Wyoming Department of Agriculture

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The Wyoming Department of Agriculture is dedicated to the promotion and enhancement of Wyoming's agriculture, natural resources and quality of life.

September 20, 2024

United States Department of the Interior
BLM Director
Attn: Protest Coordinator(HQ210)
PO Box 151029
Lakewood, CO 80215

Bureau of Land Management
Attn: Andrew Archuleta
Wyoming State Director
5353 Yellowstone Road
Cheyenne, WY 82009

Via: https://eplanning.blm.gov/eplanning-ui/project/13853/570

Re: Protest: Final Environmental Impact Statement and Proposed Resource Management Plan for the Rock Springs Field Office issued August 22, 2024, Notice of Availability: Federal Register Docket Number 2024-18912

The Wyoming Department of Agriculture (WDA) protests the Final Environmental Impact Statement (FEIS) and Proposed Resource Management Plan (RMP), Rock Springs Bureau of Land Management (BLM) Field Office.

I. Interest of the Protestor

The WDA's mission includes: dedication to the promotion and enhancement of Wyoming's agriculture, natural resources and quality of life. As the Proposed RMP could affect our industry, citizens, and natural resources, it is important for the BLM to consider our previous comments for the following protest to address our concerns.

The WDA files this protest pursuant to 43 C.F.R § 1610.5-2(a). The address, telephone number, email address, and other contact information for the WDA is:

Doug Miyamoto, Director
Wyoming Department of Agriculture
2219 Carey Ave
Cheyenne, WY 82002
307-777-6569
Email: justin.williams@wyo.gov

The WDA has served as a Cooperating Agency beginning in 2011, provided Scoping Comments, assisted in developing the range of alternatives, and provided administrative and public comments throughout the draft versions, including, but not limited to 2016, 2017, 2019, the Draft EIS in August 2023, and FEIS and Proposed RMP in August 2024. While the WDA has submitted numerous comments throughout the years and appreciates the BLM accepting or addressing a significant number of our comments found under the Proposed RMP Alternative, the WDA respectfully submits the following protest on the following Management Actions.

II. **Issues Protested: Proposed RMP Management Action 6407**

The Proposed RMP Alternative for Management Action 6407 states:

"Close the Pine Creek Special Status Plant Exclosure (Small Rockcress, *Arabis pusilla*) (583 acres) to livestock grazing.

Close the McKinnon Special Status Plant Exclosure (Precocious Milkvetch, *Astragalus proimanthus)* (121 acres) to livestock grazing.

Close the Palmer Draw Exclosure (1,608 acres) to livestock grazing.

Close all other livestock exclosures within the planning area to livestock grazing, unless a site-specific analysis indicates grazing could be used to achieve exclosure goals and objectives.

Establish new exclosures only when site-specific analysis demonstrates that doing so would help meet resource objectives. If the exclosure is of a sufficient size, consider adjusting livestock AUMs in accordance with management action 6404.

Remove exclosures when site-specific analysis determines they no longer serve their purpose. Once removed, the area would be available for livestock grazing (pg. 2-74)."

For comparison purposes below, we also include BLM's No Action Alternative A language, which is the existing 1997 Green River RMP and 2006 Jack Morrow Hills Coordinated Activity Plan : "The Palmer Draw area (970 acres) and special management exclosures are closed to livestock grazing. AUMs currently authorized in these areas would be suspended (pg. 2-74)."

In general, the Proposed RMP Alternative for Management Action 6407 does not follow 40 CFR §1502.14, which states the following: "This section is the heart of the environmental impact statement. Based on the information and analysis presented in the sections on the Affected Environment (§1502.15) and the Environmental Consequences (§1502.16), it should present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decisionmaker and the public. In this section agencies shall: (a) Rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their [sic] having been eliminated. (b) Devote substantial treatment to each alternative considered in detail including the proposed action so that reviewers may evaluate their comparative merits."

Additionally, BLM failed to comply with 40 CFR §1502.22 which states: "When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking. (a) If the incomplete information relevant to reasonably foreseeable significant adverse impacts is essential to a reasoned choice among alternatives and the overall costs of obtaining it are not exorbitant, the agency shall include the information in the environmental impact statement. (b) If the information relevant to reasonably foreseeable significant adverse impacts cannot be obtained because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, the agency shall include within the environmental impact statement: (1) A statement that such information is incomplete or unavailable; (2) a statement of the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment; (3) a summary of existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment; and (4) the agency's evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community. For the purposes of this section, "reasonably foreseeable" includes impacts which have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by

credible scientific evidence, is not based on pure conjecture, and is within the rule of reason. ” WDA is protesting on several individual items related to Management Action 6407.

1. Increase of Pine Creek Exclosure acreage and closure to livestock grazing.

According to the Status Report for the US Fish and Wildlife Service by H.J. Marriott, the Pine Creek Special Management Exclosure was originally developed in 1978 around 88 acres. The exclosure allowed short-term camping, fishing, and high intensity grazing on an as-needed basis with the cattle from the Pine Creek Allotment.[1]

Additionally, Marriott wrote a Draft Habitat Management Plan stating, “The exclosure includes about 88 acres popular with campers, anglers, hunters and travelers, and was established to prevent livestock conflict with recreational use. A fence was completed in 1982. The area is being managed for short-term camping and only minor improvements are planned. There was a management plan prepared for the exclosure (Dunder 1984) that would be appropriate to cite, with any other management considerations and policies that apply.”[2]

BLM should have included Pine Creek exclosure in Alternative A from the 1997 Green River RMP, as this denied the WDA and the public the opportunity to fully compare alternatives with the existence of the exclosure. We did however discover the following statement from the 1997 Green River RMP: “The 500 acres associated with the Arabis pusilla portion of the Special Status Plants ACEC, is closed to ORV use. In the remainder of the unit, off-road vehicle (ORV) use is limited to designated roads and trails (pg. 18) .” Between 1978 when the exclosure was established to the 2024 proposal, the BLM has increased the Pine Creek Exclosure by 495 acres, all of which is closed to livestock grazing.

The Proposed RMP Alternative as written portrays the Pine Creek Special Status Plant Exclosure as protection for Small Rockcress plants from livestock grazing. However, as mentioned above, BLM has lost the original intent of the exclosure from 1978, which was to reduce conflict between livestock and recreation. The Proposed RMP Alternative for Pine Creek has removed the possibility for high intensity grazing as originally intended, as such it doesn’t meet the original exclosure definition where rest from livestock grazing is mentioned, and now closes the exclosures to livestock grazing. This continuous shift from 1978 to 1997 and now to 2024 is a prime example of why WDA is protesting the Proposed RMP Alternative. The BLM’s lack of an impact analysis on the exclosure specifically pertaining to the size of the exclosure and the reduction of AUMs.

The BLM neglects to include the original goals, objectives, and purpose of the exclosure, or the appropriate information regarding how to “achieve the exclosure goals and objectives,” or when “serving the purpose” is met. Without providing this information, BLM is arbitrarily and inappropriately closing the available forage from livestock grazing when livestock grazing is not an identified threat for the plant species. The BLM should divulge the AUMs lost as a result of the increase in exclosure acreage and the loss of AUMs due to the closure.[3]

The Federal Register Notice from the US Fish and Wildlife Service states: “Considering that Fremont County rockcress presently exhibits high levels of resiliency, and is expected to continue to be resilient within the foreseeable future while retaining sufficient adaptive capacity and the ability to withstand catastrophic events, we find that the species is not

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[1] Marriott, H.J. 1986. A report on the status of Arabis pusilla, a Candidate Threatened species. Prepared for the US Fish and Wildlife Service by the Wyoming Natural Diversity Database, Laramie, WY. [Attachment 1].

[2] Heidel, B. 2018. *Boechera pusilla* (small rockcress; Fremont County rockcress) final monitoring report (2015-2017) and status report update. Prepared for the Bureau of Land Management. Wyoming Natural Diversity Database, Laramie, WY. [Attachment 2].

[3] Federal Register Notice, December 2018.https://www.fws.gov/sites/default/files/federal_register_document/2011-13910.pdf [Attachment 3].

presently in danger of extinction throughout all or a significant portion of its range or likely to become so within the foreseeable future. Therefore, we find that listing Fremont County rockcress as an endangered species or threatened species is not warranted (pg. 65130)."

Furthermore, when the exclosure was developed, "high intensity grazing as needed" was approved. According to the BLM's 2006 Jack Morrow Hills Coordinated Activity Plan, an Exclosure is defined as: "Study or experimental plot rested from livestock grazing. A portion of land rested from livestock grazing. Exclosures may be established as study or experimental areas or as protection for key habitats (pg. G-3)."[4]

Rest and closure from livestock are drastically two different terms and different implementations. According to the Society for Range Management "rest" and "closed range" are defined as: "To leave an area of grazing land ungrazed or unharvested for a specific time, such as a year, a growing season or a specified period required within a particular management practice. Syn. spell. cf. rest period, ungrazed, deferment." Closed Range is: "Any range on which livestock grazing or other specified use is prohibited. cf. livestock exclusion."[5]

As mentioned above, the Proposed RMP analysis does not explain the threat from livestock grazing to the Small Rockcress plant population. According to the Final Monitoring Report and Status Report for *Boechera pusilla* (Small Rockcress; Fremont County Rockcress) from Bonnie Heidel, "*Boechera pusilla* occurs on relatively barren gravelly soil pockets of exposed granite bedrock (Dorn 1990), including fractures, outcrop margins, gravel pavement, and to a lesser extent, very shallow gravelly soil overlying bedrock where sometimes subject to freeze-thaw activity. The low relief outcrops irregular surfaces. Elevation of the population as mapped ranges from 2425-2460 m (7960-8080 ft) (pg.12)."[6] Given the habitat mentioned above, the ecological site where Small Rockcress plants grow is not typical of a key area where livestock forage grows. Therefore, overlap between livestock grazing use and Small Rockcress habitat are unlikely. The BLM did not analyze the unnecessary loss of AUMs or the cumulative impacts on livestock grazing permittees or other resources due to the increased exclosure.

2. Closure of the McKinnon Special Status Plant Exclosure (Precocious Milkvetch, *Astragalus proimanthus*) (121 acres) to livestock grazing.

Unlike the Pine Creek exclosure, there is no previous record of the McKinnon exclosure in the project area. Alternative D and the Proposed RMP Alternative specifically identify a newly proposed McKinnon exclosure. Unlike previous versions of the EIS, the FEIS and Proposed RMP indicate the exclosure is for Precocious Milkvetch, *Astragalus proimanthus*, but BLM fails to provide any detailed rationale identifying the primary threats and the purpose and need of the exclosure.

The Federal Register Notice pertaining to US Fish and Wildlife Service's 12 Month Finding from June 2011 indicates: "The following potential factors that may affect the habitat or range of Astragalus proimanthus are discussed in this section, including: (1) energy development, (2) road construction, (3) off-road vehicle use, (4) range improvements, (5) disposal sites, (6) nonnative invasive plants, (7) fire, and (8) climate change and drought (pg. 33941)."

"The fact that populations from 1989 through 2000 were relatively stable (Fertig and Welp 2001, p. 14) suggests that range management did not adversely affect A. proimanthus populations during that time. No impacts from livestock have been noted recently (Glennon 2010a, pers. comm.).

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[4] Jack Morrow Hills Coordinated Activity Plan: July 2006
https://eplanning.blm.gov/public_projects/lup/63097/78908/90959/00rod_cap.pdf

[5]Society for Range Management. 1998. Glossary of terms used in range management, fourth edition. Edited by the Glossary Update Task Group, Thomas E. Bedell, Chairman.

[6]Heidel, B. 2018. *Boechera pusilla* (small rockcress; Fremont County rockcress) final monitoring report (2015-2017) and status report update. Prepared for the Bureau of Land Management. Wyoming Natural Diversity Database, Laramie, WY. [Attachment 2]

Therefore, we do not consider range improvements to be a threat to A. proimanthus now or in the foreseeable future (pg. 33943)."[7]

According to the Survey for precocious milkvetch (*Astragalus proimanthus* Barneby) in southwestern Wyoming habitats include: "Sparsely vegetated cushion plant communities, in sagebrush or juniper openings, on shallow to steep slopes of clayey gravelly soils mostly derived from the Bridger Formation. The precocious milkvetch is often associated with *Artemisia, Cryptantha, Haplopappus, Agropyron*, and *Eriogonum* but also in areas almost devoid of vegetation." As in the case with Small Rockcress, the ecological site for the precocious milkvetch is equally unlikely to overlap with key areas for livestock forage. The proposed McKinnon exclosure closure to livestock grazing will unnecessarily reduce available forage within the exclosure boundary (pg. 7).[8]

Despite neither livestock grazing or range improvements being identified as a threat to the precocious milkvetch, the BLM is insisting on creating another exclosure and prohibiting livestock grazing. According to the Proposed RMP, page 4-64: "Specific management for the Special Status Plant ACEC would provide additional protection for suitable plant habitat, which would support continued existence and regeneration of small rock cress (*Arabis pusilla*), precocious milkvetch (*Astragalus proimanthus*), Wyoming tansymustard, and hairy greenthread (*Thelesperma pubescens).*" The Proposed RMP fails to provide what the "specific management" actually is, nor does it provide the need for another exclosure, or explain why livestock grazing is closed despite it not being listed as a threat to the plant species.

3. Increase of the Palmer Draw Exclosure and continued closure to livestock grazing

Alternative A for Management Action 6407 states: "The Palmer Draw area (970 acres) and special management exclosures are closed to livestock grazing. AUMs currently authorized in these areas would be suspended."

Alternative D for Management Action 6407 states: "Close the Palmer Draw Exclosure (1,808 acres) to livestock grazing."

The Proposed RMP for Management Action 6407 states: "Close the Palmer Draw Exclosure (1,608 acres) to livestock grazing (p2-74)."

When BLM closed Palmer Draw (970 acres) and special management enclosures to livestock grazing under both the 1997 Green River RMP and 2006 Jack Morrow Hills Coordinated Activity Plan, the agency failed to disclose the number of total acres, number of total exclosures, and number of AUMs suspended under the 1997 RMP. The Proposed RMP and FEIS neglect to include an analysis of the difference between Alternative A and the Proposed RMP. The BLM's decision to increase the exclosure from 970 acres to 1,608 acres (an increase in 638 acres) is arbitrary.

The Proposed RMP and FEIS analysis fail to analyze the significant effects between the range of alternatives and the impacts to vegetation, including the native plant communities and special status plants by excluding grazing; the impacts of the closure to grazing permittees; and the cumulative effects of implementing the increased exclosure footprint, such as livestock, wildlife, or recreational hiking and ORV trailing next to or around the exclosure, etc. The BLM's analysis should have incorporated historic quantitative vegetative monitoring data and more recent sensitive plant species survey data to conclude the need for the increased exclosure acreage. Without this data, WDA and the public cannot determine whether BLM adequately analyzed reasonably foreseeable effects, in this case, what if any benefit the exclosure provides to special status plants and the negative effects to availability of forage for livestock grazing. The BLM uses "pure conjecture" when

[7]Federal Register Notice, Vol. 76, No 111, June 9, 2011: [Attachment 5].

[8]Jouseau, M.R.G. 2016. Survey for precocious milkvetch (*Astragalus proimanthus* Barneby) in southwestern Wyoming. Bureau of Land Management – Rock Springs Field Office and State

selecting the Proposed RMP Alternative, with no credible scientific evidence to prove the increased exclosures are needed and in fact do not analyze the catastrophic consequences by excluding livestock , such as increasing fine fuels, which will increase the likelihood of wildfire that could potentially decimate special status plants. Again, BLM failed to comply with 40 CFR §1502.22

4. Closure of all other livestock exclosures

The BLM is proposing to close "all other livestock exclosures within the planning area to livestock grazing, unless a site-specific analysis indicates grazing could be used to achieve exclosure goals and objectives" under the Proposed RMP (pg. 2-74).

BLM did not quantify the number of "all other exclosures." Under 40 CFR §1502.22, the BLM must include the following to adequately analyze the alternatives: number of exclosures, the total number of acres, and the total number of AUMs closed to grazing .

If the BLM were to total "all other exclosures," the number of AUMs directly lost when compounded over years or decades would be a reasonably foreseeable significant effect. However, BLM leaves the public and more importantly the livestock grazing permittees who have an exclosure on their allotment in the lurch by not divulging the information needed to analyze the effects under the Proposed RMP or compare them to Alternative A. Moreover, each individual exclosure should have its own goals and objectives written to guide BLM staff and the livestock grazing permittee to evaluate the progress of the exclosure. BLM fails to provide any information on the goals and objectives, therefore prohibiting a livestock grazing permittee from requesting an exemption to graze inside the exclosure. Neglecting to identify the information in an Appendix, at a minimum, for each exclosure is an obstruction to completing BLM's required site-specific analysis and to determine if the goals and objectives are achievable. The BLM has not indicated it cannot provide this information, which is necessary for BLM to make a reasoned choice among the alternatives.

5. Establishing New Exclosures

BLM is proposing a process in the Proposed RMP Alternative to establish new exclosures only when site-specific analysis demonstrates it would assist in meeting resource objectives. It also states, "If the exclosure is of a sufficient size, consider adjusting livestock AUMs in accordance with management action 6404 (pg. 2-74)."

The Proposed RMP Alternative includes arbitrary language such as "sufficient size," and should certainly cause the livestock grazing permittees concern. The implementation of this statement and who determines what equates to a sufficient size should cause BLM great concern as well. Considering the evolution of the 1978 Pine Creek Exclosure or the Palmer Draw Exclosure where BLM is expanding the acreages, changing the original intent, excluding the original goals and objectives, decreasing AUMs, and prohibiting the ability to remove the exclosures, is again why livestock grazing permittees should strongly reconsider or oppose any new exclosures proposed on their allotment in the future under the Proposed RMP.

6. Process for removal of exclosures

The Proposed RMP Alternative again uses subjective language such as "Remove exclosures when site-specific analysis determines they no longer serve their purpose (pg. 4-74)." The Proposed RMP or FEIS provides no information on the specific goals and objectives of any exclosures in the project area, which would be critical for the decision maker to determine if the exclosure is no longer needed. Without the goals and objectives of each individual exclosure, BLM does not have the baseline information to compare to current conditions in order to remove the exclosure. We are aware of several instances where BLM exclosures were established 30 plus years ago for a research study or to meet a resource objective, but have yet to complete a final site-specific analysis to have them considered for removal. Accordingly, BLM must include very specific goals and objectives for each exclosure, estimate time frames for meeting those goals and objectives, incorporate baseline and current resource monitoring data, with the intent of removing the exclosure when the goals and objectives are met.

Comments Submitted During the Planning Process:

WDA has commented on Management Action 6407 extensively over the years , which is found in the comments below.

On May 23, 2016, WDA provided the following comments pertaining to Management Action 6407:

ALT A to D: Is the alternative about the resource, the exclosure, or AUMs?

Alt D: “Close all exclosures within planning area to livestock grazing”

“Remove exclosures when they are determined to no longer be in the best interest of resource…”

COMMENT: The range of alternatives presented is flawed. “Best interest” is overtly subjective, non-science based. Each exclosure should have clearly written objectives. Grazing for a certain period of time could have ecological benefits.

Replace Alt. C and D with: “Manage livestock grazing to support other resource objectives and allow livestock grazing in areas closed to grazing as a tool to maintain or improve resource conditions.”

On August 24, 2017, WDA provided the following comments pertaining to Management Action 6407:

“Close all exclosures within the planning area…”

Comment: WDA is concerned there isn’t a listed number of exclosures and to assume ALL exclosures require this closure is an overreach. We recommend revising to review each exclosure for their original goals and objectives. If closure increases the ability to meet the goals and objectives, then closure can occur.

“Remove exclosures when site-specific analysis determines they no longer serve their purpose. Once removed, the area would be available for livestock grazing.”

Comment: Remove “purpose” and replace with “Original goals and objectives.” The purpose of an exclosure is subjective and can evolve based on personal interpretation.

On December 6, 2019, WDA provided the following comments pertaining to Management Action 6407:

LR-6407: “Close the Pine Creek Special Status Plant Exclosure (587 acres) to livestock grazing. Close the McKinnon Special Status Plant Exclosure (120 acres) …”

COMMENT: The plant species the exclosure is intended to protect is not identified. Not all plants may in fact benefit from no grazing. Some grazing may improve conditions, including reducing monocultures and competition, or some plants may not actually be palatable to livestock. As stated, the Alternative D a site-specific analysis is required to determine if grazing could achieve goals and objectives. There are two additional exclosures (1928 acres) compared to Alternative A, with no analysis, goals, or objectives to review. We request BLM make Alternative D, same as C, “All exclosures within the planning areas could be removed…”

On January 16, 2024, WDA provided the following comments pertaining to Management Action 6407:

MA#6407, Alt. B: "Close all exclosures within the planning area to livestock grazing. Suspend AUMs currently authorized in these exclosures."

Comment: The Alternative doesn't provide how many exclosures there are in the project area or provide how many AUMs would be suspended. The Alternative fails to explain why the exclosures are in place, or how each exclosure has the original purpose and need when it was analyzed under NEPA. To change the original intent for an unknown reason followed by suspension of AUMs for livestock is unacceptable.

III. **Issues Protested: Proposed RMP Management Action 6411**

The Proposed RMP Alternative for Management Action 6411 states:

"The following RMP decisions remain in effect with the modification described in action 4745: Salt or mineral supplements for livestock are prohibited within 500 feet of water, wetlands, or riparian areas unless analysis shows that watershed, riparian, and wildlife objectives and values would not be adversely affected. Salt or mineral supplements are prohibited on areas inhabited by Special Status plant species or other sensitive areas (pg. 2-75)."

There are two issues with Management Action 6411. First, there is no "action 4745" in Chapter 2 of the Proposed RMP. Second, while the Proposed RMP Alternative is written the same as Alternative A, the implementation and direct impacts to the livestock grazing permittees is substantially different simply due to the significant increase in acreage designated under the Special Status Plant Species ACEC (MA#7509). In the Appendix U alternative comparison, the BLM states: "The typically more resource-protective management applied to ACECs would reduce impacts on livestock by further limiting the ability to disturb forage resources compared to current management (pg. U-116) ."

Appendix U further states: "Impacts on livestock grazing management flexibility from restrictions on placement of salt and mineral supplements around riparian areas and aquatic resources would be the same as those presented under Alternative A, and less than under the larger and more restrictive buffers applied under Alternatives B and D. Management of range improvements would be the same as described under Alternative B; therefore, impacts associated with range improvements would be the same as those described under that alternative (pg. U-115)." However, the impacts are not the same between Alternative A and the Proposed RMP alternative because BLM ignores that the increase of acreage designated as Special Status Plant Species ACECs does impact and restrict salt and mineral supplement placement.

Additionally, the term "sensitive area" under the Proposed RMP is vague because the BLM doesn't identify what a "sensitive area" is. A broad interpretation could dramatically impact livestock permittees and where they place salt or minerals. Because BLM did not adequately define sensitive areas, it did not adequately analyze environmental effects pertaining to salt and mineral supplement placement. Furthermore, while Alternative A acreages states there are 66 sites involving about 1,200 acres for the ACEC, the Proposed RMP Management Action 7509 identifies an increase in 1,120 additional acres, or 4,469 acres in the ACEC. The difference between 4,469 acres and 1,200 acres is actually an increase in 3,269 acres. Therefore, BLM's analysis is deficient on this issue under 40 CFR §1502.14.

Comments Submitted During the Planning Process:

<u>On January 16, 2024, WDA provided the following comments pertaining to Management Action 6411:</u>

MA#6411, Alt B: "Prohibit placement of salt and mineral supplements...Within 1/2 mile of natural perennial or ephemeral water sources..."
Comment: The number of ephemeral channels across the project area is likely to be significant and potentially could limit many livestock grazing permittees from complying with the distance required under the Alternative while still meeting their livestock needs for salt and minerals.

IV. Issues Protested: ACEC Exclusion Area for Surface Disturbing Activities Management Actions 7421 and 7532

The Proposed RMP Alternatives are written as follows:

Management Action 7421 Proposed RMP Alternative: "Allow surface disturbing activities only if they protect or enhance ACEC values. Close to fluid mineral leasing. Petition to segregate and pursue a withdrawal from mineral location. Close to oil shale leasing. Designate as ROW avoidance area. Designate as VRM Class II. Close to Coal Leasing (pg. 2-111)."

Management Action 7532 Proposed RMP Alternative: "Designate the ACEC an exclusion area for: 1) surface disturbing activities that could adversely affect the resource values in the area; 2) the use of explosives and blasting; 3) rights-of-way. Pursue a withdrawal from mineral location and entry under the land laws, and retain the existing withdrawal. Close the area to mineral material sales for sand, gravel, or other types of construction (pg. 2-128)."

Both Management Actions are examples where ACECs were developed to address oil and gas development, mineral extraction, and other surface disturbing activities. However, as written, BLM will undoubtedly consider range improvements as a surface disturbing activity under the Proposed RMP Alternative, because the BLM has previously identified range improvements as a surface disturbing activity in the Record of Decision and Approved Rawlins Resource Management Plan Appendix 1 - Wyoming Bureau of Land Management Mitigation Guidelines for Surface Disturbing and Disruptive Activities. In that document, the BLM states: "Wyoming Mitigation Guidelines are a compilation of practices employed by the Bureau of Land Management (BLM) to mitigate impacts from surface disturbance. They apply to activities such as road or pipeline construction, range improvements, and permitted recreation activities."[9] Furthermore, the BLM is likely to find that range improvements adversely affect or cannot protect or enhance the ACEC values and exclude range improvements from ACECs.

When BLM identifies livestock grazing management as a significant causal factor in not meeting land health standards, range improvements, such as cross fencing or water developments, are crucial for modifying existing grazing management, for working towards meeting the land health standard, and for meeting resource objectives. But these Management Actions 7421 and 7532 will likely restrict the ability to incorporate range improvements, potentially leading to negative environmental effects.

The FEIS attempts to cast ACECs as being beneficial for grazing forage by stating in Appendix U: "Overall management of special designation areas under the Proposed RMP would limit surface disturbance to a greater extent than Alternative A by restricting the types of activities allowed in the areas and thereby decreasing the potential for impacts on paleontological resources. The typically more resource-protective management applied to ACECs would reduce impacts on livestock by further limiting the ability to disturb forage resources compared to current management. (pg. U-116)" While limiting surface disturbances in the ACECs may reduce impacts to forage resources, that potential benefit is outweighed by the greater likelihood that BLM will prohibit range improvements, and thereby grazing, in the ACECs. The BLM's analysis fails to account for the likely impacts flowing from the likely exclusion of range improvements from ACECs.

Comments Submitted During the Planning Process:
On January 16, 2024, WDA provided the following comments pertaining to Management Action 7432 [sic]:

MA#7432 [sic], Alt B: "Modify livestock grazing objectives and systems to manage for plant condition and composition most ecologically beneficial to identified wildlife species..."

[9] Appendix 1-Wyoming Bureau of Land Management Mitigation Guidelines for Surface Disturbing and Disruptive Activities: https://eplanning.blm.gov/public_projects/lup/63197/78289/88518/Appendix01_Wyoming_Mitigation_Guidelines.pdf (Attachment 7)

Comment: This Alternative conflicts with existing regulations for Wyoming Land Health Standards. BLM should only modify grazing management after a Standards Determination identifies livestock grazing as the significant causal factor. The RMP cannot override BLM's existing regulations.

Conclusion and Requested Relief

The Proposed RMP alternative for Management Action 6407, 6411, 7421, and 7532 are exceptionally misaligned with the remainder of the livestock grazing section and management actions. We offer the following solutions to address our protest points:

1. Select Alternative C for Management Actions 6407, 7421 and 7532.

2. Disclose all existing exclosures across the project area.

3. Disclose original goals, objectives, and current data in order to make determinations if existing exclosures have met these goals and objectives.

4. Remove exclosures where livestock grazing is not a threat or the significant causal factor for not meeting resource objectives and/or Wyoming Special Status Species Standard 4.

5. Develop clear resource objectives with proposed timelines for any new exclosures.

6. Utilize project level NEPA for any future exclosures in coordination and cooperation with livestock grazing permittees prior to the development, analysis, and implementation.

Additional option for correcting Management Actions 7421 and 7423:

1. Exempt range improvement projects as a surface disturbing activity. Utilize project level NEPA to ensure that any negative impact to the ACEC values are mitigated, while still meeting the purpose and need of the project under NEPA and meeting BLM’s land health standards.

If you have questions, please contact Justin Williams, Senior Policy Analyst at 307-777-7067.

Sincerely,

Doug Miyamoto
Director

DM/jw

CC:

Governor’s Policy Office
Wyoming Board of Agriculture
Wyoming Stock Growers Association
Wyoming Wool Growers Association
Wyoming Farm Bureau Federation
Wyoming Association of Conservation Districts
Wyoming Game and Fish Department
Wyoming County Commissioners Association
Public Lands Council

Attachment 1

V86MARO4WYNS

STATUS REPORT

Scientific Name of Taxon:	ARABIS PUSILLA Roll.
Common Name(s) of Taxon:	NCN
Family:	Brassicaceae
State(s) Where Taxon Occurs:	U.S.A., Wyoming
Recommended Federal Status:	Category 2 [additional field inventory recommended]
Author(s) of Report:	Hollis Marriott Rocky Mountain Heritage Task Force 3165 University Station Laramie, Wyoming 82071
Original Date of Report:	30 November 1986
Date of Most Recent Revision:	

TABLE OF CONTENTS

LIST OF TABLES, FIGURES AND PHOTOGRAPHS

LIST OF APPENDICES

I. SPECIES INFORMATION

1. Classification and Nomenclature

A. Taxon

1. Scientific Name:

a. Binomial:

Arabis pusilla Roll.

b. Bibliographic Citation:

Rollins, R. C. 1982. Studies on *Arabis* (Cruciferae) of western North America II. Contr. Gray Herb. 212:103-114.

c. Type Specimen(s):

U.S.A., WYOMING, Fremont County, in cracks and crevices of huge metamorphosed rocks, off Wyoming State Highway 28, 39 miles SW of Lander; 20 June 1981; Reed C. Rollins and Kathryn W. Rollins 81366 (holotype: GH, isotype: RM)(Appendix II).

2. Pertinent Synonyms: None

3. Common Names: No Common Name

4. Taxon Codes:

WNHP Taxon Code - FWS8301780

5. Size of Genus:

Over 100 species in North America (also in north temperate Europe and Asia)(Hitchcock and Cronquist 1964).

B. Family Classification

1. Family Name: Brassicaceae

2. Pertinent Synonyms: Cruciferae

3. Common Names: Mustard

C. Major Plant Group: Dicotyledoneae

D. History of Knowledge of Taxon

Arabis pusilla was described by Rollins (1982) from a collection by Reed C. and Kathryn W. Rollins of 20 June 1981 from cracks and crevices of huge metamorphosed rocks off Wyoming State Highway 28, 39 miles southwest of Lander in Fremont County, Wyoming. This specimen (No. 81366) is deposited in the Gray Herbarium of Harvard University, Cambridge, Massachusetts. No subsequent collections of the taxon were made until the fieldwork associated with this status report was carried out in 1986.

E. Current Alternative Taxonomic Treatments

None

2. Present Legal or Other Formal Status

A. International

1. Present Designated or Proposed Legal Protection or Regulation:

None

2. Other Current Formal Status Recommendations:

None

3. Review of Past Status:

None

B. National

1. United States

a. Present Designated or Proposed Legal Protection or Regulation:

U. S. Fish and Wildlife Service, Notice of Review, Category 2, FR 50(17):39525-39584, 27 September 1985.

b. Other Current Formal Status Recommendations:

Heritage Program Ranking - G1S1 (RMHTF 1986)

c. Review of Past Status:

None

C. State

1. Wyoming

a. Present Designated or Proposed Legal Protection or Regulation:

No current legislated regulations or protection.

b. Other Current Formal Status Recommendations:

Heritage Program Ranking - G1S1 (RMHTF 1986)

c. Review of Past Status:

None

3. Description

A. General Description

Perennial with a simple, thickened, mostly nonbranching caudex; stems one or few, slender, slightly decumbent toward base, 6-12 cm tall; basal leaves erect, linear to linear-oblanceolate, petiolate, entire, acute to acuminate, 1-1.5 cm long, 1.5-2 mm wide; sparsely pubescent with erect 2-3 branched trichomes, rarely ciliate on the margins with simple or forked trichomes; petioles usually ciliate on the margins with simple or forked trichomes; cauline leaves 3-5, remote, sessile, nonauriculate, 4-8 mm long; sepals oblong, nonsaccate, erect, purplish, scarious-margined, glabrous or with a few trichomes, 2-2.5 mm long; petals spatulate, erect, light lavender, 3.5-4.5 mm long; fruiting pedicels widely spreading, straight, glabrous, 2-3 mm long; siliques widely spreading to slightly ascending, glabrous, acuminate, nearly straight but with slightly undulating margins, 1-1.5 cm long, ca. 2 mm wide; styles nearly obsolete; seeds oblong, slightly compressed, wingless or occasionally with a slight distal margin, ca. 2 mm long, ca. 1 mm wide; radical pointed, slightly exceeding cotyledons; cotyledons accumbent (Rollins 1982).

B. Local Field Characters

Material from the one collection of Arabis pusilla of the 1986 field season was characterized by short, relatively wide siliques positioned at right angles to

the stem to slightly descending.

C. Identifying Characteristics of Material Which is in Interstate or International Trade or Commerce

No material is known to be or expected to be in interstate or international trade or commerce.

D. Photographs and/or Line Drawings

See page 5 and Appendices II and IV.

4. Significance of Taxon

A. Natural

Unknown

B. Human

Arabis pusilla is endemic to Wyoming where it has a highly restricted range. It is of scientific as well as aesthetic value, both for its restricted distribution and as a member of what appears to be a rapidly evolving group (the genus Arabis). When more is known about the taxon, it might serve as a suitable subject for studies in plant speciation and evolution.

5. Geographical Distribution

A. Geographical Range

USA, WYOMING, Fremont County, southern Wind River Range, South Pass area; 8000 ft asl (Fig. 1).

B. Precise Occurrences

1. Populations Currently or Recently Known Extant:

The occurrence listed below was visited in 1986. The longitude/latitude and altitude, directions for reaching the site, etc. are shown on the data form in Appendix III.

See map (Fig. 2) on following page.

01 FREMONT Pine Creek Outcrops
South Pass City Quadrangle
T29N R101W S26 S1/2

1. Pine Creek Outcrops, Arabia pusilla habitat in foreground; June 1986.

2. Arabis pusilla, Pine Creek Outcrops; June 1986.

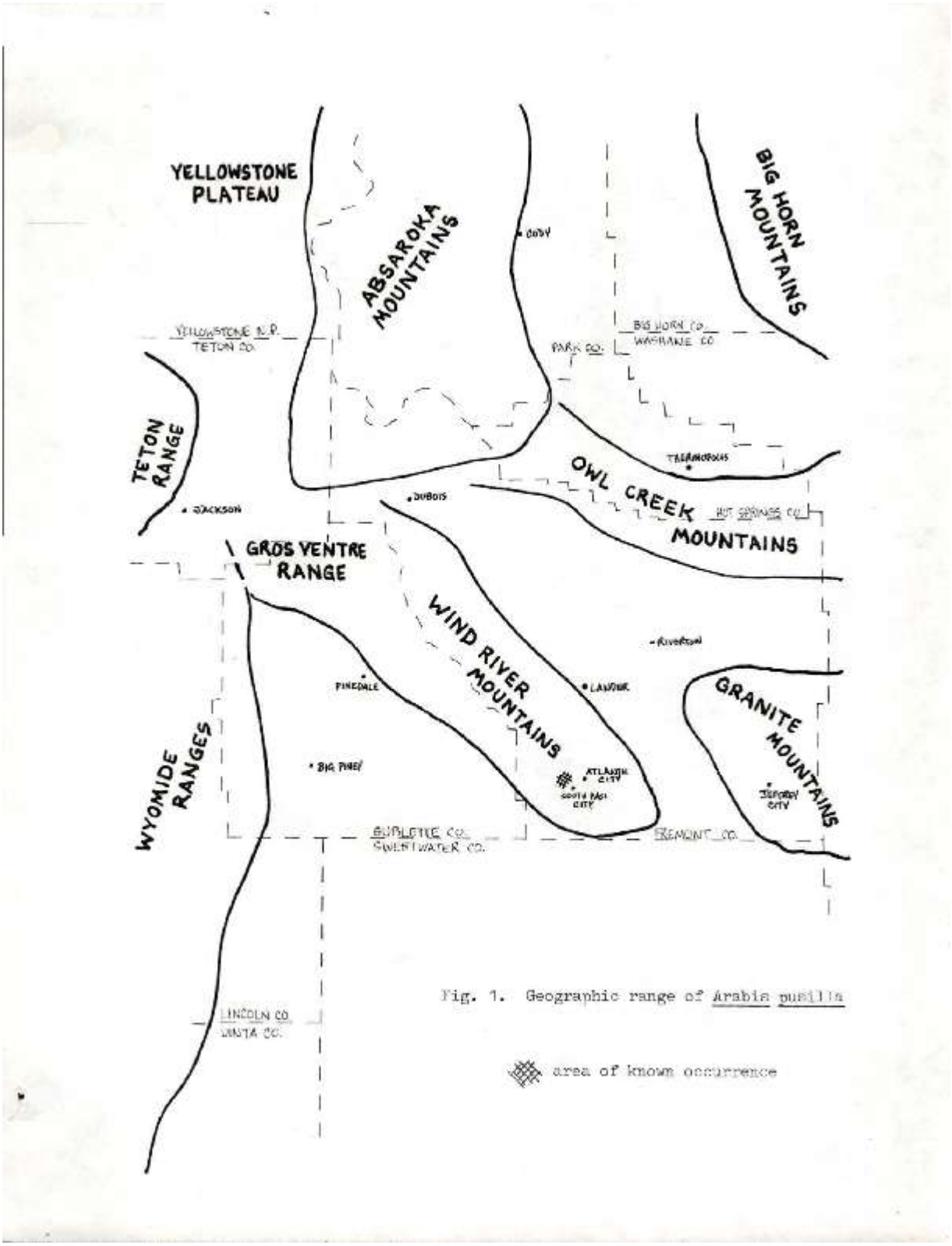

Fig. 1. Geographic range of Arabis pusilla

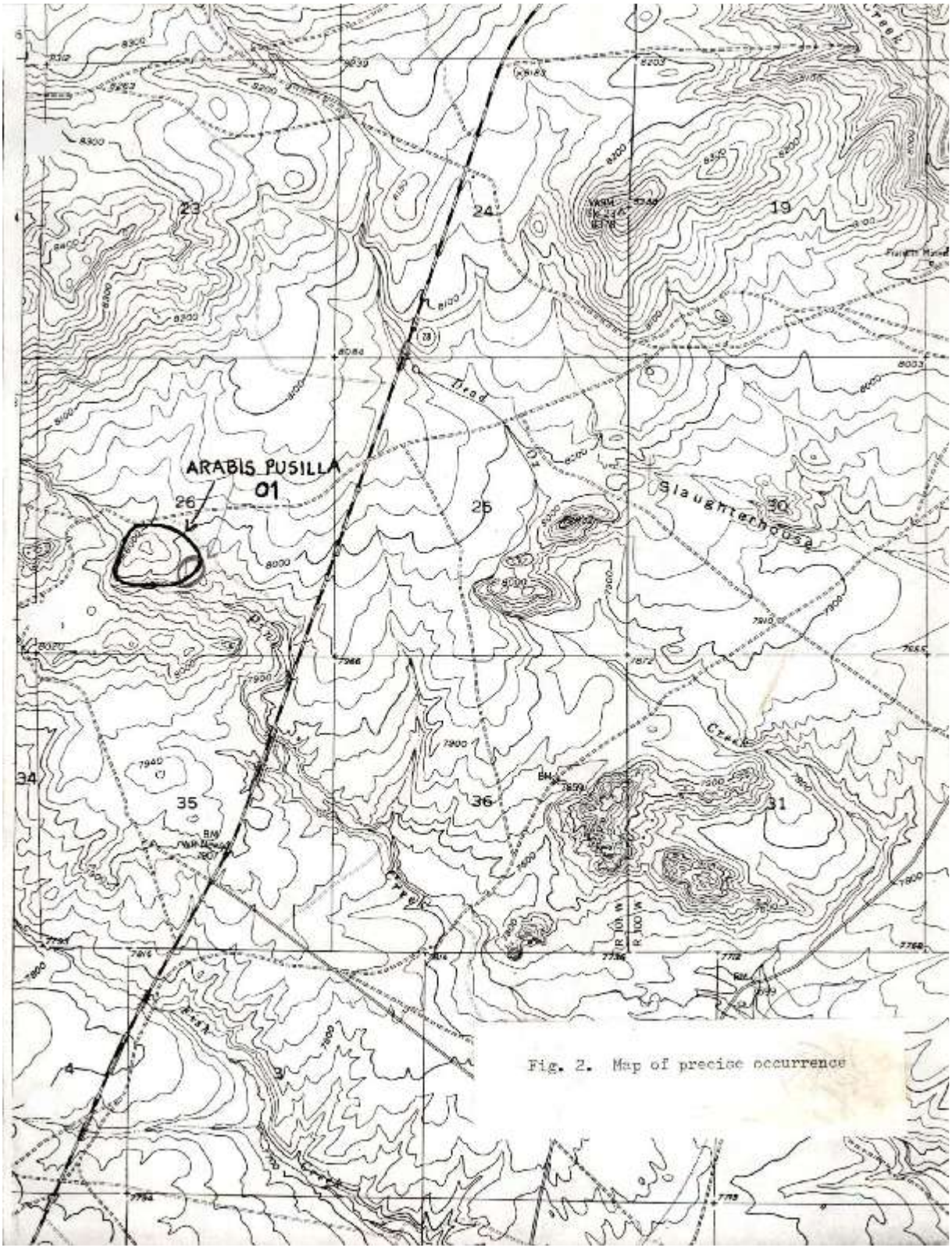

Fig. 2. Map of precise occurrence

2. Populations Known or Assumed Extirpated:

None

3. Sites Where Present Status Not Known:

None

4. Sites Not Yet Investigated and Believed Likely to Support Other Possibly Extant Natural Occurrences:

A number of granite-pegmatite outcrops occur in the South Pass area. Almost all were searched for Arabis pusilla, but only one occurrence was located. The canyon of the Sweetwater River south-southwest of Atlantic City contains outcrops of granitic rocks similar to those of the single known occurrence (Love and Christiansen 1985). This area has not been searched for the taxon. Similar rocks occur also along the southwest flank of the Wind River Range along the Lander Cutoff. This area was briefly covered, but no material of A. pusilla was found.

5. Sites Having Ambiguous or Incomplete Locality Data:

The exact location of the type collection (Rollins 81366) is not clear, although it is known to be in the area of granitic outcrops where Occ. No. 01 is located.

6. Locations Known or Suspected to be Erroneous Reports:

None

C. Status and Location of Presently Cultivated Material

None

D. Biogeographical and Phylogenetic History

Unclear. Rollins (1982) has placed Arabis pusilla in the A. demissa-A. oxylobula-A. pendulina group. Both A. demissa (var. languida) and A. pendulina (var. russeola) were collected from the general area of Occ. No. 01. The characters separating these three taxa are summarized in Table A. Because so little material of A. pusilla is available for study, it is difficult to hypothesize relationships. And as Rollins (1983) has pointed out, hybridization, apomixis and polyploidy in

Arabis have led to a complexity "that often nearly defies taxonomic resolution."

6. Environment and Habitat

A. Concise Statement of General Habitat

In crevices and on sparsely vegetated very coarse soil in granite-pegmatite outcrops surrounded by sagebrush grassland; 8000 ft asl.

B. Physical Characteristics

1. Climate:

a. Macroclimate:

Average annual precipitation at South Pass City is 12". Distribution of precipitation and average temperatures are shown in Fig. 3. There are approximately 30 frost-free days between mid-June and mid-July. The area is subjected to frequent, at times strong southwesterly winds.

b. Microclimate:

Unknown

2. Air And Water Quality Requirements:

Unknown

3. Physiographic Province:

Middle Rocky Mountains
Wind River Range

4. Physiographic and Topographic Characteristics and Elevational Range:

Level to gently sloping rock outcrops; 8000 ft.

5. Edaphic Factors:

Known from crevices and very coarse soil associated with late Archean granitic-pegmatite outcrops.

6. Dependence on Dynamic Aspects:

Unknown

Table A. Characters separating *Arabis pusilla* from sympatric taxa of the *A. demissa*-*A. oxylobula*-*A. pendulina* group (from Rollins 1982).

Character	*A. pusilla*	*A. demissa* var. *lanquida*	*A. pendulina* var. *russeola*
Basal leaf pubescence	branched trichomes; sparse	large simple trichomes on margins; small branched trichomes on blades	simple trichomes only (mostly on margins)
Silique shape	acuminate	obtuse	obtuse to acute
Silique disposition	spreading at right angles to rachis or slightly ascending (or descending)	pendulous	pendulous
Silique dimensions	1-1.5 cm long, 2 mm wide	2-4 cm long, 1.5-2 mm wide	2-4 cm long, 1.5-2mm wide
Pedicel length	2-3 mm	3-6 mm	5-8 mm

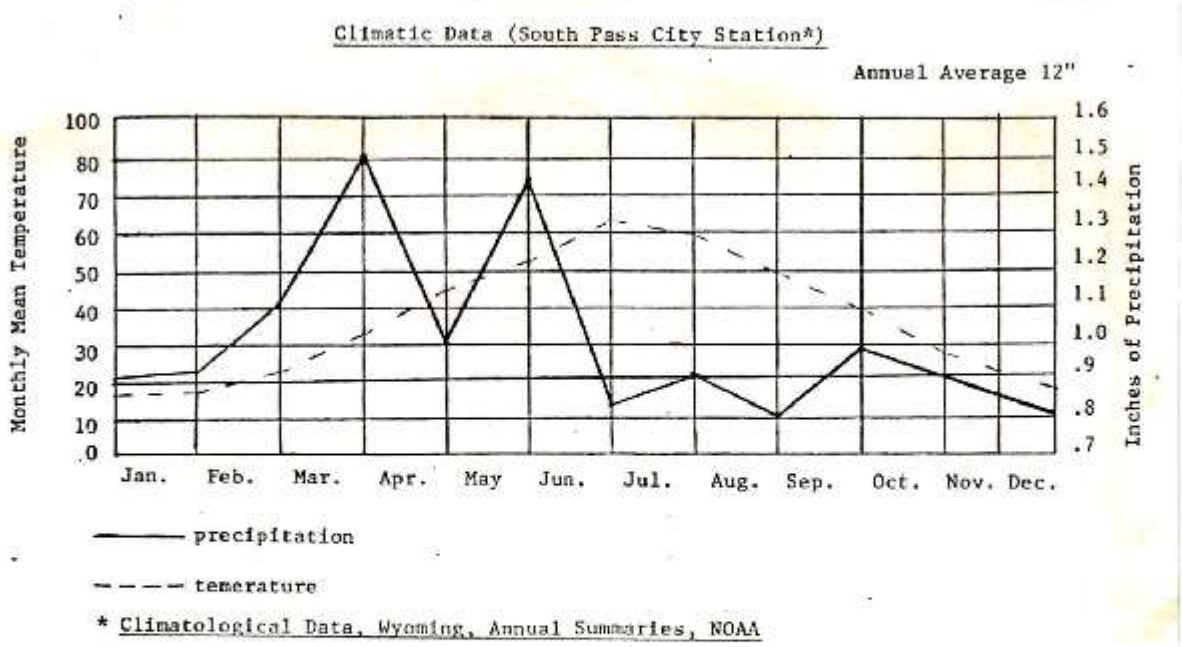

Fig. 3. Average annual precipitation and air temperature (from Krosting & Christensen. 1980. Pine Creek Allotment Management Plan).

C. Biological Characteristics

1. Vegetation Physiognomy and Community Structure:

Sagebrush grassland; scattered limber pine and Rocky Mountain juniper on rock outcrops.

2. Regional Vegetation Type:

Kuchler type: Sagebrush-steppe

3. Frequently Associated Species:

Arabis pusilla occurs on very sparsely vegetated sites in granite-pegmatite outcrops. Other taxa commonly found on these outcrops include Pinus flexilus, Juniperus communis, Rhus trilobata, Arenaria hookeri, Paronychia depressa, Potentilla sp. and Arabis microphylla.

7. Population Biology/Ecology

A. General Summary

Only one occurrence of Arabis pusilla was found during the 1986 field season. At this site, approximately 50 individuals were seen.

B. Demography

1. Known Populations

Occurrence	Est. No. Individ.
01	50?

C. Phenology

So little material of Arabis pusilla has been found that flowering and fruiting periods are all but unknown. On 20 June 1981, Rollins (81366, RM) collected the taxon in fruit. On 30 June 1986, Marriott (10322, RM) collected material with both fresh and dried fruits.

D. Reproductive Ecology

1. Type of Reproduction: Unknown

2. Pollination

a. Mechaniams: Unknown

3. Propagule Dispersal: Unknown

4. Propagule Ecology: Unknown

5. Seedling Ecology and Morphology: Unknown

6. Survivorship: Unknown

7. Overall Assessment of Reproductive Success:

Arabis pusilla is uncommon at the single known occurrence. There is no information available concerning population trends.

E. Population Ecology

1. General Summary: Unknown

2. Interactions/Competition: Unknown

3. Hybridization:

Hybridization in the genus Arabis is not uncommon (Rollins 1983), and closely related taxa (Rollins 1982) occur in the same area as Arabis pusilla (A. demissa and A. pendulina). However, so little material of A. pusilla has been available for study that taxonomic relationships are difficult to hypothesize.

8. Current Land Ownership and Management Responsibility

A. General Nature of Ownership

Bureau of Land Management

B. Specific Landowner(s)

Bureau of Land Management

C. Management Responsibility

The single known occurrence of Arabis pusilla is administered by the BLM (Rock Springs District, Green River Resource Area).

9. Management Practices and Experience

A. Management and Land Use

The single known occurrence of Arabis pusilla is located within the Pine Creek Special Management exclosure designated in 1978. The exclosure includes about 88 acres popular with campers, anglers, hunters and travelers, and was established to prevent livestock conflict with recreational use. A fence was completed in 1982. The SM is being managed for short-term camping and only minor improvements are planned (see below)(Dunder 1984). The exclosure lies within the Pine Creek Allotment, used by cattle from mid-May through mid-October.

B. Future Land Use

Planned management actions for the Pine Creek SM are outlined in Appendix I. The area will be improved for short-term camping with the addition of a vault-type outhouse and concrete picnic tables. Riparian habitat will be managed for fisherman access with short-duration, high intensity grazing on an as-needed basis using livestock from the Pine Creek Allotment.

C. Disease, Predation or Grazing

Unknown

D. Inadequacy of Existing Regulatory Mechanisms

The single known occurrence of Arabis pusilla is located on federal land (BLM) and would be protected by the Endangered Species Act, if the species were listed. The species and its habitat receive no protection at this time. There are no local or state regulations that would provide for habitat protection.

10. Evidence of Threats to Survival

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

No imminent threats recognized.

B. Potential Threats

Trampling or grazing by livestock might occur if short-duration, high intensity grazing were used in the Pine Creek SM. Some quarrying (for feldspar?) was done in the past on one of the granite-pegmatite outcrops near the single known occurrence. Mining of other outcrops would destroy potential habitat for Arabis pusilla. Other unforeseen catastrophic events could also

extirpate the individual plants on the single known occurrence.

C. Overutilization for Commercial, Sporting, Scientific or Educational Use

None currently known or expected.

D. Easements, Conservation Restrictions, etc.

None

II. ASSESSMENT AND RECOMMENDATIONS

11. General Assessment of Vigor, Trends and Status

At this time, only one occurrence of Arabis pusilla has been located, although a number of similar granite outcrops occur in the same area and all were searched. Although a systematic inventory of the single occurrence site was not done, the known population appears to be small (approximately 50 individuals). No data are available concerning population trends.

12. Priority of Listing or Status Change

A. Recommendation to U. S. Fish and Wildlife Service

Arabis pusilla should continue to be considered a Category 2 taxon until more information is available concerning its range, biology and threats to habitat. Further inventory should be conducted on as yet unsearched potential habitat.

B. Recommendation to Other U. S. Federal Agencies

Bureau of Land Management: This species is recommended for consideration as a Sensitive plant species. The Pine Creek SM, which contains the single known occurrence of Arabis pusilla, should be managed with habitat protection in mind. Campground improvements should be made well away from known and potential habitat. If livestock are turned in for riparian vegetation management, they should be closely monitored and removed immediately if any impact on A. pusilla habitat is apparent.

C. State/County Recommendations

In the event that the State of Wyoming passes rare plant legislation, this species should be considered for State status.

D. International Recommendations

None are called for since this taxon does not appear in trade.

13. Recommended Critical Habitat

A. Concise Statement

Granite-pegmatite outcrops east of Pine Creek west of WY Hwy 28 ca 0.7 air mile.

B. Legal Deacription

Occ. No.

01 South Pass City Quadrangle
T29N R101W S26 S1/2, S35 N1/2

C. Latitude and Longitude

See Appendix III.

D. Publicity-sensitivity of Suggested Critical Habitat

This taxon is not known to be collected or utilized by the horticutural trade, and its known range is very limited. The personnel responsible for BLM administration of the only known occurrence should be consulted on the sensitivity of the site. Since the occurrence is so small publicity could bring attention to the site resulting in vandalism or open knowledge of its importance could offer it a certain degree of protection.

14. Conservation/Recovery Recommendations

A. General

Arabis pusilla should continue to be considered a Category 2 taxon as so little is known concerning its range, biology and threats to habitat. BLM management of the area surrounding the single known occurrence should take into account impact on potential habitat.

B. Monitoring Activities and Recommended Further Studies

Additional field work is needed to determine the taxon's distribution. The single occurrence found in 1986 was mainly composed of individuals with dried fruits, suggesting that the taxon was nearing the end

of its season. Earlier collecting might result in more occurrences, especially at lower elevations.

15. Interested Parties

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Rocky Mountain Heritage Task Force
3165 University Station
Laramie, WY 82071

J. Scott Peterson
Rocky Mountain Heritage Task Force
1370 Pennsylvania Suite 190
Denver, CO 80203

Reed C. Rollins
Gray Herbarium, Harvard University
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Cambridge, MA 02138

Carol Taylor
US Fish and Wildlife Service
Endangered Species Field Office
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Helena, MT 59626

Wyoming Native Plant Society
Box 1471
Cheyenne, WY 82003

Ronald Hartman
Rocky Mountain Herbarium
3165 University Station
Laramie, WY 82071

Bureau of Land Management
Rock Springs District
Green River Resource Area
Box 1170
Rock Springs, WY 82901

Bureau of Land Management
Wyoming State Office
Box 1828
Cheyenne, WY 82001

Tom Wolf, Wyoming Protection Planner
Box 7621
Jackson, WY 83001

Robert Dorn
Box 1471
Cheyenne, WY 82003

Robert Lichvar
c/o Box 1471
Cheyenne, WY 82003

Paige Waldvogel
Dept. of Environmental Quality
Land Division
Herschler Building
Cheyenne, WY 82001

III. INFORMATION SOURCES

16. Sources of Information

A. Publications

Dunder, J. D. 1984. Pine Creek SM Management Plan. Unplublished report, BLM, Rock Springs District, Green River Resource District.

