

REPORT ON THE CONSERVATION STATUS OF
ANTENNARIA ARCUATA IN IDAHO

by

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March 1990

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Status Survey Report prepared for
Idaho Department of parks and Recreation
through Section 6 funding from
U.S. Fish and Wildlife Service, Region 1

REPORT ON THE CONSERVATION STATUS OF
ANTENNARIA ARCUATA IN IDAHO

Taxon name:	<u>Antennaria arcuata</u> Cronq.
Common name:	arching pussy-toes
Family:	Asteraceae (Compositae)
States where taxon occurs:	U.S.A.; Idaho, Nevada, and Wyoming
Current Federal Status:	Category 2
Recommended Federal Status:	Category 2
Author of report:	Christine C. Lorain
Original date of report:	19 March 1990
Date of most recent revision:	N/A
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ABSTRACT

Arching pussy-toes (Antennaria arcuata) is a dioecious, white-woolly perennial from disjunct locations in three western states. As of 1989, 23 populations of arching pussy-toes are known throughout its range. A single population of arching pussy-toes occurs in Blaine County, Idaho, two populations occur in Elko County, Nevada, and 20 populations are documented for Fremont County, Wyoming. The taxon occurs in moist, natural grass-sedge meadows and near seeps or springs within sagebrush grasslands.

The single Idaho population of arching pussy-toes occurs in a privately-owned portion of Huff Creek Meadows, 9 miles east of Carey, Blaine County. This population appears healthy and consists of approximately 10,000 plants covering some 150 acres. Grazing and trampling by cattle occurs at this site, but does not presently appear to have a seriously impact on the population. The most significant potential threats to the Idaho population are posed by overgrazing and alteration to the present hydrologic condition.

Little is known about the reproductive biology and effects of grazing on arching pussy-toes. Moreover, this taxon is only known from a small number of populations at three disjunct locations. For these reasons, it is recommended that the U.S. Fish and Wildlife Service maintain Antennaria arcuata as a Category 2 candidate species.

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I. Species Information.

1. Classification and nomenclature.

A. Species.

1. Scientific name.

a. Binomial: Antennaria arcuata Cronq.

b. Full bibliographic citation: Cronquist, A. 1950. Notes on the Compositae of the northwestern United States. Leaflets of Western Botany 6:41-56.

c. Type specimen: Christ 16065, Idaho: Blaine County, in wild hay meadow 9 miles east of Carey, 31 July 1946.

2. Pertinent synonym(s): None.

3. Common name(s): arching pussy-toes, meadow pussy-toes

4. Taxon codes: PDASTOH050 (Idaho, Nevada, and Wyoming Natural Heritage Programs).

5. Size of genus: A fairly small genus of about 25 to 30 species, centering in the western cordillera, but extending nearly throughout the U.S. and Canada, and circumpolar at the north; also in southern South America (Cronquist 1955).

B. Family classification.

1. Family name: Asteraceae

2. Pertinent family synonyms: Compositae

3. Common name(s) for family: Sunflower

C. Major plant group: Dicotyledoneae (Class Magnoliopsida)

D. History of knowledge of taxon: Arching pussy-toes was described by Cronquist (1950) from a 1946 collection by J.H. Christ (16065) from Blaine County, Idaho. Later, a 1905 collection from Fremont County, Wyoming was identified as arching pussy-toes by Cronquist in 1952. For a number of years, these two localities were the only known locations of this taxon. In the late 1970's, arching pussy-toes was discovered in Elko County, Nevada. As of 1989, this taxon is only known from these three disjunct locations; Idaho (one meadow in Blaine Co.), Nevada (two meadow sites in Elko County), and Wyoming (20 sites in Fremont County).

E. Comments on current alternative taxonomic treatment(s): None.

2. Present legal or other formal status

A. International: None.

B. National.

1. Present designation of proposed legal protection or regulation: Arching pussy-toes is listed as a Category 2 candidate species (U.S. Fish and Wildlife Service 1990).

2. Other current formal status recommendation: Arching pussy-toes is currently ranked as "imperiled throughout its range because of rarity or because of other factors

making it vulnerable to extinction" (global rank = G2) by The Nature Conservancy.

