

2000 Survey of BLM-Managed Public Lands  
in Southwestern Wyoming  
for  
Ute Ladies Tresses (*Spiranthes diluvialis*)  
and for Designated Weeds

Report Prepared for the BLM Rock Springs Field Office  
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## ABSTRACT

The Ute ladies tresses (*Spiranthes diluvialis*), an orchid listed as Threatened under the Endangered Species Act, is known to occur in the Uinta Basin of northeastern Utah. Earlier examinations of public lands in nearby southwestern Wyoming had indicated that habitat suitable for the species may be present there as well. An intensive 1999 survey of streams on public lands in the Red Creek Basin and the Henry's Fork Basin of Wyoming (Jones 2000) for *S. diluvialis* failed to find the plant. Intensive survey in 2000 in the Little Dry Creek and Lane Meadows Creek drainages west of Flaming Gorge and the Spring Creek and West Spring Creek drainages east of Flaming Gorge (this report) also failed to find the plant. Habitat for the species appears to be limited by morphology of the stream channels, lack of water, high salt content, and elevation. During these surveys, 10 species of designated noxious weeds were found. Of these, perennial sowthistle (*Sonchus* sp.) and Canada thistle (*Cirsium arvense*) are widespread and abundant; tamarisk (*Tamarix chinensis*) and quackgrass (*Elymus repens*) are widespread but less common; and six species -- musk thistle (*Carduus nutans*), common burdock (*Arctium minus*), plumeless thistle (*Carduus acanthoides*), field bindweed (*Convolvulus arvensis*), hoary cress (or whitetop, *Cardaria pubescens*), and perennail pepperweed (or giant whitetop, *Lepidium latifolium*) -- appear to be localized and uncommon.

## BACKGROUND

*Spiranthes diluvialis* (Ute ladies tresses), a perennial species in the orchid family (Orchidaceae), is listed as Threatened under the U.S. Endangered Species Act. *S. diluvialis* grows in riparian meadows and shrublands, sometimes within a matrix of cottonwood woodland (Moseley 1997), at low elevations in the western U.S., including the Uinta Basin of northeastern Utah (Utah Division of Wildlife Resources 1998). In April of 1999, the Bureau of Land Management's Wyoming State Office and the University of Wyoming entered a cooperative agreement for the University's Wyoming Natural Diversity Database (WYNDD) to search for *S. diluvialis* on public lands in southwestern Wyoming. This cooperative agreement also required WYNDD to document the distribution of plant species on Wyoming's designated weed list (Wyoming Department of Agriculture 1999) encountered during the survey. George Jones of the WYNDD staff conducted the first part of the search from August 13 - 17 and August 22 - 25, 1999, in the Red Creek Basin east of Flaming Gorge Reservoir and in the Henry's Fork drainage west of Flaming Gorge (Figures 1 and 2). The results of that search, during which *S. diluvialis* was not found, are reported in Jones (2000). Jones searched two additional areas August 18 - 20, 2000 (Figures 1 and 2), and the results of that search are reported herein.

## METHODS

The methods used during the 2000 search were the same as those used during the 1999 search (Jones 2000). The author consulted botanists familiar with *Spiranthes diluvialis*, examined living *S. diluvialis* and herbarium specimens, and reviewed selected reports, to learn the characteristics that distinguish the species from *Spiranthes romanzoffiana* and from *Habenaria* sp. Likely habitat to be searched was characterized, from habitat descriptions in various reports, by these features: moist soil, absence of a dense shrub layer or a dense herbaceous layer (>80% canopy cover) taller than roughly 25 cm, presence of herbaceous vegetation in which *Agrostis stolonifera*, *Juncus* spp., and *Carex* spp. (other than *C. nebrascensis*, *C. aquatilis*, and *C. rostrata* [syn. *C. utriculata*]) contributed a substantial amount of canopy cover, and a location that seemed to be inundated or have a high water table part of the year but not severely scoured. In contrast, the following characteristics were judged to indicate areas unlikely to support *S. diluvialis*: vegetation with a dense shrub layer or a dense herbaceous layer (either > 80% canopy cover) taller than 25 cm; vegetation in which *Agrostis stolonifera*, *Juncus* spp., and *Carex* spp. contributed less cover than did other species, water on surface, and bare or nearly-bare sediment bars that obviously are scoured by high water.

