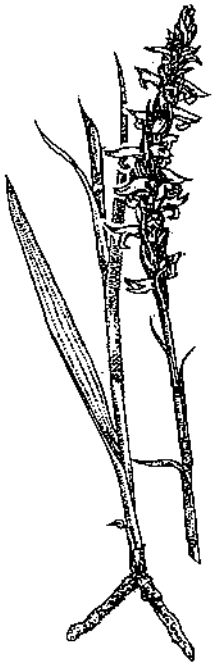

Ute Ladies Tresses (*spiranthes diluvialis*) in Idaho: 1997 and 1998 Status Reports

by Robert Mosley
Conservation Data Center

UTE LADIES TRESSES (*SPIRANTHES DILUVIALIS*) IN IDAHO:

1997 STATUS REPORT

by

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April 1998

Idaho Department of Fish and Game
Natural Resource Policy Bureau
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Stephen P. Mealey, Director

Status Survey Report prepared for
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ABSTRACT

Ute ladies tresses (*Spiranthes diluvialis*) is a white-flowered orchid that occurs in low elevation wetlands and riparian zones of the Central and Northern Rockies and adjacent plains and valleys. The specific epithet, *diluvialis*, is Latin meaning "of the flood," which is descriptive of much of the species' habitat: alluvial substrates along perennial streams and rivers. It was listed as Threatened under the Endangered Species Act in 1992. At the time of listing it was known to be extant in Colorado and Utah, with one historical population in Nevada. It was listed due to its rarity, low population sizes, and threats of loss or modification of riparian habitats. Since listing Ute ladies tresses populations have been discovered in Nebraska, Wyoming, Idaho, Montana, and Washington.

In this report I summarize our knowledge of the status of Ute ladies tresses in Idaho, through the 1997 field season. Results from the 1996 season were reported last year (Moseley 1997a). Topics covered by this report include a review of the taxonomy, species description and identification aids, the rangewide and Idaho distributions, extent of surveys in Idaho, habitat characteristics, aids in assessing potential habitat, and floodplain dynamics in relation to Ute ladies tresses habitat. I also briefly review the population biology, land ownership and land use, as well as possible threats to the species in Idaho.

My assessment of the Idaho populations is that all have existing and potential threats and are vulnerable. Flow regime alteration by Palisades Dam represents the most significant long-term threat to species viability in the Snake River metapopulation, while cattle grazing represents the most significant short-term threat. I believe flow alteration to be the greater threat of the two.

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TAXONOMY

Full bibliographic citation: Sheviak, C.J. 1984. *Spiranthes diluvialis* (Orchidaceae), a new species from the western United States. Brittonia 36(1):8-14.

Type specimen: U.S.A., Colorado, Jefferson County: mesic to wet alluvial meadows along Clear Creek just west of junction of routes 6 and 58, Golden, 17 July 1982, *C.J. Sheviak, J. K. Sheviak, W. Jennings, L. Long, and S. Smookler 2257* (Holotype: NYS; Isotype: NY).

Pertinent synonym(s): *Spiranthes romanzoffiana* var. *diluvialis* (Welsh et al. 1993). See also History of Knowledge of Taxon section, below.

Common name: Ute ladies tresses.

Size of genus: About 40 species, most American, but also in Japan, Australia, and New Zealand (Wilkens and Jennings 1993).

Family name: Orchidaceae.

Common name for family: Orchid.

History of knowledge of taxon: Prior to the description of *Spiranthes diluvialis* in 1984 (Sheviak 1984), workers in Orchidaceae had tried to accommodate *Spiranthes* specimens from low elevations in Colorado and Utah in the three taxa listed below. All these specimens are now known to be from historical or current populations of *S. diluvialis* (England 1992).

- *Spiranthes cernua* (Correll 1950; Holmgren 1977; Arnow et al. 1980; Welsh et al. 1987).
- *Spiranthes porrifolia* or *S. romanzoffiana* var. *porrifolia* (Rydberg 1906; Correll 1950; Holmgren 1977; Goodrich and Neese 1986; Welsh et al. 1987).
- *Spiranthes magnicamporum* (Lauer 1975).

At the time of listing as Threatened under the Endangered Species Act in 1992 (England 1992), Ute ladies tresses was known from Colorado, Utah, and extreme eastern Nevada. Several of these populations were known to have been extirpated. New populations have since been discovered in other portions of Utah and Colorado (Ute Ladies Tresses Recovery Team 1995), as well as eastern Wyoming in 1993 (Fertig 1994), Montana in 1994 (Heidel 1997), Nebraska in 1996 (Hazlett 1996), Idaho in 1996 (Moseley 1997a), and Washington in 1997 (Heidel 1998; U.S. Fish and Wildlife Service 1998).

In addition to the morphological data used by Sheviak (Sheviak 1984) to distinguish Ute ladies tresses as a distinct species, Arft (1995) found that it's distinctiveness is also supported by genetic

data. These genetic studies also corroborate Sheviak's hypothesis that Ute ladies tresses is a polyploid derived from the hybridization of the diploids, *Spiranthes magnicamporum* and *S. romanzoffiana.*

Alternative taxonomic treatments: In their first edition of *A Utah Flora* Welsh et al. (1987) synonomized *Spiranthes diluvialis* with *S. porrifolia*, a species that is now considered not to occur in Utah. They later treated it as a *S. romanzoffiana* var. *diluvialis* in the current edition (Welsh et al. 1993).

LEGAL OR OTHER FORMAL STATUS

International:

Convention on the International Trade in Endangered Species (CITES): As a member of the Orchid Family (Orchidaceae), Ute ladies tresses is included on the CITES Appendix II list. Species listed in Appendix II require a permit from the country of origin to export. International trade in this species has not been documented (Heidel 1997).

Heritage Network Conservation Rank: The international network of Natural Heritage Programs and Conservation Data Centers currently ranks Ute ladies tresses as "globally imperiled" or "G2" owing to extreme rarity. This indicates generally 20 or fewer occurrences, conditioned by quality, condition, viability, and vulnerability of the occurrences (Heidel 1997).

National:

Endangered Species Act of 1973: Ute ladies tresses is listed as Threatened under the Endangered Species Act and its recovery is administered by the U.S. Fish and Wildlife Service (England 1992). A draft Recovery Plan (Ute Ladies Tresses Recovery Team 1995) and Section 7 consultation recommendations and guidelines (U.S. Fish and Wildlife Service 1995; 1998) have been prepared.

Federal Agencies: Federal agencies are required to recognize protected species under the Endangered Species Act and implement applicable recovery actions.

Heritage Network Conservation Rank: Ute ladies tresses is known only from the United States, but the Washington population is close to the border with British Columbia, Canada. So, curently the only National or "N" rank is for the the United States, where it is the same as the Global rank, that is, "N2." If it is found in Canada, it will also be assigned a National Rank for that country.

State (Idaho):

Idaho Conservation Data Center: As the state node of the Natural Heritage network, the Conservation Data Center (CDC) recognizes it as "state imperiled" or "S2" in Idaho. This rank is not a legal designation and it does not afford it legal protection or regulation.

Idaho Native Plant Society: It is recognized as a "Global Priority 2" species (Idaho Native Plant Society 1998). This rank is not a legal designation and it does not afford it legal protection or regulation.

DESCRIPTION AND IDENTIFICATION

General description: Ute ladies tresses is a perennial orchid with one and sometimes multiple stems 12-50 cm tall, arising from tuberously thickened roots. Its narrow, 1-cm wide leaves can reach 28 cm long, with the longest leaves being at the base of the stem. Leaves persist during flowering. The inflorescence consists of a few to many white or ivory flowers clustered in a spike of 3-ranked spirals at the top of the stem. The sepals and petals are oriented perpendicular to the stem, the lateral sepals often spreading abruptly from the base of the flower, and all sepals are free to the base. The lip petal is somewhat constricted in the middle (Heidel 1997, adapted from Ute Ladies Tresses Recovery Team 1995).

Technical description: Herb, erect, slender to stout, 20-50 cm tall, glabrous below, pubescent above with numerous capitate trichomes. *Roots* tuberously thickened, up to 1 cm in diameter. *Leaves* linear-lanceolate, the larger to 28 x 1.5 cm, basal usually restricted to the very base of the stem and rapidly reduced upward to sheathing bracts, persisting past anthesis. *Spike* dense, 3-5 x 1.2-2.5 cm. *Floral bracts* ovate, attenuate or acuminate, the lower 9-33 mm long. *Flowers* 7.5-15 mm long, faintly fragrant with the scent of coumarin, white or ivory, the lip often yellow centrally. *Sepals* free or connate at the base, the dorsal lanceolate, acute, the lateral broadly spreading to loosely incurved or appressed, linear-lanceolate, acuminate. *Petals* connivent with the dorsal sepal, linear, acuminate. *Lip* 7-12 x 2.5-6.8 mm, ovate, lanceolate, or oblong, with a median constriction and occasionally pandurate, the margin entire or dentate toward the apex, crisped, the basal calli prominent, pubescent. *Seeds* ellipsoidal, monoembryonic (Sheviak 1984).

Local field characters and identification aids for Idaho: Prior to the discovery of *Spiranthes diluvialis* (Ute ladies tresses) along the Snake River in 1996, the Idaho flora was thought to contain only one member of the genus, *S. romanzoffiana* (hooded ladies tresses). Recently, however, a *Spiranthes* specimen collected in 1996 on BLM land in Hells Canyon was identified as *S. porrifolia* (Sheviak 1998). This is the only known population of *S. porrifolia* (western ladies tresses) in Idaho (Sheviak 1998). The three species of *Spiranthes* in Idaho are not known to occur with each other and, in general, this holds true rangewide. There is one known exception, however, at a 6,800-foot site in northern Utah where *S. diluvialis* and *S. romanzoffiana* occur in a mixed population (U.S. Fish and Wildlife Service 1998). Below are some aids based on plant

morphology and major life zone habitat that may be useful in telling the three *Spiranthes* species apart in Idaho.

Spiranthes diluvialis is characterized by whitish, stout, ringent (gaping at the mouth) flowers, with slender, elongate petals and sepals that are white to ivory-colored and free to the base. The lip is exposed in lateral view, with an oval to lance or oblong outline, a marked median constriction, the base usually dilated, the venation mostly parallel, typically with some divaricate branching in the lower half, and with crispy-wavy margins. The upper stem is sparsely to densely pubescent, the longest hairs are longer than 0.2 mm, and the glands are obviously stalked. The persistent leaves are mostly restricted to the base of the stem, reduced to bracts above (Heidel 1997, adapted from Ute Ladies Tresses Recovery Team 1995, and Wyoming Technical Plant Committee 1995).

By comparison *Spiranthes romanzoffiana* has connate sepals which usually curve in the shape of a hood on top. It has a more deeply constricted lip petal (pandurate or violin-shaped) and generally more densely congested and shorter spikes compared to *S. diluvialis*. Its leaves often extend up the lower stem.

The field characters of *Spiranthes porrifolia* include yellowish, very slenderly tubular flowers with marked fusion of the lateral sepals below the tip, spreading sepal apices (no hood formed), virtual lack of apical dilation of the lip (not violin-shaped) and a dense cushion of short, peg-like projections (sometimes referred to as callosites) on the upper surface of the apical segment of the lip, just behind the apex. The diagnostic feature of *S. porrifolia* are the callosites on the apical segment of the lip. This feature is never present in *S. romanzoffiana* (Sheviak 1998), which has a glabrous lip, and apparently not in *S. diluvialis*, although basal (as opposed to apical) calli are prominent on the lip, which is also pubescent. (Sheviak 1984)

I have never seen *Spiranthes porrifolia*, but in my experience with the other two species in Idaho, Ute ladies tresses is generally a more robust plant in every respect: taller, larger leaves, bigger flowers, etc. This is not surprising given that Ute ladies tresses is a polyploid, in part, derived from hooded ladies tresses (Sheviak 1984; Arft 1994; 1995); relative gigantism is one of the characteristics of a polyploid.

Table 1 presents my attempt at a key for the three species in Idaho, while Table 2 presents a conspectus of diagnostic features. I would appreciate receiving input and refinements on this key and conspectus based on field experience in Idaho. Figure 1 presents line drawings of the three species.

An orchid species with similar vegetative features, *Habenaria hyperborea* (northern green bog orchid), grows with Ute ladies tresses along the South Fork Snake River and occurs in potential habitat elsewhere in eastern and central Idaho (e.g., Mancuso 1997). [NOTE: last year (Moseley 1997a), based on vegetative material, I misidentified this as *H. dilatata* (white bog orchid).] Northern green bog orchid has small green flowers that usually reach anthesis much earlier than

Table 1. Diagnostic key to the three *Spiranthes* species in Idaho.

1. Lateral sepals free or only slightly connate at the base; rachis of inflorescence with at least some hairs more than 0.2 mm long; plants found at or below lower timberline in the foothills and plains ..... *S. diluvialis*

1. Lateral sepals strongly connate; rachis of inflorescence glabrous or with very short glandular hairs, mainly less than 0.1 mm long; plants at various elevations.

   2. Lip lanceolate to more or less ovate, tip with dense cushion of short, peg-like projections above; flowers slenderly tubular, generally yellowish; plants found in woodlands near lower timberline..... *S. porrifolia*

   2. Lip more or less violin-shaped, tip glabrous; flowers with curved tubular hood, generally white; plants found in montane and subalpine forest zones between upper and lower timberline, mesic grasslands, rarely in alkaline fens below lower timberline..... *S. romanzoffiana*

Ute ladies tresses, mostly in late June and July. The stem, leaves, and fruits of the bog orchid are often dried and brown at the same time that the ladies tresses was in full flower and early fruit (fruits still green). Northern green bog orchid is two-to-three times larger in size (height, stem thickness, inflorescence, leaves, etc.), with more leaves occurring higher on the stem and many more flowers in the inflorescence. This species appears to be a good indicator of Ute ladies tresses habitat along the South Fork, at least. Although possibly having a slightly wider ecological amplitude, it seems to be restricted to the moist, wetland-upland transition that is dominated by the grass, *Agrostis stolonifera*. It proved to be a useful indicator of potential habitat along the South Fork and elsewhere in Idaho.

DISTRIBUTION

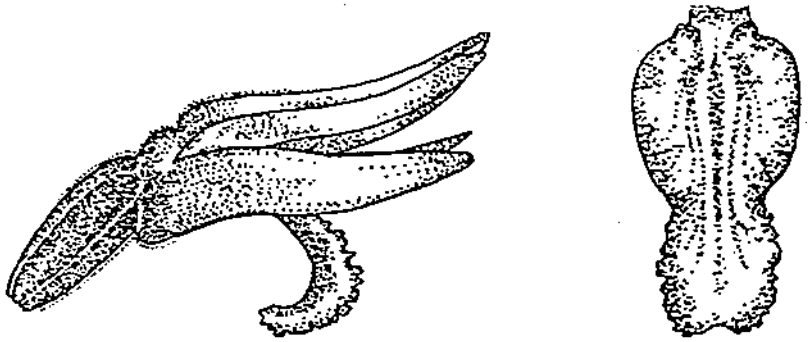
Rangewide distribution: The global range of Ute ladies tresses extends from the Great Plains of western Nebraska and adjacent Wyoming, west for about 600 miles across the Rocky Mountain and Intermountain regions to the Okanogan Valley of north-central Washington. The northernmost population in the Okanogan Valley is very close to the British Columbia border, and the distribution extends south for about 550 miles into the Great Basin of southeastern Nevada and plateaus of southern Utah. It is highly discontinuous within this area. It is known to be extant in seven states (Colorado, Utah, Nebraska, Wyoming, Idaho, Montana, and Washington). The Nevada collection from 1936 has not been relocated. The rangewide distribution is presented in Figure 2, which was prepared by Ron Hartman (1997).

Table 2. Comparison of diagnostic features of *Spiranthes diluvialis*, *S. romanzoffiana*, and *S. porrifolia*.