Arching pussy-toes is also listed as a Sensitive Plant Species for Region 4 of the U.S. Forest Service (USDA Forest Service 1988).

3. Review of past status: In 1975, arching pussy-toes was listed as a candidate species for Endangered status (Federal Register, 40(127):27855, 1 July 1975). In 1976 it was proposed for Endangered status, Category 1 (Federal Register, 41(117):24529, 11 June 1976). By 1980, it was placed on the U.S. Fish and Wildlife Service Notice of Review List for consideration to be listed as Threatened (Federal Register, FWS Notice of Review, 15 December 1980).

C. State.

1. Idaho.

- a. Present designation or proposed legal protection or regulation: None.
- b. Other current formal status recommendation: Arching pussy-toes is listed currently as "critically imperiled in Idaho imperiled throughout its range because of rarity or because of other factors making it vulnerable to extinction" (state rank = S1) by the Idaho Natural Heritage Program.
- c. Review of Past status: Steele (1977; 1981) recommended arching pussy-toes for Federal Endangered Status.

D. Nevada.

- a. Present designated or proposed legal protection or regulation: None.
- b. Other current formal status recommendation: Arching pussy-toes is listed currently as "critically imperiled in Nevada because of rarity or because of other factors making it vulnerable to extinction" (state rank = S1) by the Nevada Natural Heritage Program.
- c. Review of past status: Proposed as state endangered (Reno T/E Workshop, 2 Nov. 1979).

E. Wyoming.

- a. Present designated or proposed legal protection or regulation: None.
- b. Other current formal status recommendation: Arching pussy-toes is listed currently as "imperiled in Wyoming because of rarity or because of other factors making it vulnerable to extinction" (state rank = S2) by the Wyoming Natural Heritage Program.
- c. Review of past status: Arching pussy-toes was ranked as "critically imperiled in Wyoming" in 1983 by the Wyoming Natural Heritage Program.

3. Description.

- A. General nontechnical description: Arching pussy-toes is a loosely white-woolly perennial herb with conspicuously arching stolons. Stolons extend up to 1 dm long and give rise to new plants. Plants are dioecious (either male or female, although male plants are

rare) and covered with white-woolly hairs. Basal leaves are few, wider at the top, and several cm long. Flowering stems are solitary, 3 to 4 dm tall, with well-developed and gradually reduced stem leaves.

The flower heads are moderately numerous and arranged in a close terminal cluster. Male and female plants vary slightly in size of flowers, involucre (bracts at base of flower head), and pappus (modified calyx on top of ovary/fruit)(see Technical description below). Flowering occurs from late June to August (see Appendix II for line drawing).

- B. Technical Description: Arching pussy-toes is a dioecious, solitary-stemmed, loosely white-woolly perennial herb with conspicuously arching stolons. Stolons extend up to 1 dm long and give rise to new plants, generally short-lived. Basal leaves are few, oblanceolate, non-persistent, and average several cm long. Cauline leaves are well-developed, but narrower and gradually reduced upward. Flowering stems are solitary and 3 to 4 dm tall.

The flower heads are moderately numerous and arranged in a close terminal cluster. Those of male plants are about 5 mm long by 3-3.5 mm wide, while those of female plants are taller and narrower (5-7 mm tall by 2.5 mm wide). The involucre is tomentose below and averaging 5 mm tall, those of the male plants are obovate, 4 mm long by 1.4 mm wide, with a rounded apex. The involucre on the female plants are narrowly obovate, 6 mm long by 1 mm wide, with an acute apex. The corolla of the male flowers is wider and shorter than that of the female. The pappus hairs are rather straight and fine capillary hairs in female flowers, and flexuous and somewhat clavate at the tip in male flowers. Flowering occurs from late June to August (Cronquist 1950, Mzingo and Williams 1980)(see Appendix II).

- C. Local field characters: The most distinctive feature of arching pussy-toes is its conspicuously arching stolons, hence its common name (see Appendix II for line drawings). No other member of this genus in this area has stolons. Other characters to look for are the single flowering stem, white-woolly pubescence, and preference for damp meadow habitats.

Arching pussy-toes is quite distinct from any other *Antennaria* species. However, it can be confused with *Gnaphalium chilense* (cudweed), which grows in the same habitat and also has a white-woolly pubescence, but is an annual or biennial and lacks stolons.