In the field, the author walked through areas of likely habitat at a rate of approximately 5 feet/second, scanning the vegetation for light-colored blossoms or buds or wilted flowers. Areas of apparently unlikely habitat were searched more rapidly. In all of the areas surveyed, notes were made about the substrate, size and entrenchment of the channel, evidence of disturbance, composition of the vegetation, and abundance and distribution of weeds. On most of the streams, the character of the channel and the pattern of the vegetation differed from one segment to another, so the notes were made for stream segments rather than for the entire stream. In some cases, boundaries between

adjacent segments were located where the channel or the vegetation changed in some obvious way. In other cases, stream segments were separated by tracts of private or state land.

## RESULTS

The stream segments searched and other locations visited are shown in Figures 1 and 2, and detailed information about each segment and location is given in Appendix 1.

### SPIRANTHES DILUVALIS

No *S. diluvalis* or plants suspected to be *S. diluvalis* were found during the survey. West of Flaming Gorge, of the 9 locations and stream segments surveyed (Figure 1), only segment LM3 appeared to have habitat that might be suitable for the species. At the others, the stream channels were dry, or lacked the mesic meadows that seem to constitute suitable habitat. Salt stains were common along streams with wet channels.

In contrast, the Spring Creek drainage east of Flaming Gorge (Figure 2) appears to contain a substantial amount of habitat that is too wet for *S. diluvalis*. Spring Creek and West Spring Creek flow in narrow, deep gullies that have water across much of their bottoms (segments S1, S2, S4, S5, WS1a). Salt stains are present on the drier parts of gully bottoms and lower gully sides (segments S1, S2, S3, S4, S6). The upper parts of Spring Creek (segments S7 and S8, location S9) are at higher elevations than *S. diluvalis* has been found in nearby Utah. Segment S6 along Spring Creek appears to contain the most likely habitat for *S. diluvalis*.

### WEEDS

Seven plant species listed as noxious weeds in Wyoming (Wyoming Department of Agriculture 1999) were noted during the 2000 survey (Table 1). Of the 16 stream segments and locations surveyed at which water or moist soils were present, 14 support listed noxious weeds. Canada thistle (*Cirsium arvense*) is the most widespread of those weeds, growing west and east of Flaming Gorge (Appendix 2). This rhizomatous plant grows in patches of up to ca. 50 sq m, mostly on the drier parts of gully bottoms and on lower gully sides. Perennial sowthistle (*Sonchus* sp.) is abundant on Spring Creek east of Flaming Gorge. Hoary cress (*Cardaria* spp.) and tamarisk (*Tamarix* spp.) are widespread but uncommon, occurring both east and west of Flaming Gorge in small amounts. Musk thistle (*Carduus nutans*), quackgrass (*Elymus repens*), and perennial pepperweed (or giant whitetop, *Lepidium latifolium*) were noted only along Spring Creek and West Spring Creek east of Flaming Gorge.

## DISCUSSION

Likely habitat for *Spiranthes diluvalis* appears to be all but absent from the Little Dry Creek drainage, where most streams are intermittent and lack riparian zones. Most of the Lane Meadows Creek drainage, too, appears to be too dry to support this species.

Spring Creek and West Spring Creek, east of Flaming Gorge, are wetter, but likely habitat seems to be limited there as well. Both of these streams flow through deep, narrow gullies, where saturated soils and surface water are common. Salt stains, which

may indicate unsuitable habitat for *S. diluvialis* (Ben Franklin, Utah Natural Heritage Program, personal communication), were present on 5 of the 11 segments surveyed on these streams. The upstream portions of Spring Creek, above 7,000 feet elevation (Table 2), may be too high for *S. diluvialis*: the highest occurrence known in Utah is found at approximately 7,000 feet (Ben Franklin, Utah Natural Heritage Program, personal communication).