Hitchcock, C. L. and A. Cronquist. 1964. Vascular Plants of the Pacific Northwest. Part 2. Seattle: Univ. of Washington Press.

Love, J. D. and A. C. Christiansen. 1985. Geologic map of Wyoming. U.S. Geol. Surv.

NOAA. 1980. Climatological Data, Wyoming, Annual Summaries.

Rollins, R. C. 1982. Studies on Arabis (Cruciferae) of western North America II. Contr. Gray Herb. 212:103-114.

-------. 1983. Interspecific hybridization and taxon uniformity in Arabis (Cruciferae). Amer. J. Bot. 70:625-634.

U.S.D.I., Fish and Wildlife Service. 1985. Endangered and threatened wildlife and plants; review of plant taxa for listing as endangered or threatened species; notice of review. FR50(188):39525-39584, 27 September 1985.

B. Herbarium Collections Consulted

Rocky Mountain Herbarium (RM)
University of Wyoming, Laramie, WY

Central Wyoming College (CWC)
Riverton, WY

C. List of Known Herbarium Specimens

USA, WYOMING, Fremont County: stems few from a simple or rarely close-branched caudex, arising below terminal cluster of erect leaves; pedicels at right angle to rachis; siliques widely spreading. Growning in cracks and crevices of huge metamorphosed rocks, off Wyo. State Hwy. 28, 39 miles southwest of Lander; 20 June 1981; Rollins 81366 (HOLOTYPE: GH, ISOTYPE: RM). (Occ. No. 01 ?).

USA, WYOMING, Fremont County: T29N R101W S26 S1/2; southern Wind River Range, South Pass area, large granite-pegmatite outcrops along Pine Creek W of Hwy 28 ca 39 rd mi SW of Lander, ca 3 air mi WSW of South Pass City; E of creek, crevices in rock outcrops and on sparsely vegetated very coarse soil between outcrops; 8000 ft; 30 June 1986; Marriott 10322 (RM). (Occ. No. 01).

D. Specimen Record

Year	No. Specimens	Year	No. Specimens
2000		1980	
1998		1970	
1996		1960	
1994		1950	
1992		1940	
1990		1930	
1988		1920	
1986	1	1910	
1984		1890	
1982	1	pre-1880	

E. Recent Fieldwork

Fieldwork to determine more precisely the range of Arabis pusilla was undertaken in late June, 1986, by the RMHTF. Approximately 5 person-days were spent on field inventory (see Appendix IV for survey routes) plus additional hours for planning and report writing.

F. Knowledgeable Individuals

Reed C. Rollins
Grey Herbarium, Harvard University
22 Divinity Ave.
Cambridge, MA 02138

Hollis Marriott
3165 University Station
Laramie, WY 82071

G. Other Information Sources and References

From Rollins (1982):

Arabis pusilla Rollins, sp. nov.

Herba perennis; caulibus filiformibus, erectis vel decumbentibus, 6-12 cm altis; foliis radicalibus erectis, linearibus vel lineari-oblanceolatis, 1-1.5 cm longis, 1.5-2 mm latis, foliis caulinis 3-5, sessilibus, oblongis, remotis; sepalis oblongis, erectis, nonsaccatis, purpureis, ca. 2 mm longis; petalis spathulatis, roseis, 3.5-4.5 mm longis; pedicellis fructiferis divaricatis, rectis, glabris, 2-3 mm longis; siliquis divaricatis, acuminatis, glabris, 1-1.5 cm longis, ca. 2 mm latis; seminibus oblongis, exalatis, ca. 2 mm longis, ca. 1 mm latis; cotylendonibus accumbentibus.

17. Summary of Materials on File

A. All publications listed in Section 16A.

B. Original maps.

C. 35 mm slides of the taxon and its habitat.

D. Original copy of this report.

E. Computer and manual files on each known occurrence.

F. Field notes on areas covered during 1986 season.

G. First specimen of all numbers collected is deposited at the Rocky Mountain Herbarium (RM), University of Wyoming.

IV. AUTHORSHIP

18. Initial Authorship

Hollis Marriott
Rocky Mountain Heritage Task Force
3165 University Station
Laramie, WY 82071

ed. J.S. Peterson

19. Maintenance of Status Report

Should this taxon be listed as an Endangered or Threatened Species by the US Fish & Wildlife Service, the Service, through its Office of Endangered Species (Region 6), should maintain the primary file of information on it, encourage others to provide new information, and distribute new findings, as received, to the Interested Parties.

V. NEW INFORMATION

20. Record of Revisions

Attachment 2

Boechera pusilla (Small Rockcress; Fremont County Rockcress)

Final Monitoring Report (2015-2017)

and Status Report Update

Fremont County, Wyoming

Prepared for
Bureau of Land Management
Wyoming State Office and Rock Springs Field Office

By
Bonnie Heidel
Wyoming Natural Diversity Database
University of Wyoming
Dept. 3381, 1000 E. University Avenue
Laramie, WY 82071

February 15, 2018

Agreement No. L12AC20036, Mod. 6
and Agreement No. L16AC00389

ABSTRACT

Boechera pusilla was designated sensitive by the Bureau of Land Management (BLM), and more recently recognized as a Candidate species (Category 1) by the U.S. Fish and Wildlife Service (FWS). It is known from one population throughout its range, and has been the subject of studies and protection measures. A monitoring study was set up in 1988 within part of the largest subpopulation. The 1988 monitoring was replicated in 2003 and 2004; then from 2008-2012, and most recently in 2015-2017. Monitoring results document oscillating trend among flowering plant numbers in the original monitoring plot with relatively high numbers in 2017 (81) relative to recent years, but no rebound to 1988 numbers. In addition, complete census was sought in all of the *B. pusilla* populations, tallying a total of 1340 plants (flowering + vegetative) in 2017. New surveys of *B. pusilla* were conducted and small subpopulation boundary edits were made. A closely-related taxon, *B. pendulina*, was documented as recurrent in surrounding sections, and the recent report of a "new" *B. pusilla* population was based on material that has been redetermined as *B. pendulina*. This report represents a culmination of monitoring work, reinforcing the interpretation that there has been major decline, though it does not provide an explanation.

ACKNOWLEDGEMENTS

Boechera pusilla monitoring work was supported as a joint project of the Bureau of Land Management (BLM) and the Wyoming Natural Diversity Database (WYNDD). This study draws heavily from the previous monitoring work of Hollis Marriott. This year's report drew from her 2017 fieldwork. Taxonomic consultation with Dr. Michael Windham is acknowledged with gratitude. The 2017 monitoring was conducted with the support of Chris Keefe and Jim Glennon, BLM, under a challenge cost-share agreement between BLM and WYNDD (most fieldwork charges under L12AC20036, and all other charges under L16AC00389).

Literature citation:

Heidel, B. 2018. *Boechera pusilla* (small rockcress; Fremont County rockcress) final monitoring report (2015-2017) and status report update. Prepared for the Bureau of Land Management. Wyoming Natural Diversity Database, Laramie, WY.

Table of Contents

Figures

Tables

INTRODUCTION

Boechera pusilla (Rollins) Dorn (syn. *Arabis pusilla*) (Small Rockcress; also called Fremont County Rockcress) was on the most current list of designated sensitive species prepared by the Bureau of Land Management (BLM) in Wyoming (2010). It is now recognized as a Candidate species (Category 1 species) for listing under the Endangered Species Act (USDI Fish and Wildlife Service; FWS 2011)[1]. It is known from only one population throughout its range, so is a species of very high Wyoming contribution rank having Global and State ranks of G1/S1 (Heidel 2012). The entire population is on land administered by BLM out of the BLM Rock Springs Field Office.

Four *Boechera pusilla* status reports have been produced (Marriott 1986, Dorn 1990, Heidel 2005, 2012). The primary purpose of this project was to conduct an additional year of monitoring *B. pusilla* as culmination to a monitoring period data (2015-2017). It marks the tenth year of monitoring since the 1988 establishment year. New survey objectives were added in 2017 to resolve pilot 2016 survey questions, focusing on similar habitat near Pine Creek or otherwise in the same township as currently known. Finally, we examined new sets of climate data to look for climate patterns that might parallel population patterns. As such, this report replaces the other dual-purpose status and monitoring reports (Heidel 2005, 2012) but incorporates data directly from them. A timeline that encapsulates species studies, status changes, and related reports is presented in Appendix A, summarizing the history mentioned in different sections of this report.

MONITORING

Study design

A definition for plant population monitoring, as presented by Elzinga et al. (1998) is: "We define monitoring as the collection and analysis of repeated observations or measurements to evaluate changes in conditions and progress toward meeting a management objective." For purpose of this report, monitoring refers to repeated data-collecting visits to specific plant populations or population segments and the ensuing data analysis, to document trends and help gauge population viability in keeping with BLM's mandate to manage for viable populations. In this case, the repeated visits have been made once a year. The past year's work also included a survey component. Survey refers to a systematic search for a species where there are no pre-existing records of its presence. Census refers to a tally of individual plants by some set of standards, whether conducted in a monitoring study or in a survey study.

A monitoring design was established for *Boechera pusilla* and carried out in 1988 and it involved complete census of flowering plants in a given plot area placed within a large subpopulation (Marriott 1988). The plot area covered 16 m x 25 m (400 m^2). The original monitoring was conducted by setting out the plot boundaries and then laying a 25 m measuring tape at 2 m intervals along the 16 m baseline, counting all flowering plants and categorizing

[1] Since the time that this report was prepared, the U.S. Fish and Wildlife Service determined that listing Boechera pusilla as Endangered or Threatened is not warranted (USFWS 2018).

them within 1 m of the tape, carried out by a two-person team. The 1988 researchers also mapped the entire subpopulation as almost fitting within a 50 m x 25 m area (1250 m^2), and proposed expanding the original monitoring plot to the 50 m x 25 m area, and then converting it into a random sampling design. Detailed photo documentation and notes accompanied the establishment record of 1988 monitoring and accompanying raw data. It was recommended for annual monitoring but did not get repeated.

A separate monitoring design for *Boechera pusilla* was set up and executed in 1993 as complete census (Amidon 1993). From a schematic diagram and description of its location, it was located in roughly the same subpopulation area as the 1988 monitoring plot. The monitoring was reported in English units and spanned an area of 40 ft x 100 ft (4000 ft^2; 371.6 m^2). A series of tapes were spaced 5 ft (~1.5 m) apart and referred to as transects. A one-page summary copied from agency files was available for reference. It was also recommended for annual monitoring but the location of the plot was not marked on the ground or archived with maps, so could not be repeated.

The same subpopulation of *Boechera pusilla* that was monitored in 1988 and 1993 was not targeted for monitoring again until 2003 (Heidel 2005). It was readily apparent that the species was no longer in high density as reported in 1988, and was not random in its distribution but occurred as patches that followed irregular outcrop features, arguing against a random sampling design. The schematic maps and photo records that accompanied the 1988 monitoring were available for reference. It was possible to precisely relocate the 16 m x 25 m original plot area (400 m^2) based on photographs, field notes and a field map, confirmed in person later by Marriott in 2016. Global Positioning System (GPS) coordinates are on record, augmented by photographs from each corner point were added in 2017 as reference (Appendix B).

Monitoring of *Boechera pusilla* has been repeated in ten different years since establishment in 1988 (Table 1). The first repeat visits to the original plot were in 2003 and 2004.

In 2003, I raised questions whether overall trend results might be masked by shifts in the ratio of flowering-to-nonflowering individuals. Therefore, the scope of monitoring was expanded by adding census of nonflowering (vegetative) plants. All plants with a flowering stem of the current year were tallied as a flowering plant, no matter the number of stems or whether or not they had mature fruit. All plants without flowering stems were tallied as nonflowering, though it is challenging to reliably discern vegetative plants. They can be smaller than the diameter of a dime, and examination of many plants under hand lens was routine. Though generally out in the open, they were sometimes difficult to spot. The vegetative plant forms a small rosette, with simple hairs at the leaf margin and often a reddish coloration that are different from the two other *Boechera* species in the immediate area (*B. microphylla* and *B. pendulocarpa*).

Sometimes short-lived plants are prone to shift in their local distribution pattern. Starting in 2008, this was addressed by expanding the scale to include the largest rectangle possible within subpopulation boundaries to 50 m x 25 m (1250 m^2) as had been proposed twenty years earlier. Thus, the 1988 design was replicated, expanded, the corner points were marked, and pursued as exhaustive monitoring within the original and expanded plots. Two 50 m tapes were run the length of the monitoring plot on opposite sides, and two other 25 m tapes were stretched

perpendicular at 1 m intervals to grid off the plot for conducting complete census. Rocks were used to anchor the tapes to prevent shifting with wind, and anchoring the lanes was required to get accurate tallies in even the slightest of breezes. The zero axis was in the northeastern corner, and a pair of 25 m tape measures laid across the width of the plot to divide it into 1 m bands, in which a 1 m² frame was placed to record plant numbers along the 25 m bands. The 1250 m² sample area is henceforth referred to as the expanded plot area and the original plot is nested within it.

The monitored subpopulation covers an area that is more or less oval in outline, so there are small extensions on all sides of the 50 m x 25 m rectangular monitoring plot. The counts in these peripheral areas are not incorporated in the running tally of plot data, though they were noted separately in 2009-2012 and 2016-2017 monitoring to be stored in master datasets for the rest of subpopulation and population data. In other words, all data that are referred to as monitoring data come from just the rectangular plot area, with permanent corner markers.

Table 1. *Boechera pusilla* monitoring overview (1988-2017)

Monitoring date	Monitoring extent (400 m² or entire 1250 m²)	Inclusion of vegetative plants in addition to flowering plants
20 Jun 1988	400 m²	No
6 Jun 2003	400 m²	Yes
15 Jun 2004	400 m²	Yes
2 Jun 2008	1250 m²	No
1 Jun 2009	1250 m²	Yes
31 May 2010	1250 m²	Yes
6 Jun 2011	1250 m²	Yes
31 May 2012	1250 m²	Yes
4 Aug 2015	1250 m²	Yes
6 Jun 2016	1250 m²	Yes
2 Jun 2017	1250 m²	Yes

In this report, the term "flowering plant" is used interchangeably with "fruiting plant" and "reproductive plant." The term "nonflowering plant" is used interchangeably with "vegetative plant." The timing of *Boechera pusilla* monitoring has been early in the growing season thinking that this is a key period to evaluate life history. All monitoring was conducted when plants had fruits (siliques), except 2011, a year in which a small number of plants were still in late flower. It was a late year and traces of snow persisted around the plot area. The timing of monitoring changed in 2015 when opportunistic plans for *B. pusilla* monitoring were made on a trial basis in early August. Flowering stem breakage was rare, and there were no signs of plants having died between early and late in the summer. So monitoring is still ideal in early summer, but conditions may be amenable for later monitoring in years of mild growing conditions.

In 1988, the year that monitoring was established, there were 671 flowering plants in the original plot area. In each of the later ten years of monitoring, flowering plant tallies have always been less than 25% of 1988 flowering plant numbers. In an effort to address all possible explanations,

consultation with Hollis Marriott was pursued in 2016. She revisited the monitoring site and surroundings on July 15-17. She confirmed that the plot is located as she had originally placed it (Marriott 2016).

The scope of monitoring was expanded in 2011 to include a second subpopulation area with high numbers of *Boechera pusilla* plants, re-censused in 2016 and 2017 (see circles on the study area map, Figure 5). Census in this second area was conducted by laying tapes across occupied habitat, without establishing permanent plot boundaries and baselines. This census, like to rest of monitoring, was conducted mainly on hands and knees, and vegetative plants were included in the tally. In 2016-2017, the monitoring objective was further expanded to completely re-census of all occupied habitat (Figure 5). All other subpopulations have plants in low numbers, so they were traversed on foot, without use of measuring tapes to divide subpopulations into lanes (as needed in high density to avoid both omission and redundancy in census).

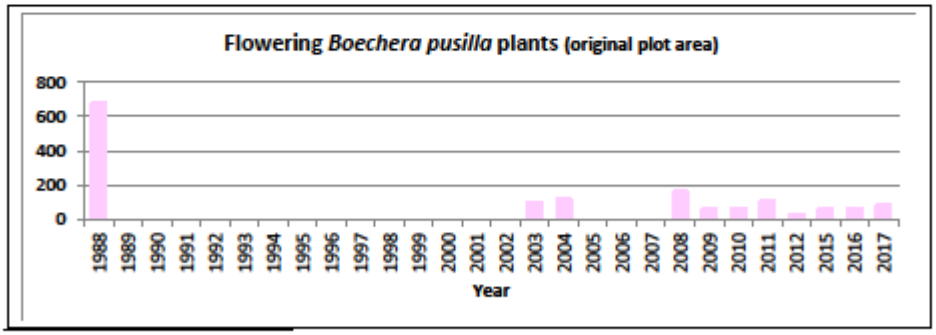
Monitoring results

The 2017 replication of 1988 monitoring shows that current *Boechera pusilla* flowering plant numbers (81 flowering plants) are about 12% of 1988 numbers (671 flowering plants). There has been no overall trend emerging from the ten years of data though there appears to be some level of oscillation (Table 2, Figure 1).

Table 2. Flowering *Boechera pusilla* plants over time

	400 m²	1250 m²
1988	671	
2003	87	
2004	112	
2008	152	400
2009	53	223
2010	56	238
2011	97	505
2012	21	213
2015	52	210
2016	52	316
2017	81	415

Figure 1. *Boechera pusilla* flowering plants in the original plot (400 m²) show small oscillation but not rebound to 1988 numbers[2],[3]

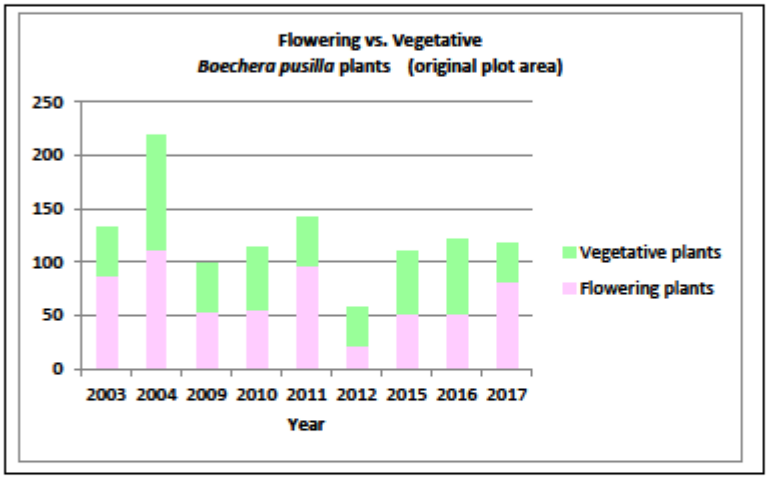


[2] Note that this is the only dataset and monitoring graph in the present report that compares the past 15 year period with the 1988 establishment report dataset, 30 years ago.

[3] All graphs in this report use pink to represent flowering plants and green to represent vegetative plants, in light or dark shades depending on whether they represent the original plot (light shade) or the expanded plot (dark shade).

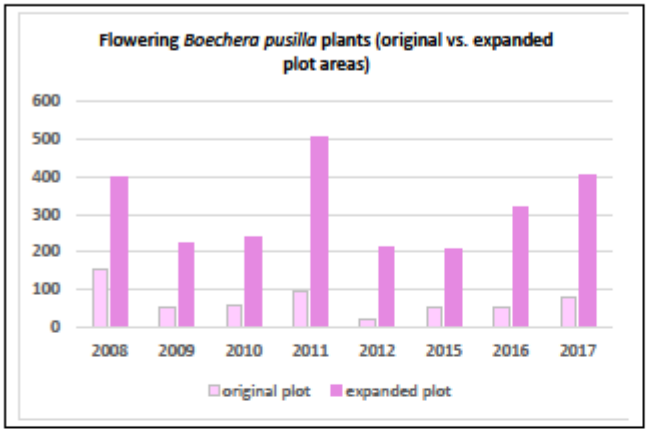
Addition of nonflowering plant census with flowering plant census indicates that nonflowering plant numbers may make up high proportions (50% or greater) of total plant numbers in both low-count years and in high-count years (Figure 2). Data also indicate that ratios between nonflowering and flowering plant numbers change between years and cannot be inferred from flowering plant counts. This indicates that the tally of all plants (flowering + vegetative) is a better representation of trends than either alone.

Figure 2. Flowering and nonflowering *Boechera pusilla* plants in the original plot (2003-2017) show that the vegetative plants can contribute ~30-70% of total plant numbers in any given year, and that vegetative plants may contribute significantly to total numbers in both low-count and high-count years



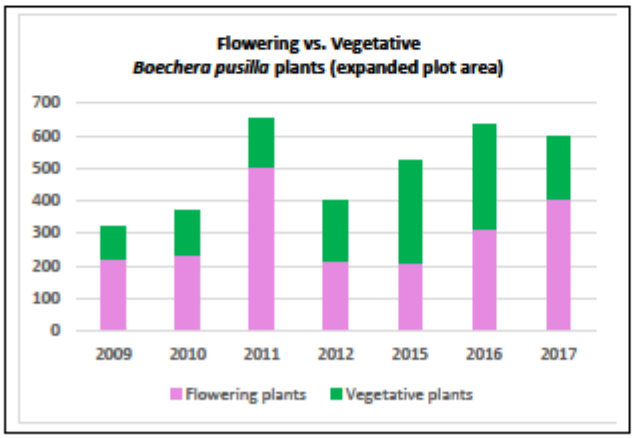
Examination of monitoring data for just flowering plants in the expanded plot versus the original plot indicates that the overall trends are analogous for any given interval between the original and expanded plot (Figure 3), refuting the idea that there might be shifts in locations for concentrated plant numbers over time. However, the expanded plot has not had flowering plant declines on par with declines in the original plot. The original plot declines up to 41% of peak numbers (2008-2017) compared to 14% declines of peak numbers in the expanded plot. It is possible that there might be some greater resiliency in portions of the expanded plot than in the original plot, keeping numbers from dropping as sharply.

Figure 3. *Boechera pusilla* flowering plants in the original and expanded plots (2008-2017; the dark pink corresponds with Table 2, second column) show that the trends in the original plot closely mirror the trends in the expanded plot



Finally, a composite graph of all flowering + vegetative plants in the expanded plot (2009-2017) shows variable ratios and overall parity in trends for each component. It does seem that vegetative plants make up a higher proportion of total plants in recent years (2012-2017) than in previous years (2009-2011).

Figure 4. Flowering and nonflowering *Boechera pusilla* plants in the expanded plot (2009-2017) show that the oscillating pattern of total monitoring plot numbers resembles that of just flowering plants, at the scale of both the original and expanded plots, and that vegetative plants comprise relatively high proportions of total plant numbers in recent years (2012-2017) compared to prior years (2009-2011)



Polygon-by-polygon monitoring results are summarized in Table 3 and detailed in Appendix C. In both 2011 and 2016, the two polygons with high numbers each had a magnitude more plants than any of the other polygons. This pattern shows every sign of being consistent between years. There are shifts between them. This underscores the benefit of the three-pronged approach using both original and expanded monitoring plots, and census throughout the rest of the population.

Table 3. *Boechera pusilla* census results, by polygon (2011-2017)

Polygon no.	Polygon location	2011 census	2016 census	2017 census
1	Oval polygon encompassing original + expanded monitoring plot (Easternmost polygon)	615	681	688
2	Second polygon with high numbers (NW¼)	726	925	537
3	Largest polygon, south of creek (SW¼)	No census	35	50
4	Expanded polygon, south of creek (SW¼)	No census	Not relocated	11
5	Small polygon bordering 2-track	25	9	27
6	Polygon west of second circled polygon (NW¼)	No census	19	22
7	Northernmost in a pair of points within one large outcrop	No census	Not relocated	8
8	Northernmost in a pair of points within one large outcrop	No census	Not relocated	1
9	Southern point above trees	No census	No census	8
10	Southwestern-most in a set of points within one large outcrop among trees	No census	No census	7
11	Small polygon east of creek beside knoll	No census	No census	8
TOTAL			1669	1367

In the limited time allocated for 2016 work, plants were not relocated at the three smallest polygons. Searches were not exhaustive.

In the expanded time allocated for 2017 work, plants were found at the three smallest polygons, and two more small polygons were located close by. Note: there is extensive outcrop habitat between these five locations. Though plants have not been found in intervening habitat, it is possible that suitable habitat lies between them and that they should be mapped as a single large polygonal area.

Furthermore, boundaries were expanded for one other polygon, and an additional small polygon was located. The latter is in the most rugged of settings among known polygons, it appears to correspond with a location marked onto maps by Robert Dorn (1990), and therefore it is inferred that the locale was overlooked in 2003-2004 surveys. By this convention of mapping, there are eleven polygons (Table 3), though five of them are all on the same semi-contiguous outcrop.

Monitoring discussion

The Category 1 designation of *Boechera pusilla* by FWS (2011) was based in some measure on trend information, placing a premium on acquiring and interpreting the most current information. The most fundamental conclusion is that there has been a persisting major decline between 1988 flowering plant numbers and more recent years. This decline is not explained by shifting ratios between flowering and nonflowering plants, or by shifts in plant distribution within the

monitored subpopulation. Dorn (1990) postulated that population size "Probably varies considerably from year to year depending on climate conditions."

Despite major decline, the monitored subpopulation still supports numbers similar to the 1988 tally of 671 flowering plants IF nonflowering plants are included in tallies, IF the expanded plot were considered rather than the much smaller original plot, and IF the top tallies (e.g., 2016 had 681 plants) were used for comparison. Results are also tempered somewhat by the fact that the species is not restricted to the one subpopulation where monitoring was started. There is exactly one other subpopulation that has had tallies of the same magnitude – sometimes greater, sometimes less than - the originally monitored subpopulation.

Alternate explanations for the documented decline in the original monitoring plot are presented in this section, and discussed as hypotheses with their respective pro- and con- arguments.

1. The 1988 results reflect highly anomalous population numbers rather than a reference point for interpreting overall population trend and comparison with the past 15 years.
2. Trends in weather or climate over the past 30 years show fundamental shift in the first 15 years compared to the past 15 years driving population trend.
3. There is some other key aspect of species' biology or species' habitat - as yet undetermined - that is subject to decadal changes, steady-state changes, or compounding effects.

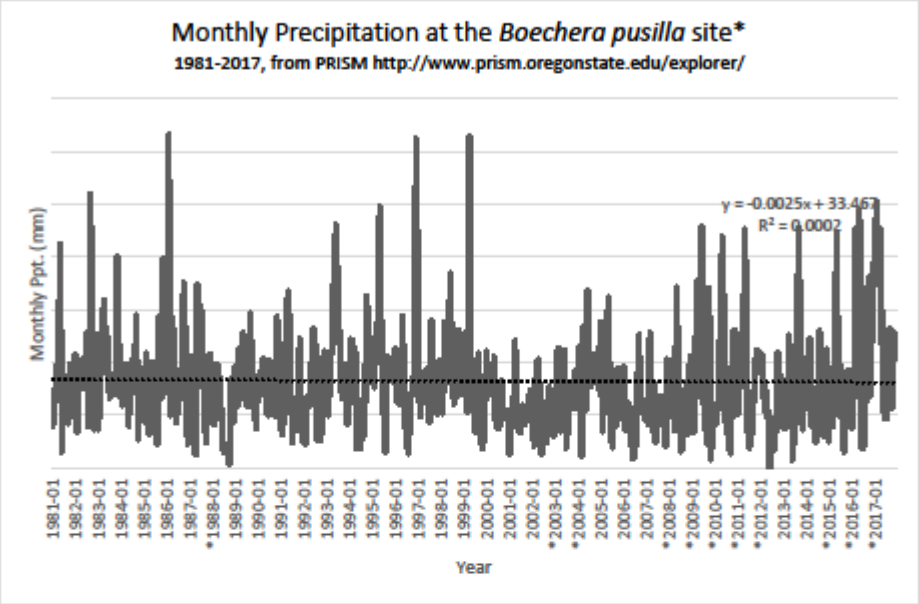
The three potential explanations (above), and their strengths and weaknesses are discussed further as hypotheses (below).

Hypothesis 1 - The 1988 monitoring report (Marriott 1988) determined that there were 671 flowering *Boechera pusilla* plants in the original plot (400 m^2) and estimated total population numbers at 800-1000. Ten years of monitoring data (over a 15-year period) are at least a magnitude larger a dataset than the one-time 1988 establishment report dataset, and the original establishment report data point is an outlier compared to recent data. It may not be possible to rigorously compare the recent dataset with a single point decades ago or determine whether or not the original point is anomalous.

Arguing against this, the 1993 pilot monitoring (Amidon 1993), though not georeferenced, appeared to overlap if not encompass the 1988 monitoring. It appears as though the 1993 plot area was almost twice as big (8000 ft^2; or about 740 m^2) as the 1988 plot area, and it documented 517 flowering *Boechera pusilla* plants. In other words, there was a relatively high number of flowering plants documented five years after the first monitoring, representing another data point with high numbers in decades past. So the 1993 data would argue against dismissing 1988 as anomalous.

Hypothesis 2 – Thirty-seven years of climate data were obtained from the Prism Climate Group (http://www.prism.oregonstate.edu/) for monthly precipitation at the *Boechera pusilla* site, consisting of a 2.5 arc-min (4 KM2) gridded data set for United States climate coverage. The graphed data show a flat trend at the *B. pusilla* site using linear regression (Figure 5). A polynomial trend line was also projected onto the same graph, and it showed a dip for the drought years (about 2000-2006), and rebounds in more recent years. Arguing against these schematic relations, *B. pusilla* population numbers have been stable since 1988 or rebounded.

Figure 5. Monthly precipitation at the *Boechera pusilla* site (1981-2017)



*Asterisks mark the years in which *Boechera pusilla* monitoring was conducted.

It is possible that only a portion of monthly precipitation data dictates over species' trends, if, for example fall precipitation is crucial for seedling germination and establishment. If this were the case, and if established plants take at least two years to flower, then trends may reflect climate conditions of two years prior. By this hypothesis, the 1988 census results could be influenced by the very high precipitation levels of 1986. It is also possible that other meteorological data such as monthly temperature might be relevant, independently or in combination with precipitation. So this hypothesis, that precipitation dictates or otherwise influences species' trends, is plausible only if there is a subset of precipitation data that is relevant, a lag in species' response, or else multi-factor considerations (e.g., adverse back-to-back precipitation extremes in "yo-yo years").

Hypothesis 3 – The third hypothesis is a catch-all or continuation of the above that we don't know some key piece of life history or interactions between the life history of *Boechera pusilla* and its environmental drivers. The growing season of the original monitoring year in 1988 did not start dry, but it was the year of Yellowstone National Park fires when there was little if any precipitation and hot temperatures in the rest of months that year. Such conditions might have been associated with low germination and high plant mortality for *B. pusilla*. This is supported by the inference that *B. pusilla* once had a prevalence of robust plants such that it was characterized as long-lived. Demographic monitoring would be needed to evaluate the merit of this specific hypothesis.

SPECIES STATUS UPDATE

The following pages provide results of recent surveys and expanded *Boechera pusilla* information. Plant species status reports and updates to them have been prepared by WYNDD as the most complete (unabridged) compilation of biological information pertaining to the conservation status of a species, as needed to evaluate its conservation needs and potentially to manage it. The structure and content of such reports are modeled after prototypes created for plants soon after passage of the Endangered Species Act, with some customized approaches for other agencies, with structural revision and elaborations as new information resources became available. There have also been format alterations in the case of this dual-purpose report that addresses culmination of species' monitoring and updates to status.

Classification

Scientific name
Boechera pusilla (Rollins) Dorn

History of the species
Boechera pusilla was first collected near South Pass in Fremont County, Wyoming by Reed and Kathryn Rollins in 1981. It was described and named by Rollins as *Arabis pusilla* (Rollins 1982); the species epithet "*pusilla*" refers to its small size. It is been recognized in the state flora under this name (Dorn 1988, 1992), later transferred to the *Boechera* genus and recognized as *B. pusilla* in the current state flora (Dorn 2001), likewise recognized by this name in the current Rocky Mountain Herbarium checklist for Wyoming (Hartman and Nelson 2018), and by this name in the *Flora of North America* (FNA; Al-Shehbaz and Windham 2010).

Synonyms
Arabis pusilla Rollins

Common name
In all reports and other information compilations (Marriott 1998, Dorn 1990, Fertig et al. 1994), Wyoming botanists have referred to *Boechera pusilla* as "Small rockcress." About ten years later, national databases including the Biota of North America (BONAP) and the PLANTS database came on-line, and posted the common name as "Fremont County rockcress".

Family
Mustard Family (Brassicaceae)

Size of genus
A total of 111 species of *Boechera* are recognized in FNA (Al-Shehbaz and Windham 2010, Kiefer and Koch 2016), of which 26 are in Wyoming (Rocky Mountain Herbarium 2018).

Phylogenetic relationships
Arabis had once been treated as a synonym of *Boechera* (e.g., Rollins 1993) and they have many morphological similarities. More recently, FNA authors determined that similarities are due to evolutionary convergence rather than shared ancestry (Al-Shehbaz and Windham 2010). The

Boechera genus is restricted to North America and Greenland, whereas the *Arabis* genus is mainly an Old World genus (Al-Shehbaz 2003). The rationale and implications for this change in Wyoming have been highlighted by Dorn (2002).

FNA authors (Al-Shehbaz and Windham 2010) state that "The taxonomic complexity of *Arabis*, in the broad sense, is legendary. When the genus is split, most of the problematic taxa come to reside in *Boechera*. A rare confluence of hybridization, apomixis and polyploidy makes this one of the most difficult genera in the North American flora." In spite of the complexity, or because of it, the genus *Boechera* is receiving attention as a model system for studying ecological, evolutionary, and related genetic characteristics of numerous species in the same genus at a continental scale (Rushworth et al. 2011). There is work underway to determine the embryology, karology, and modes of reproduction in every *Boechera* species that exists (Dobes et al. 2006), and an on-line database of chromosome counts and literature is maintained. This work is expected to shed light on taxonomic relations and insights into speciation.

Recently a definitive genetic study was published on adaptive radiation in the *Boechera* genus (Kiefer and Koch 2012). The majority of the 111 species in the genus were subject to phylogenetic reconstruction and network analysis, including *B. pusilla*. The researchers tried to identify ITS types inside and outside major lineages. The genus-wide picture provides evidence of enormous reticulate evolution in the genus, supporting prior interpretations for *B. pusilla* as apomictic triploid of alloploid origin, though leaving unresolved its placement in major lineages. The FNA authors also discuss the distinctions between the primary products of divergent evolution, the sexual diploids, and the secondary products of reticulate evolution, the apomictic species such as *B. pusilla*, most of which are inferred to be polyploids (Al-Shehbaz and Windham 2010).

Rollins (1982) and Dorn (1990) postulated that *Boechera pusilla* is closely related to *B. demissa* var. *languida* (syn. *B. languida*; nodding rockcress), *B. pendulina* var. *russeola* (treated as *B. pendulina* in FNA; Daggett rockcress), and *B. oxylobula* (Glenwood Springs rockcress), a Colorado species. On the other hand, Al-Shehbaz and Windham (2010) state that morphological evidence suggests that *B. pusilla* is an apomictic species that arose through hybridization between *B. lemmonii* and *B. pendulina*. Elsewhere they note that apomictic species in the genus appear to be of relatively recent origin and generally have not migrated beyond regions where their parents are sympatric.

Michael Windham (Duke University) has microsatellite analyses from four *Boechera pusilla* plant specimens to date, including the holotype, one of the isotypes, and a cytogenetic voucher collected in 1999. There was minimal genetic variability in this sample, and all work done so far indicates that the species is an apomictic triploid with genomes derived from *B. pendulina, B. lemmonii*, and (probably) *B. oxylobula* (Windham pers. commun. 2012. Sampling was expanded in 2017, related genetics datasets have been posted (Li et al. 2017) and results pending.

Present legal or other formal status

U.S. Fish & Wildlife Service
Boechera pusilla was placed on the list of Candidate species by FWS in 1985. It was petitioned for listing in 1996. Based on protections in the BLM Green River Range Management Plan,

Area of Critical Environmental Concern establishment in 1997 and mineral withdrawal in 1998, FWS removed it from the list of Candidates in 2001 (FWS 2004). It was again petitioned to list in 2007. The Service issued a 12-month finding that it potentially warrants protection under the ESA (FWS 2011) which made it a Candidate species (Category 1 species) though listing was precluded by higher priority work. Most recently, FWS determined that listing was not warranted (FWS 2018).

Agency status

Boechera pusilla was on the first and on the most current list of sensitive species designated by the Bureau of Land Management (BLM) in Wyoming (2001, 2010). Its subsequent designation as a Candidate species automatically pre-empts its BLM designation.

Natural heritage rank

Boechera pusilla is known from only one population throughout its range, so is a species of very high Wyoming contribution rank having Global and State ranks of G1/S1 (Heidel 2012). These pair of rankings do not have any legal or regulatory status in Wyoming.

Description

General description

Boechera pusilla is a perennial herb with one-to-several slender, decumbent flowering stems 5-17 cm long. The plant has a cluster of linear, erect basal leaves with relatively sparse, simple, biforked or triforked spreading hairs. Flowering stems generally have 2-5 widely-spaced stem leaves, usually without auricles. Flowers are small, white to lavender and four-petaled. The fruits are linear siliques that spread at right angles from the decumbent stems on short pedicels 3-5 mm, usually secund. The fruits are relatively short: mostly 2.2-3.3 cm long and 1.5- 2 mm wide (Rollins 1982, 1993; Dorn 2001; Fertig et al. 1994; Al-Shehbaz and Windham 2010).

Technical description

The following text is reprinted from the description of Al-Shehbaz and Windham (2010) though some characteristics may warrant closer inspection as set off by brackets []. *Many of the characteristics are evaluated further by Marriott (2017; Table 5.)*

Perennials; [long-lived; (cespitose)]; apomictic; [caudex often woody]. Stems usually 2-6 [per caudex branch], arising from margin of rosette near ground surface, 0.5-2 dm, glabrous or sparsely pubescent proximally, trichomes simple and short-stalked, 2-rayed, to 0.2 mm, glabrous distally. Basal leaves: blade linear-oblanceolate, 1-2.5 mm wide, margins entire, ciliate along petiole, trichomes (simple), 0.4-0.7 mm, surfaces usually sparsely pubescent, rarely glabrous, trichomes short-stalked, 2- or 3-rayed, 0.1-0.4 mm. Cauline leaves [3-5], not concealing stem; blade auricles 0-0.2 mm, surfaces of distalmost leaves usually glabrous or, rarely, margins sparsely ciliate. Racemes [6-13 flowered], unbranched. Fruiting pedicels horizontal to divaricate-descending, straight or slightly curved downward, [2-3 mm], glabrous. Flowers divaricate-ascending at anthesis, sepals glabrous or sparsely pubescent, trichome spreading, 2-rayed; petals white to lavender, 4-5 x 1.5-1.8 mm, glabrous; pollen spheroid. Fruits horizontal or divaricate-descending, not appressed to rachis, [secund], straight, edges parallel, 1.6-3.2 cm x 1.5-2 mm; valves glabrous; ovules 20-32 per ovary; style 0.1-0.4 mm. Seeds uniseriate, 1.2-1.5 x 0.8-0.9 mm; not winged or with distal wing 0.05-0.1 mm wide. The following page of images represents key characteristics of the species (Fig. 6-11).

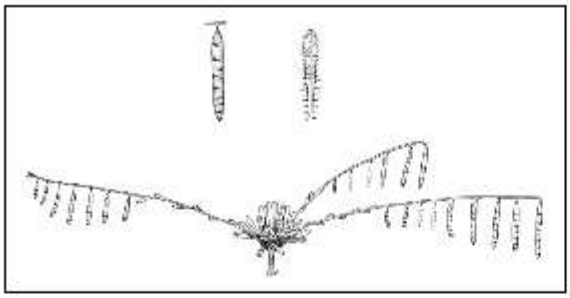


Figure 6. *Boechera pusilla*, illustration by Isobel Nichols, from Fertig et al. 1994

Figure 7. *Boechera pusilla* flower

Figure 8. One vegetative *Boechera pusilla* plant with an "old" and three "new" rosettes.

Figure 9. The flowering stalks of *Boechera pusilla* become more one-sided and prostrate as they mature.

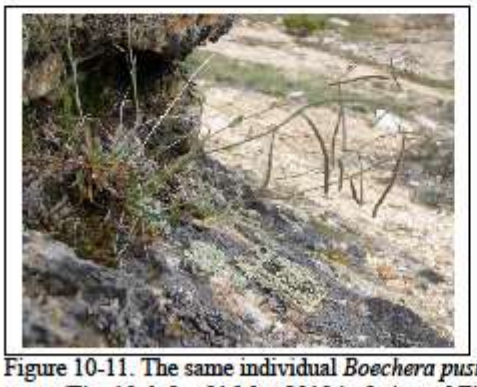


Figure 10-11. The same individual *Boechera pusilla* plant, as photographed in two consecutive years (Fig. 10, left – 31 May 2010 in fruit; and Fig. 11, right – 6 June 2011 in flower).

Similar Species

There are a striking number of different *Boechera* species in and near the South Pass area. One is common in parts of the *B. pusilla* population, *B. pendulocarpa*. It is most readily distinguished by the gray color of its leaves and stems, associated with dense hairs, compared with the bright green, sparse hairs of *B. pusilla*. Two other *Boechera* species are sympatric with, but rare in, occupied *B. pusilla* habitat: *B. microphylla* and *B. grahamii*.

Collections were made of all *Boechera* in the habitat and the vicinity incidental to surveys (Marriott 1986, Heidel 2005) to ensure that all species similarities and differences are addressed. The Rocky Mountain Herbarium (RM) on-line specimen database (2008) was also queried for species in the area. A table of characteristic was expanded from Heidel (2005) that represents *B. pusilla*, three overlapping species, four other species in the same or surrounding sections, and one species in nearby townships. The current comparison incorporates specimen reviews and verifications of all RM collections in the genus provided by Al-Shehbaz. Marriott (1986; Table A) presented the first concise table of distinguishing characteristics between *B. pusilla* and putative parent species. The comparative table has been updated with all current nomenclature, and replaced with all species in the area (Table 4).

Perhaps one of the most similar species to *Boechera pusilla* is *B. pendulina* (syn. *B. p.* var. *russeola*). As part of the 2017 study, all traits of both species were profiled from the most detailed literature (Al-Shehbaz and Windham 2010; Rollins 1993) and evaluated against individual specimens available at RM by Marriott (2017). Specimens included material collected in 2016. Of the five primary traits that distinguish the two according to the FNA treatment, none of the five are consistent for *B. pendulina* specimens in Wyoming, and do not encompass the range of values for specimens (Table 5). There is a closing remark in the FNA text that Wyoming material previously treated as *B. p.* var. *russeola* is a triploid apomict unlike *B. pendulina* as diploid elsewhere, and that further study is needed to determine whether they are in fact the same species. Marriott (2017) concluded that the FNA key is problematic in distinguishing between *B. pusilla* and *B. pendulina* in Wyoming and provided a set of *B. pendulina* photographs showing the species and its habitat (Appendix D).

Phenology

There are generalizations that *Boechera pusilla* flowers from May to mid-June. However, it was in fruit and finished flowering in June during eight of the nine monitoring years when visited early. Flowering during June was only found once in 2011, a year with a moist, late growing season when it was still in flower and early fruit on 6 June, indicating that there may be a phenology shift of three weeks or more between years depending on weather conditions. This was also the only year with extensive snow cover in adjoining woods. There was just one plant that still had flowers found in 2017 monitoring, which was also a late snowfall year.

The flowers are indeterminate, flowering from the base to the tip, with only slightly staggered phenology. Most flowering stems of the same plant are at similar phenological stages, but occasionally under moist conditions, a late flowering stem may be produced. Most plants in the same setting are at similar phenological stages, but different subpopulations may be at slightly different phases, as was observed in monitoring and in repeat visits of 2011.

Table 4. Characteristic features of *Boechera pusilla* and other *Boechera* species in the same area of the Wind River Range[4]

Species	Synonym	Proximity to *B. pusilla*	Basal leaf shape/ pubescence	Silique disposition	Silique dimensions	Pedicel length	Growth form
Boechera grahamii	*Arabis confinis; A. x divaricarpa; Boechera brachycarpa, B. drummondii, B. stricta*	Sympatric	Oblanceolate, sparsely to densely pubescent, trichomes 2-4 rayed	Divaricately ascending to descending, usually gently curved downward	3.5-9 cm long; 1-1.8 mm wide	6-12 mm	Solitary or few stems from simple caudex; biennial or perennial
Boechera pauciflora	*Arabis holboellii* var. *pinetorum* and *Boechera pinetorum* – misappl.	Vicinity	Oblanceolate; densely pubescent, trichomes 2-5 rayed	Horizontal, divaricate-descending or widely pendant, not secund, curved	5.5-10.5 long; 1.5-2.2 wide	4-13 mm	Solitary or few stems from simple caudex; biennial or perennial
Boechera retrofracta	*Arabis holboellii* var. *secunda; Boechera holboellii* var. *secunda*	Vicinity	Oblanceolate, densely pubescent, trichomes 5-10 rayed	Straight-descending or at least sharply bent near base, sometimes ~secund, straight	3.5-9 cm long; 0.9-1.8 mm wide	7-12 mm	Solitary or few stems from simple caudex; biennial or perennial
Boechera languida	*Arabis demissa* var. *languida*	Vicinity	Linear oblanceolate to oblanceolate, densely pubescent; trichomes simple, 2-4 rayed	Pendent; straight to slightly curved	3-4.5 mm long; 1.8-2 mm wide	3-13	Few-several stems from a simple or branched caudex; perennial
Boechera lemmonii	*Arabis lemmonii*	Alpine species of nearby townships	Oblanceolate to obovate, densely to sparsely hairy, trichomes 3-9 rayed	Divaricately ascending to slightly descending, secund, straight or curved	2-4.4 cm long; 1.6-2.3 mm wide	2-6	One-many stems from woody caudex, somewhat cespitosa; perennial
Boechera microphylla	*Arabis microphylla*	Sympatric	Oblanceolate to linear-oblanceolate; densely pubescent, trichomes 4-8 rayed	Ascending to divaricately-ascending, not secund	3-7 cm long; 1-1.5 mm wide	5-15mm	Usually many stems from a much-branched caudex; perennial
Boechera pendulina	*Arabis pendulina* var. *russeola*	Vicinity	Oblanceolate or obovate; pubescent, essentially all simple, trichomes 2-rayed	Widely pendent, not secund, curved to nearly straight	2-4 cm long; 1.5-2 mm wide	5-8 mm	Few-several stems from a simple or branched caudex; perennial
Boechera pendulocarpa	*Arabis holboellii* var. *pendulocarpa; Boechera exilis*	Among	Narrowly oblanceolate; densely hairy, trichomes 4-8 rayed	Erect to pendent, not secund, straight	2.5-3.8 long; 1.5-2.2 wide	3-8 mm	Solitary or few stems from branched caudex; perennial
Boechera pusilla	*Arabis pusilla*	-	Linear-lanceolate or linear-oblanceolate; sparsely pubescent, trichomes 2- to 3-rayed	Spreading at right angles to rachis, slightly ascending or descending, secund, straight	1-3.8 cm long; some fruits up to 2 mm wide	2-5 mm	Solitary or 2-6 stems per caudex branch, perennial

[4] Nomenclature follows Flora of North America (Al-Shehbaz and Windham 2010) and Rocky Mountain Herbarium (2018).

Table 5. Attributes of *Boechera pusilla* and *Boechera pendulina* from the literature, and from comparing specimens (Marriott 2017)

Source (literature or specimen)	caudex	stems	basal leaves	basal leaf pubescence	cauline leaves	fruiting pedicels	siliques	seeds	descriptive notes	other notes
FNA desc. 2010 *B. pusilla*	often woody	2 - 6	linear-oblanc	ciliate along petiole, trichomes simple; surfaces usu sparsely pubescent, rarely glabrous, trichomes short stalked, 2 or 3 rayed	3-5, blade auricles 0-02. mm	horizontal to divaricate-descending, straight or slightly curved down, 2-5 mm	horizontal or divaricate-descending, secund, straight, edges parallel, 1.6-3.2 cm x 1.5-2 mm	uniseriate, not winged or with tiny distal wing		"Morphological evidence suggests pusilla is apomict that arose thru hybridization between lemmonii and pendulina"
FNA desc, 2010 *B. pendulina*	often woody	2 - 6	oblanceolate to obovate	ciliate throughout, trichomes usu simple; surfaces pubescent, trichomes simple & short and long-stalked, 2 rayed	2-10 (13)	divaricate-ascending to horizontal, curved or angled down	widely pendant, not secund, curved to nearly straight, edges parallel, 2.2-4 cm x 1.2-2.1 mm	biseriate, usually not winged	diploid	"Typical collections are sexual diploids, whereas type of var. russeola is a triploid apomict; further study needed to determine if the two are conspecific."
Rollins desc. 1982 *B. pusilla*	mostly unbranched	1-few, slender, slightly decumbent toward base	erect, linear to lin-oblanc, petiolate, acute to acuminate	sparsely pub with erect 2-3 branched hairs, rarely ciliate on margins with simple or forked hairs; petioles usu ciliate on margins with simple or forked hairs	3-5, usu remote, non auriculate	widely spreading, straight, 2-3 mm	widely spreading to slightly ascending, acuminate, nearly straight but with slightly undulating margins, 1-1.5 cm long, ca 2 mm wide	oblong, slighty compressed wingless or occ with slight distal margin, ca 2 mm x 1 mm	"very slender stems"; seeds in double row (not in description); of leaf hairs: "small, mostly forked or 3-branched, only a few along petiole margin are simple" pedicels "at right angles to infructescence rachis to slightly ascending	"Fremont Co., in cracks and crevices of huge metamorphic rocks" Rollins 81366 (holotype, GH; "isotypes to be distributed)
Rollins desc. 1982 *B. pendulina*									more robust individuals than pusilla, with much longer, narrower siliques; pendulous siliques, arched pedicels	
Marriott 10322 *B. pusilla*		2 - 10, slightly decumbent at base	generally erect; almost linear to oblanceolate; some old lvs	ciliate along petiole and margins with simple, 2-, 3-forked hairs (some tiny);	7 - 4 (old stems hard to say)	curved down, a few horizontal	horizontal to widely pendant; not obviously secund; straight (two very slightly	maybe uniseriate		in RM reference collection; dupl. det. Rollins 1986; mostly dehisced fruit but not all (June 30)

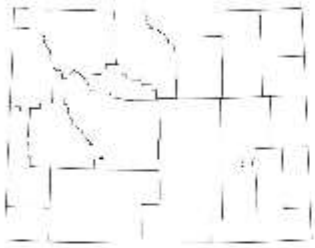
			on one individ are broader	surfaces glabrous or sometimes with hairs like margin			curved?); to 1.8 mm wide;			
Johnston & Lucas 1689X ***B. pendulina***		1 - 10, slightly decumbent at base	generally erect; almost linear to oblanceolate	ciliate along petiole and margins with simple hairs; occasionally similar hairs on surface	on the order of 7 - 10	curving or arcing down, a few horizontal	widely pendant to descending; sometimes close to stem but pedicel not close; not secund; straight or slightly curved; to 2 mm wide		petiole and margin hairs noticeably coarser than in Marriott 10322	in RM reference collection; det. Rollins 1982; mature fruit (June 15; near hwy at South Pass)
Marriott 12581 ***B. pendulina***		3, slightly decumbent at base	generally erect; almost linear to oblanceolate	ciliate along petiole and margins with simple hairs; occasionally similar hairs on surface	3 - 4	curving or arcing down	widely pendant to descending; sometimes close to stem but pedicel not close; not secund; straight or slightly curved; to 1.8 mm wide		petiole and margin hairs noticeably coarser than in Marriott 10322	
Marriott 12583 ***B. pendulina***		4, decumbent at base	generally erect; almost linear to oblanceolate	ciliate along petiole and margins with simple hairs; occasionally similar hairs on surface	1 - 2 (or more? one broken stem)	curving or arcing down, a few horizontal	widely pendant to descending; sometimes close to stem but pedicel not close; not secund; straight or slightly curved; to 1.8 mm wide	possibly biseriate	petiole and margin hairs noticeably coarser than in Marriott 10322	
Marriott 12584 ***B. pendulina***		1 - 2, slightly decumbent at base	generally erect; almost linear to oblanceolate	ciliate along petiole and margins with simple hairs; occasionally similar hairs on surface	7 - 9	curving or arcing down, a few horizontal	widely pendant to descending; sometimes close to stem but pedicel not close; mostly secund; straight or slightly curved; to 1.9 mm wide		petiole and margin hairs noticeably coarser than in Marriott 10322	

Marriott 12586 *B. pendulina*		1 - 2, slightly decumbent at base	generally erect; almost linear to oblanceolate	ciliate along petiole and margins with simple hairs; occasionally similar hairs on surface	1 - 3	curving or arcing down	horizontal to widely pendant; somewhat secund?; to 1.8 mm wide		petiole and margin hairs noticeably coarser than in Marriott 10322	
Marriott 12587 *B. pendulina*		2 or 3, slightly decumbent at base	generally erect; almost linear to oblanceolate	ciliate along petiole and margins with simple hairs; occasionally similar hairs on surface	3	curving or arcing down	widely pendant to descending; sometimes close to stem but pedical not close; mostly secund; straight or slightly curved; to 1.8 mm wide		petiole and margin hairs noticeably coarser than in Marriott 10322	
Marriott 12578 (2016) *B. pendulina*		1, slightly decumbent at base	generally erect; almost linear to oblanceolate	ciliate along petiole and margins with simple hairs; occasionally similar hairs on surface	2	curving or arcing down	widely pendant to descending; not secund; straight or slightly curved; to 1.9 mm wide		petiole and margin hairs noticeably coarser than in Marriott 10322	
SUMMARY Range of values (*B. pendulina* specimen)		1-many; decumbent at base; 6.9 - 18 cm long	generally erect; almost linear to oblanceolate	ciliate along petiole and margins with simple hairs; typically glabrous on surface, occasionally similar hairs on surface	3-7	5-8 mm; there is usually consistency of curvature and angles within any given inflorescence	silique length x width: 2.4 - 4 x 1.3 - 2 cm, not secund			
SUMMARY range of values (*B. pusilla* specimen - including late June set)		1-many; decumbent at base; 6.2 - 17 cm long; almost never "woody" or long-lived	generally erect; almost linear to oblanceolate	ciliate along petiole sometimes extending around entire leaf margins, trichomes simple; surfaces usually sparsely pubescent, rarely glabrous, trichomes short stalked, 2 or 3 rayed	2-5	3-5 mm; variable on any given inflorescence; upper tend to ascend, lower tend to descend	silique length x width: 2.2 - 3.3 cm x 1.5 - 2.1 mm, not secund in the strict sense			

Geographic Range

Distribution
Boechera pusilla is a narrow endemic known from one location in Fremont County, Wyoming. It is located at the southern end of the Wind River Range in southwestern Fremont County (Figure 18). It is managed by the Bureau of Land Management Rock Springs Field Office, within the High Desert District. It lies midway between the towns of Lander and Farson along State Highway 28.