- D. Identifying characteristics of material which is in interstate or international commerce or trade: No interstate or international trade is known. See above section for differences with closely related genera/species.

E. Photographs and/or line drawings: Line drawings of arching pussy-toes appear in Mozingo and Williams (1980)(see Appendix II). Photographs (35 mm slides) of arching pussy-toes and its habitat in Idaho are in the slide collection of the Idaho Natural Heritage Program. Several have been reproduced in Appendix III.

4. Significance.

A. Natural: None known.

B. Human: The Idaho population of arching pussy-toes is the type locality of the species. Additionally, arching pussy-toes exhibits a high degree of habitat specificity and a disjunct distribution pattern that provides interest to scientists, especially those specializing in phytogeography and ecophysiology.

5. Geographical distribution.

A. Geographical range: Arching pussy-toes is known from disjunct sites in three western states, each within a single county; Idaho, Blaine County, near Carey; Wyoming, Fremont County, southern Wind River Range and Granite Mountains; Nevada, Elko County, north central part and east flank of the Independence Mountains.

B. Precise occurrences in Idaho.

1. Populations currently or recently known extant: In Idaho, arching pussy-toes is documented from a single location, Huff Creek Meadows, Blaine Co (see Appendix IV and V).

2. Populations known or assumed extirpated: None known from Idaho.

3. Historically known populations where current status not known: None known from Idaho.

4. Locations not yet investigated believed likely to support additional natural populations: Due to its disjunct distribution, potential suitable habitat for arching pussy-toes in Idaho would include high elevation (5250-6000 ft.) meadows within moderately arid sites between the steppe proper and the coniferous forest zone.

5. Reports having ambiguous or incomplete locality information: None known from Idaho.

6. Locations known or suspected to be erroneous reports:
None known in Idaho, however, a single site located in the Steens Mountains, Harney County in far southeastern Oregon was later determined to be Antennaria luzuloides (Schultz & Schultz 1978).

C. Biogeographical and phylogenetic history: The disjunct distribution pattern of arching pussy-toes suggests that it may have been a widespread species in the earlier part of the Pleistocene (Packard 1979). At least three other rare species, Machaeranthera laetevirens, Lesquerella kingii var. cobrensis, and Phacelia inconspicua exhibit a similar distribution, with disjunct populations in central Nevada and southern Idaho (Moseley 1989). Arching pussy-toes, however, also has additional disjunct populations in central Wyoming, making its range suggestive of that of the rare species Silene scaposa var. lobata (Packard 1979).

According to Cronquist (1950), the phylogenetic affinities of arching pussy-toes are "obscure", because "Antennaria arcuata is so different from any other species of the genus known".

6. General environment and habitat description.

A. Concise statement of general environment and habitat: Arching pussy-toes occupies natural grass-sedge meadows surrounded by the sagebrush grassland community (see slides of habitat in Appendix III). In Idaho, arching pussy-toes occurs on small, bare or lichen-covered spots of soil among grasses. This population also lies between a thermal spring and cold water channel. The mixing of these waters may be a critical factor in maintaining the Idaho population (Caicco 1986). Habitats in Nevada include open, flat meadows, while in Wyoming the taxon is found on small mounds (hummocks) in moist meadows and near seeps or springs (Marriott 1986). Elevations range between 4950 to 7900 feet. The substrates range from black clay soils and silt/loams (Nevada) to moist alkaline conditions (Idaho) to alluvium associated with drainages (Wyoming).

B. Physical characteristics.

1. Climate.

a. Koppen climate classification: Habitat for arching pussy-toes in Idaho is classified as Koppen's unit BSk: semiarid climate or steppe, with an average annual temperature under 64.4° F. (Trewartha and Horn 1980).

b. Regional macroclimate: The regional macroclimate for the area that supports arching pussy-toes in Idaho is extrapolated from the Arco weather station, ca. 20 air miles northeast of Huff Creek Meadow. Mean annual temperature for Arco is 56.3° F and the mean annual precipitation is 10.96 inches. The annual temperature range for Arco is very wide, with highest temperatures occurring in July and the lowest occurring in January. Mean annual precipitation exhibits two peaks, most received during May and June and only slightly less during December and January. Much of this precipitation during the winter is in the form of snow, while almost 25% of the total annual precipitation occurs in the spring, mostly as rain. July marks the dry season when an average of less than 1 inch of precipitation occurs over a five-month period. Annual precipitation can fluctuate widely from year to year. The period between the last freeze of the spring and the first freeze of the fall is estimated to be only 92 days (Johnson 1978).