Character	*S. diluvialis*	*S. romanzoffiana*	*S. porrifolia*
Leaves	Several, mostly at base of stem, persistent.	Often numerous, sometimes extending up the lower stem, persistent.	Similar to *S. romanzoffiana*.
Rachis	Sparsely to densely pubescent, the longest hairs ≥ 0.19 mm (often much longer), the glands obviously stalked.	Glabrous or sparsely pubescent, the longest hairs <0.18 mm long (usually much less), the glands often sessile or subsessile.	Similar to *S. romanzoffiana*.
Flowers	Ascending, rather long and slender, whitish to ivory-colored, ringent (gaping at the mouth); lip exposed in lateral view.	Strongly ascending, short, broad at base, white to cream, well-developed hood open only at the apex (not ringent); lip hidden in lateral view except for reflexed tip.	Very slenderly tubular, ventrally curved, yellowish, open only at the apex (not ringent), lip hidden in lateral view except for reflexed tip.
Sepals	Often connate at base for a short distance, sometimes free; variably appressed, spreading, or ascending; hood rarely evident.	Fused for some length, generally >1/2, and united with the petals to form a prominent hood above the lip.	Fused for some length forming a slender tube, and joined with the petals, appressed for most of their length but widely spreading toward the apices (no hood formed).
Lip	Ovate to lanceolate or oblong in outline, with a marked median constriction, the base usually dilated; lacking a dense cushion of short hairs on upper surface near apex; membranous when moist; venation mostly parallel, typically with some branching divaricating veins in lower half, often elongated.	Strongly pandurate (violin-shaped with marked median constriction) the apex dilated; glabrous on upper surface; membranous when moist; prominently veined below the constriction with laterally diverging, branched veins.	Ovate to lanceolate in outline, ± acute, the apex only slightly or not at all dilated, dense cushion of short, peg-like projections on the upper surface of the apical segment of the lip just behind the apex, membranous when moist.
Chromosome	$2n = 74$	Commonly $2n = 44$	$2n = 44, 66, 88$
Flowering Period in Idaho	Late August through mid-September; rarely late September and early October.	Variable but typically mid-July; late June at low elev. in N ID; fruits dehiscing when *S. diluvialis* is in prime flower.	Idaho specimen in full flower when collected 14 August 1996.
Major Life Zones in Idaho	Sagebrush-steppe to transition zone with montane forest (lower timberline).	Montane and subalpine coniferous forests, aspen; rarely alkaline fens in high-elevation sagebrush-steppe; steppe in N ID.	One known population at 5,000' in seep in Douglas-fir stand at lower timberline near transition to fescue grasslands (lower timberline).

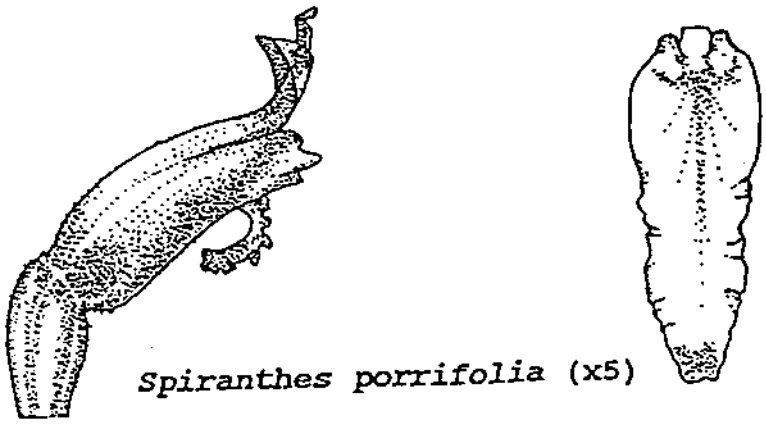
Figure 1. Line drawings of *Spiranthes diluvialis*, *S. romanzoffiana*, and *S. porrifolia*; A. flowers. B. habit. Illustrations are by Carolyn Crawford.

Figure 1A



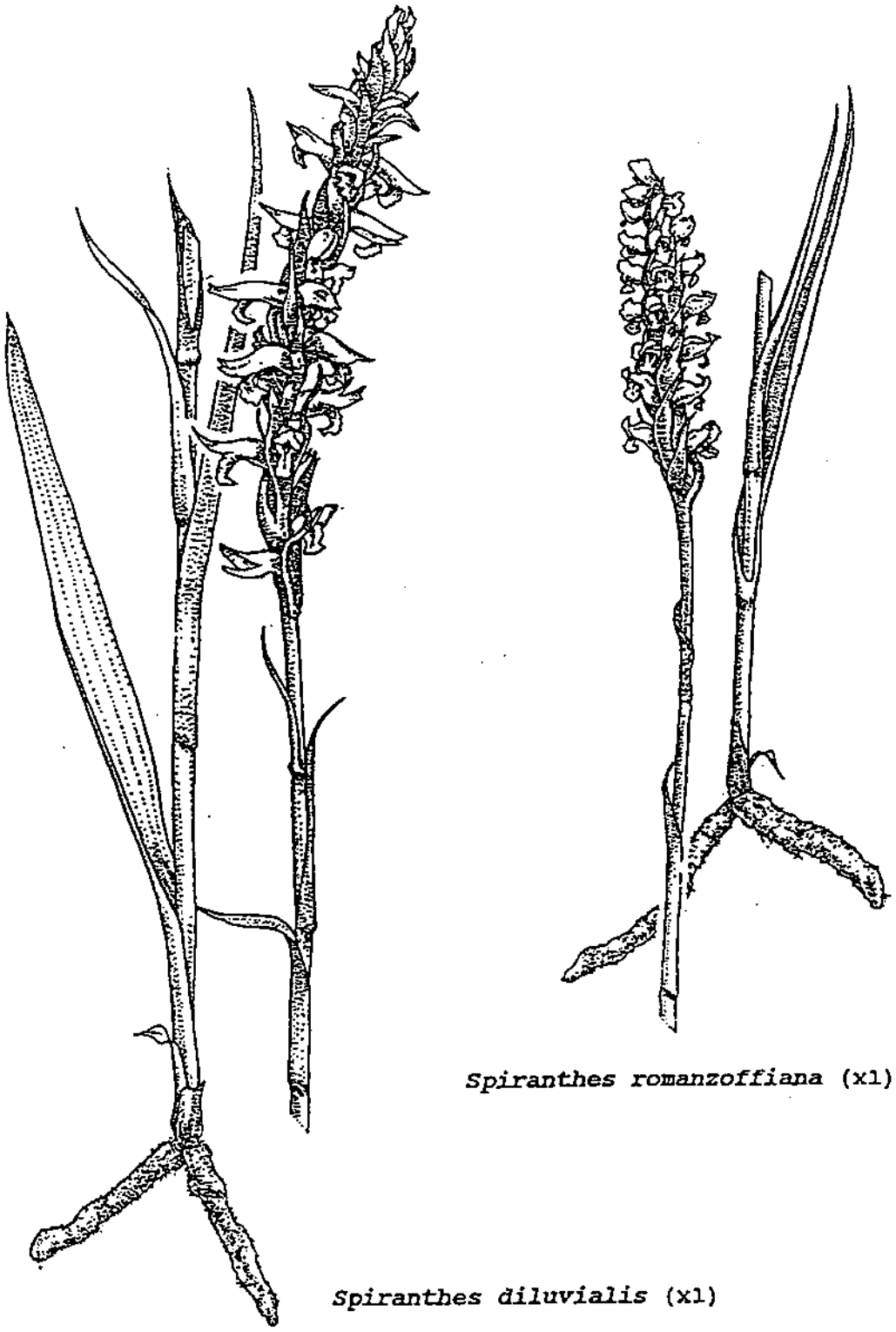
Spiranthes diluvialis (x5)

Spiranthes romanzoffiana (x5)



Spiranthes porrifolia (x5)

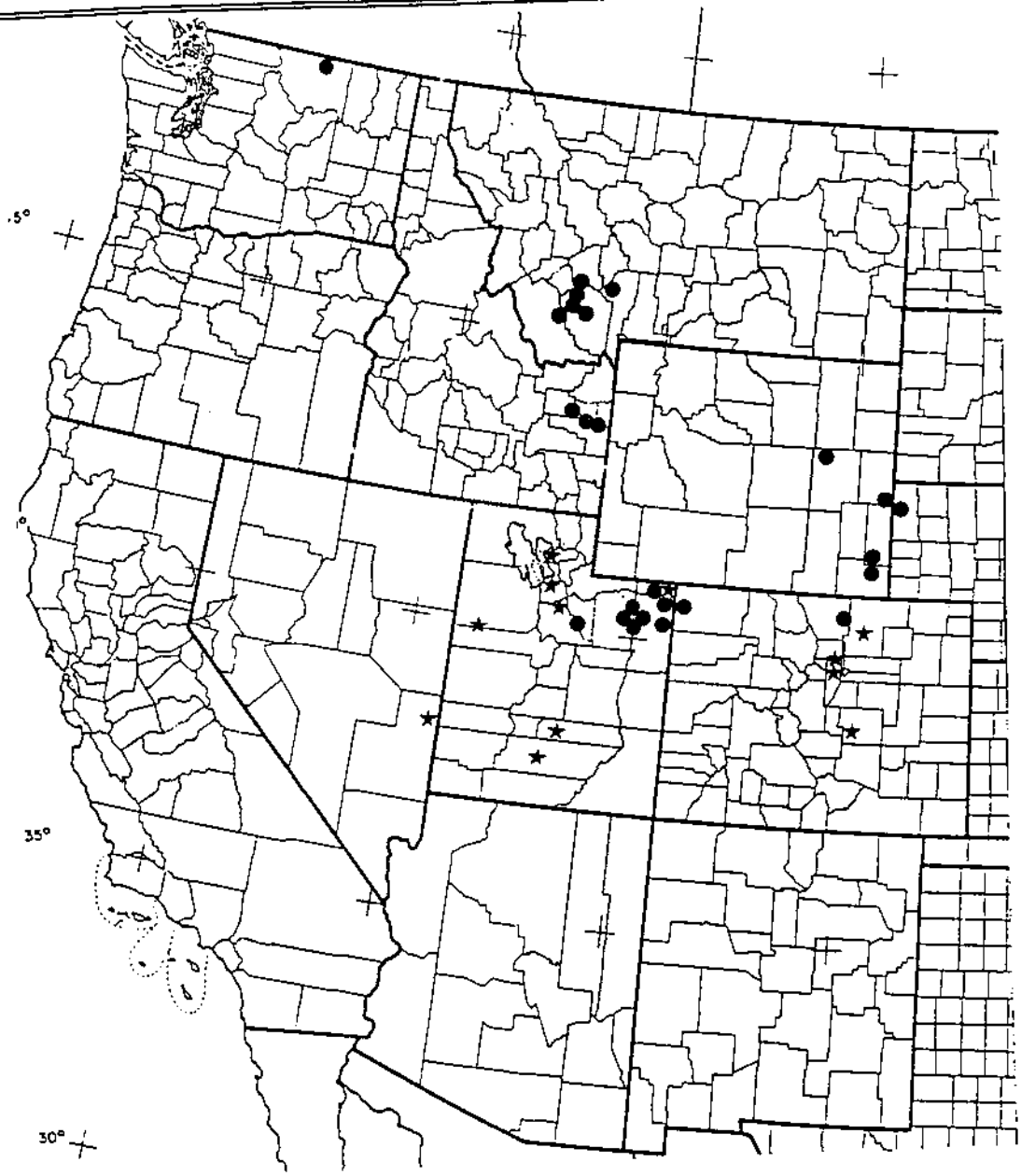
Figure 1B



Spiranthes romanzoffiana (x1)

Spiranthes diluvialis (x1)

Figure 2. Rangewide distribution of *Spiranthes diluvialis*, prepared by Ron Hartman (1997).



Spiranthes diluvialis -- Ute ladies'-tresses

● = populations discovered in the past 5 years, including ones from ID, MT, NE, WA, and WY.

★ = populations discovered earlier, all have been relocated except the one in NV.

Idaho distribution: In Idaho, Ute ladies tresses is known from the Snake River floodplain in the far eastern part of the state, in Jefferson, Madison and Bonneville counties (Figure 3). Populations are scattered along 49 river miles from near the confluence of the Henry's Fork, upstream to Swan Valley, nine river miles below Palisades Dam. In Idaho, this stretch of river is known locally as the "South Fork;" on USGS maps and in Wyoming the same waterway is known simply as the Snake River.

Precise occurrences in Idaho: I consider the populations along the Snake River to be one large metapopulation, although 20 occurrences have been delineated in the CDC data base based on management and geographic considerations. The precise occurrences for Idaho have been compiled and distributed in other reports (Moseley 1997a; 1997b; 1997c; 1997d), so I will only present a summary here (Table 3). Refer to the other reports for detailed location data for individual Idaho occurrences.

Historical sites in Idaho: None.

Unverified/undocumented reports in Idaho: None.

Extent of surveys in Idaho: In 1995, the Section 7 (ESA) consultation guidelines for Ute ladies tresses identified Priority Survey Areas for states containing populations, as well as adjacent states known to have potential habitat (U.S. Fish and Wildlife Service 1995). In Idaho, the Bear River drainage and the Snake River above American Falls Reservoir were identified as Category 3 watersheds, where surveys were encouraged, although populations were not known to occur. Beginning in late July 1996, biologists from the CDC began to conduct extensive searches throughout these watersheds for Ute ladies tresses. These 1996 inventories are summarized in Moseley (1997a) and Moseley (1997c).

After its discovery on the Snake River in August 1996, the Section 7 consultation area was expanded to include 24 counties in eastern and east-central Idaho. During 1997, federal and state agencies from throughout the consultation area were active in conducting intensive, project-specific inventories, as well as extensive, systematic surveys of potential habitat. The CDC has compiled all known survey routes on a set of 1:100,000-scale maps. Our conservative estimate is that at least 515 miles of streams and rivers in the consultation area have been surveyed specifically for Ute ladies tresses in 1996 and 1997. Ute ladies tresses was discovered along about 10% of this riparian mileage, along one contiguous segment of the Snake River.

Figure 3. Distribution of *Spiranthes diluvialis* in Idaho.

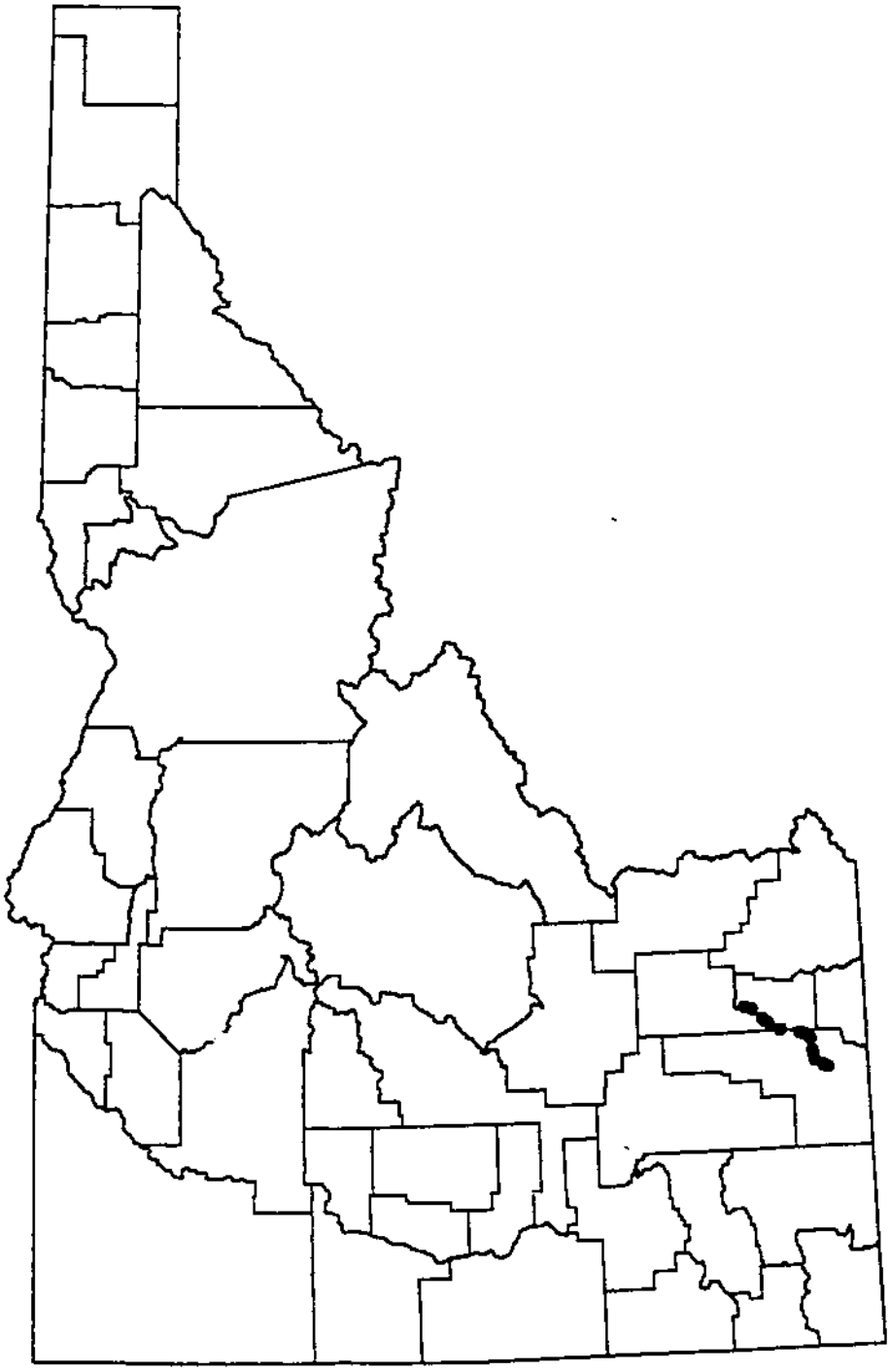


Table 3. Ute ladies tresses occurrences in Idaho, arranged by river mile along the Snake River.