Figure 12. *Boechera pusilla* distribution in Wyoming



Boechera pusilla is mapped as spanning about 18.4 acres (7.45 ha), and comprised of 11 separate areas (referred to in this report as subpopulations) shown as discrete polygons (Figures 13 and 14). However, the largest area might be more accurately represented as a series of points rather than continuous occupied habitat. There is also a set of six polygons that might also be mapped as a single large area. The subpopulations as currently mapped are labelled 1-11 consistent with the tabulation monitoring results (Table 3). The population record is compiled in Appendix E.

Extant sites
Boechera pusilla is extant at the type locality, i.e., the one known location.

Historical sites
None

Unverified/undocumented reports
The previous monitoring report, an interim one (Heidel 2017), reported *Boechera pusilla* at a second location east of Highway 28. This has proven to be a location of *B. pendulina*, based on herbarium research and critical review of distinguishing characteristics (Table 5).

Sites where present status is not known
None

Extent of surveys in Wyoming
The 2016-2017 surveys focused on previously unsurveyed habitat in the same township as the *Boechera pusilla* population (T29N R101W) and townships to the immediate east and south (Appendix F; Figure 15).

Figure 13. *Boechera pusilla* population (USGS topographic basemap; 1 section = 1 mile)

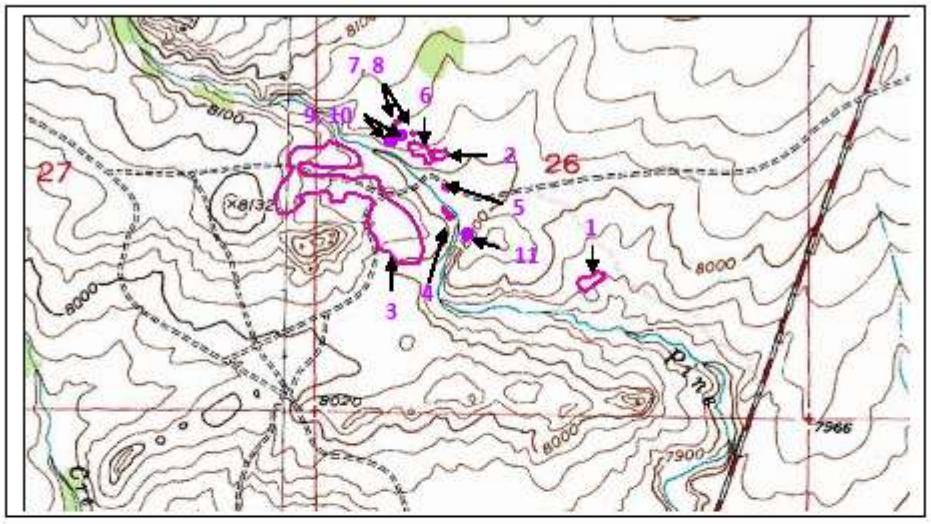
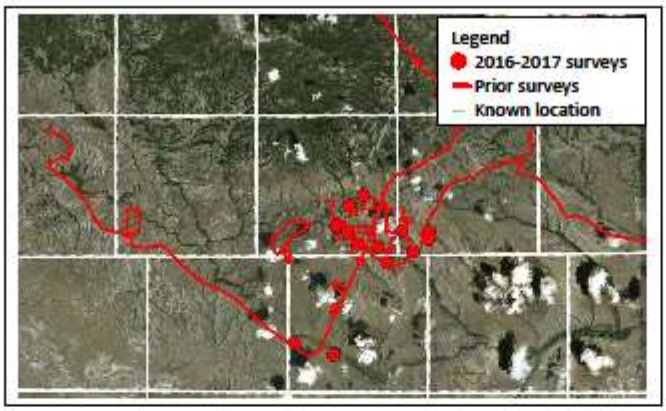


Figure 14. *Boechera pusilla* population (NAIP aerial imagery basemap)

Figure 15. Negative surveys for *Boechera pusilla* (each cell is 1 township = 6 miles)



Potential distribution in Wyoming

Potential distribution models were developed for *Boechera pusilla* by Fertig and Thurston (2003) and tested in 2003-2004 (Heidel 2005). A potential distribution model was developed by Andersen (Andersen et al. 2016) but noted that the low number of presence points constrained modeling. In 2017 surveys, aerial imagery was used to target bare areas with no prior record of surveys, prioritizing those close to Pine Creek (upstream and downstream) of the known population (Figure 15). The most detailed information is in a brief report, accompanying species determination notes, collection labels and survey forms for *B. pendulina* (Marriott 2017). All results were negative, though many new locations of the latter were documented.

Habitat

Boechera pusilla occurs on relatively barren gravelly soil pockets of exposed granite bedrock (Dorn 1990), including fractures, outcrop margins, gravel pavement, and to a lesser extent, very shallow gravelly soil overlying bedrock where sometimes subject to freeze-thaw activity. The low relief outcrops irregular surfaces. Elevation of the population as mapped ranges from 2425-2460 m (7960-8080 ft).

The first habitat description for *Boechera pusilla*, recorded on the collection label and in the Rollins publication (1982), described the setting as "cracks and crevices of huge metamorphosed rocks." However, the bedrock is igneous rather than metamorphic, essentially granitic material with phenocrysts (giant crystals) slowly cooled deep below the surface. The occupied habitat does not have major crevices because the outcrops have very little relief (Figures 16-22) but it does have fractures. The "huge" rocks in Rollins' habitat description may refer to nearby pluton landmarks (prominent knolls formed by solidification of molten magma deep within the earth) rather than the occupied habitat itself. The habitat description for *B. pusilla* was slightly modified in Al-Shehbaz and Windham (2010) as "cracks and crevices of granite outcrop."
The list of species directly associated with *Boechera pusilla* has been expanded from prior reports to over 60 species (Table 6), present on the same outcrop if not the same microhabitat. The moist 2011 and 2017 conditions and repeated visits have afforded opportunity to expand the

roster. This list includes many perennial montane species, a few intermontane annuals, and a couple of plains species at their upper range limits. This list is taken from field notes and collections at the monitored subpopulation. Some of the more common species in occupied habitat are widespread ones that include *Achnatherum hymenoides* (Indian ricegrass), *Erigeron compositus* (cut-leaved fleabane), and *Sedum lanceolatum* (lance-leaf stonecrop). The habitat is almost free of non-native species. *Taraxacum erythrospermum* (syn. *T. laevigatum*; red-seed dandelion) is present in the monitored subpopulation at low levels. In 2017, *Alyssum desertorum* (desert madwort) was locally common at one end of the other second *B. pusilla* subpopulation. Though it has probably been present all along in this locale, it was in conspicuously high numbers in 2017.

Table 6. Plant species associated with *Boechera pusilla*

Scientific Name	Common Name	Growth Form
Achnatherum hymenoides	Indian ricegrass	Perennial grass
Achnatherum pinetorum	Pine needlegrass	Perennial grass
Alyssum desertorum	Desert madwort	Annual herb
Androsace septentrionalis	Pygmy rock-jasmine	Annual herb
Antennaria dimorpha	Cushion pussytoes	Perennial herb
Antennaria parvifolia	Littleleaf pussytoes	Perennial herb
Artemisia arbuscula	Dwarf sagebrush	Shrub
Artemisia tridentata ssp. wyomingensis	Wyoming big sagebrush	Shrub
Artemisia tripartita var. rupicola	Three-tip sagebrush	Shrub
Balsamorrhiza incana	Hoary balsamroot	Perennial herb
Boechera grahamii	Graham rockcress	Perennial herb
Boechera microphylla	Small-leaf rockcress	Perennial herb
Boechera pendulocarpa	Drooping-fruit rockcress	Perennial herb
Bouteloua gracilis	Blue grama	Perennial graminoid
Camissonia scapoidea	Paiute suncup	Annual herb
Carex douglasii	Douglas' sedge	Perennial graminoid
Carex rossii	Ross' sedge	Perennial graminoid
Chaenactis douglasii	Douglas' dusty-maiden	Perennial herb
Collinsia parviflora	Blue-eyed Mary	Annual herb
Crepis modocensis	Siskiyou hawksbeard	Perennial herb
Cryptantha flavoculata	Miner's candle	Perennial herb
Cryptantha watsonii	Watson's cryptantha	Annual herb
Danthonia unispicata	Few-flower wild oatgrass	Perennial graminoid
Draba nemorosa	Woodland whitlow-grass	Perennial herb
Draba oligosperma	Few-seed whitlow-grass	Perennial herb
Elymus albicans	Montana wheatgrass	Perennial grass
Elymus elymoides	Bottlebrush squirreltail	Perennial graminoid
Elymus albicans	Bluebunch wheatgrass	Perennial grass
Eremogone congesta var. congesta	Ballhead sandwort	Perennial herb
Erigeron caespitosus	Tufted fleabane	Perennial herb
Erigeron compositus	Cut-leaved fleabane	Perennial herb

Eriogonum caespitosum	Matted wild-buckwheat	Perennial herb
Eriogonum ovalifolium var. purpureum	Cushion wild-buckwheat	Perennial herb
Eriogonum umbellatum	Sulfur-flower wild-buckwheat	Perennial herb
Eremogone hookeri	Hooker's sandwort	Perennial herb
Festuca idahonis	Idaho fescue	Perennial grass
Gymnosteris parvula	Small-flowered starlet	Annual herb
Hesperostipa comata	Needle-and-thread	Perennial grass
Ivesia gordonii	Ivesia	Perennial herb
Juniperus communis	Common juniper	Shrub
Lewisia pygmaea	Alpine lewisia	Perennial herb
Lithophragma tenellum	Prairie woodlandstar	Annual herb
Lupinus argenteus var. argenteus	Silvery lupine	Perennial herb
Navarretia breweri	Yellow pincushion-plant	Annual herb
Paronychia depressa	Spreading nailwort	Perennial herb
Penstemon humilis	Low beardtongue	Perennial herb
Phlox hoodii	Hood's phlox	Perennial herb
Phlox multiflora	Rocky mountain phlox	Perennial herb
Pinus flexilis	Limber pine	Tree
Poa fendleriana	Muttongrass	Perennial grass
Poa secunda	Curly bluegrass	Perennial grass
Potentilla pensylvanica	Pennsylvania cinquefoil	Perennial herb
Purshia tridentata	Bitterbrush	Shrub
Rhus trilobata	Fragrant sumac	Shrub
Ribes cereum	Wax currant	Shrub
Sedum lanceolatum	Lance-leaf stonecrop	Perennial herb
Selaginella densa	Dense spike-moss	Fern ally – perennial
Senecio integerrimus	Western groundsel	Perennial herb
Stenotus acaulis	Stemless mock goldenweed	Perennial herb
Taraxacum erythrospermum	Red-seed dandelion	Perennial herb
Trifolium gymnocarpon	Holly-leaf clover	Perennial herb

Vegetation cover is very patchy in occupied habitat of *Boechera pusilla* and the species is generally absent from areas of high cover (Figures 16-20). The question was raised whether associated plants might have greater competitive ability that could successionally encroach upon *B. pusilla* habitat, but the abrupt vegetation boundaries suggest this is not the case. The recent monitoring years provide no evidence of encroachment but do provide succession information anecdotes. One of the associated species that seems most problematic in the local successional picture is *Selaginella densa* (dense spike-moss). It is a colonizer in the same microhabitats as those occupied by *B. pusilla*. It appeared that *S. densa* plants had extensive dieback in or around 2008-2011. *Boechera pusilla* plants were sometimes seen growing in live *S. densa* mats, but at least as often noted in dead ones in 2010-2011 (Figure 18-19).

Figure 16. Three main microhabitats occupied by *Boechera pusilla*

Figure 17. "Crevice habitat" where present in partially-filled outcrop fractures

Figures 18 and 19. Pavement habitat where present in the middle of a dead *Selaginella densa* mat (above) and dying mat (below)

Figure 20. *Boechera pusilla* also occupies shallow soils overlying bedrock, settings that border the outcrops and which are subject to frost heaving. The frost heaves may be present or absent from one year to the next.

Figure 21 (below). The landscape has sharp breaks in vegetated and unvegetated zones despite low relief, not only in occupied habitat, but also surroundings.

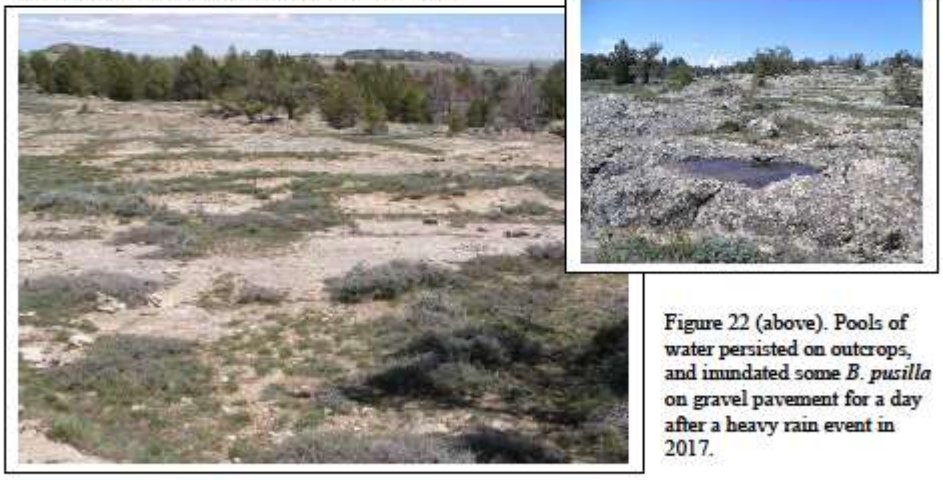


Figure 22 (above). Pools of water persisted on outcrops, and inundated some *B. pusilla* on gravel pavement for a day after a heavy rain event in 2017.

The processes that keep the rock outcrops unvegetated are not known, but the hard crystalline rock has virtually no water-holding capacity. This was evident in 2017 when ephemeral pools persisted on the gravel pavement of occupied *Boechera pusilla* habitat the day after heavy

evening downpours. Dorn (1990) suggested that it may be adapted to wide fluctuations in available moisture, as the limited soil layer goes through rapid drying and saturation flux. The restricted distribution of *B. pusilla* corresponds with the distribution of one of the larger expanses of pegmatite in the area (Heidel 2005). The outcrops are covered by an array of crustose lichens, but the lichens do not provide a colonization surface. Frost-heaving has been noted in gravelly shallow soils in and near occupied habitat, a process that may help maintain the abrupt break between vegetated and semi-barren conditions (Figure 15).

Further evaluation of climate conditions was pursued incidental to monitoring. Two climate datasets are available near *Boechera pusilla* habitat, the NOAA meteorological data from South Pass City (488385), and the SNOTEL monitoring data above South Pass (No. 775), as presented in prior reports. However, they are in different elevation zones or topographic positions. For purposes of characterizing climate, PRISM data (Figure 5) may be more appropriate.

Microclimate conditions of *Boechera pusilla* occupied habitat have not been documented but it is hypothesized that the pegmatite outcrops retard the temperature changes of the seasons, slow to heat early in the growing season, but radiating stored heat late in the growing season. It is hypothesized that *Selaginella densa* wicks the moisture that falls in light rainfall events, at least when it is alive, and helps slow moisture loss from evaporation whether it is dead or alive. There are also an expanded set of habitat photos from the monitoring plot (Appendix B).

The following physical habitat information draw almost exclusively from a combination of Marriott (1986) and Dorn (1990) in keeping with original headings.

Climate
Koppen climate classification – Cold steppe with winter drought
Regional macroclimate – The plants grow in an area with about 12 inches of mean annual precipitation based on nearest measurements at South Pass City (Marriott 1986). The mean maximum and minimum temperature in January are from 25 to 3 °F (-4 to -16 °C), and mean maximum and minimum temperature in July are from 76 to 42 °F (24 to 6 °C; in Dorn 1990). The number of growing degree days is at least in the range of 41-60 days or longer (after Curtis and Grimes 2004).

Physiographic and topographic characteristics (Dorn 1990)
The plants grow on exposed shallow soil pockets on granite outcrops with slopes generally from 0-10 degrees and all exposures. The bedrock is an early Precambrian intrusive igneous rock called the Louis Lake batholith and consists largely of gray homogeneous biotite-hornblende quartz diorite and granodiorite (Bayley 1973).

Edaphic factors (Dorn 1990)
Soils are poorly developed and derived from the parent material and the immediate surroundings. They tend to be very gravelly with a sandy to loamy base and very shallow with subirrigation occurring from extensive runoff from the exposed bedrock.

Dependence on dynamic aspects (Dorn 1990)
The plants are dependent on the barren substrate with little competition from other vegetation. They also may be adapted to wide fluctuations in moisture availability as the shallow soil dries out rapidly and then is saturated by subirrigation after each precipitation event.

Pollination
Boechera pusilla has been characterized as an apomictic species by Al-Shehbaz and Windham (2010). Some apomictic *Boechera* species have a mixed-mating system, i.e., both self-crossing and out-crossing, but limited information on *B. pusilla* pollination is available. The observation that fruit development starts before flowers senesce seems consistent with apomixis (Figure 23).

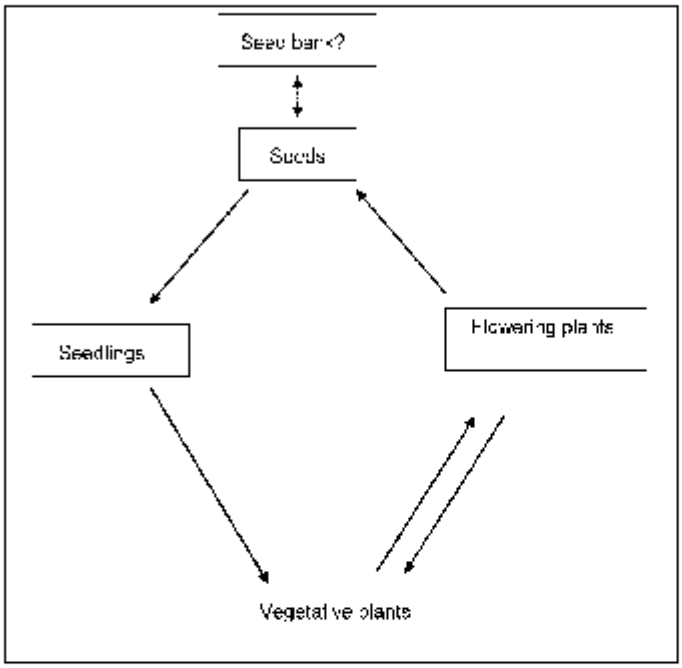
Figure 23. In most years of *Boechera pusilla* monitoring, terminal flowers on the inflorescence abort. Late flowers developed when conditions were moist and cool.

Population biology and demography

Life history
Boechera pusilla was called a "long-lived" perennial by FNA authors (Al-Shehbaz and Windham 2010) but this has not been documented and is not evident from review of herbarium specimens. There are individual plants in certain monitoring plot locations that have probably persisted for at least five years (see Figures 10-11), and similar specimens signify relatively large individuals. But it seems as though the majority of plants in any given monitoring year have had a single or at most two rosettes, consistent with a young age. A schematic life history diagram is presented in Figure 24. There is no data on mean or maximum life expectancy, average length of time to flowering, or seed ecology. The fact that vegetative plants comprised relatively high proportions of plants in both low-count and high-count years might indicate that plants can "revert" to vegetative conditions in years when conditions are not favorable for flowering stem production, and that establishment of new vegetative plants coincides with years of high counts.

Signs of dead and dying plants have rarely been noted in monitoring, suggesting that mortality is concentrated in other times of year.

Figure 24. *Boechera pusilla* life history[5]



Seeds are likely to germinate in fall. Seedlings have never been observed in the course of monitoring despite close inspection, but it is possible that the very small vegetative plants noted early in the growing season may have germinated in the previous fall. It has been grown in the greenhouse at the University of Wyoming, and the seeds were germinated without a cold treatment (Bill Higgins pers. commun. 2012), i.e., no dormancy requirement, consistent with fall germination. The seed does not have wings, and there are no known dispersal mechanisms, though wind and water have been suggested as possible vectors (Dorn 1990). The seed is 1.2-1.5 mm long (Al-Shehbaz and Windham 2010). It is not clear if *Boechera pusilla* forms a seed bank, i.e., dormant seeds that remain in underground storage until conditions are favorable. The paucity of soil development could limit formation of a seed bank if feasible.

[5] This diagram highlights presence/absence of the reproductive stage without having any data on the age-related life cycle.

Figure 25. One flowering *Boechera pusilla* plant (left arrow) and one very small vegetative plant (right arrow). The latter may have germinated in the previous fall (photographed 4 June 2017).

Demographic studies in the field or in the greenhouse have not been conducted to determine mean or maximum life expectancy of established plants. It is inferred that first-year plants produce a single cluster of basal leaves (rosette) and that plants can probably produce flowers by their second year. The slender flower stalks do not ordinarily persist between years, but vestiges have been observed on both flowering and vegetative plants of the current year. There is not a fixed ratio of vegetative to flowering plants.

Plants have been characterized as typically 2-6 stems with an average of 3.0 flowering stems per plant, and 10.4 fruits per plant (Marriott 1988). This is apt to be a high value for dry years if not for average years. Some flowering plants in the monitoring plot failed to produce any fruits whatsoever in 2003 (12 of 87 plants had flowering stalks with 100% aborted fruits). This could have been influenced by freezing conditions or drought. The flowering plant in Figure 25 has two flowering stems, one with six fertile fruits, but the other has only two maturing fruits and at least three pedicels of aborted fruits. It appears as though fruit abortion further reduces fecundity under stress. Observations suggest that fruit maturation, and not just flowering stalk numbers, vary greatly between years.

Likewise, plants seem to produce greater numbers of flowering stalks in wet years and fewer in dry years. Flowering plants in 2003 had a maximum of six flowering stems per plant and up to 28 fruits per plant. In 1988 there were up to 11 flowering stems per plant and up to 37 fruits per plant (Marriott 1988 raw data). In 2011 there was an average of 4.3 stems per plant in 2011. A few notably robust, many-stemmed plants were photographed in 2017 (Figure 26).

Figure 26. The largest of *Boechera pusilla* plants found in 2017 (below) had at least ten flowering stems and about 40 fruits

Population size and trends

The original 1988 monitoring documented 681 flowering plants in a small portion of one area, and a pilot 1993 monitoring in the same area came up with 517 flowering plant numbers, i.e., also a much higher number than has ever been recorded in the same area in later years (2003-2017). The peak tally is 91 flowering plants from virtually the same area as 1988 monitoring, from among ten years of data collecting. This is the basis for concluding that there has been major decline. Three alternate hypotheses were framed to explain the decline but do not provide robust answers to date. Results in the monitoring section of this report provide a silver lining to this conclusion. The population size has exceeded 1000 plants in each of the three years of extensive population monitoring (2011, 2016-2017; Table 3) by including vegetative plants with the tally of flowering plants, and by including a second large subpopulation with the one that was originally monitored.

Discussion

There is a Species Status Assessment (SSA) initiated in 2016 by FWS that will address the factors affecting species' viability (Reeves 2017). This section is a highlight from past WYNDD reports rather than a rendering of USFWS discussions and drafts that are works in progress.

Grazing
The original monitoring area lies within an exclosure representing a special management area designated for recreation use in 1978, and managed for such use (Dunder 1984). The rest of the population is part of grazing allotment, where the species occupies habitat that has limited use. Water sources are widely available in the pastures where the species is present and while some subpopulations are close to Pine Creek, they have little or no use by livestock. Salt block placement has not been noted near the population. Signs of stray cows entering the exclosure have been noted on rare occasions, without evidence of affecting the species.

The jack-legged fence was repaired recently where it intersects the closed-off road, and the original sign saying "Foot Travel Welcome" that had fallen has been replaced by a No Motorized Use sign. Some trees are dying in the area, and dead trees could fall onto the fence, or fire could burn the surroundings, putting the integrity of the wooden exclosure fence at risk.

Roads
The exclosure that curtails grazing also prevents traffic into this area and the rest of the population north of Pine Creek. There is little or no motorized traffic into that portion of the population located south of Pine Creek.

Recreational use
The Pine Creek area is a popular fishing area and readily accessible for primitive camping off of State Hwy 28. There was formerly a pit toilet by the creek, near the highway (Dunder 1984) that has since been removed. The only current access to the *B. pusilla* population is on foot.

Non-native species
Alyssum desertorum (desert madwort) was noted as abundant in one corner of a large subpopulation in 2017. There are no known noxious weeds or cheatgrass (*Bromus tectorum*) in the population, on the road into the area, or at area camping spots. Reduction of motorized vehicle use is consistent with reducing chances of spreading weeds.

Mining
Diamonds are sometimes associated with pegmatite. Gold and silver deposits have been mined in the Atlantic City and South Pass areas, and there was also localized placer mining in those areas. The exclosure has been withdrawn from surface mining, as addressed in a 1998 withdrawal.

Weather/climate
The 2003 and 2004 growing seasons had below-average monthly precipitation (Figure 5), among a series of dry years, and marked the start of recent *Boechera pusilla* monitoring. This was initially hypothesized as a factor in species' decline compared to the start of monitoring in 1988 (Heidel 2005). But there has not been a rebound in *B. pusilla* numbers despite rebounds in monthly precipitation since then.

Genetic isolation
There has never been any report of hybrids within the *Boechera pusilla* population despite its overlap with other species of *Boechera* and the proximity of additional species. The detailed

surveys for *B. pusilla* and comparisons conducted this year reinforce the distinction between it and the superficially similar *B. pendulina* and its habitat.

Gene conservation
In 2011, which was the first of recent years having high fruit production, seeds of *Boechera pusilla* were collected by WYNDD, submitted to Denver Botanic Garden, and conveyed for long-term storage at the National Center for Genetics Resource Preservation (NCGRP) of the USDA in Fort Collins. Viability results have not been obtained to date. Placement of a large seed collection in cold storage represents a safety net of sorts.

Other considerations
There is a Resource Management Plan update pending in the BLM Rock Springs Field Office. It would be appropriate to bring all past BLM decisions regarding *Boechera pusilla* into the pending document.

There is a Pine Creek Special Management exclosure, as designated in 1978. Marriott (1988) reported on its designation:

> "The exclosure includes about 88 acres popular with campers, anglers, hungers and travelers, and was established to prevent livestock conflict with recreational use. A fence was completed in 1982. The area is being managed for short-term camping and only minor improvements are planned. There was a management plan prepared for the exclosure (Dunder 1984) that would be appropriate to cite, with any other management considerations and policies that apply."

Later, in 1994, Barbara Amidon (Rock Springs BLM) initiated a Habitat Management Plan for this species, and helped secure Area of Critical Environmental Concern (ACEC) designation in 1997 for its occupied habitat, along with mineral withdrawal.

Recommendations
There are almost no records of BLM staff visiting the species and the exclosure since 1993. It is possible that it is regularly visited because "The exclosure fence is high priority for annual maintenance each spring following snowmelt to assure its integrity" (Dunder 1984). It might be helpful for two or more BLM natural resources staff to become familiar with locations of the two largest subpopulations on the ground, and for them to oversee these annual inspections, whether in person, by technicians or by interns, not only checking for exclosure integrity but also checking for any recreation use issues and weeds at recreation spots and population access points. WYNDD welcomes any form of species' observation information, any time.

The *Boechera pusilla* SSA was initiated by FWS in 2016 to address species' needs, conditions and viability. Distribution of this report is recommended to all parties involved, and discussion of report results would ideally flag any prospective changes to the three SSA components (needs, condition and viability) that are coming out of this study.

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Attachment 3

with better understanding of patient coverage and benefits (including its use in patient medical records to help clarify a patient's healthcare benefit package). A commenter stated that the HPID could be used for enforcement or certification of compliance of health plans. The adoption of a standard unique health plan identifier is required by statute, and HHS remains open to industry and NCVHS discussion and recommendations for appropriate use case(s) that meet the requirements of administrative simplification and will explore options for a more effective standard unique health plan identifier in the future.

We solicit and welcome comments on our proposal, on the alternatives we have identified, and on other alternatives that we could consider, as well as on the costs and benefits of a health plan identifier.

In accordance with the provisions of Executive Order 12866, this proposed rule was reviewed by the Office of Management and Budget.

List of Subjects in 45 Part 162

Administrative practice and procedures, Electronic Transactions, Health facilities, Health insurance, Hospitals, Medicaid, Medicare, Reporting and recordkeeping requirements.

For the reasons set forth in the preamble, the Department of Health and Human Services proposes to amend 45 CFR part 162 to read as follows:

PART 162—ADMINISTRATIVE REQUIREMENTS

■ 1. The authority citation for part 162 is revised to read as follows:

Authority: 42 U.S.C. 1320d–1320d–9 and secs. 1104 and 10109 of Pub. L. 111–148, 124 Stat 146–154 and 915–917.

§ 162.103 [Amended]

■ 2. Section 162.103 is amended by removing the definitions of "Controlling health plan (CHP)" and "Subhealth plan (SHP)".

Subpart E [Removed and Reserved]

■ 3. Part 162 is amended by removing and reserving Subpart E.

Dated: December 6, 2018.

Alex M. Azar II,

Secretary, Department of Health and Human Services.

[FR Doc. 2018–27435 Filed 12–18–18; 8:45 am]

BILLING CODE 4120–01–P

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[4500090022]

Endangered and Threatened Wildlife and Plants; 12-Month Findings on Petitions to List 13 Species as Endangered or Threatened Species

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of 12-month petition findings.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), announce 12-month findings on petitions to list 13 species as endangered or threatened species under the Endangered Species Act of 1973, as amended (Act). After a thorough review of the best available scientific and commercial information, we find that it is not warranted at this time to list the Cedar Key mole skink, Florida sandhill crane, Fremont County rockcress, Frisco buckwheat, Ostler's peppergrass, Frisco clover, MacGillivray's seaside sparrow, Ozark pyrg, pale blue-eyed grass, San Joaquin Valley giant flower-loving fly, striped newt, Tinian monarch, and Tippecanoe darter. However, we ask the public to submit to us at any time any new information that becomes available relevant to the status of any of the species mentioned above or their habitats.

DATES: The findings in this document were made on December 19, 2018.

ADDRESSES: Detailed descriptions of the basis for each of these findings are available on the internet at *http://www.regulations.gov* under the following docket numbers:

Species	Docket No.
Cedar Key mole skink	FWS–R4–ES–2015–0047
Florida sandhill crane	FWS–R4–ES–2018–0099
Fremont County rockcress	FWS–R6–ES–2018–0049
Frisco buckwheat, Ostler's peppergrass, and Frisco clover	FWS–R6–ES–2018–0100
MacGillivray's seaside sparrow	FWS–R4–ES–2018–0067
Ozark pyrg	FWS–R4–ES–2018–0101
Pale blue-eyed grass	FWS–R1–ES–2018–0102
San Joaquin Valley giant flower-loving fly	FWS–R8–ES–2015–0023
Striped newt	FWS–R4–ES–2018–0065
Tinian monarch	FWS–R1–ES–2018–0103
Tippecanoe darter	FWS–R5–ES–2018–0066

Supporting information used to prepare these findings is available for public inspection, by appointment, during normal business hours, by contacting the appropriate person, as specified under **FOR FURTHER INFORMATION CONTACT**. Please submit any new information, materials, comments, or questions concerning these findings to the appropriate person, as specified under **FOR FURTHER INFORMATION CONTACT**.

FOR FURTHER INFORMATION CONTACT:

Species	Contact information
Cedar Key mole skink	Jay Herrington, Field Supervisor, North Florida Ecological Services Field Office, 904–731–3191.
Florida sandhill crane	Jay Herrington, Field Supervisor, North Florida Ecological Services Field Office, 904–731–3191.
Fremont County rockcress	Tyler Abbot, Project Leader, Wyoming Ecological Services Field Office, 307–772–2374, ext. 231.

Species	Contact information
Frisco buckwheat, Ostler's peppergrass, and Frisco clover.	Jennifer Lewinsohn, Biologist, Utah Ecological Services Field Office, 801–597–8352.
MacGillivray's seaside sparrow	Thomas McCoy, Field Supervisor, South Carolina Ecological Services Field Office, 843–300–0431.
Ozark pyrg	Melvin Tobin, Field Supervisor, Arkansas Ecological Services Field Office, 501– 513–4473.
pale blue-eyed grass	Karen Reagan, Biologist, Washington Fish and Wildlife Office, 360–753–7762.
San Joaquin Valley giant flower-loving fly	Josh Hull, Recovery and Listing Division Chief, Sacramento Fish and Wildlife Office, 916–414–6742.
striped newt	Jay Herrington, Field Supervisor, Northeast Florida Ecological Services Field Office, 904–731–3191.
Tinian monarch	Mary Abrams, Field Supervisor, Pacific Islands Fish and Wildlife Office, 808–792–9400.
Tippecanoe darter	Robert Anderson, Field Supervisor, Pennsylvania Field Office, 814–234–4090, ext. 7447.

If you use a telecommunications device for the deaf (TDD), please call the Federal Relay Service at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Background

We are required to make a finding whether or not the petitioned action is warranted within 12 months after receiving any petition we determined contained substantial scientific or commercial information indicating that the petitioned action may be warranted (section 4(b)(3)(B) of the Act (16 U.S.C. 1531 *et seq.*)) ("12-month finding"). We must make a finding that the petitioned action is: (1) Not warranted; (2) warranted; or (3) warranted but precluded. "Warranted but precluded" means that (a) the petitioned action is warranted, but the immediate proposal of a regulation implementing the petitioned action is precluded by other pending proposals to determine whether species are endangered or threatened species, and (b) expeditious progress is being made to add qualified species to the Lists of Endangered and Threatened Wildlife and Plants (Lists) and to remove from the Lists species for which the protections of the Act are no longer necessary. Section 4(b)(3)(C) of the Act requires that we treat a petition for which the requested action is found to be warranted but precluded as though resubmitted on the date of such finding, that is, requiring that a subsequent finding be made within 12 months of that date. We must publish these 12-month findings in the **Federal Register.**

Summary of Information Pertaining to the Five Factors

Section 4 of the Act (16 U.S.C. 1533) and the implementing regulations at part 424 of title 50 of the Code of Federal Regulations (50 CFR part 424) set forth procedures for adding species to, removing species from, or reclassifying species on the Lists. The Act defines "endangered species" as any species that is in danger of extinction throughout all or a significant portion of its range (16 U.S.C. 1532(6)), and "threatened species" as any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (16 U.S.C. 1532(20)). Under section 4(a)(1) of the Act, a species may be determined to be an endangered species or a threatened species because of any of the following five factors:

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

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

(C) Disease or predation;

(D) The inadequacy of existing regulatory mechanisms; or

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

In considering whether a species may meet the definition of an endangered species or a threatened species because of any of the five factors, we must look beyond the mere exposure of the species to the stressor to determine whether the species responds to the stressor in a way that causes actual impacts to the species. If there is exposure to a stressor, but no response, or only a positive response, that stressor does not cause a species to meet the definition of an endangered species or a threatened species. If there is exposure and the species responds negatively, we determine whether that stressor drives or contributes to the risk of extinction of the species such that the species warrants listing as an endangered or threatened species. The mere identification of stressors that could affect a species negatively is not sufficient to compel a finding that listing is or remains warranted. For a species to be listed or remain listed, we require evidence that these stressors are operative threats to the species and its habitat, either singly or in combination, to the point that the species meets the definition of an endangered or a threatened species under the Act.

In conducting our evaluation of the five factors provided in section 4(a)(1) of the Act to determine whether the Cedar Key mole skink (*Plestiodon egregius insularis*), Florida sandhill crane (*Antigone canadensis pratensis*), *Boechera pusilla* (Fremont County rockcress), *Eriogonum soredium* (Frisco buckwheat), *Lepidium ostleri* (Ostler's peppergrass), *Trifolium friscanum* (Frisco clover), MacGillivray's seaside sparrow (*Ammodramus maritimus macgillivraii*), Ozark pyrg (*Marstonia ozarkensis*), *Sisyrinchium sarmentosum* (pale blue-eyed grass), San Joaquin Valley giant flower-loving fly (*Rhaphiomidas trochilus*), striped newt (*Notophthalmus perstriatus*), Tinian monarch (*Monarcha takatsukasae*), and Tippecanoe darter (*Etheostoma tippecanoe*) meet the definition of "endangered species" or "threatened species," we considered and thoroughly evaluated the best scientific and commercial information available regarding the past, present, and future stressors and threats. We reviewed the petitions, information available in our files, and other available published and unpublished information. These evaluations may include information from recognized experts; Federal, State, and tribal governments; academic institutions; foreign governments; private entities; and other members of the public.

The species assessment forms for the Cedar Key mole skink, Florida sandhill crane, Fremont County rockcress, Frisco buckwheat, Ostler's peppergrass, Frisco clover, MacGillivray's seaside sparrow, Ozark pyrg, pale blue-eyed grass, San Joaquin Valley giant flower-loving fly, striped newt, Tinian monarch, and Tippecanoe darter contain more detailed biological information, a thorough analysis of the listing factors, and an explanation of why we determined that these species do not meet the definition of an endangered species or a threatened species. This supporting information can be found on the internet at *http://www.regulations.gov* under the appropriate docket number (see

ADDRESSES, above). The following are informational summaries for each of the findings in this document.

Cedar Key Mole Skink

Previous Federal Actions

On July 11, 2012, we received a petition from the Center for Biological Diversity, C. Kenneth Dodd, Jr., Kenney Krysko, Michael J. Lannoo, Thomas Lovejoy, Allen Salzberg, and Edward O. Wilson to list 53 amphibians and reptiles, including the Cedar Key mole skink, as endangered or threatened species under the Act and to designate critical habitat. On July 1, 2015, we published the 90-day finding in the **Federal Register** (80 FR 37568), concluding that the petition presented substantial information indicating the Cedar Key mole skink may warrant listing. This document constitutes the 12-month finding on the July 11, 2012, petition to list the Cedar Key mole skink under the Act.

Summary of Finding

The Cedar Key mole skink is a shiny brown lizard reaching a total length of approximately 15 centimeters (5.9 inches) with the light pink colored tail accounting for two-thirds of the length. This subspecies is semi-fossorial (adapted to digging, burrowing, and living underground) and cryptic in nature but has also been seen running along the substrate surface when exposed.

The Cedar Key mole skink inhabits the beach berm and dry coastal hammock habitats on eight islands of the Cedar Keys along a 10-mile section of Levy County along Florida's Gulf Coast. The Cedar Key mole skink relies on dry, unconsolidated soils for movement, cover, and nesting.

We evaluated all relevant factors under the five factors, including any regulatory mechanisms and conservation measures ameliorating stressors. The primary stressors include effects of sea-level rise and climate change-associated shifts in rainfall, temperature, and storm intensities. The continued occurrence of the Cedar Key mole skink in low numbers on two of the historically surveyed islands, as well as recent observations on five additional islands, indicates a level of resiliency to the stressors that have been acting upon the subspecies in the past and are currently acting on it. In addition, over time, the subspecies has persisted on multiple islands, providing a level of redundancy that will help the Cedar Key mole skink withstand the potential increased catastrophic events into the future. Finally, the subspecies should continue to exhibit a level of representation with suitable habitat continuing to occur on multiple islands in varying sizes and elevations across the range of the subspecies. In sum, we find that the continued presence of occupied habitat (as well as potentially occupied suitable habitat) and projected continuance of suitable habitat across the subspecies' range continues to provide a level of resiliency, redundancy, and representation to the subspecies such that the Cedar Key mole skink is not presently in danger of extinction throughout all or a significant portion of its range or likely to become so within the foreseeable future. We find that the stressors acting on the subspecies and its habitat, either singly or in combination, are not of sufficient imminence, intensity, or magnitude to indicate that this subspecies meets the definition of an endangered species or a threatened species. Therefore, we find that listing the Cedar Key mole skink as an endangered species or threatened species is not warranted. A detailed discussion of the basis for this finding can be found in the Cedar Key mole skink species assessment form and other supporting documents (see **ADDRESSES**, above).

Florida Sandhill Crane

Previous Federal Actions

On April 20, 2010, we received a petition from the Center for Biological Diversity, the Alabama Rivers Alliance, the Clinch Coalition, Dogwood Alliance, the Gulf Restoration Network, Tennessee Forests Council, and the West Virginia Highlands Conservancy to list 404 aquatic, riparian, and wetland species, including the Florida sandhill crane, as endangered or threatened species under the Act. On September 27, 2011, we published a 90-day finding in the **Federal Register** (76 FR 59836), concluding that the petition presented substantial information indicating the Florida sandhill crane may warrant listing. This document constitutes the 12-month finding on the April 20, 2010, petition to list the Florida sandhill crane under the Act.

Summary of Finding

Florida sandhill cranes are graceful, monogamous, long-lived birds in the Gruidae family. This subspecies is one of six that reside in North America, and one of three that are non-migratory. The Florida sandhill crane is a single, large population that ranges from the Okefenokee Swamp in southern Georgia to the Everglades in southern Florida, overlapping with the greater sandhill crane subspecies during the winter season. Both males and females raise one to two chicks per nesting attempt and are able to re-nest two to three times per year, if necessary.

Florida sandhill cranes use a variety of adjacent, open upland habitats, including grasslands, prairies, emergent palustrine wetlands, open pine forests, pastures, and forest-pasture transition areas. They also use the transition areas between wetland and upland habitats, and they feed in human-manipulated environments year-round, such as (but not limited to) agricultural lands, golf courses, airports, and suburban areas.

We evaluated all relevant factors under the five factors, including any regulatory mechanisms and conservation measures ameliorating stressors. The primary threats to the Florida sandhill crane include habitat loss/conversion/degradation, changing climate conditions (drought and precipitation/heavy rain events), and mortalities resulting from predation, collisions, or human interactions/nest disturbances. The most significant of these threats for the long-term persistence of Florida sandhill crane is loss, conversion, or degradation of suitable habitat. Habitat has been lost historically and is expected to be lost or converted into the future. However, the Florida sandhill crane continues to currently occupy its historical range, and is also expected to in the future, albeit as a smaller (*i.e.*, less abundant) population than is currently represented. Its demonstrated ability to adapt to and use agricultural and suburban habitats (*e.g.*, croplands, pastures, golf courses, recreational areas) for breeding, nesting, and feeding activities help ensure its resiliency into the future. Although drought, precipitation changes/events, and direct mortalities will play a role on the species' resource needs and reproductive success, the best available information suggests that any impacts are affecting and likely to affect the subspecies at the individual level as opposed to the population/rangewide level both currently and in the future. Therefore, we find that listing the Florida sandhill crane as endangered or threatened is not warranted. A detailed discussion of the basis for this finding can be found in the Florida sandhill crane species assessment form and other supporting documents (see **ADDRESSES**, above).

Fremont County Rockcress

Previous Federal Actions

On July 30, 2007, we received a petition from Forest Guardians (now WildEarth Guardians), to list 206

Mountain-Prairie Region species, including the Fremont County rockcress, as endangered or threatened species under the Act. On August 18, 2009, we published a 90-day finding in the **Federal Register** (74 FR 41649), concluding that the petition presented substantial information indicating the Fremont County rockcress may warrant listing. On June 9, 2011, we published a 12-month finding in the **Federal Register** (76 FR 33924), concluding that listing the Fremont County rockcress is warranted based on survey information indicating the species was in decline. However, listing the species was precluded at that time by higher priority actions, and the species was added to the candidate species list with a listing priority number of 8. We subsequently addressed the status of the species annually in our candidate notices of review (76 FR 66370, October 26, 2011; 77 FR 69994, November 21, 2012; 78 FR 70104, November 22, 2013; 79 FR 72450, December 5, 2014; 80 FR 80584, December 24, 2015; 81 FR 87246, December 2, 2016). In 2016, we revised the listing priority number from an 8 to an 11 because we found that the threats affecting the species were no longer high in magnitude nor were they imminent, and were instead low in magnitude and non-imminent.

Summary of Finding

The Fremont County rockcress is a narrow endemic perennial herb known to occur on approximately 18 acres (7 hectares) of habitat in the southern foothills of the Wind River Range, Wyoming. The species' habitat consists of sparsely vegetated, course, granite soil pockets in exposed granite-pegmatite (igneous rock solidified from lava or magma) outcrops, and the habitat faces extreme cold temperature and wind conditions. The species is also characterized by its reproductive system, in which individual plants reproduce through asexual seed production.

We evaluated all relevant factors under the five factors, including any regulatory mechanisms and conservation measures ameliorating stressors. To assess the resiliency of the species, we reviewed the abundance of flowering and non-flowering individuals and colonization of populations, which is driven by the species' reproductive system, winter precipitation, soil availability, sunlight, and freedom from competition. Stochastic events such as severe precipitation events, wildfire, and invasions of nonnative, invasive species affect the resiliency of the species. However, we find that there are no stressors currently impacting the species; the species has demonstrated persistence as a narrow endemic; there are protections in place to benefit the species; and its sole occurrence has sufficiently high levels of flowering plant abundance, colonization, and suitable habitat factors.

Considering that Fremont County rockcress presently exhibits high levels of resiliency, and is expected to continue to be resilient within the foreseeable future while retaining sufficient adaptive capacity and the ability to withstand catastrophic events, we find that the species is not presently in danger of extinction throughout all or a significant portion of its range or likely to become so within the foreseeable future. Therefore, we find that listing Fremont County rockcress as an endangered species or threatened species is not warranted. A detailed discussion of the basis for this finding can be found in the Fremont County rockcress species assessment form and other supporting documents (see **ADDRESSES**, above).

Frisco Buckwheat, Ostler's Peppergrass, and Frisco Clover

Previous Federal Actions

On July 30, 2007, we received a petition from Forest Guardians (now WildEarth Guardians), to list 206 Mountain-Prairie Region species, including the Frisco buckwheat, Ostler's peppergrass, and Frisco clover, as endangered or threatened species under the Act. On August 18, 2009, we published 90-day findings in the **Federal Register** (74 FR 41649), concluding that the petition presented substantial information indicating the Frisco buckwheat, Ostler's peppergrass, and Frisco clover may warrant listing. On February 23, 2011, we published 12-month findings in the **Federal Register** (76 FR 10166), concluding that listing the Frisco buckwheat, Ostler's peppergrass, and Frisco clover is warranted primarily due to the threat of habitat destruction from mining activities. However, listing the species was precluded at that time by higher priority actions, and the species were added to the candidate species list with listing priority numbers of 8. We subsequently addressed the status of these species annually in our candidate notices of review (76 FR 66370, October 26, 2011; 77 FR 69994, November 21, 2012; 78 FR 70104, November 22, 2013; 79 FR 72450, December 5, 2014; 80 FR 80584, December 24, 2015; 81 FR 87246, December 2, 2016).

Summary of Finding

The Frisco buckwheat, Ostler's peppergrass, and Frisco clover are rare endemic plants species found only in Utah. These species are addressed here together as they occupy roughly the same area, have similar life histories, and face similar potential threats. Frisco buckwheat and Ostler's peppergrass occur together in three populations, occupying 297 acres (120 hectares) and 153 acres (62 hectares) of habitat, respectively. The Frisco clover is known from six populations and occupies 360 acres (146 hectares) of habitat.

These three species are long-lived perennial plants that flower in the spring and summer months and likely require pollinators for maximum reproduction. Plant survival and successful recruitment require suitable intact soils with microsites for establishment and growth. The low canopy coverage of associated vegetation must result in low plant competition but also appears to provide sufficient floral resources to support pollinators. The health (long-term productivity) of populations is affected by the population size, habitat quantity, and habitat quality available to support stable or increasing populations. In addition to proximity between populations, habitat connectivity is important to support gene flow within populations.

We evaluated all relevant factors under the five factors, including any regulatory mechanisms and conservation measures ameliorating stressors. The primary stressors are precious metal exploration and mining; stone mining; nonnative, invasive species; and climate change. We found that there has been no reduction in redundancy or representation from historic conditions for these species. Currently, there is some stone mining occurring with minimum overlap with the plant populations and no significant impact on current viability. Despite some impacts from mining, invasive species, and climate change, the species are likely to face minimal decreases in population resiliency and minimal reduction in redundancy and representation, with all populations persisting within the foreseeable future. Therefore, we find that listing the Frisco buckwheat, Ostler's peppergrass, and Frisco clover as endangered or threatened is not warranted. A detailed discussion of the basis for this finding can be found in the Frisco buckwheat, Ostler's peppergrass, and Frisco clover species assessment form and other supporting documents (see **ADDRESSES**, above).

MacGillivray's Seaside Sparrow

Previous Federal Actions

On April 20, 2010, we received a petition from the Center for Biological Diversity, the Alabama Rivers Alliance, the Clinch Coalition, Dogwood Alliance, the Gulf Restoration Network, Tennessee Forests Council, and the West Virginia Highlands Conservancy to list 404 aquatic, riparian, and wetland species, including the MacGillivray's seaside sparrow, as endangered or threatened species under the Act. On September 27, 2011, we published a 90-day finding in the **Federal Register** (76 FR 59836), concluding that the petition presented substantial information indicating the MacGillivray's seaside sparrow may warrant listing. Subsequently, we entered into a stipulated settlement agreement with the Center for Biological Diversity that required us to submit a 12-month finding to the **Federal Register** by September 30, 2018. The court later agreed to extend this deadline until December 15, 2018. This document constitutes the 12-month finding on the April 20, 2010, petition to list the MacGillivray's seaside sparrow under the Act.

Summary of Finding

The MacGillivray's seaside sparrow is a subspecies of seaside sparrow that occurs in Atlantic coastal marshes in South Carolina, Georgia, and Florida. The MacGillivray's seaside sparrow is an olive-gray bird with a relatively long bill and short, sharp tail, and the subspecies reaches approximately 14 to 15 centimeters (5.5 to 6 inches) in length.

MacGillivray's seaside sparrows spend their entire life in coastal salt and brackish marshes. The subspecies is currently characterized by four breeding populations. In South Carolina, the subspecies breeds in lower elevation areas of natural high marsh and impoundments; in Georgia, the MacGillivray's seaside sparrow breeds in higher elevation areas of natural low salt marsh. The subspecies needs dense herbaceous cover for nesting and sheltering, and high tide roosting sites in the marsh to evade flooding. Adult MacGillivray's seaside sparrows have behavioral adaptations to balance the trade-off in risk from predation and flooding to nest success, and, therefore, will shift nest-site placement along a nest height gradient to contend with these dual risks.

We evaluated all relevant factors under the five factors, including any regulatory mechanisms and conservation measures ameliorating stressors. The primary stressors are predation, tidal flooding, sea level rise, and increased storm frequency due to climate change. We conclude that the viability of the MacGillivray's seaside sparrow will continue to be characterized by four breeding populations across most of the current range of coastal marshes in South Carolina, Georgia, and Florida in the near term and within the foreseeable future. In addition, although sea level rise will cause the loss of high abundance breeding habitat, the MacGillivray's seaside sparrow will continue to occur in different habitat types and thus will maintain some adaptive capacity in the future.

We find that the stressors acting on the subspecies and its habitat, either singly or in combination, are not of sufficient imminence, intensity, or magnitude to indicate that this subspecies meets the definition of an endangered species or a threatened species. Therefore, we find that listing the MacGillivray's seaside sparrow as endangered or threatened is not warranted. A detailed discussion of the basis for this finding can be found in the MacGillivray's seaside sparrow species assessment form and other supporting documents (see **ADDRESSES**, above).

Ozark Pyrg

Previous Federal Actions

On April 20, 2010, we received a petition from the Center for Biological Diversity, the Alabama Rivers Alliance, the Clinch Coalition, Dogwood Alliance, the Gulf Restoration Network, Tennessee Forests Council, and the West Virginia Highlands Conservancy to list 404 aquatic, riparian, and wetland species, including the Ozark pyrg, as endangered or threatened species under the Act. On September 27, 2011, we published a 90-day finding in the **Federal Register** (76 FR 59836), concluding that the petition presented substantial information indicating the Ozark pyrg may warrant listing. This document constitutes the 12-month finding on the April 20, 2010, petition to list the Ozark pyrg under the Act.

Summary of Finding

The Ozark pyrg is a freshwater snail historically found in a shoal of the White River near Cotter, Arkansas, and in the North Fork White River near the confluence. No specific life-history data exist regarding the species' reproduction, diet, age, growth, population size structure, or fecundity. However, many species within the same genus are adapted to springs, ponds, and other sensitive aquatic habitats. Some of these species also show a preference for gravel and pebble substrates and shallower water depths.

Based on extensive surveys between 1915, when the species was first described, and 2010 throughout the range of the species in Arkansas and Missouri that have yielded no specimens, and the extreme modification of the habitat at the species' type locality, the best available science indicates there are no extant populations of the Ozark pyrg. Therefore, we determine the Ozark pyrg to be extinct. As a result, the Ozark pyrg does not meet the statutory definition of either an endangered species or a threatened species and, accordingly, does not warrant listing under the Act. A detailed discussion of the basis for this finding can be found in the Ozark pyrg species assessment form and other supporting documents (see **ADDRESSES**, above).

Pale Blue-Eyed Grass

Previous Federal Actions

On July 30, 2007, we received a petition from Forest Guardians (now WildEarth Guardians), to list 206 Mountain-Prairie Region species, including the pale blue-eyed grass, as endangered or threatened species under the Act. On August 18, 2009, we published a 90-day finding in the **Federal Register** (74 FR 41649), concluding that the petition presented substantial information indicating the pale blue-eyed grass may warrant listing. This document constitutes the 12-month finding on the July 30, 2007, petition to list the pale blue-eyed grass under the Act.

Summary of Finding

The pale blue-eyed grass is a long-lived perennial herb in the iris family that produces small, pale blue flowers. The species is a narrow endemic known from a limited area in the Cascade Range of south-central Washington and north-central Oregon. Individual plants need early seral, open habitats with cool temperatures to break seed dormancy, adequate moisture to germinate and establish, and warm sunny days to stimulate flowering. Individual plants need pollinators for sexual exchange of genetic materials and adequate seed set but can reproduce by self-fertilizing and by sprouting rhizomes to reproduce vegetatively. Seeds need a dispersal mechanism that moves them away from the parent plant, thereby reducing intraspecific competition and exposure to pathogens that may have infected older established plants.

For robust resiliency over time, it can be assumed that pale blue-eyed grass populations likely need numerous individuals representing a diversity of genotypes within habitat patches of adequate area, quality, and connectivity to maintain survival and reproduction in spite of disturbance and shifting environmental conditions. Redundant populations across the range are needed to increase the species' chances of surviving catastrophic events. Representation through genetic and environmental diversity within and among populations is necessary to conserve long-term adaptive capability.

We evaluated all relevant factors under the five factors, including any regulatory mechanisms and conservation measures ameliorating stressors. The primary stressors affecting the pale blue-eyed grass' status include grazing, motor vehicles, invasive plants, putative hybridization, camping and recreation, habitat-disturbing management activities, habitat encroachment, and effects of climate change. Despite impacts from these stressors at an individual level, the species has maintained resilient populations. Although we predict some continued impacts from these stressors in the future, we anticipate the species will continue to be viable in resilient populations that are distributed widely throughout both of its representative areas (Washington and Oregon). Therefore, we find that listing the pale blue-eyed grass as an endangered species or threatened species is not warranted. A detailed discussion of the basis for this finding can be found in the pale blue-eyed grass species assessment form and other supporting documents (see **ADDRESSES**, above).

San Joaquin Valley Giant Flower-Loving Fly

Previous Federal Actions

On June 26, 2014, we received a petition from Gregory R. Ballmer and Kendall H. Osborne to list the San Joaquin Valley giant flower-loving fly as an endangered species under the Act. On April 10, 2015, we published a 90-day finding in the **Federal Register** (80 FR 19259), concluding that the petition presented substantial information indicating that listing the San Joaquin Valley giant flower-loving fly may be warranted. This document constitutes the 12-month finding on the June 26, 2014, petition to list the San Joaquin Valley giant flower-loving fly under the Act.

Summary of Finding

San Joaquin Valley giant flower-loving fly larvae have small, foot-like protrusions like caterpillars, and grow to about 6.4 centimeters (2.5 inches). They burrow down to moist sands below the surface, where they prey on the burrowing larvae of other insects. After 1 to 2 years, the fly larva produces a pupa, which metamorphoses into an adult. Adults are strong flyers, are 2.5 to 3.5 centimeters (1 to 1.5 inches) long, and live about 3 days. The species' "flight season" lasts about 7 weeks, from mid-August to early October. Males seek potential mates by sight, occasionally defending territories from other males. After mating, females lay eggs in shaded areas, either on the surface of bare sandy soil, or in shallow holes dug into the sand using their abdomens. Eggs likely hatch in about 10 days.

The San Joaquin Valley giant flower-loving fly's known historical range includes eight locations across the San Joaquin Valley, California, but it is now known only from Sand Ridge, a large stable sand dune about 24 kilometers (15 miles) east of Bakersfield, in Kern County, California. For over 20 years prior to discovery of the Sand Ridge population in 1997, the species was thought to be extinct. A second, smaller population was also discovered in 1997, about 16 kilometers (10 miles) south of Bakersfield, but no individuals have been observed there since 2006.

We evaluated all relevant factors under the five factors, including any regulatory mechanisms and conservation measures ameliorating stressors. The primary stressors that may be affecting the species include effects of climate change, urban and agricultural development, sand mining, vegetation overgrowth, small population size, off-highway vehicles, and pesticide drift. Despite the fly being dependent on rare areas of inland dune sand and having lost seven of eight historically known populations, we found that the remaining population provides sufficient resiliency, redundancy, and representation now and in the future. Further, we found that the stressors we assessed are not of sufficient imminence, intensity, or magnitude, either singly or in combination, to indicate that the fly is in danger of extinction throughout all or a significant portion of its range now or in the foreseeable future. Therefore, we find that listing the San Joaquin Valley giant flower-loving fly as an endangered species or threatened species is not warranted. A detailed discussion of the basis for this finding can be found in the San Joaquin Valley giant flower-loving fly species assessment form and other supporting documents (see **ADDRESSES**, above).

Striped Newt

Previous Federal Actions

On July 14, 2008, we received a petition from Dr. D. Bruce Means, Ryan C. Means, and Rebecca P.M. Means of the Coastal Plains Institute and Land Conservancy, requesting that the striped newt be listed as a threatened species under the Act. On March 23, 2010, we published a 90-day finding in the **Federal Register** (75 FR 13720), concluding that the petition presented substantial information indicating that listing the striped newt may be warranted. On June 7, 2011, we published a 12-month finding in the **Federal Register** (76 FR 32911), concluding that listing the striped newt was warranted due to threats associated with habitat loss, disease, drought, and inadequacy of existing regulatory mechanisms to address those threats. However, listing the species was precluded at that time by higher priority actions, and the species was added to the candidate species list with a listing priority number of 8. We subsequently addressed the status of the species annually in our candidate notices of review (76 FR 66370, October 26, 2011; 77 FR 69994, November 21, 2012; 78 FR 70104, November 22, 2013; 79 FR 72450, December 5, 2014; 80 FR 80584, December 24, 2015; 81 FR 87246, December 2, 2016).

Summary of Finding

The striped newt uses ephemeral wetlands and the upland habitat (*e.g.*, scrub, mesic flatwoods, sandhills) that surrounds those wetlands. Striped newts have a lifespan of 12 to 15 years and use aquatic and terrestrial habitats during their complex life cycle. Adult striped newts can occur as both a gilled aquatic form and a terrestrial form.

The current range of the striped newt extends from southern Georgia to north-central Florida, with 105 breeding ponds extant in Florida and 11 in Georgia. Striped newts are divided into two regions: the Eastern Region (peninsular Florida and eastern Georgia) and the Western Region (panhandle Florida and western Georgia). Patterns in precipitation and temperature cause ecological differentiation between these two regions.

We evaluated all relevant factors under the five factors, including any regulatory mechanisms and conservation measures ameliorating stressors. The primary stressors are land

use change, fire suppression, effects of climate change, and off-road vehicle impacts. Potential impacts associated with overutilization and predation were also analyzed but found not to affect the species to such an extent that they would have a negative impact on species' viability.

We have concluded that the threats currently impacting the striped newt are of lower magnitude than were previously thought. Furthermore, new populations of striped newt have been discovered since the species was added to the candidate species list, resulting in increased resiliency, redundancy, and representation for the species. Additionally, past conservation efforts, including captive rearing and release of striped newts, have helped reestablish striped newt populations in previously extirpated areas, such as in the Apalachicola National Forest. Finally, 85 percent of striped newt populations currently occur on conserved lands.

Based on the best available information, we find that the striped newt does not meet the definition of an endangered species or threatened species. Therefore, we find that listing the striped newt as an endangered species or threatened species is not warranted. A detailed discussion of the basis for this finding can be found in the striped newt species assessment form and other supporting documents (see **ADDRESSES**, above).

Tinian Monarch

Previous Federal Actions

On December 12, 2013, we received a petition from the Center for Biological Diversity requesting that the Tinian monarch be listed as an endangered or threatened species under the Act. On September 18, 2015, we published a 90-day finding in the **Federal Register** (80 FR 56423), concluding that the petition presented substantial information indicating that listing the Tinian monarch may be warranted. This document constitutes the 12-month finding on the December 12, 2013, petition to list the Tinian monarch under the Act.

Summary of Finding

The Tinian monarch is a small flycatcher bird about 15 centimeters (6 inches) bill to tail. Tinian monarchs are dull with light rufous underparts, olive-brown upperparts, and dark chocolate brown wings and tail. This species is endemic to the island of Tinian, which is part of the Northern Mariana Islands in the western Pacific Ocean.

The Tinian monarch lives mainly in forested habitat where it shelters, breeds, and forages for insects. There are various types of forest on Tinian including native limestone, secondary-mixed, and nonnative tangantangan forest, all of which are inhabited by the monarch. Individuals breed year round beginning at about 2 years of age and live around 10 years.

We evaluated all relevant factors under the five factors, including any regulatory mechanisms and conservation measures ameliorating stressors. The primary potential stressors affecting the Tinian monarch include the risk of the invasive, predatory brown treesnake establishing on Tinian and habitat loss from civilian and military development, including loss via potential resulting wildfires. We find that the risk of brown treesnake establishing on Tinian now and in the future is low, because of the sufficient interdiction program on Guam and Tinian that prevents the spread of the snake to areas where it is not found, including Tinian. We also find that despite extensive historical impacts to Tinian's forest habitat, the Tinian monarch is currently thriving. This is the result of expansive forest regrowth and the species' highly resilient nature, which is evidenced by its rebound following historical periods of habitat loss and by its ability to forage and reproduce within the remaining native forest, abundant nonnative forest, and mixed forest on Tinian. Therefore, we find that listing the Tinian monarch as an endangered species or threatened species is not warranted. A detailed discussion of the basis for this finding can be found in the Tinian monarch species assessment form and other supporting documents (see **ADDRESSES**, above).

Tippecanoe Darter

Previous Federal Actions

On April 20, 2010, we received a petition from the Center for Biological Diversity, the Alabama Rivers Alliance, the Clinch Coalition, Dogwood Alliance, the Gulf Restoration Network, Tennessee Forests Council, and the West Virginia Highlands Conservancy to list 404 aquatic, riparian, and wetland species, including the Tippecanoe darter, as endangered or threatened species under the Act. On September 27, 2011, we published a 90-day finding in the **Federal Register** (76 FR 59836), concluding that the petition presented substantial information indicating that listing the Tippecanoe darter may be warranted. This notice constitutes the 12-month finding on the April 20, 2010, petition to list the Tippecanoe darter under the Act.

Summary of Finding

The Tippecanoe darter is one of the smallest species of darters (35 millimeters (1.38 inches) in length). Males are distinguished by their gold or orange color with blue-black vertical bars, while females are more subdued in color. The fish has a relatively widespread, disjunct distribution with 12 of its 15 historical populations extant across six States: Indiana, Kentucky, Ohio, Pennsylvania, Tennessee, and West Virginia. The species is expanding its range in some areas.

Tippecanoe darters inhabit fourth-order and larger streams and rivers, and prefer riffles and runs with rocky bottom substrates and adequate water flow to keep spaces between and under rocks free from sediment. Individuals are mature within their first year, spawn in May to early August, and live to between 1 and 2 years of age.

We evaluated all relevant factors under the five factors, including any regulatory mechanisms and conservation measures ameliorating stressors. The primary stressors affecting the Tippecanoe darter include habitat fragmentation from dams and impairments to water quality, including sedimentation and agricultural and urban runoff. Despite impacts from these stressors, the species has maintained resilient populations and is increasing occupancy in some reaches, likely due to improved water quality or improved survey techniques. Although we predict some continued impacts from these stressors in the future, we anticipate the species will persist in resilient populations that are distributed widely throughout each of its representative physiographic provinces.

In summary, we find that the stressors acting on the species and its habitat, either singly or in combination, are not of sufficient imminence, intensity, or magnitude to indicate that this species meets the definition of an endangered species or a threatened species. Therefore, we find that listing the Tippecanoe darter as an endangered species or threatened species is not warranted. A detailed discussion of the basis for this finding can be found in the Tippecanoe darter species assessment form and other supporting documents (see **ADDRESSES**, above).

New Information

We request that you submit any new information concerning the taxonomy of, biology of, ecology of, status of, or stressors to the Cedar Key mole skink, Florida sandhill crane, Fremont County rockcress, Frisco buckwheat, Ostler's peppergrass, Frisco clover,

MacGillivray's seaside sparrow, Ozark pyrg, pale blue-eyed grass, San Joaquin Valley giant flower-loving fly, striped newt, Tinian monarch, and Tippecanoe darter to the appropriate person, as specified under **FOR FURTHER INFORMATION CONTACT**, whenever it becomes available. New information will help us monitor these species and make appropriate decisions about their conservation and status. We encourage local agencies and stakeholders to continue cooperative monitoring and conservation efforts.

References Cited

Lists of the references cited in the petition findings are available on the internet at *http://www.regulations.gov* in the dockets provided above in **ADDRESSES** and upon request from the appropriate person, as specified under **FOR FURTHER INFORMATION CONTACT**.

Authors

The primary authors of this document are the staff members of the Species Assessment Team, Ecological Services Program.

Authority

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

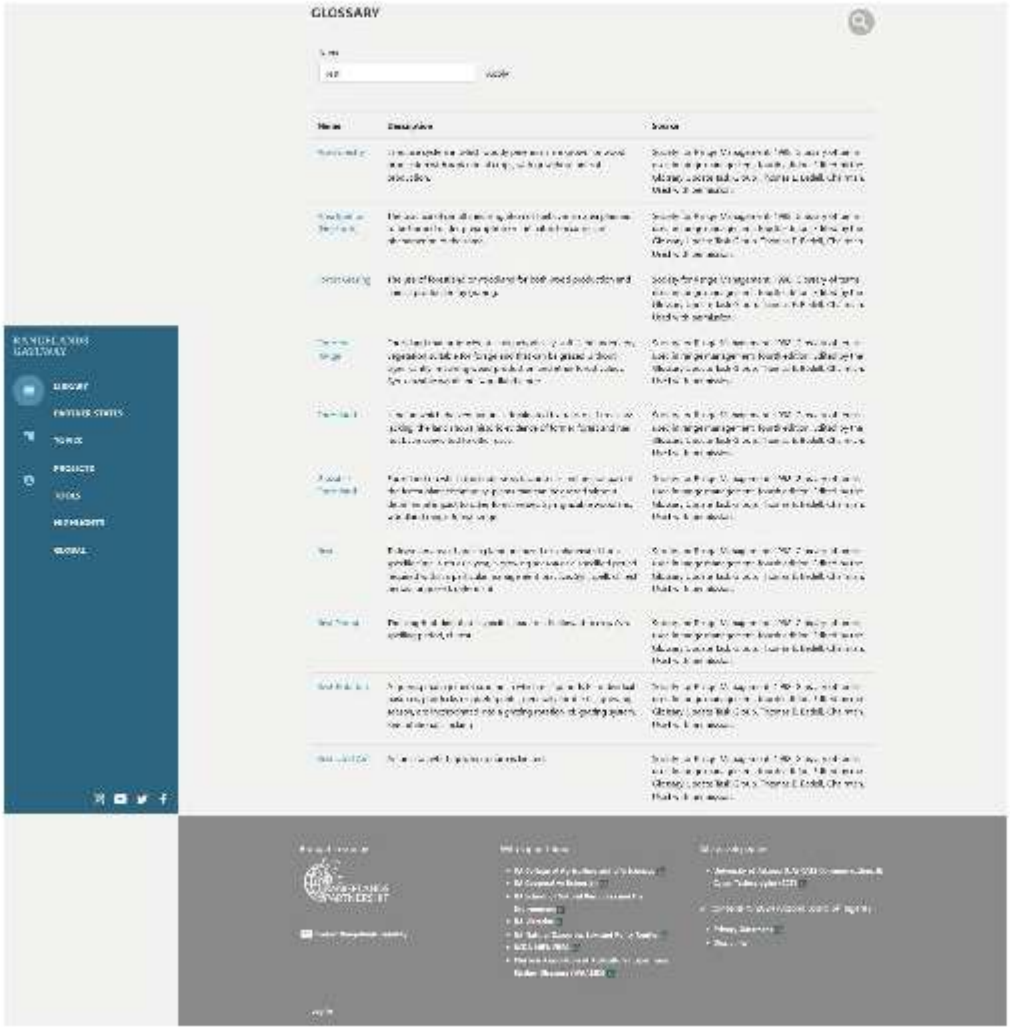
Dated: December 7, 2018.

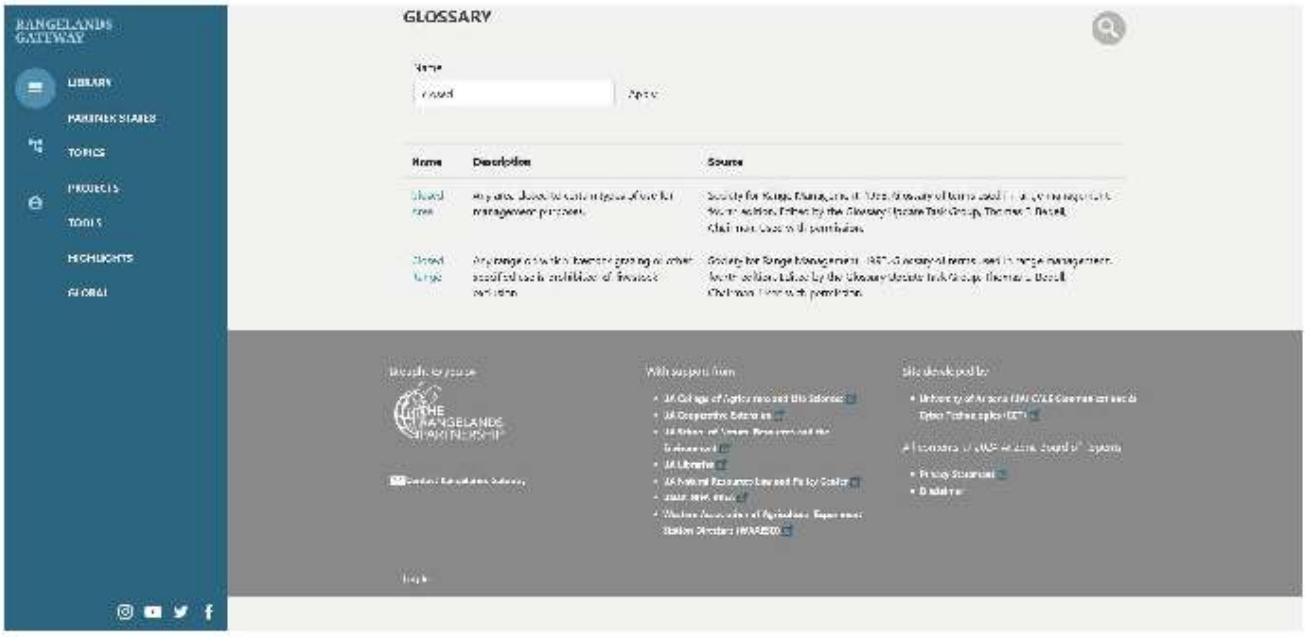
Margaret E. Everson,

Principal Deputy Director, U.S. Fish and Wildlife Service, Exercising the Authority of the Director, U.S. Fish and Wildlife Service.

[FR Doc. 2018–27467 Filed 12–18–18; 8:45 am]
BILLING CODE 4333–15–P

ATTACHMENT 4





[1] **https://rangelandsgateway.org/glossary?name=rest&antibot_key=EW_F0yTAtYcB1ThjMltNGrLiduqrZt125e3Lv-x_yo**

ATTACHMENT 5

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[FWS–R6–ES–2011–0023; MO 92210–0–0008–B2]

Endangered and Threatened Wildlife and Plants; 12–Month Finding on a Petition To List *Abronia ammophila, Agrostis rossiae, Astragalus proimanthus, Boechera (Arabis) pusilla,* and *Penstemon gibbensii* as Threatened or Endangered

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of 12-month petition finding.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), announce a 12-month finding on a petition to list *Abronia ammophila* (Yellowstone sand verbena), *Agrostis rossiae* (Ross' bentgrass), *Astragalus proimanthus* (precocious milkvetch), *Boechera (Arabis) pusilla* (Fremont County rockcress or small rockcress), and *Penstemon gibbensii* (Gibbens' beardtongue) as threatened or endangered, and to designate critical habitat under the Endangered Species Act of 1973, as amended (Act). After review of all available scientific and commercial information, we find that listing *A. ammophila, A. rossiae, A. proimanthus,* and *P. gibbensii* is not warranted at this time. However, we ask the public to submit to us any new information that becomes available concerning the threats to *A. ammophila, A. rossiae, A. proimanthus,* and *P. gibbensii* or their habitats at any time. After a review of all the available scientific and commercial information, we find that listing *B. pusilla* as threatened or endangered is warranted. However, currently listing *B. pusilla* is precluded by higher priority actions to amend the Federal Lists of Endangered and Threatened Wildlife and Plants. Upon publication of this 12-month petition finding, we will add *B. pusilla* to our candidate species list. We will develop a proposed rule to list *B. pusilla* as our priorities allow. We will make any determinations on critical habitat during development of the proposed listing rule. In any interim period, we will address the status of the candidate taxon through our annual Candidate Notice of Review.

DATES: The finding announced in this document was made on June 9, 2011.

ADDRESSES: This finding is available on the Internet at *http://www.regulations.gov* at Docket Number FWS–R6–ES–2011–0023. Supporting documentation used in preparing this finding is available for public inspection, by appointment, during normal business hours at the U.S. Fish and Wildlife Service, Wyoming Ecological Services Field Office, 5353 Yellowstone Road, Suite 308A, Cheyenne, WY 82009. Please submit any new information, materials, comments, or questions concerning this finding to the above address.

FOR FURTHER INFORMATION CONTACT: R. Mark Sattelberg, Field Supervisor, Wyoming Ecological Services Field Office (see **ADDRESSES**); by telephone at 307–772–2374; or by facsimile at 307–772–2358. If you use a telecommunications device for the deaf (TDD), please call the Federal Information Relay Service (FIRS) at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Background

Section 4(b)(3)(B) of the Act (16 U.S.C. 1531 *et seq.*), requires that, for any petition to revise the Federal Lists of Endangered and Threatened Wildlife and Plants that contains substantial scientific or commercial information that listing the species may be warranted, we make a finding within 12 months of the date of receipt of the petition. In this finding, we will determine that the petitioned action is: (1) Not warranted, (2) warranted, or (3) warranted, but the immediate proposal of a regulation implementing the petitioned action is precluded by other pending proposals to determine whether species are threatened or endangered, and expeditious progress is being made to add or remove qualified species from the Federal Lists of Endangered and Threatened Wildlife and Plants. Section 4(b)(3)(C) of the Act requires that we treat a petition for which the requested action is found to be warranted but precluded as though resubmitted on the date of such finding, that is, requiring a subsequent finding to be made within 12 months. We must publish these 12-month findings in the **Federal Register**.

Previous Federal Actions

Federal action for *Agrostis rossiae* and *Astragalus proimanthus* began as a result of section 12 of the original Act, which directed the Secretary of the Smithsonian Institution to prepare a report on plants considered to be endangered, threatened, or extinct in the United States. This report, designated as House Document No. 94–51, was presented to Congress on January 9, 1975. That document lists *A. rossiae* as a threatened species and *A. proimanthus* as an endangered species (House Document 94–51, pp. 57, 90, 163). On July 1, 1975, we published a notice in the **Federal Register** (40 FR 27823) accepting the Smithsonian Institution report as a petition within the context of section 4(c)(2) (petition provisions are now found in section 4(b)(3) of the Act), and giving notice of the Service's intention to review the status of the plant taxa listed therein.

As a result of that review, we published a proposed rule on June 16, 1976, in the **Federal Register** (41 FR 24523) to determine endangered status pursuant to section 4 of the Act for approximately 1,700 vascular plant taxa, including *Astragalus proimanthus*. This list of plant taxa was assembled based on comments and data received by the Smithsonian Institution and the Service in response to House Document No. 94–51 and the July 1, 1975, **Federal Register** publication. General comments received in response to the 1976 proposal are summarized in an April 26, 1978, **Federal Register** publication (43 FR 17909). In 1978, amendments to section 4(f)(5) of the Act required that all proposals over 2 years old be withdrawn. However, proposals already over 2 years old were given a 1-year grace period. On December 10, 1979, we published a notice in the **Federal Register** (44 FR 70796) withdrawing the portion of the June 16, 1976, proposal that had not been made final. This removed both *A. proimanthus* and *Agrostis rossiae* from proposed status, but retained both species as candidate plant taxa that "may qualify for listing under the Act."

On December 15, 1980, we published a current list of those plant taxa native to the United States being considered for listing under the Act; this identified both *Agrostis rossiae* and *Astragalus proimanthus* as category 1 taxa (45 FR 82480). The Service defined category 1 taxa as a taxonomic group for which we presently had sufficient information on hand to support the biological appropriateness of these taxa being listed as threatened or endangered species (45 FR 82480). On November 28, 1983, *A. rossiae* was lowered to a category 2 taxon "currently under review," whereas *A. proimanthus* was moved to the "taxa no longer under review" list, and given a 3C rank, indicating the species was more abundant or widespread than previously believed or not subjected to any identifiable threat (48 FR 53640). We defined category 2 taxa as those for which we had information at that time that indicated proposing to list was possibly appropriate, but for which substantial data on biological

vulnerability and threat(s) was not currently known or on file to support proposed rules. *Boechera* (formerly *Arabis*) *pusilla* and *Penstemon gibbensii* were added as category 2 taxa during the same review (48 FR 53640). These four species retained the same ranking for the subsequent review on September 27, 1985 (50 FR 39526). The February 21, 1990, list kept *A. rossiae, B. pusilla,* and *P. gibbensii* as category 2 taxa, and reverted *A. proimanthus* back to a category 2 taxon (55 FR 6184).

The September 30, 1993, review changed the status of *Boechera pusilla* to a category 1 species (58 FR 51144). This review added a "status trend" column. Each species was identified as increasing (I), stable (S), declining (D), or unknown (U). The 1993 review added *Abronia ammophila* and assigned it a 2U rank, moved *Boechera pusilla* up to a 1D rank, and listed *Agrostis rossiae* as 2U, *Astragalus proimanthus* as 2S, and *Penstemon gibbensii* as 2U (58 FR 51144).

On February 28, 1996, we proposed discontinuing the designation of category 2 species as candidates due to the lack of sufficient information to justify issuance of a proposed rule (61 FR 7596). This proposal included eliminating candidate status for four of the five species addressed in this finding; only *Boechera pusilla* was proposed to remain a candidate (61 FR 7596). This policy change was finalized on December 5, 1996, stating that the listing of category 2 species was not needed because of other lists already maintained by other entities such as Federal and State agencies (61 FR 64481).

On September 19, 1997, we published a notice of review that retained *Boechera pusilla* as a candidate species (62 FR 49398). However, on October 25, 1999, we published a notice of review that indicated our intent to remove several species, including *B. pusilla,* from the list of candidate species because evidence suggested that these taxa were either more abundant than previously believed or that the taxa were not subject to the degree of threats sufficient to warrant continuance of candidate status, issuance of a proposed listing, or a final listing (64 FR 57534). The change of status for *B. pusilla* was finalized on October 20, 2000, on the basis that regulatory mechanisms and changes to management of the associated land reduced or eliminated the threats facing *B. pusilla* and ensured the survival and conservation of this species (65 FR 63044).

On July 30, 2007, we received a formal petition dated July 24, 2007, from Forest Guardians (now WildEarth Guardians), requesting that we: (1) Consider all full species in our Mountain-Prairie Region ranked as G1 or G1G2 by the organization NatureServe, except those that are currently listed, proposed for listing, or candidates for listing; and (2) list each species as either threatened or endangered. The petition identified 206 species as petitioned entities, including the 5 species we address in this status review. A species ranking of G1 is defined as a species that is critically imperiled across its entire range (or global range) (NatureServe 2010b, p. 3). A ranking of G1G2 means the species is either ranked as a G1 or a G2 species, with G2 defined as imperiled across its entire range (NatureServe 2010b, pp. 3–4). The petition incorporated all analysis, references, and documentation provided by NatureServe in its online database at *http://www.natureserve.org/* into the petition. The petition clearly identified itself as a petition and included the identification information, as required in 50 CFR 424.14(a). We sent a letter to the petitioners, dated August 24, 2007, acknowledging receipt of the petition and stating that, based on preliminary review, we found no compelling evidence to support an emergency listing for any of the species covered by the petition.

On March 19, 2008, WildEarth Guardians filed a complaint (1:08–CV–472–CKK) indicating that the Service failed to comply with its mandatory duty to make a preliminary 90-day finding on their two multiple-species petitions—one for mountain-prairie species and one for southwest species. We subsequently published two initial 90-day findings on January 6, 2009 (74 FR 419), and February 5, 2009 (74 FR 6122). The February 5, 2009, finding determined that there was not substantial scientific or commercial information indicating that listing 165 of the 206 petitioned species in the mountain-prairie region may be warranted (74 FR 6122). Two additional species were evaluated in a January 6, 2009, 90-day finding (74 FR 419), and no determination was made on whether substantial information had been presented on the remaining 39 species included in the petition (74 FR 6122). The 5 species covered in this 12-month finding were among the remaining 39 species. An additional species was determined to qualify for candidate status (73 FR 75175; December 10, 2008). On March 13, 2009, the Service and WildEarth Guardians filed a stipulated settlement in the District of Columbia Court, agreeing that the Service would submit to the **Federal Register** a finding as to whether WildEarth Guardians' petitions present substantial information indicating that the petitioned actions may be warranted for the remaining 38 mountain-prairie species by August 9, 2009.

On June 18, 2008, we received a petition from WildEarth Guardians dated June 12, 2008, to emergency list 32 species under the Administrative Procedure Act and the Endangered Species Act. Of those 32 species, 11 were included in the July 24, 2007, petition to be listed on a non-emergency basis. Although the Act does not provide for a petition process for an interested person to seek to have a species emergency listed, section 4(b)(7) of the Act authorizes the Service to issue emergency regulations to temporarily list a species. In a letter dated July 25, 2008, we stated that the information provided in both the 2007 and 2008 petitions and in our files did not indicate that an emergency situation existed for any of the 11 species. The Service's decisions whether to exercise its authority to issue emergency regulations to temporarily list a species are not judicially reviewable. *See Fund for Animals* v. *Hogan,* 428 F.3d 1059 (DC Cir. 2005).

On August 18, 2009, we published a notice of 90-day finding (74 FR 41649) on the remaining 38 species from the petition to list 206 species in the mountain-prairie region of the United States as threatened or endangered under the Act. We found that the petition presented substantial scientific and commercial information for 29 of the 38 species, indicating that listing may be warranted for those species. The 5 species we address in this 12-month finding were included within these 29 species. We also opened a 60-day public comment period to allow all interested parties an opportunity to provide information on the status of the 29 species (74 FR 41649). The public comment period closed on October 19, 2009. We received 224 public comments. Of these, 38 specifically addressed *Abronia ammophila, Agrostis rossiae, Astragalus proimanthus, Boechera pusilla,* and *Penstemon gibbensii.* All information received has been carefully considered in this finding. This notice constitutes the 12-month finding on 5 of the 206 species identified in WildEarth Guardians' petition dated July 24, 2007, to list *Abronia ammophila, Agrostis rossiae, Astragalus proimanthus, Boechera pusilla,* and *Penstemon gibbensii* as threatened or endangered.

Summary of Procedures for Determining the Listing Status of Species

Review of Status Based on Five Factors

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

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

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

(C) Disease or predation;

(D) The inadequacy of existing regulatory mechanisms; or

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

In making these findings, information pertaining to each species in relation to the five factors provided in section 4(a)(1) of the Act is discussed below. In considering what factors might constitute threats to a species, we must look beyond the exposure of the species to a particular factor to evaluate whether the species may respond to the factor in a way that causes actual impacts to the species. If there is exposure to a factor and the species responds negatively, the factor may be a threat, and during the status review, we attempt to determine how significant a threat it is. The threat is significant if it drives or contributes to the risk of extinction of the species such that the species warrants listing as endangered or threatened as those terms are defined by the Act. However, the identification of factors that could impact a species negatively may not be sufficient to compel a finding that the species warrants listing. The information must include evidence sufficient to suggest that the potential threat has the capacity (*i.e.*, it should be of sufficient magnitude and extent) to affect the species' status such that it meets the definition of endangered or threatened under the Act.

Findings

Distinct Population Segments

After considering the five factors, we assess whether each species is threatened or endangered throughout all of its range. Generally, we next consider in our findings whether a distinct vertebrate population segment (DPS) or any significant portion of the species' range meets the definition of endangered or is likely to become endangered in the foreseeable future (threatened). Section 3(16) of the Act defines a species to include only a vertebrate species as a DPS. Therefore, the Service's Policy Regarding the Recognition of Distinct Vertebrate Population Segments Under the Endangered Species Act (DPS Policy) (61 FR 4722; February 7, 1996) is not applicable to plants and no population segments under the review could qualify as DPSs under the Act. Although the Service's DPS Policy is not applicable to plants, we do determine in our findings whether a plant species is threatened or endangered in a significant portion of its range.

Significant Portion of the Range

In determining whether a species is threatened or endangered in a significant portion of its range, we first identify any portions of the range of the species that warrant further consideration. The range of a species can theoretically be divided into portions an infinite number of ways. However, there is no purpose to analyzing portions of the range that are not reasonably likely to be both (1) significant and (2) threatened or endangered. 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 there or likely to become so within the foreseeable future. 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 essentially uniform throughout its range, no portion is likely to warrant further consideration. Moreover, if any concentration of threats applies only to portions of the species' range that are not significant, such portions will not warrant further consideration.

If we identify portions that warrant further consideration, we then determine whether the species is threatened or endangered in these portions of its range. Depending on the biology of the species, its range, and the threats it faces, the Service may address either the significance question or the status question first. Thus, if the Service considers significance first and determines that a portion of the range is not significant, the Service need not determine whether the species is threatened or endangered there. Likewise, if the Service considers status first and determines that the species is not threatened or endangered in a portion of its range, the Service need not determine if that portion is significant. However, if the Service determines that both a portion of the range of a species is significant and the species is threatened or endangered there, the Service will specify that portion of the range as threatened or endangered under section 4(c)(1) of the ESA.

Evaluation of the Status of Each of the Five Plant Species

For each of the five species, we provide a description of the species and its life-history and habitat, an evaluation of listing factors for that species, and our finding that the petitioned action is warranted or not for that species. We follow these descriptions, evaluations, and findings with a discussion of the priority and progress of our listing actions.

Species Information for *Abronia ammophila*

Species Description

Abronia ammophila is a low-growing, mat-forming perennial herb (Clark *et al.* 1989, p. 7; Fertig 1994, unpaginated; (National Park Service (NPS) 1999b, p. 3; Fertig 2000b, unpaginated; Saunders and Sipes 2006, p. 76). *A. ammophila* is a highly restricted endemic (occurring only in one location or region) to the Yellowstone Plateau (NPS 1999a, p. 1). In addition to the common name of Yellowstone sand verbena, *A. ammophila* has been called Tweedy's sand verbena (Clark *et al.* 1989, p. 7; Marriott 1993, p. 1) and Wyoming sand verbena (Integrated Taxonomic Information System 2010a, unpaginated).

Abronia ammophila has a large taproot (primary root that grows vertically downward, not highly branched) that can be over 0.5 meter (m) (1.6 feet (ft)) in length, which helps the plant root into the loose sand (Whipple 1999, p. 3; Whipple 2002, p. 257; Saunders and Sipes 2004, p. 9). Its stems can grow up to 2 to 4 decimeters (dm) (0.66 to 1.31 ft) in length; however, this plant is only 2.5 to 10.2 centimeters (cm) (1 to 4 inches (in.)) tall (Rydberg 1900, p. 137; Galloway 1975, p. 344; Fertig 1994, unpaginated; NPS 1999b, p. 3; Fertig 2000b, unpaginated; NPS 2000, unpaginated). *A. ammophila* is covered by sticky glands, which result in the plants being covered with sand (Coulter and Nelson 1909, p. 175; NPS 1999b, p. 3; NPS 2000, unpaginated; Whipple 2002, pp. 257–258; Saunders and Sipes 2006, p. 76). The leaf blades are succulent (fleshy) and oval or diamond-shaped with smooth edges (Fertig 1994, unpaginated; NPS 1999b, p. 3).

The flowers of *Abronia ammophila* are whitish to light pink or light green and grow in a capitulum (head-like group of flowers) typically containing 4 to 21 flowers (Saunders and Sipes 2006, p. 79). The flowers are hermaphroditic (possessing both male and female reproductive organs) (Saunders and Sipes 2004, p. 9; 2006, p. 76). As with other members of the Nyctaginaceae (the Four O'Clock) family, *A. ammophila* lacks true petals (Saunders and Sipes 2004, p. 9; 2006, p. 76).

Discovery and Taxonomy

Frank Tweedy made the first collection of *Abronia ammophila* in 1885; however, he labeled it as *Abronia villosa* (desert sand verbena). The collection was from the sandy beaches on the north side of Yellowstone Lake at the mouth of Pelican Creek (Tweedy 1886, p. 59). *A. villosa* is a common purple-flowered species of the American southwest (Whipple 2002, p. 256). In 1900, Per Axel Rydberg determined that Tweedy's sample was sufficiently different from other *Abronia* to warrant recognition as a unique species; he named it *Abronia arenaria* (coastal sand verbena) (NPS 1999b, p. 2; Whipple 1999, p. 3; 2002, p. 256). However, the name *A. arenaria* had previously been used (NPS 1999b, p. 2; Whipple 1999, p. 2; 2002, p. 256). E.L. Greene proposed the name *A. ammophila* for the Yellowstone sand verbena species (Greene 1900 as cited in Whipple 2002, p. 256).

The name *Abronia ammophila* was formally recognized (Coulter and Nelson 1909, p. 175); however, midway through the 20th century it was combined with *Abronia fragrans* (snowball sand verbena), a widespread western species (Hitchcock *et al.* 1964 and Despain 1975 as cited in Whipple 2002, p. 257). In 1975, a study of the *Abronia* genus determined that the Yellowstone species was unique (Galloway 1975, p. 344; NPS 1999b, p. 3; Whipple 2002, p. 257). Plant material collected from scrub communities of sandy hills near Big Piney, Sublette County, Wyoming, also was included under *A. ammophila* (Galloway 1975, p. 344, NPS 1999b, p. 3; Whipple 2002, p. 257). Further examination revealed that the specimens from Sublette County are actually *Abronia mellifera* (white sand verbena) (Marriott 1993, pp. 6, 9; Fertig 1994, unpaginated).

Abronia ammophila is a member of the New World plant family Nyctaginaceae that typically lives in warmer climates, such as deserts and tropical areas (NPS 2000, unpaginated). The genus *Abronia* contains approximately 20 to 30 species (NPS 1999b, p. 2, Flora of North America 2010a, unpaginated). Most *Abronia* occur in the western United States and Mexico, but some extend into southern Canada and east into the Great Plains and Texas (NPS 1999b, p. 2). *A. ammophila* is similar to *Abronia mellifera* (Fertig 1994, unpaginated) and *Abronia fragrans* (Flora of North America 2010, unpaginated). We recognize *A. ammophila* as a valid species and a listable entity.

Biology and Life History

Abronia ammophila starts to flower by the middle of June and continues producing flowers until a frost occurs that kills its aboveground parts, usually in late August or early September (NPS 1999b, p. 6; Whipple 1999, p. 3; NPS 2000, unpaginated; Whipple 2002, p. 258). This extended blooming period is unusual in comparison to other plants in Yellowstone National Park (YNP) (Whipple 1999, p. 3). Additionally, unlike many of its associated species, *A. ammophila* continues to flower vigorously even after setting fruit (NPS 1999b, p. 6; Whipple 2002, p. 258).

Abronia ammophila is visited by several orders of insects (Saunders and Sipes 2004, p. 10; 2006, p. 80). The most frequent visitors to *A. ammophila* are lepidopterans (butterflies and moths) (Saunders and Sipes 2004, p. 10; 2006, p. 80). Even though *Abronia ammophila* is visited by a diverse range of pollinators, the total number of pollinator visitations is extremely low (Saunders and Sipes 2006, p. 81). The low level of pollinator visits may be offset by *A. ammophila* exhibiting a mixed-mating system (Saunders and Sipes 2004, pp. 6, 10, 12; 2006, p. 82). In addition to cross-pollination facilitated by pollinators, *A. ammophila* is able to self-pollinate with or without a pollen vector (Saunders and Sipes 2004, pp. 6, 10, 12; 2006, pp. 80–82; Whipple 2010b, pers. comm.). Self-pollination is highly likely due to the floral morphology (the structure of the flower) and the functional phenology (life cycle) of *A. ammophila* (Saunders and Sipes 2006, p. 81).

Abronia ammophila is capable of producing large numbers of flowers (Saunders and Sipes 2004, p. 13). Seed dispersal mechanisms of *Abronia ammophila* have not been extensively studied. Primary seed dispersal appears to occur beneath the parent plant (Saunders and Sipes 2006, p. 79). Seeds also accumulate in depressions of the sand, where the wind has blown them (NPS 1999b, p. 6; Whipple 2002, p. 258). The sticky surface of the seeds may facilitate dispersal, for example on the feet of waterfowl (NPS 1999b, pp. 6–7; Whipple 2002, p. 258). Water also may facilitate dispersal (Saunders and Sipes 2006, p. 79). As *A. ammophila* occurs in locations that are not located adjacent to each other, there appears to be an effective method of seed dispersal (NPS 1999b, pp. 6–7; Whipple 2002, p. 258). However, the longevity of *A. ammophila* seeds in the seed bank in unknown (NPS 1999b, p. 7; Whipple 2002, p. 258).

Habitat

Abronia ammophila is endemic to YNP, within Park and Teton Counties of Wyoming (Whipple 2002, p. 256; Fertig 2000b, unpaginated; Saunders and Sipes 2006, p. 76). Specifically, *A. ammophila* occurs around Yellowstone Lake typically within 40 m (131.2 ft) of the shoreline (NPS 1999b, p. 5; Whipple 1999, p. 3; Fertig 2000b, unpaginated; Whipple 2002, p. 262). The plant has been found up to 60 m (196.9 ft) inland and up to approximately 10 m (32.8 ft) above the high-water line (NPS 1999b, p. 5; Whipple 1999, p. 3; Fertig 2000b, unpaginated; Whipple 2002, p. 262). *A. ammophila* generally occurs above the high-water mark; no plants grow in areas that are regularly inundated (NPS 1999b, p. 5; Whipple 1999, p. 3; 2002, p. 262). Yellowstone Lake is a high-elevation (2,360 m (7,742 ft)), freshwater lake that was formed by volcanic activity (Pierce *et al.* 2007, pp. 131–132; NPS 2006a, unpaginated). The lake level was originally 61 m (200 ft) higher than its present level, and the level is not entirely stable (Pierce *et al.* 2007, pp. 131–132; NPS 2006a, unpaginated). *A. ammophila* appears to be able to adapt to the continually changing boundaries of its habitat as defined by Yellowstone Lake's fluctuations.

Occurring between the area of beach affected by wave action and the more densely vegetated areas inland, *Abronia ammophila* prefers open, sunny, sparsely vegetated sites (NPS 1999b, p. 5; Whipple 2002, p. 262; Saunders and Sipes 2006, p. 77). Associated vegetative species include *Phacelia hastata* (silver-leaf scorpion-weed), *Rumex venosus* (veiny dock), *Polemonium pulcherrimum* (Jacob's-ladder), and *Lupinus argenteus* (silvery lupine) (NPS 1999b, p. 5; Whipple 2002, p. 262; Saunders and Sipes 2006, p. 77). *A. ammophila* loses its competitive advantage on more stable soils or in areas where *Artemisia tridentata* (big sagebrush) or *Eriogonum umbellatum* (sulfur flower buckwheat) occur (Whipple 2002, p. 262; Saunders and Sipes 2006, p. 77).

Abronia ammophila occurs at four locations around Yellowstone Lake; these locations are identified as North

Shore, Rock Point, Pumice Point, and South Arm (NPS 1999a, pp. 3–6; NPS 1999b, pp. 4–5; Whipple 2002, p. 262). These populations cover an area of 0.6 hectares (ha) (1.48 acres (ac)) (Whipple 2011, pers. comm.). The populations all occur in loose, unconsolidated (loosely arranged) sand with a minimal amount of fines (powdered material), gravel, or organic matter (NPS 1999b, p. 5; Whipple 2002, p. 262; Saunders and Sipes 2006, p. 77). All sites are located on beach sand except the Pumice Point site, which occurs on black sand (NPS 1999b, p. 5; Whipple 2002, p. 262). Some of the populations occur in horseshoe-shaped, sandy depressions (blowouts) (NPS 1999a, p. 3; 1999b, p. 5; Whipple 2002, p. 262; Saunders and Sipes 2006, p. 77). Additionally, the largest subpopulation in the North Shore area—the "Thermal" site—is located adjacent to a small thermal barren (area where no vegetation grows) (NPS 1999a, p. 6; NPS 1999b, p. 6). This area hosts an extremely dense population of *Abronia ammophila* with some of the largest individuals (NPS 1999b, p. 6). *A. ammophila* is able to coexist with thermal influences; however, most of the populations grow on ground that is not thermally influenced (NPS 1999a, p. 6).

Distribution and Abundance

Herbarium records show that *Abronia ammophila* was previously more widely distributed along the northern shore of Yellowstone Lake (NPS 1999b, p. 9; Whipple 2002, p. 258). Locations such as 0.40 kilometer (km) (0.25 mile (mi)) west of the mouth of Pelican Creek and several locations near the current Fishing Bridge development have been recorded as collection locations of *A. ammophila* (NPS 1999b, p. 9; Whipple 2002, pp. 258–259). Many additional areas of the northern shoreline provide suitable habitat for *A. ammophila*, such as west of Pelican Creek to the outlet of the Yellowstone River and Mary Bay (NPS 1999b, p. 9; Whipple 2002, p. 259; Whipple 2010a, pers. comm.). Construction of the East Entrance Road and the Fishing Bridge campground, an area that was near the current parking area for the Fishing Bridge Museum, as well as higher human use may have extirpated populations of *A. ammophila* in these areas (NPS 1999b, pp. 8–9; Whipple 2002, pp. 258–259; Whipple 2010a, pers. comm.).

Table 1 below presents available information regarding the four populations of *Abronia ammophila*. The 1998–1999 survey was a rigorous population count (NPS 1999a, entire). The other years were generally estimates, except for some of the smaller populations where an exact count was easily obtained (Correy 2009, entire; Whipple 2010d, pers. comm.).

TABLE 1—POPULATION ESTIMATES OF ABRONIA AMMOPHILA

Population (year of discovery)	Estimated numbers (year)
North Shore (prior to 1998).	Approx. 1,000 (early 1990s). 7,978 (1998–1999) rigorous count. Approx. 3,600 (2010).
Rock Point (1998)	325 (1998). 120 (2009).
Pumice Point (1998)	22 (1998). 1 (2001). 5 (2009). 24 (2010).
South Arm (1998)	1 (1998). 3 (2006). 2 (2010).
Totals	1,000 (early 1990s) (only North Shore known). 8,326 (1998–1999) rigorous count. 2,728 (2009) estimate. 3,626 (2010) estimate.

References: NPS 1999a, Appendix A; Corry 2009, Table 1; Whipple 2002, p. 259; 2010d pers. comm.

The majority of *Abronia ammophila* is found in the North Shore population scattered along a 2.41-km (1.5-mi) stretch of beach on the northern shoreline of Yellowstone Lake between the mouth of Pelican Creek and Storm Point (NPS 1999a, p. 3; 1999b, p. 4; Correy 2009, p. 2). This population contains 95 percent or more of all *A. ammophila* (NPS 1999a, pp. 2, Appendix A; Whipple 2002, p. 264; Correy 2009, p. 4). Prior to surveys conducted between 1995 and 1999, the North Shore population of *A. ammophila* was the only known population (NPS 1999a, p. 3; Correy 2009, p. 2). Of the additionally discovered sites, two are located on the west shore of Yellowstone Lake: One at Rock Point, and one at a picnic area 1.6 km (1 mi) west of Pumice Point (NPS 1999a, p. 5; NPS 1999b, p. 4). Additionally, a single plant was found during surveys on the east shore of the South Arm (NPS 1999a, p. 5). Not all suitable habitat within YNP has been surveyed (NPS 1999a, pp. 6–7).

Casual surveys of the North Shore area in the early 1990s estimated the population to be around 1,000 plants (Correy 2009, pp. 1–2), with the majority of the plants of a large-size class representing mature, older plants (NPS 1999a, p. 1; 1999b, p. 7). No seedlings were observed (NPS 1999b, p. 7). Extensive surveys during the 1998–1999 field seasons conservatively estimated the North Shore population to consist of 7,978 *Abronia ammophila* plants, with 45 percent of the population represented by young recruitment within the prior 2 years (recruit and medium class plants) (NPS 1999a, p. 1). The record high lake levels of 1996 and 1997 appeared to improve the habitat conditions for *A. ammophila* by eroding the southern edge of the stabilized sand along the northern shoreline (NPS 1999b, p. 7; Whipple 2002, p. 265). Although this erosion washed away part of the existing habitat, it also improved conditions for recruitment of seedlings (NPS 1999b, p. 7; Whipple 2002, p. 265).

During the 2009–2010 field season, surveys of the North Shore population yielded an approximate count of 3,600 *A. ammophila* plants (Correy 2009, p. 3; Whipple 2010d, pers. comm.; Whipple 2011, pers. comm.). The North Shore population can be split into four subpopulations (Correy 2009, p. 2). Two of these subpopulations had comparable population counts during both the 1998–1999 survey and the 2009–2010 estimate (Correy 2009, pp. 3–4). The remaining two subpopulations, the Thermal and Long Skinny groups, had decreased in both total area populated and total number of plants (Correy 2009, p. 5). The central portion of the Thermal group is now bare or mostly bare sand due to increased ground temperatures (due to changes within the Yellowstone geothermal basin), ground subsidence, increased scouring during storms, or a combination of such factors (Correy 2009, p. 5). The Long Skinny group also may have been affected by increased ground temperatures, particularly on the western end; furthermore, some of the habitat may have eroded (Correy 2009, p. 5). Additional factors potentially affecting the low population count include many years of drought (Whipple 2002, p. 265; Correy 2009, pp. 5–6) and lack of rigorous survey methods (Correy 2009, pp. 5–6).

The Rock Point and Pumice Point *Abronia ammophila* populations were accurately counted in 1998 and 2009 (Correy 2009, Table 1). In 1998, the Rock Point population consisted of 324 individual plants; the 2009 survey counted 120 individual plants (NPS 1999a, p. 6; Correy 2009, Table 1). An area of Rock Point surveyed in 1998 had no *A. ammophila* in June, but contained many medium-sized plants later in the summer (NPS 1999a, p. 6). The Pumice Point population consisted of 22 plants in 1998, whereas only 5 were counted in 2009 (NPS 1999a, p. 6; Correy 2009,

Table 1). In 1998, the Pumice Point population contained a higher percentage of large (diameter greater than or equal to 5 up to 30 cm (2 up to 11.8 in.)) and very large (diameter greater than or equal to 30 cm (11.8 in.)) plants when compared to the North Shore population distribution (NPS 1999a, p. 6). Additionally, the Pumice Point population contained 24 plants in the 2010 field survey (Whipple 2010e, pers. comm.), which is comparable to the 1998 population count.

The South Arm population contained only one large *Abronia ammophila* plant when it was discovered in 1998 (NPS 1999a, p. 6). When this site was revisited in 2005, the large individual found in 1998 was no longer present, but three small *A. ammophila* plants were present (Correy 2009, p. 2). Additionally, during the 2010 field survey, this population consisted of two plants (Whipple 2010e, pers. comm.).

Dead and dying plants were counted during the 1998–1999 field surveys. Dead and dying *Abronia ammophila* plants accounted for 1.3 percent of the total population (NPS 1999a, Appendix A). Of the dead *A. ammophila* plants, many were large individuals; however, some were failed seedlings (NPS 1999b, p. 7). The majority of dead and dying plants did not display obvious causes of mortality; they were interspersed throughout the communities (NPS 1999b, p. 7). Additionally, stressed *A. ammophila* plants are able to recover and put out new growth later in the season (NPS 1999b, p. 7).

The Wyoming Natural Diversity Database (WNDD) has designated *Abronia ammophila* as a plant species of concern with ranks of G1 and S1 (Heidel 2007, p. 1). This designation indicates that *A. ammophila* is considered to be critically imperiled because of extreme rarity (*i.e.*, often less than five occurrences (a location where a plant or plants has been recorded)) or because some factor makes it highly vulnerable to extinction both at the global and State level; however, this ranking does not grant *A. ammophila* any special status under State legislation (WNDD 2009, unpaginated; WNDD 2010, unpaginated). Since *A. ammophila* is endemic to Wyoming, the Wyoming occurrences encompass the entire global range. Additionally, YNP considers *A. ammophila* to be a sensitive species of concern; therefore, it evaluates effects to this species in conjunction with any project or action that has the potential to affect the plant (Whipple 2011, pers. comm.).

Trends

Natural fluctuations in the *Abronia ammophila* population from year to year or even within a season are not understood (Correy 2009, p. 6). From the first population estimates of the North Shore population in the early 1990s to the more rigorous survey conducted in 1998–1999, there was extensive recruitment and the *A. ammophila* population increased approximately 87 percent (NPS 1999a, p. 1; Correy 2009, pp. 6, Table 1). Notably, 1996 and 1997 had high precipitation, with resultant high lake levels (NPS 1999a, p. 2). The 1998–1999 surveys recorded approximately 20 percent of the population to be seedlings or recruit size class (NPS 1999a, Appendix A). The 2009 population estimate of the North Shore populations shows a decrease from the 1998–1999 survey (Correy 2009, Table 1). However, the 1998–1999 survey was an exact count, whereas the 2009 was an estimate. Additionally, the subsequent 2010 population estimate shows a slight increase in the population size compared to the 2009 population estimate (Whipple 2010e, pers. comm.). Hypotheses for population fluctuations are changing thermal activity of the underlying area, ground subsidence, changing precipitation levels, and human and animal activity (Correy 2009, pp. 5–6). The *A. ammophila* population seems to be stable within the parameters of a population that lives in an unstable habitat that fluctuates with wave action and weather (Whipple 2010a, pers. comm.).

Five Factor Evaluation for *Abronia ammophila*

Information pertaining to *Abronia ammophila* in relation to the five factors provided in section 4(a)(1) of the Act is discussed below.

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

Potential factors that may affect the habitat or range of *Abronia ammophila* are discussed in this section, including: (1) Development, (2) trampling, (3) nonnative invasive plants, (4) climate change, and (5) drought.

Development

Abronia ammophila occurs entirely inside YNP, which limits potential threats to its habitat. By statute, regulation, and policy, YNP conserves wildlife and habitat; preserves and maintains biological processes, ecosystem components, and ecological integrity; controls invasive plants; and protects and monitors populations of sensitive plants and animals (See *Yellowstone National Park* under *Factor D. The Inadequacy of Existing Regulatory Mechanisms* in this Five Factor Evaluation for *Abronia ammophila* section). YNP was established prior to the States in which it is located (Mazzu 2010, pers. comm.; Whipple 2010e, pers. comm.). This means that YNP owns not only the land, but also the mineral rights; therefore, energy development is not a threat (Mazzu 2010, pers. comm.; Whipple 2010e, pers. comm.). Construction of new roads, trails, or structures within YNP is rare, with reconstruction of existing features occurring occasionally. When new construction or reconstruction occurs in areas where there are sensitive species, YNP analyzes and carries out construction in a manner that minimizes adverse effects. *A. ammophila* populations are located a sufficient distance from roads; therefore, road reconstruction does not impact any of the *A. ammophila* populations (Whipple 2010e, pers. comm.).

As noted above (see Distribution and Abundance), *Abronia ammophila* has been extirpated in some areas in which there is no longer habitat due to the construction of roads or structures. However, the construction in these areas occurred prior to YNP identifying *A. ammophila* as a species of conservation concern. Now, when new construction or reconstruction occurs, YNP analyzes and carries out construction in a manner that avoids adverse effects to sensitive species. Additionally, projects must be accompanied by a Resource Compliance Checklist that requires the evaluation of any potential impacts to resources including rare plants; if there are impacts, mitigation measures are developed (Schneider 2010, pers. comm.). The majority of YNP remains undeveloped, and we have no information that this will change; therefore, we do not consider development to be a threat to the species now or in the foreseeable future.

Trampling

Trampling of *Abronia ammophila*, by both humans and wildlife, is a potential concern at most sites (Whipple 2010a, pers. comm.). The *Abronia* genus is vulnerable to disturbance by trampling (NPS 1999b, p. 8; Whipple 2010e, pers. comm.). Trampling is frequently indicated as a threat to *A. ammophila* (*e.g.*, NPS 1999a; 1999b); however, studies that seek to document trampling indicate that there is very little foot traffic actually impacting the populations of *A. ammophila* (NPS 1999a, pp. 2, 5).

The North Shore population is located in one of the least visited portions of the north side of Yellowstone Lake's shoreline (NPS 1999b, p. 8). A large wetland restricts access to this site from the west (NPS 1999b, p. 8). The Storm Point Trail approaches the east end of the North Shore population, and visitors occasionally walk down the beach toward this population (NPS 1999b, p. 8). The YNP plans to install a sign just past the Storm Point Trail requesting that visitors remain near the water and avoid sensitive vegetation areas (Schneider 2010, pers. comm.).

The Pelican Creek Nature Trail is also near the North Shore population (Schneider 2010, pers. comm.). No plants currently occur in this area; however, it is historical habitat (Whipple 2010a, pers. comm.; Schneider 2010, pers. comm.). YNP is currently considering conservation measures, including closing all or part of this trail to protect the potential habitat (Whipple 2010a, pers. comm.; Schneider 2010, pers. comm.). A final decision, on this trail, has not been made at this time (Whipple 2011, pers. comm.).

The Pumice Point population of *Abronia ammophila* is located near an unmarked picnic area; the plants are located within 10 m (32.8 ft) of the picnic tables (NPS 1999b, p. 8). This area is currently unsigned (not marked as a picnic area from the main road), and the entrance is inconspicuous (Whipple 2010c, pers. comm.). Additionally, the *A. ammophila* in this area may be benefiting from the disturbance; if foot traffic did not occur, the area might be more densely vegetated and not available as habitat for *A. ammophila* (NPS 1999b, p. 8; Whipple 2010c, pers. comm.).

The two remaining populations are in areas with little visitation (NPS 1999b, p. 8). The Rock Point population is approximately a half-hour walk from the closest access point (Whipple 2010c, pers. comm.). The South Arm population is accessible by boat, with a backcountry campsite located about 200 m (656.2 ft) from the population (Whipple 2010c, pers. comm.). This backcountry campsite has no trail access (Whipple 2010c, pers. comm.).

YNP has received approximately 3 million visitors a year for the past 20 years; visitation was over 3 million for 11 of those years (NPS 2010a, unpaginated). From January to September of 2010, YNP received 3.4 million visitors, an increase of 8.7 percent over the previous year (NPS 2010b, unpaginated). Even with increases to visitation, we have no information indicating that the number of visitors correlates with increased trampling of *Abronia ammophila* populations to a level that poses a threat to the species.

Wildlife trampling, particularly by ungulates, is occasionally indicated as a concern (Whipple 2010a, pers. comm.) We believe that these anecdotal observations do not add up to routine impacts on a scale that would cause the species to be threatened or endangered. Additionally, we believe that trampling by wildlife represents a natural ecological interaction in YNP that the species would have evolved with and poses no threat to long-term persistence.

In summary, the populations of *Abronia ammophila* are located in areas of YNP that do not receive the bulk of visitor traffic. When surveys have attempted to document trampling by humans, observers had determined that the impact is minor. We have only anecdotal evidence of wildlife trampling. Therefore, we have no information indicating that trampling by either humans or wildlife is a threat to the species now or in the foreseeable future.

Nonnative Invasive Plants

After habitat loss, the spread of nonnative invasive species is considered the second largest threat to imperiled plants in the United States (Wilcove *et al.* 1998, p. 608). Nonnative invasive plants alter ecosystem attributes including geomorphology, fire regime, hydrology, microclimate, nutrient cycling, and productivity (Dukes and Mooney 2004, pp. 411–437). Nonnative invasive plants can detrimentally affect native plants through competitive exclusion, altered pollinator behaviors, niche displacement, hybridization, and changes in insect predation (D'Antonio and Vitousek 1992, pp. 74–75; DiTomaso 2000, p. 257; Mooney and Cleland 2001, p. 5449; Levine *et al.* 2003, p. 776; Traveset and Richardson 2006, pp. 211–213).

As of 2010, YNP has documented 218 nonnative plant species occurring within its boundaries (NPS 2010e, p. 1). Encroachment of invasive plants may potentially affect *A. ammophila*, as this species prefers open, sparsely vegetated sites and does not compete well in areas that are more densely vegetated.

Currently, nonnative invasive plants have affected only a few sites occupied by *Abronia ammophila* (NPS 1999b, p. 8; Whipple 2010a, pers. comm.). The invasive grass *Bromus tectorum* (cheatgrass) has been noted in the vicinity of the North Shore population, and *Cirsium arvense* (Canada thistle) occurs near the Rock Point population (Whipple 2010a, pers. comm.). Additionally, some *B. tectorum* was documented around the Storm Point population (NPS 1999b, p. 8). To combat these occurrences, YNP has an exotic vegetation management plan in place that emphasizes prevention, education, early detection and eradication, control, and monitoring (Olliff *et al.* 2001, entire).

In summary, nonnative invasive plants occur within YNP; however, the majority of these species do not impact the habitat of *Abronia ammophila*. A few nonnative invasive species have been documented near the habitat of *A. ammophila*. These species are being monitored and the National Park System (NPS) has mechanisms in place to help control these encroachments. We have no information indicating that nonnative invasive species are modifying the species habitat to the extent that it represents a threat to the species now or in the foreseeable future.

Climate Change

The Intergovernmental Panel on Climate Change (IPCC) was established in 1988 by the World Meteorological Organization and the United Nations Environment Program in response to growing concerns about climate change and, in particular, the effects of global warming. The IPCC Fourth Assessment Report (IPCC 2007, entire) synthesized the projections of the Coupled Model Intercomparison Project (CMIP) Phase 3, a coordinated large set of climate model runs performed at modeling centers worldwide using 22 global climate models (Ray *et al.* 2010, p. 11). Based on these projections, the IPCC has concluded that the warming of the climate system is unequivocal, as evidenced from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level (IPCC 2007, pp. 6, 30; Karl *et al.* 2009, p. 17). Changes in the global climate system during the 21st century are likely to be larger than those observed during the 20th century (IPCC 2007, p. 19). Several scenarios are virtually certain or very likely to occur in the 21st century including: (1) Over most land, weather will be warmer, with fewer cold days and nights, and more frequent hot days and nights; (2) areas affected by drought will increase; and (3) the frequency of warm spells and heat waves over most land areas will likely increase (IPCC 2007, pp. 13, 53).

In some cases, climate change effects can be demonstrated and evaluated (*e.g.*, McLaughlin *et al.* 2002, p. 6073). Where regional effects from global climate change have been demonstrated, we can

rely on that empirical evidence to predict future impacts, such as increased stream temperatures (see status review for Rio Grande cutthroat trout, 73 FR 27900; May 14, 2008) or loss of sea ice (see determination of threatened status for the polar bear, 73 FR 28212; May 15, 2008), and treat these effects as a threat that can be analyzed. In instances for which a direct cause and effect relationship between global climate change and regional effects to a specific species has not been documented, we rely primarily on synthesis documents (*e.g.*, IPCC 2007, entire; Independent Scientific Advisory Board 2007, entire; Karl *et al.* 2009, entire) to inform our evaluation of the extent that regional impacts due to climate change may affect our species. These synthesis documents present the consensus view of climate change experts from around the world. Additionally, we have examined models downscaled to specific regions (*e.g.*, Ray *et al.* 2010, entire; WRCC 2011, p. 1; CIG 2011, p. 1)—including some in-progress finer-scaled models that include Wyoming and the surrounding area—in order to inform our evaluation of the extent that regional impacts may threaten species. Typically, the projections of downscaled models agree with the projections of the global climate models (Ray *et al.* 2010, p. 25). Climate change projections are based on models with assumptions and are not absolute.

Portions of the global climate change models can be used to predict changes at the regional-landscape scale; however, this approach contains higher levels of uncertainty than using global models to examine changes on a larger scale. The uncertainty arises due to various factors related to difficulty in applying data to a smaller scale, and to the paucity of information in these models such as regional weather patterns, local physiographic conditions, life stages of individual species, generation time of species, and species reactions to changing carbon dioxide levels. Additionally, global climate models do not incorporate a variety of plant-related factors that could be informative in determining how climate change could affect plant species (*e.g.*, effect of elevated carbon dioxide on plant water-use efficiency, the physiological effect to the species of exceeding the assumed (modeled) bioclimatic limit, the life stage at which the limit affects the species (seedling versus adult), the life span of the species, and the movement of other organisms into the species' range) (Shafer *et al.* 2001, p. 207). Moreover, empirical studies are needed on what determines the distributions of species and species assemblages.

Regional landscapes also can be examined by downscaling global climate models. Two common methods of downscaling are statistical downscaling and dynamic downscaling (Fowler *et al.* 2007, p. 1548). These downscaled models typically inherit the broad-scale results of global climate change models, imbed additional information, and run the models at a finer scale (Ray *et al.* 2010, p. 25, Hostetler 2011, pers. comm.). These methods provide additional information at a finer spatial scale (*i.e.*, all of Wyoming downscaled to a 15-km (9.3-mi) resolution (Hostetler 2010, pers. comm.). However, they are not able to account for the myriad of processes that may affect a species that only inhabits a narrow range, as local effects may reduce or amplify the large-scale patterns that are projected over the larger spatial resolution of the global climate models (Ray *et al.* 2010, p. 24). In summary, global climate models can play an important role in characterizing the types of changes that may occur, so that the potential impacts on natural systems can be assessed (Shafer *et al.* 2001, p. 213). However, they are of limited use to assess local impacts to species with a limited range, such as the five plants discussed in this finding.

Climate change is likely to affect the habitat of *Abronia ammophila*, but we lack scientific information on what those changes may ultimately mean for the status of the species. Yellowstone Lake water levels affect habitat conditions for *A. ammophila*. As noted previously, the record high lake levels of 1996 and 1997 (due to increased snowpack and subsequent spring snowmelt) had both positive and negative effects on *A. ammophila* (NPS 1999b, p. 7; Whipple 2002, p. 265). In general, the outflow and maximum water surface elevation of Yellowstone Lake are functions of winter snow accumulation and spring precipitation inputs; these vary significantly from year to year (Farnes 2002, p. 73). Analysis of snow depth and last date of snow cover in YNP from 1948 to 2003 has shown that winters are getting shorter, as measured by the number of days with snow on the ground (Wilmers and Getz 2005, entire). This change is due to decreased snowfall and an increase in the number of days with temperatures above freezing (Wilmers and Getz 2005, entire).

Climate change effects are not limited to the timing and amount of precipitation; other factors potentially influenced by climate change may in turn affect the habitat conditions for *Abronia ammophila*. For example, fire frequency, insect populations (*e.g.*, mountain pine beetle, *Dendroctonus ponderosae*), and forest pathogens may be influenced by climate change (Logan and Powell 2001, p. 170; Westerling *et al.* 2006, pp. 942–943) and may in turn affect forest canopy cover and the timing of snowmelt within the Yellowstone Lake watershed. The increased rate of snowmelt caused by fire-generated openings in the forest canopy from the 1988 fires in YNP may have slightly reduced the annual maximum Yellowstone Lake level because it spread the snowpack melt rate over a longer period of time (Farnes 2002, p. 73). Impacts of specific events on *A. ammophila* and its habitat have not been analyzed.

Climate change is likely to affect multiple variables that may influence the availability of habitat for *A. ammophila*. As lake levels have fluctuated in the past and *A. ammophila* has adapted to these fluctuations, this species should be able to persist so long as climate change does not result in extreme changes to important characteristics of the species habitat, such as the complete loss of water from Yellowstone Lake. At this time, the best available scientific information does not indicate that impacts from climate change are likely to threaten the species now or in the foreseeable future.

Drought

Precipitation studies show that YNP weather cycles typically follow the larger weather patterns across the larger Northern Rockies ecosystem (Gray *et al.* 2007, p. 24). The reconstruction of precipitation levels in YNP from AD 1173–1998 shows strong interannual variability (Gray *et al.* 2007, entire). Moreover, extreme wet and dry years, which have occurred recently, fall within the range of past variability (Gray *et al.* 2007, entire).

We believe that *Abronia ammophila* has evolved to adapt to recurring drought conditions because it persists in this type of environment. Short-term population fluctuations appear to be typical for the species. The population at Rock Point was thought to have been extirpated due to drought; however, a survey in 2004 located seedlings at this site (Saunders and Sipes 2004, p. 4). The Pumice Point population completely vanishes some years. It is located on sand that does not connect to the aquifer, and during drought years the population can be 9.1 m (30 ft) above water (Whipple 2010e, pers. comm.). Although drought may temporarily influence the abundance of

plants at some specific locations, we have no information indicating that drought threatens the species now or in the foreseeable future.

Summary of Factor A

YNP offers protection of *Abronia ammophila* populations from all kinds of development including roads, campgrounds, buildings, mining, and energy development. There are currently no plans for any further development in YNP near the existing populations or potential habitat of *A. ammophila*. We have no information to suggest that trampling, nonnative invasive plants, climate change, or drought represents a threat to the species.

We conclude that the best scientific and commercial information available indicates that *Abronia ammophila* 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.

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

There has been limited use and collection of *Abronia ammophila* and its parts for scientific study (Saunders and Sipes 2006, p. 77). Additionally, the Denver Botanical Gardens (DBG) collected approximately 3,300 *A. ammophila* seeds in 2005 (DBG 2008, p. 3). The DBG is a participating institution in the Center for Plant Conservation, an organization dedicated to preventing the extinction of plants native to the United States (Center for Plant Conservation 2010, unpaginated). Because these collections were limited, we do not believe this collection constituted a threat to the species. The collections also contribute to the long-term conservation of the species.

Specimens, seeds, and parts of *Abronia ammophila* are occasionally collected for scientific purposes in order to increase the knowledge of this species (*e.g.*, Saunders and Sipes 2006; DBG 2008); however, these collections are rare. We do not have any evidence of risks to *A. ammophila* from overutilization for commercial, recreational, scientific, or educational purposes, and we have no reason to believe this factor will become a threat to the species in the future. We conclude that the best scientific and commercial information available indicates that *A. ammophila* 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.

Factor C. Disease or Predation

Disease

Abronia ammophila is not known to be affected or threatened by any disease. Therefore, we do not consider disease to be a threat to *A. ammophila* now or in the foreseeable future.

Predation—Grazing and Herbivory

No studies have been conducted investigating the effects of grazing or herbivory on *Abronia ammophila*. Minimal insect herbivory has been noted. Sphingid moth larvae and others tentatively identified in the family *Noctuidae* have been seen feeding on the aboveground plant parts (Saunders and Sipes 2004, p. 11). Also, what appeared to be an army cutworm caterpillar was observed eating the belowground parts of an uprooted plant (NPS 1999b, p. 7).

Additionally, some uprooted, partially eaten taproots were found in areas with abundant rodent tunnels (NPS 1999b, p. 7). Ungulate grazing has been noted on species that grow near *Abronia ammophila;* however, none has been noted on *A. ammophila* (NPS 1999b, p. 7). Any predation, as noted above, would represent a natural ecological interaction in YNP. We have no evidence that the extent of such predation represents a population level threat to *A. ammophila*. Therefore, we do not consider predation to be a threat to the species now or in the foreseeable future.

Summary of Factor C

We have no evidence of adverse impacts to *Abronia ammophila* from disease or predation. We conclude that the best scientific and commercial information available indicates that *A. ammophila* is not in danger of extinction or likely to become so within the foreseeable future because of disease or predation from herbivory or grazing.

Factor D. The Inadequacy of Existing Regulatory Mechanisms

The Act requires us to examine the adequacy of existing regulatory mechanisms with respect to threats that may place *Abronia ammophila* in danger of extinction or likely to become so in the future. Existing regulatory mechanisms that could have an effect on potential threats to *A. ammophila* include (1) local land use laws, processes, and ordinances; (2) State laws and regulations; and (3) Federal laws and regulations. *A. ammophila* occurs entirely on Federal land under the jurisdiction of the YNP; therefore, the discussion below focuses on Federal laws. Actions adopted by local groups, States, or Federal entities that are discretionary, including conservation strategies and guidance, are not regulatory mechanisms; however, we may discuss them in relation to their effects on potential threats to the species.

Federal Laws and Regulations

Yellowstone National Park

All known populations of *Abronia ammophila* occur within YNP. The YNP was established as the first national park on March 1, 1872, under control of the Secretary of the Department of the Interior (NPS 2010c, unpaginated). The NPS was established by the NPS Organic Act of 1916, and reaffirmed by the General Authorities Act, as amended (NPS 2008a, unpaginated; Schneider 2010, pers. comm.). The NPS Organic Act states, "[The NPS] shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations* * * to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (16 USC 1) (NPS 2006b, p. 8; NPS 2008a, unpaginated; Schneider 2010, pers. comm.).

Additionally, the Management Policies of the NPS state that conservation is paramount in situations of conflict between conserving resources and values and providing for enjoyment of them (NPS 2006b, p. 9; Schneider 2010, pers. comm.). These policies also charge the NPS with preserving the fundamental physical and biological processes, and maintaining all the components and processes of a naturally evolving park ecosystem, including the natural abundance, diversity, and genetic and ecological integrity of the plant and animal species native to those ecosystems (NPS 2006b, pp. 35–36; Schneider 2010, pers. comm.). The NPS is responsible for the inventory of native species that are of special management concern to parks (such as rare, declining, sensitive, or unique species and their habitats) and will manage them to maintain their natural distribution and abundance (NPS 2006b, pp. 45–46; Schneider 2010, pers. comm.). The Management Policies also direct the NPS to control detrimental nonnative species and manage detrimental visitor access (NPS 2006, p. 45).

As stated above, YNP is required, to the maximum extent practicable, to

prevent exotic (nonnative invasive) plant introduction and to control established exotic plants by law, executive order, and management policy (*e.g.*, Executive Order 13112, National Park Service Management Policies (NPS 1988), and the Federal Noxious Weed Act of 1974) (Olliff *et al.* 2001, pp. 348–349). YNP's approach emphasizes prevention, education, early detection and eradication, control, and monitoring (Olliff *et al.* 2001, entire).

Visitors to national parks are prohibited from removing, defacing, or destroying any plant, animal, or mineral; this includes collecting natural or archeological objects (NPS 2006c, p. 2). Visitors are prohibited from driving off roadways or camping outside of designated campgrounds (NPS 2010d, unpaginated). Additionally, YNP has developed a Conservation Plan for *Abronia ammophila* (NPS 1999b, entire). This plan recommends the protection of all known (and any newly discovered) populations, monitoring of the populations, reestablishment of historical occupancy areas, long-term seed storage, and research (NPS 1999b, pp. 10–11).

National Environmental Policy Act

All Federal agencies are required to adhere to the National Environmental Policy Act (NEPA) of 1970 (42 U.S.C. 4321 *et seq.*) for projects they fund, authorize, or carry out. The Council on Environmental Quality's regulations for implementing NEPA (40 CFR 1500–1518) 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.

Summary of Factor D

We considered the adequacy of existing regulatory mechanisms to protect *Abronia ammophila*. We believe the existing regulatory mechanisms, especially the NPS Organic Act, adequately protect the Yellowstone Lake shore habitat of *Abronia ammophila* from the potential threats of development, trampling, and nonnative invasive plants. We expect that *A. ammophila* and its habitat will be generally protected from direct human disturbance. Therefore, we conclude that the existing regulatory mechanisms are adequate to protect *A. ammophila* from the known potential threat factors.

We conclude that the best scientific and commercial information available indicates that *Abronia ammophila* is not in danger of extinction or likely to become so within the foreseeable future because of inadequate regulatory mechanisms.

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

Natural and manmade factors with the potential to affect *Abronia ammophila* include: (1) Small population size, (2) pollination, and (3) genetic diversity.

Small Population Size

Small populations can be especially vulnerable to environmental disturbances such as habitat loss, nonnative species, grazing, and climate change (Barrett and Kohn 1991, p. 7; Oostermeijer 2003, p. 21; O'Grady 2004, pp. 513–514). However, plants that are historically rare may have certain adaptations to rarity (*e.g.*, early blooming, extended flowering, or mixed-mating systems) that enable them to persist (Brigham 2003, p. 61).

Based on herbarium records, extirpation of *Abronia ammophila* sites has occurred (see Distribution and Abundance discussion above). However, additional sites also have been recently discovered, and not all suitable habitat within YNP has been surveyed (NPS 1999a, pp. 6–7). We have no information on whether these new sites represent recent expansion of the species or if surveys were not previously conducted in these areas.

We do not have any indication that *Abronia ammophila* was ever present on the landscape over a more extensive range. Existing sites are monitored, and surveys have located new occurrences. We have no information indicating that random demographic or environmental events are a threat to the species now or in the foreseeable future because of its small population size.

Pollination

Small populations may represent an unreliable food source, which may be visited by fewer pollinators than larger, less fragmented populations (Oostermeijer 2003, p. 23). However, low visitation rates may be more of a concern in currently rare species that were historically abundant (Brigham 2003, p. 84). We have no information suggesting that *Abronia ammophila* was previously more abundant across the landscape. Co-flowering species (species that flower during the same timeframe) also may be important to pollination of *A. ammophila;* the pollinators recorded as visiting *A. ammophila* also were observed visiting other dune plants in the vicinity (Saunders and Sipes 2004, p. 13).

Only very limited information is available regarding pollination of *Abronia ammophila*. However, *A. ammophila* is a historically rare species that exhibits a mixed-mating system. A mixed-mating system and co-flowering species may help alleviate negative effects that may occur due to low pollination visitation rates. Therefore, we have no information indicating that poor pollination is a threat to the species now or in the foreseeable future.

Genetic Diversity

Small population size can decrease genetic diversity due to genetic drift (the random change in genetic variation each generation), and inbreeding (mating of related individuals) (Antonovics 1976, p. 238; Ellstram and Elam 1993, pp. 218–219). Genetic drift can decrease genetic variation within a population by favoring certain characteristics and, thereby, increasing differences between populations (Ellstram and Elam 1993, pp. 218–219). Self-fertilization and low dispersal rates can cause low genetic diversity due to inbreeding (Antonovics 1976, p. 238; Barrett and Kohn 1991, p. 21). This decreased genetic diversity diminishes a species' ability to adapt to the selective pressures of a changing environment (Newman and Pilson 1997, p. 360; Ellstrand 1992, p. 77).

Limited information is available regarding the genetic diversity of the *Abronia* genus. No information is available regarding the genetic diversity exhibited by *Abronia ammophila*. Therefore, we have no information indicating that a lack of genetic diversity is a threat to the species now or in the foreseeable future.

Summary of Factor E

Abronia ammophila is a historically rare species that, as such, has adaptations such as a mixed-mating system and prolific flowering, which minimize the risks of small population size, low pollinator abundance, and genetic diversity. Therefore, we conclude that the best scientific and commercial information available indicates that *Abronia ammophila* is not in danger of extinction or likely to become so within the foreseeable future because of small population size,

pollination, or reduced genetic diversity.

Finding for *Abronia ammophila*

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

The primary factor potentially impacting *Abronia ammophila* is human disturbance through trampling. However, studies that have sought to quantify foot traffic in the habitat of *A. ammophila* have found that there is little foot traffic occurring (NPS 1999a, pp. 2, 5). Additionally, *A. ammophila* prefers open sites and thrives under some disturbance. Other factors potentially affecting *A. ammophila*—including nonnative invasive plants, drought, small population size, limited pollinators, and genetic diversity—are either limited in scope, or lacking evidence apparent to us indicating that they adversely impact the species. We have no evidence that overutilization, disease, or predation are affecting this species. Although climate change will likely impact the status of some plant species in the future, we do not have enough information to determine that climate change will result in a species-level response from *A. ammophila*. Additionally, the existing regulatory mechanisms directing management of YNP appear to be adequate to protect the species from potential threats.

Based on our review of the best available scientific and commercial information pertaining to the five factors, we find that the threats are not of sufficient imminence, intensity, or magnitude to indicate that *Abronia ammophila* is in danger of extinction (endangered) or likely to become endangered within the foreseeable future (threatened), throughout all of its range. Therefore, we find that listing *A. ammophila* as a threatened or endangered species is not warranted throughout its range.

Significant Portion of the Range

Having determined that *Abronia ammophila* 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 *A. ammophila* is in danger of extinction or is likely to become endangered in the foreseeable future.

In determining whether *Abronia ammophila* is threatened or endangered in a significant portion of its range, we first addressed whether any portions of the range of *A. ammophila* warrant further consideration. We evaluated the current range of *A. ammophila* to determine if there is any apparent geographic concentration of the primary stressors potentially affecting the species including trampling, nonnative invasive plants, drought, small population size, limited pollinators, and genetic diversity. This species' small range suggests that stressors are likely to affect it in a uniform manner throughout its range. However, we found the stressors are not of sufficient imminence, intensity, magnitude, or geographically concentrated such that it warrants evaluating whether a portion of the range is significant under the Act. We do not find that *A. ammophila* is in danger of extinction now, nor is likely to become endangered within the foreseeable future, throughout all or a significant portion of its range. Therefore, listing *A. ammophila* as threatened or endangered under the Act is not warranted at this time.

We request that you submit any new information concerning the status of, or threats to, *Abronia ammophila* to our Wyoming Ecological Services Field Office (see **ADDRESSES** section) whenever it becomes available. New information will help us monitor *A. ammophila* and encourage its conservation. If an emergency situation develops for *A. ammophila*, or any other species, we will act to provide immediate protection.

Species Information for *Agrostis rossiae*

Species Description

Agrostis rossiae is a small annual grass in the family Poaceae (Clark *et al.* 1989, p. 8; Fertig 1994, unpaginated; 2000c, unpaginated). *A. rossiae* grows as a dense clump about 5 to 15 cm (2.0 to 5.9 in.) high (Fertig 2000c, unpaginated). The short leaves are 1.0 to 2.5 cm (0.39 to 0.98 in.) long, and 0.5 to 2.0 millimeters (mm) (0.02 to 0.08 in.) wide, with slightly inflated and smooth sheaths (the lower part of the leaf that surrounds the stem) (Clark *et al.* 1989, p. 8; Clark and Dorn 1981, p. 10; Fertig 1994, unpaginated; 2000c, unpaginated). The one-flowered spikelets (flowers) form at the top of the stems in a narrow, compact panicle (a structure in which the flowers mature from the bottom upwards) that is 2.0 to 6.0 cm (0.79 to 2.36 in.) long (Dorn 1980, p. 59; Fertig 2000c, unpaginated). The panicle remains compact at maturity (Fertig 1994, unpaginated). Branches of the panicle are scabrous (rough), purple, and lack spikelets at the base (Clark *et al.* 1989, p. 8; Dorn 1980, p. 59; Fertig 2000c, unpaginated).

Discovery and Taxonomy

Edith A. Ross collected the first recorded specimen of *Agrostis rossiae* in July of 1890 (Vasey 1982, p. 77; Hitchcock 1905, p. 41). The genus *Agrostis* consists of over 100 species occurring in both hemispheres, typically in cooler areas of temperate climates (Hitchcock 1905, p. 5). More recent sources list 150 to 200 species (Harvey 2007, unpaginated), or up to 220 species within the *Agrostis* genus (Watson and Dallwitz 1992, unpaginated).

Species of the *Agrostis* genus are able to form morphologically similar ecotypes (subspecies that survives as a distinct group due to environmental pressures and isolation) in response to variations in climate, heavy metals in the soil, and other unusual soil conditions (Bradshaw 1959, entire; Jowett 1964, p. 78; Aston and Bradshaw 1966, entire; Jain and Bradshaw 1966, pp. 415–417). Therefore, morphology of *Agrostis* species is not a reliable indicator of species (Tercek 2003, p. 9).

In the geothermally influenced areas of YNP, thermal *Agrostis scabra* (rough bentgrass) is sympatric (occurs in the same area) with *Agrostis rossiae* (Tercek 2003, pp. 9–10). *A. scabra* occurs as an annual in the thermal areas of YNP; however, this species is typically a perennial when it occurs in nonthermal habitats (Fertig 2000c, unpaginated; Tercek 2003, pp. 9–10). *A. scabra* can be distinguished from *A. rossiae*, when mature, by its spreading panicle (Fertig 1994, unpaginated; 2000c, unpaginated; Tercek 2003, pp. 9–10). Another similar species, although not sympatric, is *Agrostis variabilis* (mountain bentgrass), which is a perennial with panicle branches bearing spikelets nearly to the base (whereas *A. rossiae* lacks spikelets at the base) (Fertig 1994, unpaginated; Fertig 2000c, unpaginated). Genetic studies have shown that thermal *Agrostis* species occurring in YNP are more closely related to other thermal *Agrostis* species worldwide than to the nonthermal *Agrostis scabra* (Tercek 2003, pp. 17–21). Additionally, *A. rossiae* and thermal *A. scabra* are closely related to each other (Tercek *et al.* 2003, p. 1308–1309); however, additional genetic studies need to be completed to quantify their relationship. We recognize *A. rossiae* as a valid species and a listable entity.

Biology and Life History

Agrostis rossiae is a thermal species that takes advantage of the warmth from its environment and germinates from December to January, when nonthermal areas remain covered in snow (Tercek 2003, pp. 12, 45, 51). The growing season for *A. rossiae* is from December 1 to April 1; it blooms in May, matures in June, and dies by mid-June when the thermal ground temperature reaches between 40 and 45 °C (104 and 113 °F) (a temperature that kills *A. rossiae*) (Beetle 1977, p. 40; Tercek 2003, pp. 10, 34, 12, 45, 51–52).

Agrostis rossiae plants do not have a reduced seed set when isolated from external pollen sources; this suggests that *A. rossiae* reproduces through apomixis (reproduction that does not involve pollination) (Tercek 2003, p. 19). Seeds remain viable for about 100 years in artificial conditions, but persist for less time in natural conditions (Tercek 2010, pers. comm.). Seeds do not disperse very far from the parent plant (Whipple 2010a, pers. comm.).

Habitat

Typically, *Agrostis rossiae* grows on glacial deposits, which are at a slightly higher elevation than nearby hot springs (Tercek 2003, p. 11). These deposits border active geysers and hot springs at elevations of 2,210 to 2,256 m (7,250 to 7,400 ft) (Clark *et al.* 1989, p. 8; Fertig 1994, unpaginated; 2000c, unpaginated). These geothermally influenced soils remain moist throughout the year even though they are partially isolated from the water table of nearby hot springs by the higher elevation or a nonpermeable rock layer (White *et al.* 1971, p. 77; Fournier 1989, pp. 20–21; Tercek 2003, pp. 36, 45–46; Tercek and Whitbeck 2004, p. 1956).

The geysers in YNP are vapor-dominated, meaning that steam and other gases rise out of the ground (Fournier 1989, pp. 20–21; Tercek 2003, p. 36). The geysers are important to the soils because the elements and chemicals produced from the geysers affect the composition of the soil on which this species grows. The accompanying soils are rich in silica and calcium, and contain gases such as hydrogen sulfide and iron sulfide that are converted into sulfuric acid by bacteria (Tercek and Whitbeck 2004, p. 1956; White *et al.* 1971, p. 77; Fournier 1989, pp. 20–21; Tercek 2003, p. 36). The sulfuric acid lowers the pH (a measure of acidity and alkalinity) of the soil (White *et al.* 1971, p. 77; Fournier 1989, pp. 20–21; Tercek 2003, p. 36). YNP's thermal soils are more acidic (pH 3.9–5.6), in general, than the nonthermal soils (pH 4.3–6.4) (Tercek and Whitbeck 2004, p. 1964). *Agrostis rossiae* demonstrates peak growth in acidic soils (pH 3.0), whereas the optimal growth of both thermal and nonthermal *Agrostis scabra* occurs at a pH of 5.0 (Terceck and Whitbeck 2004, p. 1964). While *A. rossiae* is more tolerant of acidity than other sympatric *Agrostis* species, its growth declines at pH of less than 3.0 (Tercek and Whitbeck 2004, p. 1964). Many of the thermal features in YNP have a very high acidity (Whipple 2011, pers. comm.).

In addition to *Agrostis scabra*, a limited number of thermally adapted species occur in the same habitat as *Agrostis rossiae: Racomitrium canescens* (Racomitrium moss), several heat-loving soil fungi, a heat-tolerant grass—*Dichanthelium lanuginosum* (panicgrass), and a few annual forbs (Tercek and Whitbeck 2004, p. 1956). Annual forbs include *Conyza canadensis* (Canadian horseweed), *Gnaphalium stramineum* (cottonbatting plant), *Plantago elongata* (Prairie plantain), *Mimulus guttatus* (seep monkeyflower), and *Heterotheca depressa* (hairy false goldenaster) (Fertig 2000c, unpaginated).

Distribution and Abundance

Agrostis rossiae is endemic to YNP, occurring only in Teton County, Wyoming (Beetle 1977, p. 40; Clark and Dorn 1981, p. 10; Clark *et al.* 1989, p. 8; Fertig 2000c, unpaginated, Tercek 2003, p. 10). Even though there are many thermal areas in YNP, *Agrostis rossiae* only occurs in the west-central portion of YNP (Tercek 2003, p. 10). Specifically, *A. rossiae* only occurs in the Firehole River drainage and the Shoshone Geyser Basin (Greater Yellowstone 2010, unpaginated). The reason for this restriction is not known. One proposed hypothesis is that the high acidity of some of the other thermal areas restricts the species' distribution; another is that *A. rossiae* is a fairly recently evolved species that has not had time for successive generations to disperse and colonize a wider area (Whipple 2010e, pers. comm.).

Four known populations of the plant occur in an area of approximately 4.86 ha (12 ac); these populations are named Upper Geyser Basin, Shoshone, Midway, and Lower Geyser (Whipple 2010a, pers. comm.). Many of these occurrences are ephemeral (only persist for a short period) subpopulations (Fertig 2000c, unpaginated). Because of the changing thermal habitat, subpopulation numbers and locations may fluctuate greatly (Fertig 2000c, unpaginated). One small (generally less than 50 plants) subpopulation northeast of Infant Geyser in Geyser Hill disappeared due to changes in soil temperatures between 1992 and 2008 (Fertig 2000c, unpaginated; Whipple 2010e, pers. comm.).

The WNDD has designated *Agrostis rossiae* as a plant species of concern with ranks of G1 and S1 (Heidel 2007, p. 1). This designation indicates that *A. rossiae* is considered to be critically imperiled because of extreme rarity. For background information on G1 and S1 rankings, please refer to the last paragraph under *Distribution and Abundance* in the Species Information for *Abronia ammophila* section. Since *A. rossiae* is endemic to Wyoming, the Wyoming occurrences encompass the entire global range. Additionally, YNP considers *A. rossiae* to be a sensitive species of concern; therefore, it evaluates effects to this species in conjunction with any project or action that has the potential to affect the plant (Whipple 2011, pers. comm.).

Trends

Subpopulations can range in size from a solitary plant up to several thousand plants, in an area with a diameter of 100 m (328.1 ft) (Tercek 2003, p. 10; Tercek and Whitbeck 2004, p. 1956). Surveys conducted in 1995 suggest that the total population of all known *Agrostis rossiae* plants is approximately 5,000 to 7,500 individuals (Fertig 2000a, p. 36; 2000a, unpaginated). The 1998 survey determined the total population consisted of between 5,580 and 7,735 plants (Whipple *in litt.* 2009, entire). The entire population has not been surveyed in any additional years (Whipple *in litt.* 2009, entire). Surveys have been completed on a sporadic schedule, with not all populations surveyed in a given year (Whipple 2009 *in litt.*, unpaginated). All population counts are estimates as *A. rossiae* is an annual with a clumped growth form, and exact counts are unable to be obtained without destroying the plants (Whipple 2010d, pers. comm.). Overall, there is not enough information to conclusively determine rangewide trends; however, the total population numbers appear to be stable despite subpopulation fluctuations. Additionally, the known populations have expanded in the last 3 years (Whipple 2010a, pers. comm.).

Five Factor Evaluation for *Agrostis rossiae*

Information pertaining to *Agrostis rossiae* in relation to the five factors provided in section 4(a)(1) of the Act is discussed below.

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

The following potential factors that may affect the habitat or range of *Agrostis rossiae* are discussed in this section, including: (1) Development, (2) trampling, (3) nonnative invasive species, (4) climate change, (5) thermal fluctuations, (6) drought, and (7) fire.

Development

Agrostis rossiae occurs entirely inside YNP, which limits potential threats to its habitat from development. As stated above (see Factor D under *Abronia ammophila*), YNP owns both its land and the mineral rights so energy development within the YNP's boundary is not a threat (Mazzu 2010, pers. comm.; Whipple 2010e, pers. comm.).

In the late 1970s and early 1980s, potential for geothermal energy development outside YNP was considered a threat to *Agrostis rossiae* because of the potential to affect the thermal basin that underlies YNP (Fertig 2000, unpaginated). Currently, no known applications for geothermal leases have this potential (Mazzu 2010, pers. comm.; Whipple 2010e, pers. comm.). However, applications are occasionally made for geothermal leases in the geothermal areas outside of YNP (NPS 2008b, unpaginated). The Geothermal Steam Act of 1970 (30 U.S.C. 1001–1027, December 24, 1970), as amended in 1977, 1988, and 1993, provides protections for the thermal features in YNP (see *Factor D. The Inadequacy of Existing Regulatory Mechanisms* below) (Legal Information Institute 2010, unpaginated). This law should protect the species, unless high energy costs, such as occurred in the late 1970s and early 1980s, encourage development interest that results in changes that weaken these protections. Therefore, *A. rossiae* is not threatened by geothermal energy development inside or outside of YNP's boundary.

As stated above, new construction of roads, trails, or structures occurring in YNP is rare, with reconstruction of existing features occurring occasionally (Whipple 2010e, pers. comm.). When new construction or reconstruction occurs in areas where there are sensitive species, YNP analyzes and carries out construction in a manner that minimizes adverse effects. For example, the reconstruction of the Biscuit Basin Boardwalk in the summer of 2010 included rerouting the boardwalk and restoration of *Agrostis rossiae* habitat that had been impacted during prior maintenance (Whipple 2010a, pers. comm.; 2010e, pers. comm.).

The majority of YNP remains undeveloped, and we have no information that this will change; therefore, we do not view development to be a threat to the species now or in the foreseeable future.

Trampling

Most habitat of *Agrostis rossiae* is easily accessible to visitors, as it is generally located near popular thermal features in YNP (Whipple 2010a, pers. comm.). However, visitors are required to stay on boardwalks and designated trails around thermal areas (NPS 2006c, unpaginated). Human impact to *A. rossiae* was noted in a survey of the Shoshone Geyser Basin area (Whipple 2009 *in litt.*, unpaginated). This trampling was partially mitigated by the reroute discussed above; surveys in 2000, after the trail was rerouted, documented a healthy *A. rossiae* population (Whipple 2009 *in litt.*, unpaginated). No studies have specifically examined disturbance due to trampling or its effects on *A. rossiae*. However, *A. rossiae* is typically located in the vicinity of thermal features that could be detrimental for humans to walk near, and any areas that have the potential for trampling are protected by YNP's policies.

For information on impacts of increased visitation to YNP, please refer to the "Trampling" discussion under *Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range* in the Five Factor Evaluation for *Abronia ammophila* section. As the plant is located in YNP, it is afforded protections (see *Factor D: The Inadequacy of Existing Regulatory Mechanisms* below).

Wildlife, also, have the potential to trample *Agrostis rossiae*. American bison (*Bison bison*) scat (fecal droppings) has been found in the vicinity of *A. rossiae* at several sites; however, no trampling of *A. rossiae* was noted in the survey notes (Whipple 2009 *in litt.*, unpaginated). In 1998, a small patch of *A. rossiae* was highly impacted by the actions of a rutting bull elk (*Cervus canadensis*); however, that *A. rossiae* population was reported to be healthy when resurveyed in 2000 (Whipple 2009 *in litt.*, unpaginated). We believe that these anecdotal observations do not add up to routine impacts on a scale that would cause the species to be threatened or endangered. Additionally, we believe that trampling by wildlife, as noted above, represents a natural ecological interaction in YNP with which the species would have evolved and poses no threat to long-term persistence.

We have no information indicating that trampling by either humans or wildlife is a threat to the species now or in the foreseeable future.

Nonnative Invasive Plants

For general background information on nonnative invasive plants, please refer to the first paragraph of "Nonnative Invasive Plants" under *Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range* in the Five Factor Evaluation for *Abronia ammophila* section.

As stated above, as of 2010, YNP has documented 218 nonnative plant species occurring within its boundaries (NPS 2010e, p. 1). The majority of these plants have not been documented in or around *Agrostis rossiae* habitat. Encroachment of nonnative species has the potential to affect *Agrostis rossiae*. However, at this time, none of the nonnative species are able to tolerate the hottest of the thermal habitats, where *A. rossiae* primarily grows (Whipple 2010e, pers. comm.). Several nonnative species that are considered either invasive or exotic occur near the thermal habitats of *A. rossiae* (Whipple 2009 *in litt.*, entire). In order to combat nonnative invasives that can tolerate the transition areas closer to the thermal habitat of *A. rossiae*, YNP is targeting *Rumex acetosella* (common sheep sorrel) around the Shoshone Geyser Basin (Schneider 2010 pers. comm.) and *Hypericum perforatum* (St. John's wort) near the Lower Geyser Basin (Whipple 2010f, pers. comm.). Additionally, NPS plans to establish trial plots in some of the geyser basins to determine the best control mechanisms (Schneider 2010 pers. comm.). Nonnative species currently occur only within the transition zones and not in the hot thermal habitat of *A. rossiae*. Additionally, the NPS has an exotic plant management plan (see *Factor D: The Inadequacy of Existing Regulatory Mechanisms* in the Five Factor Evaluation for *Abronia ammophila* section), which includes measures to identify and treat any new nonnatives; therefore, we believe that *A. rossiae* will be protected from nonnative plant invasions.

We have no information indicating that nonnative invasive species are modifying the habitat of *Agrostis rossiae* to the extent that they represent a threat to the species now or in the foreseeable future.

Climate Change

For general background information on climate change, please refer to the first paragraphs of "Climate Change" under *Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range* in the Five Factor Evaluation for *Abronia ammophila* section.

Agrostis rossiae is adapted to an ephemeral habitat subject to lethal summer soil temperatures and appears most clearly influenced by the condition of thermal features as opposed to other climatic factors. Although climate change has the potential to affect the species' habitat, it is not clear that climate change has relevance to the condition or availability of habitat for this species because we have no information that climate change will play a significant role in altering geothermal features. Climate change may affect the timing and amount of precipitation as well as other factors linked to habitat conditions for this species. We are uncertain how these changes will affect the geothermal habitat of *A. rossiae*. At this time the available scientific information does not clearly indicate that climate change is likely to threaten the species now or in the foreseeable future.

Thermal Fluctuations

The thermal features in YNP are part of the largest and most varied geyser basin in the world; this basin is essentially undisturbed (NPS 2008b, unpaginated). Few of YNP's thermal features have ever been diverted for human use (such as bathing pools or energy), despite the proximity of roads and trails (NPS 2008b, unpaginated). Thermal features can be affected by nearby ground-disturbing activities; water, sewer, and other utility systems adjacent to YNP have likely affected the park's features in the past (NPS 2008b, unpaginated). In other countries, geothermal drill holes and wells located 4.02 to 9.98 km (2.5 to 6.2 mi) from thermal features have reduced geyser activity and hot spring discharges (NPS 2008b, unpaginated). Connections between YNP's underlying geothermal basins are not fully understood. Therefore, if geothermal activities were to occur outside YNP, they could have the potential to affect this species.

Agrostis rossiae tends to follow very subtle geothermal features, growing along geothermal cracks and edges of sunken pools (Whipple 2010e, pers. comm.). For example, in Cathos Springs, *A. rossiae* currently grows along one crack and in a ring around the spring; however, when the water level is higher or the ground level hotter, the distribution shifts, or the plant may not be present at all in a given year (Whipple 2010e, pers. comm.). As discussed above, the Geothermal Steam Act of 1970 (30 U.S.C. 1001–1027, December 24, 1970), as amended in 1977, 1988, and 1993, prevents significant adverse effects to the thermal features in YNP (see *Factor D: The Inadequacy of Existing Regulatory Mechanisms* below) (Legal Information Institute 2010, unpaginated). Additionally, the NPS is included in discussions of activities that may affect the groundwater or geothermal areas of YNP (Mazzu 2010, unpaginated). Therefore, we have no information indicating that human-caused changes to the thermal features are likely to threaten the species now or in the foreseeable future.

Drought

For background information, please refer to the first paragraph of the "Drought" discussion under *Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range* in the Five Factor Evaluation for *Abronia ammophila* section. As noted above under the *Habitat* section for this species, the vapor-dominated geothermally influenced soils on which *Agrostis rossiae* typically grows remain moist throughout the year (Tercek 2003, pp. 36, 45–46). However, these soils are influenced by the amount and timing of the rain that falls in the area (Tercek and Whitbeck 2004, p. 1958). Typically around May or June, the snow in the surrounding area has melted and rains are no longer frequent enough for the soils in the areas surrounding the habitat of *A. rossiae* to remain moist (Tercek and Whitbeck 2004, p. 1958). This decrease in soil moisture of the surrounding habitat is accompanied by a sharp increase in the thermal soil temperatures (Tercek and Whitbeck 2004, p. 1958). The typical growing season in the hot thermal habitats is approximately 120 days (Tercek and Whitbeck 2004, p. 1963). *A. rossiae* requires only 30 to 70 days to complete its life cycle (Tercek and Whitbeck 2004, p. 1963). A decrease in the growing season of 40 percent could occur prior to drought having a detrimental effect on this species. Prediction models indicate that areas already affected by drought will suffer greater effects from temperature increases caused by climate change and that high precipitation effects will become more frequent (IPCC 2007, entire). Although we do not fully understand how these changes will affect the habitat of *A. rossiae*, we do know that this species is resilient to changes in the thermal basins of its environment. Therefore, we do not believe that drought will rise to the level of a threat to the species now or in the foreseeable future.

Fire

As *Agrostis rossiae* completes its annual life cycle by mid-June, it is typically dead by the time fire season occurs (Whipple 2010e, pers. comm.); YNP's fire season generally extends from late June to the first large rain events in September. The fires in 1988 burned the area where *A. rossiae* occurs; however, the fire did not carry on the ground through the *A. rossiae* populations and, therefore, did not have any effect on the population (Whipple 2010e, pers. comm.). We have no information indicating that fire is likely to threaten the species now or in the foreseeable future.

Summary of Factor A

YNP offers protection to the populations of *Agrostis rossiae* from all kinds of development, including roads, campgrounds, buildings, mining, and energy development. There are currently no plans for any further development in YNP near the existing populations or potential habitat of *A. rossiae*. We have no information to show that *Agrostis rossiae* is likely to be threatened by trampling, nonnative species, climate change, thermal fluctuations, drought, or fire.

We conclude that the best scientific and commercial information available indicates that *Agrostis rossiae* 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.

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

There has been limited use and collection of the leaves of *Agrostis rossiae* for scientific purposes to determine the genetic relationship between different *Agrostis* species (Tercek 2003, p. 12). We have no indications of *A. rossiae* being collected for any other purposes (Whipple 2010e, pers. comm.). Therefore, we conclude that the best scientific and commercial information available indicates that *A. rossiae* 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.

Factor C. Disease or Predation

Agrostis rossiae is not known to be affected or threatened by any disease. We have no records showing predation by grazing or herbivory on *A. rossiae*. Therefore, we conclude that the best scientific and commercial information available indicates that *A. rossiae* is not in danger of extinction or likely to become so within the foreseeable future because of disease or predation.

Factor D. The Inadequacy of Existing Regulatory Mechanisms

All known populations of *Agrostis rossiae* occur within YNP, which is under the jurisdiction of the NPS. Please refer to *Yellowstone National Park* under the *Factor D: The Inadequacy of Existing Regulatory Mechanisms* section in the Five Factor Evaluation for *Abronia ammophila* section for additional information.

The Geothermal Steam Act of 1970 (30 U.S.C. 1001–1027, December 24, 1970), as amended in 1977, 1988, and 1993, governs the lease of geothermal resources on public lands (Legal Information Institute 2010, unpaginated). In addition to preventing the issuance of geothermal leases on lands in YNP, it prevents the issuance of any lease that is reasonably likely to result in a significant adverse effect on thermal features within YNP (Legal Information Institute 2010, unpaginated).

Summary of Factor D

The existing regulatory mechanisms, especially the NPS Organic Act and the Geothermal Steam Act, appear to adequately protect *Agrostis rossiae* and its habitat in YNP. We expect that *A. rossiae* and its habitat will be generally protected from direct human disturbance. Therefore, we conclude that the existing regulatory mechanisms are adequate to protect *A. rossiae* from the known potential threat factors.

We conclude that the best scientific and commercial information available indicates that *Agrostis rossiae* is not in danger of extinction or likely to become so within the foreseeable future because of the inadequacy of existing regulatory mechanisms, provided the existing mechanisms are not weakened or removed.

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

Natural and manmade factors with the potential to affect *Agrostis rossiae* include: (1) Competition and hybridization, (2) small population size, and (3) genetic diversity.

Competition and Hybridization

Previously, *Agrostis scabra* has been listed as a threat to *Agrostis rossiae*, possibly because of competition or hybridization (*e.g.*, Fertig 2000a; 2000c; NatureServe 2010a, p. 1). However, *A. scabra* is a native species that does not compete with or restrict *A. rossiae* (Whipple 2010a, pers. comm.). The thermal areas in which *A. rossiae* grows have lethal summer soil temperatures (greater than 45 °C (113 °F)) that preclude the growth of perennial roots and reproduction of any plant that requires greater than 120 days to complete its life cycle (Tercek 2003, p. 51). Nonthermal *A. scabra* is able to germinate in garden experiments of thermal temperatures; however, nonthermal *A. scabra* seldom occurs in the interior of the thermal habitats where *A. rossiae* occurs (Tercek 2003, p. 53). Additionally, nonthermal *A. scabra* requires a growing season of approximately 160 days in order to flower; the typical growing season in the transition zone between thermal and nonthermal ground is approximately 105 days (Tercek 2003, p. 52). Therefore, even if the nonthermal *A. scabra* germinated in the transition zone, it would be unable to reproduce before desiccation occurred.

Conversely, thermal *Agrostis scabra* is able to flower at the same time as *Agrostis rossiae* (Tercek 2003, p. 10). However, each thermal area is typically populated by only one of these species because of differences in microhabitat requirements (*e.g.*, soil temperature, soil pH) (Tercek 2003, p. 10). A few thermal areas do support populations of both *A. rossiae* and thermal *A. scabra* (Whipple 2010e, pers. comm.); however, *A. rossiae* and thermal *A. scabra* maintain separate morphologies in these locations and when they are grown under uniform laboratory conditions (Tercek *et al.* 2003, p. 1311; Whipple 2010e, pers. comm.). Additionally, attempts to cross-pollinate *A. rossiae* and thermal *A. scabra* were unsuccessful; however, experiments that are more rigorous are needed to determine conclusively whether these two *Agrostis* species can hybridize (Tercek 2003, p. 19) and to confirm that there is not a crossbreeding effect that could be a threat to *A. rossiae*.

Small Population Size

For general background information on small population size, please refer to the first paragraph of "Small Population Size" under *Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence* in the Five Factor Evaluation for *Abronia ammophila* section.

We do not have any indication that *Agrostis rossiae* was ever present on the landscape over a more extensive range. Nor do we have any evidence that the populations of *A. rossiae* are sufficiently small to experience the problems that occur in some species because of small population size. Additionally, *A. rossiae* has the potential to expand its habitat, although potential habitat may be limited (see Distribution and Abundance) (Whipple 2010e, pers. comm.). We have no information indicating that random demographic or environmental events are a threat to the species because of a small population size. Therefore, we do not consider small population size to be a threat to *A. rossiae* now or in the foreseeable future.

Genetic Diversity

For general background information on genetic diversity, please refer to the first paragraph of "Genetic Diversity" under *Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence* in the Five Factor Evaluation for *Abronia ammophila* section.

Decreased genetic diversity diminishes a species' ability to adapt to the selective pressures of a changing environment (Newman and Pilson 1997, p. 360; Ellstrand 1992, p. 77). However, *Agrostis rossiae* continually adapts to the changing thermal conditions of its environment and is able to shift its distribution to follow these changes (Whipple 2010e, pers. comm.). Therefore, potential decreased genetic diversity does not appear to be affecting *A. rossiae*.

Gene flow can also have negative effects on a species (Ellstrand 1992, p. 77). Genes favoring adaptations to a different environment or hybridization between two species can result (Ellstrand 1992, p. 77). Gene flow between *Agrostis* populations is low (Tercek 2003, p. 19). Therefore, there may be some risk to the species, but we do not fully understand this risk based on currently available information.

Limited information is available about the genetic diversity of *Agrostis rossiae*. We do not have any indication that *A. rossiae* is at risk of suffering from reduced genetic diversity and consider it capable of adapting to changes based on our current understanding of the species' genetics. Therefore, we do not consider reduced genetic diversity to be a threat to *A. rossiae* now or in the foreseeable future.

Summary of Factor E

Agrostis scabra is a native species that does not outcompete or invade the habitat of *Agrostis rossiae*. Typically, these two species do not occur together. Additionally, we have no information to suggest that small population size or reduced genetic diversity limit *A. rossiae*. We conclude that the best scientific and commercial information available indicates that *Agrostis rossiae* is not in danger of extinction or likely to become so within the foreseeable future because of competition or hybridization, small population size, or reduced genetic diversity.