- c. Local microclimate: The Idaho population of arching pussy-toes occurs in moist, natural grass-sedge meadows. These sites are seasonally moist to wet in spring and can receive considerable snow accumulations in winter with the possibility of frost heaving.
2. Air and water quality requirements: Unknown, however, the Idaho, population of arching pussy-toes lies between a thermal spring and cold water channel, which feed into the meadow. The mixing of these waters may be a critical factor in the unusual occurrence of this taxon in Idaho (Caicco 1986).
 3. Physiographic provinces: The Idaho population of arching pussy-toes lies on the Snake River Plain section of the Columbia Intermontane Geomorphic Province (Ross and Savage 1967).
 4. Physiographic and topographic characteristics: Arching pussy-toes populations occur on level to gently sloping sites in drainage bottoms, generally associated with wet meadow, seeps or springs.
 5. Edaphic factors: Arching pussy-toes occurs on substrates that range from black clay soils and silt/loams (Nevada) to moist alkaline conditions (Idaho) to alluvium associated with drainages (Wyoming).
 6. Dependence of this taxon on natural disturbance: Unknown, but in Idaho, arching pussy-toes seems to prefer bare soils within grass-sedge meadows in a sagebrush grassland community. These microsites are small and generally lack vegetative cover. It appears that frost heaving may be an essential natural disturbance behind the maintenance of these microsites (Marriott 1986).
 7. Other unusual physical features: None known.
- C. Biological characteristics.
1. Vegetation physiognomy and community structure: Arching pussy-toes populations occurs within undescribed grass-sedge meadows, and along seeps or springs. These habitats are dominated by various native and introduced grasses and graminoids in addition to numerous annual and perennial forbs. Surrounding these habitats is a sagebrush-grassland community.
 2. Regional vegetation type: Kuchler (1964) places this portion of Idaho in the potential vegetation type of Sagebrush Steppe (Artemisia-Agropyron).
 3. Frequently associated species: In Idaho, the commonly associated species of arching pussy-toes are mosses, Potentilla gracilis, Juncus spp., Deschampsia cespitosa, Iris missouriensis, Achillea millefolium, Antennaria rosea, Sisyrinchium douglasii, Distichlis stricta, and Poa pratensis,.
 4. Dominance and frequency: In Idaho, arching pussy-toes can be locally common in small spots with bare or moss-covered soils within a natural grass-sedge meadow (Steele 1981).

5. Successional phenomena: The meadow community in which arching pussy-toes occurs in Idaho, appears to be maintained in a relatively stable seral stage by continued grazing.
6. Dependence on dynamic biotic features: None known.
7. Other endangered species: None known.

7. Population biology.

A. General summary: Arching pussy-toes is known from a single population in Idaho, two populations in Nevada and 20 populations in Wyoming. Most occurrences appear healthy with numerous individuals present. The principal form of reproduction appears to be vegetatively by stolons. Staminate plants are rare, and are apparently only known from the Nevada populations. It is unknown if fertile seeds are produced. Additionally, little is known about the pollinators, methods of dispersal, and effects of grazing on arching pussy-toes as they relate to its survival and reproductive biology.

B. Demography.

1. Known populations: Arching pussy-toes is known from a single population in Idaho, two populations in Nevada, and 20 populations in Wyoming. In Idaho, the population size consists of 3000-4000 genets and 4000-5000 ramets covering over 150 acres.

2. Demographic details (Idaho): (see Appendix V for complete record)

1. Huff Creek Meadow (001)
 - a. Location:
 - b. Area: 150 acres
 - c. Number and size of plants: 3000-4000 genets, 4000-5000 ramets in 1989
 - d. Density: Moderate to High
 - e. Presence of dispersed seeds: Unknown
 - f. Evidence of reproduction: Appears to be reproducing by stolons
 - g. Evidence of expansion/contraction: No evidence.