Occurrence Name	Occurrence No.	River Mile[1]	Land Ownership
Annis Island	006	835	BLM
Lorenzo Levee	008	836.5	Private
Archer Powerline	015	844	Private
Twin Bridges Island	007	848	BLM, County
Railroad Island	005	847	BLM
Kelly's Island	001	853	BLM
Mud Creek Bar	009	862	BLM
Rattlesnake Point	002	863.5	BLM
TNC Island	010	863.5	BLM
Warm Springs Bottom	003	866*	BLM
Lufkin Bottom	011	867*	BLM
Gormer Canyon #5	012	867.8*	Targhee NF
Gormer Canyon #4	013	868.5*	Targhee NF
Pine Creek #5	014	873.5*	BLM
Pine Creek #3 & #4	016	874.5*	BLM
Lower Conant Valley	017	876.3*	BLM
Upper Conant Valley	018	878*	BLM
Lower Swan Valley	019	881.8*	BLM
Falls Campground	004	882*	Targhee NF
Squaw Creek Islands	020	884*	BLM, Private

[1]In some cases the river miles reported on the USGS quads are incorrect. I use the remeasured river mile index of the Hydrology and Hydraulics Committee (1976) as the reference for this table and subsequent discussions. Cases where the remeasurement disagrees with the quad are marked with an asterisk (*).

Below are the surveys and surveyors on records at the CDC, the general area of inventory, and the dates they were performed.

- Bob Moseley (1997a) and others - throughout eastern Idaho, July - September 1996.
- Steve Popovich - proposed Boulder Mountain Trail route, Big Wood River valley, August 1996.
- Michael Mancuso (1997) - Salmon and Challis National Forests, August and September 1997.
- Michael Mancuso (1998) - The Nature Conservancy's Flat Ranch Preserve, July 1997 (found *Spiranthes romanzoffiana*).
- Bob Moseley and others - wetlands in Monida Pass area, July 1997 (found *Spiranthes romanzoffiana*).
- Bob Moseley (1997c; 1997d) and many others - Snake River corridor and other selected areas in eastern Idaho, August - October 1997.
- Bob Moseley (1997e) and others - Bonneville Power Administration fish hatchery sites around Fort Hall, August 1997.
- Bob Moseley and Michael Mancuso (1997) - 13 proposed Idaho Transportation Department (ITD) bridge projects in east-central and eastern Idaho, August - September 1997.
- Bob Moseley (1997f) - proposed Idaho Transportation Department (ITD) road projects near Soda Springs and Montpelier, September 1997.
- Mabel Jankovsky-Jones and Michael Mancuso - numerous wetlands and riparian areas in the valleys of east-central Idaho.
- Rose Lehman - Snake River Ranger Station and other areas on the Snake, August - September 1997.
- Jim Glennon (1997) and others - BLM Pocatello Resource Area, August - September 1997.
- Klara Varga (1997) - eastern portion of Caribou National Forest, August - September 1997.
- Edna Rey-Vizgirdas and others - selected areas of the Caribou National Forest, August 1997.
- Duane Atwood (1997) and others - Malad Ranger District, Caribou National Forest, August 1997.
- TRC Mariah Associates, Inc. (1997) - lower Sage Creek canyon, Caribou National Forest, August 1997.
- John Shelly - several proposed ITD road projects in south-central Idaho, August - September 1997.
- Seth Phalen (1997) - Basin Creek Bridge project area, Salmon River, August 1997.
- Calypso Consulting - Pacific Corp project areas along the Bear River, August 1997.

HABITAT

I used several references for characterizing the rangewide habitat for Ute ladies tresses, cited here once to eliminate redundancy in the descriptions below: U.S. Fish and Wildlife Service (1995; 1998), Ute Ladies Tresses Recovery Team (1995); and Heidel (1998). These should be referred to for greater detail. In addition, the state Heritage Program botanists can be consulted for habitat descriptions at each occurrence within their state. They are also good sources for up-to-

date status information in each state. The Idaho habitat descriptions build upon my previous reports (Moseley 1997a; 1997c; 1997g).

Macro-scale characteristics: It is useful to view the distribution of Ute ladies tresses in the context of large-scale ecological patterns, that is, ecosystems of regional extent or *ecoregions*. Bailey (1995) has devised an ecoregional classification where ecoregions are differentiated according to a hierarchical scheme using climate and vegetation as indicators of the extent of each unit. The two broadest levels of the hierarchy, *domain* and *division*, are defined by large ecological climate zones. *Ecoregions* (also called provinces) are subdivisions of *divisions* based on vegetational macro-features, which express more refined climatic differences. Mountains exhibiting altitudinal zonation are distinguished as separate ecoregions from surrounding lowlands having a similar climatic regime. Below are the ecoregional categories for the rangewide and Idaho distributions of Ute ladies tresses. Refer to Bailey (1995) for a map and detailed descriptions of these units.

In addition to ecoregions, it is also useful to understand the distribution of Ute ladies tresses in the context of broad-scale life zones, usually expressed as vegetation zones (e.g., Daubenmire 1943; Barbour and Billings 1988). These are also reviewed for the rangewide and Idaho distributions of Ute ladies tresses.

Rangewide:

All known populations of Ute ladies tresses generally occur below the coniferous forest vegetation zone. The populations are within steppe, shrub-steppe, or pinyon-juniper woodland zones. Occasionally, populations occur at or near lower timberline, the transition between coniferous forest and nonforest or woodland vegetation.

In terms of ecoregional considerations, all populations of Ute ladies tresses occur in the Dry Domain (Bailey's code 300), which features a dry climate where the annual losses of water through evaporation exceed annual water gains from precipitation. It occurs in four divisions and seven ecoregions, as follows (Bailey's hierarchial codes precede the names):

300 Dry Domain
- 330 Temperate Steppe Division
  - 331 Great Plains-Palouse Dry Steppe Ecoregion - *Nebraska, Wyoming, and Colorado Front Range populations.*

- M330 Temperate Steppe Regime Mountains
  - M331 Southern Rocky Mountains Steppe-Open Woodland-Coniferous Forest-Alpine Meadow Ecoregion - *some Idaho, Utah, and northeastern Colorado populations.*
  - M332 Middle Rocky Mountains Steppe-Coniferous Forest-Alpine Meadow Ecoregion - *Montana populations.*

M333 Northern Rocky Mountains Forest-Steppe-Coniferous Forest-Alpine Meadow Ecoregion - *Washington population.*

340 Temperate Desert Division
341 Intermountain Semidesert and Desert Ecoregion - *some Utah and the historical Nevada populations.*
342 Intermountain Semidesert Ecoregion - *some Idaho populations.*

M340 Temperate Desert Regime Mountains
M341 Nevada-Utah Mountains Semidesert-Coniferous Forest-Alpine Meadow Ecoregion - *some Utah populations.*

Idaho:

Sagebrush-steppe is the predominant vegetation zone along the occupied stretch river. There is a narrow band of juniper woodlands (*Juniperus scopulorum* and possibly *J. osteosperma*) adjacent to the river on southerly slopes below Heise. Above Heise, the Snake River flows through the transition zone between forest and nonforest, with isolated stands of Douglas-fir *(Pseudotsuga menziesii*), big-tooth maple (*Acer grandidentatum*), and aspen (*Populus tremuloides*) occurring on northerly aspects.

Idaho populations occur in two ecoregions, Intermountain Semidesert (342) and Southern Rocky Mountains (M331). The 49-mile segment of the Snake River containing the populations transcends these two ecoregions, with Heise being on the boundary. In other words, the Snake River exits the Rocky Mountains at Heise and begins its journey across the Snake River Plain.

Meso-scale characteristics: In this section I describe general characteristics of Ute ladies tresses habitat such as geologic and floodplain features, soils, landscape setting, plant communities, and broad hydrologic gradients.

Rangewide:

In the meso-scale sense, Ute ladies tresses is a species of the lowlands. It occurs on plains, in broad intermontane valleys, and in narrow mountain valleys, generally at lower elevations relative to the surrounding landscape. While the absolute elevation of populations varies widely, from 1,800 feet in the Okanogan Valley to 6,800 feet in the Uinta Mountains, the relative position of these sites is low.

In the Rocky Mountains and Intermountain regions, most populations are in valley bottoms along medium to large streams and rivers of moderate gradient (not slow and meandering), generally as they near the edge of the mountains or somewhat out onto the plains, but before they start to slow down. It can also be found in meadows and irrigated pastures, isolated from rivers and streams. Hydrologically, the populations are subirrigated from groundwater that is tied to adjacent stream systems, as well as more stable water sources, such as springs and lakes.

Communities occupied by Ute ladies tresses are generally characterized as herbaceous (usually graminoid) wet meadows, irrigated pastures, riparian shrublands, and riparian deciduous forests. See the references listed above for detailed characterizations of communities occupied in each state. Heidel (1998) has detailed soils and vegetation data from Montana habitats, which are very different from Idaho habitats.

Idaho:

The 49-mile segment of the Snake River occupied by Ute ladies tresses has an overall gradient of about 0.2% and a relatively broad floodplain dominated by narrow-leaf cottonwood (*Populus angustifolia*) forests. This is a very dynamic system, where episodic flood events and subsequent river channel migration creates a shifting mosaic of communities and habitats on the floodplain. This scenario was more prevalent prior to the construction of Palisades Dam in 1956, which has eliminated most large floods (Merigliano 1996a). The specific epithet of Ute ladies tresses, *diluvialis*, is Latin meaning "of the flood" (Sheviak 1984) and is very descriptive of its habitat along the Snake River.

Two occupied river segments can be differentiated based on floodplain characteristics and they coincide with the boundary of the two ecoregions discusses in a pervious section. The 18-mile long segment below Heise is in the Intermountain Semidesert Ecoregion (342*)*. The floodplain is relatively wide as it spreads out onto the Snake River Plain, and has extensive channels, sloughs, islands, and large bars. In fact, it spread out too much for people living in the floodplain and the river is now confined between levees that parallel this segment along most of its length. Six of the 20 occurrences known for Ute ladies tresses in Idaho occur in this segment. I observed very little potential habitat along this stretch, and most of the places where potential habitat was observed, we found Ute ladies tresses.

The 31-mile long segment above Heise is in the Southern Rocky Mountain Steppe-Open Woodland-Coniferous Forest-Alpine Meadow Ecoregion (M331). The Snake River flows through a relatively narrow valley and canyon, surrounded by mountainous terrain instead of a volcanic plain. The floodplain is much narrower than below, but still has many complex floodplain features such as channels, sloughs, islands, and terraces. Fourteen of the 20 occurrences known for Ute ladies tresses in Idaho occur in this segment. This upstream segment is *THE* hotbed for Ute ladies tresses in Idaho, especially the stretch between Wolverine and Squaw creeks, where many population occur and much potential habitat exists (Moseley 1997c).

All Ute ladies tresses populations occur on alluvial deposits, ranging from very coarse cobbles to finer-textured sands and possibly sandy loams. The soils are classified primarily as Xeric Torrifluvents, which have mildly alkaline surface and subsurface layers (Miles 1981). The alluvial deposits are of mixed geologic origin, with a variety of bedrock types, including sedimentary, volcanic, and metamorphic rocks, occurring in the 5,752 square-mile discharge area above the Heise Gauge. See Merigliano (1996a) for a detailed discussion of the physical environment of this Snake River segment and its relationship to riparian vegetation and plants.

With one exception, all populations are probably submerged annually or near-annually during high river flows in the late spring and early summer. My estimate is that they are under water with flows of 18,000 to 20,000 cubic feet per second (cfs) at the Heise Gauge, possibly less. The maximum allowed by the Bureau of Reclamation, who controls discharge from Palisades Dam, is 24,500 cfs (Martin 1998). The only population that does not appear to be flooded during these events is on Kelly's Island (EO#001), which is the only population dominated by *Eleocharis rostellata* in Idaho (discussed below). All populations were under water in June 1997, when river flows at Heise reached 43,000 cfs. This is an unprecedented level since the closure of Palisades Dam in November 1956, but is considered a 10-year flow event prior to Palisades (Martin 1998).

Within the floodplain forests of the Snake River, Ute ladies tresses occupies four distinct cover types. Two of these types, *Eleocharis rostellata* and *Elaeagnus commutata*, have been recognized as community types in riparian and wetland classifications (Jankovsky-Jones 1997a) and tend to occur as larger-scale patches on the Snake River. The other two, *Salix exigua/Agrostis stolonifera* and *Equisetum variegatum*, are rarer and occur as small-scale patches within the cottonwood forests. Each cover type is described below. Refer to the occurrence records in Moseley (1997b) for the distribution of these types at individual occurrences. In a later section, I describe the floodplain dynamics along the Snake in relation to possible successional pathways of these communities and it's affect on Ute ladies tresses populations.

Eleocharis rostellata (wandering spike-rush) community type: This is the odd ball for Idaho Ute ladies tresses occurrences. Only the Kelly's Island population (EO#001) occurs in this community type and Kelly's Island is the only place this community is known to occur on the Snake River. This community is widely scattered in eastern Idaho (Jankovsky-Jones 1996; 1997a), with at least two occurrences containing *Spiranthes romanzoffiana* (fens near Blackfoot Reservoir and in the Teton Valley). In central Idaho, the wandering spike-rush community is uncommon, most often found in wetland habitats influenced by geothermal waters (Moseley 1995), but also occurring along at least one spring creek (Jankovsky-Jones 1997b). Wandering spike-rush occurs in nearly monotypic stands in this community type and overall species diversity is low. At Kelly's Island, this community occurs in an old river channel at the center of the island that no longer regularly floods. See Appendix B in Jankovsky-Jones (1997a) for a more detailed description of this community type.

Elaeagnus commutata (silverberry) community type: This is the primary habitat of Ute ladies tresses in Idaho. Most populations occur here. The silverberry community type occurs as a narrow, often linear band in the transition zone between sedge (*Carex*)-dominated areas or open water in the center of the channels and the higher terraces dominated by old narrowleaf cottonwood stands. Sedge-dominated areas have standing water and are too wet, while the higher terraces, which usually have an understory of *Poa pratensis* (Kentucky bluegrass), are too dry. Ute ladies tresses habitat is characterized by a dense sward of the rhizomatous grass, *Agrostis stolonifera* (redtop), covering the ground, with an overstory of widely scattered silverberry. Shrub canopy cover averages less than 10%. In Idaho, the silverberry community type is restricted to the Snake River, between Palisades Dam and the confluence with the

Henrys Fork. See Appendix B in Jankovsky-Jones (1997a) for a more detailed description of this community type.