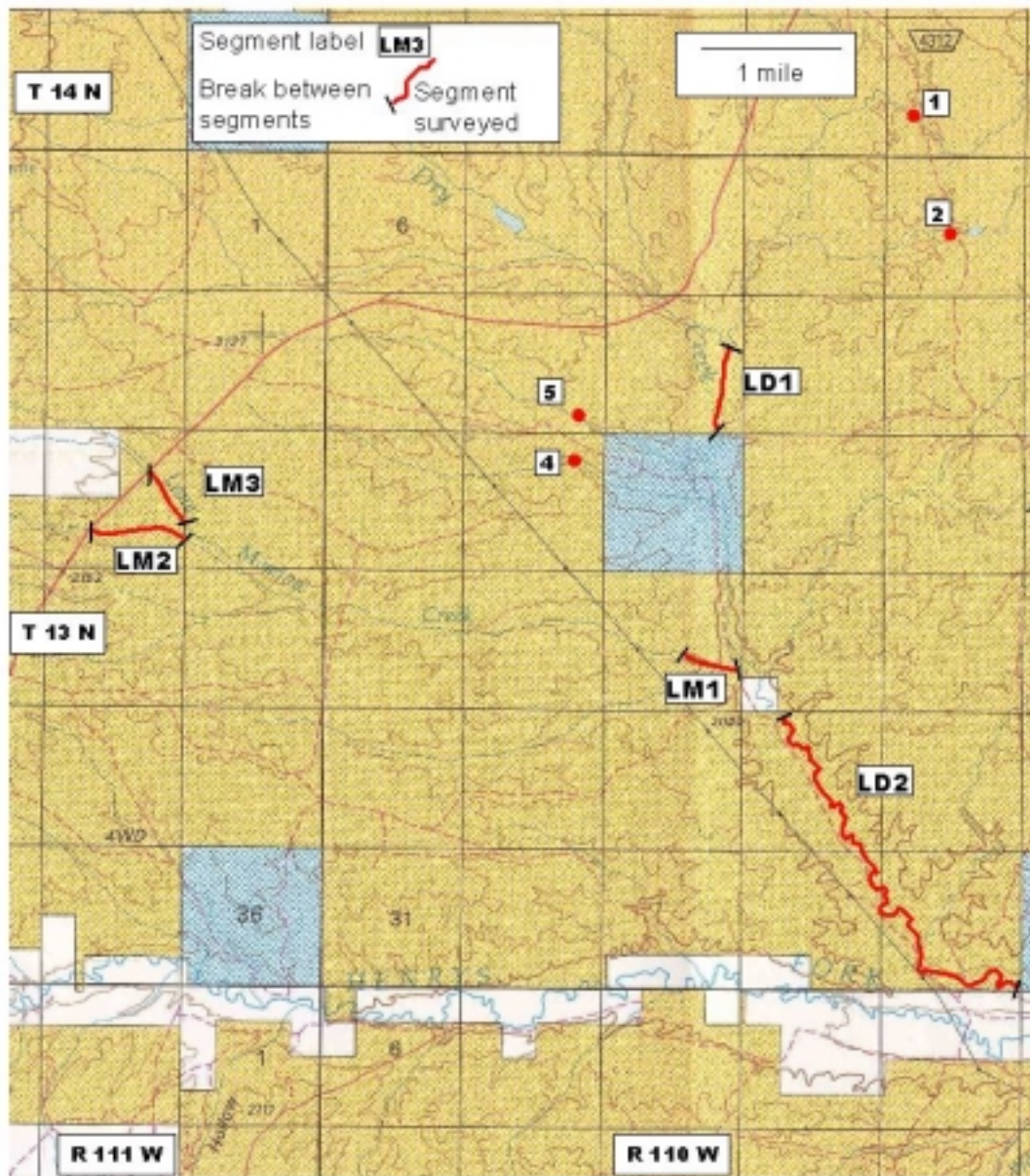
The results of the 2000 survey of these streams, combined with the results of the 1999 survey (Jones 2000), suggest strongly that the amount of habitat suitable for *Spiranthes diluvialis* on public lands in the Flaming Gorge region is limited by lack of water, high salt content of alluvium and water, morphology of stream channels, and high elevation. Additional survey on the streams searched in 2000 (Little Dry Creek, Lane Meadows Creek, Spring Creek, and West Spring Creek) and the streams searched in 1999 seems unwarranted

## REFERENCES

- Jones, George P. 2000. 1999 survey of BLM-managed public lands in southwestern Wyoming for Ute Ladies Tresses (*Spiranthes diluvialis*) and for designated weeds. Unpublished report prepared for the BLM Rock Springs Field Office by the Wyoming Natural Diversity Database. 53 pp.
- Moseley, Robert. 1997. Ute ladies tresses (*Spiranthes diluvialis*) inventory: Snake River corridor and selected other areas. Unpublished report prepared for the Upper Snake River Districts, Bureau of Land Management by the Conservation Data Center, Idaho Department of Fish and Game, Boise ID. 18 pp. + appendices.
- Utah Division of Wildlife Resources. 1998. Endemic and rare plants of Utah: an overview of their distribution and status. Prepared for the Utah Reclamation Mitigation and Conservation Commission and the U.S. Department of Energy under Cooperative Agreement No. UC-95-0015, Section V.A.10.a. 696 pp.
- Wyoming Department of Agriculture. 1999. Wyoming weed and pest control act designated list. Wyoming Department of Agriculture, Cheyenne WY. Updated January 6, 1999.

**Figure 1. Streams and locations surveyed in 2000, west of Flaming Gorge.**

Base is Firehole Canyon 1:100,000 quad, BLM Edition - 1999





**Figure 2. Streams and locations surveyed in 2000, east of Flaming Gorge.**

Base is Firehole Canyon 1:100,000 quad, BLM Edition - 1999

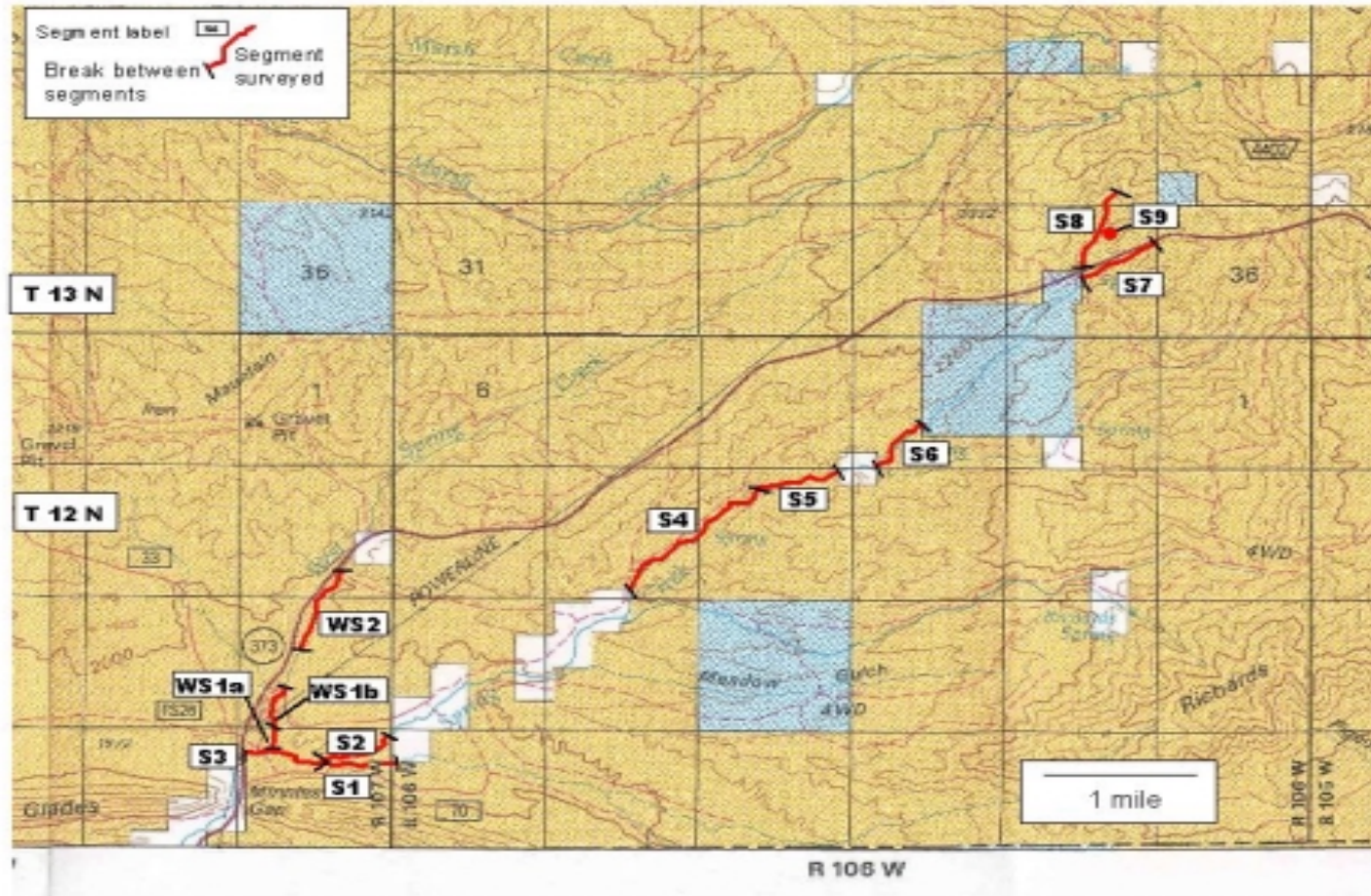




TABLE 1. DESIGNATED NOXIOUS OR PROHIBITED WEEDS FOUND IN THE 1999 AND 2000 SURVEYS

Except where otherwise noted, the names are those given on Wyoming's designated list (Wyoming Department of Agriculture 1999). Species were found in both years unless indicated otherwise.

SCIENTIFIC NAME	COMMON NAME
<i>Arctium minus</i> (1999 only)	Common burdock
<i>Carduus acanthoides</i> <sup>(1)</sup>	Plumeless thistle
<i>Carduus nutans</i>	Musk thistle
<i>Cardaria pubescens</i>	Hoary cress, Whitetop
<i>Cirsium arvense</i>	Canada thistle
<i>Convolvulus arvensis</i> (1999 only)	Field bindweed
<i>Elymus repens</i> ( <i>Agropyron repens</i> ) <sup>(2)</sup>	Quackgrass
<i>Lepidium latifolium</i> (2000 only)	Perennial pepperweed, Giant whitetop
<i>Sonchus arvensis</i> (and <i>S. uliginosus</i> ) <sup>(3)</sup>	Perennial sowthistle
<i>Tamarix</i> spp. ( <i>T. chinensis</i> , <i>T. ramosissima</i> , <i>T. parviflora</i> ) <sup>(4)</sup>	Tamarisk, Salt cedar

(1) The identification of *Carduus acanthoides* is tentative. The species was unknown from Sweetwater County prior to this project, and no voucher specimen was collected.

(2) The scientific name on the state list is *Agropyron repens*, but Dorn (1992) uses *Elymus repens*.

(3) The state list includes only *S. arvensis*. Dorn (1992) lists a second perennial sowthistle, *S. uliginosus* Bieb. Whitson et al. (1991) note that *S. arvensis* and *S. uliginosus* are very similar to each other morphologically and ecologically, and they consider *S. uliginosus* to be a subspecies of *S. arvensis*, *S. arvensis* L. ssp. *uliginosus* (Bieb.) Neiman.

(4) Dorn (1992) recognizes only *T. chinensis* from Wyoming.

TABLE 2. ELEVATIONS OF STREAM SEGMENTS AND LOCATIONS SURVEYED DURING 2000.

Elevations were estimated from 1:24,000-scale topographic maps.

STREAM SEGMENT OR LOCATION	ELEVATION (FEET)
<b>LITTLE DRY CREEK BASIN</b>	
Locations 1, 2, 4, and 5	6700 - 6860
LD1	6600 - 6640
LD2	6410 - 6500
<b>LANE MEADOWS CREEK</b>	
LM1	6580 - 6650
LM2	6960 - 7000
LM3	6960 - 6980
<b>SPRING CREEK</b>	
S1	6400
S2	6400
S3	6380
S4	6650 - 6830
S5	6830 - 6960
S6	7000 - 7090
S7	7520 - 7720
S8	7520 - 7920
Location S9	7640
<b>WEST SPRING CREEK</b>	
WS1a	6360
WS1b	6400
WS2	6440 - 6560

## APPENDIX 1: DESCRIPTIONS OF STREAM SEGMENTS

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Brief descriptions are given here of the physical environment and the vegetation along the streams surveyed in 2000, to show where likely habitat occurs. On most of the streams, the character of the channel and the pattern of the vegetation differs from one segment to another, so the descriptions were made for stream segments rather than for the entire stream. Notes were also made on the distribution and abundance of weeds in each stream segment.

Stream segments were delimited in the field. In most cases, boundaries between adjacent segments were located where the channel or the vegetation changed in some obvious way. Figures 1 and 2 show the locations of the stream segments. Except where noted, these descriptions were made from survey on foot.

### WEST SIDE OF FLAMING GORGE

#### LITTLE DRY CREEK BASIN

**Location 1. Intermittent stream west of Black Mountain.** Ca. 20 m of stream observed from truck at crossing of 2-track road in SW1/4 of SW1/4 Section 35, T14N, R110W. Elevation 6,860 feet. Surveyed August 18, 2000.

*Spiranthes diluvialis?* No

Physical environment: Channel 1 to 2 m wide, unvegetated channel bottom and bars, dry at time of survey.

Vegetation: No riparian or wetland species. Scattered *Artemisia tridentata* ssp. *wyomingensis* and upland grasses.

Weeds: None

**Location 2. Intermittent stream west of Black Mountain.** Ca. 20 m of stream observed from truck at crossing of 2-track road in NW1/4 of SE1/4 Section 2, T13N, R110W. Elevation 6,860 feet. Surveyed August 18, 2000.

*Spiranthes diluvialis?* No

Physical environment: Channel 1 to 2 m wide, unvegetated channel bottom and bars, dry at time of survey.

Vegetation: No riparian or wetland species. Scattered *Artemisia tridentata* ssp. *wyomingensis* and upland grasses.

Weeds: None

**Location 4. Intermittent stream west of Little Dry Creek.** Ca. 50 m of stream walked in NE1/4 of NE1/4 Section 17, T13N, R110W. Elevation 6,700 feet. Surveyed August 18, 2000.

*Spiranthes diluvialis?* No

Physical environment: Channel 1 to 2 m wide, dry at time of survey.

Vegetation: No riparian or wetland species. Scattered *Chrysothamnus nauseosus*.

Weeds: None

**Location 5. Intermittent stream downstream from Middle Reservoir, west of Little Dry Creek.** Ca. 50 m of stream in SE1/4 of SE1/4 Section 8, T13N, R110W, observed through binoculars from truck on 2-track road along ridge ca. 300 m to south. Elevation 6,700 feet. Surveyed August 18, 2000.

*Spiranthes diluvialis?* No

Physical environment: Channel 1 to 2 m wide, dry at time of survey.

Vegetation: No riparian or wetland species.

Weeds: No observations.

#### LITTLE DRY CREEK

**Segment LD1.** From mouth of western tributary in NE1/4 of NE1/4 Sec 16, upstream ca. 0.25 mile to mouth of another western tributary in SE1/4 of SE1/4 Section 9, T13N, R110W. Elevation 6600 to 6640 feet. Surveyed August 18, 2000.

*Spiranthes diluvialis?* No

Physical environment: Channel 10 m wide, 1 - 2 m below valley floor, with sand, gravel, and cobbles. Downstream half (on Section 16) with water in most of channel, upstream half (Section 9) with water only in scattered pools. Salt stains in channel and floodplain.

Vegetation: Scattered bunchgrass in channel; *Chrysothamnus nauseosus*, *C. linifolius* on 1st surface, sometimes with *Distichlis stricta* and *Iva axillaris*.

Weeds:

*Cardaria* was present on state land (Section 16)

**Segment LD2.** From mouth of western tributary (Silt Reservoir tributary) in SE1/4 of NW1/4 Section 27 downstream to private land in SE1/4 Section 35, T 13N, R 110W. Elevation 6500 - 6410 feet. Surveyed August 18, 2001.

*Spiranthes diluvialis?* No

Physical environment: Channel 3 - 10 m wide, 1.5 - 2 m below valley floor, dry. Alluvium of fines, gravel, cobbles. Salt stains on alluvium in channel. Channel dry except for stretch of ca. 50 m with water in NE1/4 of SE1/4 Section 35.