C. Phenology.

1. Patterns: Flowering takes place late June and continues through August. Fruits develop in August and September.
2. Relation to climate and microclimate: Specific details are unknown.

D. Reproductive ecology.

1. Type of reproduction: Arching pussy-toes reproduces vegetatively by stolons, which produce short-lived plants with a single erect stem (Cronquist 1950). Cronquist (1950) noted that staminate plants are "unknown". It appears that no staminate plants are presently known from the Idaho or Wyoming sites (Marriott 1986). However, Nevada information, which provides the most detailed description of arching pussy-toes, consistently mentions the minute differences between the male and female plants (Mozingo and Williams 1980). This would suggest that seeds are formed, and reproduction by seeds is occurring, at least in the Nevada populations. However, it is unknown if fertile seeds actually exist and apomixis has been suggested (Packard 1979).

2. Pollination.

- a. Mechanisms: Unknown.
 - b. Specific known pollinators: Unknown.
 - c. Other suspected pollinators: None known.
 - d. Vulnerability of pollinators: Unknown.
3. Seed dispersal.
- a. General mechanisms: Specific details unknown, but wind, water, and gravity dispersal is suspected if fertile seeds are produced.
 - b. Specific agents: Unknown, but probably wind, water, or gravity.
 - c. Vulnerability of dispersal agents and mechanisms: Unknown.
 - d. Dispersal patterns: Unknown.
4. Seed biology.
- a. Amount and variation of seed production: Unknown.
 - b. Seed viability and longevity: Unknown.
 - c. Dormancy requirements: Unknown.
 - d. Germination requirements: Unknown.
 - e. Percent germination: Unknown.
5. Seedling ecology: It is unknown if fertile seeds exist.
6. Survival and mortality: Unknown.
7. Overall assessment of reproductive success: Unknown, but reproduction by stolons appears to be successful, with most populations supporting several hundred or thousand individuals. Seed dispersal in arching pussy-toes is questionable, since the existence of fertile seeds is unknown. No data is available concerning population trends or the effects of grazing on reproduction.
8. Population ecology of the taxon.
- A. General summary: In Idaho, arching pussy-toes is known from a single site, Huff Creek Meadows, Blaine County. Plants occur in small spots of bare or moss-covered soils in a grass-sedge meadow within the sagebrush grassland community (Steele 1981). No herbivore, parasites, or disease damage is known. Grazing and trampling by cattle occurs at this sites, but does not appear to be seriously detrimental to the population (Steele 1981). Competition from numerous weeds, both native and exotic, may be occurring, however, it poses no immediate threat to arching pussy-toes (Caicco 1986).
 - B. Positive and neutral interactions: None known.
 - C. Negative interactions.
 - 1. Herbivores, predators, pests, parasites and diseases: None known.

2. Competition.
 - a. Intraspecific: Unknown.
 - b. Interspecific: In Idaho, competition from native and exotic weeds is likely, but does not constitute an immediate threat.
 3. Toxic and allelopathic interactions with other organisms: None known.
- D. Hybridization.
1. Naturally occurring: Unknown, but in Idaho Antennaria microphylla (A. rosea) is frequently found with arching pussy-toes.
 2. Artificially induced: Unknown.
 3. Potential in cultivation: Unknown.
- E. Other factors of population ecology: Staminate plants appear to be rare, and presently only documented from Nevada (Cronquist 1950, Mozingo and Williams 1980).
9. Current land ownership and management responsibility:
- A. General nature of ownership: The Idaho population of arching pussy-toes occurs in Huff Creek Meadow, which is owned by two private individuals and the State of Idaho. Additionally, a fair portion of the meadow is public land administered by the Shoshone District of the Bureau of Land Management.
 - B. Specific landowners (Idaho):
Actual population of arching pussy-toes in Idaho occurs on private property owned by:

Carl and Roy Payne
P.O. Box 124
Carey, Idaho

Surrounding land is owned or administered by:

Milford Sweat
Carey, Idaho

Bureau of Land Management
Shoshone District

State of Idaho
 - C. Management responsibility: Same as above.
 - D. Easements, conservation restrictions, ect.: None presently in Idaho, however, Huff Creek Meadow is a priority acquisition for the Idaho Field Office of The Nature Conservancy and a Preserve Design Package has been prepared (Caicco 1986).