Salix exigua (coyote willow)/*Agrostis stolonifera* cover type: This is essentially the same in composition, structure, and its position on the hydrologic gradient as the silverberry community type described above, except silverberry is absent. Coyote willow is the dominant shrub, albeit in relatively low cover, and redtop forms a dense sward in the understory. This habitat is rarely encountered on the Snake River. Coyote willow usually occurs in very dense stands.

Equisetum variegatum (horsetail) cover type: At three occurrences, Ute ladies tresses occurs in a dense sward of a small-stemmed horsetail, either *Equisetum variegatum* and/or possibly *E. laevigatum*; they are difficult to key, but apparently both species are present, with the former being more common. The horsetail forms a near monoculture over small areas and redtop occurs in only minor amounts. Shrubs are virtually absent. The exotic wetland forb, *Myosotis scorpioides*, is prominent in this habitat. *Equisetum variegatum* and *E. laevigatum* (as well as *E. hymenale*) are all common associates in the silverberry community type, but do not attain the ground cover dominance as they do here.

Micro-scale characteristics: At this scale, I describe the within-community microsites, microhydrologic gradients, and associated species.

Rangewide:

Ute ladies tresses is a wetland species and, although apparently not on the current national list of plant species occurring in wetlands, it will be added in the next update and have a wetland indicator status of obligate (P. Guillory, U.S. Fish and Wildlife Service, Boise, personal communication, 1998). It's habitat is often inundated early in the growing season, draining gradually as the season progresses and water levels recede. Groundwater is usually close enough to the surface that the substrate retains subsurface moisture through the growing season. During drought years, however, substrate moisture may not be present within 12 inches of the soil surface (U.S. Fish and Wildlife Service 1998).

There are many rangewide associates, but as would be expected from a species covering such a huge geographic area, there are regional differences. Species that have a high constancy at Ute ladies tresses sites throughout its range include *Agrostis stolonifera*, *Juncus balticus*, *Juncus longistylus*, *Equisetum laevigatum*, and *Habenaria hyperborea* (Heidel 1998). Heidel (1998) and U.S. Fish and Wildlife Service (1998) have extensive lists and descriptions of vascular plant species associated with Ute ladies tresses throughout its range. Refer to these reports (especially Heidel 1998) for more information.

Idaho:

The rangewide hydrologic characteristics described above hold true for Idaho populations of Ute ladies tresses. Most populations are submerged during spring runoff. The sandy and cobbly substrates drain readily, but the soil surface is kept moist throughout the growing season, fed by capillary fringe from the water table. It does not occur in the standing-water habitats of adjacent channels nor does it occur on the higher benches where the hydraulic lift is not enough to keep the near-surface soils moist enough. Water availability to plants from hydraulic lift varies considerably among substrate textures along the Snake River (Merigliano 1996a). In Idaho, *Agrostis stolonifera* is the best indicator of ideal microhydrologic conditions for Ute ladies tresses. *Eleocharis palustris* and *Carex* species (mostly *C. utriculata*) are common indicators of standing-water habitats, while *Poa pratensis* indicates soil surfaces that are too dry. *Poa pratensis* occasionally occurs with Ute ladies tresses, but always in low amounts and always with *Agrostis stolonifera* as the dominant.

The range of Ute ladies tresses in Idaho more or less coincides with the range of *Elaeagnus commutata* (silverberry) in the state. Silverberry has a limited distribution in Idaho, and the CDC and Idaho Native Plant Society used to track it as a species of conservation concern. It was only dropped from the Idaho list in 1997 (Idaho Native Plant Society 1997). In eastern Idaho, silverberry is largely restricted to the Snake River floodplain from Market Lake (ca. 12 river miles below the Henrys Fork confluence), upstream to Palisades Dam. It is nearly continuous along this stretch of river. A single stand is also known from the Willow Creek drainage above Ririe Reservoir, ca. 10 south of the Snake River. In central Idaho, a few small, widely scattered populations are known from the banks of the East Fork and main Salmon River above Challis.

Even more precisely, there is a nearly exact coincidence of Ute ladies tresses populations with the distribution of the *Elaeagnus commutata* community type (ct) along the Snake River. The lowest occurrence of this ct that I observed is the site of the lowest orchid population on Annis Island (EO#006). Likewise, the upstream limit of this ct largely coincides with the highest population at Squaw Creek Islands (EO#020). A small stand of the silverberry ct occurs near the mouth of Box Canyon, 4.5 river miles above Squaw Creek Islands. In fact, this stand appeared to be great potential habitat, but was so thoroughly and utterly mowed by cattle that I could not identify most of the associated herbaceous species during a search in September. Silverberry populations extend downstream for about 13 miles below the lowest orchid population, but preliminary observations indicate they occur as small stands of scattered individuals and never form stands that could be considered an occurrence of the silverberry ct. Further inventories between Market Lake and the Henrys Fork confluence in 1998 will elucidate the distribution of the community type further.

Below is a list of vascular plant species that are directly associated with Ute ladies tresses populations in Idaho. Exotic species are marked with an asterisk. Refer to the occurrence records in Moseley (1997b) for the species associated with individual occurrences.

SHRUBS & TREES
Alnus incana (sprouts)
Betula occidentalis
Cornus sericea
**Elaeagnus angustifolia*
Elaeagnus commutata
Populus angustifolia (sprouts)
Rosa woodsii
Salix bebbiana
Salix exigua
Salix lutea

GRASSES & GRAMINOIDS
**Agrostis stolonifera*
Calamagrostis inexpansa
Carex lanuginosa
Eleocharis rostellata
Juncus balticus
Juncus ensifolius
Juncus nevadensis
Juncus tenuis
Muhlenbergia asperifolia
**Phleum pratense*
**Poa pratensis*
Triglochin maritima

FORBS
Aster ascendens
Aster spathulatus (=*A. occidentalis*)
Castilleja exilis
**Cirsium sp.* (seedling)
Glycyrrhiza lepidota
Habenaria hyperborea
Mentha arvense
**Myosotis scorpioides*
**Plantago major*
Polygonum lapathifolium
Potentilla anserina
Solidago occidentalis
Solidago missouriensis
**Sonchus arvense*
**Taraxacum officinale*
**Trifolium pratense*
**Trifolium repens*
Viola sp.

PTERIDOPHYTES
Equisetum hymenale
Equisetum laevigatum
Equisetum variegatum

ASSESSING POTENTIAL HABITAT

From the habitat discussion above, a series of macro- meso- and micro-scale indicators can help land managers in Idaho assess whether or not they administer suitable habitat and aid in preparing for field inventories of project areas:

Macro-scale indicators: In southern Idaho, riparian and wetland habitats that are within the sagebrush-steppe and pinyon-juniper woodland zones below 7,000' should be considered prime. Southern Idaho habitats that are at lower timberline or in the shrub-steppe or woodland transition to montane coniferous forest should also be considered suitable if they are below 7,000'. I consider the steppe zone of northern Idaho, including the Palouse Prairie, Rathdrum Prairie, and canyon grasslands, to be a possibility for potential habitat. The upper elevations of this zone ranges from 2,500' on the Rathdrum and Palouse prairies to around 4,500' in the canyon grasslands. I don't consider the montane coniferous forest, subalpine coniferous forest, and alpine zones to be likely places to find Ute ladies tresses.

From an ecoregional classification standpoint, Ute ladies tresses populations are known from every Ecoregion that occurs in Idaho. At the next lower level of Bailey's (1995) classification

hierarchy, populations are known from four Sections that occur in Idaho (McNab and Avers 1994), as follows:

- Idaho populations above Heise occur in the Overthrust Mountains Section (M331D) of the Southern Rocky Mountains Steppe-Open Woodland-Coniferous Forest-Alpine Meadow Ecoregion (M331). This section includes the mountain ranges in southeastern Idaho, south of the Teton Valley.

- Idaho populations below Heise occur in the Snake River Basalts Section (342D) of the Intermountain Semidesert Ecoregion (342). This section encompasses the eastern Snake River Plain from Bliss to Island Park.

- Some of the Montana populations occur in the Beaverhead Mountains Section (M332E) of the Middle Rocky Mountains Steppe-Coniferous Forest-Alpine Meadow Ecoregion (M332). This Section includes the mountain ranges and large intermontane valleys of east-central Idaho

- The Washington population occurs in the Okanogan Highlands Section (M333A) of the Northern Rocky Mountains Forest-Steppe-Coniferous Forest-Alpine Meadow Ecoregion (M333). This section includes the Selkirk Mountains and Priest and Pend Oreille valleys of the Idaho panhandle.

Meso-scale indicators: Ute ladies tresses is a species of the lowlands. In the Rocky Mountains and Intermountain region it most often occurs along medium to large streams and rivers of moderate gradient, generally as they near the edge of the mountains or somewhat out onto the plains, but before they start to slow down and meander. The occupied communities along rivers in other states tend to be typical, widespread riparian communities types in Idaho, mostly graminoid openings within riparian shrublands dominated by common taxa. In Idaho, *Agrostis stolonifera* openings within riparian shrub communities, especially *Salix exigua*, should be considered prime potential habitat if other meso- and macro-scale indicators are present. Given the perfect coincidence of Ute ladies tresses and the primary distribution of *Elaeagnus commutata* in Idaho, outlying populations of silverberry in the Salmon River and Willow Creek drainages should be checked.

In other states, Ute ladies tresses occasionally occurs in broad intermontane valleys in spring-fed wetlands isolated from dynamic riparian systems. In the Northern Rocky Mountain and Intermountain portions of its range, these wetland communities include alkaline fens (Montana) and *Eleocharis rostellata* communities (Idaho, Utah, and Washington). The fen communities in Montana include *Carex simulata*, *Eleocharis pauciflora*, *Agrostis stolonifera*, and *Juncus balticus* community types (Heidel 1998). These are all widespread associations in Idaho, but only in a few cases do they occur in low elevation alkaline fens. The *Eleocharis rostellata* community is uncommon in Idaho. It occurs in thermally influenced wetlands in central Idaho (Moseley 1995) and various, non-thermal wetland settings in the far eastern part of the state.

Micro-scale indicators: Soil must be moist to the surface throughout the growing season, except possibly during severe droughts. This moisture level is usually maintained by capillary fringe from the water table. *Agrostis stolonifera* is the best indicator of the proper hydrologic setting for Ute ladies tresses within riparian communities, although it tends to have a slightly wider amplitude along the hydrologic gradient. Populations can be flooded in the spring. It has not been found to occur in dense shrub patches in Idaho, although it can occur in small grassy openings within dense stands.

FLOODPLAIN DYNAMICS IN RELATION TO UTE LADIES TRESSES HABITAT

As Merigliano (1996a) stated, river systems are inherently dynamic and the Snake River is no exception. The dynamics of the floodplain and its vegetation through space and time must be considered when assessing the long-term viability of Ute ladies tresses and its habitat along the Snake. Luckily two things happened recently that elucidate the relationship between these dynamics and the ecology of Ute ladies tresses populations. The first (and minor) event was the exceptionally high flows that took place in 1997, and the observations that I made on its effect on Ute ladies tresses populations. The second (and much more important) is the research conducted by Mike Merigliano on the vegetation and floodplain dynamics along the Snake River (Merigliano 1994; 1996a; 1996b; Merigliano and Potts 1994). Observations and information from both of these, relative to Ute ladies tresses, are summarized below.

1997 flood observations: During June 1997, the Snake River flooded at a level unprecedented since Palisades Dam was closed in 1956. Martin (1998) provides an excellent background summary for the flood. From May 12 through June 5, Palisades Dam releases were between 16,000 to 18,000 cfs. The June 6 through June 9 releases were increased, but remained below the 24,500 cfs considered by the Bureau of Reclamation to be flood stage at Heise. Flows at Heise were above 39,000 cfs between June 12 and June 22, with a peak of about 43,000 cfs on June 14. The flow at Heise was considered about a 10-year event prior to Palisades Dam. The unregulated flow at Palisades Dam, calculated as if no dams were available to capture runoff, was about 56,000 cfs, or about a 100-year event or greater.

On June 12, 1997, I visited two of the four occurrences that were known at the time, Kelly's Island (EO#001) and Falls Campground (EO#004). The other two were inaccessible due to flooding. Later in the summer, I visited all but two of the 20 occurrences that were known by the end of the 1997 inventories. All occurrences I visited in June were under water, including Kelly's Island. Observations later in the season after the flow had receded indicated that the high water line in June had been well above the elevation of all known populations. The effect of the high flows on the habitat and the populations appeared to vary, however, as discussed below.

Four populations (EO#001-004) were discovered in 1996 and had pre-flood data. Many of the plants were flagged. The *Eleocharis rostellata* community at Kelly's Island (EO#001) was probably under water for the first time in many years, possibly since Palisades Dam's closure.

There was no major sediment deposition at this site that would cover the habitat, but I could not find any Ute ladies tresses plants in the middle of the *Eleocharis rostellata* stand as they were in 1996. Instead, plants were flowering along the periphery of the stand, where few were seen in 1996. This may have been the result of prolonged ponding of water in this mid-island depression, a topographic feature unlike any other population in Idaho. At Rattlesnake Point (EO#002) a thin sand veneer was deposited over the population. This did not appear to hinder the growth of Ute ladies tresses and associated species, although only three plants were observed in 1997, compared to 15 in 1996.

Some of the most interesting observations were made at Warm Springs Bottom (EO#003). The upstream portion of the population is near the river, at the entrance of a large channel that carries water only at high flows. During the flood, sands as +deep as 1.5 feet were deposited on this 5' x 150' patch. No ladies tresses were observed (five plants were seen in 1996), silverberry plants were dead, and few redtop culms were emerging from the sand where it formed a dense sward in 1996. The only species with high cover was *Equisetum variegatum*, where it appears to be aggressively colonizing the fresh sands. This may represent an early sere of the *E. variegatum* cover type described in a previous section, where the horsetail forms a sward, redtop has very low cover, and no shrubs are present. Community succession may eventually lead to shrubs, redtop, and Ute ladies tresses increasing in density, possibly to the point where shrub density becomes to great and Ute ladies tresses is excluded until the next flood starts the cycle again. A similar event took place at Falls Campground (EO#004) where the one plant observed in 1996 was probably covered by a deep sand deposit. I say probably because the flagging was washed away and I couldn't locate the exact spot.

Although there was no 1996 information, it appeared that portions of several populations discovered in 1997 were also buried by deep sand deposits during the flood (e.g., Mud Creek Bar EO#009 and Pine Creek #5 EO#014). Monitoring of these sites again in 1998 (and hopefully beyond) will help determine if these populations were extirpated or suffered only a temporary set-back.

Merigliano floodplain and vegetation dynamics research: Merigliano (1996a) investigated the cottonwood ecosystem along the Snake River from Palisades Dam to Heise. His primary focus was vegetation dynamics in time and space, with emphasis on the cottonwood component,. Because riparian vegetation is intricately related to the river's physical processes, he also studied these. His research was aimed primarily at developing restoration models for the floodplain communities under flow regimes controlled by Palisades Dam. In doing so, he also created a time-series view of island and river bar development and, by extension, Ute ladies tresses habitat dynamics. Keep in mind, however, Merigliano's research occurred prior to the 1997 flood.

Merigliano (1996a) mapped the stand ages of most (all?) cottonwood stands along this segment of the Snake River, some in great detail. These maps contain the location of eight occurrences of Ute ladies tresses. From the stand ages, he inferred the date and rates of island and bar development, because cottonwood will regenerate only on new surfaces deposited by floods. By

extension then, we can also infer the maximum age of Ute ladies tresses habitat within or adjacent to these stands (Table 4). It appears that substrates on which these eight ladies tresses populations occur today are mostly less than 100 years old, with the youngest being 40-50 years old (Table 4). The most graphic example appears in his Figure 27, which includes a pair of photos from 1951 and 1987 showing the Squaw Creek Islands populations (EO#020). The 1951 photo shows exposed gravel and sand bars, that were apparently deposited in the 1940's, where Ute ladies occurs today.

The youngest ages in Table 4 coincide with the closure of Palisades Dam. Apparently no or little recruitment of new Ute ladies tresses habitat has taken place since then. This is the same scenario that Merigliano documented for the narrow-leaf cottonwood community, whose age class structure is advancing throughout the river segment, with little recruitment of new stands since Palisades Dam. In other words, the advancing age and eventual decline of cottonwood communities because of flow regime alterations appears to be an excellent indicator for the decline of other aspects of biotic diversity along the Snake River, including bald eagle nesting and roosting trees and Ute ladies tresses habitat.

Table 4. Maximum age of some Ute ladies tresses habitats in 1997, inferred from the 1992 age of adjacent cottonwood stands. Because an occurrence can be comprised of several populations, ages are given separately for each population. The occurrences are arranged downstream to upstream.

Occurrence Name	Occurrence Number	Maximum age of Ute ladies tresses habitat (years)	Reference Plate or Figure in Merigliano (1996a)
Warm Springs Bottom	003	78-101; 59-80	Plates 9, 15
Lufkin Bottom	011	65-77; 78-86; 79; 73	Plates 7, 15
Pine Creek #5	014	31-54; 60; 44-51; 47	Plates 4, 14
Lower Conant Valley	017	80; 80-84; 84; 80-84	Figure 28; Plates 3, 13
Upper Conant Valley	018	71-130	Plate 12
Lower Swan Valley	019	41-55	Plate 11
Falls Campground	004	106-130; 71-85	Plate 11
Squaw Creek Islands	020	42; 43-45; 55	Figure 27; Plate 2

POPULATION BIOLOGY

The population biology of Ute ladies tresses has been thoroughly reviewed elsewhere and it would be redundant for me to entirely repeat it here. I highly recommend Heidel's (1998) review of the population biology of Ute ladies tresses in relation to the broader literature on orchid biology. Another excellent work is Anna Arft's (1995) Ph.D. Dissertation pertaining to the genetics, demography, and conservation management of Ute ladies tresses. She summarized her work in an "executive summary" that appeared in the Colorado Native Plant Society's newsletter *Aquilegia* (Arft 1994). Other good references on the population biology of Ute ladies tresses include reports by the U.S. Fish and Wildlife Service (1995; 1998) and Ute Ladies Tresses Recovery Team (1995). In this section I discuss just observations and data pertaining to the Idaho populations, sometimes in relation to what is know about the species elsewhere in its range.

Phenology: After two years of observations, it appears that Idaho populations of Ute ladies tresses begin flowering in mid-August and continue for about 1.5 months. Some plants were still observed in full flower during the first week of October in both 1996 and 1997. Similar to what has been observed in Montana (Heidel 1998), flowering can vary significantly among individuals within a population, with up to a four-week off-set. For example, some plants at Squaw Creek Islands (EO#020) had dehiscing fruits in mid-September, while others were in full flower.

In relation to *Spiranthes romanzoffiana*, Ute ladies tresses generally appears to flower nearly a month later, at least in eastern Idaho. In 1996 and 1997, *S. romanzoffiana* at Woods Creek Fen in the Teton Valley, 23 miles north and 1,000 feet higher in elevation, was in full flower during mid- to late July and had dehiscing fruits at the time the lower-elevation Ute ladies tresses was flowering on the Snake River. The same pattern was also observed at the Henry Stampede Park fen near Blackfoot Reservoir, about 38 miles south and 1,000 feet higher than the Snake River. I also observed *S. romanzoffiana* in full flower in late July at 10,000 feet in the Pioneer Mountains near Ketchum. Some variation exists, however, as *S. romanzoffiana* was observed flowering in early September along the Salmon River near Sunbeam (E. Rey-Vizgirdas, U.S. Fish and Wildlife Service, Boise, personal communication, 1998).

Population size and condition: A total of 1,071 plants were observed in Idaho in 1997. Table 5 contains the population sizes observed during 1997 for the 20 Idaho occurrences. For comparison, the 1996 population data are included for the four populations known at the time. Keep in mind that these numbers represent mostly flowering individuals, which should be taken as a very conservative low estimate of actual population size. Refer to Heidel (1997) for an excellent review of observed population fluctuations in relation to seasonal dormancy of Ute ladies tresses. In general, Ute ladies tresses occurs at very low densities and the area occupied by these population is very small, most often just a few square feet. Warm Springs Bottom (EO#003) is the exception, with this large population covering much area. Refer to Moseley (1997b) for more detailed population data for each occurrence.

Table 5. Demographic details for *Spiranthes diluvialis* occurrences in Idaho. Occurrences are arranged from downstream to upstream.

Occurrence Name	Occurrence Number	Number of plants observed in 1997	Number of plants observed in 1996
Annis Island	006	35	----
Lorenzo Levee	008	1	----
Archer Powerline	015	145	----
Twin Bridges Island	007	160	----
Railroad Island	005	9	----
Kelly's Island	001	22	12
Mud Creek Bar	009	9	----
Rattlesnake Point	002	4	15
TNC Island	010	9	----
Warm Springs Bottom	003	301	173
Lufkin Bottom	011	61	----
Gormer Canyon #5	012	10	----
Gormer Canyon #4	013	10	----
Pine Creek #5	014	6	----
Pine Creek #3 & #4	016	18	----
Lower Conant Valley	017	127	----
Upper Conant Valley	018	61	----
Lower Swan Valley	019	1	----
Falls Campground	004	14	1
Squaw Creek Islands	020	168	----

Reproductive biology: Again, refer to Heidel for a review of what is known about the reproductive biology of Ute ladies tresses. Very little is known specifically about the Idaho populations. Reproduction in Ute ladies tresses is sexual and requires insect vectors (Sipes and Tepedino 1995). This aspect of Ute ladies tresses conservation management should be carefully considered by managers in assessing the long-term impact of livestock grazing on species and population viability. Rare plant pollinators can be negatively impacted by livestock grazing (Sugden 1985). All of the fruits I observed in 1996 and 1997 appeared to be viable.

Competition: In Idaho, Ute ladies tresses generally occurs in stands dominated by one species, either *Eleocharis rostellata*, *Equisetum variegatum*, or most often *Agrostis stolonifera*. The former two are native species, while the latter is an escaped or seeded exotic that has become naturalized throughout the state. It is unknown if the introduction of *A. stolonifera* has affected population density or persistence. Apparently, competition for light (or possibly nutrients) may be a factor, as Ute ladies tresses is rarely found in dense shrub stands, although openings they occupy can be shaded by surrounding shrubs and trees.

Herbivory: Many of the populations of Ute ladies tresses in Idaho occur in public-land cattle allotments administered by the BLM and/or the Targhee National Forest. In her three year monitoring study in Colorado, Arft (1995) found that fruit set was the single most important biological factor influencing the persistence of Ute ladies tresses and that the grazing treatment resulted in lower fruit set than ungrazed treatments.

Many of the Idaho populations are grazed, often late in the season during the flowering and fruiting period for Ute ladies tresses. Occasionally wild ungulates (moose and deer) selectively graze ladies tresses inflorescences. Cattle love the redtop turf in which it grows and they selectively graze the localized stands, often to a stubble height of a few millimeters, clipping all ladies tresses plants along with it. This has been observed to eliminate all flowering/fruiting stems of the season (e.g., Falls Campground EO#004 in 1997) or leave standing only plants that are close to the base of shrubs and, therefore, physically protected from grazing (e.g., Annis Island EO#006 in 1997 and Falls Campground EO#004 in 1996).

Land ownership and management responsibility: Fifteen of the 20 occurrences are entirely or partially on public land managed by the BLM (Table 3; and see Moseley 1997b). Three occurrences occur entirely on the Targhee National Forest. Two occurrences occur entirely on private land below Heise and the upstream-most occurrence at Squaw Creek Islands is partially on private land. Management of the Twin Bridges Island occurrence is shared by Madison County and the BLM.

Land use and possible threats: As documented in a previous section, alteration of the flow regime resulting from the operation of Palisades Dam is the single biggest long-term threat facing the species in Idaho (see section on Floodplain Dynamics in Relation to Ute Ladies Tresses Habitat).

Regarding short-term, localized land use impacts and possible threats, every occurrence except EO#008 and EO#019 has some human activity taking place within them (Table 6). It is not known, however, the degree to which these pose a threat to persistence and viability of Ute ladies tresses populations.

Also refer to U.S. Fish and Wildlife Service (1998) for a good review of rangewide threats to the viability of Ute ladies tresses populations.

ASSESSMENT AND RECOMMENDATIONS

General assessment of vigor, trends, and status: My assessment of the Idaho populations is that all Idaho populations have existing and potential threats and are vulnerable. Flow regime alteration by Palisades Dam represents the most significant long-term threat to species viability in the Snake River metapopulation, while cattle grazing represents the most significant short-term threat. In my opinion, flow alteration is the greater threat of the two.

Recommendation to the U.S. Fish and Wildlife Service: While the Idaho status information summarized in this report is a necessary component, it does not provide sufficient scope or information for making rangewide status decisions. As with last year's report (Moseley 1997a), this status survey report should be considered an interim summary. With Section 6 funding, information from 1998 surveys will again be summarized in a status report next year. Stay tuned.

Recommendations to the other federal agencies: The U.S. Fish and Wildlife Service will work with the BLM and Forest Service on management guidelines for the Ute ladies tresses populations on federal land.

In addition, three other important actions will take place along the Snake River in 1998, performed by the CDC with funding from the BLM and U.S. Fish and Wildlife Service: 1) a resurvey of suitable-appearing, but unoccupied habitat to determine if plants were missed in 1997 due to prolonged dormancy and/or phenological timing; 2) monitor population levels of known populations and compare with 1996 and 1997 data to determine variability of observable plant numbers; and 3) finish the intensive survey of the remaining segment of the Snake River corridor from the Henry's Fork confluence to Market Lake.

Recommendation to the Heritage Network: Ute ladies tresses in now known from about 90 occurrences rangewide. The current conservation rank for Ute ladies tresses, "globally imperiled" or G2, is outdated and needs to be revised. A more appropriate designation would be "rare or uncommon, but not imperiled" or G3, which typically is given to species with 21 to 100 occurrences (Master 1991).

Table 6. Known activities at *Spiranthes diluvialis* occurrences in Idaho. Occurrences are arranged from downstream to upstream.

Occurrence Name	Occurrence No.	Human Activities
Annis Island	006	Cottonwood Grazing Allotment (BLM)
Lorenzo Levee	008	undisturbed private land
Archer Powerline	015	private grazing land; Utah Power and Light powerline right-of-way
Twin Bridges Island	007	cattle grazing (BLM?); adjacent to county campground and boat ramp
Railroad Island	005	Tressel Grazing Allotment (BLM)
Kelly's Island	001	adjacent to BLM fee campground; group recreational activities; trespass cattle grazing
Mud Creek Bar	009	intermittent outfitter camp; lots of bank fishing; some dispersed camping; trespass cattle grazing
Rattlesnake Point	002	BLM land unofficially within Targhee NF grazing allotment
TNC Island	010	dispersed camping
Warm Springs Bottom	003	Targhee NF grazing allotment; very popular fishing area; dispersed camping; ATV area
Lufkin Bottom	011	designated river camping area
Gormer Canyon #5	012	designated river camping area
Gormer Canyon #4	013	designated river camping area
Pine Creek #5	014	designated river camping area; 5-Ways Grazing Allotment (BLM)
Pine Creek #3 & #4	016	designated river camping area; 5-Ways Grazing Allotment (BLM)
Lower Conant Valley	017	designated river camping area
Upper Conant Valley	018	historical trespass grazing (seems to be solved)

Lower Swan Valley	019	apparently none
Falls Campground	004	Targhee NF grazing allotment; fee campground
Squaw Creek Islands	020	historical livestock trespass; leafy spurge invasion

Recommendations regarding present or anticipated activities: The Snake River Basin Office of the U.S. Fish and Wildlife Service has prepared Section 7 consultation guidelines for Idaho, the most recent being dated 2/4/98 (U.S. Fish and Wildlife Service 1998). They will be updated annually or as needed. These guidelines characterize potential habitat and outline survey protocols. The CDC and the Snake River Basin Office are in the process of preparing maps of potential habitat based on the distribution of important associated species and plant communities that are known habitat for Ute ladies tresses.

At the moment, I believe riparian habitats in east-central and eastern Idaho present the best opportunities for discovering new populations of Ute ladies tresses in the state, although over 500 miles of stream and river corridors were surveyed in this area during 1996 and 1997, and it is still known only from the upper Snake River.

As mentioned previously, cattle grazing in redtop stands is often severe. This can affect survey results. If an area looks to be good potential habitat, but the redtop turf has mowed-lawn appearance, the site should be noted and resurveyed the following year prior to cattle turn-out.

REQUEST TO BOTANISTS AND SURVEYORS!

As mentioned in a previous section, the CDC has compiled all known Ute ladies tresses survey routes for 1996 and 1997. The routes are mapped on 1:100,000-scale maps, identified by surveyor and year. Copies are available upon request from the CDC office in Boise. We plan to do the same thing in 1998. Please send a copy of all survey reports and maps to me so I can keep the master set of maps up-to-date. Thanks.

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IDAHO DEPARTMENT OF FISH AND GAME

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UTE LADIES TRESSES (*SPIRANTHES DILUVIALIS*) IN IDAHO:

1998 STATUS REPORT

by

Robert K. Moseley
Conservation Data Center

November 1998

Idaho Department of Fish and Game
Natural Resource Policy Bureau
600 South Walnut, P.O. Box 25
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Stephen P. Mealey, Director

Status Survey Report prepared for:
Idaho Department of Parks and Recreation
through Section 6 funding from
U.S. Fish and Wildlife Service, Region 1
and
Upper Snake River District, Bureau of Land Management

SUMMARY

This 1998 status report for Ute ladies tresses is meant to compliment the 1997 report (Moseley 1998a) and only contains new or updated information about the species in Idaho. I follow the same format in this update as I did in the 1997 report, which should be consulted for information not covered here. The big news is that not much changed in 1998, so the Taxonomy, Legal Status, Description and Identification, Assessing Potential Habitat, Flood Plain Dynamics, and Assessment and Recommendations sections are little changed from last year's report. I have updated the Distribution section with information about the new occurrence found along the Snake River. Substantive new data on the composition and structure of communities occupied by Ute ladies tresses appear in the Habitat section. The Population Biology section contains our 1998 observations on population levels, phenology, land use, and a new section reviewing sampling for genetic studies. Finally, I outline the Ute ladies tresses conservation work being planned for the Snake River populations in 1999, which will focus on population and habitat monitoring, continued habitat characterization, and the relationship of primary succession in ladies tresses habitat to fluvial processes.

ACKNOWLEDGMENTS

Funding was provided to the Conservation Data Center (CDC) for its 1998 Ute ladies tresses work by the Upper Snake River District of the Bureau of Land Management (BLM) and the U.S. Fish and Wildlife Service (USFWS). Considerable field work was conducted by Karen Rice and Susan Murdock of the BLM, and Rose Lehman of the Targhee National Forest, who contributed their information and knowledge to this report. Chris Murphy of the CDC also helped with field sampling and inventory. Thanks also to Karen Rice, Rose Lehman, Edna Rey-Vizgirdis, Mike Merigliano, and Terry Vernholm for reviewing a draft version.

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TAXONOMY

No change from 1997 status report (Moseley 1998a).

LEGAL OR OTHER FORMAL STATUS

No change from 1997 status report.

DESCRIPTION AND IDENTIFICATION

No change from 1997 status report.

DISTRIBUTION

Rangewide distribution: No change from 1997 status survey report (Moseley 1998a).

Idaho distribution: The distribution of Ute ladies tresses in Idaho at the end of the 1998 field season is virtually the same as it was in 1997. Only one new occurrence was discovered this year and several new populations were found at previously delineated occurrences. In Idaho, it is still only known from the Snake River flood plain in the far eastern part of the state, in Jefferson, Madison, and Bonneville counties. Populations are scattered along 49 river miles from near the confluence of the Henry's Fork, upstream to Swan Valley, nine river miles below Palisades Dam. In Idaho, this stretch of river is known as the "South Fork," while on USGS maps and in Wyoming the same waterway is known simply as the Snake River.

Precise occurrences in Idaho: I consider the populations along the Snake River to be one large metapopulation, although 21 occurrences have been delineated in the CDC data base based on management and geographic considerations. I distributed the precise occurrence records and maps for Idaho populations in October 1998 (Moseley 1998b), so only a summary is presented here (Table 1). Refer to the occurrence records for detailed location data on individual Idaho occurrences.

During the 1998 inventory season, one new occurrence was discovered. Rose Lehman, Targhee National Forest, found a small population (occurrence 021) along the Snake River, less than a mile upstream from a previously-known site. Our 1998 surveys added new populations to several previously-known occurrences. These results are discussed in the Population Biology section.

Table 1. 1998 Ute ladies tresses occurrences in Idaho, arranged by river mile along the Snake River from downstream to upstream.

Occurrence Name	Occurrence No.	River Mile[1]	Land Ownership
Annis Island	006	835	BLM
Lorenzo Levee	008	836.5	Private
Archer Powerline	015	844	Private
Twin Bridges Island	007	846	BLM, Madison County
Railroad Island	005	847	BLM
Kelly's Island	001	853	BLM
Mud Creek Bar	009	862	BLM
Rattlesnake Point	002	863.5	BLM
TNC Island	010	863.5	BLM
Warm Springs Bottom	003	866*	BLM
Lufkin Bottom	011	867*	BLM
Gormer Canyon #5	012	867.8*	Targhee NF
Gormer Canyon #4	013	868.5*	Targhee NF
Gormer Canyon #3	021	869*	Targhee NF
Pine Creek #5	014	873.5*	BLM
Pine Creek #3 & #4	016	874.5*	BLM
Lower Conant Valley	017	876.3*	BLM
Upper Conant Valley	018	878*	BLM
Lower Swan Valley	019	881.8*	BLM
Falls Campground	004	882*	Targhee NF
Squaw Creek Islands	020	884*	BLM, Targhee NF,Private

[1]In some cases the river miles reported on the USGS quads are incorrect. I use the remeasured river mile index of the Hydrology and Hydraulics Committee (1976) as the reference for this table and subsequent discussions. Cases where the remeasurement disagrees with the quad are marked with an asterisk (*).

Extent of surveys in Idaho: Systematic surveys for Ute ladies tresses began in Idaho in a modest way during 1996 (CDC 1998; Moseley 1997a; 1997b). These surveys resulted in its discovery in Idaho. The 1997 Section 7 consultation area included 24 counties in eastern and east-central Idaho. Based on these guidelines, nearly 600 miles of rivers and creeks were surveyed by a small army of botanists during 1997. Refer to CDC (1998) and Moseley (1998a) for summaries of the 1997 survey work. When a Ute ladies tresses population was discovered in Washington in late 1997, the USFWS issued new Section 7 guidelines that expanded the consultation area to include the entire state (U.S. Fish and Wildlife Service 1998). Needless to say, during the 1998 field season the botanical army searching for *Spiranthes* expanded substantially. As I did last year, I will attempt to compile and map all the 1998 survey information for the state (see Request to Botanists and Surveyors! section, below).

HABITAT

In last year's status report (Moseley 1998a) I discussed rangewide and Idaho-specific habitat characteristics for Ute ladies tresses at three scales: macro-, meso-, and micro-scales. I have nothing new to report for the macro- and micro-scales, at either rangewide or statewide levels. There is new information for meso-scale characteristics in Idaho. Remember that meso-scale characteristics included geologic and flood plain features, soils, landscape setting, plant communities, and broad hydrologic gradients. This year we collected quantitative data on the composition and structure of plant communities supporting Ute ladies tresses. In the 1997 report they were only discussed in general terms.

Review of Plant Communities

Last year I described Ute ladies tresses as occurring in four types of communities or cover types: *Eleocharis rostellata, Elaeagnus commutata, Salix exigua/Agrostis stolonifera*, and *Equisetum variegatum*. This pattern held true again in 1998, although I'm now adding *Agrostis stolonifera* to the name of the *Elaeagnus commutata* type (i.e., *E. commutata/A. stolonifera*). Below is a brief description of each community.

Eleocharis rostellata (wandering spike-rush): This is the odd ball for Idaho Ute ladies tresses occurrences. Only a portion of the Kelly's Island occurrence (001) occurs in this community. Wandering spike-rush occurs in nearly monotypic stands and overall species diversity is low. At Kelly's Island this community occurs in an old river channel at the center of the island that no longer floods regularly. Kelly's Island is the only place this community is known to occur in the Snake River corridor from American Falls to the Wyoming border. There are, however, extensive stands at travertine springs along Fall Creek, ca. two miles upstream from the Snake River, south of Swan Valley.

Elaeagnus commutata/Agrostis stolonifera (silverberry/redtop): The silverberry/redtop community occurs as a narrow, often linear band in the transition zone between sedge-dominated areas or open water in the center of the channels and the higher bars dominated by narrowleaf cottonwood stands. Sedge-dominated areas have standing water and are too wet, while the higher bars are too dry. Ute ladies tresses habitat is characterized by a dense ground cover of redtop, a rhizomatous grass, with an overstory of widely scattered silverberry. This is the most common habitat for Ute ladies tresses along the Snake River.

Salix exigua (sandbar willow)/*Agrostis stolonifera*: This is essentially the same in composition, structure, and its position on the hydrologic gradient as the silverberry/redtop community described above, except silverberry is absent. Sandbar willow is the dominant shrub, albeit in relatively low cover, and redtop forms a dense sward in the understory. This is a common habitat for Ute ladies tresses along the Snake.

Equisetum variegatum (variegated scouring rush): This community occurs in small stands, usually adjacent to the silverberry or sandbar willow types. The low-growing, rhizomatous *Equisetum variegatum* dominates the ground cover. Redtop and other associates occur in only minor amounts. Shrubs are virtually absent. This is a relatively common habitat for Ute ladies tresses in the Snake River corridor, although it has low aerial coverage.

Methods for 1998 Data Collection

We collected composition and structure data in the silverberry/redtop, sandbar willow/redtop, and variegated scouring rush communities. We did not collect data in the wandering spike-rush community because of its single occurrence and its simple composition and structure; it is essentially a monotypic stand of wandering spike-rush. The sampling methods follow standards set up by the Natural Heritage/Conservation Data Center network in western North America (Bourgeron et al. 1992). The salient features of the methodology applied to sampling Ute ladies tresses habitat along the Snake River are as follows:

1. Plots were subjectively placed in Ute ladies tresses populations to assure the best habitat characterization in these small, isolated sites. Random placement of plots would have been impractical in this situation. Please note that in the data presented below, Ute ladies tresses does not appear in every plot; however, it was present in every stand sampled except for Plot 003C (explained below).

2. We used microplots to sample herbaceous species (graminoids and forbs) and a line-intercept procedure to sample woody species, as follows:

Herbaceous species: A 10 meter-long transect was used for the microplot layout. We used a transect instead of a rectangular arrangement, because of the linear nature of Ute ladies tresses habitat. Ten 20 x 50 cm (0.1 m^2) microplots were placed at 1 m intervals along the transect. Percent foliar cover was estimated for every graminoid and forb (including pteridophyte)

species in the microplot, using the following classes:

Code	Cover Class	Midpoint
1	<1%	0.5%
3	1% to 4.9%	3%
10	5% to 14.9%	10%
20	15% to 24.9%	20%
30	25% to 34.9%	30%
40	35% to 44.9%	40%
50	45% to 54.9%	50%
60	55% to 64.9%	60%
70	65% to 74.9%	70%
80	75% to 84.9%	80%
90	85% to 94.9%	90%
98	95% to 100%	97.5%

The class midpoint was used to calculate percent cover in all analyses that follow.

Woody species: For woody plants we measured the amount of canopy of each species intercepted by the 10 m-long transect tape. This value was converted to percent cover. Narrowleaf cottonwood was the only tree species in the plots. It is lumped with the shrubs in the life-form analyses because it only occurred as low, scrawny sprouts that were shrub-like.

3. Location of the plot was documented and the general site described. The following environmental features were noted for each transect: dominant life form, parent material, landform, plot position, slope shape, aspect, slope, elevation, erosion potential, erosion type, valley width, ground cover disturbance, animal use, and disturbance history. Ground cover was estimated, using the same cover classes defined above, for the following categories: bare soil (particles < 1/16 in. diam.); gravel (particles 1/16 to 3 in. diam.); rock (particles > 3 in. diam.); litter and duff; wood (downed fragments > 0.25 in. dia.); moss; and basal vegetation (area occupied by root crowns and stems, excluding moss).

4. I treat Plot 003C somewhat differently in the results that follow. This plot is from the upper end of the Warm Springs Bottom occurrence (003) from a stand where Ute ladies tresses was last observed in 1996. It was subsequently buried by deep sands in the June 1997 flood. In other

words, this plot is in habitat where Ute ladies tresses appears to have been extirpated. See Moseley (1998a) and the Flood Plain Dynamics in Relation to Ute Ladies Tresses Habitat section, below, for further discussion of this situation.

Results

Fourteen plots were sampled from throughout the 49-mile-long Ute ladies tresses metapopulation in the Snake River corridor. Summarized canopy cover and constancy data for species, life form, and ground cover appear in Table 2. Cover data for all plots appear in Appendix 1; original plot forms are archived in the files of the CDC. A total of 55 species (not counting unidentifiable forbs) occurred in all the plots, with 7 being woody species, 18 graminoids, and 30 forbs. Expect for Plot 003C, the average number of species/plot is about the same for each community, varying from 15.6 to 17.4.

Equisetum variegatum clearly dominates one community, while *Salix exigua* and *Elaeagnus commutata* are mutually exclusive in the two communities where they dominate the shrub layer. *Agrostis stolonifera* and *Poa pratensis* dominate the sandbar willow/redtop and silverberry/redtop communities. In the first two status reports for Ute ladies tresses in Idaho (Moseley 1997a; 1998a), I characterized these communities as having a dense sward of redtop dominating the ground cover. Detailed sampling using the microplots revealed a somewhat different picture. *Agrostis stolonifera* does indeed have high cover (average 60-70%), but surprisingly so does *P. pratensis* (average 30%). The reason it was overlooked previously was that, unlike in adjacent cottonwood stands, *P. pratensis* has a cryptic, vegetative habit when it occurs in Ute ladies tresses habitat. No flowering culms were observed in any plots. *Agrostis stolonifera*, on the other hand, has an overwhelming aspect dominance because of the tall culms and reddish and brown inflorescences. So, what I thought was solely a dense turf of reproductive *A. stolonifera*, actually has a high cover of vegetative *P. pratensis* hidden low in the canopy.

This discussion of *A. stolonifera* and *P. pratensis* brings up the issue of the dominance of introduced species in Ute ladies tresses habitat. Non-native species comprise 3% cover in Plot 003C, which was recently buried by flood alluvium, but increase to 33% in the variegated scouring rush community, and 109% and 100% in the sandbar willow/redtop and silverberry/redtop communities, respectively (Figure 1). These are cumulative totals, which, with canopy overlap, can be greater than 100%. The relative contribution of forbs and graminoids to these totals is shown in Figure 1. While there are more introduced forb species (nine versus five graminoids; Table 2), it is the rhizomatous graminoids that comprise most of the cover. *Agrostis stolonifera* is the most prominent, occurring in all three communities, followed by *P. pratensis* in the two shrub types.

The effect of these sod-forming exotics on Ute ladies tresses population viability and habitat characteristics is unknown. Recent work by Gremmen et al. (1998) on redtop invasion of a sub-Antarctic island may be analogous to Ute ladies tresses habitat in Idaho. They monitored redtop invasion on the island between 1966 and 1995 and compared the composition and structure of

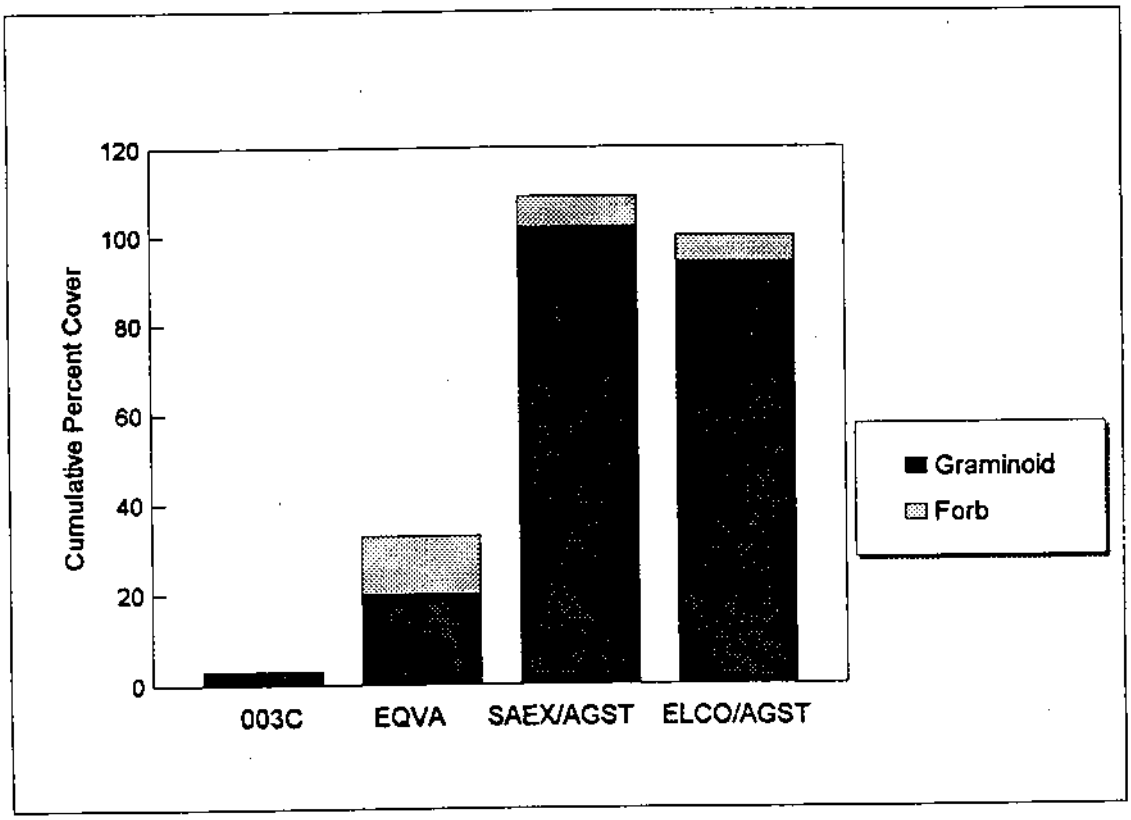
Table 2. Summary of species cover and constancy (in parentheses) data for Ute ladies tresses habitat arranged by community type and Plot 003C. No constancy values are given for Plot 003C because n = 1. Canopy cover is given in classes defined in the Methods section. Ground cover categories are also explained in Methods. Heights are in meters. * = introduced species.

	Plot 003C (extirpated) n = 1	**Equisetum variegatum** n = 5	**Salix exigua/ Agrostis stolonifera** n = 3	**Elaeagnus commutata/ Agrostis stolonifera** n = 5
WOODY SPECIES				
Betula occidentalis		1 (20)		1 (40)
Elaeagnus commutata				10 (100)
Populus angustifolia	1	3 (40)	3 (100)	1 (40)
Rosa woodsii				1 (20)
Salix bebbiana			3 (33)	
Salix exigua		3 (40)	10 (100)	
Salix lutea	1		3 (33)	
GRAMINOIDS				
**Agrostis stolonifera*	3	20 (100)	70 (100)	60 (100)
Calamagrostis neglecta			1 (33)	3 (20)
Carex lanuginosa		10 (100)	3 (100)	3 (40)
Carex nebraskensis		1 (40)		1 (40)
Carex sp.			1 (33)	
Eleocharis palustris		3 (40)	1 (33)	
**Festuca arundinacea*				3 (40)
Juncus balticus		1 (40)	1 (33)	3 (60)
Juncus ensifolius		3 (100)		1 (20)
Juncus longistylis		1 (40)		
Juncus tenuis		1 (40)	1 (33)	1 (20)
Muhlenbergia asperifolia		1 (20)		10 (40)

	Plot 003C	Eqva	Saex/Agst	Elco/Agst
Muhlenbergia richardsonis		10 (20)	3 (66)	3 (60)
Phalaris arundinacea			3 (33)	
**Phleum pratense*			1 (33)	1 (20)
**Poa palustris*			1 (33)	
**Poa pratensis*		1 (20)	30 (100)	30 (100)
Scirpus pungens				1 (20)
FORBS & PTERIDOPHYTES				
Aster ascendens		1 (40)	3 (100)	3 (40)
Aster hesperius		3 (40)		3 (40)
Cicuta douglasii		1 (20)		
**Cirsium vulgare*			1 (33)	1 (20)
Clematis ligusticifolia				1 (20)
Conyza canadensis		1 (20)		
Epilobium ciliatum		1 (20)		
Equisetum arvense		1 (20)		1 (20)
Equisetum laevigatum		1 (40)	3 (100)	10 (100)
Equisetum variegatum	60	60 (100)	3 (33)	3 (60)
Euthamia occidentalis		3 (20)	3 (33)	
Fragaria virginiana				1 (20)
Glycyrrhiza lepidota		3 (40)		3 (60)
Habenaria hyperborea				1 (20)
**Medicago lupulina*				1 (20)
Mentha arvense		3 (80)	1 (66)	1 (20)
**Myosotis scorpioides*		3 (40)	3 (66)	1 (20)
**Plantago major*		3 (60)	3 (33)	1 (40)
Potentilla anserina			1 (33)	
Prunella vulgaris		3 (40)	3 (66)	1 (20)

	Plot 003C	Eqva	Saex/Agst	Elco/Agst
Ranunculus cymbalaria		3 (80)	1 (33)	
**Rumex crispus*			1 (33)	
Smilacina stellata				1 (33)
Solidago missouriensis	1	1 (20)	3 (66)	1 (20)
**Sonchus arvense*		3 (40)		
Spiranthes diluvialis		1 (60)		1 (20)
**Taraxacum officinale*		3 (80)	1 (33)	1 (60)
**Trifolium fragiferum*		3 (60)		1 (20)
**Trifolium repens*		1 (40)	1 (66)	1 (40)
Viola sp.		3 (80)	1 (33)	3 (60)
unknown forbs		3 (40)		1 (40)
TOTAL SPECIES (avg)	5.0	17.4	17.3	15.6
LIFE FORM DATA				
Woody Cover / Mean Ht.	1 / 0.5	3 / 0.5	10 / 1.6	10 / 1.4
Graminoid Cover / Mean Ht	3 / 0.4	40 / 0.5	98 / 0.5	90 / 0.7
Forb Cover / Mean Ht.	60 / 0.1	80 / 0.2	10 / 0.1	20 / 0.1
GROUND COVER				
Soil	70	10	10	10
Gravel				
Rock		1		1
Litter	1	10	50	60
Wood	1	1		1
Moss	0	30	10	3
Basal Vegetation	30	50	30	30

Figure 1. Canopy cover of non-native species in plots from Ute ladies tresses habitat along the Snake River, Idaho. The X axis represents community types and Plot 003C (see text). EQVA = Equisetum variegatum community; SAEX/AGST = Salix exigua/Agrostis stolonifera community; ELCO/AGST = Elaeagnus commutata/Agrostis stolonifera community. The Y axis represents cumulative percent cover.



stands with and without redtop. It invaded communities whose position along the hydrologic gradient, as well as some other environmental and physical attributes, appear similar to ladies tresses habitat along the Snake. Redtop averaged 83% cover in invaded stands and reduced the cover and constancy of all native species of vascular plants, bryophytes, and a lichen. It also reduced native species richness in all stands. What had been a relatively diverse community dominated by a large forb and having high moss ground cover, became a dense redtop turf. Could a similar scenario have played out along the Snake a century ago? It's possible, but we'll never know for sure.

There is one major difference between Gremmen's study area and the Snake River. His communities do not experience the dynamic fluvial processes that are known to radically affect the flood plain habitat of Ute ladies tresses in Idaho. This brings us back to the composition and structure data collected this year in both extant and extirpated habitats. Plot 003C is treated separately in Table 2 because it represents habitat where Ute ladies tresses was observed in 1996, but was subsequently buried by sand in June 1997 and apparently extirpated (see detailed discussion in Flood Plain Dynamics section in Moseley 1998a). Given the dominance of *Equisetum variegatum* at this site it probably belongs in the *E. variegatum* community. Although no composition and structure data were collected in 1996, this was a silverberry/redtop community prior to the flood. The silverberry was killed and *E. variegatum* invaded the open sands during 1997 and 1998. These data and other observations give some insights into possible scenarios for primary succession in Ute ladies tresses habitat along the Snake River. Admittedly, this hypothesis is a relatively simplistic, Clementsian view of an orderly natural succession and does not account for the creation of and dispersal into new habitats. It should be treated as a working hypothesis that probably will be refined by further research in 1999 (see Conservation Work for 1999 section). Here are the key points of this hypothesis:

- It appears that Plot 003C represents the pioneering stage of the variegated scouring rush community, formed in deposition from a (pre-dam) 10-year flood event (Martin 1998; Moseley 1998a).

- The variegated scouring rush community may be an early sere of the silverberry/redtop community. Shrubs, redtop, and *Poa pratensis* increase in density over time.

- Shrub density eventually increases to the point where Ute laddies tresses is excluded from the stands if another flood does not deposit alluvium and start the cycle again.

ASSESSING POTENTIAL HABITAT

No change from 1997 status report.

FLOOD PLAIN DYNAMICS IN RELATION TO UTE LADIES TRESSES HABITAT

1997 flood observations: In last year's report (Moseley 1998a) I made several observations on the June 1997 flood in relation to the four Ute ladies tresses occurrences known at the time. My 1998 observations of flood effects on two of the four occurrences are worth mentioning here.

- Falls Campground (004) - Although its exact location was not known, the single plant seen in 1996 was not seen this year and none were observed in the vicinity. The site remains under deep sand deposited during the 1997 flood.

- Warm Springs Bottom (003) - I saw no plants at the site of the alluvial deposition (Plot 003C mentioned above). The composition and structure of the habitat remains radically different from the pre-flood community, which was silverberry/redtop. The widely scattered silverberry shrubs that occupied the site prior to the flood never resprouted and are dead, and redtop occurs in very low cover.

Merigliano floodplain and vegetation dynamics research: In this section last year (Moseley 19988a) I used Merigliano's (1996) research to estimate the substrate age of selected Ute ladies tresses occurrences above Heise, which ranged from about 40 to 100 years old. What I didn't mention last year was that portions of two occurrences occur on man-made substrates that can also be dated

Annis Island (006) - Many of the populations that comprise this occurrence are on excavated or fill material resulting from construction of the nearby levees. Construction of the Snake River levee system began in the early 1950s, with the authorization of Palisades Dam by Congress, and continued through the early 1960s (K. Rice, personal communication, 1998). The exact time of levee construction on Annis Island is unknown.

Warm Springs Bottom (003) - In 1970, a small dam was constructed by Idaho Fish and Game along the spring-creeks on Warm Springs Bottom. We were going to use the resulting pond to raise fingerling trout, but the dam was built in an active channel and was blown out by floods in 1971. It was rebuilt the next year and lasted until either 1975 or 1976 when high water again washed it out. It was then never rebuilt (P. Jeppson, personal communication, 1998). The densest portion of the Warm Springs Bottom occurrence is on excavated or filled surfaces resulting from dam construction, making it the youngest-known surface supporting Ute ladies tresses along the Snake River.

POPULATION BIOLOGY

Refer to Heidel (1998) for a review of the population biology of Ute ladies tresses, in general, and Moseley (1998a) for observations and data pertaining to the Idaho populations. Below is updated information based on 1998 observations.

Phenology: Based on 1996 and 1997 observations, we thought Ute ladies tresses began flowering in mid-August. This year it started significantly earlier, probably around August 1. For example, the Upper Conant Valley (018) population was in full flower on August 13 this year, compared to the same phenological stage on September 17, 1997. Throughout the Idaho metapopulation, however, we observed many plants in full flower through the end of September 1998. In an update to last year's information, Karen Rice (personal communication, 1998) reported that some individuals were in flower through late October 1997. Similar to last year, flowering time can vary significantly among individuals within a population, with up to a four-week off-set.

There was one very surprising phenological finding this year. Like many orchids, Ute ladies tresses plants are known to have a prolonged dormancy, but I always assumed that at least some individuals in a population would be observable above ground every year. This appears not to be the case. No plants were seen at Gormer Canyon #5 (012), Lower Conant Valley (017), and that portion of the Squaw Creek (020) occurrence discovered in 1997. The Squaw Creek and Lower Conant Valley occurrences had relatively dense populations last year. No disturbances occurred at any of these sites during the intervening year. The implication of this is that you can never be sure that Ute ladies tresses is not present based on a single visit to potential habitat. It should be noted, however, that nearby populations were in full flower and that this was not a widespread phenomenon over a large segment of river.

Population size and condition: A total of 2,604 Ute ladies tresses plants were observed at the 21 occurrences in Idaho during 1998 (Table 3), an increase of 1,533 plants over 1997. The observed number of plants at most occurrences in 1998, was similar to 1997. A notable decrease took place at what were three large populations in 1997, Warm Springs Bottom (003), Lower Conant Valley (017), and Squaw Creek Islands (020). The latter two were discussed in the previous section and no major disturbances were observed at Warm Springs Bottom. So, these fluctuations in numbers of above-ground individuals appear to be natural variability. Most of the increase was a result of a thorough survey of Annis Island (006), which contains 78% of observed plants along the Snake River in 1998. Only a superficial inventory was conducted on Annis Island last year, largely because of heavy cattle grazing. This year the cows were taken off by late June. Five surveyors worked on the island over the course of two days in late August. A total of 2,036 individual plants were observed in 18 populations at the site.

Population genetics: Leaf tip samples were collected from Ute ladies tresses at various Idaho occurrences over the last three years. A summary of these activities is outlined below:

- 1996 - Upon discovery of Ute ladies tresses in Idaho, Moseley collected samples from the Rattlesnake Point (002) and Warm Springs Bottom [(003); voucher Moseley 3016 (S.P.)] occurrences. They were sent to Anna Arft, University of Colorado, who confirmed the species identification genetically, and compared the genetic structure of Idaho plants to previously-analyzed populations elsewhere.

Table 3. Number of plants observed at *Spiranthes diluvialis* occurrences in Idaho, 1996-1998. Occurrences are arranged from downstream to upstream. Dashed line means that occurrence wasn't counted that year.

Occurrence Name	Occurrence No.	1996	1997	1998
Annis Island	006	----	35	2,036
Lorenzo Levee	008	----	1	----
Archer Powerline	015	----	145	----
Twin Bridges Island	007	----	160	108
Railroad Island	005	----	9	14
Kelly's Island	001	12	22	30
Mud Creek Bar	009	----	9	32
Rattlesnake Point	002	15	4	23
TNC Island	010	----	9	9
Warm Springs Bottom	003	173	301	80
Lufkin Bottom	011	----	61	96
Gormer Canyon #5	012	----	10	0
Gormer Canyon #4	013	----	10	11
Gormer Canyon #3	021	----	----	8
Pine Creek #5	014	----	6	14
Pine Creek #3 & #4	016	----	18	113
Lower Conant Valley	017	----	127	0
Upper Conant Valley	018	----	61	15
Lower Swan Valley	019	----	1	8
Falls Campground	004	1	14	5
Squaw Creek Islands	020	----	168	2

- 1997 - USFWS personnel sent samples from Archer Powerline (015) to the University of Colorado for confirmation through genetic analysis.

- 1998 - A systematic, range-wide analysis of the genetic structure of Ute ladies tresses is being coordinated by Gerry Steinauer, Nebraska Natural Heritage Program. Laboratory analysis will continue to be conducted by Anna Arft at the University of Colorado. Gerry identified a collector in every state who would collect sample leaf tips from ten plants at four populations in each state. I was the Idaho collector and attempted to spread the four sample sites over the range of occupied river corridor. Unfortunately, the highest collection site was at Pine Creek #3 & #4 (016), ca. 9.5 river miles below the uppermost populations. All populations along the upper stretch were either too small (<10 plants) or did not appear above ground this year. The other three samples were from the lowest occurrence at Annis Island (006), as well as two more in the center of its distribution, Kelly's Island (001) and Lufkin Bottom (011).

Reproductive biology: No change from 1997 status report.

Competition: Two exotic, sod-forming grasses, *Agrostis stolonifera* and *Poa pratensis*, dominate a majority of Ute ladies tresses habitat in Idaho. The implications of this for possible compositional and structural changes in Ute ladies tresses habitat are discussed in the Habitat section. Its affect on ladies tresses population density, demography, or viability is unknown. If, however, the scenario worked out by Gremmen et al. (1998) is analogous to the Snake River, the impact could have been large. Unfortunately, we'll never know for sure because no pre-invasion data exist.

Herbivory: Livestock grazing was a significant management issue in 1997 (see Moseley 1998a for a description of the problem). The effect of cattle grazing on inventory results is well-illustrated at Annis Island (006). Although the season-of-use for this allotment us usually in the early season (May-June), in 1997 the BLM allowed late-season grazing because of early-season access problems associated with the flood. During our inventory in August 1997, we found only 35 plants in the heavily grazed redtop turf. In 1998, grazing was back to its normal early season of use. During our inventories in early September 1998, we found vigorous regrowth of all species in the redtop habitats, including the discovery of over 2,000 Ute ladies tresses individuals.

The biological effects of grazing on Ute ladies tresses viability and plant succession in its habitat is not well understood. Annis Island has been grazed for many years and it still supports the largest population known in Idaho by far. The other interesting aspect of the Annis Island situation is that most of the populations are outside the levee system and no longer experience the normal erosion and deposition that occurs with the larger floods. These processes are probably responsible, at least in part, for maintaining open shrub habitat elsewhere along the Snake River. Grazing may actually be a surrogate for natural flooding by reducing shrub density on Annis Island. Another important aspect of cattle herbivory that is not well understood is its interaction with the cover and vigor of exotic turf-forming grasses (redtop and Kentucky bluegrass) that

dominate much of Ute ladies tresses in Idaho.

Land ownership and management responsibility: See Table 1 for land ownership and management responsibilities for the Idaho occurrences. Fifteen of the 21 occurrences are entirely or partially on public land managed by the BLM. Four occurrences, including the new one discovered in 1998, occur entirely on the Targhee National Forest. Two occurrences occur entirely on private land below Heise and the upstream-most occurrence at Squaw Creek Islands (020) is partially on private land. Madison County and the BLM each manage populations within the Twin Bridges Island (007) occurrence.

Land use and possible threats: As documented in last year's report (Moseley 1998a), alteration of the flow regime resulting from the operation of Palisades Dam is the single biggest long-term threat facing the species in Idaho. Regarding short-term, localized land use impacts and possible threats, nearly every occurrence has human activity taking place in or around them, either direct use or through cattle grazing (Table 4). It is not known, however, the degree to which these pose a threat to persistence and viability of Ute ladies tresses populations.

Livestock grazing was the biggest management issue during 1997. Over the last year, grazing management has changed significantly on nearly all grazed occurrences, as follows:

- Small exclosures were used to prevent cattle from taking Ute ladies tresses plants at several occurrences in late 1997, mostly as an interim measure until a longer-term solution could be found. The small exclosure at Falls Campground (004), however, appears to have turned into a permanent solution, even though only a small area occupied by plants in 1997 was caged Habitat known to be occupied in 1996 and much potential habitat remains unprotected.

- Cattle grazing was eliminated from the Rattlesnake Point (002) occurrence by the Forest Service through construction of fences and a cattleguard.

- Trespass grazing at Kelly's Island (001) was eliminated.

- There was an attempt by the Forest Service to implement early season grazing on Warm Springs Bottom (003), but cattle remained on the site into August 1998. Herbivory was observed on Ute ladies tresses plants.

- Livestock grazing administered by the BLM occurs in three allotments, affecting four Ute ladies tresses occurrences:

  5-Ways Allotment [Pine Creek #5 (014) and Pine Creek #3 &#4 (016)] - has been early-season grazing since about 1987, which followed two years of nonuse. It was also in nonuse from about 1991 to 1996. During 1997, the allotment was grazed, but the June flood prevented livestock from grazing the floodplain of the Snake River (and Ute ladies tresses habitat).

Table 4. Known activities and impacts observed in 1998 at *Spiranthes diluvialis* occurrences in Idaho. Occurrences are arranged from downstream to upstream.

Occurrence Name	Occ. No.	Human Activities
Annis Island	006	Cottonwood Grazing Allotment (BLM). Season of use changed to spring (out by end of June).
Lorenzo Levee	008	Not visited this year.
Archer Powerline	015	Not visited this year.
Twin Bridges Island	007	County campground and boat ramp being reconstructed. County and FEMA will protect one population that occurs in project area.
Railroad Island	005	Tressel Grazing Allotment (BLM). No change from 1997.
Kelly's Island	001	Heavily trampled habitat by humans in 1997 & 1998. Problem with trespass cattle grazing solved. No impacts seen associated with being adjacent to BLM fee campground.
Mud Creek Bar	009	Trespass cattle grazing has been controlled. Intermittent outfitter camp, lots of bank fishing, some dispersed camping, but none appears to be impacting populations.
Rattlesnake Point	002	No cows anymore, due to new fences and a cattleguard.
TNC Island	010	Dispersed camping at upstream end; some trampling of habitat. Outfitter camp (located mid-island) was permitted in 1998.
Warm Springs Bottom	003	Targhee NF grazing allotment, grazed through late August. ATV use appears to have been eliminated by construction of bigger barriers. Popular fishing area but no impacts observed.
Lufkin Bottom	011	Same as 1997. Designated river camping area with some trampling in vicinity of plants.
Gormer Canyon #5	012	Spotted knapweed common immediately above upper edge of habitat. No human use seen.
Gormer Canyon #4	013	No change. River camp site nearby, but population isolated from impacts.
Gormer Canyon #3	021	Near lightly use designated river camp. Habitat undisturbed.
Pine Creek #5	014	Designated river camping area. 5-Ways Grazing Allotment (BLM); cattle off by mid-June. No impacts from either activity observed.

Pine Creek #3 & #4	016	Designated river camping area. 5-Ways Grazing Allotment (BLM); cattle off by mid-June. No impacts from either activity observed.
Lower Conant Valley	017	Undisturbed.
Upper Conant Valley	018	Undisturbed.
Lower Swan Valley	019	Undisturbed.
Falls Campground	004	Targhee NF grazing allotment with cage around known cluster of plants. Recreational impacts from campground appear minimal.
Squaw Creek Islands	020	No change to the undisturbed state of the populations discovered in 1997. The 1998 population is near dispersed camp site and habitat appears to receive some recreational trailing.

Trestle Allotment [Railroad Island (005)] - has been early-season and late fall grazing since 1991. In 1997, the adjacent Lowder Slough Allotment was added to the Trestle Allotment to allow cattle an alternate pasture use in the fall.

Cottonwood Allotment [Annis Island (006)] - has been early-season cattle grazing since 1991. In 1997, the BLM allowed the lessees to graze in the late summer because livestock could not access the floodplain during the June flood. Ten horses graze the allotment until mid-August.

With funding from the Federal Emergency Management Agency (FEMA), Madison County is reconstructing and relocating the boat ramp and campground on Twin Bridges Island. Only one small population of occurrence 007 is in the project area. It occurs in a roadside ditch between the old boat ramp and the picnic ground. Madison County and FEMA have agreed to erect a barrier between the population and the road to protect it from disturbance (Moseley 1998c).

ASSESSMENT AND RECOMMENDATIONS

General assessment of vigor, trends, and status: My assessment of the Idaho populations is unchanged from last year, that is, all Idaho populations have existing and potential threats and are vulnerable. Flow regime alteration by Palisades Dam represents the most significant long-term threat to species viability in the Snake River metapopulation, while cattle grazing represents the most significant short-term threat. Management actions implemented by the BLM and Forest Service in 1997 and 1998, however, have greatly reduced the threat of cattle grazing.

Recommendation to the U.S. Fish and Wildlife Service: While the Idaho status information summarized in this report is a necessary component, it does not provide sufficient scope or information for making rangewide status decisions. As with last year's report (Moseley 1998a), this status survey report should be considered an interim summary.

Recommendations to the other federal agencies: The USFWS will work with the BLM and Forest Service on management guidelines for Ute ladies tresses populations on federal land. The Forest Service should implement an early season of use on the cattle allotment that encompasses Warm Springs Bottom, closing the allotment to grazing after the end of June (see section on land use and possible threats).

Recommendation to the Heritage Network: No change from last year. The current conservation rank for Ute ladies tresses, "globally imperiled" or G2, is outdated and should be changed to the more appropriate designation of "rare or uncommon, but not imperiled" or G3, which typically is given to species with 21 to 100 occurrences (Master 1991). The Utah Natural Heritage Program has lead responsibility for the global conservation rank and has initiated a review with this in mind (B. Franklin, personal communication, 1998).

Recommendations regarding present or anticipated activities: The Snake River Basin Office of the USFWS has prepared Section 7 consultation guidelines for Idaho, the most recent being dated February 4, 1998 (U.S. Fish and Wildlife Service 1998). They will be updated annually or as needed. These guidelines characterize potential habitat and outline survey and conservation protocols.

REQUEST TO BOTANISTS AND SURVEYORS!

As I mentioned in a previous section, the CDC compiled all known Ute ladies tresses survey routes for 1996 and 1997. The routes are mapped on 1:100,000-scale maps, identified by surveyor and year. Copies are available upon request from the CDC office in Boise. We plan to do the same thing in 1998. If you conducted any surveys, please send me the information and share it with the world. The minimum information needed is: (1) area surveyed (mapped on ca. 1:100,000-scale maps); (2) surveyor; and (3) date. This information will be compiled throughout the winter and distributed in early spring.

CONSERVATION WORK FOR 1999

The three actions recommended last year (Moseley 1998a) were all accomplished during 1998: 1) a resurvey of suitable-appearing, but unoccupied habitat to determine if plants were missed in 1997 due to prolonged dormancy and/or phenological timing; 2) monitor population levels of known populations and compare with 1996 and 1997 data to determine variability of observable plant numbers; and 3) finish the intensive survey of the remaining segment of the Snake River corridor from the Henry's Fork confluence to Market Lake.

In addition to the nearly 600 miles surveyed in 1997 (CDC 1998; Moseley 1998a), many hundreds more miles were surveyed in Idaho during 1998 (to be documented in a later report). The South Fork of the Snake River remains the only known location for Ute ladies tresses in the state. Aside from project clearances, it appears that additional systematic surveys for Ute ladies tresses in eastern and east-central Idaho are not warranted. I recommend, therefore, that conservation activity be focused on the 49-mile segment of the Snake River known to be occupied habitat. Funding has been secured by the CDC from the BLM and Forest Service to carry out the following proposed work:

1. Continue to monitor population levels and habitat conditions of all known populations and compare with 1996 - 1998 data. Compile 1999 population and habitat data into the centralized data bases at the CDC. This will provide land managers with an understanding of annual variability of observable population levels. Annual monitoring of habitat conditions is important to quickly determine if management regimes or other human disturbances are adversely affecting habitat quality and, potentially, population viability.

2. The Fall Creek Travertine Springs areas is ecologically unique and contains potential habitat for Ute ladies tresses. It is also only a few miles from the Snake River corridor. We will conduct a survey for Ute ladies tresses, sample plant communities in the area, characterize the physical and ecological processes maintaining those communities, as well as record observations on succession and management implications. These data will be entered into the CDC's conservation site and community data bases and compared to ecologically similar sites elsewhere in Idaho.

3. As mentioned previously, there are both long- and short-term threats affecting nearly all Ute ladies tresses in Idaho. River flow alteration by Palisades Dam represents the most significant long-term threat, while direct human use (recreation) and cattle grazing are having short-term impacts to its habitat. In collaboration with researchers from the University of Montana, we plan to gain a greater understanding of primary successional pathways in ladies tresses habitat that will help land and river managers maintain viable populations of Ute ladies tresses. This work will build on past (Merigliano 1996) and ongoing studies of the relationship between fluvial geomorphology, riparian community ecology, and river management. It will also build upon the preliminary ecological data collected this year and the successional hypothesis developed from them (discussed in the Habitat section).

Primary succession is the sequential development of plant communities on newly created habitat. Along the Snake River, this begins with new substrate deposition by a flood. This has implications for river management because it appears that there is no natural Ute ladies tresses habitat younger than Palisades Dam (Moseley 199a). Another possible effect of damming on primary succession is the persistence of some physical site factor on new islands that limits Ute ladies tresses. An understanding of primary succession in Ute ladies tresses habitat will also allow us to better predict the consequences of human disturbance. Secondary succession is the development of communities following interruption by disturbance to the primary successional sequence. In Ute ladies tresses habitat along the Snake, this results largely from cattle grazing

and, to a minor extent, recreational trampling. This is important information for the BLM and Forest Service, who manage most of the recreation and cattle grazing in ladies tresses habitat along the river (see Herbivory section).

The ultimate goal is to relate flood plain dynamics and primary succession to long-term conservation of Ute ladies tresses on the Snake River. Below are the general objectives for three related areas: substrate age, primary succession, and flow regime. We will develop a detailed study plan for this work in early 1999.

A. Determine the age of the alluvial substrate supporting occupied Ute ladies tresses habitat. This will be inferred from the flood plain mapping conducted by Merigliano (1996) above Heise, supplemented with additional air photo interpretation below Heise and measurements directly from ladies tresses habitat using decay rates for an isotope of lead. We are currently testing the applicability of using Pb^{210} to age substrates in herbaceous communities. Samples collected during Fall 1998 were sent to a laboratory in Ontario, Canada for analysis.

B. Model development of plant communities along the primary successional gradient. It appears that we can use a combination of two different techniques to model this chronological sequence: (1) use time-series analysis of a site, that is, observed changes over time in Ute ladies tresses habitat, and (2) infer the chrono-sequence from plots of different successional ages. The model will include estimates of the rate of development along the primary successional pathways and the compositional and structural characteristics of these changes, including possibly the invasion of exotic turf-forming grasses.

C. Determine the elevation Ute ladies tresses habitat on the flood plain and relate river flows. Related to this, we will characterize flow regime and depositional events responsible for creating new habitat and destroying old habitat. Ultimately, we will also try and answer the question of whether the flow regime predicted to restore cottonwood forests (Merigliano 1996) will suffice to maintain Ute ladies tresses habitat.

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APPENDIX 1

Spiranthes diluvialis habitat plot data.

Values in the matrix are cover class codes, which are defined in the Habitat section.

	Equisetum variegatum						*Salix exigua/ Agrostis stolonifera*			*Elaeagnus commutata/ Agrostis stolonifera*				
	003C	003B	011A	006A	005A	007A	002B	003A	020A	010A	002A	017A	016A	006B
WOODY SPECIES														
Betula occidentalis				1								1	1	
Elaeagnus commutata										1	1	10	10	3
Populus angustifolia	1		3			3	1	3	1			1		1
Rosa woodsii											1			
Salix bebbiana								3						
Salix exigua		1				10	3	10	10					
Salix lutea	1							3						
GRAMINOIDS														
**Agrostis stolonifera*	3	3	20	3	40	50	90	50	70	60	98	50	40	40
Calamagrostis neglecta									1	10				
Carex lanuginosa		1	10	3	10	3	3	1	1			3		20
Carex nebraskensis				3	1								1	
Carex sp.								1						
Eleocharis palustris			1		20			1						
**Festuca arundinacea*										10			3	
Juncus balticus			1	3				1				1	3	1
Juncus ensifolius		1	1	3	3	1								1
Juncus longistylis			1	1										
Juncus tenuis		1		1				1						1

	003C	003B	011A	006A	005A	007A	002B	003A	020A	010A	002A	017A	016A	006B
Muhlenbergia asperifolia						1				20				10
Muhlenbergia richardsonis				30			1		3			1	1	3
Phalaris arundinacea								3						
**Phleum pratense*									1			1		
**Poa palustris*								1						
**Poa pratensis*		1					3	60	40	40	20	60	40	10
Scirpus pungens													1	
FORBS & PTERIDOPHYTES														
Aster ascendens					3	1	3	1	3	10				3
Aster hesperius		3	10								3		3	
Cicuta douglasii			1											
**Cirsium vulgare*								1			1			
Clematis ligusticifolia														3
Conyza canadensis						1								
Epilobium ciliatum						1								
Equisetum arvense				1							1			
Equisetum laevigatum			1			1	1	1	3	3	1	1	10	10
Equisetum variegatum	60	80	50	40	30	80	3			3	1			1
Euthamia occidentalis					10			3						
Fragaria virginiana												3		
Glycyrrhiza lepidota			3	10							10	10		1

	003C	003B	011A	006A	005A	007A	002B	003A	020A	010A	002A	017A	016A	006B
Habenaria hyperborea												1		
**Medicago lupulina*													3	
Mentha arvense		3	3		10	1	1	1					1	
**Myosotis scorpioides*		10	1				1	3				1		
**Plantago major*			1	10	1		3						1	3
Potentilla anserina							1							
Prunella vulgaris		3		3			1		3	1				
Ranunculus cymbalaria		1	1	1		3			1					
**Rumex crispus*								1						
Smilacina stellata										1				
Solidago missouriensis	1	1						3	1			3		
**Sonchus arvense*		10	1											
Spiranthes diluvialis		1		1		1							1	
**Taraxacum officinale*		1		3	10	1	1				1		1	1
**Trifolium fragiferum*				3	10	3				1				
**Trifolium repens*			1	3			1		1		1		1	
Viola sp.		1	1	3		1			1	1		3	1	
unknown forbs			10	1									1	1
TOTAL SPECIES	5	17	20	21	12	17	16	21	15	13	12	16	19	18

	003C	003B	011A	006A	005A	007A	002B	003A	020A	010A	002A	017A	016A	006B
LIFE FORM DATA														
Woody Cover / Mean Ht.	1/0.5	1/1.0	3/0.2	1/0.1	0/0	10/1.0	3/2.0	10/1.2	10/1.5	1/1.0	1/1.2	10/1.0	10/1.5	3/2.5
Graminoid Cover / Mean Ht.	3/0.4	3/0.3	30/0.3	40/0.1	70/0.7	50/0.9	98/0.9	98/0.4	98/1.0	98/0.8	98/1.5	98/0.2	80/0.5	80/0.3
Forb Cover / Mean Ht.	60/0.1	98/0.1	70/0.2	80/0.1	70/0.2	90/0.2	10/0.2	10/0.1	10/0.1	10/0.2	10/0.1	20/0.1	20/0.1	20/0.1
GROUND COVER														
Soil	70	10	3	1	50	1	20	0	0	10	30	0	3	1
Gravel	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rock	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Litter	1	3	40	0	10	1	10	80	60	80	20	80	50	60
Wood	1	0	1	0	3	1	0	0	0	0	0	1	1	0
Moss	0	10	50	10	0	60	0	1	40	1	0	3	3	0
Basal Vegetation	30	70	10	90	40	40	70	20	10	10	50	10	40	40

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