

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

2002 STATUS REPORT

by

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SUMMARY

The 2002 status report for *Spiranthes diluvialis* (Ute ladies' tresses) compliments previous 1997-2001 status reports and contains only new or updated information about the species and its habitat in Idaho. The 1997 status report is the best source for basic distribution and habitat information, as well as for the description and identification of *Spiranthes diluvialis*. The 1998 status report is the best source for more detailed habitat information regarding populations on the South Fork Snake River. The 1999 status report explains the methods and results of on-going research on floodplain dynamics in relation to *Spiranthes diluvialis* habitat. The 2000-2002 status reports focus on current habitat conditions, threats to populations, and the conservation of *Spiranthes diluvialis*. The same format is used in this update as in previous reports, which should be consulted for information not covered here. Reports can be downloaded from the Idaho Conservation Data Center (CDC) homepage at: www2.state.id.us/fishgame/info/cdc/plant_pubs.htm

Major findings and highlights reported here include:

- 1,753 *Spiranthes diluvialis* plants were tallied in 2002. The total number was over 2,000 plants less than the 2001 total. Nearly all of the decrease was attributable to late-season trespass cattle grazing at Annis Island that removed flowering stems and made the annual tally difficult at this occurrence. Discounting Annis Island, the total number of plants observed at all other occurrences was only about 130 less than in 2001 (and nearly the same as in 1999). Compared to 2001, five occurrences had more plants observed, six had less, and eight remained nearly the same.
- At one occurrence, the total number of *Spiranthes diluvialis* plants observed decreased each of the last five years. One occurrence has shown a decrease in total observed plants each of the last three years. One occurrence increased each of the last four years. Three occurrences have had zero observed plants for at least two consecutive years.
- Late-season trespass cattle grazing occurred at Annis Island. Cattle grazing complied with allotment requirements at all other grazed occurrences.
- *Spiranthes diluvialis* habitat at Mud Creek Bar, heavily trampled by an outfitter camp in 2001, mostly recovered and did not have decreased mesic graminoid cover nor decreased numbers of observed *Spiranthes diluvialis*. However, noxious weed levels slightly increased. The BLM released biological control agents at Mud Creek Bar and two other occurrences, as well as at other locations on the South Fork Snake River, to curtail noxious weed invasions.
- The herbaceous vegetation of *Spiranthes diluvialis* habitat at Annis Island, burned by a wildfire in 2001, had nearly recovered to its pre-burn character. This portion of the occurrence supported about the same number of *Spiranthes diluvialis* plants as in 2001.
- Off-highway vehicle use occurred within *Spiranthes diluvialis* habitat at three occurrences. As in prior years, impacts from recreation activities (trails and campsites) were noticeable at TNC Island and Lufkin Bottom. New campsite impacts were found at three occurrences.
- Beaver activity, combined with drainage restrictions caused by an old dam, flooded a portion of occupied *Spiranthes diluvialis* habitat at Warm Springs Bottom.
- Twenty-two permanent habitat monitoring transects, established in 2001, were re-sampled using an index of habitat change method. One new transect was established. Information collected at these permanent habitat monitoring transects were incorporated into this status report.
- The CDC completed a model for predicting the distribution of potential *Spiranthes diluvialis* habitat on all lands in Idaho.
- During an inventory of Idaho Fish and Game managed lands, a new *Spiranthes diluvialis* population was discovered at the Chester Wetlands Segment of the Sand Creek Wildlife Management Area on the Henrys Fork River. This is the first occurrence discovered at a location other than on the South Fork Snake River in Idaho.

TABLE OF CONTENTS

ACKNOWLEDGMENTS.....i

SUMMARY ii

TABLE OF CONTENTS iii

LISTS OF TABLES..... iii

TAXONOMY 1

LEGAL OR OTHER FORMAL STATUS 1

DESCRIPTION AND IDENTIFICATION 1

DISTRIBUTION..... 1

 Rangewide distribution 1

 Idaho distribution 1

 Precise occurrences in Idaho 1

 Extent of surveys in Idaho 2

HABITAT..... 2

 Environmental characteristics, plant communities, and associated species 2

 Vegetation monitoring..... 3

ASSESSING POTENTIAL HABITAT..... 3

FLOODPLAIN DYNAMICS IN RELATION TO *SPIRANTHES DILUVIALIS* HABITAT.....4

 Floodplain and vegetation dynamics research—an update 4

POPULATION BIOLOGY.....4

 Phenology..... 4

 Population size and condition..... 5

 Population genetics..... 12

 Reproductive biology and pollination ecology 12

 Competition 13

 Herbivory 13

 Land ownership and management responsibility 13

 Land use, possible threats, and conservation actions 13

ASSESSMENT AND RECOMMENDATIONS..... 15

 General assessment of vigor, trends, and status 15

 Recommendation to the U.S. Fish and Wildlife Service..... 16

 Recommendations to the Upper Snake River, BLM and Caribou-Targhee NF..... 16

 Recommendations to the Idaho Department of Fish and Game..... 16

 Recommendations to the Heritage Network..... 17

 Recommendations regarding present or anticipated activities 17

MONITORING WORK—2002 AND 2003 17

REFERENCES..... 18

LIST OF TABLES

Table 1. *Spiranthes diluvialis* population counts at occurrences on the South Fork Snake River for 1996-2002.....6

Table 2. Summary of habitat conditions, threats, and conservation actions accomplished in 2002, and conservation actions planned for 2003, for *Spiranthes diluvialis* occurrences on the South Fork Snake River..... 7

TAXONOMY

No changes from 1997-2001 status reports.

LEGAL OR OTHER FORMAL STATUS

No changes from 1997-2001 status reports.

DESCRIPTION AND IDENTIFICATION

No changes from 1997-2001 status reports.

DISTRIBUTION

Rangewide Distribution: No major changes from 1997-2001 status reports. Since 1998, the most significant expansion in the rangewide distribution of *Spiranthes diluvialis* was the discovery in late summer 2000 of a population on the reservoir above Rocky Reach Dam on the Columbia River, north of Chelan in Chelan County, Washington. This site is at least 75 miles southwest of the other Washington population in the Okanogan Valley. Since 1998, inventories in other states have not significantly expanded the range of *Spiranthes diluvialis*, although several occurrences have been expanded to include adjacent watersheds (e.g., in the Diamond Fork basin in Utah).

Idaho Distribution: During early September 2002, the CDC conducted inventories on selected Idaho Fish and Game managed lands known or suspected to have potential habitat for *Spiranthes diluvialis*. During this inventory, a new *Spiranthes diluvialis* population was discovered at the Chester Wetlands Segment of the Sand Creek Wildlife Management Area (WMA), on the Henrys Fork River about 6 miles northeast of St. Anthony. This site is about 25 miles north-northeast of the nearest known occurrence on the South Fork Snake River in eastern Idaho. In Idaho, this is the first occurrence discovered at a location other than the South Fork Snake River. *Spiranthes diluvialis* is now known from 49 river miles of the South Fork Snake River floodplain in Jefferson, Madison, and Bonneville counties, and one site in Fremont County in the Henrys Fork basin.

Precise Occurrences in Idaho: An “element occurrence” is the standard database record used throughout the Natural Heritage Program/Conservation Data Center network to track rare species, or “elements,” of conservation concern. Occurrences represent a specific geographic location and may or may not be equivalent to the biological definition of a population because of management, habitat, and geographic considerations (NatureServe 2002). Each occurrence is assigned a three-digit number. The number for each occurrence is listed in Table 1. All Idaho occurrence records for *Spiranthes diluvialis* were updated in November 2002 (Conservation Data Center 2002). In 2002, the precise location of the mainland portion (on the western river bank) of the Black Canyon occurrence was mapped. With the addition of the Chester Wetlands occurrence on the Henrys Fork, the total number of Idaho occurrences stands at 23.

For the fourth consecutive year there were no *Spiranthes diluvialis* observed at Squaw Creek Islands. As noted in previous status reports (Moseley 1998b, 2000; Murphy 2000, 2001b), only *Spiranthes romanzoffiana* (hooded ladies’ tresses) has been observed at Squaw Creek Islands since 1998. In addition, no *Spiranthes diluvialis* were observed at Gormer Canyon #5 four of the last five years, including the last three years in a row. No *Spiranthes diluvialis* were observed at Railroad Island each of the last two years. Due to annual variability in the number of flowering stems, prolonged dormancy, the potential for mistimed surveys, and late-season livestock grazing (at Squaw Creek Islands), I believe it is premature to consider any of these occurrences to be extirpated.

Extent of Surveys in Idaho: The 1997 and 1998 *Spiranthes diluvialis* status reports (Moseley 1998a, 1998b), and the overall summary of inventories for *Spiranthes diluvialis* in two other reports by Moseley (1997, 1999a), are the best sources for details on the extent of surveys from 1996 through 1999. In late summer 2000, the Idaho CDC conducted a field inventory for *Spiranthes diluvialis* on Bureau of Land Management (BLM) lands managed by the Shoshone Field Office in south-central Idaho (Mancuso 2000). During late summer 2002, the CDC searched for *Spiranthes diluvialis* at selected, previously uninventoried WMAs managed by the Idaho Department of Fish and Game known or suspected to have potential habitat. WMAs inventoried included Chester Wetlands Segment of Sand Creek, Gem State, and Deer Parks in eastern Idaho; Niagara Springs and Big Cottonwood in south-central Idaho; and Boundary Creek in northern Idaho. Since 1999, numerous other site or project specific *Spiranthes diluvialis* inventories have been done throughout the state by various land management agencies and other private entities to meet U.S. Fish and Wildlife Service (USFWS) Section 7 requirements. This information is best obtained directly from the land management agency for which the inventory was done.

HABITAT

Environmental Characteristics, Plant Communities, and Associated Species: No changes from 1997-2001 status reports for the South Fork Snake River occurrences. The following is a description of the newly discovered Chester Wetlands (023) occurrence.

Chester Wetlands - The Chester Wetlands occurrence is located at 5030 to 5040 feet elevation, very similar to elevations of many occurrences on the South Fork Snake River. The sub-populations of *Spiranthes diluvialis* at Chester Wetlands were located on mesic graminoid dominated margins of low-lying swales and pond margins. These sites had concave microtopography and mostly sandy to sandy-loam soils. The soil was not excessively alkaline, but probably slightly alkaline (based on the presence of associated species often occurring on slightly alkaline soils). *Spiranthes diluvialis* plants were rarely observed in the bottom of swales or on completely saturated ground. The soil moisture on these microsites may be too high during the growing season. These wet sites support dense vegetation dominated by one or more of the following species that may out-compete *Spiranthes diluvialis*: *Carex simulata* (analogue sedge), *C. nebrascensis* (Nebraska sedge), *C. utriculata* (beaked sedge), *Eleocharis* spp. (spikerushes), *Glyceria grandis* (American mannagrass) (or other tall and dense grasses), *Scirpus* spp. (bulrushes), *Sparganium* spp. (burreeds), or *Typha latifolia* (broadleaf cattail). Adjacent, slightly drier soils were often dominated by dense and tall *Agrostis stolonifera* (redtop) and/or *Poa pratensis* (Kentucky bluegrass), weedy exotic forbs (e.g., *Carduus* spp. (musk thistles)), or occasionally shrubs and trees such as *Artemisia cana* (silver sagebrush), *Crataegus douglasii* (black hawthorne), *Salix* spp. (willows), and *Populus* spp. (cottonwoods).

Unlike *Spiranthes diluvialis* occurrences that are tied directly to the fluvial system of the South Fork Snake River (with only occasional input from toeslope springs or floodplain upwellings), the Chester Wetlands occurrence is sub-irrigated by water from nearby canals combined with a naturally high groundwater table. The hydrologic regime of the Henrys Fork River probably does not play a large role at this site. The river is naturally shallowly entrenched in a basalt bedrock controlled channel at Chester. Only the sub-population located about 20 m from the Henrys Fork bank might be flooded during large peak flow events. This sub-population is also fed by sub-irrigation from a leaky canal located about 50 to 75 m above the habitat. The other sub-populations are all located over 0.75 mile from the Henrys Fork in a wetland complex sub-irrigated by a naturally high groundwater table (possibly perched atop basalt bedrock) augmented by irrigation from a series of small ditches and canals. The soil at this site is sandy and allows groundwater to readily flow through the area. Habitat often occurs adjacent to perennial and vernal ponds that are located in swales between sandy hummocks. The water level in the perennial ponds

appears to remain relatively high for most the year, evidenced by the narrow bands of mature emergent and woody vegetation lining the pond margins. The water level does appear to drop in late summer if irrigation is cut off, but the soil in *Spiranthes diluvialis* habitat was still moist at or near the surface during early to mid-September.

Spiranthes diluvialis occurred in small, patchy communities that were "turf"-like and distinctly dominated by a mix of mesic graminoid species, as opposed to denser and less diverse *Agrostis stolonifera* dominated areas. The most common community type was *Muhlenbergia richardsonis* (mat muhly), although some *Spiranthes diluvialis* occurred within patches of the *Agrostis stolonifera* community type. All mesic graminoid communities with *Spiranthes diluvialis* always had high cover of both *Agrostis stolonifera* and *Muhlenbergia richardsonis*. *Carex nebrascensis*, *Juncus ensifolius* (daggerleaf rush), and *Trifolium repens* (white clover) frequently co-occurred as sub-dominant species (each consistently having moderate to high cover). *Aster ascendens* (western aster), *Equisetum variegatum* (variegated scouringrush), *Juncus balticus* (Baltic rush), *J. tenuis* (poverty rush), *Poa pratensis*, and *Sonchus arvensis* (perennial sowthistle) were also usually present with moderate cover. Shrubs and trees, including *Alnus incana* (thin leaf alder), *Crataegus douglasii*, *Rosa woodsii* (Wood's rose), *Populus trichocarpa* (black cottonwood), *P. angustifolia* (narrowleaf cottonwood), *Salix bebbiana* (Bebb's willow), *S. lasiandra* (Pacific willow), *S. lutea* (yellow willow), and *S. geyeriana* (Geyer's willow), were usually nearby (typically less than 5 m away), but *Spiranthes diluvialis* was not observed growing under the canopy of any woody species. Other commonly associated species, usually with low to moderate cover, were *Cirsium vulgare* (bull thistle), *Equisetum laevigatum* (smooth horsetail), *Eleocharis pauciflora* (fewflower spikerush), *Erigeron lonchophyllus* (shortray fleabane), *Festuca pratensis* (meadow ryegrass), *Potentilla anserina* (Argentina anserina), *Prunella vulgaris* (common selfheal), and *Taraxacum officinale* (common dandelion). Associated species with low cover and frequency, included *Aster hesperius* (white panicle aster), *Carduus spp.*, *Carex simulata*, *Cirsium arvense* (Canada thistle), *Epilobium ciliatum* (fringed willowherb), *Juncus confusus* (Colorado rush), *Lactuca serriola* (prickly lettuce), *Medicago lupulina* (black medic), and *Trifolium pratense* (red clover).

Vegetation Monitoring: Monitoring of floodplain vegetation succession was conducted annually from 1999 to 2001 at portions of the Warm Springs Bottom and Black Canyon occurrences. Vegetation at these sites reveal much about the influence of floodplain dynamics on succession in *Spiranthes diluvialis* habitat. For example, the June 1997 flood apparently extirpated the upstream portion of the Warm Springs Bottom occurrence with deep sand deposition, altering plant community succession. The island portion of the Black Canyon occurrence is on a frequently flooded, young fluvial landform also subject to vegetation changes. Annual monitoring includes permanently marked belt transects and repeat photo-points at each site. The permanent transects and photo-points were not re-sampled in 2002 due to time constraints and the obvious lack of changes in the vegetation at both occurrences. Transects and photo-points at both occurrences will be re-sampled in 2003. Vegetation monitoring data and selected repeat photos from 1999 to 2001 are included in prior status reports (Moseley 2000; Murphy 2000, 2001b).

ASSESSING POTENTIAL HABITAT

In July 2001, the CDC completed a model for predicting the distribution of potential habitat for *Spiranthes diluvialis* on the National Forests of Idaho (Jankovsky-Jones and Graham 2001). This model was expanded in 2002 to include all non-Forest Service lands in Idaho (Jankovsky-Jones and Graham 2002). Funding for the 2002 model was provided by the Idaho Department of Transportation. The model was completed in three phases. The first phase was the development of a rangewide habitat profile for *Spiranthes diluvialis* in 1999 (Moseley 1999b). Rangewide habitat indicators at the meso- and macro-scales, obtained from all occurrences rangewide, were used for the profile. These indicators included: plant associations containing *Spiranthes diluvialis*; riparian plant associations adjacent to occurrences;

elevation; broad upland vegetation zones surrounding occurrences; ecoregion; lithology; and hydrologic setting. Phase 2 consisted of mapping the known distribution of riparian plant associations in Idaho (Jankovsky-Jones and Graham 2001). Location data from riparian vegetation plots and all known riparian and wetland plant association occurrences (data sources included the National Forests, BLM, and CDC) were obtained and entered into a database. In phase 3, a Geographic Information System (GIS) model was populated with habitat indicator values based on habitat profile and riparian plant association location information (Jankovsky-Jones and Graham 2001, 2002). Fifth field watersheds were the unit area considered for the model.

For all of Idaho, the model identified 28 watersheds with very high likelihood of having *Spiranthes diluvialis* potential habitat and 97 watersheds with high likelihood of having potential habitat (Jankovsky-Jones and Graham 2002). These are watersheds that should be targeted for future surveys, especially if they occur near the South Fork Snake River or Henrys Fork watersheds. A substantial number of these watersheds are found within the Southern Rocky Mountains Ecoregion of eastern Idaho. However, numerous watersheds located in the east-central Idaho portion of the Middle Rocky Mountains Ecoregion, especially those with calcareous lithology, were also identified to have high to very high likelihood of potential habitat. Interestingly, watersheds of the Lower Henrys Fork, where the new Chester Wetlands occurrence was discovered, were identified as being only moderately likely to have potential *Spiranthes diluvialis* habitat. The lack of plant association data may be a limitation to the model's predictive power in some areas, such as central Idaho. Ideally, ground-truthing of the model should be done by stratified random surveys of all watershed classes.

In general, the indicators of *Spiranthes diluvialis* habitat at micro-, meso-, and macro-scales described by in prior status reports (Moseley 1998a, 1998b, and 2000), as well as the rangewide habitat profile (Moseley 1999b), still form the best overall guide for identifying potential *Spiranthes diluvialis* habitat. However, the discovery of the Chester Wetlands occurrence highlights the need for surveyors to broaden their view of potential habitat in Idaho. Inventories should not only focus on riverine and floodplain habitats, but also include non-riverine habitats such as sub-irrigated meadows and pond margins (fed by irrigation and/or natural groundwater) having sandy (possibly slightly alkaline) soils. Mixed mesic graminoid plant communities dominated by *Agrostis stolonifera* and *Muhlenbergia richardsonis*, with *Carex nebrascensis*, *Equisetum variegatum*, *Juncus ensifolius*, *Juncus spp.*, *Poa pratensis*, *Sonchus arvensis*, and *Trifolium repens*, should be focused on in survey areas.

FLOODPLAIN DYNAMICS IN RELATION TO *SPIRANTHES DILUVIALIS* HABITAT

Floodplain and Vegetation Dynamics Research—An Update: No major changes from 2001 status report. In 1999, a habitat ecology study was initiated, in cooperation with Mike Merigliano of the University of Montana, with the goal of relating floodplain dynamics and primary habitat succession to long-term conservation of *Spiranthes diluvialis* on the South Fork Snake River (Moseley 2000). To examine relationships between floodplain dynamics and *Spiranthes diluvialis* habitat, data were collected in 1999 and 2000 on: the age and characterization of alluvial substrates supporting *Spiranthes diluvialis*; the elevation of habitat on the floodplain and the relationship to various river flow stages; and plant community development along primary successional pathways. A complete description of floodplain dynamics research methods and preliminary results appears in the 1999 to 2001 status reports (Moseley 2000; Murphy 2000, 2001b). Complete results of this work are scheduled to be reported in 2003.

POPULATION BIOLOGY

Phenology: No major changes from 1997-2001 status reports. Timing our population surveys with the unpredictable and annually variable peak-flowering period of *Spiranthes diluvialis* remains an obstacle to

obtaining accurate long-term monitoring data (Murphy 2001). The inventory of Chester Wetlands on the Henrys Fork was conducted on September 10 and 11. On these days, only about 10 to 20% of the observed *Spiranthes diluvialis* plants were still blooming. The remainder of plants had developed immature capsules. It is unlikely that any of these non-flowering individuals were mis-identified *Spiranthes romanzoffiana* because these plants lacked the tightly spiraled inflorescence of strongly ascending flowers and capsules characteristic of *S. romanzoffiana*. In addition, the immature capsules were similar to those of *Spiranthes diluvialis* observed on the South Fork Snake River at this time of year.

Population Size and Condition: Comprehensive monitoring on the South Fork Snake River was done between August 21 and September 5, 2002, one week later than in 2000 and 2001 (Murphy 2001b). As with prior years, the two occurrences located on private land were not surveyed. Due to time constraints, *Spiranthes diluvialis* was not tallied at the Gormer Canyon #4 occurrence. Detailed population, habitat, and other information for each Idaho occurrence is provided in the Element Occurrence Records for *Spiranthes diluvialis* (Conservation Data Center 2002). Reconnaissance during mid-August indicated no apparent trend toward an early peak-flowering period for 2002. Nevertheless, due to the possibility of early blooming individuals missed by later surveys, the total count of observed flowering plants is likely an underestimate.

After 5 years of intensive demographic monitoring of both flowering and non-flowering/vegetative *Spiranthes diluvialis* plants in a population in southwest Montana, Heidel (2001) found that in a good flowering year less than 50% of the total population flowered. Based on this research, there may actually be at least twice as many *Spiranthes diluvialis* plants present in a population than are usually observed. Our monitoring on the South Fork Snake River, like most *Spiranthes diluvialis* monitoring in other states, does not include the excessively time consuming process of counting vegetative individuals. While it is unknown if the ratio of flowering to non-flowering individuals is similar in Idaho as in Montana, it is likely our tallies represent less than the actual population of *Spiranthes diluvialis* on the South Fork Snake River.

A total of 1,753 *Spiranthes diluvialis* plants were observed at the 19 occurrences monitored on the South Fork Snake River during 2002 (Table 1). A total of 433 individuals were observed at Chester Wetlands. The total observed on the South Fork Snake River was 2,380 plants less than the record high total in 2001 and the lowest total since 1997. Nearly all of the decrease was attributable to a large reduction at Annis Island. This reduction was related to late-season trespass cattle grazing that removed flowering *Spiranthes diluvialis* stems making the annual tally difficult (Table 2). Discounting Annis Island, the total number of plants observed at all other occurrences was only about 130 less than in 2001 (and nearly the same as in 1999 and only slightly less than 2001). The number of plants observed on the mainland portion of the Black Canyon occurrence decreased from 390 in 2001 to 165 in 2002. In contrast, the total *Spiranthes diluvialis* observed at Lufkin Bottom increased from 184 in 2001, to 309 in 2002.

Of the 19 occurrences monitored on the South Fork Snake River in 2002, five had more plants observed compared to 2001, six occurrences had fewer plants, and eight occurrences remained the same or nearly the same. Four occurrences, Railroad Island, Gormer Canyon #5, Upper Conant Valley, and Squaw Creek Islands, had zero *Spiranthes diluvialis* observed. For the fourth consecutive year, there were no *Spiranthes diluvialis* observed at Squaw Creek Islands. In addition, there has been no *Spiranthes diluvialis* observed at Gormer Canyon #5 four of the last five years, including the last three years in a row. No *Spiranthes diluvialis* were observed at Railroad Island each of the last two years. Tables 1 and 2 summarize the numbers of flowering plants and habitat conditions observed in 2002.

Table 1. *Spiranthes diluvialis* population counts at occurrences on the South Fork Snake River for 1996-2002. Occurrences are arranged by location in order from downstream sites to upstream sites.

Occurrence Name	Occ. #	1996	1997	1998	1999	2000	2001	2002
Annis Island	006	----	35	2,036	1,917	726	2,557	306
Lorenzo Levee	008	----	1	----	----	----	----	----
Archer Powerline	015	----	145	----	----	----	----	----
Twin Bridges Island	007	----	160	108	99	43	36	14
Railroad Island	005	----	9	14	42	17	0	0
Kelly's Island	001	12	22	30	30	15	19	15
Mud Creek Bar	009	----	9	32	71	63	16	20
Rattlesnake Point	002	15	4	23	26	0	19	68
TNC Island	010	----	9	9	118	21	17	13
Warm Springs	003	173	301	80	476	942	522	538
Black Canyon	022	----	----	----	50	42	507	236
Lufkin Bottom	011	----	61	96	224	494	184	309
Gormer Canyon #5	012	----	10	0	1	0	0	0
Gormer Canyon #4	013	----	10	11	12	7	7	----
Gormer Canyon #3	021	----	----	8	59	30	76	47
Pine Creek #5	014	----	6	14	30	47	24	24
Pine Creek #3 & #4	016	----	18	113	200	103	118	121
Lower Conant Valley	017	----	127	0	40	23	12	12
Upper Conant Valley	018	----	61	15	5	5	1	0
Lower Swan Valley	019	----	1	8	4	9	13	27
Falls Campground	004	1	14	5	6	13	5	3
Squaw Creek Islands	020	----	168	2	0	0	0	0
Total	----	201	1,171	2,604	3,410	2,600	4,133	1,753
(Mean)	----	(50)	(59)	(137)	(171)	(130)	(207)	(92)

Table 2. Summary of habitat conditions, threats, and conservation actions accomplished in 2002, and conservation actions planned for 2003, for *Spiranthes diluvialis* occurrences on the South Fork Snake River.

Occurrence # (land ownership)	Habitat Conditions, Threats, and Human Activities	Conservation Actions Accomplished in 2002 & Planned for 2003
Annis Island #006 (BLM)	Trespass cattle grazing through first half of August on the mainland portion of occurrence. Graminoids and some forbs, including <i>Spiranthes diluvialis</i> , were cropped to less than 5 - 10 cm stubble height. The herbaceous layer of occupied habitat burned in 2001 was nearly completely recovered, with only trace evidence of the fire remaining. Cover of <i>Carduus nutans</i> , <i>Cirsium arvense</i> , and other noxious weeds were similar to, or slightly less, in 2001.	2002: BLM performed allotment compliance and monitoring inspections. Livestock trespass reported to the USFWS. Biological control agents (<i>Aphthona flava</i> , <i>A. lacertosa</i> , and <i>A. nigriscutis</i>) released for leafy spurge. CDC re-sampled habitat monitoring transects and established an additional habitat monitoring transect on the island portion of occurrence. 2003: BLM will continue allotment compliance inspections and continue release of noxious weed biological control agents if agents are available.
Lorenzo Levee #008 (private)	Not visited in 2002.	
Archer Powerline #015 (private)	Not visited in 2002.	
Twin Bridges Island #007 (BLM and Madison County)	Recent OHV trail through habitat behind picnic pavilion on the Madison County park portion of occurrence (this sub-population is almost extirpated, with only one plant found behind the picnic pavilion in 2001 and zero in 2002).	CDC re-sampled the habitat monitoring transect on the BLM portion of occurrence. BLM repaired the fence along the Madison County park/BLM boundary to limit OHV activity at the occurrence.
Railroad Island #005 (BLM)	Conditions were dry, but slightly moister than 2001. One recreation trail with trace impacts.	CDC re-sampled the habitat monitoring transect.
Kelly's Island #001 (BLM)	One minor recreation trail through mainland portion of occurrence, but only trace impacts. No human disturbance on the island portion of occurrence, although dredging occurred in a nearby channel. <i>Sonchus arvensis</i> and <i>Cirsium arvense</i> density was about the same as 2001.	CDC re-sampled the habitat monitoring transect.

Occurrence # (land ownership)	Habitat Conditions, Threats, and Human Activities	Conservation Actions Accomplished in 2002 & Planned for 2003
Mud Creek Bar #009 (BLM)	Minor recreation trails, but no impacts to habitat. Trails and OHV impacts from outfitter camp in 2001 were still evident, but herbaceous layer was recovering. Bank erosion continues. <i>Centaurea maculosa</i> density appeared slightly higher than in 2001.	2002: BLM released knapweed biological control agent (<i>Cyphocleonus achates</i>). OHV barriers will be reconstructed in fall. CDC re-sampled the habitat monitoring transect. 2003: BLM will continue release of knapweed biological control agents if agents are available.
Rattlesnake Point #002 (BLM)	One recent campfire ring within 10 m of occupied habitat, but no other human impacts observed. No recent grazing. <i>Cirsium vulgare</i> density appeared higher than previous years. Beaver and ungulate activity noticeable.	Pasture rested from cattle grazing during 2002. CDC re-sampled the habitat monitoring transect.
TNC Island #010 (BLM)	Recreation trails through occupied habitat at the upstream end of island/bar. Heavily used campsites nearby.	CDC re-sampled the habitat monitoring transect.
Warm Springs Bottom #003 (BLM)	Recent OHV trails through occupied habitat (within 2 m of <i>Spiranthes diluvialis</i>), but soil disturbance was limited to wettest areas. Beaver dammed a spring channel and water backed up through a culvert and behind the old dam resulting in flooding of a portion of the occurrence. Moose and beaver activity high throughout the occurrence. Cattle grazing less than in prior years.	BLM reconstructed OHV barriers in fall. CDC re-sampled the habitat monitoring transects.
Black Canyon #022 (BLM and private)	Campsite, fire ring, and boat landing trail about 10 m from occupied habitat on the mainland portion of occurrence. <i>Cirsium arvense</i> and <i>Sonchus arvensis</i> density similar to 2001 on the island portion of occurrence. Ungulate browsing maintaining woody vegetation at similar height and cover as 2001.	BLM purchased a conservation easement on the property inclusive of the mainland portion of the occurrence. CDC re-sampled the habitat monitoring transect on the island portion of occurrence. CDC established a permanent photo monitoring point on the mainland portion that may be used as a habitat monitoring transect in the future.
Lufkin Bottom #011 (BLM)	Recreation trails through portions of the outer bank habitat resulting in trampled vegetation. Recreation impacts slightly higher than in 2001, but no trampled <i>Spiranthes diluvialis</i> were documented.	CDC re-sampled the habitat monitoring transects.

Occurrence # (land ownership)	Habitat Conditions, Threats, and Human Activities	Conservation Actions Accomplished in 2002 & Planned for 2003
Gormer Canyon #5 #012 (USFS)	<i>Centaurea maculosa</i> and <i>Cirsium arvense</i> have thoroughly invaded the occurrence. No <i>Spiranthes diluvialis</i> observed.	2002: BLM released knapweed biological control agents (<i>Cyphocleonus achates</i>). No habitat monitoring transect established. 2003: BLM will continue release of noxious weed biological control agents if agents are available.
Gormer Canyon #4 #013 (USFS)	Regular river patrols by the BLM and USFS did not report any abnormal use or major environmental changes in the area of the campsite near the occurrence.	CDC did not re-sample the habitat monitoring transect due to time constraints.
Gormer Canyon #3 #021 (USFS)	Density of <i>Cirsium arvense</i> and <i>Sonchus arvensis</i> slightly higher than 2001. Major wildlife trail through occurrence.	2002: CDC re-sampled the habitat monitoring transect. 2003: BLM will continue release of noxious weed biological control agents if agents are available.
Pine Creek #5 #014 (BLM)	No human impacts or other threats observed.	2002: BLM performed Five-ways Allotment compliance and monitoring inspection. CDC re-sampled the habitat monitoring transect. 2003: BLM will continue allotment compliance and monitoring inspections.
Pine Creek #3 & #4 #016 (BLM)	<i>Cirsium arvense</i> invasion continues.	2002: BLM performed Five-ways Allotment compliance and monitoring inspection. CDC re-sampled the habitat monitoring transects. 2003: BLM will continue allotment compliance and monitoring inspections. BLM will continue release of Canada thistle biological control agents if agents are available.
Lower Conant Valley #017 (BLM)	Dry conditions. <i>Spiranthes diluvialis</i> again found in only one swale rather than three. No human impacts noted.	CDC re-sampled the habitat monitoring transect.
Upper Conant Valley #018 (BLM)	No human impacts or other threats observed.	CDC re-sampled the habitat monitoring transect.
Lower Swan Valley #019 (BLM)	One recent campfire ring about 10 m from occupied habitat, but no other human impacts observed. Heavy moose browsing.	CDC re-sampled the habitat monitoring transect.

Occurrence # (land ownership)	Habitat Conditions, Threats, and Human Activities	Conservation Actions Accomplished in 2002 & Planned for 2003
Falls Campground #004 (USFS)	Use of recreation trails on bank near the mainland portion of occurrence was higher than in 2001. Moose browsing remains high on mainland. One minor recreation trail through island portion of occurrence, but no impacts to habitat were observed.	2002: CDC re-sampled the habitat monitoring transects. 2003: USFS and CDC will continue to survey pasture prior to cattle "on date."
Squaw Creek Islands #020 (BLM)	No <i>Spiranthes diluvialis</i> observed during cursory survey of mainland and nearest island portions of occurrence. Main river channel island was not surveyed. Mainland portion was heavily grazed during late summer. Human trails also present.	No habitat monitoring transect established.

Potential Relationships Between Habitat Conditions, Habitat Changes, and Population Size -

Livestock Grazing: The effect of cattle grazing on the observable population of *Spiranthes diluvialis* and habitat conditions are mostly a function of the timing and intensity of grazing. In 2002, late-season trespass cattle grazing at Annis Island substantially decreased the number of *Spiranthes diluvialis* observed. Forage utilization was not evenly distributed at Annis Island. Graminoids and some forbs were cropped to less than 5 cm stubble height in some areas, while other areas had less grazing. Nevertheless, herbivory of *Spiranthes diluvialis* occurred and the total tally was low. Late-season cattle grazing also occurred at Annis Island in 2000, at Warm Springs Bottom in 1998, and at Rattlesnake Point in 2000 (Moseley 2000; Murphy 2000). However, all three occurrences appeared resilient to late-season grazing the prior year, with an increase in *Spiranthes diluvialis* observed the following year (Table 1). A similar increase after late-season cattle grazing the year before was documented in Montana by Heidel (2001). Following intense grazing in 2001, Rattlesnake Point was rested from cattle grazing in 2002 and the number of observed *Spiranthes diluvialis* increased again. In addition, *Spiranthes diluvialis* individuals were observed for the first time in two areas on the inside channel terraces at Rattlesnake Point in 2002. The new occurrence at Chester Wetlands was formerly a private cattle ranch that was probably grazed every year until being rested in 2002. The exact past grazing regime is not known, and it is unclear how *Spiranthes diluvialis* may have responded to past land management activities.

While other ecological factors may also contribute to habitat conditions beneficial for increases in observable *Spiranthes diluvialis*, spring and early summer cattle grazing can sometimes benefit *Spiranthes diluvialis* flowering by decreasing the cover and density of competing forbs and grasses (Allison 2001; Heidel 2001; Riedel 2002). Preliminary *Spiranthes diluvialis* habitat monitoring at Rattlesnake Point shows that after intensive cattle grazing in 2001, the cover of some weed species, mainly *Cirsium vulgare*, slightly increased in 2002, but the total cover of all weeds was slightly lower than 2001 (Murphy 2002). Similarly, at Annis Island, the cover of competitive tall forbs, *Carduus nutans*, *Cirsium arvense*, and other noxious weeds were similar or slightly lower in 2002 than in 2001 (Murphy 2002). A rest-rotation spring/early summer cattle grazing regime is probably not harmful, and may be beneficial to *Spiranthes diluvialis* on the South Fork Snake River.

Fire: During late spring 2001, a human-ignited wildfire burnt a portion of the southwest edge of the Annis Island occurrence. In 2002, the herbaceous layer was nearly completely recovered, with only trace evidence of the fire remaining, although the duff layer was still reduced (Murphy 2002). The cover of woody vegetation, especially *Populus angustifolia*, surrounding occupied habitat, was still much reduced from pre-fire levels. *Spiranthes diluvialis* was documented within burned areas in 2002, although the total number observed was slightly less than the total observed in 2001. Late season grazing probably explains the slight decrease in the total observed. In Colorado, the number of flowering *Spiranthes diluvialis* consistently increased each year after repeated spring prescribed fires in its habitat (Riedel 2002).

Recreation: Impacts to *Spiranthes diluvialis* habitat from recreation activities are typically localized. To date, there is no obvious relationship between the number of *Spiranthes diluvialis* observed and recreation impacts. For example, the number of *Spiranthes diluvialis* plants observed at Lufkin Bottom increased by a large amount from 2001 (Table 1). Lufkin Bottom annually experiences trampling of occupied *Spiranthes diluvialis* habitat by campers, boaters, and anglers. Annual camping impacts and recreation use levels have fluctuated between 1999 and 2002. No other major changes to habitat conditions, resulting from human or natural causes, have been observed during this time (Murphy 2000, 2001a, 2002). Although human trails occur very close to *Spiranthes diluvialis*, no trampled plants were confirmed in 2001 or 2002.

The number of observed *Spiranthes diluvialis* slightly increased at Mud Creek Bar in 2002, although the

total is much lower than the previous highs in 1999 and 2000 (Table 1). In 2001, an unauthorized outfitter camp, with heavy human trampling, was established less than 15 m away from occupied habitat (Murphy 2001b). Although the trail from the boat landing to last year's camp went directly through occupied habitat and was still evident in 2002, the mesic graminoid habitat was recovering (Murphy 2002). However, the cover of noxious weeds (especially *Centaurea maculosa* (spotted knapweed)) and competitive tall forbs slightly increased. The long-term impacts of intensive recreation disturbance will be monitored. Potential *Spiranthes diluvialis* habitat at Mud Creek Bar continues to be lost to non-human related bank erosion.

Wildlife Activity: In addition to ungulate browsing, beaver activity can also alter *Spiranthes diluvialis* habitat conditions on the South Fork Snake River. In late summer 2002, beaver dammed a secondary spring channel about 250 m below *Spiranthes diluvialis* habitat near the old breached dam at Warm Springs Bottom. Water backed up behind the beaver dam and through a culvert in the old dam, flooding occupied *Spiranthes diluvialis* habitat up to 10 cm deep. *Spiranthes diluvialis* was observed flowering in standing water up to about 10 cm deep. During surveys on September 4, 2002, water was draining into the main spring channel behind the old dam and a new channel was being created. Beaver had also entered this newly flooded area and were creating a major trail through the habitat. *Spiranthes diluvialis* can tolerate periodic inundation (Ward and Naumann 1998), but it remains to be seen how the beaver-caused flooding at Warm Springs will affect *Spiranthes diluvialis* population numbers and distribution.

The only occurrence steadily increasing in observed *Spiranthes diluvialis* numbers each year since 1999 is Lower Swan Valley (Table 1). There have been no obvious changes to habitat conditions during this time and there is no observable explanation for this trend. The occurrence is on an island ungrazed by livestock, receives very light recreation use, and has relatively low density and cover of competitive tall forbs and exotic weeds (Table 2; Murphy 2001a, 2002). Woody vegetation, especially *Elaeagnus commutata*, has relatively high density at this occurrence, but heavy browsing by moose keep the cover and height of shrubs from excessively shading *Spiranthes diluvialis*.

Competing Vegetation and Noxious weeds: Competing woody vegetation, tall forbs, and invasive exotic species, combined with other ecological factors, may be causing declines in the observable *Spiranthes diluvialis* population at several occurrences (Murphy 2001a, 2002). For example, the Gormer Canyon #5 occurrence may be on its way to being extirpated because of competition with *Centaurea maculosa* and *Cirsium arvense* (Table 2). Dry surface soil conditions may also be a factor at this occurrence. Squaw Creek Islands also has degraded habitat conditions and is grazed during the late summer every year making surveys difficult (it may, however, only support *Spiranthes romanzoffiana*). At Twin Bridges Island, the Madison County park portion of the occurrence may be nearly extirpated, with zero *Spiranthes diluvialis* plants observed in 2002 (only one plant was observed in 2001 and zero in 1999 and 2000). The mainland sub-populations at Kelly's Island and Falls Campground may also be nearly extirpated. Although both of these sub-populations have exclosures to cattle grazing and browsing, zero *Spiranthes diluvialis* were observed within these exclosures in 2002. Only two plants were observed at Kelly's Island and zero at Falls Campground. Both of these occurrences have high levels of competing vegetation (e.g., *Sonchus arvensis* at Kelly's Island and shrubs at Falls Campground). Like many occurrences on the South Fork Snake River, Chester Wetlands had moderately high cover of noxious and invasive exotic weeds. *Sonchus arvensis* was the most common noxious weed and may pose a competitive threat. *Cirsium vulgare*, *C. arvense*, *Carduus acanthoides* (spiny plumeless thistle), and *C. nutans* (musk thistle) are also present.

Potential Relationships Between Streamflow, Climate, Soil Moisture Conditions, and Population Size -
The total number of observed *Spiranthes diluvialis* plants has decreased each year since high tallies in either 1997 or 1999 at Railroad Island, Twin Bridges Island (the main channel portion of the occurrence),

TNC Island, Lower Conant Valley, and Upper Conant Valley (where only one plant was observed in 2001 and zero observed in 2002). Importantly, the habitat at each of these occurrences is relatively undisturbed and in good to excellent condition (Table 2; Murphy 2001a, 2002). None are grazed by livestock and only TNC Island receives light trampling from recreationists each year (Table 2). While competition from invasive exotic weeds play a role at Railroad Island and TNC Island, and competition from woody vegetation is important at Railroad Island, there could be another, ecological factor, such as soil moisture, causing apparent long-term declines in observable *Spiranthes diluvialis* at all of the above occurrences.

One possible reason for a steady decline at these occurrences is that they are all located on moderately well-drained sandy soils that are only marginally moist enough to support *Spiranthes diluvialis*. These marginal sites may have benefited from being inundated for a long period of time during the June 1997 flood. Alternatively, deposition of new sand on top of formerly ideal *Spiranthes diluvialis* habitat may have decreased soil moisture conditions and lead to long-term population declines (Ward and Naumann 1998; Moseley 2000). Consecutive drought years, with lower than normal summer stream flows, may result in insufficient soil moisture for *Spiranthes diluvialis* to flower, causing plants to remain vegetative or dormant (Riedel 2002). In contrast, declines in the number of flowering individuals have also been observed in years with excessively cool and wet conditions through spring and early summer (Heidel 2001). According to available climate statistics from June 1997 to October 2002 for the Swan Valley and Rexburg weather stations (the nearest and most representative stations for the South Fork Snake River area), only in 1998 was the average temperature extremely cool and total precipitation extremely high (Idaho State Climate Service 2002). This may explain large decreases in observed *Spiranthes diluvialis* from 1997 totals at Falls Campground, Twin Bridges, Lower Conant Valley, and Upper Conant Valley. In contrast to 1998, average summer temperatures for 2000 to 2002 were slightly higher than normal and total summer precipitation slightly or very much below normal (especially in 2000 and 2001 at Rexburg).

Throughout the range of the species, the depth to water table during the growing season is often about 50 to 80 cm, but sometimes much less or more (depths over 80 cm have been observed in late summer) (Ward and Naumann 1998; Moseley 2000; Riedel 2002). On the South Fork Snake River, Moseley (2000) found that late August to early September streamflows on the South Fork Snake River of about 8,400 cfs at the Heise Gauge were sufficiently high enough to create about an 80 cm or less deep water table for all but one occurrence, Rattlesnake Point, of the 14 surveyed. Mean monthly streamflow statistics (U.S. Geological Survey 2002) for 1997 through 2002 on the South Fork Snake River during the main growing season of *Spiranthes diluvialis* (May through August) indicate that only during the extreme drought year of 2001 were August streamflows sufficiently low (6,879 cfs) to cause moisture stress at occurrences. Of the occurrences in decline with data on water table depth, Lower Conant Valley appears most vulnerable to moisture stress (Moseley 2000). Insufficient data on water table depth exists for Railroad Island and TNC Island. Twin Bridges Island and Upper Conant Valley are much less vulnerable to moisture stress. Mean monthly streamflows for June through August, 1997 to 2002, never dropped below 9,582 cfs on the South Fork Snake River. Even all April, May, and September mean streamflows for 1997 to 2000 were above 7,331 cfs (probably high enough to maintain sufficient moisture at most occurrences). Early and late season flows were lower than this in 2001, and possibly also in 2002. Late August and September surface soil moisture may be partly maintained by summer thunderstorm showers (although even these were diminished in 2001; Idaho State Climate Service 2002). Thus, in less severe drought years such as 1999, 2000, and 2002, insufficient soil moisture is probably not a limiting factor at *Spiranthes diluvialis* occurrences on the South Fork Snake River. Only during years with abnormally low summer streamflows, combined with drought (e.g., 2001), might soil moisture stress be a factor in observable population decline in 2001 at some occurrences (e.g., possibly Rattlesnake Point, Falls Campground, Mud Creek Bar, Lufkin Bottom, Pine Creek #5, and Lower Conant Valley).

Population Genetics: No changes from 1997-2001 status reports.

Reproductive Biology and Pollination Ecology: No major changes from 1997-2001 status reports. Potential insect pollinators of *Spiranthes diluvialis* observed on the South Fork Snake River in past years include either an Anthophoridae (Anthophorinae) or an Apidae (Bombinae) bee; a white butterfly, probably a member of the Pieridae family (*Pontia* species?); and a Red Admiral butterfly (*Vanessa atalanta*) (Murphy 2000, Murphy 2001b). Sympatric plants that concurrently bloom with *Spiranthes diluvialis* may influence the amount and diversity of insect pollinators in the community. During the last three years, the following species were observed flowering the same time as *Spiranthes diluvialis*: *Aster ascendens*, *Aster hesperius* (western lined aster), *Cirsium vulgare*, *Euthamia occidentalis* (western goldenrod), *Lactuca serriola*, *Medicago lupulina*, *Melilotus alba* (white sweetclover), *Ranunculus repens* (creeping buttercup), *Sonchus arvensis*, *Tanacetum vulgare* (common tansy), *Tragopogon dubius* (yellow salsify), *Trifolium pratense*, and *T. repens* (Murphy 2000). Of these, only the *Aster* species and *Euthamia occidentalis* are native.

Competition: No major changes from 1997-2001 status reports. Also see information in the “Population Size and Condition” section above and the “Land Use and Possible Threats” section below. Monitoring data from Colorado indicate that competition from both native and weedy exotic herbaceous species may be more important than previously thought in contributing to the decline of *Spiranthes diluvialis* populations (Allison 2001; Riedel 2002). For example, in the Colorado study, plots grazed by cattle and mowed for hay in the early summer (i.e., plots with the least competing vegetation) had the highest density of vegetative and flowering *Spiranthes diluvialis*.

Herbivory: No change from 1997-2001 status reports. Unlike in Colorado (Riedel 2002), we have not observed vole herbivory at *Spiranthes diluvialis* occurrences in Idaho.

Land Ownership and Management Responsibility: No major changes from 1997-2001 status reports. The new occurrence at Chester Wetlands (023) is owned by the Idaho Department of Fish and Game. In addition, the BLM purchased a conservation easement on the property that includes the mainland portion of the Black Canyon (022) occurrence. The property will remain in private ownership.

Land Use, Possible Threats, and Conservation Actions: Detailed information for each occurrence is found in the *Spiranthes diluvialis* occurrence records (Conservation Data Center 2002) and prior status reports. See also the “Population Size and Condition” section above. All occurrences, except Lower Conant Valley and Upper Conant Valley, are still threatened by either localized human activities (e.g., inappropriate cattle grazing, recreation, etc.) and/or noxious weed invasion. However, the magnitude of the threats is highly variable across the occurrences. Table 2 summarizes information for all the South Fork Snake River occurrences. The summary presented below also includes information from the second year of sampling 23 habitat monitoring transects located at each occurrence on public land along the South Fork Snake River. Information from the new Chester Wetlands occurrence is also included below.

Livestock Grazing - Late-season trespass cattle grazing occurred at Annis Island in 2002 (Table 2). Late-season grazing presents a short-term threat to *Spiranthes diluvialis* due to the increased chance of direct grazing and trampling of flowering plants and a long-term threat from potentially decreased reproduction (Heidel 2001). Cattle grazing complied with allotment season-of-use requirements at all other grazed occurrences in 2002. As a result, grazing disturbance during the *Spiranthes diluvialis* growing season was less than in 2001 at Warm Springs Bottom and Falls Campground. Additionally, the Rattlesnake Point and Chester Wetlands occurrences were rested from cattle grazing in 2002 (although cattle might have briefly traveled through Rattlesnake Point). In total, six occurrences were grazed by cattle in 2002. The BLM and the USFS performed grazing allotment compliance and monitoring inspections in 2002 to

ensure compliance with the permitted season of use. These agencies will continue these compliance inspections in 2003. If compliance with current livestock management plans is continued, cattle grazing is a negligible threat. In some situations grazing may reduce competing vegetation to the benefit of *Spiranthes diluvialis*. However, soil compaction and invasion by noxious weeds and unpalatable forbs, sometimes associated with cattle grazing, should be monitored as indirect threats to *Spiranthes diluvialis*.

Off-highway Vehicle Use - Recent OHV travel through *Spiranthes diluvialis* habitat was observed at Warm Springs Bottom, Annis Island and Twin Bridges Island. No trampled *Spiranthes diluvialis* were confirmed from this travel. At Warm Springs Bottom, two 4-wheelers drove through occupied habitat (within 2 m of *Spiranthes diluvialis* plants), but soil disturbance was limited to the wettest areas near the main spring channel crossing. At Twin Bridges Island, a 4-wheeler drove through a wetland adjacent to occupied *Spiranthes diluvialis* habitat behind the picnic pavilion on the Madison County park portion, causing damage to vegetation and soils. Unlike 2001, no recent OHV use was observed at Mud Creek Bar in 2002. The OHV barriers at Warm Springs Bottom and Mud Creek Bar were reconstructed in fall 2002. OHV tracks were also observed in the vicinity of the sub-population at Chester Wetlands near the Henrys Fork bank, but no tracks were observed within occupied habitat.

Noxious Weeds and Exotic Species - Invasion of *Spiranthes diluvialis* habitat by noxious weeds and other competitive exotic species (e.g., *Phalaris arundinacea* (reed canarygrass) and *Tanacetum vulgare*) remains a threat at nearly all occurrences. Since monitoring began in 1997, *Cirsium arvense* has been documented within occupied *Spiranthes diluvialis* habitat (i.e., within about 5 m of *Spiranthes diluvialis*) at all occurrences except TNC Island, Pine Creek #5, and Lower Conant Valley. *Sonchus arvensis* has been documented at all but the following occurrences: Rattlesnake Point, Annis Island (although it has been observed within about 100 m), Mud Creek Bar, TNC Island, Pine Creek #5, Lower Conant Valley, Upper Conant Valley, and Lower Swan Valley. In 2002, no new colonies of noxious weeds or other competitive exotic species, nor any major expansions of currently known colonies, were observed at any occurrences (Table 2). Slightly higher cover of *Cirsium arvense* and *Sonchus arvensis* was observed at Gormer Canyon #3, an occurrence annually disturbed by a heavily used wildlife trail. Slightly higher *Centaurea maculosa* cover was observed at Mud Creek Bar, possibly due to colonization of soils disturbed by human trampling in 2001. A potential relationship between high cover of noxious weeds and competitive exotic species and decreasing population trend was identified at the Kelly's Island, Falls Campground, Railroad Island, and TNC Island occurrences (Murphy 2001a, 2002). *Sonchus arvensis* cover is high at Kelly's Island and the island portion of Falls Campground, while *Phalaris arundinacea* cover is high at Railroad Island and TNC Island. Future habitat and population monitoring data will be used to identify any correlations, if they exist.

Invasion by noxious weeds and competitive exotic species is often symptomatic of soil disturbances. However, on the South Fork, moderate to high cover of noxious weeds was observed at occurrences annually disturbed by livestock grazing and recreation activities, as well as at undisturbed occurrences (Murphy 2001a, 2002). In addition, a flush of exotic weedy species, especially *Cirsium vulgare*, but also sometimes *Cirsium arvense*, is observed after summer cattle grazing is severely reduced or eliminated. Chester Wetlands also had moderately high cover of noxious and invasive exotic weeds. *Sonchus arvensis* was the most common noxious weed, occasionally with high cover, followed by *Cirsium vulgare*, *C. arvense*, *Carduus acanthoides*, and *C. nutans* in decreasing prominence. The response of noxious and invasive species to the elimination of cattle grazing in 2002 at this site will be monitored.

To slow or reverse the spread of noxious weeds on the South Fork Snake River, the BLM continued to release biological control agents in 2002. These releases supplemented prior releases of biological control agents for *Cirsium arvense*, *Centaurea maculosa*, and *Euphorbia esula* (leafy spurge) (Murphy 2000, 2001b). In 2002, *Aphthona flava*, *A. lacertosa*, and *A. nigriscutis* (Coleoptera: Chrysomelidae) were

released at Annis Island to control *Euphorbia esula* and *Cyphocleonus achates* (Coleoptera: Curculionidae) was released at Mud Creek Bar and Gormer Canyon #5 to control *Centaurea maculosa* (Table 2). In addition, the BLM released 19 other colonies of biological control insects along the South Fork Snake River from Swan Valley to the confluence with the Henrys Fork. The BLM will continue to release biological control agents along the South Fork in 2003, pending their availability.

Recreation - Minor recreation trails (used once, or only infrequently) traversing occupied *Spiranthes diluvialis* habitat were observed at Kelly's Island, Falls Campground, Railroad Island, Mud Creek Bar, and Squaw Creek Islands (Table 2). These trails resulted in trampled vegetation, but did not expose or compact soil. New campfire rings were observed within 10 m of occupied habitat at Rattlesnake Point, Lower Swan Valley, and Black Canyon (on the mainland portion of the occurrence). Future recreation activities at these occurrences will be monitored for impacts to *Spiranthes diluvialis* habitat. In addition, portions of the TNC Island and Lufkin Bottom occurrences experience annual trampling of habitat by campers, boaters, and anglers. Camping impacts and recreation use were slightly greater in 2002 than 2001 at Lufkin Bottom (Table 2; Murphy 2001a, 2002). Although human trails and campsites occur very close to *Spiranthes diluvialis* at all of the above occurrences, no trampled plants were observed in 2001 or 2002. In 2002, the BLM and USFS conducted 20 weekly to bi-weekly river patrols on the upper South Fork Snake River to maintain dispersed camp areas, ensure compliance with over night camping and sanitation regulations, and increase public education of river users. These patrols will continue in 2003. In addition, an educational kiosk will be established at the Conant Boat Access that will advise recreationists to avoid *Spiranthes diluvialis* occurrences.

Other Potential Threats - Landscape level threats, including floodplain alteration related to levee construction and maintenance; water diversions; road and bridge development; bank stabilization rip-rapping; channel dredging; and housing development, continue along the South Fork Snake and Henrys Fork Rivers. No new floodplain alteration projects or other threats directly impacting *Spiranthes diluvialis* were observed in 2002 (Murphy 2002). In 2002, the BLM Upper Snake/South Fork Snake River Land and Water Conservation Fund project acquired three conservation easements, totaling 1,510 acres, on private lands along the South Fork Snake River to prevent further subdivision and resort development. This included protection of the mainland portion of the Black Canyon occurrence. The BLM is currently negotiating three additional conservation easements, totaling about 1,000 acres, on private lands along the South Fork Snake River. Additionally, two acquisitions of property in fee-title are pending using Bonneville Power Administration Funds. Closure of these negotiations is dependent on FY2003 appropriations as well as land owner willingness.

ASSESSMENT AND RECOMMENDATIONS

General Assessment of Vigor, Trends, and Status: Assessment of the Idaho *Spiranthes diluvialis* meta-population is similar to previous status reports. While the total number of plants observed in the meta-population was the lowest since 1997, and over 2,000 plants less than the total in 2001, nearly all of the decrease was attributable to late-season trespass cattle grazing at Annis Island. Discounting Annis Island, the total number of plants observed at all other occurrences was only about 130 less than in 2001 (and nearly the same as in 1999). The total *Spiranthes diluvialis* plants observed decreased each of the last five years at Twin Bridges Island and each of the last three years at TNC Island. Only the Lower Swan Valley occurrence has increased each of the last three years. Overall habitat conditions are generally very good at this occurrence (Murphy 2002). Three occurrences have had zero observed plants for at least two consecutive years. Two of these occurrences (Gormer Canyon #5 and Squaw Creek Islands) possibly do not support any *Spiranthes diluvialis*. Based on population monitoring data since 1999, the largest, core occurrences on the South Fork Snake River are Annis Island, Warm Springs Bottom, Black Canyon, Lufkin Bottom, and Pine Creek #3 and #4. While all occurrences are important for overall meta-

population dynamics, these occurrences are probably the main sources for future colonization of new habitat by *Spiranthes diluvialis* on the South Fork Snake River. The addition of Chester Wetlands, with 433 *Spiranthes diluvialis* observed, is very important and valuable for the long-term recovery of the species in Idaho. It is one of the largest known occurrences in Idaho and it significantly expands the known range of *Spiranthes diluvialis* in Idaho.

Flow regime alteration by Palisades Dam, combined with floodplain development, represents a significant long-term threat to the viability of the South Fork Snake River meta-population (Moseley 2000; Murphy 2000, 2001b). Over time, channel migration may decrease soil moisture at existing *Spiranthes diluvialis* occurrences while also allowing encroachment of dense woody vegetation, both leading to decreases or elimination of *Spiranthes diluvialis* habitat. Periodic floods may be needed to set back woody vegetation succession and also create new landforms with fine sediments that are suitable for colonization by *Spiranthes diluvialis*. If the operation of Palisades Dam prevents or reduces these necessary high flows, then a decrease in the number and size of *Spiranthes diluvialis* occurrences might result. Currently, on a local scale, noxious weed invasion is the most imminent and serious threat to *Spiranthes diluvialis* on the South Fork Snake River (Table 2) and possibly also at Chester Wetlands on the Henrys Fork. Keeping the irrigation water rights necessary for maintaining the historic hydrologic regime at Chester Wetlands is an important issue at this occurrence. Impacts from cattle grazing, though much reduced, still occur (e.g., late season trespass grazing at Annis Island this year). Recreation use continues to increase on the South Fork Snake River and currently causes local impacts to *Spiranthes diluvialis* habitat (e.g., at Lufkin Bottom during most years).

Recommendation to the U.S. Fish and Wildlife Service: It is emphasized that information in this status report should be considered up to date for all Idaho *Spiranthes diluvialis* occurrences. The information in these status reports should be included in the updated rangewide status report currently being written by the USFWS.

Recent monitoring and research (e.g., Allison 2001; Heidel 2001; Murphy 2001a, 2002; Riedel 2002; and others), plus discovery of the new Chester Wetlands (023) occurrence on the Henrys Fork, have provided much useful information regarding *Spiranthes diluvialis* status, habitat characteristics and ecology, and response to land management actions. In addition, predictive modeling of potential *Spiranthes diluvialis* habitat in Idaho has been completed (Jankovsky-Jones and Graham 2001, 2002). Section 7 consultation guidelines for Idaho were revised in 2001. Based on new information in 2002, the Snake River Basin Office of the USFWS should consider another revision of the Section 7 consultation guidelines for Idaho. In addition, the Biological Assessment of the BLM and Caribou-Targhee National Forest's Snake River Activity/Operations Plan for *Spiranthes diluvialis* on the South Fork Snake River, developed in 1997 as required by Section 7 consultation, should be revised to reflect new monitoring and research information.

Recommendations to Upper Snake River District, Bureau of Land Management and the Caribou-Targhee National Forest: No change from 1997-2001 status reports. The proposed conservation actions by the BLM and USFS for 2003 are sufficient for the short-term conservation of *Spiranthes diluvialis* on the South Fork Snake River and should be implemented.

Recommendations to Idaho Department of Fish and Game: The City of Boulder, Colorado, Open Space and Mountain Parks owns land supporting *Spiranthes diluvialis* that is similar to the Chester Wetlands occurrence (a former cattle ranch now managed by the Idaho Department of Fish and Game for wildlife habitat). The City of Boulder park land also has a long history of cattle ranching, haying, and irrigation. After intensive monitoring of *Spiranthes diluvialis* population response to specific land management actions, the City of Boulder Open Space and Mountain Parks developed a management

regime beneficial to the persistence of *Spiranthes diluvialis* (Allison 2001; Riedel 2002). In *Spiranthes diluvialis* habitat at the Boulder parks, spring cattle grazing and/or prescribed fire is followed by early summer irrigation. In mid-summer (e.g., early July), the habitat is then mowed for hay. The goal is to reduce competition from woody vegetation, noxious weeds, and tall forbs and grasses in occupied *Spiranthes diluvialis* habitat. The land is not disturbed during the *Spiranthes diluvialis* growing season from mid/late July through September or early October. These actions are done carefully so as to avoid impacts to songbird or waterfowl breeding in the spring and early summer, as well as to avoid excessive scarification or compaction of moist soils that may lead to worsened noxious weed invasions. This example illustrates that a management regime for Chester Wetlands can be compatible with *Spiranthes diluvialis* conservation, habitat management goals, and Section 7 consultation requirements if planned and implemented properly. The response of *Spiranthes diluvialis* to any land management activities at Chester Wetlands must be monitored carefully each year.

Water rights must be maintained so that irrigation creating, in part, the hydrologic regime present on the ranch can continue. Water conservation projects, such as converting irrigation ditches to concrete, must be carefully planned because seepage from ditches appears to feed wetlands supporting *Spiranthes diluvialis* (especially at the sub-population near the Henrys Fork bank). Projects related to habitat restoration, such as dredging or filling ponds and wetland from their current extent, must also be analyzed for their impacts to wetlands supporting *Spiranthes diluvialis*.

Competition from noxious weeds may pose a significant threat to *Spiranthes diluvialis* at Chester Wetlands. The release of biological control agents for *Cirsium arvense* and *Carduus* species should be considered. Finally, it is important to note that not every area with the potential to support *Spiranthes diluvialis* was surveyed at the Chester Wetlands site in 2002. The remainder of the Chester Wetlands site should be surveyed in 2003. Other unsurveyed potential habitat owned and/or managed by the Idaho Fish and Game in the Henrys Fork basin (e.g., Cartier Slough, Warm Slough, and Sand Creek Wildlife Management Areas) should also be inventoried.

Recommendations to the Heritage Network: No change from 1997-2001 status reports.

Recommendations Regarding Present or Anticipated Activities: No change from 1997-2001 status reports.

MONITORING WORK—2002 AND 2003

In 2001 a systematic, easily repeatable method for objectively measuring changes and threats to the habitat of *Spiranthes diluvialis* was developed, tested, and implemented. Twenty-three permanent habitat monitoring transects were established at 18 occurrences on public land in 2001. In 2002, one additional transect was established and sampled at Annis Island. Twenty-two of 23 transects established in 2001 were also re-sampled. The complete methods, results, and discussion for 2001 are found in “Monitoring Ute ladies’ tresses (*Spiranthes diluvialis*) habitat on the South Fork Snake River, Idaho—First year results” (Murphy 2001a). Results from 2002 are found in Murphy (2002). The data collected provide a reference point for annually measuring future environmental change at both the population and landscape levels. An “index of habitat change” method was used that involves the measurement of specific habitat attributes important to *Spiranthes diluvialis*. The index integrates what we have learned about *Spiranthes diluvialis* habitat from prior vegetation sampling, monitoring, and floodplain dynamics research. Habitat attribute measurement uses a relative scale that yields cumulative values representing current habitat conditions at each transect. The cumulative values change if conditions change. Much of the information collected in 2001 and 2002 was incorporated in the “Population Biology” section of this status report.

Habitat and population monitoring oriented toward *Spiranthes diluvialis* conservation will continue along the South Fork of the Snake River in 2003, funded by the BLM and Caribou-Targhee National Forest. Re-sampling habitat monitoring transects (and possibly establishing a few more in under-represented habitats) and measurement of *Spiranthes diluvialis* population levels will continue. In addition, permanent vegetation monitoring transects and photo-points will be re-sampled at the Warm Springs Bottom and Black Canyon occurrences.

REFERENCES

- Allison, T. D. 2001. *Spiranthes diluvialis*: an evaluation of treatment effects and survey results. Prepared for City of Boulder, Department of Open Space and Mountain Parks. 26 pp.
- Conservation Data Center, Idaho Department of Fish and Game. 2002. Element Occurrence database for *Spiranthes diluvialis*. Boise.
- Heidel, B. 2001. Monitoring Ute ladies' tresses (*Spiranthes diluvialis*), in Jefferson County, Montana, 1996-2000. Prepared for Montana State Office and Butte Field Office BLM. Montana Natural Heritage Program, Helena. 10 pp. plus appendices.
- Idaho State Climate Services. 2002. State Climate Services Website. Climate data available online at <http://snow.ag.uidaho.edu/index.html>. Biological and Agricultural Engineering Department, University of Idaho, Moscow.
- Jankovsky-Jones, M., and D. Graham. 2001. Predicting the distribution of potential habitat for *Spiranthes diluvialis* on National Forests in Idaho by fifth field watersheds: Phase 3 – Develop a Predictive Model. Prepared for U. S. Department of Agriculture, Forest Service. Conservation Data Center, Idaho Department of Fish and Game, Boise. 5 pp. plus appendices and GIS files.
- Jankovsky-Jones, M., and D. Graham. 2002. Predicting the distribution of potential habitat for *Spiranthes diluvialis* in Idaho by fifth field watersheds. Prepared for Idaho Department of Transportation. Conservation Data Center, Idaho Department of Fish and Game, Boise. GIS files.
- Mancuso, M. 2000. Field investigation for *Spiranthes diluvialis* (Ute ladies' tresses) on BLM lands managed by the Shoshone Field Office, south-central Idaho. Prepared for Upper Snake River District BLM. Conservation Data Center, Idaho Department of Fish and Game, Boise. 12 pp. plus appendices.
- Moseley, R. K. 1997. 1997 Ute ladies' tresses (*Spiranthes diluvialis*) inventory: Snake River corridor and other selected areas. Prepared for Upper Snake River District BLM. Conservation Data Center, Idaho Department of Fish and Game, Boise. 18 pp. plus appendices.
- Moseley, R. K. 1998a. Ute ladies' tresses (*Spiranthes diluvialis*) in Idaho: 1997 status report. Prepared for Idaho Department of Parks and Recreation. Conservation Data Center, Idaho Department of Fish and Game, Boise, Boise. 35 pp. plus appendices.
- Moseley, R. K. 1998b. Ute ladies' tresses (*Spiranthes diluvialis*) in Idaho: 1998 status report. Prepared for Idaho Department of Parks and Recreation. Conservation Data Center, Idaho Department of Fish and Game, Boise. 23 pp. plus appendices.
- Moseley, R. K. 1999a. 1998 Inventories for Ute ladies' tresses in Idaho. Conservation Data Center, Idaho Department of Fish and Game, Boise. 7 pp.
- Moseley, R. K. 1999b. Predicting the distribution of potential habitat for *Spiranthes diluvialis* on National Forests in Idaho: Phase 1 – Habitat profile. Prepared for U. S. Department of Agriculture, Forest Service. Conservation Data Center, Idaho Department of Fish and Game, Boise. 14 pp. plus appendices.
- Moseley, R. K. 2000. Ute ladies' tresses (*Spiranthes diluvialis*) in Idaho: 1999 status report. Prepared for

- Upper Snake River District BLM and Targhee National Forest. Conservation Data Center, Idaho Department of Fish and Game, Boise. 16 pp. plus appendices.
- Murphy, C. J. 2000. Ute ladies' tresses (*Spiranthes diluvialis*) in Idaho: 2000 status report. Prepared for Upper Snake River District BLM and Targhee National Forest. Conservation Data Center, Idaho Department of Fish and Game, Boise. 20 pp. plus appendix.
- Murphy, C. J. 2001a. Monitoring Ute ladies' tresses (*Spiranthes diluvialis*) habitat on the South Fork Snake River, Idaho—First year results. Prepared for Upper Snake River District BLM and Caribou-Targhee National Forest. Conservation Data Center, Idaho Department of Fish and Game, Boise. 19 pp. plus appendices.
- Murphy, C. J. 2001b. Ute ladies' tresses (*Spiranthes diluvialis*) in Idaho: 2001 status report. Prepared for Upper Snake River District BLM and Caribou-Targhee National Forest. Conservation Data Center, Idaho Department of Fish and Game, Boise. 23 pp.
- Murphy, C. J. 2002 (in progress). Monitoring Ute ladies' tresses (*Spiranthes diluvialis*) habitat on the South Fork Snake River, Idaho—Second year results. Prepared for Upper Snake River District BLM and Caribou-Targhee National Forest. Conservation Data Center, Idaho Department of Fish and Game, Boise.
- NatureServe 2002. Draft element occurrence data standard: February 6, 2002. Available online at <http://whiteoak.natureserve.org/eodraft/index.htm>. NatureServe in cooperation with the Network of Natural Heritage Programs and Conservation Data Centers.
- Riedel, L. 2002. *Spiranthes diluvialis* update: Habitat, conservation issues, and monitoring City of Boulder Open Space and Mountain Parks, Boulder, Colorado. Prepared for U. S. Fish and Wildlife Service *Spiranthes diluvialis* Recovery Team meeting in Salt Lake City Utah, November 2002, by City of Boulder, Department of Open Space and Mountain Parks, Boulder. 7 pp.
- U.S. Geological Survey. 2002. National Water Information System Web Site. Streamflow data available online at <http://waterdata.usgs.gov/nwis>. U.S. Department of Interior, Geological Survey, Water Resources.
- Ward, J., and T. Naumann. 1998. Ute ladies' -tresses orchid (*Spiranthes diluvialis* Sheviak) inventory, Dinosaur National Monument and Browns Park National Wildlife Refuge, 1998. Prepared for National Park Service, Dinosaur National Monument, and U. S. Fish and Wildlife Service, Browns Park National Wildlife Refuge, Colorado. 27 pp. plus appendices.

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