Finding for *Agrostis rossiae*

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

The primary factors potentially impacting *Agrostis rossiae* are visitor impacts, the invasion of *Agrostis scabra*, and changing thermal activity. However, *A. scabra* is a native species that typically does not compete with *A. rossiae*, the existing boardwalks and trails offer sufficient pathways for visitors to navigate around the thermal areas, and sufficient regulatory mechanisms exist to prevent human-caused changes to the thermal basin by groundwater or geothermal development. Other factors affecting *A. rossiae*—including nonnative invasive plants, drought, small population size, and genetic diversity—are either limited in scope, or lacking evidence apparent to us indicating that they adversely impact the species as a whole. We have no evidence that overutilization, disease, or predation are affecting this species. Although climate change may impact the species in the future, we do not have enough information to determine that climate change will elicit a species-level response from *A. rossiae*. Based on our knowledge of the species, the regulatory mechanisms to protect the species appear appropriate.

Based on our review of the best available scientific and commercial information pertaining to the five factors, we find that the threats are not of sufficient imminence, intensity, or magnitude to indicate that *Agrostis rossiae* is in danger of extinction (endangered), or likely to become endangered within the foreseeable future (threatened), throughout all of its range. Therefore, we find that listing *A. rossiae* as a threatened or endangered species is not warranted throughout all of its range.

Significant Portion of the Range

Having determined that *Agrostis rossiae* 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 *A. rossiae* is in danger of extinction or is likely to become endangered in the foreseeable future.

In determining whether *Agrostis rossiae* is threatened or endangered in a significant portion of its range, we first addressed whether any portions of the range of *A. rossiae* warrant further consideration. We evaluated the current range of *A. rossiae* to determine if there is any apparent geographic concentration of the primary stressors potentially affecting the species including visitor-related impacts (trampling), changing thermal activity, nonnative invasive plants, drought, small population size, and genetic diversity. This species' small range suggests that stressors are likely to affect it in a uniform manner throughout its range. Furthermore, we found the stressors are not of sufficient imminence, intensity, magnitude, or geographically concentrated such that it warrants evaluating whether a portion of the range is significant under the Act. We do not find that *A. rossiae* 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 *A. rossiae* as threatened or endangered under the Act is not warranted at this time.

We request that you submit any new information concerning the status of, or threats to, *Agrostis rossiae* to our Wyoming Ecological Services Field Office (see **ADDRESSES** section) whenever it becomes available. New information will help us monitor *A. rossiae* and encourage its conservation. If an emergency situation develops for *A. rossiae*, or any other species, we will act to provide immediate protection.

Species Information for *Astragalus proimanthus*

Species Description

Astragalus proimanthus is a mat-forming, stemless, perennial herb measuring 2 to 3 dm (7.9 to 11.8 in.) in diameter (Fertig 2001, unpaginated) and up to 4 cm (1.6 in.) in height (Dorn 1979 *in litt.*, unpaginated). The densely clustered, 1.0- to 3.5-cm-long (0.39- to 1.38-in.-long) leaves are divided into three narrow, 5- to 9-mm-long (0.2- to 0.4-in.-long) leaflets (small leaflike divisions of a larger compound leaf) (Fertig and Welp 2001, p. 7). The plants are covered with fine hairs and appear silvery, with leaflets that are equally hairy on both sides (Barneby 1964, p. 1153). The 17-mm-long (0.67-in.-long), asymmetrical, pea-like flowers have five petals: one large broad upper petal, two side petals, and two lower petals that form a canoe shape (Fertig and Welp 2001, p. 7). The broad upper petal, called the banner petal, is constricted along the midline, forming a fiddle shape (Roberts 1977, p. 63). The yellow to whitish flowers are often tinged with lavender or pink, especially near the center, and occur in pairs at the base of the leaves (Fertig and Welp 2001, p. 7). This plant has a taproot that is woody and branching (Barneby 1964, p. 1153).

Discovery and Taxonomy

The first specimens of *Astragalus proimanthus* were discovered and collected 9.7 km (6 mi) north of the town of McKinnon (Sweetwater County, Wyoming) on June 13, 1946, by H.C. Ripely and R.C. Barneby (Barneby 1964, p. 1154). A second population was located in 1961 (Barneby 1964, p. 1154). The population discovered in 1961 was collected from and revisited multiple times in the decades that followed; however, the population discovered in 1946 could not be relocated after multiple attempts (Fertig and Welp 2001, p. 8). In 2000, two populations were discovered, one of which may be the original site collected by Barneby in 1946 as this population was found 9.7 km (6 mi) north of the town of McKinnon (Fertig and Welp 2001, p. 9).

The flowering plant genus *Astragalus* is the largest genus of vascular plants (Montana Plant Life 2010, unpaginated). With the common names "milk-vetch" or "locoweed" (family Fabaceae or Leguminosae), the genus contains more than 2,000 species, which are distributed worldwide, although they are primarily found in the northern hemisphere (Barneby 1989, p. 1; Montana Plant Life 2010, unpaginated). Based on similar morphological features of the flower, calyx (collective term for the sepals, which are the green, leaflike structures that protect the delicate inner parts of the flower while it is developing), and fruits, *Astragalus proimanthus* is in a taxonomic grouping within *Oropahca* (subgenus) with *Astragalus gilviflorus* (Dubois milkvetch) and *Astragalus hyalinus*

(summer milkvetch), which both occur in Wyoming (Fertig and Welp 2001, p. 6). *A. proimanthus* has been considered a descendant of *A. hyalinus* (Roberts 1977, p. 63). *A. proimanthus* is similar to *A. hyalinus* in its dwarf habit of growth and short flower with fiddle-shaped banner petal, but it is dissimilar in having smooth, hairless petals and an earlier flowering period (by a month or so) (Barneby 1964, p. 1154). Additionally, *A. proimanthus* grows in a small, compact form and not in a large, highly curved cushion characteristic of *A. hyalinus*. *A. proimanthus* resembles *A. gilviflorus* in its growth form and has a similar range of numbers of seeds in the fruits; however, unlike *A. gilviflorus*, it has narrow, oval-shaped fruit and short, differently shaped banner petals (Barneby 1964, p. 1154). The only other *Astragalus* species in Wyoming with three leaflets have smaller flowers than *A. proimanthus* (Fertig 1994, unpaginated). All species within the subgenus *Oropahca* have 12 chromosomes (Roberts 1977, p. 1), but it is unknown if they are interfertile (capable of cross-pollinating or breeding with other *Astragalus* species) (Fertig and Welp 2001, p. 14). No evidence of hybridization between *A. proimanthus* and other *Astragalus* species has been documented (Fertig and Welp 2001, p. 14). Based on this information, we recognize *A. proimanthus* as a valid species and a listable entity.

Biology and Life History

Astragalus proimanthus (precocious milkvetch) is named for its early flowering period. It has been observed in flower as early as April 28, and it may continue to bloom until mid-June (Fertig and Welp 2001, p. 14). *Astragalus* species are typically insect-pollinated; however, we have no information specific to *A. proimanthus* (Heidel 2003, p. 19). Both insects and birds have been observed visiting the flowers of *A. proimanthus* and may be involved in pollination (Fertig and Welp 2001, p. 14). Fruits are continuously produced from mid-May through late July (Roberts 1977, pp. 43, 97). The narrow, oval fruit pods (7 to 10 mm (0.28 to 0.39 in.) long) are attached to the stems and are covered in dense, fine hair (Fertig and Welp 2001, p. 7). The fruit pods contain 11 to 14 seeds (Barneby 1964, p. 1154) that are brown and 2.0 to 3.1 mm (0.08 to 0.12 in.) long (Roberts 1977, p. 64). Fruit production may be limited during drought years as evidenced by low fruiting rates observed in 2000 (Fertig and Welp 2001, p. 14). Due to the absence of seed structures (*e.g.*, winged edges) to enhance dispersal, seed dispersal appears passive and limited to short distances (Fertig and Welp 2001, p. 14).

Although *Astragalus proimanthus* is perennial, its lifespan may be shorter than is commonly assumed for mat-forming perennials, as is evidenced by shifts in location of plant subpopulations and disappearances of previously documented plant occurrences (Fertig and Welp 2001, pp. 13–14, 17). Longevity is an important life-history trait for the persistence and survival of species occurring in harsh environments where recruitment (reproductive success) is variable and unpredictable (Garcia *et al.* 2008, p. 261).

Habitat

Astragalus proimanthus is a narrow endemic occurring only on the shale bluffs of the Henrys Fork River, near the town of McKinnon, which is in the southern Green River Basin of southwestern Sweetwater County, Wyoming (Fertig and Welp 2001, p. 8). Sparsely vegetated rims and gullied upper slopes of benches, bluffs, and mesa-like ridges at elevations of 1,950 to 2,195 m (6,400 to 7,200 ft) provide habitat for *A. proimanthus* (Fertig and Welp 2001, p. 11).

Astragalus proimanthus inhabits cushion plant and bunchgrass communities dominated by *Phlox hoodii* (spiny phlox or carpet phlox), *Haplopappus nuttallii* (rayless aster), *Cryptantha sericea* (silky cryptantha), and *Elymus spicatus* (bluebunch wheatgrass) in openings within *Artemisia tridentata* (big sagebrush) and grasslands intermixed with *Juniperus osteosperma* (Utah juniper) (Fertig and Welp 2001, p. 11). *A. proimanthus* also occurs on gentle slopes at the base of ridges within a matrix of *Artemisia nova* (black sagebrush), *Sarcobatus vermiculatus* (greasewood), *J. osteosperma*, and *Grayia spinosa* (spiny hopsage) (Fertig and Welp 2001, p. 11). This species grows in fine-textured limestone shale clays that are dry, shallow, and covered by a dense layer of coarse cobbles, whitish flakey shale, and dark volcanic rock (Fertig and Welp 2001, pp. 11–12).

Individual *Astragalus proimanthus* plants are often separated by apparently suitable, nonvegetated habitat, and typically occur in densities ranging from 0.18 to 3.4 plants per square meter (m^2) (0.15 to 2.8 plants per square yard (yd^2)) (Fertig and Welp 2001, p. 14). The habitat in which *A. proimanthus* grows typically has less than 5 to 10 percent vegetative cover (Fertig and Welp 2001, pp. 11–12). The absence of plants from seemingly suitable habitat may be the result of passive seed dispersal (addressed above) or episodic (occurring at irregular intervals) establishment events, such as gully washouts (Fertig and Welp 2001, p. 14).

Average annual precipitation where *Astragalus proimanthus* occurs is 25 cm (9.8 in.), with peak precipitation events occurring in May and June (Martner 1986 as cited in Fertig and Welp 2001, p. 12). Mean annual temperature is 4.4 °C (40 °F), with mean lows of −14.4 °C (6 °F) in January, and mean highs of 28.9 °C (84 °F) in July (Martner 1986 as cited in Fertig and Welp 2001, p. 12). The average number of days per year at or below freezing are 225 (Martner 1986 as cited in Fertig and Welp 2001, p. 12).

Distribution and Abundance

The distribution of *Astragalus proimanthus* consists of 3 populations which are made up of 26 subpopulations (Fertig and Welp 2001, pp. 12–13; Heidel 2010a, pers. comm.). The largest population contains 21 subpopulations and occurs within 3.2 km (2 mi) of the Henrys Fork River along an 8-km (5-mi) stretch (WNDD *in litt.* 2010, unpaginated). The second largest population consists of four subpopulations and occurs 12.9 km (8 mi) further upstream on the Henrys Fork River, near the mouth of Cottonwood Creek (WNDD *in litt.* 2010, unpaginated). The smallest population consists of one subpopulation and occurs 2.5 km (1.5 mi) north of the largest population, along Lane Meadow Creek—a tributary to the Henrys Fork River (WNDD *in litt.* 2010, unpaginated). The entire distribution of *A. proimanthus* is limited to an area of less than 129.5 ha (320 ac) within an area of 6.4 by 22.5 km (4 by 14 mi) (Fertig and Welp 2001, p. 8).

Population estimates of *A. proimanthus* have varied widely, probably reflecting variability in survey methods and discovery of new subpopulations (Fertig and Welp 2001, p. 13). In 1980, prior to the discovery of all 26 subpopulations, an estimated 200 plants were documented as occurring within 2 populations (Dorn 1980, p. 49). The first survey to inventory the entire known distribution was completed in May of 1981, with the total number of *A. proimanthus* plants estimated at 22,000 plants occurring on 97.1 ha (240 ac) (Whiskey Basin Consultants 1981, p. 5). Conclusions from field studies conducted in 1989 are that, although the distribution of *A. proimanthus* was limited, subpopulations within that distribution were large, containing thousands of individual plants; the total population size was estimated at 25,000 to 40,000 individuals (Fertig and Welp

2001, p. 13). However, the 1989 field studies focused on identifying new subpopulations and initiating a monitoring program, not on conducting a quantitative census (Fertig and Welp 2001, p. 13). In June 2000, a survey of 11 subpopulations representing the 3 known populations, conducted by the WNDD, resulted in a count of 2,644 individuals; this was extrapolated to a minimum total population estimate of 10,500 to 13,000 individuals (Fertig and Welp 2001, p. 13).

The distribution of *A. proimanthus* may be associated with the presence of a light-colored shale formation, where it is the uppermost soil layer (Whiskey Basin Consultants 1981, p. 9). The Henrys Fork River has eroded this shale formation away in some areas, causing it to be exposed over a distance of 9 km (5.5 mi) near the river (Whiskey Basin Consultants 1981, p. 9). Approximately 95 percent of the known occurrences of *A. proimanthus* have been found on BLM-administered lands, with 4 percent occurring on State lands, and 1 percent on private lands (Heidel 2010b, pers. comm.).

The WNDD has designated *Astragalus proimanthus* as a plant species of concern with ranks of G1 and S1 (Heidel 2007, p. 3). For background information on G1 and S1 rankings, please refer to the last paragraph under *Distribution and Abundance* in the Species Information for *Abronia ammophila* section. Since *A. proimanthus* is endemic to Wyoming, the Wyoming occurrences encompass this species' entire global range.

Trends

Population trends for *Astragalus proimanthus* are difficult to determine because survey methodologies have not remained consistent, baseline data are lacking, and precipitation has varied significantly during survey years (Fertig and Welp 2001, p. 13). Shifts in the distribution suggest that *A. proimanthus* may be shorter-lived than is often assumed for mat-forming perennials (Fertig and Welp 2001, p. 14). The importance of yearly fluctuations in precipitation and temperature to the establishment and survival of this species is unknown (Fertig and Welp 2001, p. 14).

Population counts and distribution of *Astragalus proimanthus* along established transects have varied during the past two decades (Fertig and Welp 2001, p. 14). Five transects were established in 1989 to evaluate changes in abundance and density of plants (Marriott 1989, Appendix D). Surveys from two transects monitored from 1989 to 1998 showed a long-term increase in numbers and densities of plants (Fertig and Welp 2001, pp. 37–47). However, numbers along a third transect decreased by 7 percent from 1989 to 1998, and then the transect could not be relocated in 2000 possibly due to a local extirpation of plants (Fertig and Welp 2001, pp. 14, 37–47). Surveys from the fourth transect showed a steady decline in overall plant numbers, reaching a 43 percent decrease in numbers by 2000 (Fertig and Welp 2001, pp. 14, 37–47). Surveys from the fifth transect revealed short-term oscillations in the population size, with numbers increasing between 1989 and 1998 and then decreasing 8 percent by 2000 (Fertig and Welp 2001, pp. 37–47). Changes in numbers and plant densities may be attributed to the short lifespans of individual plants or the lack of new plants becoming established (Fertig and Welp 2001, p. 14). Localized increases and decreases in population numbers and density may be expected for this species, as evidenced by the variable numbers and changes in spatial distributions along survey transects (Fertig and Welp 2001, p. 40). However, overall monitoring data suggest that the main population along the bluffs of the Henrys Fork River was relatively stable from 1998 to 2000 despite localized shifts in distribution (Fertig and Welp 2001, p. 14).

Five Factor Evaluation for *Astragalus proimanthus*

Information pertaining to *Astragalus proimanthus* in relation to the five factors provided in section 4(a)(1) of the Act is discussed below.

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

The following potential factors that may affect the habitat or range of *Astragalus proimanthus* are discussed in this section, including: (1) energy development, (2) road construction, (3) off-road vehicle use, (4) range improvements, (5) disposal sites, (6) nonnative invasive plants, (7) fire, and (8) climate change and drought.

Energy Development

Energy development has been identified as a potential threat to *Astragalus proimanthus* (Marriot 1989, p. 8, Fertig and Welp 2001, p. 16). The distribution of *A. proimanthus* is limited to Sweetwater County, Wyoming (WNDD *in litt.* 2010, unpaginated). Sweetwater County sits atop the coal seams and oil and gas reserves of the Upper Green River Basin, which by some estimates contain 10 percent of the nation's total onshore natural gas reserves, as well as the largest known trona (a source of sodium carbonate) deposit in the world (Headwaters Economics 2009, p. 26). Uranium and coal (Headwaters Economics, p. 26) as well as oil shale resources (Congressional Research Service 2008, p. 3) occur throughout the county. There also is the potential for wind energy development in Sweetwater County (BLM 2010a, unpaginated).

Oil and gas exploration and extraction; coal, uranium, and trona mining; and oil shale and wind energy development may involve ground-disturbing actions that have the potential to remove or disturb *Astragalus proimanthus* and its habitat (Marriott 1989, p. 8; Fertig and Welp 2001, p. 16). Oil and gas exploration and coal mining may involve drilling, using explosives, driving heavy earth-moving equipment off road, clearing land for resource extraction or project infrastructures, and constructing roads and utility lines. Oil shale development may involve converting oil shale into crude oil through a process called destructive distillation, which may require land removal (Congressional Research Service 2008, p. 4). Wind energy development involves clearing land for constructing turbine sites and infrastructure including utility lines and roads. Additionally, all energy development may result in increased human use and vehicular traffic, which can result in trampling and increased erosion in the area.

In 2000, seismic explorations took place near the mouth of Cottonwood Creek, where a population of *Astragalus proimanthus* occurs (Fertig and Welp, 2001, p. 16). Associated road construction may have disturbed *A. proimanthus* habitat, but there is no indication that plants were removed by these activities and any population-level effects are unknown. Presently, there is no ongoing energy development near the known occurrences of *A. proimanthus* on BLM-administered lands (Glennon 2010a, pers. comm.).

Astragalus proimanthus is a special status species designated by the BLM State Director as sensitive (BLM 1997, p. 19). This status requires that potential habitat on Federal or split estate (*i.e.*, mixed surface and mineral ownership) lands be searched to determine if sensitive plants are located in the project area before the project occurs (BLM 1997, p. 19). Areas with special status plant populations are closed to activities that would adversely affect them, including surface disturbances, locating new mining claims, mineral material sales, all off-road vehicle (ORV)

use, and use of explosives and blasting (BLM 1997, p. 19).

In the Green River Resource Management Plan (RMP), the BLM has established a Special Status Plant Species Area of Critical Environmental Concern (ACEC) that covers four plant species including *Astragalus proimanthus* (BLM 1997, pp. 19, 34). This ACEC protects 100 percent of *A. proimanthus* that occurs on BLM land (BLM 2011, unpaginated). This ACEC is closed to energy development activities that have the potential to adversely affect *A. proimanthus* and its habitat. Prohibited activities include surface disturbing activities and surface occupancy (such as leasable mineral exploration and development or construction of long-term facilities or structures), mineral material sales, and use of explosives and blasting (BLM 1997, pp. 19, 34). The ACEC has provisions by which any newly located *A. proimanthus* individuals and habitat can be added to the ACEC by an amendment to the RMP (BLM 1997, pp. 19, 34).

Additionally, BLM-administered lands under a 48.6-ha (120-ac) fenced enclosure around one of the subpopulations of *Astragalus proimanthus*, north of the town of McKinnon, have been withdrawn from mineral exploration and mining (BLM 1999, p. 6; Glennon 2010a, pers. comm.). The BLM has committed to pursuing the withdrawal of mining claims in all areas of the Special Status Plants Species ACEC (BLM 1997, p. 34).

Although occurrences of *Astragalus proimanthus* on BLM-administered lands are protected from the impacts of energy development, future energy development remains a potential threat to occurrences of *A. proimanthus* that are not located on Federal land. However, this potential threat is unlikely to rise to the level of a threat to the species as the vast majority of known occurrences (95 percent) of *A. proimanthus* are located on BLM-administered lands (Heidel 2010b, pers. comm.; WNDD *in litt.* 2010, unpaginated). Therefore, we do not consider energy development to be a threat to *A. proimanthus* now or in the foreseeable future.

Road Construction

Roads can destroy or modify habitat and increase human access that may lead to trampling or the introduction of nonnative invasive plants (discussed below). Additionally, road construction can lead to increased erosion, and vehicle traffic on unimproved roads can result in increased atmospheric dust and dust deposition on vegetation.

Habitat for *Astragalus proimanthus* has been lost at several locations due to road construction (Fertig and Welp 2001, p 16). Wyoming State Highway 1 intersects two subpopulations (Fertig and Welp 2001, p. 13). Several two-track vehicle trails are located near populations of *A. proimanthus* (BLM 1997, p. 199). During the summer of 1993, BLM personnel documented surface disturbance due to traffic; this was partially associated with vehicles accessing the unauthorized McKinnon Dump, which is no longer in use and has since been reclaimed (BLM 1997, p. 199).

On BLM lands, special status plant populations are closed to activities that could adversely affect them or their habitat (BLM 1997, p. 19), and the ACEC is closed to all direct surface-disturbing road construction (BLM 1997, p. 34). Future road development is a potential threat to occurrences of *Astragalus proimanthus* that are not on BLM-managed lands. However, future road construction does not rise to the level of a threat to *A. proimanthus*, because the species primarily occurs on BLM-administered lands and, therefore, is protected by the provisions in the ACEC and its designation as a special status plant species (BLM 1997, pp. 19, 34). Therefore, we do not consider road construction to be a threat to *A. proimanthus* now or in the foreseeable future.

Off-Road Vehicle Use

The use of ORVs is both a means of transportation and recreation in Wyoming. Approximately 35.5 percent of Wyoming's 506,000 residents use ORVs for recreational purposes (Foulke *et al.* 2006, p. 3). During 2004 and 2005, Sweetwater County had the fifth highest ORV permit sales in the State (Foulke *et al.* 2006, pp. 8–9).

The area of BLM-administered land in Sweetwater County, Wyoming, where *Astragalus proimanthus* occurs has not experienced the high level of ORV use seen in some other areas of Wyoming (Glennon 2010a, pers. comm.). There are no large communities nearby to support local ORV recreational activities. The closest town (within 3.2 km (2 mi) of the nearest populations of *A. proimanthus*) is McKinnon, with a population of 49 in 2000 (U.S. Census Bureau 2010, unpaginated). The larger communities of Green River (estimated population of 12,411 in 2009), Rock Springs (estimated population of 20,905 in 2009), and Evanston (estimated population of 11,958 in 2009) (U.S. Census Bureau 2009, unpaginated) are 78.9, 106.2, and 120.7 km (49, 66, and 75 mi) from McKinnon, respectively. There are many ORV opportunities closer to these communities than those on the BLM-administered lands near the town of McKinnon.

In addition, *Astragalus proimanthus* habitat is generally not attractive to ORV users. Recreational destinations in the area where *A. proimanthus* occurs are largely limited to a few historic sites and trails (BLM 1997, pp. 4–6). Available two-track vehicle trails provide access to most common destinations, such as water sources and hunting campsites, so that off-road access is not often necessary (Glennon 2010a, pers. comm.). Additionally, *A. proimanthus* occurs on slopes and ridges (Fertig and Welp 2001, p. 11) that are not conducive to ORV travel that is destination-oriented.

Finally, the ACEC is closed to ORV use (BLM 1997, p. 72). However, there are no physical barriers to keep ORVs out of the ACEC, except for in the 48.6-ha (120-ac) fenced exclosure (Glennon 2010a, pers. comm.). At other locations in southwestern Wyoming, violators of BLM and U.S. Forest Service travel restrictions on ORV use have been reported (WGFD 2010, unpaginated). The potential for impacts from illegal ORV use on BLM-administered lands is possible even within the ACEC. However, impacts from illegal ORV use are unlikely due to the low human populations in the area, the difficulty of traversing the habitats occupied by *Astragalus proimanthus*, and the greater likelihood of enforcement of the prohibition of ORV use within an ACEC due to critical resource concerns (BLM 1997, p. 110). Therefore, we do not consider ORV use to be a threat to *A. proimanthus* now or in the foreseeable future.

Range Improvements

Habitat modifications due to range improvement projects for livestock have been identified as a potential threat to *Astragalus proimanthus* (Marriott 1989, p. 8). However, this was prior to the designation of the ACEC that provides special protections for *A. proimanthus* (BLM 1997, p. 34). As stated in the Green River RMP, within the ACEC: "Livestock grazing objectives and management practices will be evaluated and, as needed, modified to be consistent with the management objectives for this area" (BLM 1997, p. 34). The plan also specifies, "Grazing systems will be designed to achieve desired plant communities and proper functioning conditions of watersheds (upland and riparian)" (BLM 1997, p. 34). Additionally, no wild horse traps will be constructed within this area (BLM 1997, p. 34). Movement of

livestock between areas of known use and range improvements will be evaluated and monitored, and locations of range improvements will be modified, if necessary, to ensure that the habitat where *A. proimanthus* occurs will not be trampled (Glennon 2010a, pers. comm.). The fact that populations from 1989 through 2000 were relatively stable (Fertig and Welp 2001, p. 14) suggests that range management did not adversely affect *A. proimanthus* populations during that time. No impacts from livestock have been noted recently (Glennon 2010a, pers. comm.). Since 1997, range management practices also are evaluated pursuant to the management objectives of the ACEC (BLM 1997, p. 19). Additionally, known locations of *A. proimanthus* are protected and closed to surface-disturbing activities or any disruptive activity that could adversely affect the plants or their habitat (BLM 1997, p 19). Therefore, we do not consider range improvements to be a threat to *A. proimanthus* now or in the foreseeable future.

Disposal Sites

Disturbance associated with garbage disposal sites (dumps) has been identified as a potential threat to *Astragalus proimanthus* (Marriott 1989, p. 8). Surveys conducted by the BLM in 1993 and 1994 documented disturbances to the habitat of *A. proimanthus* due to the presence of the McKinnon Dump (BLM 1997, p. 199). The McKinnon Dump was an illegal dump located on BLM land (Board of County Commissioners of Sweetwater County 1992, unpaginated). The BLM and Sweetwater County worked together to clean up and reclaim the McKinnon Dump (Board of County Commissioners of Sweetwater County 1992, unpaginated; BLM 1997, p. 199). Since 1997, the ACEC appears to have effectively protected *A. proimanthus* from surface disturbance, such as dumps, on BLM-administered lands (BLM 1997, p. 34). Therefore, we do not view disposal sites to be a threat to *A. proimanthus* now or in the foreseeable future.

Nonnative Invasive Plants

For general background information on nonnative invasive plants, please refer to the first paragraph of "Nonnative Invasive Plants" under *Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range* in the Five Factor Evaluation for *Abronia ammophila* section.

We have no evidence of impacts to *Astragalus proimanthus* from nonnative invasive plants. *A. proimanthus* grows in shallow, dry soils that support only sparse vegetation (Fertig and Welp 2001, pp. 11–12). The characteristics of its harsh habitat may explain why no nonnative invasive plants have been reported in proximity to the known occurrences. Therefore, we do not consider nonnative invasive plants to be a threat to this species now or in the foreseeable future.

Fire

We find the potential impact of wildfire to the species to be minimal due to the sparse vegetation cover in habitats occupied by *Astragalus proimanthus*. From 1980 through 2009 (29 years), seven wildfires occurred in the area BLM mapped as potential habitat for *Astragalus proimanthus* (Caldwell 2011, pers. comm.). However, no fires burned in areas with known occurrences of *A. proimanthus;* moreover, the total acreage burned during this 29-year period was 0.3 ha (0.7 ac) (Caldwell 2011, pers. comm.). All seven wildfires were caused by lightning strikes to isolated junipers, and only that individual tree burned (Stephenson 2011, pers. comm.). Areas of barren ground between widely spaced vegetation and low fuel loads prevent fires from spreading far beyond points of ignition (Brooks and Pyke 2002, p. 5), as the existence of adequate fuels is one of the requirements for a fire to start and continue to burn (Moritz Lab 2010, entire). Therefore, we do not consider fire to be a threat to this species now or in the foreseeable future.

Climate Change and Drought

For general background information on climate change, please refer to the first paragraphs of "Climate Change" under *Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range* in the Five Factor Evaluation for *Abronia ammophila* section.

Although assessing the magnitude and type of effect climate change may have on *Astragalus proimanthus* is complex, we believe climate change has the potential to affect the species given the predictions discussed previously of increased springtime temperatures, decreased springtime precipitation, and increased drought. The importance of yearly fluctuations in precipitation and temperature on the establishment and survival of *A. proimanthus* is unknown (Fertig and Welp 2001, p. 14). However, drought is not unusual or unnatural in Wyoming. Severe or extreme drought conditions occur more than 20 percent of the time over the southwestern regions of the State (Curtis and Grimes 2004, Chapter 6.2). As noted previously, monitoring data suggest that the main population along the bluffs of the Henrys Fork River was relatively stable from 1998 to 2000 (Fertig and Welp 2001, p. 14). During this same period, this species' habitat experienced drought conditions, including severe droughts (Curtis 2004, unpaginated). Although climate change may affect the duration and severity of drought in some locations, we do not have information to suggest *A. proimanthus* is unlikely to be able to respond to this potential stressor. Therefore, we do not consider climate change and drought to be a threat to this species now or in the foreseeable future.

Summary of Factor A

Occurrences of *Astragalus proimanthus* have experienced historical impacts from road development and illegal trash dumps. Additionally, seismic exploration for oil and gas occurred near one population where associated road construction may have disturbed *A. proimanthus* habitat, but there is no indication that plants were destroyed. Currently, the habitat disturbance due to the McKinnon dump has effectively been addressed. The special species status of *A. proimanthus* and the provisions in the ACEC are adequate to alleviate the threats to *A. proimanthus* from energy development, road construction, ORV use, range improvements, and other land uses that have the potential to disturb the habitat of *A. proimanthus*. Although potential threats on State and private lands may exist, such as ORV use or range improvements, only 5 percent of this species' distribution occurs on private lands, and no impacts to the species on private lands has been documented.

In summary, we note that procedural considerations for amending the Green River RMP to ensure that all individual *Astragalus proimanthus* plants on BLM-administered lands are protected by the Special Status Plant Species ACEC (BLM 1997, pp. 19–20, 34) are lengthy and may not accurately delineate the oscillating distributions and new discoveries of this species. However, maintenance actions may be used in certain situations including new population discoveries and species' range shifts (see Factor D: Bureau of Land Management below). Therefore, we find that the protections provided by the special status plant species designation (BLM 1997, p. 19) in combination with the protections provided by the Special Status Plant ACEC, as documented in the Green River RMP (BLM 1997, p. 34), provide

effective protection to 95 percent of the population of *A. proimanthus*.

We conclude that the best scientific and commercial information available indicates that *Astragalus proimanthus* 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.

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

Astragalus proimanthus is not known to be collected for any purposes. One species of this genus, *Astragalus membranaceus* (Huang qi), has been used in traditional Chinese medicine for thousands of years (University of Maryland 2006, unpaginated). However, this species is native to Asia, and *Astragalus* species that grow in the United States do not share similar medicinal properties (University of Maryland 2006, unpaginated). We have no information to indicate that *A. proimanthus* is threatened by overutilization for commercial, recreational, scientific, or educational purposes.

We conclude that the best scientific and commercial information available indicates that *Astragalus proimanthus* 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.

Factor C. Disease or Predation

Disease

Astragalus proimanthus is not known to be affected or threatened by any disease. Therefore, we do not consider disease to be a threat to *A. proimanthus* now or in the foreseeable future.

Predation—Grazing and Herbivory

Grazing and herbivory effects on *Astragalus proimanthus* have not been studied. Bird or insect predation on many *A. proimanthus* flowers was noted on at least one occasion (Barneby 1964, p. 1154). Most occurrence reports do not mention any instances of herbivory (WNDD *in litt.* 2010, unpaginated; Marriot 1989, p. 16). Domestic sheep apparently do not graze *A. proimanthus* (Mutz 1981, p. 6), and direct impacts from grazing are thought to be unlikely due to the plant's low stature, coarse pubescence (fine, short hairs), and low palatability (Mutz 1981, p. 6; Marriott 1989, unpaginated; Fertig and Welp 2001, p. 14). Therefore, we do not consider predation to be a threat to *A. proimanthus* now or in the foreseeable future.

Summary of Factor C

We conclude that the best scientific and commercial information available indicates that *Astragalus proimanthus* is not in danger of extinction or likely to become so within the foreseeable future because of disease or predation.

Factor D. The Inadequacy of Existing Regulatory Mechanisms

The Act requires us to examine the adequacy of existing regulatory mechanisms with respect to threats that may place *Astragalus proimanthus* in danger of extinction or likely to become so in the future. Existing regulatory mechanisms that could have an effect on potential threats to *A. proimanthus* include (1) Federal laws and regulations; (2) State laws and regulations; and (3) local land use laws, processes, and ordinances. Most (95 percent) of *A. proimanthus* occurs on Federal land; therefore, the discussion below focuses on Federal laws. Actions adopted by local groups, States, or Federal entities that are discretionary, including conservation strategies and guidance, are not regulatory mechanisms; however, we may discuss them in relation to their effects on potential threats to the species.

Federal Laws and Regulations

Bureau of Land Management

As discussed previously, the special status species designation and the Special Status Plant Species ACEC, as documented in the Green River RMP (BLM 1997, pp. 19, 34), have adequate provisions to effectively protect 95 percent of the population distribution of *Astragalus proimanthus*. An RMP, the primary management tool that implements regulatory mechanisms, goes through revisions approximately every 15 years, and a revision to the Green River RMP is anticipated by 2013 (Dana 2010b, pers. comm.). This revision has been started and the special status plant designation, based on the BLM State Directors' designation, will carry over into the newly revised RMP.

Astragalus proimanthus was designated by the BLM State Director as a BLM State-sensitive species (BLM 2010b, p. 23). The BLM focuses sensitive species management on maintaining species habitat in functional ecosystems, ensuring the species is considered in land management decisions, preventing a need to list the species under the Act, and prioritizing conservation that emphasizes habitat (BLM 2010b, p. 1). The BLM sensitive species are automatically included as special status plant species, along with candidate, threatened, and endangered plant species (BLM 1997, p. 19), and locations of special status plant species are closed to activities that could adversely affect them or their habitat (BLM 1997, p. 19). Additionally, the ACEC delineates known distributions of *A. proimanthus* and its essential habitat, while furthering the protection of newly discovered locations on BLM lands (BLM 1997, p. 34). The BLM conducts searches to identify additional areas where *A. proimanthus* may be located (BLM 1997 p. 34). In January 2011, the BLM took a maintenance action on the Green River RMP to include all newly discovered locations of *A. proimanthus* on BLM-administered lands in the ACEC (BLM 2011, unpaginated). Maintenance actions are based on new or changed data, and document or refine previously approved decisions incorporated into an RMP (43 CFR 1610.5–4). A maintenance action does not require formal public involvement and interagency coordination as this action is limited to refining or documenting a previously approved decision incorporated in the plan (43 CFR 1610.5–4). As a result of this maintenance action 100 percent of the known locations of *A. proimanthus* occurring on BLM-administered lands are protected by the ACEC (BLM 2011, unpaginated).

National Environmental Policy Act

All Federal agencies are required to adhere to the NEPA for projects they fund, authorize, or carry out. For more information about NEPA, please refer to *Factor D. The Inadequacy of Existing Regulatory Mechanisms* in the Five Factor Evaluation for *Abronia ammophila* section.

State and Local Laws and Regulations

The remaining 5 percent of the distribution of *A. proimanthus* occurs on State and private lands, and are not protected by regulatory mechanisms.

Summary of Factor D

The existing ACEC appears to adequately protect the majority (95 percent) of the habitat of *Astragalus proimanthus*. We expect that *A. proimanthus* and its habitat will be generally protected from direct human disturbance. We have no evidence of impacts to *A. proimanthus* from inadequate regulatory mechanisms.

We conclude that the best scientific and commercial information available indicates that *Astragalus proimanthus* is not in danger of extinction or likely to become so within the foreseeable future because of inadequate regulatory mechanisms.

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

Natural and manmade factors with the potential to affect *Astragalus proimanthus* include: (1) Small population size, (2) pollination, and (3) genetic diversity.

Small Population Size

For background information, please refer to the first paragraph of "Small Population Size" under *Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence* in the Five Factor Evaluation for *Abronia ammophila* section.

We have no evidence that the populations of *Astragalus proimanthus* are experiencing the problems that occur in some species with small population size. We do not have any indication that *A. proimanthus* was ever present on the landscape over a more extensive range. We also have no information indicating that random demographic or environmental events are a threat to the species because of its small population size. Therefore, we do not consider small population size to be a threat to *A. proimanthus* now or in the foreseeable future.

Pollination

Please refer to the first paragraph of "Pollination" under *Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence* in the Five Factor Evaluation for *Abronia ammophila* section for background information. *Astragalus proimanthus* is believed to have been historically rare, with populations appearing to be stable (Fertig and Welp 2001, p. 13). We have no information indicating that a lack of pollinators is a threat to the species. Therefore, we do not consider lack of pollinators to be a threat to *A. proimanthus* now or in the foreseeable future.

Genetic Diversity

For background information, please refer to the first paragraph of "Genetic Diversity" under *Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence* in the Five Factor Evaluation for *Abronia ammophila* section. We have no information indicating that a lack of genetic diversity is a threat to the species. Therefore, we do not consider lack of genetic diversity to be a threat to *A. proimanthus* now or in the foreseeable future.

Summary of Factor E

We have no information to suggest that *Astragalus proimanthus* was ever present across the landscape with a broader range. We have no indication that *A. proimanthus* is suffering from any problems associated with small population size. We also have no information showing that *A. proimanthus* is suffering from low pollination rates or reduced genetic diversity. Therefore, we conclude that the best scientific and commercial information available indicates that *Astragalus proimanthus* is not in danger of extinction or likely to become so within the foreseeable future because of small population size, reduced pollination, or reduced genetic diversity.

Finding

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

Occurrences of *Astragalus proimanthus* experienced historical impacts from road development and illegal trash dumps. Additionally, seismic exploration for oil and gas occurred near one population, with no known impacts to the species. However, the provisions in the ACEC now in place are adequately alleviating any potential threats to *A. proimanthus* from energy development, road construction, ORV use, range improvements, and other land uses that have potential to disturb *A. proimanthus* and its habitat. Although potential threats on State and private lands exist, such as ORV use or range improvements, no impacts to the plants on these lands have been documented or are reasonably anticipated. We have no information to show that *A. proimanthus* is threatened by overutilization for commercial, recreational, scientific, or educational purposes at this time. We conclude that the best scientific and commercial information available indicates that *Astragalus proimanthus* is not in danger of extinction or likely to become so within the foreseeable future because of climate change, drought, nonnative invasive plants, fire, small population size, lack of pollinators, or reduced genetic diversity. We have no information regarding actual or potential adverse impacts due to overutilization, disease, inadequate regulatory mechanisms, reduced genetic diversity, or reduced pollination.

Based on our review of the best available scientific and commercial information pertaining to the five factors, we find that the threats are not of sufficient imminence, intensity, or magnitude to indicate that *Astragalus proimanthus* is in danger of extinction (endangered), or likely to become endangered within the foreseeable future (threatened), throughout all of its range. Therefore, we find that listing *A. proimanthus* as a threatened or endangered species is not warranted throughout all of its range.

Significant Portion of the Range

Having determined that *Astragalus proimanthus* 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 *A. rossiae* is in danger of extinction or is likely to become endangered in the foreseeable future.

In determining whether *Astragalus proimanthus* is threatened or endangered in a significant portion of its range, we first addressed whether any portions of the range of *A. proimanthus* warrant further consideration. We evaluated the current range of *A. proimanthus* to determine if there is any apparent geographic concentration of the primary stressors potentially affecting the species including energy development, road construction, ORV use, range improvements, and other land uses. This species' small range suggests that stressors are likely to affect it in a uniform manner throughout its range. However, we found the stressors are not of sufficient imminence, intensity, magnitude, or geographically concentrated such that it warrants evaluating whether a portion of the range is significant under the Act. We do not find that *A. proimanthus* is in danger of extinction now, nor is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Therefore, listing *A. proimanthus* as threatened or endangered under the Act is not warranted at this time.

We request that you submit any new information concerning the status of, or threats to, *Astragalus proimanthus* to our Wyoming Ecological Services Field Office (see **ADDRESSES** section) whenever it becomes available. New information will help us monitor *A. proimanthus* and encourage its conservation. If an emergency situation develops for *A. proimanthus*, or any other species, we will act to provide immediate protection.

Species Information for *Penstemon gibbensii*

Species Description

Penstemon gibbensii is a perennial forb (herbaceous plant that is not a grass) averaging approximately 23 cm (9 in.) in height (Dorn 1990a, p. 3). Its leaves are long and narrow, often folded down the length of the mid-rib, pubescent (covered with fine, short hairs) to smooth, and typically less than 5 mm (0.2 in.) wide (Fertig and Neighbours 1996, p. 4). Populations at lower elevations are conspicuously more pubescent, possibly as an adaptation to conserve moisture in warmer habitats (Dorn 1990a, p. 6). The bright blue flower is tube-shaped, 15 to 20 mm (0.6 to 0.8 in.) long, and may appear from early June to September, depending on moisture levels (Fertig 2000d, unpaginated).

Taxonomy

Penstemon, with an estimated 271 species, is the largest plant genus endemic to North America, and the Intermountain Region represents the center of diversity (Wolfe *et al.* 2006, p. 1699). In the early 1970s, Robert Gibbens collected the first specimens of *Penstemon gibbensii* in Sweetwater County, Wyoming (Dorn 1982, p. 334). These specimens were sent to a *Penstemon* specialist for identification and subsequently lost (Dorn 1990a, p. 1). In 1981, Robert Dorn resurveyed the area and relocated *P. gibbensii* in the field (Dorn 1982, p. 334; Heidel 2009, p. 1). *P. gibbensii* was determined to be a new, undescribed species based on its morphology (Dorn 1982, p. 334; Fertig and Neighbours 1996, pp. 4–6). This species has been reproductively isolated for some time as each known population of *P. gibbensii* exhibits slight morphological and habitat differences (Dorn 1989 as cited in Fertig and Neighbours 1996, pp. 3–4).

Penstemon gibbensii is a member of the Scrophulariaceae (figwort or snapdragon) family (Dorn 1982, p. 334; Fertig and Neighbours 1996, p. 2). Similar species include *Penstemon cyananthus* (Wasatch beardtongue), *Penstemon fremontii* (Fremont's beardtongue), *Penstemon saxosorum* (upland beardtongue), and *Penstemon scariosus* (White River beardtongue) (Fertig 2000d, unpaginated). *P. gibbensii*, which occurs at a lower elevation than *P. saxosorum*, can be distinguished by stems that are pubescent nearly to the base, narrower leaves, and corollas (all the petals of the flower) that are pubescent inside and out (Dorn 1982, p. 334). *P. gibbensii* is more pubescent than *P. cyananthus*, and has much narrower leaves (Dorn 1982, p. 334). The current taxonomic status of *P. gibbensii* is accepted (Integrated Taxonomic Information System 2010b, unpaginated). We recognize *P. gibbensii* as a valid species and a listable entity.

Biology and Life History

Reproduction of *Penstemon gibbensii* is by seed, with no evidence of vegetative reproduction (Fertig and Neighbours 1996, p. 16). Based upon flower color and shape, this species is probably insect pollinated (Fertig and Neighbours 1996, p. 16). Bees have been seen visiting flowers at sites in Colorado and Utah (Langton 2010, pers. comm.). Fruits are oval, light-brown capsules (Fertig 2000d, unpaginated). Seeds are probably dispersed primarily by gravity or wind (Fertig and Neighbours 1996, p. 16). *P. gibbensii* appears to have minimal reproductive success, as evidenced by below-normal seedling numbers in most years due to dry conditions (Heidel 2009, p. 21). In 1985, 1988, and 1991, at three transects in the Cherokee Basin occurrence, 0 to 56 percent of *P. gibbensii* plants were seedlings (Warren *in litt.* 1992, Table 2). Seedling establishment is probably episodic and dependent on occasional years with adequate summer moisture (Fertig and Neighbours 1996, p. 16). *P. gibbensii* is able to take advantage of summer precipitation, as it is a warm-season species (Warren *in litt.* 1992, unpaginated).

No information was available regarding chilling requirements for seeds of *P. gibbensii*. However, close relatives (*i.e.*, *Penstemon cyananthus*, *Penstemon fremontii*, and *Penstemon scariosus*) have seeds that are largely dormant at harvest and require a long chilling period prior to germination (Meyer and Kitchen 1994, p. 354). These species have evolved seed germination mechanisms that permit the carryover of seeds between years as a persistent seed bank, which maximizes the probability of seedling survival in favorable years (Meyer and Kitchen 1994, p. 363). Recognizing the similarities between these *Penstemon* species and their climatic conditions, we assume that *P. gibbensii* also requires a chilling period and has a persistent seed bank.

Habitat

Penstemon gibbensii occurs in a cold steppe climate on barren shale or sandy-clay slopes (Dorn 1990a, p. 6). Habitat is often located on steep upper or middle slopes eroding below a more resistant caprock (Heidel 2009, p. 13). Slopes are generally 20 to 30 degrees and predominately south- or west-facing (Dorn 1990a, p. 8). These conditions reduce percolation (water seeping into the ground) and increase evaporation (Heidel 2009, p. 20). *P. gibbensii* has been reported at elevations from 1,634 to 2,347 m (5,360 to 7,700 ft) (Dorn 1990a, p. 5; CNHP 2010a, unpaginated). Soils are typically highly erodible, with low nutrient levels, low soil moisture, and high selenium content (Spackman and Anderson 1999, p. 3).

Biological soil crusts are well-developed in *Penstemon gibbensii* habitat in Colorado and Utah, but were not noted at any sites in Wyoming (Heidel 2009, p. 14). Biological soil crusts are commonly found in semiarid and arid environments such as the Great Basin and Colorado Plateau, and are formed by a community of living organisms that can include cyanobacteria, green algae, microfungi, mosses, liverworts, and lichens (USGS 2006, unpaginated). These crusts provide many positive benefits for the larger biotic community including decreased erosion, improved water infiltration, increased seed germination, and improved plant growth (Spackman and Anderson 1999, p 3; USGS 2006, p. 2).

Penstemon gibbensii exploits a largely barren, challenging environment (Dorn 1990a, p. 3). This species is generally not tolerant of competition from other species or other *Penstemon* plants; individual plants are usually spaced one to several meters (3 or more ft) apart (Dorn 1990a, pp. 8–9). Total vegetative cover is typically 5 to 10 percent (Fertig 2000, p. 2). Associated species include *Elymus spicatus* (bluebunch wheatgrass), *Achnatherum hymenoides* (Indian ricegrass), *Herperostipa comata* (needle-and-thread grass), *Eriogonum brevicaule* (shortstem wild buckwheat), *Eremogone hookeri* (Hooker's sandwort), and *Minuartia nuttallii* (Nuttall's stitchwort) (Heidel 2009, p. 13). Adjacent vegetative communities may include pinyon-juniper woodlands, sagebrush shrublands, or greasewood-saltbush shrublands (Dorn 1990a, p. 9).

Distribution

Penstemon gibbensii is a regional endemic, with a range that includes Carbon and Sweetwater Counties in Wyoming, Moffat County in Colorado, and Daggett County in Utah (Dorn 1990a, p. 6; Heidel 2009, p. 31). *P. gibbensii* was not recognized as a new species until 1981 (Dorn 1982, p. 334; Fertig and Neighbours 1996, pp. 4–6). Consequently, its historical range is unknown. However, *P. gibbensii* was possibly always uncommon (Heidel 2009, pp. 5, 8). The species is currently known from nine occurrences including: Cherokee Basin, Sand Creek,

Flat Top Mountain, T84N R18W, Willow Creek, and Red Creek Rim in Wyoming; Spitzie Draw and Sterling Place in Colorado; and Dagget County, Utah. These nine occurrences are spread across 193 km (120 mi) and occupy approximately 109 ha (270 ac) in Wyoming, 10 ha (25 ac) in Colorado, and 2 ha (5 ac) in Utah (Heidel 2009, p. 31). Three of the six Wyoming occurrences and the Colorado and Utah occurrences are within 5 to 8 km (3 to 5 mi) of each other (Heidel 2009, p. 9). In Wyoming, surveys for additional occurrences have been conducted in over 100 sections (each section is 259 ha (640 ac)), primarily along the Carbon-Sweetwater County line (Heidel 2009, p. 12). Additional potential habitat also has been searched in Moffat County, Colorado, and in Daggett County, Utah; no new populations have been found in these areas (Dorn 1990a, p. 6; Spackman and Anderson 1999, p. 31).

Most known *Penstemon gibbensii* (approximately 77 percent) occur on State and Federal land. All Wyoming occurrences, with the exception of the T84N R18W occurrence and a small portion of the Sand Creek occurrence are on land managed by BLM (Heidel 2009, p. 27). The Nature Conservancy (TNC) manages the T84N R18W occurrence, which is on State and private land (Heidel 2009, p. 31). A small portion of the Sand Creek occurrence also is on State land (Heidel 2009, p. 27). In Colorado, the Spitzie Draw occurrence is on Browns Park National Wildlife Refuge (NWR) (managed by the Service) and BLM land, and the Sterling Place occurrence is on BLM land. The Daggett County, Utah, occurrence is on State land (Heidel 2009, p. 27). Management responsibilities are described in Table 2 below.

Abundance

Table 2 presents available information regarding the known occurrences of *Penstemon gibbensii*. The plant numbers and occupied habitat do not sum to the exact current total due to slight differences between references. Most estimates are based on walking surveys through occupied habitat; two sites (Cherokee Basin and Flat Top Mountain) also have permanent transects for trend monitoring (Heidel 2009, Appendix B).

TABLE 2—KNOWN OCCURRENCES OF PENSTEMON GIBBENSII

Species occurrence (year identified)	Estimated plant numbers (year surveyed)	Occupied habitat	Management
Cherokee Basin, WY (1981)	450 (1985) 1,400 (1988) 2,766 (1991) 1,000 (1995) 50–100 (2007)	6.2 ha (15.2 ac)	BLM-Rawlins Field Office.
Sand Creek, WY (1987)	2,000 (1989) 1,900–2,000 (1995) 3,000 (2005)	48.1 ha (118.7 ac)	BLM-Rawlins Field Office and State of WY.
Flat Top Mountain, WY (1987)	300 (1989) 1,000–1,200 (1995) 300 (2008)	7.2 ha (17.9 ac)	BLM-Rawlins Field Office.
T84N R18W, WY (1997)	4,500–5,000 (1999) 500–1,000 (2008)	28.8 ha (71.2 ac)	TNC.
Willow Creek, WY (2004)	2,200 (2008)	15.6 ha (38.5 ac)	BLM-Rawlins Field Office.
Red Creek Rim, WY (2008)	120 (2008)	3.3 ha (8.1 ac)	BLM-Rawlins Field Office.
Spitzie Draw, CO (1982)	263 (2009)	~5 ha (12 ac)	Service-Browns Park NWR. BLM-Little Snake Field Office.
Sterling Place, CO (1984)	656 (2010)	~4 ha (9 ac)	BLM-Little Snake Field Office.
Daggett County, UT (1989)	300 (2010)	5 ha (12 ac)	State of UT.
Current Total	~11,000–14,000	~122 ha (300 ac)	

Table 2 References: Heidel 2009, pp. 22, 31; CNHP *in litt.* 2009a, p. 2; *in litt.* 2009b, p. 2; *in litt.* 2010a, p. 2.

The Colorado Natural Heritage Program (CNHP) has designated *Penstemon gibbensii* as a plant species of special concern (CNHP 2010b, unpaginated). The WYNDD also has designated *P. gibbensii* as a plant species of concern (Heidel 2007, p. 18). The Utah Native Plant Society ranks *P. gibbensii* as a rare plant of "extremely high priority" (Utah Rare Plants 2010, unpaginated). These designations are typically based on TNC's natural heritage State rank. *P. gibbensii* is ranked S1 in all three States because of its extreme rarity. These designations indicate that particular consideration may be taken by the States with regard to management decisions potentially affecting *P. gibbensii*, but do not result in any regulatory protection for the species.

Trends

Long-term population trend data for *Penstemon gibbensii* is not available. Short-term trends can be examined at four of the nine occurrences, where population estimates are available for more than 1 year (see Table 1). Only a single population estimate is available from the two most recently discovered sites in Wyoming and the three sites in Colorado and Utah. Short-term trends for the three Wyoming populations of *P. gibbensii* that have been surveyed more frequently were described as stable to slightly increasing in 2000; this was attributed to favorable climatic conditions in the preceding years (Fertig 2000d, unpaginated). Since 2000, populations appear to be stable to increasing at the Sand Creek occurrence and declining at the other three Wyoming sites. Seedling establishment is probably episodic (occurring at irregular intervals) and dependent on rare years of adequate summer moisture (Fertig and Neighbours 1996, p. 16; Heidel 2009, p. 22). The resultant uneven survival of seedlings may account for short-term population fluctuations in this species (Fertig and Neighbours 1996, p. 16). Survey results from 1995 may represent peak

population estimates due to ideal climatic conditions, rather than mean or low estimates (Heidel 2009, p. 23). Overall, there is not enough information to conclusively determine rangewide trends for the species.

Five Factor Evaluation for *Penstemon gibbensii*

Information pertaining to *Penstemon gibbensii* in relation to the five factors provided in section 4(a)(1) of the Act is discussed below.

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

The following potential factors that may affect the habitat or range of *Penstemon gibbensii* are discussed in this section: (1) Energy development, (2) roads, (3) trampling, (4) nonnative invasive plants, and (5) climate change and drought.

Energy Development

As previously discussed, many activities associated with energy development can destroy or modify habitat. Since 1989, energy exploration has increased in the Wyoming portion of the range of *Penstemon gibbensii* (Heidel 2009, p. 28). However, most occurrences of *P. gibbensii* are on unstable slopes that are unlikely to be developed for roads, pipelines, or well pads (Fertig and Neighbours 1996, pp. 19–20; Heidel 2009, p. 28). However, the Sand Creek occurrence, which is on flatter terrain, is located in an active oil and gas field, with one pipeline passing through a subpopulation of *P. gibbensii* and an accompanying access road intersecting a limited portion (does not impact a lot of potential habitat of *P. gibbensii*) of another subpopulation (Heidel 2009, p. 43). A well pad also is located nearby (Heidel 2009, p. 28).

While this development has destroyed some *P. gibbensii* habitat, some of the land disturbances at Sand Creek have provided additional habitat by exposing appropriate substrate for plant establishment (Dorn 1990a, p. 13; Heidel 2009, p. 43). Two pipelines have been laid at the Willow Creek occurrence, one adjacent to a subpopulation and the other through a subpopulation that may have destroyed plants (Heidel 2009, p. 55). However, these developments dissect limited areas of occupied habitat at Willow Creek, and the current impacts are likely not severe as most of *P. gibbensii* is located on unstable slopes (Heidel 2009, p. 28). The sale of leases for oil and gas development continues in Carbon and Sweetwater Counties in Wyoming (BLM 2010c, pp. 51–63, 75–77, 83). Consequently, further energy development is possible within the foreseeable future; however, potential impacts from it are unknown.

In addition to oil and gas development, uranium is mined near the Red Creek Rim occurrence (Heidel 2009, p. 28). No impacts to *Penstemon gibbensii* have been documented as a result of uranium mining. Sub-bituminous coal underlies portions of the range of *Penstemon gibbensii;* however, this coal is not suitable for strip mining (Heidel 2009, p. 28). Oil shale rock also is present (Heidel 2009, p. 28). Wind energy development and gravel quarry development are possible, but have not occurred to date (Heidel 2009, p. 28).

In conclusion, minimal impacts to *Penstemon gibbensii* were noted from oil and gas development, no impacts have been documented from uranium mining, and the other types of development are currently only speculative. Therefore, we do not consider energy development to be a threat to *P. gibbensii* now or in the foreseeable future.

Roads

Roads can destroy or modify habitat. Roads also can increase access, leading to trampling or the introduction of nonnative invasive plants (discussed below). A few roads cross or are adjacent to occurrences of *Penstemon gibbensii*. As mentioned under energy development, one access road intersects a limited portion of a subpopulation at the Sand Creek occurrence, but also may provide additional habitat as *P. gibbensii* is able to colonize the margins of disturbed areas (Heidel 2009, pp. 28, 43). Another road crosses the edge of the Willow Creek occurrence (Heidel 2009, p. 43). At the Spitzie Draw occurrence, State Route 318 passes within 0.4 km (0.25 mi), and an access road passes within 200 m (656 ft) (Spackman and Anderson 1999, p. 23). State Route 318 also passes within 50 m (164 ft) of a portion of the Sterling Place occurrence (CNHP *in litt.* 2010a, p. 3). A steep road is adjacent to the Flat Top Mountain occurrence (Fertig and Neighbours 1996, p. 35). The Flat Top Mountain road is experiencing erosion that, if unchecked, could eventually encroach on *P. gibbensii* occupied habitat (Fertig and Neighbours 1996, p. 35; Heidel 2009, p. 59). We have no information on the building of future roads, but do not anticipate any based on the topography and isolated nature of most of *P. gibbensii*'s distribution. Although some roads occur in and near the habitat of *P. gibbensii*, we do not have any indication that they have significant negative effects to the species. Additionally, we have no information on dust or levels of travel on these roads impacting *P. gibbensii* or its habitat.

In conclusion, only minimal impacts to *Penstemon gibbensii* were noted from roads. Therefore, we do not consider roads to be a threat to *P. gibbensii* now or in the foreseeable future.

Trampling

Trampling by livestock, ORVs, or human foot traffic can destroy plants and increase soil erosion, especially at sites with steep, loose soils. It has been mentioned as a potential concern at seven of nine occurrences (Warren *in litt.* 1992, unpaginated; Fertig and Neighbours 1996, p. 20; Spackman and Anderson 1999, p. 31; Fertig 2000d, unpaginated; Heidel 2009, p. 28; CNHP *in litt.* 2010a, p. 4). *Penstemon gibbensii* may colonize the margins of disturbed areas, but cannot become established within an area of active use (Heidel 2009, p. 28). Soil disturbance has been noted at the Sterling Place occurrence from cattle bedding down (CNHP *in litt.* 2010a, p. 4) and at the Cherokee Basin occurrence from humans (Warren *in litt.* 1992, unpaginated). Survey activities at Cherokee Basin in 1988 left distinct footprints that were still distinguishable in places 3 years later (Warren *in litt.* 1992, unpaginated).

As stated above, biological soil crusts have been noted at occurrences in Colorado and Utah, but not in Wyoming (Spackman and Anderson 1999, pp. 22, 26; Heidel 2009, pp. 14, 20; CNHP 2010a, unpaginated; *in litt.* 2010d, p. 2). The absence of biological soil crusts in Wyoming may reflect the effects of trampling from historically heavy sheep (*Ovis aries*) grazing (Heidel 2009, p. 27).

In summary, trampling is a potential concern at most sites and has been documented at two sites. However, we have no information regarding whether any *Penstemon gibbensii* plants were actually trampled. Additionally, *P. gibbensii* is able to colonize the margins of disturbed habitats and is able to live in Wyoming where there is no evidence of biological crusts in their habitat. We have no information indicating that trampling is a threat to the species. Therefore, we do not consider trampling to be a threat to *P. gibbensii* now or in the foreseeable future.

Nonnative Invasive Plants

For general background information on nonnative invasive plants, please refer to the first paragraph of "Nonnative Invasive Plants" under *Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range* in the Five Factor

Evaluation for *Abronia ammophila* section.

Encroachment of nonnative invasive plants may potentially impact *Penstemon gibbensii*. However, *P. gibbensii* is typically restricted to bare, sparsely vegetated slopes with large areas of exposed soil where competition with other plant species, including nonnative invasive species, is minimal (Heidel 2009, p. 26). Nonnative invasive plant numbers are generally low in, and adjacent to, *P. gibbensii* occurrences, and are most common near roads (Spackman and Anderson 1999, p. 23; Heidel 2009, p. 29). *Alyssum desertorum* (desert madwort) has been documented at or near Cherokee Basin and Red Creek Rim; *Bromus tectorum*, at or near Cherokee Basin, Red Creek Rim, Sand Creek, Sterling Place, and Dagget County; *Halogeton glomeratus* (halogeton), at or near Cherokee Basin, Red Creek Rim, Spitzie Draw, and Sterling Place; and *Salsola australis* (Russian thistle), at or near Spitzie Draw and Sterling Place (Heidel 2009, p. 29; CNHP 2010a, p. 2; *in litt* 2010d, p. 2). These species have been occasionally noted for at least 10 years (Spackman and Anderson 1999, pp. 23, 27; Heidel 2009, p. 29; CNHP 2010a, unpaginated; CNHP 2010e, unpaginated), but there is no evidence of increasing trends regarding their numbers at these sites. There is no evidence that any of these nonnative invasive species have had a negative impact on *P. gibbensii*.

Nonnative invasive plants are present at or near six occurrences of *Penstemon gibbensii*. However, their numbers are generally low, and there is no evidence that they are problematic. We have no information indicating that nonnative invasive plants are a threat to the species. Therefore, we do not consider nonnative invasive plants to be a threat to *P. gibbensii* now or in the foreseeable future.

Climate Change and Drought

For general background information on climate change, please refer to the first paragraphs of "Climate Change" under *Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range* in the Five Factor Evaluation for *Abronia ammophila* section.

Plant species with restricted ranges that also are climatically limited may experience population declines as a result of climate change (Schwartz and Brigham 2003, p. 11). Whether *Penstemon gibbensii* would be positively impacted by an increase in barren land due to drought that provided potential habitat, or negatively impacted by a loss of current marginal habitat, cannot be predicted. Dorn (1990a, p. 6) noted that *P. gibbensii* has fewer and smaller flowers than most species of *Penstemon* and hypothesized that this species may have once grown under moister conditions and could be in long-term decline due to climatic change. However, no additional supporting data were provided. He also noted that populations at lower, hotter elevations are more pubescent, a possible adaptation to conserve moisture (Dorn 1990a, p. 6).

Drought is a natural and common phenomenon within the range of *Penstemon gibbensii* (Dorn 1990a, p. 6). Average annual precipitation ranges from approximately 26 cm (10 in.) at Wyoming occurrences to about 41 cm (16 in.) at Colorado and Utah occurrences (Heidel 2009, pp. 19–20). As discussed above, *P. gibbensii* appears to have minimal reproductive success in most years because of dry conditions, but responds favorably to late-summer moisture that occurs infrequently (Fertig and Neighbours 1996, p. 16; Heidel 2009, p. 22). *Penstemon gibbensii* is a warm-season plant that remains succulent through the summer; therefore, it can take advantage of summer thunderstorms after other species have stopped growing or completed their life cycle (Warren *in litt.* 1992, unpaginated). Morphological adaptations discussed above (pubescent, narrow leaves in hotter climes) also indicate that the species is not limited by variations in the regional climate to a great degree.

We believe that *Penstemon gibbensii* has evolved to adapt to recurring drought conditions. Short-term population fluctuations, in response to varying climatic conditions from year to year, appear to be typical for the species. We have no information indicating that climate change or drought is a threat to the species. Therefore, we do not consider climate change or drought to be a threat to *P. gibbensii* now or in the foreseeable future.

Summary of Factor A

Two occurrences (Sand Creek and Willow Creek) have experienced minor impacts from energy development. Five occurrences (Sand Creek, Willow Creek, Spitzie Draw, Sterling Place, and Flat Top Mountain) have roads that are nearby or cross a portion of the occurrence. The Sand Creek occurrence, which appears to be experiencing more disturbances from energy development and road usage than the other sites, has had an increase in *P. gibbensii* numbers according to survey results despite these disturbances. We are not aware of any future energy development projects being planned in or near any of the *P. gibbensii* occurrences. Furthermore, the topography at most occurrences does not lend itself to energy development or road construction (Fertig and Neighbours 1996, pp. 19–20; Heidel 2009, p. 28). Therefore, we do not anticipate substantial habitat disturbance in the future. Trampling has been documented at two sites, but there is no information indicating that plants have been destroyed. Nonnative invasive plants are present at or near six occurrences of *P. gibbensii*. However, nonnative invasive plant numbers are generally low, and there is no evidence that they are problematic. Climate change and drought could potentially modify habitat at all occurrences. However, the species appears to have adapted to recurrent drought and variations in climatic conditions. Adverse impacts due to habitat destruction, modification, or curtailment appear minimal at the present time.

We conclude that the best scientific and commercial information available indicates that *Penstemon gibbensii* 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.

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

We are not aware of any adverse impacts to *Penstemon gibbensii* from overutilization for commercial, recreational, scientific, or educational purposes at this time. We conclude that the best scientific and commercial information available indicates that *P. gibbensii* 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.

Factor C. Disease or Predation

Disease

We are not aware of any adverse impacts to *Penstemon gibbensii* from disease at this time. Therefore, we do not consider disease to be a threat to *P. gibbensii* now or in the foreseeable future.

Predation—Grazing and Herbivory

Penstemon gibbensii is relatively succulent and may be grazed by mule deer (*Odocoileus hemionus*), pronghorn (*Antilocapra americana*), domestic cattle (*Bos taurus*), and other herbivores

during late summer when green vegetation is sparse (Heidel 2009, p. 26). Currently, there is no sheep grazing in the habitat of *P. gibbensii* (Fertig and Neighbours 1996, p. 19); as discussed above, historical sheep use may have been heavy in Wyoming (Heidel 2009, p. 14). Grazing appears to be restricted almost entirely to flowering stems, which could impact seed production, seed bank replenishment, and long-term viability (Fertig and Neighbours 1996, p. 19). However, steep slopes, unstable footing, and overall low forage production in *P. gibbensii* habitat may limit use by wildlife and livestock (Warren *in litt.* 1992, unpaginated; Heidel 2009, p. 27).

Grazing intensity often varies between years and between sites and does not appear to negatively affect *Penstemon gibbensii.* At the Spitzie Draw occurrence, variable levels of browsing by mule deer were noted in 2009 (CNHP *in litt.* 2009a, unpaginated; *in litt.* 2009b, unpaginated), but little evidence of grazing or browsing was found in 2010 (CNHP *in litt.* 2010c, p. 2). At the Sterling Place occurrence, there was little evidence of damage to *P. gibbensii* from mule deer or elk (*Cervus canadensis*), but there was moderate to heavy cattle grazing (CNHP *in litt.* 2010a, p. 2). At the Daggett County occurrence, there was little evidence of any grazing (CNHP *in litt.* 2010b, p. 2). *P. gibbensii* numbers at Flat Top Mountain were high in 1995 and low in 2008 (see Table 2). However, plants experienced low levels of herbivory (approximately 5 percent) in both years (Heidel 2009, p. 24). Cattle grazing also was observed at the Sand Creek occurrence in 2005 (Heidel 2009, p. 43).

The Cherokee Basin occurrence is the only site that is fenced. In 1985, the BLM fenced 95 percent of the site to exclude cattle, and 5 percent or less was left unfenced (Warren *in litt.* 1992, unpaginated). The allotment, an area larger than the *P. gibbensii* occurrence, was monitored to compare the effects of grazing pressure (Warren *in litt.* 1992, unpaginated). In 1992, the overall level of livestock use in the allotment was low to moderate, the range was in good to excellent condition with an improving trend, and a reduced stocking rate was not recommended (Warren *in litt.* 1992, unpaginated). The Cherokee Basin exclosure has been critical in ruling out grazing as the cause of recent declines at this occurrence, where plant numbers have declined since the early 1990s (see Table 1) (Heidel 2009, p. 30).

No specific information regarding grazing is available for the T84N R18W, Willow Creek, or Red Creek Rim occurrences, other than general observations regarding the potential for grazing by livestock and wildlife.

Grazing intensity is variable between years and sites, but appears to have minimal impact to *Penstemon gibbensii*, possibly because of steep slopes, unstable footing, and overall low forage production in the species' habitat. Fluctuations in plant numbers have occurred at Flat Top Mountain, despite consistent levels of grazing, and at Cherokee Basin, in the absence of grazing, which supports the conclusion that grazing causes minimal adverse impacts to *P. gibbensii*. Therefore, we do not consider grazing to be a threat to *P. gibbensii* now or in the foreseeable future.

Summary of Factor C

We have no evidence of adverse impacts to *Penstemon gibbensii* from disease. *P. gibbensii* is relatively succulent and may be grazed by both wildlife and livestock, particularly in late summer when most sympatric vegetation has dried. However, the typical habitat of *P. gibbensii* (steep slopes, loose substrate, and sparse vegetative cover) appears to limit heavy grazing at most sites and minimize impacts from grazing.

We conclude that the best scientific and commercial information available indicates that *Penstemon gibbensii* is not in danger of extinction or likely to become so within the foreseeable future because of disease or predation.

Factor D. The Inadequacy of Existing Regulatory Mechanisms

The Act requires us to examine the adequacy of existing regulatory mechanisms with respect to threats that may place *Penstemon gibbensii* in danger of extinction or likely to become so in the future. Existing regulatory mechanisms that could have an effect on potential threats to *P. gibbensii* include (1) Federal laws and regulations; (2) State laws and regulations; and (3) local land use laws, processes, and ordinances. Actions adopted by local groups, States, or Federal entities that are discretionary, including conservation strategies and guidance, are not regulatory mechanisms; however, we may discuss them in relation to their effects on potential threats to the species.

Federal Laws and Regulations

Bureau of Land Management

Most known *Penstemon gibbensii* occurrences are on BLM land (see Table 2). The BLM recognizes *P. gibbensii* as a sensitive species throughout its range (Heidel 2009, p. 6). Sensitive species designation requires that the species is: (1) Native, (2) at risk or populations trending downward throughout all or a significant portion of its range, and (3) dependent on special or unique habitat on BLM lands (Sierra 2009, *in litt.*). As discussed above, these species are managed to promote their conservation and minimize the likelihood and need for listing under the Act. The oldest known occurrence at Cherokee Basin was fenced by the BLM for added protection (see Factor C). Four occurrences (Cherokee Basin, Flat Top Mountain, Spitzie Draw, and Sterling Place) were recommended by the BLM for designation as ACECs (Heidel 2009, pp. 30–31). However, the final records of decision for the Rawlins RMP in Wyoming and the Little Snake River RMP in Colorado did not designate any of these occurrences as ACECs (Heidel 2009, pp. 30–31). Designation as an ACEC would have protected these sites from surface disturbances associated with energy and road development. Nevertheless, as discussed under Factor A, additional energy development is not anticipated, and the steep slopes found at these sites render them ill-suited for most road construction.

National Wildlife Refuge

Browns Park National Wildlife Refuge maintains a variety of native habitats and wildlife, with emphasis on migratory birds, threatened and endangered species, and species of special concern. The NWR has a portion of one occurrence of *Penstemon gibbensii*, which is protected by refuge regulations that require all vehicles to remain on developed roads and prohibit the collection, possession, or destruction of any plant (Service 2010, unpaginated).

National Environmental Policy Act

Most known *Penstemon gibbensii* (approximately 77 percent) occur on Federal and State land (Heidel 2009, pp. 22, 27). All Federal agencies are required to adhere to the NEPA for projects they fund, authorize, or carry out. Please refer to the NEPA discussion under *Factor D. The Inadequacy of Existing Regulatory Mechanisms* in the Five Factor Evaluation for *Abronia ammophila* section for additional information.

State Regulatory Mechanisms

The *Penstemon gibbensii* occurrence in Daggett County, Utah, and a portion of the T84N R18W, Wyoming occurrence are on State lands. *P. gibbensii* is designated as a rare plant in Utah and a species of concern in Wyoming (WNDD 2007, p. 2; Utah Rare Plants 2010, p. 2). These designations

signify recognition by the States regarding the rarity of the species, but do not confer any specific protection.

Local Land Use Laws, Ordinances, and Contracts

The Nature Conservancy

TNC has a conservation easement on the private land portion of the T84N R18W occurrence that protects the area from many development activities (Heidel 2009, p. 31). This is a permanent easement that includes surface rights, but not mineral rights (Browning 2010, pers. comm.).

Summary of Factor D

We have no evidence of impacts to *Penstemon gibbensii* from inadequate regulatory mechanisms. All but a portion of one occurrence are on Federal or State lands. The portion on private land is largely protected by a conservation easement. Seven of the nine known occurrences are managed all or in part by BLM, which promotes the conservation of sensitive species and minimizes the likelihood and need for their listing under the Act. The Service has refuge regulations that protect *P. gibbensii* occurring on their lands.

We conclude that the best scientific and commercial information available indicates that *Penstemon gibbensii* is not in danger of extinction or likely to become so within the foreseeable future because of inadequate regulatory mechanisms.

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

Natural and manmade factors with the potential to affect *Penstemon gibbensii* include: (1) Small population size, (2) pollination, and (3) genetic diversity.

Small Population Size

For general background information on small population size, please refer to the first paragraph of "Small Population Size" under *Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence* in the Five Factor Evaluation for *Abronia ammophila* section.

No information exists regarding the historical range or population numbers of *Penstemon gibbensii*, but experts familiar with the species conclude that it was likely historically rare (Dorn 1990a, p. 6; Fertig and Neighbours 1996, p. 4; Spackman and Anderson 1999, p. 32; Heidel 2009, p. 5). *P. gibbensii* is a local endemic that has evolved to exploit a barren, erodible habitat (Dorn 1990a, p. 3). The slight morphological differences, different substrates, and widely separated distribution suggest that the species is a paleoendemic (has been in existence for a long period of time in a single region) (Dorn 1990a, p. 6; Heidel 2009, p. 5). Detailed descriptions of the species' abundance and trends are provided under the *Abundance* and *Trends* sections for this species. No occurrences have been extirpated since the species was first identified in 1981, indicating some resilience to perturbation.

New occurrences of *Penstemon gibbensii* continue to be documented including Willow Creek in 2004 and Red Creek Rim in 2008 (Heidel 2009, p. 9). *P. gibbensii* is presently known from nine occurrences that span a distance of 193 km (120 mi) (Heidel 2009, p. 31). Some potentially suitable areas have not yet been surveyed (Heidel 2009, pp. 10–12), and more occurrences may be located.

Penstemon gibbensii is likely a historically rare plant that has nonetheless persisted. Existing sites are monitored, and surveys have located new occurrences. No occurrences have been extirpated. We have no information indicating that random demographic or environmental events are a threat to the species because of its small population size. Therefore, we do not consider small population size to be a threat to *P. gibbensii* now or in the foreseeable future.

Pollination

Penstemons are pollinated by a variety of insects and hummingbirds, but most commonly by insects from the Order Hymenoptera (Wolfe *et al.* 2006, pp. 1699, 1709). Bees have been seen visiting flowers at sites in Colorado and Utah (Langton 2010, pers. comm.). As discussed above, pollinators may regard small populations as inferior or unreliable food sources, leading to low visitation rates (Oostermeijer 2003, p. 23). Low visitation rates may be more of a concern in currently rare species that were historically abundant (Brigham 2003, p. 84). However, as identified above, *Penstemon gibbensii* is believed to have been historically rare (Dorn 1990a, p. 6; Fertig and Neighbours 1996, p. 4; Spackman and Anderson 1999, p. 32; Heidel 2009, p. 5).

Only very limited information is available regarding pollination of *Penstemon gibbensii*. However, we have no information indicating that poor pollination is a threat to the species. Therefore, we do not consider lack of pollinators to be a threat to *P. gibbensii* now or in the foreseeable future.

Genetic Diversity

For general background information on genetic diversity, please refer to the first paragraph of "Genetic Diversity" under *Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence* in the Five Factor Evaluation for *Abronia ammophila* section.

The risk of negative consequences to rare plants from reduced genetic diversity varies (Brigham 2003, p. 88). *Penstemon gibbensii* is one of several plant species being studied in a comparative population genetics analysis. Initial results from a study of two Wyoming populations document high variation of DNA sequences within populations examined to date; however, between-population differentiation analysis has not yet been conducted (Heidel 2009, p. 5). These results are preliminary and limited in scope, but indicate that an adequate level of genetic diversity exists in these populations. Genetic exchange could be possible as three of the Wyoming occurrences and the three occurrences in Colorado and Utah are within 5 to 8 km (3 to 5 mi) of each other (Heidel 2009, p. 9).

Only very limited information regarding the genetic diversity exhibited by *Penstemon gibbensii* is available. However, we have no information indicating that a lack of genetic diversity is a threat to the species. Therefore, we do not consider reduced genetic diversity to be a threat to *P. gibbensii* now or in the foreseeable future.

Summary of Factor E

We conclude that the best scientific and commercial information available indicates that *Penstemon gibbensii* is not in danger of extinction or likely to become so within the foreseeable future because of small population size, reduced pollination, or reduced genetic diversity.

Finding

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

Five occurrences (Sand Creek, Willow Creek, Spitzie Draw, Sterling Place, and

Flat Top Mountain) have experienced some minimal adverse impacts to the habitat of *Penstemon gibbensii* due to oil and gas development and road construction. The topography at most occurrences does not lend itself to energy development or road construction; therefore, we do not anticipate substantial habitat disturbance in the future. All occurrences could experience increased temperatures and precipitation changes from climate change. Whether this would result in a net gain or net loss in potential habitat cannot be predicted. However, differing morphological adaptations at the various occurrences indicate that the species can adapt to variable climate conditions.

Five occurrences (Sand Creek, Flat Top Mountain, Spitzie Draw, Sterling Place, and Daggett County) have documentation of grazing. However, the typical habitat of *P. gibbensii* (steep slopes, loose substrate, and sparse vegetative cover) appears to limit heavy grazing. Two occurrences (Cherokee Basin and Sterling Place) have experienced some trampling by humans and livestock. However, we are not aware of any loss of *P. gibbensii* at either of these sites from trampling.

All occurrences experience drought as a natural and regular phenomenon, which likely results in short-term population fluctuations. However, *P. gibbensii* has evolved to adapt to recurring drought conditions. Six occurrences (Cherokee Basin, Sand Creek, Red Creek Rim, Spitzie Draw, Sterling Place, and Daggett County) have nonnative invasive plants at or near the site. However, the typical habitat of *P. gibbensii* is sparsely vegetated slopes with large areas of bare soil where competition with other plant species, including nonnative invasive plants, is minimal.

All occurrences have relatively small populations. However, *P. gibbensii* is considered historically rare. No occurrences have been extirpated since the species was first identified, and new occurrences continue to be documented. We have no information regarding actual or potential adverse impacts due to overutilization, disease, inadequate regulatory mechanisms, reduced genetic diversity, or reduced pollination.

Based on our review of the best available scientific and commercial information pertaining to the five factors, we find that the threats are not of sufficient imminence, intensity, or magnitude to indicate that *Penstemon gibbensii* is in danger of extinction (endangered), or likely to become endangered within the foreseeable future (threatened), throughout all of its range. Therefore, we find that listing *P. gibbensii* as a threatened or endangered species is not warranted throughout all of its range.

Significant Portion of the Range

Having determined that *Penstemon gibbensii* 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 *P. gibbensii* is in danger of extinction or is likely to become endangered in the foreseeable future.

In determining whether *Penstemon gibbensii* is threatened or endangered in a significant portion of its range, we first addressed whether any portions of the range of *P. gibbensii* warrant further consideration. We evaluated the current range of *P. gibbensii* to determine if there is any apparent geographic concentration of the primary stressors potentially affecting the species including energy development, roads, climate change, grazing, trampling, drought, nonnative invasive plants, and small population size. *P. gibbensii* is likely a historically rare endemic plant known from nine occurrences spanning a distance of 193 km (120 mi) (Heidel 2009, p. 31). This species' small range suggests that stressors are likely to affect it in a uniform manner throughout its range. All stressors occur at or near most sites, with the exception of energy development, which has been documented at or near three occurrences. However, the sale of oil and gas leases is ongoing; consequently, it is a potential stressor at most sites. Effects to *P. gibbensii* from these stressors are not disproportionate in any portion of the species' range. As we explained in detail in our analysis of the status of the species, none of the stressors faced by the species are sufficient to place it in danger of extinction now (endangered) or in the foreseeable future (threatened). Therefore, no portion is likely to warrant further consideration, and a determination of significance is not necessary.

We do not find that *Penstemon gibbensii* 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 *P. gibbensii* as threatened or endangered under the Act is not warranted at this time.

We request that you submit any new information concerning the status of, or threats to, *Penstemon gibbensii* to our Wyoming Ecological Services Field Office (see **ADDRESSES** section) whenever it becomes available. New information will help us monitor *P. gibbensii* and encourage its conservation. If an emergency situation develops for *P. gibbensii*, or any other species, we will act to provide immediate protection.

Species Information for *Boechera pusilla*

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 cm (6.7 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 mm (0.12 in.) (Marriott 1986, p. 3; Dorn 1990b, pp. 2–3; Fertig 1994, unpaginated; Heidel 2005, p. 3).

Discovery and Taxonomy

Boechera pusilla was first collected near South Pass in Fremont County, Wyoming, in 1981 (Dorn 1990b, p. 1). *B. pusilla* is a member of the *Brassicaceae* (mustard) family and was formerly classified as *Arabis pusilla* (Fertig 1994, unpaginated), which was the name used in the petition (Forest Guardians 2007, p. 23). 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. 382–383). 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 finding, 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 oxylobula* (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* (Lemmon's rockcress) (Flora of North America 2010b, unpaginated). We recognize *B. pusilla* as a valid species and a listable entity.

Biology and 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. 15–16), which is thought to be caused by freezing conditions in spring or possibly drought (Heidel 2005, pp. 15–16). 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. 874–876), 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).

Habitat

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 m (8,000 to 8,100 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. 6–8). *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 km²; 72 mi²) (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. 8–9). 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).

Distribution and Abundance

The distribution of *Boechera pusilla* is extremely limited due to its very specific habitat requirements (Dorn 1990b, p. 8). The only known population of *B. pusilla* is located on lands administered by the 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 ha (160 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).

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.). 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 that year (Marriott 1986, p. 15). In 1990, numbers were down to about 600 flowering plants for the entire population (Dorn 1990b, p. 8). 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.). The decrease to 600 flowering plants documented in 1990 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, 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 m² (0.156 down to 0.031 flowering plants per ft²) 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 subpopulation plot, where the largest number of plants is found, had 671 individual flowering *Boechera pusilla* plants in 1988 (Heidel 2005, p. 14). This area had 87 flowering plants when it was counted again in 2003 (Heidel 2005, p. 14). In 2010, the plot had 56 flowering plants (Heidel 2010c, pers. comm.). Flowering plant numbers in the subpopulation plot has consistently declined. However, numbers of flowering plants for the entire subpopulation where the plot is located increased from between 100 and 150 in 2003 (Heidel 2005, p. 14) to 283 in 2010 (Heidel 2010c, pers. comm.). 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 of which has been surveyed periodically as described above (Heidel 2005, p. 14; Heidel 2010c, pers. comm.). 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 2010 compared to 2003, but the overall trend is downward, with 2010 population numbers at 350 compared to 800 to 1000 in 1988.

Reproductive success may vary considerably from year to year depending on climate conditions, leading to wide fluctuations in populations (Dorn 1990b, p. 10). Possible evidence of these fluctuations is low levels of fruit production in 2003 that visibly increased in 2010 (Heidel 2010c, pers. comm.). However, 2010 plant numbers are low compared to those documented in 1988 and 1990.

Five Factor Evaluation for *Boechera pusilla*

Information pertaining to *Boechera pusilla* in relation to the five factors provided in section 4(a)(1) of the Act is discussed below.

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

The following potential factors that may affect the habitat or range of *Boechera pusilla* are discussed in this section: (1) Recreational activities, (2) energy development, (3) nonnative invasive plants, (4) climate change, and (5) drought.

Recreational Activities

Boechera pusilla's 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 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 has 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. 17–18). Currently the nearest gas development occurs approximately 10.1 km (6.3 mi) from the location of *B. pusilla* (Kile 2010, 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

For general background information on nonnative invasive plants, please refer to the first paragraph of "Nonnative Invasive Plants" under *Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range* in the Five Factor Evaluation for *Abronia ammophila* section.

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. 531–532); 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

For general background information on climate change, please refer to the first paragraphs of "Climate Change" under *Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range* in the Five Factor Evaluation for *Abronia ammophila* section.

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.). As discussed above, a 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 are not sufficient during this period to understand the role of drought in population decline. Therefore, because of lack of evidence, we do not consider drought to be a threat to *B. pusilla* now or in the foreseeable future.

Summary of Factor A

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.

Factor 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 DBG; however, they do not have a record of receiving any *B. pusilla* seeds (Neale 2010b, 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*. Therefore, 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.

Factor 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 is found in *B. pusilla*. Therefore, we do not consider disease to be a threat to *B. pusilla* now or in the foreseeable future.

Predation—Grazing 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 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.

Summary of Factor C

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.

Factor D. Inadequacy of Existing Regulatory Mechanisms

The Act requires us to examine the adequacy of existing regulatory mechanisms with respect to threats that may place *Boechera pusilla* in danger of extinction or likely to become so in the future. Existing regulatory mechanisms that could have an effect on potential threats to *B. pusilla* include (1) Federal laws and regulations; (2) State laws and regulations; and (3) local land use laws, processes, and ordinances. Because the entire population of *Boechera pusilla* occurs on BLM lands, we focus our discussion on Federal laws. Actions adopted by local groups, States, or Federal entities that are discretionary, including conservation strategies and guidance, are not regulatory mechanisms; however, we may discuss them in relation to their effects on potential threats to the species.

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 RMPs should address sensitive species, and that implementation "should consider all site-specific methods and procedures needed to bring species and their habitats to the condition under which management under the Bureau sensitive species policies would no longer be necessary" (BLM 2008, p. 2A1). 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 17–18). 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 2013 (Dana 2010b, 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. Please refer to the NEPA discussion under *Factor D. The Inadequacy of Existing Regulatory Mechanisms* in the Five Factor Evaluation for *Abronia ammophila* section for additional information.

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).

Summary of Factor D

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 plant's 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.

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

Natural and manmade factors with the potential to affect *Boechera pusilla* include: (1) Small population size, and (2) threats not yet fully identified.

Small Population Size

For general background information on small population size, please refer to the first paragraph of "Small Population Size" under *Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence* in the Five Factor Evaluation for *Abronia ammophila* section.

In order for a population to sustain itself, there must be enough reproducing individuals and habitat to ensure its survival. Conservation biology defines this as the "minimum viable population" requirement (Grumbine 1990, pp. 127–128). This requirement may be between 500 and 5,000 individuals for other species of *Boechera* depending on variability among species, demographic constraints, and evolutionary history (Ladyman 2005, p. 26). *Boechera pusilla* occurs in relatively small numbers, with the total population size no greater than

1,000 flowering plants in the past (Heidel 2005, p. 14) and at 350 flowering plants in 2010 (Heidel 2010d, pers. comm.). Plant numbers are at levels that may not ensure this species' continued existence over the long term. As noted above, botanists who have studied *B. pusilla* note an overall declining trend of the species (Heidel 2005, p. 14; Heidel 2010c, pers. comm.; Windham 2010, 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 (Windham 2010, pers. comm.). As established in an earlier section, the number of flowering plants in the population in 2010 was approximately 350, an increase from 2003 estimates of 150 to 250. However, if a decline similar to the significant decrease between 1988 (800 to 1,000 flowering plants) and 2003 (150 to 250 flowering plants) occurs again, the species may have difficulty perpetuating itself into the future.

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. 482–484), such as climate shift that the species is not adapted to or factors that lead to reduced reproductive success (Ladyman 2005, pp. 30–31). 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. 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.

Summary of Factor E

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 (150–250 flowering plants) to 2010 (350 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), and species numbers are below that level. 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. Some of the decline may be attributable to drought conditions, but we 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 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.

Five Factor Evaluation Summary for Boechera pusilla

Boechera pusilla has a threat that is 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. The trend may have been reversed somewhat, but without improved population numbers, the species may reach a population level at which other stressors become threats. The species may already be below the minimum viable population, so other stressors may begin to present threats to the species. 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.

Finding

As required by the Act, we considered the five factors in assessing whether *Boechera pusilla* is threatened or endangered throughout all of its range. We examined the best scientific and commercial information available regarding the past, present, and future threats faced by *B. pusilla*. We reviewed the petition, information available in our files, other available published and unpublished information, and we consulted with recognized *B. pusilla* experts and other Federal agencies.

This status review identified threats to *Boechera pusilla* attributable to Factor E. The primary threat to the species is from a threat that is not fully identified, but is indicated by the species' small, declining population size. This threat to *B. pusilla* is not fully understood, but may be connected with drought conditions, disease, or other factors. Protective measures have been taken previously to maintain the species' habitat, but the species continues to experience declines. *B. pusilla* has only one population, with most of the individuals occurring in a single subpopulation. The range of the species is small due to limitations of a highly specialized habitat. Although population levels increased in 2010, the species is experiencing an overall pattern of decline that we anticipate will continue. *B. pusilla* numbers already may be below the minimum viable population requirement, so other vulnerabilities associated with the small population may now present threats to

the species. Therefore, the species appears likely to be in danger of extinction currently, or in the foreseeable future, as result of a threat that is not fully identified, but is manifest by an ongoing declining population trend.

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

We reviewed the available information to determine if the existing and foreseeable threats render the species at risk of extinction now such that issuing an emergency regulation temporarily listing the species under section 4(b)(7) of the Act is warranted. We determined that issuing an emergency regulation temporarily listing the species is not warranted for this species at this time, because 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. However, if at any time we determine that issuing an emergency regulation temporarily listing *Boechera pusilla* is warranted, we will initiate this action at that time.

Listing Priority Number

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

As a result of our analysis of the best available scientific and commercial information, we have assigned *Boechera pusilla* a Listing Priority Number (LPN) of 8, based on our finding that the species faces threats that are of moderate magnitude and are imminent. These threats include a threat that is not fully identified that may work in combination with the small population. Our rationale for assigning *B. pusilla* an LPN of 8 is outlined below.

Under the Service's guidelines, the magnitude of threat is the first criterion we look at when establishing a listing priority. The guidance indicates that species with the highest magnitude of threat are those species facing the greatest threats to their continued existence. These species receive the highest listing priority. We consider the threats that *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 Five Factor Evaluation for *Boechera pusilla*, is not fully understood, we know it exists as indicated by the declining population. Because we have not detected the source or nature of the threat, we consider the threat to be moderate in magnitude. 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) and 2010 (350), 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.

Under our LPN guidelines, the second criterion we consider in assigning a listing priority is the immediacy of threats. This criterion is intended to ensure that the species facing actual, identifiable threats are given priority over those for which threats are only potential or that are intrinsically vulnerable but are not known to be presently facing such threats. We consider the threat to *Boechera pusilla* as described in *Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence* under Five Factor Evaluation for *Boechera 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.

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

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

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

Preclusion and Expeditious Progress

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

The resources available for listing actions are determined through the annual Congressional appropriations process. The appropriation for the Listing Program is available to support work involving the following listing actions: Proposed and final listing rules; 90-day and 12-month findings on petitions to add species to the Lists of Endangered and Threatened Wildlife and Plants (Lists) or to change the status

of a species from threatened to endangered; annual "resubmitted" petition findings on prior warranted-but-precluded petition findings as required under section 4(b)(3)(C)(i) of the Act; critical habitat petition findings; proposed and final rules designating critical habitat; and litigation-related, administrative, and program-management functions (including preparing and allocating budgets, responding to Congressional and public inquiries, and conducting public outreach regarding listing and critical habitat).

The work involved in preparing various listing documents can be extensive and may include, but is not limited to: Gathering and assessing the best scientific and commercial data available and conducting analyses used as the basis for our decisions; writing and publishing documents; and obtaining, reviewing, and evaluating public comments and peer review comments on proposed rules and incorporating relevant information into final rules. The number of listing actions that we can undertake in a given year also is influenced by the complexity of those listing actions; that is, more complex actions generally are more costly. The median cost for preparing and publishing a 90-day finding is $39,276; for a 12-month finding, $100,690; for a proposed rule with critical habitat, $345,000; and for a final listing rule with critical habitat, the median cost is $305,000.

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

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

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

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

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

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

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

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

We assigned *Boechera pusilla* an LPN of 8. This is based on our finding that the species faces immediate and moderate magnitude threats from a threat we do not fully understand but is manifest by reduced population levels that may be below the minimum viable population requirement. Under our 1983 Guidelines, a "species" facing imminent moderate-magnitude threats is assigned an LPN of 7, 8, or 9 depending on its taxonomic status. Because *B. pusilla* is a species, we assigned it an LPN of 8. Therefore, work on a proposed listing determination for *B. pusilla* is precluded by work on higher priority candidate species (*i.e.*, species with LPN of 7); listing actions with absolute statutory, court ordered, or court-approved deadlines; and final listing determinations for those species that were proposed for listing with funds from previous FYs. This work includes all the actions listed in the tables below under expeditious progress.

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

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

FY 2010 AND FY 2011 COMPLETED LISTING ACTIONS

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

FY 2010 AND FY 2011 COMPLETED LISTING ACTIONS—Continued

Publication date	Title	Actions	FR pages
12/15/2009	90-Day Finding on Petitions To List Nine Species of Mussels From Texas as Threatened or Endangered With Critical Habitat.	Notice of 90-day Petition Finding, Substantial.	74 FR 66260–66271.
12/16/2009	Partial 90-Day Finding on a Petition to List 475 Species in the Southwestern United States as Threatened or Endangered With Critical Habitat.	Notice of 90-day Petition Finding, Not substantial & Substantial.	74 FR 66865–66905.
12/17/2009	12-month Finding on a Petition To Change the Final Listing of the Distinct Population Segment of the Canada Lynx To Include New Mexico.	Notice of 12-month petition finding, Warranted but precluded.	74 FR 66937–66950.
01/05/2010	Listing Foreign Bird Species in Peru & Bolivia as Endangered Throughout Their Range.	Proposed Listing Endangered	75 FR 605–649.
01/05/2010	Listing Six Foreign Birds as Endangered Throughout Their Range.	Proposed Listing Endangered	75 FR 286–310.
01/05/2010	Withdrawal of Proposed Rule to List Cook's Petrel	Proposed rule, withdrawal	75 FR 310–316.
01/05/2010	Final Rule to List the Galapagos Petrel & Heinroth's Shearwater as Threatened Throughout Their Ranges.	Final Listing Threatened	75 FR 235–250.
01/20/2010	Initiation of Status Review for *Agave eggersiana* & *Solanum conocarpum*.	Notice of Intent to Conduct Status Review for Listing Decision.	75 FR 3190–3191.
02/09/2010	12-month Finding on a Petition to List the American Pika as Threatened or Endangered.	Notice of 12-month petition finding, Not warranted.	75 FR 6437–6471.
02/25/2010	12-Month Finding on a Petition To List the Sonoran Desert Population of the Bald Eagle as a Threatened or Endangered Distinct Population Segment.	Notice of 12-month petition finding, Not warranted.	75 FR 8601–8621.
02/25/2010	Withdrawal of Proposed Rule To List the Southwestern Washington/Columbia River Distinct Population Segment of Coastal Cutthroat Trout (*Oncorhynchus clarki clarki*) as Threatened.	Withdrawal of Proposed Rule to List	75 FR 8621–8644.
03/18/2010	90-Day Finding on a Petition to List the Berry Cave salamander as Endangered.	Notice of 90-day Petition Finding, Substantial.	75 FR 13068–13071.
03/23/2010	90-Day Finding on a Petition to List the Southern Hickorynut Mussel (*Obovaria jacksoniana*) as Endangered or Threatened.	Notice of 90-day Petition Finding, Not substantial.	75 FR 13717–13720.
03/23/2010	90-Day Finding on a Petition to List the Striped Newt as Threatened.	Notice of 90-day Petition Finding, Substantial.	75 FR 13720–13726.
03/23/2010	12-Month Findings for Petitions to List the Greater Sage-Grouse (*Centrocercus urophasianus*) as Threatened or Endangered.	Notice of 12-month petition finding, Warranted but precluded.	75 FR 13910–14014.
03/31/2010	12-Month Finding on a Petition to List the Tucson Shovel-Nosed Snake (*Chionactis occipitalis klauberi*) as Threatened or Endangered with Critical Habitat.	Notice of 12-month petition finding, Warranted but precluded.	75 FR 16050–16065.
04/05/2010	90-Day Finding on a Petition To List Thorne's Hairstreak Butterfly as threatened or Endangered.	Notice of 90-day Petition Finding, Substantial.	75 FR 17062–17070.
04/06/2010	12-month Finding on a Petition To List the Mountain Whitefish in the Big Lost River, Idaho, as Endangered or Threatened.	Notice of 12-month petition finding, Not warranted.	75 FR 17352–17363.
04/06/2010	90-Day Finding on a Petition to List a Stonefly (*Isoperla jewetti*) & a Mayfly (*Failceon eatoni*) as Threatened or Endangered with Critical Habitat.	Notice of 90-day Petition Finding, Not substantial.	75 FR 17363–17367.
04/7/2010	12-Month Finding on a Petition to Reclassify the Delta Smelt From Threatened to Endangered Throughout its Range.	Notice of 12-month petition finding, Warranted but precluded.	75 FR 17667–17680.
04/13/2010	Determination of Endangered Status for 48 Species on Kauai & Designation of Critical Habitat.	Final Listing Endangered	75 FR 18959–19165.
04/15/2010	Initiation of Status Review of the North American Wolverine in the Contiguous United States.	Notice of Initiation of Status Review for Listing Decision.	75 FR 19591–19592.
04/15/2010	12-Month Finding on a Petition to List the Wyoming Pocket Gopher as Endangered or Threatened with Critical Habitat.	Notice of 12-month petition finding, Not warranted.	75 FR 19592–19607.
04/16/2010	90-Day Finding on a Petition to List a Distinct Population Segment of the Fisher in its United States Northern Rocky Mountain Range as Endangered or Threatened with Critical Habitat.	Notice of 90-day Petition Finding, Substantial.	75 FR 19925–19935.
04/20/2010	Initiation of Status Review for Sacramento splittail (*Pogonichthys macrolepidotus*).	Notice of Initiation of Status Review for Listing Decision.	75 FR 20547–20548.
04/26/2010	90-Day Finding on a Petition to List the Harlequin Butterfly as Endangered.	Notice of 90-day Petition Finding, Substantial.	75 FR 21568–21571.
04/27/2010	12-Month Finding on a Petition to List Susan's Purse-making Caddisfly (*Ochrotrichia susanae*) as Threatened or Endangered.	Notice of 12-month petition finding, Not warranted.	75 FR 22012–22025.

FY 2010 AND FY 2011 COMPLETED LISTING ACTIONS—Continued

Publication date	Title	Actions	FR pages
04/27/2010	90-day Finding on a Petition to List the Mohave Ground Squirrel as Endangered with Critical Habitat.	Notice of 90-day Petition Finding, Substantial.	75 FR 22063–22070.
05/04/2010	90-Day Finding on a Petition to List Hermes Copper Butterfly as Threatened or Endangered.	Notice of 90-day Petition Finding, Substantial.	75 FR 23654–23663.
06/01/2010	90-Day Finding on a Petition To List *Castanea pumila* var. *ozarkensis*.	Notice of 90-day Petition Finding, Substantial.	75 FR 30313–30318.
06/01/2010	12-month Finding on a Petition to List the White-tailed Prairie Dog as Endangered or Threatened.	Notice of 12-month petition finding, Not warranted.	75 FR 30338–30363.
06/09/2010	90-Day Finding on a Petition To List van Rossem's Gull-billed Tern as Endangered or Threatened.	Notice of 90-day Petition Finding, Substantial.	75 FR 32728–32734.
06/16/2010	90-Day Finding on Five Petitions to List Seven Species of Hawaiian Yellow-faced Bees as Endangered.	Notice of 90-day Petition Finding, Substantial.	75 FR 34077–34088.
06/22/2010	12-Month Finding on a Petition to List the Least Chub as Threatened or Endangered.	Notice of 12-month petition finding, Warranted but precluded.	75 FR 35398–35424.
06/23/2010	90-Day Finding on a Petition to List the Honduran Emerald Hummingbird as Endangered.	Notice of 90-day Petition Finding, Substantial.	75 FR 35746–35751.
06/23/2010	Listing *Ipomopsis polyantha* (Pagosa Skyrocket) as Endangered Throughout Its Range, & Listing *Penstemon debilis* (Parachute Beardtongue) & *Phacelia submutica* (DeBeque Phacelia) as Threatened Throughout Their Range.	Proposed Listing Endangered Proposed Listing Threatened.	75 FR 35721–35746.
06/24/2010	Listing the Flying Earwig Hawaiian Damselfly & Pacific Hawaiian Damselfly As Endangered Throughout Their Ranges.	Final Listing Endangered	75 FR 35990–36012.
06/24/2010	Listing the Cumberland Darter, Rush Darter, Yellowcheek Darter, Chucky Madtom, & Laurel Dace as Endangered Throughout Their Ranges.	Proposed Listing Endangered	75 FR 36035–36057.
06/29/2010	Listing the Mountain Plover as Threatened	Reinstatement of Proposed Listing Threatened.	75 FR 37353–37358.
07/20/2010	90-Day Finding on a Petition to List *Pinus albicaulis* (Whitebark Pine) as Endangered or Threatened with Critical Habitat.	Notice of 90-day Petition Finding, Substantial.	75 FR 42033–42040.
07/20/2010	12-Month Finding on a Petition to List the Amargosa Toad as Threatened or Endangered.	Notice of 12-month petition finding, Not warranted.	75 FR 42040–42054.
07/20/2010	90-Day Finding on a Petition to List the Giant Palouse Earthworm (*Driloleirus americanus*) as Threatened or Endangered.	Notice of 90-day Petition Finding, Substantial.	75 FR 42059–42066.
07/27/2010	Determination on Listing the Black-Breasted Puffleg as Endangered Throughout Its Range; Final Rule.	Final Listing Endangered	75 FR 43844–43853.
07/27/2010	Final Rule to List the Medium Tree-Finch (*Camarhynchus pauper*) as Endangered Throughout Its Range.	Final Listing Endangered	75 FR 43853–43864.
08/03/2010	Determination of Threatened Status for Five Penguin Species.	Final Listing Threatened	75 FR 45497–45527.
08/04/2010	90-Day Finding on a Petition To List the Mexican Gray Wolf as an Endangered Subspecies With Critical Habitat.	Notice of 90-day Petition Finding, Substantial.	75 FR 46894–46898.
08/10/2010	90-Day Finding on a Petition to List *Arctostaphylos franciscana* as Endangered with Critical Habitat.	Notice of 90-day Petition Finding, Substantial.	75 FR 48294–48298.
08/17/2010	Listing Three Foreign Bird Species from Latin America & the Caribbean as Endangered Throughout Their Range.	Final Listing Endangered	75 FR 50813–50842.
08/17/2010	90-Day Finding on a Petition to List Brian Head Mountainsnail as Endangered or Threatened with Critical Habitat.	Notice of 90-day Petition Finding, Not substantial.	75 FR 50739–50742.
08/24/2010	90-Day Finding on a Petition to List the Oklahoma Grass Pink Orchid as Endangered or Threatened.	Notice of 90-day Petition Finding, Substantial.	75 FR 51969–51974.
09/01/2010	12-Month Finding on a Petition to List the White-Sided Jackrabbit as Threatened or Endangered.	Notice of 12-month petition finding, Not warranted.	75 FR 53615–53629.
09/08/2010	Proposed Rule To List the Ozark Hellbender Salamander as Endangered.	Proposed Listing Endangered	75 FR 54561–54579.
09/08/2010	Revised 12-Month Finding to List the Upper Missouri River Distinct Population Segment of Arctic Grayling as Endangered or Threatened.	Notice of 12-month petition finding, Warranted but precluded.	75 FR 54707–54753.
09/09/2010	12-Month Finding on a Petition to List the Jemez Mountains Salamander (*Plethodon neomexicanus*) as Endangered or Threatened with Critical Habitat.	Notice of 12-month petition finding, Warranted but precluded.	75 FR 54822–54845.
09/15/2010	12-Month Finding on a Petition to List Sprague's Pipit as Endangered or Threatened Throughout Its Range.	Notice of 12-month petition finding, Warranted but precluded.	75 FR 56028–56050.
09/22/2010	12-Month Finding on a Petition to List *Agave eggersiana* (no common name) as Endangered.	Notice of 12-month petition finding, Warranted but precluded.	75 FR 57720–57734.

FY 2010 AND FY 2011 COMPLETED LISTING ACTIONS—Continued

Publication date	Title	Actions	FR pages
09/29/2010	Determination of Endangered Status for the African Penguin.	Final Listing Endangered	75 FR 59645–59656.
09/29/2010	Determination for the Gunnison Sage-grouse as a Threatened or Endangered Species.	Notice of 12-month petition finding, Warranted but precluded.	75 FR 59803–59863.
09/30/2010	12-Month Finding on a Petition to List the Pygmy Rabbit as Endangered or Threatened.	Notice of 12-month petition finding, Not warranted.	75 FR 60515–60561.
10/06/2010	Endangered Status for the Altamaha Spinymussel & Designation of Critical Habitat.	Proposed Listing Endangered	75 FR 61664–61690.
10/7/2010	12-month Finding on a Petition to list the Sacramento Splittail as Endangered or Threatened.	Notice of 12-month petition finding, Not warranted.	75 FR 62070–62095.
10/28/2010	Endangered Status & Designation of Critical Habitat for Spikedace & Loach Minnow.	Proposed Listing Endangered (uplisting)	75 FR 66481–66552.
11/2/2010	90-Day Finding on a Petition to List the Bay Springs Salamander as Endangered.	Notice of 90-day Petition Finding, Not substantial.	75 FR 67341–67343.
11/2/2010	Determination of Endangered Status for the Georgia Pigtoe Mussel, Interrupted Rocksnail, & Rough Hornsnail & Designation of Critical Habitat.	Final Listing Endangered	75 FR 67511–67550.
11/2/2010	Listing the Rayed Bean & Snuffbox as Endangered	Proposed Listing Endangered	75 FR 67551–67583.
11/4/2010	12-Month Finding on a Petition to List *Cirsium wrightii* (Wright's Marsh Thistle) as Endangered or Threatened.	Notice of 12-month petition finding, Warranted but precluded.	75 FR 67925–67944.

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

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

Species	Action
Actions Subject to Court Order/Settlement Agreement	
6 Birds from Eurasia	Final listing determination.
Flat-tailed horned lizard	Final listing determination.
Mountain plover [4]	Final listing determination.
6 Birds from Peru	Proposed listing determination.
Pacific walrus	12-month petition finding.
Wolverine	12-month petition finding.
Solanum conocarpum	12-month petition finding.
Desert tortoise—Sonoran population	12-month petition finding.
Thorne's Hairstreak butterfly [3]	12-month petition finding.
Hermes copper butterfly [3]	12-month petition finding.
Utah prairie dog (uplisting)	90-day petition finding.
Actions With Statutory Deadlines	
Casey's june beetle	Final listing determination.
7 Bird species from Brazil	Final listing determination.
Southern rockhopper penguin—Campbell Plateau population	Final listing determination.
5 Bird species from Colombia and Ecuador	Final listing determination.
Queen Charlotte goshawk	Final listing determination.
5 species southeast fish (Cumberland darter, rush darter, yellowcheek darter, chucky madtom, and laurel dace) [4].	Final listing determination.
Ozark hellbender [4]	Final listing determination.
Altamaha spinymussel [3]	Final listing determination.
3 Colorado plants (*Ipomopsis polyantha* (Pagosa Skyrocket), *Penstemon debilis* (Parachute Beardtongue), and *Phacelia submutica* (DeBeque Phacelia)) [4].	Final listing determination.
Salmon crested cockatoo	Final listing determination.
Loggerhead sea turtle (assist National Marine Fisheries Service) [5]	Final listing determination.
2 mussels (rayed bean (LPN = 2), snuffbox No LPN) [5]	Final listing determination.
Mt Charleston blue [5]	Proposed listing determination.
CA golden trout [4]	12-month petition finding.
Black-footed albatross	12-month petition finding.