10. Management practices and experience.

A. Habitat management.

1. Review of past management and land-use experiences.
 - a. This taxon: Livestock grazing has been the dominant land-use practice, both past and present, for sites supporting arching pussy-toes in Idaho.
 - b. Related taxa: Unknown
 - c. Other ecologically similar taxa: Unknown
2. Performance under changed conditions: It appears that arching pussy-toes has persisted at the known Idaho site prior to 1946, when the type collection was made, despite continual grazing by domestic livestock. It is unknown whether grazing activity has had a positive or negative effect on the population of arching pussy-toes over this time, however, grazing seems to have no observable deleterious effects at present.
3. Current management policies and actions: Grazing by cattle is taking place on the land inhabited by arching pussy-toes in Idaho.
4. Future land use: Future plans unknown, however, Huff Creek Meadow is a priority acquisition for the Idaho Field Office of The Nature Conservancy.

B. Cultivation.

1. Controlled propagation techniques: None known.
2. Ease of transplanting: Unknown.
3. Pertinent horticultural knowledge: None known.
4. Status and location of presently cultivated material: None known to be in cultivation.

11. Evidence of threats to survival.

A. Present or threatened destruction, modification, or curtailment of habitat or range.

1. Past threats: In the past, livestock grazing has been the dominant land-use practices and threat to arching pussy-toes in Idaho.
2. Existing threats: Direct grazing by domestic livestock continues to pose a threat to arching pussy-toes in Idaho. The habitat of arching pussy-toes is moist meadows and seeps, areas that receive heavy grazing since livestock tend to concentrate near water sources. It is, however, possible that disturbance through grazing and trampling actually opens up habitat for arching pussy-toes, but this has not been investigated or documented.
3. Potential threats: Continued grazing, especially overgrazing, by domestic livestock poses a potential threat to arching pussy-toes in Idaho. Additionally, indirect activities associated with grazing, such as stockpond construction and other water development are potential threats. The landowner indicated to Guy Bonnivier (Idaho Field Office, The Nature Conservancy) that he has considered constructing a small dam on the downstream end of the meadow, creating a small reservoir and flooding the arching pussy-

toes population.

Competition from exotic and native weeds and widening and/or alterations of Highway 20 (Alt. 93), which is near the Idaho population, pose additional threats.

- B. Overutilization for commercial, sporting, scientific, or educational use.
 - 1. Past threats: Minimal to no past threats in Idaho.
 - 2. Existing threats: Minimal to no existing threats in Idaho.
 - 3. Potential threats: Minimal to no potential threats in Idaho.
- C. Disease, predation, or grazing.
 - 1. Past threats: No direct past threats to population viability of arching pussy-toes due to disease or predation are known in Idaho. Livestock herbivory and trampling has taken place, however, it appears to have had little impact (Steele 1981).
 - 2. Existing threats: No direct existing threats to population viability of arching pussy-toes due to disease or predation are known. Grazing occurs on the Idaho site, but does not presently pose a significant threat.
 - 3. Potential threats: No direct potential threats to population viability of arching pussy-toes due to disease and predation are known. Indirect activities associated with grazing, such as stockpond construction and other water development are potential threats.
- D. Inadequacy of existing regulatory mechanisms.
 - 1. Past threats: None.
 - 2. Existing threats: None.
 - 3. Potential threats: None.
- E. Other natural or manmade factors.
 - 1. Past threats: None Known.
 - 2. Existing threats: None Known.
 - 3. Potential threats: Alteration of the present drainage patterns and water supply either naturally or man-caused could prove deleterious to the Idaho population of arching pussy-toes.

II. Assessment and Recommendations.

- 12. General assessment or vigor, trends, and status: As of 1989, 23 populations of arching pussy-toes are known throughout its range, 20 of these are in Wyoming. In Idaho, only one site is known, Huff Creek Meadows, Blaine County. This site covers some 150 acres and supports approximately 4000 plants. Suitable habitat in and around Huff Creek Meadows has been surveyed numerous times, but no additional populations have been located (Caicco 1986).

The most significant potential threats are posed by overgrazing and alteration to the existing hydrologic conditions. Presently, the Idaho population seems to be static and there does not appear to be any immediate concern for the

long-term viability or conservation status of arching pussy-toes in Idaho.

13. Recommendations for listing or status change.

A. Recommendations to the U.S. Fish and Wildlife Service: Arching pussy-toes is listed presently with the Fish and Wildlife Service as a Category 2 candidate species with a priority listing of 5 (High magnitude of threat, but non-imminent). Category 2 includes taxa for which listing as an endangered or threatened species is possibly appropriate, but substantial data on bio-logical vulnerability and threat(s) are not currently known. Due to the small number of populations and disjunct distribution they exhibit, federal candidate status is still warranted. Status surveys have been completed in Wyoming (Marriott 1986) and now Idaho, but the Nevada portion of its range remains to be analyzed. Until a status survey is conducted for the Nevada portion of its range it is recommended that Antennaria arcuata be maintained as a Category 2 candidate species with a priority listing of 5.

B. Recommendations to other U.S. Federal Agencies.

1. Bureau of Land Management: While the single known Idaho population of arching pussy-toes occurs on private land, it sits within 1/4 miles of public land administered by the Shoshone District of the Bureau of Land Management. Because arching pussy-toes has such a restricted distribution in Idaho, and suitable habitat for the species occurs on adjacent land administered by the Bureau of Land Management, it is recommended that Antennaria arcuata be recognized as a Sensitive Plant Species for the Shoshone District of the Bureau of Land Management. Present land use (principally grazing) seems to pose no significant threat to the species, however, additional biological data may necessitate livestock removal in the future.

C. Other status recommendations.

1. Counties and local areas: No recommendations.

2. State: It is recommended that Antennaria arcuata be maintained as a S1 rank in Idaho.

3. Other Nations: No recommendations.

4. International: No recommendations.

14. Recommended critical habitat: In Idaho, the critical habitat for arching pussy-toes appears to be the moist grass-sedge meadow and the hydrologic condition of combining waters from thermal and cold springs.

15. Conservation/recovery recommendations.

A. General conservation recommendations.

1. Recommendations regarding present or anticipated activities: For the most part, existing land-use of habitat containing the Idaho population of arching pussy-toes appears compatible with its long-term viability. Monitoring of the population should be continued and areas of critical habitat should be protected to insure the maintenance of the taxon in Idaho.

2. Areas recommended for protection: See Recommended critical habitat. Presently, Huff Creek Meadow is a priority acquisition for the Idaho Field Office of The Nature Conservancy.

3. Habitat management recommendations: Most of these

meadows are presently allocated or used for grazing, which does not appear to be detrimental to arching pussy-toes, however, additional biological data may necessitate livestock removal in the future.

4. Publicity sensitivity: None.

5. Other recommendations: None.

B. Monitoring activities and further studies recommended:

- 1) Arching pussy-toes should be monitored to ascertain the effects of grazing. This would be best accomplished by establishing grazing exclosures within populations and monitoring population trends over 10 to 20 years.
- 2) Reproductive studies, especially seed production and viability should be initiated. This would include information about staminate plants within all the known populations.
- 3) Hydrologic relationships involving the thermal and cold springs in relation to arching pussy-toes should be assessed.
- 4) Additional inventories should be carried out in suitable habitat in Idaho.

16. Interested parties:

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III. Information Sources.

17. Sources of information.

A. Publications.

1. References cited in report: See Appendix I.
2. Other pertinent publications.
 - a. Technical: See Appendix VI.
 - b. Popular: None.

B. Herbaria consulted: Specimens of arching pussy-toes from Idaho are known to be deposited at Washington State University (WS), University of Idaho Forestry Herbarium (IDF), New York Botanical Garden (NY), Intermountain Herbarium, Logan (UTC), Intermountain Forest and Range Experimental Station, Boise (BOIS), and the US Forest Service, Intermountain Region Herbarium, Ogden (OGDF). The following is a list of known herbarium specimens, indexed by collector:

001 - J.H. Christ 16065 (WS - type, NY - isotype)
R. Steele 397 (IDF, UTC, OGDF, and BOIS)
B.F. and L.J. Harrison 13,475 (BLM 7/17/81)

C. Fieldwork: Despite numerous searches of similar habitats in the vicinity of Huff Creek Meadow, between the early 1970's and 1989, no additional populations have been located in Idaho. Periodic monitoring of the Huff Creek Meadow population continues to be carried out. Field investigations conducted in the 1980's in Wyoming have revealed many new locations (see Appendix VI).

D. Knowledgeable individuals (Idaho):

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E. Other information sources: See Interested Parties.

18. Summary of material on file: Color slides, field forms, maps, and all published and unpublished references pertaining to arching pussy-toes in Idaho are on file at the Idaho Natural Heritage Program office.

IV. Authorship.

19. Initial authorship:

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20. Maintenance of statue report: The Idaho Natural Heritage Program will maintain current information and update the status report as needed. Should arching pussy-toes be listed as an endangered or threatened species by the U.S. Fish and Wildlife Service, the Service, through its Boise Field Office should maintain the primary files on information, encourage others to provide new information, and distribute new findings, as received, to the interested parties (section II.16.)

V. New information.

21. Record of revisions: Not applicable.

Appendix I

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Appendix II

Line drawings of Antennaria arcuata
(taken from Mozingo and Williams 1980)

Appendix III

Slides of Antennaria arcuata and its habitat in Idaho.

- Slide 1. Close-up of inflorescence.
- Slide 2. Close-up of plant showing arching stolons that connect genets.
- Slide 3. View of plants in meadow showing clonal habit.
- Slide 4. Huff Creek Meadow (001) with Antennaria arcuata throughout meadow in foreground.
- Slide 5. View of Huff Creek Meadow (001).

Appendix IV

Maps of Antennaria arcuata distribution.

- Map A. General distribution of known population in Idaho.
- Map B. Portion of Paddleford Flat 7.5' quadrangle

Appendix V

Occurrence record for Antennaria arcuata
population in Idaho.

Appendix VI

Status Report for Antennaria arcuata in Wyoming
(Marriott 1986)

Status report on *Antennaria arcuata* in central Wyoming. Unpublished report prepared for the Bureau of Land Management Wyoming State Office, Rawlins District, and Rock Springs District by Wyoming Natural Diversity Database, Laramie, WY. Fertig, W., L. Welp, and S. Markow. 1998. The status of rare plants in southwest Wyoming. Unpublished report prepared for the Bureau of Land Management by the Wyoming Natural Diversity Database, Laramie, WY. Bayer, R. J. and G. L. Stebbins. 1993. A synopsis with keys for the genus *Antennaria* (Asteraceae: Inuleae: Gnaphaliinae) of North America. Canadian Journal ...
Marriott, H. J. 1986. A report on the status of *Antennaria arcuata*, a Candidate Threatened species. Unpublished. 3. Allozyme variation, genecology, and phytogeography of *antennaria arcuata* (asteraceae), a rare species from the great basin and red desert with small disjunct populations.
@inproceedings{Bayer1992ALLOZYMEVG, title={ALLOZYME VARIATION, GENECOLOGY, AND PHYTOGEOGRAPHY OF ANTENNARIA ARCUATA (ASTERACEAE), A RARE SPECIES FROM THE GREAT BASIN AND RED DESERT WITH SMALL DISJUNCT POPULATIONS}, author={Randall J. Bayer}, year={1992} }. Randall J. Bayer. Evaluating Approaches to the Conservation of Rare and Endangered Plants. Douglas W. Schemske, Brian C. Husband, +3 authors John George Bishop. Status Survey Report prepared for Idaho Department of Parks and Recreation. through Section 6 funding from U.S. Fish and Wildlife Service, Region 1. REPORT ON THE CONSERVATION STATUS OF *Phacelia inconspicua* IN IDAHO. C. Biogeographical and phylogenetic history: At least three other rare species, *Machaeranthera laetevirens*, *Lesquerella kingii* var. *cobrensis*, and *Antennaria arcuata*, exhibit a similar distribution pattern, with widely disjunct populations in central Nevada and south-central Idaho. *Antennaria arcuata*, however, also has an additional disjunct population in central Wyoming. 6. General environment and habitat description.