack of genetic variability may increase, but we are uncertain if *B. pusilla* also reproduces sexually as do some other species of *Boechera*. Apomixis has been shown to reduce extinction risk if certain other variables are present, such as high levels of biomass and no soil acidity (Freville *et al*. 2007, p. 2666). However, information on what apomixis means for conservation of a species remains limited (Freville *et al*. 2007, p. 2669).

Threats not yet fully identified

In addition to the small population size of *Boechera pusilla*, an unknown threat or threats may be present that is causing reduced numbers of the plant. The species was removed from the candidate list in 2000 based on

the regulatory protections that were in place. Based on our current understanding of the species, these regulatory protections appear appropriate and sufficient. However, the species still has small population numbers that have declined overall since the implementation of these protections. We do not understand the nature of the threat or threats, but the reduced population numbers demonstrate that some type of threat is present. We have limited data to inform our understanding of what this threat could be, and have received no additional data on this since the species again became a candidate in 2011. The decline could be linked to drought cycles, but we do not have sufficient data to correlate numbers of *B. pusilla* with drought. A disease could be present in the species, but we have no information to indicate disease is reducing the number of plants.

In summary, *Boechera pusilla* has a small population size that is confined to a small area because of habitat requirements. The species may be vulnerable to stochastic events due to its small population size. *B. pusilla* reproduces itself asexually, which may reduce some risks of a small population size, but does not fully eliminate this threat. Declines have occurred in the species, even after habitat protection measures were put in place. Although the population numbers increased from 2003 (150250 flowering plants) to 2010 (350 flowering plants) and the latest numbers from the most recent survey year for which data is available in 2011 (1,452 flowering plants), numbers remain low, the plant appears to have an overall trend of decline, and this overall trend may continue in the foreseeable future. A viable population for the species may be 500 to 5,000 plants (Ladyman 2005, p. 26). We are uncertain what is causing reduced population levels and consider the reduction to be an indicator that a threat is present for the species. We are not able to fully describe this threat and we have no updated information on this unknown threat for inclusion in this document.

Some of the decline may be attributable to drought conditions, but we currently do not fully understand the cause of the decline. Additionally, disease may be present but has not been documented. The small population size creates a vulnerability that may work in combination with the threat that we are currently not able to explain. Therefore, the species appears likely to be in danger of extinction or likely to become so within the foreseeable future because of the combination of small population size and a threat that we cannot fully identify but that is manifest by an overall declining population.

Conservation Measures Planned or Implemented :

On February 23, 1998, the Secretary of the Interior issued Public Land Order No. 7312 to withdraw 412.8 ha (1,020 ac) of public land from certain uses for 50 years as a measure to protect *Boechera pusilla* from settlement, sale, location of minerals, or entry under the general land laws. The BLM has excluded grazing from the habitat area, developed a habitat management plan for the species, designated the habitat area as an ACEC, incorporated the habitat area into a SRMA, and designated *B. pusilla* as a sensitive species.

Summary of Threats :

Boechera pusilla has a threat that is currently not identified, but that is indicated by the small and declining population size. The population size may be declining from a variety of unknown causes, with drought or disease possibly contributing to the trend. However, we are currently unable to determine the cause of declining population size. The trend may have been reversed somewhat recently, but without improved population numbers, the species may reach a population level at which other stressors become threats. We are unable to determine how climate change may affect the species in the future. To the extent that we understand the species, other potential habitat-related threats have been removed through the implementation of Federal regulatory mechanisms and associated actions. Overutilization, predation, and the inadequacy of regulatory mechanisms are not viewed as threats to the species.

For species that are being removed from candidate status:

_____ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing

Decisions(PECE)?

Recommended Conservation Measures :

We support the continued implementation of several regulatory mechanisms currently in place to protect *Boechera pusilla* by the BLM. The BLM has excluded grazing from the habitat area, developed a habitat management plan for the species, designated the habitat area as an ACEC, incorporated the habitat area into a SRMA, and designated *B. pusilla* as a sensitive species. Additionally, the Secretary of the Interior removed essentially the entire area with occupied habitat from mineral development.

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**	Monotypic 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:

We consider the threats that *Boechera pusilla* faces to be moderate in magnitude. Although the threat, as described in *Factor E. Other Natural Or Manmade Factors Affecting Its Continued Existence* under the Five Factor Evaluation for *B. pusilla*, is not fully understood, we know it exists as indicated by the declining population. Because we currently do not have information to detect the source or nature of the threat, we consider the threat to be moderate in magnitude. The most recent information available included in this document indicates the population levels have decreased significantly from the recorded high in 1988 (800 to 1,000), but they also increased between 2003 (150 to 250), 2010 (350), and 2011 (1,451) so we do not consider the magnitude of the threat to be high. The threat is not fully understood, but is manifest by a declining population that may have stabilized somewhat; therefore, we consider the magnitude of the threat to be moderate.

Imminence :

Based on the latest information available and included in this document, we consider the threat to *Boechera pusilla* as described in *Factor E. Other Natural Or Manmade Factors Affecting Its Continued Existence* under the Five Factor Evaluation for *B. pusilla* to be imminent because, although not fully identified, we have

evidence that the species is currently facing a threat indicated by reduced population size. The threat appears to be ongoing, although we are unsure of the extent and timing of its effects on *B. pusilla*. The threat is occurring in the only known population in the United States, and the population may already be below the minimum viable population requirement, which may allow population reductions and increases in population vulnerability to occur more quickly in the future. We expect some additional declines will occur in the future, and if declines occur at rates similar to those in the past, population levels could be precariously low. Therefore, we consider the threat to be imminent.

__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?

We determined that issuing an emergency regulation temporarily listing the species is not warranted at this time, because threats to the species would not be further controlled with a change in status. Additionally, the most recent survey information suggests that, while the population has not rebounded to previous highs, the population declines also have not continued.

Description of Monitoring:

Monitoring work conducted on *B. pusilla* started in 1988 to census the population. A revised monitoring study was set up in 1993 to similarly census a slightly smaller part of the largest subpopulation but not repeated. Funding for surveys to test a new potential distribution model was provided in 2003 and monitoring work was included with objectives. Monitoring was conducted in some of the following years (2003, 2004, 2008, 2009, 2010, and 2011) based on provisional support. However, we have no new updated monitoring information since 2011.

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

none

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

Wyoming

State Coordination:

The State of Wyoming has provided information in past years.

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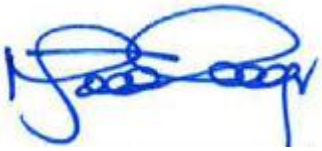
Approval/Concurrence:

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:  05/30/2013
Date

Concur: 10/28/2013
Date

Did not concur: _____ _____
Date

Director's Remarks: