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Ute Ladies Tresses (Spiranthes diluvialis) in Idaho: 1999 and 2000 Status Reports

by

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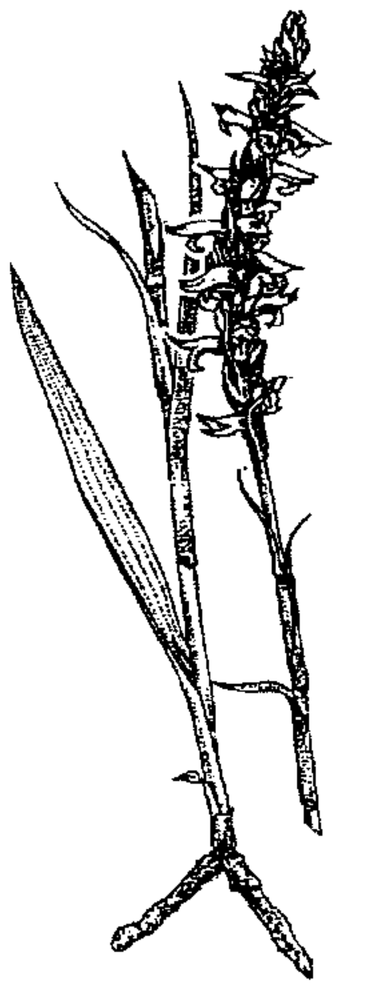

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UTE LADIES TRESSES (*SPIRANTHES DILUVIALIS*) IN IDAHO: PART A: 1999 STATUS REPORT

by

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SUMMARY

This 1999 status report for Ute ladies tresses is meant to compliment the 1997 and 1998 reports (Moseley 1998a; 1998b) 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 previous reports, which should be consulted for information not covered here.

New findings reported here include:

- The discovery that eight occurrences on the upstream end of its distribution are mixed populations of *Spiranthes diluvialis* and *S. romanzoffiana*. We also recognize the distinct possibility that the upstream-most occurrence at Squaw Creek Islands may not contain any *S. diluvialis* at all. I discuss the reasons for these humbling discoveries.
- We permanently monumented the transect at the Warm Springs Bottom population that was extirpated during the 1997 flood. I review the two years of plant composition and structure data.
- We discovered one new occurrence along the Snake River, within the known distribution. The total number of occurrences in Idaho is now 22.
- We collected new plant composition and structure information in habitats at three sites.
- We characterized the substrate stratigraghy underlying Ute ladies tresses in 25 soil pits at 18 occurrences. I summarize the results.
- We surveyed 20 flood plain cross-sections through Ute ladies tresses and adjacent habitats. I provide a summary of the vertical relationships of the habitats in reference to river flows.
- Finally, I outline the Ute ladies tresses conservation work being planned for the Snake River populations in 2000, which will again focus on population and habitat monitoring, as well as continued research on the habitat-flood plain succession relationships.

ACKNOWLEDGMENTS

Funding was provided to the Conservation Data Center (CDC) for its 1999 Ute ladies tresses work by the Upper Snake River District of the Bureau of Land Management (BLM) and the Targhee National Forest. 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. Michael Mancuso and Chris Murphy of the CDC also helped with field sampling and inventory. Mike Williamson of the University of Montana provided valuable logistical and surveying support. Mike Merigliano continues to provide valuable insights into the flood plain ecology of the South Fork Snake River.

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TAXONOMY

No change from 1997 and 1998 status reports.

LEGAL OR OTHER FORMAL STATUS

No change from 1997 and 1998 status reports.

DESCRIPTION AND IDENTIFICATION

An exciting and somewhat confounding discovery during 1999 was that all of the upstream populations along the Snake River are mixtures of *Spiranthes diluvialis* and *S. romanzoffiana*. Karen Rice of the BLM and Rose Lehman of the Targhee National Forest were the first to discover this during August 1998, but solid evidence had disappeared by the time the CDC did surveys in September. This year, population surveys were done during mid-August. We found that the eight occurrences at the upstream end of its distribution are mixed, as follows (arranged downstream to upstream):

Gormer Canyon #4	013
Gormer Canyon	021
Pine Creek #5	014
Pine Creek #3 & #4	016
Lower Conant Valley	017
Upper Conant Valley	018
Lower Swan Valley	019
Falls Campground	004
Squaw Creek Islands	020 (see discussion below)

See Moseley (1999) for details about each occurrence. During the late August and September surveys in past years, we overlooked the *S. romanzoffiana* because it flowers much earlier and was in fruit or had virtually disappeared. During the mid-August surveys in 1999 (ca. August 16 to 20), some *S. romanzoffiana* plants were still in flower, although most were in fruit. The *S. diluvialis* was just beginning to flower at this time; in fact, during revisits to many of these sites during late August and September to do habitat research, there were clearly more flowering plants visible than the earlier visit. All populations below Gormer Canyon #4 appear to be pure Ute ladies tresses.

Most interesting of all is that the Squaw Creek Islands (020) occurrence may, in fact, not contain any *S. diluvialis*. After looking back at our field notes and other survey data, the following story emerged (see also Moseley 1999). In 1997 we counted 137 plants at a couple of sites, but all were in fruit. We assumed they were *S. diluvialis*, because they were within a couple of river miles of plants (Falls Campground 020) that were clearly identified as that species. In 1998, we found no plants at all at the island populations originally discovered the previous year. Klara Varga, Targhee National Forest, did find two plants on the north side of the river that she identified as *S. diluvialis*. Then, during several visits throughout the 1999 season, we found 81 *S. romanzoffiana* in flower and fruit and no *S. diluvialis*. One *S. romanzoffiana* was also found at the mainland site and no *S. diluvialis*.

We were initially confused, but quickly recovered and were able to count individuals of the two species in these mixed populations (Moseley 1999) based on the following characteristics:

1. *S. romanzoffiana* has a much earlier phenology and only a few plants overlap flowering with *S. diluvialis*. Most *S. romanzoffiana* is in fruit while *S. diluvialis* is just beginning to flower.

2. The characters used to distinguish the two species, outlined in Moseley (1998a), work well. The most obvious feature is that *S. romanzoffiana*, even in fruit, has a much tighter spiral to the inflorescence.

Mixed populations of *Spiranthes* species are rare but not unprecedented. At least one population in Utah has both *S. diluvialis* and *S. romanzoffiana*.

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In a recent review of John Coulter's collections from the Hayden Survey of 1873 (Hayden 1873, page 783), Mike Merigliano (personal communication) noted that he collected *S. romanzoffiana* from the "Snake River Valley" in July. The collection, probably deposited at the Academy of Natural Sciences in Philadelphia, should be verified.

DISTRIBUTION

Rangewide Distribution: No change from previous reports.

Idaho Distribution: The distribution of Ute ladies tresses in Idaho at the end of the 1999 field season is virtually the same as it was in 1997-1998. Only one new occurrence was discovered this year and several new populations were found at previously delineated occurrences. It is still only known from the Snake River flood plain in the far eastern part of Idaho, 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 22 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 1999 (Moseley 1999). Refer to the occurrence records for detailed location data on individual Idaho occurrences.

During the 1999 inventory season, one new occurrence was discovered on a small island complex across from the mouth of Black Canyon. This population is slightly up river and across the main channel from the Warm Springs Bottom (003) occurrence. The island is administered by the BLM.

Rose Lehman, Targhee National Forest, found a new population at the downstream end of the bar and island complex below Falls Campground. While considered part of occurrence 004, this small population is rather disjunct from the previously known site near the campground.

As noted previously, the Squaw Creek Island (020) occurrence may not contain any Ute ladies tresses. Surveys during 2000 should carefully reassess the situation and, if no Ute ladies tresses are found, delete this site from the records.

Extent of Surveys in Idaho: No change from previous reports.

HABITAT

Plant Communities: This year I'd like to straighten out the nomenclature for plant communities containing Ute ladies tresses. I've given varied and conflicting names in the past, although the descriptions and quantitative data still apply (Moseley 1997; 1998a; 1998b). Except for one, the following plant community names follow the catalog compiled for Idaho by Jankovsky-Jones et al. (1999; and see references therein).

Scientific Name	Common Name	Comment
Elaeagnus commutata	silverberry/redtop	Formerly *E. commutata/Agrostis stolonifera*
Salix exigua/Mesic graminoid	sandbar willow/mesic graminoid	Formerly *S. exigua/A. stolonifera*
Equisetum variegatum	variegated scouring rush	Not formerly described; not in Jankovsky-Jones et al. (1999)
Carex lanuginosa	woolly sedge	New this year, found at Kellys Island 001
Eleocharis rostellata	wandering spike-rush	No change

1999 Data Collection: During 1998, we collected composition and structure data for all but the last two plant communities in the above table (Moseley 1998b). In 1999, I sampled one plot in each in the *Carex lanuginosa* and *Eleocharis rostellata* communities at Kellys Island. I also sampled the new occurrence across from Black Canyon (022). Methods followed those described last year (Moseley 1998b).

Below is the species cover data for the three plots. Canopy cover classes are the same as last year. Heights are in meters and an asterisk (*) indicates an introduced species. Compare with composition and structure data reported last year (Moseley 1998b).

	Equisetum variegatum # 022	*Carex lanuginosa* # 001	*Eleocharis rostellata* # 001
WOODY SPECIES			
Betula occidentalis	1		
Elaeagnus commutata		1	
Populus angustifolia	1		
Salix exigua	1		
GRAMINOIDS			
**Agrostis stolonifera*	1	30	
Calamagrostis neglecta		1	
Carex lanuginosa	1	70	
Carex nebraskensis	1		
Eleocharis rostellata		1	98
Juncus balticus		3	1
Juncus ensifolius	1		1
Juncus longistylis		1	
Muhlenbergia asperifolia		3	
Phalaris arundinacea	1		
**Poa pratensis*	1		
Scirpus pungens		3	
FORBS & PTERIDOPHYTES			
Aster ascendens	1	1	
Conyza canadensis	1		
Epilobium ciliatum	1		
Equisetum arvense	3		
Equisetum hyemale	50		

Equisetum laevigatum		10	
Equisetum variegatum	20		
Mentha arvense	1		
Potentilla anserina		1	
Potentilla rivularis	1		
**Sonchus arvense*		30	
Spiranthes diluvialis	1		
**Trifolium repens*	3		
Triglochin maritimum			1
Veronica anagalis-aquaticus	1		
TOTAL SPECIES	20	13	4
LIFE FORM DATA			
Woody Cover	1	1	0
Graminoid Cover	3	98	98
Forb Cover	70	40	0
GROUNDCOVER			
Soil	0	1	1
Gravel	0	0	0
Rock	3	0	0
Litter	0	90	90
Wood	1	1	9
Moss	90	0	0
Basal Vegetation	3	10	10

ASSESSING POTENTIAL HABITAT

No change from previous reports.

FLOOD PLAIN DYNAMICS IN RELATION TO UTE LADIES TRESSES HABITAT

1997 Flood Observations: In last year's report (Moseley 1998b), I made continued observations on two patches of Ute ladies tresses that were apparently extirpated by depositions from the June 1997 flood. These observations continued during 1999 and were greatly expanded on one occurrence.

Falls Campground (004) - Although its exact location was not known, the single plant seen in 1996 has not been seen since. The site remains under deep sand deposited during the 1997 flood.

Warm Springs Bottom (003) - Unlike the Falls Campground occurrence, flagging indicating the former location of ladies tresses plants in this patch remained on the shrubs after the flood. I also had photographs of the location from 1996 and 1997. During 1998, I sampled the composition and structure of the vegetation on the extirpated patch and took additional photographs. In 1999, we turned that information into baseline data by permanently marking a belt transect through the previously occupied habitat and retaking photos. Establishment of the permanent transect and photo-points and the results of the first year of monitoring are described below.

Michael Mancuso and I placed the permanent transect parallel to the orientation of this former population, which was a linear band between the reed canarygrass in the channel and the water birch at the edge of the channel. This is the same place I made species composition and cover estimates in 1998 (Moseley 1998b). The 10-meter long transect had ten 0.1 m^2 microplots placed at 1 m intervals along the transect. Methods for sampling are described in Moseley (1998b, page 4). The beginning and end of the transect are monumented with potato-digger bars painted orange on top. Here are some details:

Plot Number:	98SD03C
Azimuth of Transect:	17°, with 17° E declination
GPS Location:	N 43° 35.469
	W 111° 27.766

Below is a comparison of composition and cover estimates from 1998 and 1999. *Equisetum variegatum* was the first to invade the open sands in September 1997. It continues to increase in cover, now dominating the transect. *Agrostis stolonifera*, the dominant forb on the site before the flood, appears to be slowly increasing in cover. The widely scattered *Elaeagnus commutata* shrubs that occupied the site prior to the flood never resprouted and are dead. Species richness increased threefold and moss cover on the sand increased dramatically from 1998 to 1999.

	1998	1999
WOODY SPECIES		
Betula occidentalis		seedling
Elaeagnus commutata	dead stems	dead stems
Populus angustifolia	1	1
Salix exigua		3
Salix lutea	1	
GRAMINOIDS		
Agrostis stolonifera	3	10
Juncus ensifolius		1
Phalaris arundinacea		1
Poa pratensis		1
Unknown grass		1
FORBS & PTERIDOPHYTES		
Aster ascendens		1
Epilobium ciliatum		1
Equisetum variegatum	60	80
Medicago lupulina		3
Solidago missouriensis	1	3
Taraxacum officinale		1
Trifolium repens		3
unknown forb		1
TOTAL SPECIES	5	16
LIFE FORM DATA		
Woody Cover / Mean Ht. (m)	1 / 0.5	1 / 0.8
Graminoid Cover / Mean Ht. (m)	3 / 0.4	10 / 0.4
Forb Cover / Mean Ht. (m)	60 / 0.1	90 / 0.1

GROUND COVER		
Soil (sand)	70	60
Gravel	0	0
Rock	0	0
Litter	1	1
Wood	1	1
Moss	0	30
Basal Vegetation	30	10

We were able to formally retake a series of photos from the site taken during 1996, 1997, and 1998. Prior to 1999, no attempt had been made to repeat the previous year's photos. For the most part, the repeat photographs graphically illustrate the quantitative results from the transect, discussed above. Below is a list of the repeat photo sets archived at the CDC office in Boise.

Photo Number	First Taken	Repeat
96-1	1996	1999
97-1	1997	1999
97-2	1997	1999
97-3	1997	1999
98-1	1998	1999
98-2	1998	1999

A soil pit was dug near the beginning (upstream end) of the transect. The details are discussed in the next section, but we found that the June 1997 flood deposited 18 cm of sand on the site. Nine other pits we dug in extant populations had a deposition of 1997 sand visible on the surface. The average depth was 5.2 cm, with deepest deposition being 8 cm. Apparently there is a threshold of flood deposit depth, above which Ute ladies tresses can't deal with. This transect should continue to be monitored to see if the ladies tresses is persisting beneath the sand and needs more time to reach the surface.

Flood Plain and Vegetation Dynamics Research: As mentioned previously, I consider the Snake River populations of Ute ladies tresses to be a single metapopulation. Although it is a working hypothesis at this point, the underlying assumption is that the Snake River metapopulation consists of a set of local populations linked by dispersal. Although each patch supports its own breeding population, no single population is adequately large enough to ensure the long-term viability of the metapopulation. Therefore, multiple local patches of habitat must be maintained in order to conserve the metapopulation.

Along the Snake River, the greatest factor affecting the distribution and viability of habitat patches is the dynamics of the flood plain. Under pre-Palisades Dam flow regimes, suitable habitat patches were being destroyed and created by periodic flood events. This is significant because, if Ute ladies tresses is similar to cottonwood, habitat patches are only viable for a finite period of time. Eventually the habitat may become too dry because of channel degradation or encroached upon by dense shrubs through plant succession. Periodic high flows create new habitat and possibly also limit shrub encroachment. Merigliano (1996) found that, under post-Palisades river operations, cottonwood forests are not viable in the long term. Current river operations are also considered a long-term viability threat to Ute ladies tresses (Moseley 1998b).

Habitat Ecology Study - During 1999, we began a study of the habitat ecology of Ute ladies tresses focusing on the implications of flood plain dynamics and habitat succession on river and land management. CDC biologists worked in collaboration with river researchers from the University of Montana. This work will build on past (Merigliano 1996) and ongoing studies of the relationship between fluvial geomorphology, riparian community ecology, and river management.

The project 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 study objectives for three related areas: substrate age, primary succession, and flow regime. Results from each of these objectives contribute to meeting the goal stated above. Basically, we plan to look at the distribution of ladies tresses habitat in three dimensions: temporal distribution on the flood plain, horizontal distribution on the flood plain, and vertical distribution related to river stage. The objectives are:

1. Determine the age of the alluvial substrate supporting occupied Ute ladies tresses habitat. This will be inferred from (a) the flood plain mapping conducted by Merigliano (1996) above Heise, (b) supplemented with additional air photo interpretation both above and below Heise, and (c) measurements directly from ladies tresses habitat using decay rates for an isotope of lead.

2. 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 permanent transect, described above, is the only place where a time-series analysis can be done, and that is for an extirpated site. 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 that are sought after by cattle. The hypothesis is: Does the spatial sequence of community types described in Moseley (1998b, page 11) represent the primary (time) successional sequence of Ute ladies tresses habitat on the South Fork flood plain?

3. 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) would suffice to maintain Ute ladies tresses habitat.

This project will continue through 2000, so here I will summarize the work done in 1999 toward meeting these objectives. Work was done in three areas: (1) substrate aging; (2) characterizing flood plain deposits underlying Ute ladies tresses populations; and (3) surveying flood plain cross sections through Ute ladies tresses populations and adjacent habitats.

Substrate Age - Work in this area during 1999 was preliminary. An important question that needed to be answered was whether there was enough organic matter in the sediments underlying *Spiranthes* populations to measure lead isotope (Pb^{210}) decay rates. Mike Merigliano collected samples from the Snake River flood plain and sent them to a laboratory in Ontario, Canada, for testing. The tests came back positive; there was enough organic matter in the sediments to estimate age of deposition. This avenue of research will be conducted during 2000.

Substrate Characterization - I dug 25 soil pits in Ute ladies tresses habitat at 18 of the 22 occurrences along the Snake River. The depth of each layer and the water table, textural classes, and community types are reported in the table in Appendix 1. Most of these pits are also represented two-dimensionally on diagrams of the flood plain cross sections in Appendix 2. Some general interpretations of these data appear below.

Ute ladies tresses populations are underlain by varying amounts of fine-textured sediments overlying a deep cobble/pebble/sand layer. This cobble layer probably represents the major depositional event that formed the bar. These cobbles probably also represent the same surface on which the cottonwood forest became established higher portions of the bars, although the lower portions containing ladies tresses could have been reworked by the river to some extent. In any event, the cottonwood ages of the adjacent habitat, reported in Merigliano (1996) and summarize for ladies tresses by Moseley (1998a), at least represent the maximum age for the ladies tresses sites.

Following bar deposition, over-bank deposits of finer-textured material were deposited on these cobbles. The depth of these fine layers varied from site to site, but consisted of "unaltered" sands, sands that appeared to have organic matter incorporated in them (called loamy sand in Appendix 1 and 2), and in some places a surface layer of sand deposited during the June 1997 flood. Only one population (Black Canyon 022) lacked any fine layer. Mottles were only rarely present in the layers and occurred only in the *Equisetum variegatum* and *Eleocharis rostellata* communities. It is these over-bank deposits that we hope to age in 2000 using Pb^{210} decay rates.

The water table was encountered in most pits, where it ranged from 1 cm to 110 cm deep,averaging 60 cm (n = 17). If a water table was encountered, soils in pits were moist to the surface. I did not reach the water table in eight pits. A couple were dug in October, but five were from August and September, when the river levels were still fairly high. If no water table was reached, moist soil was usually encountered within 15-20 cm of the surface.

Flood Plain Cross Sections - In mid-October, Chris Murphy and I used a level to run traverses across the flood plain in the vicinity of the soil pits. We used these data to construct a cross section of the flood plain in the vicinity of Ute ladies tresses habitat and establish a vertical control from which to look at the relationship of river stage and the height of ladies tresses populations. The traverses started at the edge of the water along the main Snake River channel or a side channel. In one instance, it started in the lowest point in a dry channel. The traverses usually ran through the lower parts of the bar containing Ute ladies tresses, then up onto the highest part containing narrow-leaf cottonwood stands. In some instances, cottonwood was encountered first and the traverse ended in the ladies tresses habitat.

Appendix 2 contains 17 cross-sections through Ute ladies tresses habitat. Three additional cross-sections were surveyed, but not diagramed. Although not always indicated in the diagrams, Ute ladies tresses occurs at all soil pits indicated on the profiles. Using hydraulic geometry equations developed by Mike Merigliano (1994; 1996), and with Mike's help, we were able to estimate the stage (height) of the river for these cross-sections at various discharges. The stage equation we used was developed from the now-defunct Dry Canyon gage, because it represents reaches of the Snake River supporting extensive flood plain habitats. Existing gages at Irwin and Heise are along confined segments of the river and are not representative of reaches supporting Ute ladies tresses. The equation we used was:

$$\text{river depth} = 0.70\,(Q^{0.470})$$

where Q is the discharge of the Snake River measured by the Heise gage. The equation calculates river height in feet, so it must be converted to meters. In the discussion below, we adjusted the river height to our surveyed river elevation of 4,800 cfs, which was the river level during most of the October 12-14 period of the survey. The flow was 5,100 cfs on October 12, which only results in a 3-cm difference in the river depth at any of the profiles, a figure beyond the resolution of the diagrams.

On the diagrams in Appendix 2, I indicate two of these levels with a dotted line: (1) the ordinary post-Palisades Dam high flow in the spring, which is about 20,000 cfs (20K on the diagrams), and (2) the peak discharge of the June 1997 flood, about 43,000 cfs (43K on the diagrams). River depths at other discharges important in our 1999 sampling are listed below. The height of the river at a given flow can be estimated along the y axis in the diagrams in Appendix 2 using the river stage figures in the following table. It should be noted, however, that these are just estimates. The calculations are based on the flood plain geometry at the Dry Canyon gage site, but applied to all ladies tresses sites along the Snake. Also, these figures probably apply better to the main Snake River channel than to side channels. It is thought, however, that differences between estimated and actual river height are minor (Merigliano, personal communication).

Discharge at Heise Gage (cfs)	River Stage (m)	Comment
4,800	0.0	base of survey
7,500	0.27	discharge at water table observations
8,000	0.31	discharge at water table observations
8,800	0.38	discharge at water table observations
9,400	0.43	discharge at water table observations
9,700	0.45	discharge at water table observations
20,000	1.10	ordinary annual high flow; marked in App 2
24,500	1.32	post-Palisades BOR flood stage
30,000	1.57	
40,000	1.96	
43,000	2.07	peak discharge, June 1997 flood; marked in App 2

POPULATION BIOLOGY

Phenology: No change from previous reports.

Population Size and Condition: A total of 3,410 Ute ladies tresses plants were observed at the 22 occurrences in Idaho during 1999 (see table below), 800 more plants than counted last year. This may actually be an underestimate, because the comprehensive surveys were mostly done in mid-August and many Ute ladies tresses were just beginning to flower or were in bud. I noticed more plants at some sites during visits later in the year while conducting flood plain research. Annis Island is still the largest population, even with a probable underestimate (see Moseley 1999 for detailed information on each occurrence).

Occurrence Name	Occ. #	1996	1997	1998	1999
Annis Island	006	----	35	2,036	1917
Lorenzo Levee	008	----	1	----	----
Archer Powerline	015	----	145	----	----
Twin Bridges Island	007	----	160	108	99
Railroad Island	005	----	9	14	42
Kellys Island	001	12	22	30	30
Mud Creek Bar	009	----	9	32	71

Rattlesnake Point	002	15	4	23	26
TNC Island	010	----	9	9	118
Warm Springs Bottom	003	173	301	80	476
Black Canyon	022	----	----	----	50
Lufkin Bottom	011	----	61	96	224
Gormer Canyon #5	012	----	10	0	1
Gormer Canyon #4	013	----	10	11	12
Gormer Canyon #3	021	----	----	8	59
Pine Creek #5	014	----	6	14	30
Pine Creek #3 & #4	016	----	18	113	200
Lower Conant Valley	017	----	127	0	40
Upper Conant Valley	018	----	61	15	5
Lower Swan Valley	019	----	1	8	4
Falls Campground	004	1	14	5	6
Squaw Creek Islands	020	----	168	2	0

Population Genetics: No change from previous reports.

Reproductive Biology: No change from previous reports.

Competition: No change from previous reports.

Herbivory: No change from previous reports.

Land Ownership and Management Responsibility: The only change this year was discovery of a new occurrence on the island across from Black Canyon (occurrence 022). This island is managed by the BLM.

Land Use and Possible Threats: Documented for each occurrence in Moseley (1999). No real change from last year. A small exclosure was erected by the Targhee National Forest around the new Falls Campground population discovered this year.