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

Species	Action
Mount Charleston blue butterfly	12-month petition finding.
Mojave fringe-toed lizard [1]	12-month petition finding.
Kokanee—Lake Sammamish population [1]	12-month petition finding.
Cactus ferruginous pygmy-owl [1]	12-month petition finding.
Northern leopard frog	12-month petition finding.
Tehachapi slender salamander	12-month petition finding.
Coqui Llanero	12-month petition finding/Proposed listing.
Dusky tree vole	12-month petition finding.
3 MT invertebrates (mist forestfly(*Lednia tumana*), *Oreohelix* sp.3, *Oreohelix* sp. 31) from 206 species petition.	12-month petition finding.
5 UT plants (*Astragalus hamiltonii*, *Eriogonum soredium*, *Lepidium ostleri*, *Penstemon flowersii*, *Trifolium friscanum*) from 206 species petition.	12-month petition finding.
2 CO plants (*Astragalus microcymbus*, *Astragalus schmolliae*) from 206 species petition	12-month petition finding.
5 WY plants (*Abronia ammophila*, *Agrostis rossiae*, *Astragalus proimanthus*, *Boechera* (*Arabis*) *pusilla*, *Penstemon gibbensii*) from 206 species petition.	12-month petition finding.
Leatherside chub (from 206 species petition)	12-month petition finding.
Frigid ambersnail (from 206 species petition) [3]	12-month petition finding.
Platte River caddisfly (from 206 species petition) [5]	12-month petition finding.
Gopher tortoise—eastern population	12-month petition finding.
Grand Canyon scorpion (from 475 species petition)	12-month petition finding.
Anacroneuria wipukupa (a stonefly from 475 species petition) [4]	12-month petition finding.
Rattlesnake-master borer moth (from 475 species petition) [3]	12-month petition finding.
3 Texas moths (*Ursia furtiva*, *Sphingicampa blanchardi*, *Agapema galbina*) (from 475 species petition).	12-month petition finding.
2 Texas shiners (*Cyprinella* sp., *Cyprinella lepida*) (from 475 species petition)	12-month petition finding.
3 South Arizona plants (*Erigeron piscaticus*, *Astragalus hypoxylus*, *Amoreuxia gonzalezii*) (from 475 species petition).	12-month petition finding.
5 Central Texas mussel species (3 from 475 species petition)	12-month petition finding.
14 parrots (foreign species)	12-month petition finding.
Berry Cave salamander [1]	12-month petition finding.
Striped Newt [1]	12-month petition finding.
Fisher—Northern Rocky Mountain Range [1]	12-month petition finding.
Mohave Ground Squirrel [1]	12-month petition finding.
Puerto Rico Harlequin Butterfly [3]	12-month petition finding.
Western gull-billed tern	12-month petition finding.
Ozark chinquapin (*Castanea pumila* var. *ozarkensis*) [4]	12-month petition finding.
HI yellow-faced bees	12-month petition finding.
Giant Palouse earthworm	12-month petition finding.
Whitebark pine	12-month petition finding.
OK grass pink (*Calopogon oklahomensis*) [1]	12-month petition finding.
Ashy storm-petrel [5]	12-month petition finding.
Southeastern pop snowy plover & wintering pop. of piping plover [1]	90-day petition finding.
Eagle Lake trout [1]	90-day petition finding.
Smooth-billed ani [1]	90-day petition finding.
32 Pacific Northwest mollusks species (snails and slugs) [1]	90-day petition finding.
42 snail species (Nevada & Utah)	90-day petition finding.
Red knot *roselaari* subspecies	90-day petition finding.
Peary caribou	90-day petition finding.
Plains bison	90-day petition finding.
Spring Mountains checkerspot butterfly	90-day petition finding.
Spring pygmy sunfish	90-day petition finding.
Bay skipper	90-day petition finding.
Unsilvered fritillary	90-day petition finding.
Texas kangaroo rat	90-day petition finding.
Spot-tailed earless lizard	90-day petition finding.
Eastern small-footed bat	90-day petition finding.
Northern long-eared bat	90-day petition finding.
Prairie chub	90-day petition finding.
10 species of Great Basin butterfly	90-day petition finding.
6 sand dune (scarab) beetles	90-day petition finding.
Golden-winged warbler [4]	90-day petition finding.
Sand-verbena moth	90-day petition finding.
404 Southeast species	90-day petition finding.
Franklin's bumble bee [4]	90-day petition finding.
2 Idaho snowflies (straight snowfly & Idaho snowfly) [4]	90-day petition finding.
American eel [4]	90-day petition finding.
Gila monster (Utah population) [4]	90-day petition finding.
Arapahoe snowfly [4]	90-day petition finding.
Leona's little blue [4]	90-day petition finding.
Aztec gilia [5]	90-day petition finding.
White-tailed ptarmigan [5]	90-day petition finding.
San Bernardino flying squirrel [5]	90-day petition finding.

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

Species	Action
Bicknell's thrush [5]	90-day petition finding.
Sonoran talussnail [5]	90-day petition finding.
2 AZ Sky Island plants (*Graptopetalum bartramii* & *Pectis imberbis*) [5]	90-day petition finding.
I'iwi [5]	90-day petition finding.
High-Priority Listing Actions	
19 Oahu candidate species [2] (16 plants, 3 damselflies) (15 with LPN = 2, 3 with LPN = 3, 1 with LPN = 9).	Proposed listing.
19 Maui-Nui candidate species [2] (16 plants, 3 tree snails) (14 with LPN = 2, 2 with LPN = 3, 3 with LPN = 8).	Proposed listing.
Dune sagebrush lizard (formerly Sand dune lizard) [4] (LPN = 2)	Proposed listing.
2 Arizona springsnails [2] (*Pyrgulopsis bernadina* (LPN = 2), *Pyrgulopsis trivialis* (LPN = 2))	Proposed listing.
New Mexico springsnail [2] (*Pyrgulopsis chupaderae* (LPN = 2)	Proposed listing.
2 mussels [2] (sheepnose (LPN = 2), spectaclecase (LPN = 4).)	Proposed listing.
8 Gulf Coast mussels (southern kidneyshell (LPN = 2), round ebonyshell (LPN = 2), Alabama pearlshell (LPN = 2), southern sandshell (LPN = 5), fuzzy pigtoe (LPN = 5), Choctaw bean (LPN = 5), narrow pigtoe (LPN = 5), and tapered pigtoe (LPN = 11)) [4].	Proposed listing.
Umtanum buckwheat (LPN = 2) [4]	Proposed listing.
Grotto sculpin (LPN = 2) [4]	Proposed listing.
2 Arkansas mussels (Neosho mucket (LPN = 2) & Rabbitsfoot (LPN = 9)) [4]	Proposed listing.
Diamond darter (LPN = 2) [4]	Proposed listing.
Gunnison sage-grouse (LPN = 2) [4]	Proposed listing.
Miami blue (LPN = 3) [3]	Proposed listing.
4 Texas salamanders (Austin blind salamander (LPN = 2), Salado salamander (LPN = 2), Georgetown salamander (LPN = 8), Jollyville Plateau (LPN = 8)) [3].	Proposed listing.
5 SW aquatics (Gonzales Spring Snail (LPN = 2), Diamond Y springsnail (LPN = 2), Phantom springsnail (LPN = 2), Phantom Cave snail (LPN = 2), Diminutive amphipod (LPN = 2)) [3].	Proposed listing.
2 Texas plants (Texas golden gladecress (*Leavenworthia texana*) (LPN = 2), Neches River rose-mallow (*Hibiscus dasycalyx*) (LPN = 2)) [3].	Proposed listing.
FL bonneted bat (LPN = 2) [3]	Proposed listing.
Kittlitz's murrelet (LPN = 2) [5]	Proposed listing.
Umtanum buckwheat (LPN = 2) [3]	Proposed listing.
21 Big Island (HI) species [5] (includes 8 candidate species—5 plants & 3 animals; 4 with LPN = 2, 1 with LPN = 3, 1 with LPN = 4, 2 with LPN = 8).	Proposed listing.
Oregon spotted frog (LPN = 2) [5]	Proposed listing.
2 TN River mussels (fluted kidneyshell (LPN = 2), slabside pearlymussel (LPN = 2) [5]	Proposed listing.
Jemez Mountain salamander (LPN = 2) [5]	Proposed listing.

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

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

Boechera pusilla will be added to the list of candidate species upon publication of this 12-month finding. We will continue to evaluate this species as new information becomes available. Continuing review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

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

References Cited

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

Author(s)

The primary authors of this notice are the staff members of the Wyoming Ecological Services Field Office.

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

Dated: May 16, 2011.

Rowan W. Gould,

Acting Director, Fish and Wildlife Service.

[FR Doc. 2011–13910 Filed 6–8–11; 8:45 am]

BILLING CODE 4310–55–P

Attachment 6

Survey for precocious milkvetch (*Astragalus proimanthus* Barneby) in southwestern Wyoming

Prepared for:
Bureau of Land Management – Rock Springs Field Office and State Office
and
Wyoming Natural Diversity Database
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December 16, 2016

Abstract

Field surveys for precocious milkvetch (*Astragalus proimanthus*) were conducted in 2015 using three information resources to locate a new population, expand the easternmost outlier population, and add to the negative survey data for this species. Soils data was compiled to help characterize habitat requirements, and new collections were made to better document the species and its habitat.

Acknowledgements

This report is an update that reflects and builds upon earlier reports on precocious milkvetch prepared by Walter Fertig and Laura Welp for Wyoming, 2001. I would like to thank Bonnie Heidel and Joy Handley (Wyoming Natural Diversity Database, WYNDD) for providing support to the field survey. The field survey and the preparation of this report was supported by the Bureau of Land Management – Rock Springs Field Office and Wyoming State Office, in collaboration with Wyoming Natural Diversity Database.

Suggested report citation:
Jouseau, M.R.G. 2016. Survey for precocious milkvetch (*Astragalus proimanthus* Barneby) in southwestern Wyoming. Bureau of Land Management – Rock Springs Field Office and State Office and Wyoming Natural Diversity Database, Laramie, WY.

Cover Photograph: *Astragalus proimanthus* by Marcel R. Jouseau

Table of Contents

Figures

Table

Appendixes

Introduction

A status report on precocious milkvetch (*Astragalus proimanthus* Barneby) was prepared for the BLM Wyoming State Office in 2001 (Fertig & Welp 2001) based on field surveys, monitoring, and synthesis of all available information and knowledge of the species. Since that time, potential distribution models have been produced (Fertig and Thurston 2003, Andersen et al. 2016) and other sensitive species surveys conducted in the area (Jouseau 2012). The purpose of the field survey described in this report was to use potential distribution output, existing environmental information, and investigator expertise to conduct expanded field surveys for *A. proimanthus* and expand information on its distribution and habitat.

Study Area

This study area is located in southern Sweetwater Co. and eastern Uinta, an area of approximately 25 miles east to west and 8 miles north to south, see Fig. 1. The reader is referred to Fertig and Welp (2001) for an overview of the study area. More detailed information on soil conditions is detailed as part of results (this report).

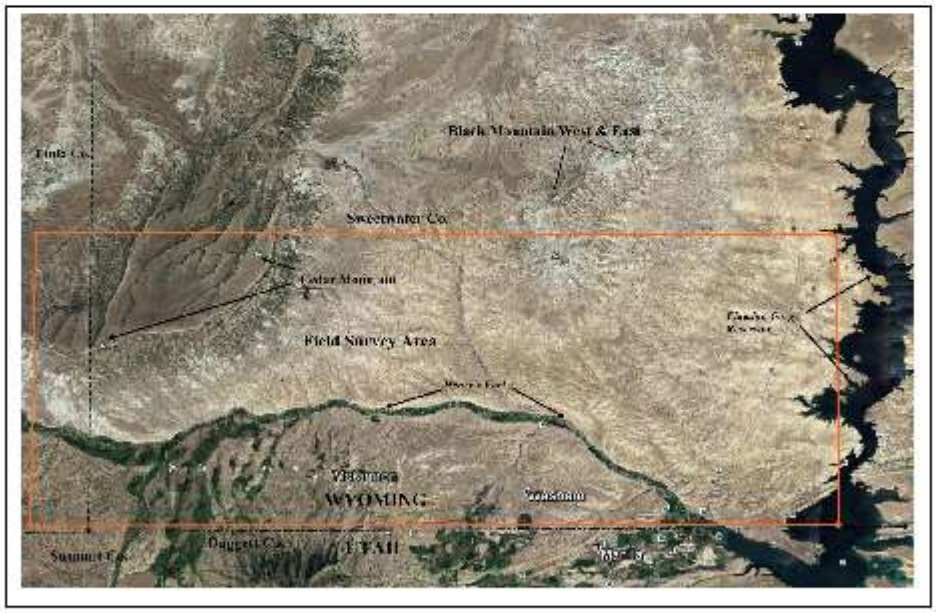


Figure 1. Survey area -- base photograph from Google Earth.

The Henry's Fork River runs through the study area, dissecting the expansive steppe landscape, bordered by low promontories in the vicinity named as mountains (Figure 2).

Figure 2. General view of survey area. By Marcel Jouseau

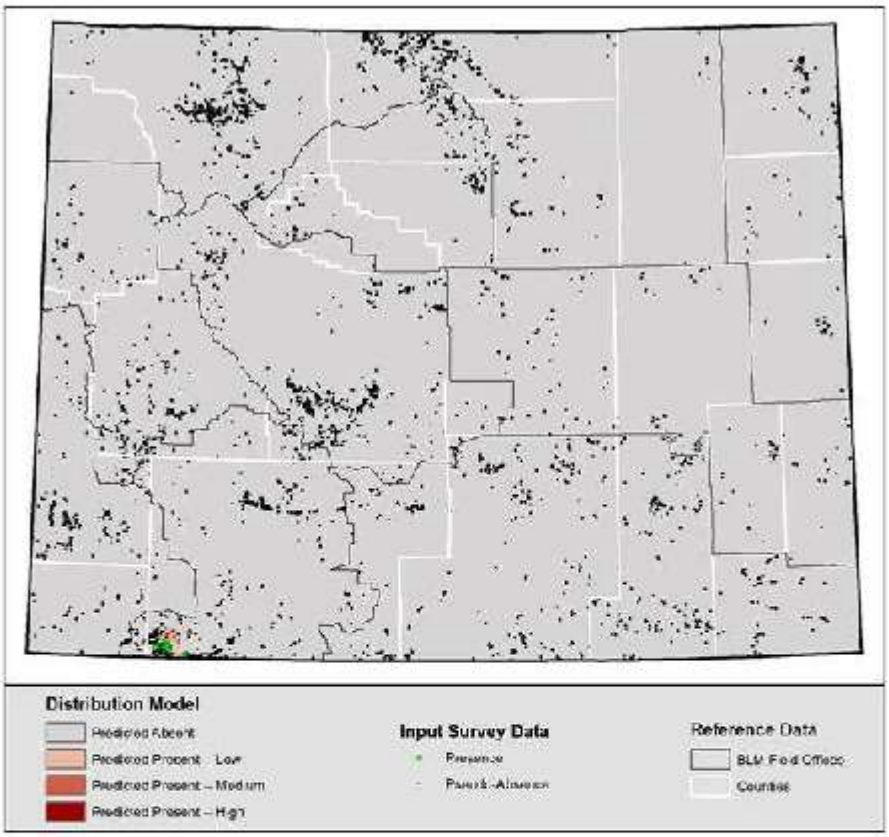


Figure 3 - Map of the potential distribution of *Astragalus proimanthus* (Andersen et al., 2016)

Methods

Three primary information resources were used in conducting *Astragalus proimanthus* field surveys:

1. The status report by Fertig and Welp (2001), which provides a complete record of where the species is known, and where it was sought but not found. Printouts and maps from this prior work were used in the 2015 study.
2. Re-checking herbaria records of *A. proimanthus*, including NYB, RM, RSA, BRY, US, UVU). Information on 20 vouchers of the precocious milkvetch was collected from the various herbaria and collated.
3. Potential distribution models for *A. proimanthus* (Fertig and Thurston 2003, Andersen et al. 2016). – see Figure 3 for the latter. Staff of WYNDD provided a digital copy of appropriate USGS topographic maps with the boundaries of the predicted niche of *A. proimanthus*.

The field survey was undertaken during the period of May 18 to May 27, 2015. These dates corresponded with early to peak blooming period for the taxon to facilitate the surveys. Areas selected were surveyed on foot and presence/absence points of the taxon were recorded with a global positioning system (GPS) receiver Magellan Meridian Gold model. The GPS unit was loaded with topographic maps showing not only elevation contour lines but also all roads, including forest roads, streams and other features allowing the surveyor to assess one's location relative to the landscape seen. Besides presence/absence records, notes including dates, points recorded, whether taxon present or absent, brief observations about the terrain and soils were recorded in a field notebook. Additionally, pictures of the soil, slopes or plant were collected and synchronized with the GPS coordinates so that they could be displayed together with the locational data in ArcView 3.3, ArcGIS, or QGIS. The GPS unit recorded at all time the route hiked by the surveyor by recording every 10 meters the location of the surveyor, thus providing a detailed electronic trace of the areas actually surveyed. The presence/absence point files and track files were saved in the field on a removable digital flash drive in the GPS. The name of each file was also recorded in the field book. Each evening, the data collected during the day were copied onto a laptop to provide a second copy of the data for safe-keeping, as well as to visualize the data with ArcView 3.3, a GIS software, on aerial photo to determine the quality of the data and extent of the area surveyed. Voucher specimens of *A. proimanthus* were collected in areas believed to be unknown populations or colonies at that time. All specimens were deposited at the Rocky Mountain Herbarium (RM) in 2015.

Results

One new population of *Astragalus proimanthus* was documented, and one of the three original populations was expanded across two additional sections in five areas (Figure 4). The new location lies south of Henry's Fork in T12N-R110W-Sec 5. The western most colonies were expanded with a new location within previously documented records in T13N-R111W- Sec 32. The easternmost occurrence was expanded in T12 N- R109W- Sec 17 & 16; T12 N-R110W-Sec 5. An electronic copy of all 2015 survey digital GPS tracks, presence-absence points, 85 pictures in the field of soil, slopes or plants, and label information from specimen vouchers sent to RM Herbarium were recorded on a CD and delivered to WYNDD. Known element occurrences and 2015 discovered occurrences or colonies are described in Appendix-A which is made part of this report. Topographic maps incorporating the traces of the 2015 survey routes (GPS tracks) are displayed in Appendix-B, attached to the report. Appendix-C to this report contains the printout of a Microsoft Excel spreadsheet that displays the specific locations of where each of 85 geo-referenced photographs was taken that includes the waypoint (site) number, photograph number, geographic coordinates in decimal degrees, datum WGS 1984 and in Universal Transverse Mercator (UTM), Zone 12 North, datum 1927 coordinates. The digital spreadsheet can be easily digitally-joined to the appropriate attributes table in a geographic Information System software such as Arcview 3.3, ArcGIS or QGIS, thus

allowing one to view each plant or habitat within the context of the geographic and topographic environment provided in a GIS project. Finally, Appendix-D to this report displays the specific information to be included on the label for each of the nine specimens of *A. proimanthus* sent to the Rocky Mountain (RM) herbarium.

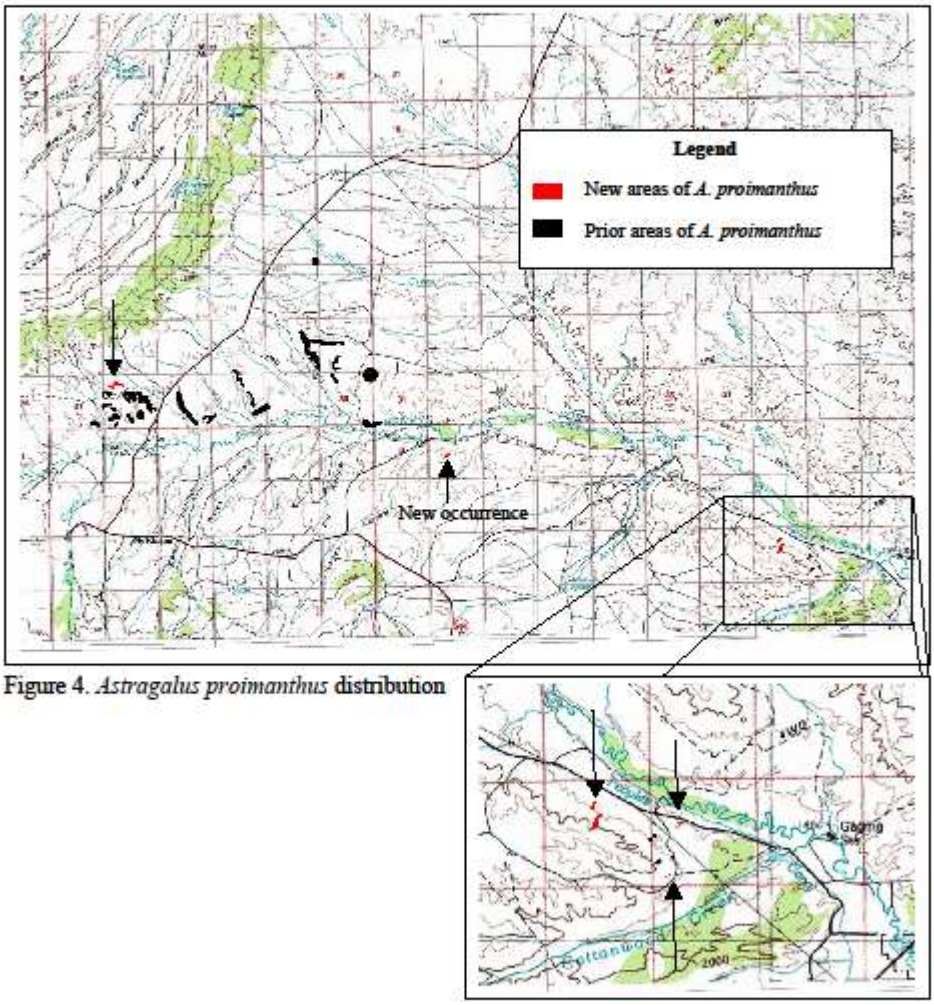


Figure 4. *Astragalus proimanthus* distribution

The reader is referred to the Fertig and Welp (2001) report for the bulk of species information. The 2015 field survey and supporting work expanded documentation in select topics that represent elaborations, discussions or updates to the prior work.

Description: Densely cespitose or pulvinate low convex cushions. Leaves silvery hirsute; leaflets equally pubescent on both upper and lower surfaces. Stipules hyaline, lanceolate or ovate 7-12mm long. , leaves 1.5-3.5 cm long, the petiole slightly widened at the base. Leaf composed of three leaflets 5-9 mm long. Flowers sessile or on almost non-existent peduncle, in axillary pairs. Calyx 8-10.5 mm long, densely white hirsute; tube cylindric or cylindro-campanulate about 6 mm long and about 3-4 mm in diameter. Petals white or pale lemon yellow, glabrous; the banner (upper petal), glabrous on the back, erect, somewhat fiddle-shaped, 12-17 mm long and 5mm wide, substantially notched at the apex; the claw and blade, somewhat oblong-oblanceolate, of about similar length; wings 11-16 mm long narrowly oblanceolate, obtuse (Barneby, 1964) . The apex of the banner may be marked with pink/purple veins, or be entirely white/pale lemon yellow. See Figures 5 & 6. Fruit pods are sessile, 7-10 mm long, narrowly elliptic to ovoid, slightly flattened from the sides, densely fine-hairy, and have 11-14 ovules; (Roberts, 1977; Isely, 1998).

Figures 5 & 6. Banner (upper petal) of *Astragalus proimanthus*, showing shape and color variation. By Marcel Jouseau

Phenology: Label information on vouchers for *A. proimanthus* in herbaria indicates that 15 out of 17 specimens were collected while the plant was flowering. Those specimens were collected as early as May 5 and as late as June 28. Six of the records 17 records were collected from June 3 to August 4, while the species had reached fruiting stage. In 2015, the author collected nine vouchers during the period May 22 to May 26. The taxon was in bloom at all collection points.

Flowering stage likely begins in late April and continues through early June to be followed by the main fruiting period from mid-June to August. However, year to year weather variations, altitude and slope orientation all contribute to variations in phenological stages of the species.

In 2008-2011, while surveying for *Penstemon acaulis* var. *acaulis*, this author noted that, at the beginning of the season, plants of this taxon found at about 6,400 ft were flowering 4 to 5 days earlier than those found at about 6700-6800 ft.

Abundance: In 2000, the total numbers within the three extant occurrences were estimated at between 10,500 and 13,200 plants. During the 2015 survey a roughly- estimated total of 500 additional individual plants were found.

Habitat: Sparsely vegetated cushion plant communities, in sagebrush or juniper openings, on shallow to steep slopes of clayey gravelly soils mostly derived from the Bridger Formation. The precocious milkvetch is often associated with *Artemisia, Cryptantha, Haplopappus, Agropyron*, and *Eriogonum* but also in areas almost devoid of vegetation.

Many of the labels of specimens of *Astragalus proimanthus* filed in herbaria provide a small amount of information on the soil in which the species was found. From those pieces of information one can deduce that specimens were often found on soils derived from shale and occasionally from sandstone parent material.

Southern Sweetwater County, the area subject of the modeling for the presence of *A. proimanthus*, is considered a very arid region, generally not suited for crop farming. Consequently federal and state agencies have put few resources into the development of soil data for the area. An exception is the Henry's Fork area where a soil survey was recently produced (USDA NRCS 2016). Henry's Fork and various canals provide water for land irrigation that has led to fairly intensive farming. The soil survey for the Henrys Fork Area, Utah- Wyoming -- Parts of Daggett and Summit Counties, Utah and Sweetwater and Uinta Counties, Wyoming, was published in 2004 and became available on-line in 2016 (USDA NRCS 2016).

Polygons of known populations of *A. proimanthus* and data points collected in 2015 for new locations of presence of the species were superimposed on the digital soil survey of the Henry's Fork Area in a GIS. The intersection of those polygons and points of presence of the species with the soil polygons provided information on the soils where *A. proimanthus* has been found to grow. Maps of those intersections of the plant species and soils are presented as Figures 13-16, and maps of soils near *A. proimanthus* locales are shown in Figures 17-20.

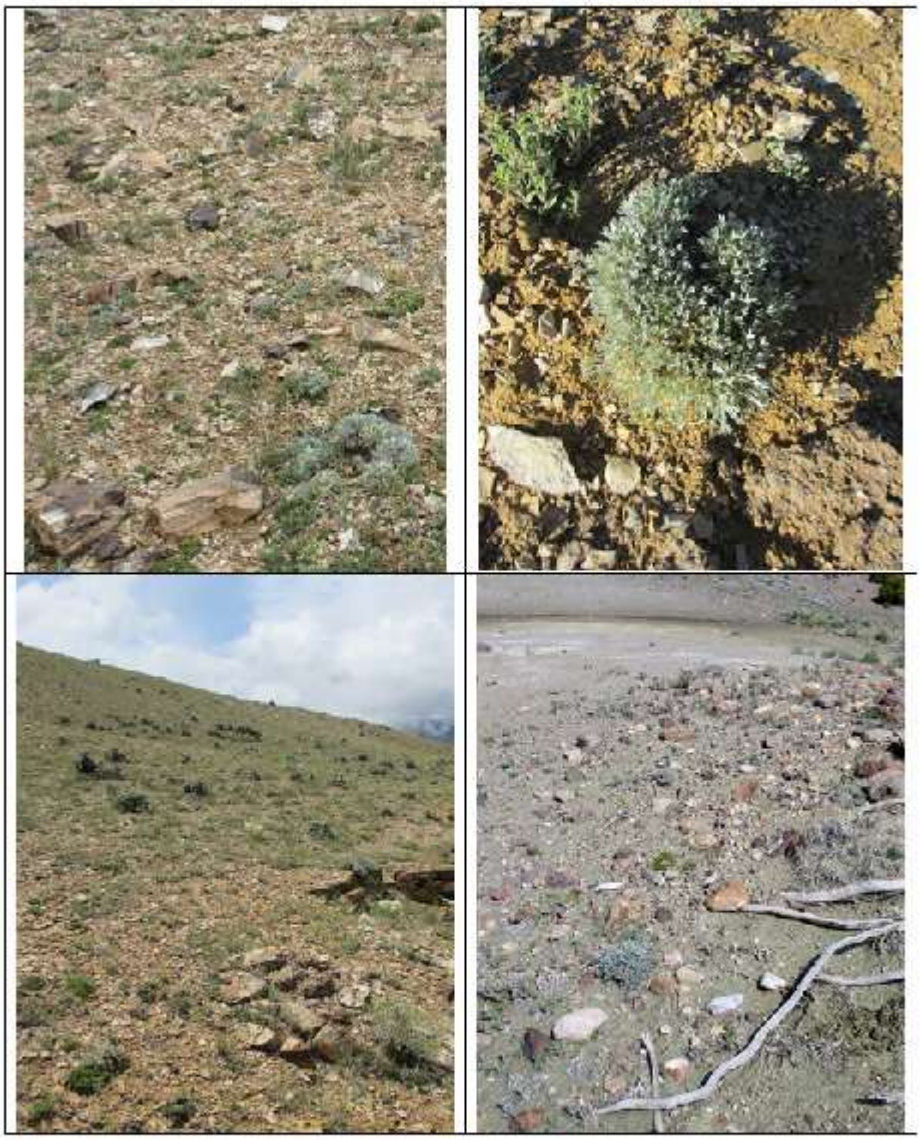
Those intersections of the plant and soil data in the survey area show that *A. proimanthus* grows exclusively within a soil complex known as the "Blazon thin solum-Blazon-Lilsnake complex, 2 to 40 percent slopes". This soil complex is made up of 3 major soils: Blazon thin solum, Blazon and Lilsnake and 3 minor soil units: Rock Outcrop, Poposhia and Lilsnake like. Some of the characteristics of these soils are shown in Table 1.

Table 1. Some characteristics of soils of the Blazon thin solum-Blazon-Lilsdale complex

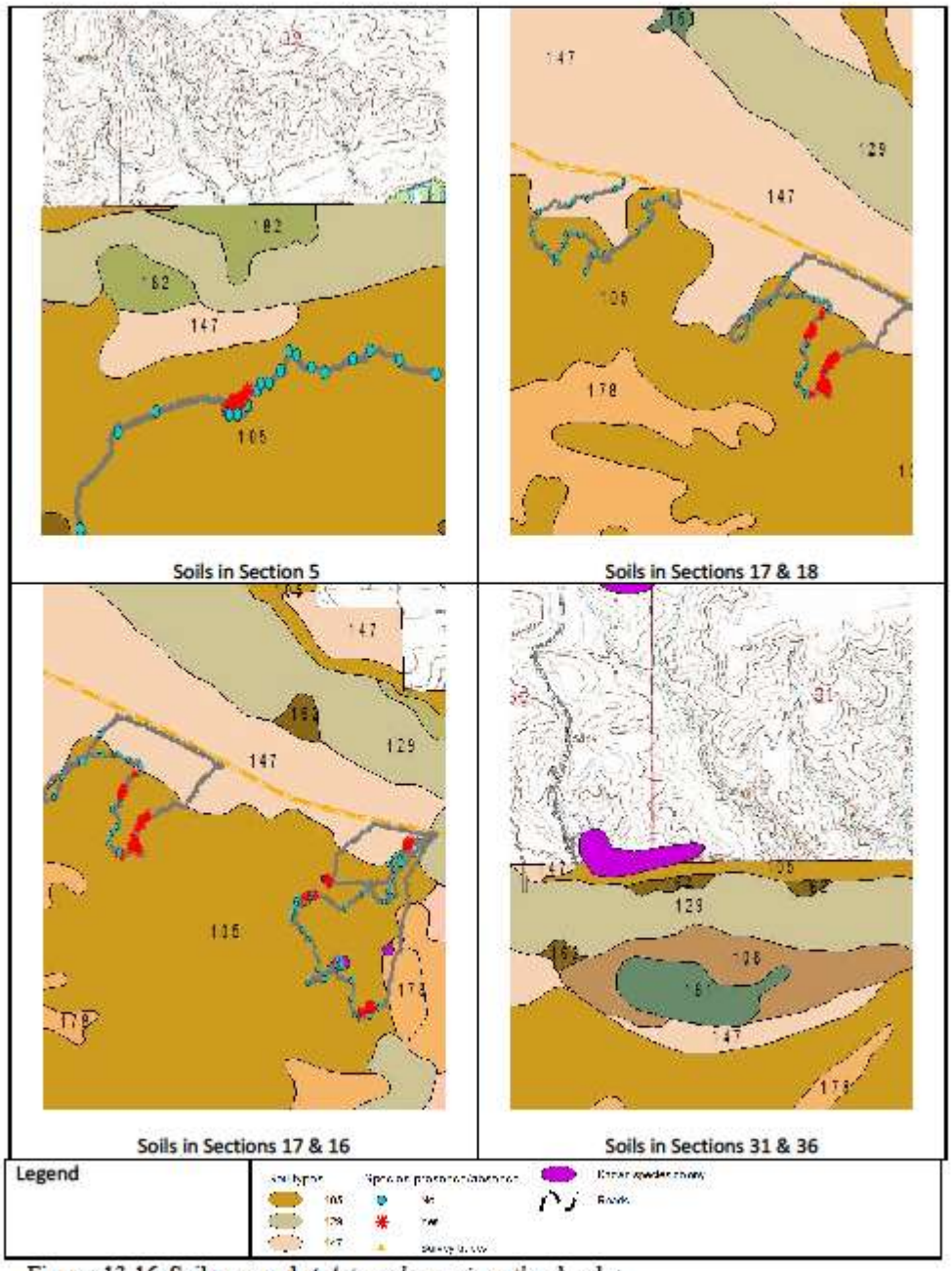
Soil name & (% of the complex)	Blazon thin solum (30%)	Blazon (30%)	Lilsnake (20%)	Poposhia (7%)
Material	weathered from shale	weathered from shale	weathered from sandstone	alluvium from shale-sandstone
Depth to Bedrock	4-10 inches	10-20 inches	10-20 inches	>80 inches
Slope	6-40%	6-40%	2-10%	0-10%
Calcium Carbonate	up to 15%	up to 15%	up to 50%	up to 15%
Gypsum	up to 4%	up to 5%		up to 3%
Salinity	very slight to slight	very slight to slight	none to very slight	none to very slight
Water storage in profile	very low	very low	very low	high
pH	7.9-9.0 7.9 - 9.0	7.9-9.0 7.9 - 9.0	7.9-8.4 7.9 - 8.4	7.9-9.0 7.9 - 9.0
Clay content	15-27%	28-35%	18-27%	15-27%
Gravel content	<10% 30 - 45%	<10% 10 -20%	<15% <15%	<10% <10%
Available Water Capacity (In/In)	0.16 - 0.18 0.19 - 0.21	0.19 - 0.21 0.19 - 0.21	0.14 - 0.16 0.10 - 0.12	0.14 - 0.17 0.14 - 0.20
Organic matter content	0.5 -1%	0.5- 1%	<0.5%	1-2%

The proximity of several colonies of *A. proimanthus* to the limits of the Henrys Ford Area soil survey allows one to speculate that those colonies are likely also growing in the Blazon thin solum-Blazon-Lilsnake soil complex (Figures 17-20). This speculation is further supported by the occasional notes on soil and slope attached to specimens of the species found in herbaria.

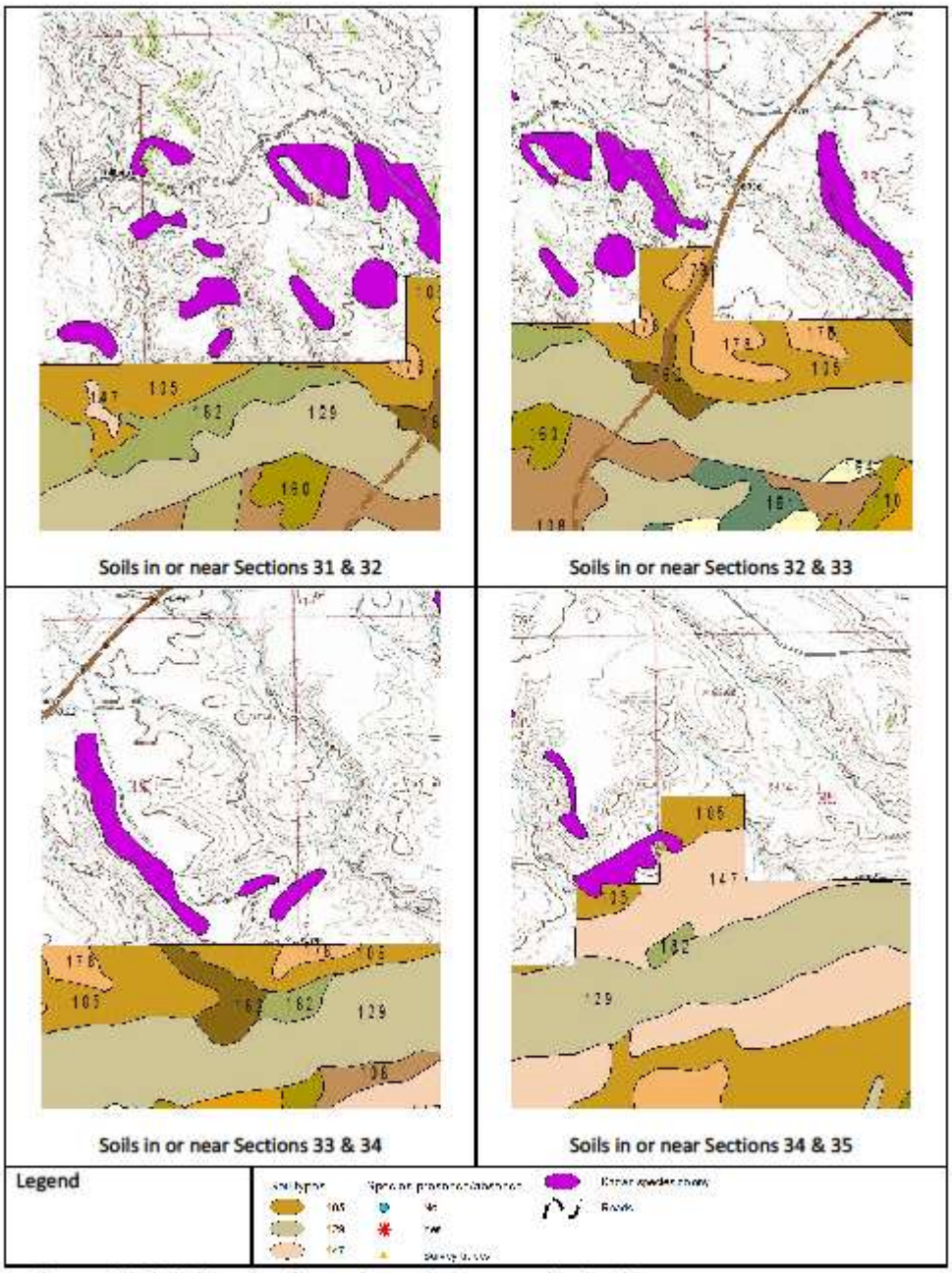
Figures 7 & 8. Characteristic soil conditions of *Astragalus proimanthus*



Figures 9-12. Characteristic soil conditions of *Astragalus proimanthus*



Figures 13-16. Soils mapped at *Astragalus proimanthus* locales



Figures 17-20. Soils mapped near *Astragalus proimanthus* locales

Threats: The precocious milkvetch populations, as known to date, occupy public land managed by the BLM and are located away from any major population center. Fertig and Welp (2001) noted the negative impact of a county landfill on a colony of the species. The 2015 survey did not provide further evidence of "urban" encroachment on the species. There was also no evidence of impact by recreational activities.

However, the wet conditions of 2015 suggested that the habitat can be impacted by cattle and wild horse trampling under some conditions. The most substantial impact was in the area of element occurrence 004 where horses (not present at the time) tore up the wet clayey soils.

Further, at the same location, a small slump had occurred leaving an area of about 100 ft by 200ft with a layer of very "liquid" clay several inches deep, devoid of any vegetation that was too impenetrable and unsafe for inspection. It was not possible to relate the animal activities and the landslide. It should be noted that despite extensive time and efforts it was not possible to relocate that very small population of precocious milkvetch but perhaps the few square meters in which the species grow were undisturbed but simply inaccessible at the time. Many of the various colonies of precocious milkvetch occur on very steep slopes that are susceptible to damage by grazing animals and also to natural slumping during prolonged rainy periods.

Discussion

Information at hand reinforces the interpretation that *Astragalus proimanthus* is an edaphic endemic and thus, soils data or directly related data has merit in documenting, maintaining and locating potential habitat. From a geobotanical standpoint, three areas should be the focus of any future surveys for *A. proimanthus*. The 2015 survey was limited in extent by the adverse weather conditions (snow, prolonged rains, fog). It would have been useful to attempt to link the new eastern colonies in sections 16, 17 and 5, on the north-facing slopes in the valley of the Henry's Fork, to determine whether other populations exist or whether occurrence 007 and the new colonies are in fact outliers. Similarly a search of the areas north and east of occurrence 004 extending to Twins Butte and to the east side of Flaming Gorge reservoir might have put the Barneby's plants, rediscovered by Welp in 2000, in a different geographical and ecological context. The south-facing area north of Henry's Fork also warrant a search as part of a corridor partly delineated by occurrences 001 and 007.

The areas south of occurrence 001 do not warrant any further search as the 2015 survey determined that the land beyond this population toward Burntfork, north and south of Henry's Fork, is far more densely vegetated and thus very unlikely to be occupied by precocious milkvetch that favors generally bare or nearly bare soils. Since the late 1990s much research on plant distribution has focused on the effect of corridors, or linear structures, on the distribution of plants, animals, insects and pollen (Tewskbury et al, 2002; Haddad et al., 2004; Nobis and Skórka, 2016). The linear corridor created by Henry's Fork valley together with the exposure of shale geologic formations and soils derived from those shales throughout the valley within the study area suggest that other sites suitable for colonies of precocious milkvetch could be found.

The 2015 fieldwork suggests that indeed there is potential habitat between the eastern and western distribution areas, but this possibility was not fully explored. The gap between eastern and western populations, and the two populations each known from a single point all warrant expanded survey. The positive and negative data collected in this study contributes to filling that gap.

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ATTACHMENT 7

APPENDIX 1—WYOMING BUREAU OF LAND MANAGEMENT MITIGATION GUIDELINES FOR SURFACE DISTURBING AND DISRUPTIVE ACTIVITIES

INTRODUCTION

Wyoming Mitigation Guidelines are a compilation of practices employed by the Bureau of Land Management (BLM) to mitigate impacts from surface disturbance. They apply to activities such as road or pipeline construction, range improvements, and permitted recreation activities. The guidelines are designed to protect resources such as soils and vegetation, wildlife habitat, and cultural or historic properties. The guidelines are presented as an appendix of the Resource Management Plan (RMP) for easy reference, as they apply to many resources and derive from many laws. All BLM RMPs have included these guidelines as appendices. Public comment on the guidelines, per se, has not been requested. The guidelines are not land use decisions; rather they are examples of mitigation measures that could be applied, as appropriate, based on site-specific National Environmental Policy Act (of 1969) (NEPA) analysis for individual proposals. Comment on the use and application of specific mitigation measures can be made during the NEPA process for individual proposals. Because mitigation measures change or are modified, based on new information, the guidelines are updated periodically for all Field Offices in Wyoming.

WYOMING BLM MITIGATION GUIDELINES FOR SURFACE DISTURBING AND DISRUPTIVE ACTIVITIES

Introduction

These guidelines are primarily intended for the purpose of attaining statewide consistency in the ways requirements are determined for avoiding and mitigating environmental impacts and resource and land use conflicts. Consistency in this sense does not mean that identical requirements would be applied for all similar types of land use activities that may cause similar types of impacts. It also does not mean that the requirements or guidelines for a single land use activity would be identical in all areas.

There are two ways the mitigation guidelines are used in the RMP and Environmental Impact Statement (EIS) process: (1) as part of the planning criteria in developing the RMP alternatives, and (2) in the analytical processes of both developing the alternatives and analyzing the impacts of the alternatives. In the first case, an assumption is made that any one or more of the mitigations will be appropriately included as conditions of relevant actions being proposed or considered in each alternative. In the second case, the mitigations are used (1) to develop a baseline for measuring and comparing impacts among the alternatives, (2) to identify other actions and alternatives that should be considered, and (3) to help determine whether more stringent or less stringent mitigations should be considered.

The EIS for the RMP does not decide or dictate the exact wording or inclusion of these guidelines. Rather, the guidelines are used in the RMP EIS process as a tool to help develop the RMP alternatives and to provide a baseline for comparative impact analysis in arriving at RMP decisions. These guidelines will be used in the same manner in analyzing activity plans and other site-specific proposals. These guidelines and their wording are matters of policy. As such, specific wording is subject to change primarily through administrative review, not through the RMP EIS process. Any further changes that may

be made in the continuing refinement of these guidelines and any development of program-specific standard stipulations will be handled in another forum, including appropriate public involvement and input.

Purpose

The purposes of the "Wyoming BLM Mitigation Guidelines" are (1) to reserve, for BLM, the right to modify the operations of all surface and other human presence disturbance activities as part of the statutory requirements for environmental protection, and (2) to inform a potential lessee, permittee, or operator of the requirements that must be met when using BLM-administered public lands. These guidelines have been written in a format that will allow for (1) their direct use as stipulations, and (2) the addition of specific or specialized mitigation following the submission of a detailed plan of development or other project proposal, and an environmental analysis.

Those resource activities or programs currently without a standardized set of permit or operation stipulations can use the mitigation guidelines as stipulations or as conditions of approval, or as a baseline for developing specific stipulations for a given activity or program.

Because use of the mitigation guidelines was integrated into the RMP EIS process and will be integrated into the site-specific environmental analysis process, the application of stipulations or mitigation requirements derived through the guidelines will provide more consistency with planning decisions and plan implementation than has occurred in the past. Application of the mitigation guidelines to all surface and other human presence disturbance activities concerning BLM-administered public lands and resources will also provide more uniformity in mitigation than has occurred in the past.

Mitigation Guidelines

1. Surface Disturbance Mitigation Guideline

Surface disturbance will be prohibited in any of the following areas or conditions. Exception, waiver, or modification of this limitation may be approved in writing, including documented supporting analysis, by the Authorized Officer.

a. Slopes in excess of 25 percent
b. Within important scenic areas (Class I and II Visual Resource Management Areas)
c. Within 500 feet of surface water and/or riparian areas
d. Within either one-quarter mile or the visual horizon (whichever is closer) of historic trails
e. Construction with frozen material or during periods when the soil material is saturated or when watershed damage is likely to occur.

Guidance

The intent of the Surface Disturbance Mitigation Guideline is to inform interested parties (e.g., potential lessees, permittees, or operators) that when one or more of the five (1a through 1e) conditions exist, surface disturbing activities will be prohibited unless or until a permittee or his designated representative and the surface management agency arrive at an acceptable plan for mitigation of anticipated impacts. This negotiation will occur prior to development.

Specific criteria (e.g., 500 feet from water) have been established based on the best information available. However, items such as geographical areas and seasons must be delineated at the field level.

Exception, waiver, or modification of requirements developed from this guideline must be based on environmental analysis of proposals (e.g., activity plans, plans of development, plans of operation, Applications for Permit to Drill) and, if necessary, must allow for other mitigation to be applied on a site-specific basis.

2. Wildlife Mitigation Guideline

a. To protect important big game winter habitat, activities or surface use will not be allowed from November 15 to April 30 within certain areas encompassed by the authorization. The same criteria apply to defined big game birthing areas from May 1 to June 30.

Application of this limitation to operation and maintenance of a developed project must be based on environmental analysis of the operational or production aspects.

Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the Authorized Officer.

b. To protect important raptor and/or sage and sharp-tailed grouse nesting habitat, activities or surface use will not be allowed from February 1 to July 31 within certain areas encompassed by the authorization. The same criteria apply to defined raptor and game bird winter concentration areas from November 15 to April 30.

Application of this limitation to operation and maintenance of a developed project must be based on environmental analysis of the operational or production aspects.

Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the Authorized Officer.

c. No activities or surface use will be allowed on that portion of the authorization area identified within (legal description) for the purpose of protecting (e.g., sage/sharp-tailed grouse breeding grounds, and/or other species/activities) habitat.

Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the Authorized Officer.

d. Portions of the authorized use area legally described as (legal description) are known or suspected to be essential habitat for (name), which is a threatened or endangered species. Prior to conducting any onsite activities, the lessee/permittee will be required to conduct inventories or studies in accordance with BLM and U.S. Fish and Wildlife Service guidelines to verify the presence or absence of this species. In the event that (name) occurrence is identified, the lessee/permittee will be required to modify operational plans to include the protection requirements (e.g., seasonal use restrictions, occupancy limitations, facility design modifications) of this species and its habitat.

Guidance

The Wildlife Mitigation Guideline is intended to provide two basic types of protection: seasonal restriction (2a and 2b) and prohibition of activities or surface use (2c). Item 2d is specific to situations involving threatened or endangered species. Legal descriptions will ultimately be required and should be measurable and legally definable. There are no minimum subdivision requirements at this time. The area delineated can and should be defined as necessary, based on current biological data, prior to the time of

processing an application and issuing the use authorization. The legal description must eventually become a part of the condition for approval of the permit, plan of development, and/or other use authorization.

The seasonal restriction section identifies three example groups of species and delineates three similar time frame restrictions. The big game species, including elk, moose, deer, antelope, and bighorn sheep, all require protection of crucial winter range between November 15 and April 30. Elk and bighorn sheep also require protection from disturbance from May 1 to June 30, when they typically occupy distinct calving and lambing areas. Raptors include eagles, accipiters, falcons (peregrine, prairie, and merlin), buteos (ferruginous and Swainson's hawks), osprey, and burrowing owls. The raptors and sage and sharp-tailed grouse require nesting protection between February 1 and July 31. The same birds often require protection from disturbance from November 15 through April 30 while they occupy winter concentration areas.

Item 2c, the prohibition of activity or surface use, is intended for protection of specific wildlife habitat areas or values within the use area that cannot be protected by using seasonal restrictions. These areas or values must be factors that limit life-cycle activities (e.g., sage-grouse strutting grounds, known threatened and endangered species habitat).

Exception, waiver, or modification of requirements developed from this guideline must be based on environmental analysis of proposals (e.g., activity plans, plans of development, plans of operation, Applications for Permit to Drill) and, if necessary, must allow for other mitigation to be applied on a site-specific basis.

3. Cultural Resource Mitigation Guideline

When a proposed discretionary land use has potential for affecting the characteristics that qualify a cultural property for the National Register of Historic Places (National Register), mitigation will be considered. In accordance with Section 106 of the Historic Preservation Act, procedures specified in 36 Code of Federal Regulations (CFR) 800 will be used in consultation with the Wyoming State Historic Preservation Officer and the Advisory Council on Historic Preservation in arriving at determinations regarding the need and type of mitigation to be required.

Guidance

The preferred strategy for treating potential adverse effects on cultural properties is "avoidance." If avoidance involves project relocation, the new project area may also require cultural resource inventory. If avoidance is imprudent or unfeasible, appropriate mitigation may include excavation (data recovery), stabilization, monitoring, protection barriers and signs, or other physical and administrative measures.

Reports documenting results of cultural resource inventory, evaluation, and the establishment of mitigation alternatives (if necessary) shall be written according to standards contained in BLM manuals, the cultural resource permit stipulations, and in other policies issued by BLM. These reports must provide sufficient information for Section 106 consultation. Reports shall be reviewed for adequacy by the appropriate BLM cultural resource specialist. If cultural properties on, or eligible for, the National Register are located within these areas of potential impact and cannot be avoided, the Authorized Officer shall begin the Section 106 consultation process in accordance with the procedures contained in 36 CFR 800.

Mitigation measures shall be implemented according to the mitigation plan approved by the BLM Authorized Officer. Such plans are usually prepared by the land use applicant according to BLM specifications. Mitigation plans will be reviewed as part of Section 106 consultation for National Register eligible or listed properties. The extent and nature of recommended mitigation shall be commensurate

with the significance of the cultural resource involved and the anticipated extent of damage. Reasonable costs for mitigation will be borne by the land use applicant. Mitigation must be cost effective and realistic. It must consider project requirements and limitations, input from concerned parties, and be BLM approved or BLM formulated.

Mitigation of paleontological and natural history sites will be treated on a case-by-case basis. Factors such as site significance, economics, safety, and project urgency must be taken into account when making a decision to mitigate. Authority to protect (through mitigation) such values is provided for in the Federal Land Policy and Management Act (FLPMA), Section 102(a)(8). When avoidance is not possible, appropriate mitigation may include excavation (data recovery), stabilization, monitoring, protection barriers and signs, or other physical and administrative protection measures.

4. Special Resource Mitigation Guideline

- To protect (resource value), activities or surface use will not be allowed (i.e., within a specific distance of the resource value or between date to date) in (legal description).
- Application of this limitation to operation and maintenance of a developed project must be based on environmental analysis of the operational or production aspects.
- Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the Authorized Officer.
- Example Resource Categories (Select or identify category and specific resource value) include—
  - Recreation areas
  - Special natural history or paleontological features
  - Special management areas
  - Sections of major rivers
  - Prior existing rights-of-way
  - Occupied dwellings
  - Other (specify).

Guidance

The Special Resource Mitigation Guideline is intended for use only in site-specific situations where one of the first three general mitigation guidelines will not adequately address the concern. The resource value, location, and specific restrictions must be clearly identified. A detailed plan addressing specific mitigation and special restrictions will be required prior to disturbance or development and will become a condition for approval of the permit, plan of development, or other use authorization.

Exception, waiver, or modification of requirements developed from this guideline must be based on environmental analysis of proposals (e.g., activity plans, plans of development, plans of operation, Applications for Permit to Drill) and, if necessary, must allow for other mitigation to be applied on a site-specific basis.

5. No Surface Occupancy Guideline

- No Surface Occupancy (NSO) will be allowed on the following described lands (legal description) because of (resource value).
- Example Resource Categories (Select or identify category and specific resource value) include—
  - Recreation areas (e.g., campgrounds, historic trails, national monuments)

- Major reservoirs/dams
- Special management area (e.g., known threatened or endangered species habitat, areas suitable for consideration for Wild and Scenic Rivers [WSR] designation)
- Other (specify).

Guidance

The NSO Mitigation Guideline is intended for use only when other mitigation is determined insufficient to adequately protect the public interest and is the only alternative to "no development" or "no leasing." The legal description and resource value of concern must be identified and be tied to an NSO land use planning decision.

Waiver of, or exception(s) to, the NSO requirement will be subject to the same test used to initially justify its imposition. If, upon evaluation of a site-specific proposal, it is found that less restrictive mitigation would adequately protect the public interest or value of concern, then a waiver or exception to the NSO requirement is possible. The record must show that because conditions or uses have changed, less restrictive requirements will protect the public interest. An environmental analysis must be conducted and documented (i.e., environmental assessment, environmental impact statement, etc., as necessary) in order to provide the basis for a waiver or exception to an NSO planning decision. Modification of the NSO requirement will pertain only to refinement or correction of the location(s) to which it applied. If the waiver, exception, or modification is found to be consistent with the intent of the planning decision, it may be granted. If found inconsistent with the intent of the planning decision, a plan amendment would be required before the waiver, exception, or modification could be granted.

When considering the "no development" or "no leasing" option, a rigorous test must be met and fully documented in the record. This test must be based on stringent standards described in the land use planning document. Because rejection of all development rights is more severe than the most restrictive mitigation requirement, the record must show that development was considered subject to reasonable mitigation, including NSO. The record must also show that other mitigation was determined to be insufficient to adequately protect the public interest. A "no development" or "no leasing" decision should not be made solely because it appears that conventional methods of development would be unfeasible, especially where an NSO restriction may be acceptable to a potential permittee. In such cases, the potential permittee should have the opportunity to decide whether or not to go ahead with the proposal (or accept the use authorization), recognizing that an NSO restriction is involved.