Vegetation: Most of valley bottom is *Sarcobatus vermiculatus*, *Chrysothamnus linifolius*, and *Artemisia tridentata* ssp. *tridentata* with *Distichlis stricta*. Patches of *Distichlis stricta* and *Juncus balticus* herbaceous vegetation present. Channel bottom has patches of *Iva axillaris*, *Chrysothamnus* spp., and *Artemisia tridentata* ssp. *tridentata*. Downstream from Section 34/35 line, *Populus angustifolia* becomes common, mostly  $\leq 25$  cm" dbh and ca. 7 m tall. Suckers are present in channel (most browsed), and dead trees (standing and fallen) are common. In most trees, much of canopy is dead.

Weeds: *Tamarix chinensis* present, 1 shrub < 1 meter tall and one patch of seedlings to 0.5 meter tall in NE1/4 of NE1/4 Section 34.

#### LANE MEADOW CREEK

**Segment LM1.** From mouth of creek upstream ca. 0.25 mile, in SE1/4 Section 21, T13N, R110W. Elevation ca. 6550 to 6580 feet. Surveyed August 19, 2001.

*Spiranthes diluvialis?* No

Physical environment: Channel 2 - 3 m wide, entrenched 1.5 - 2 m. Dry. Alluvium of sand, gravel, and cobbles.

Vegetation: Along edge of channel and on bars, *Chrysothamnus linifolius*, *Lupinus* sp., *Artemisia tridentata* ssp. *tridentata*. *Rosa* sp. present in places.

Weeds: None observed

**Segment LM2.** Ca. 0.25 mile of southern branch of stream immediately downstream from paved county road, in NE1/4 and SE1/4 Section 14, T13N, R111W. Elevation 6960 - 7000 feet. Surveyed August 19, 2001.

*Spiranthes diluvialis?* No

Physical environment: Channel 2 - 2.5 m wide, entrenched 2 - 2.5 m in places and on valley floor in others.

Vegetation: In most of area, shrub vegetation of *Sarcobatus vermiculatus* and *Artemisia tridentata* ssp. *tridentata* with *Chrysothamnus nauseosus* and *C. viscidiflorus*, and an undergrowth of *Elymus smithii* and *Distichlis stricta*. In places, *Elymus smithii* forms meadows up to ca. 1000 square m, with dry soil surface. Grazed throughout.

Weeds:

*Cirsium arvense* present, 5 or 6 stems, grazed to < 6" tall.

**Segment LM3.** Ca. 0.25 mile of northern branch of stream immediately downstream from paved county road, in NE1/4 Section 14, T13N, R111W. Elevation 6960 - 6980 feet. Surveyed August 19, 2001

*Spiranthes diluvialis?* No

Physical environment: Channel in gully 2 m wide at bottom and as deep as 3 m.

Vegetation: Channel bottom has scattered *Potentilla anserina* and *Iva axillaris* with *Juncus balticus*; cover < 5%. Gully sides have *Chrysothamnus nauseosus* and *Artemisia tridentata* ssp. *wyomingensis*; most of valley bottom is *Sarcobatus vermiculatus*, *A. tridentata* ssp. *wyomingensis*, *Elymus smithii*, and *Poa secunda*.

Weeds: None observed

EAST SIDE OF FLAMING GORGE

SPRING CREEK

**Segment S1.** Near Minnie's Gap. From confluence of two branches upstream along southern branch ca. 0.25 mile to boundary with private land. NE1/4 Section 24, T 12N, R 107W. Elevation ca. 6400 feet. Surveyed August 19, 2001.

*Spiranthes diluvialis?* No

Physical environment: Gully 3 m deep, up to 10 m wide. Water flows across much of gully bottom in some of segment, and in discrete channel ca. 0.25 meter wide in other parts. Salt stains are common on lower gully sides.

Vegetation: Gully bottom is thick herbaceous vegetation (ca. 80% canopy cover), 0.5 meter tall, of *Carex aquatilis*, *Hordeum brachyantherum*, *Eleocharis* sp.; *Typha* sp. patches are present. Dense litter covers soil surface. Lower gully sides are *Sonchus* sp., *Chrysothamnus linifolius*, some *Sarcobatus vermiculatus* and *Artemisia tridentata* ssp. *tridentata*.

Weeds:

*Sonchus* sp. grows in a nearly continuous fringe along the bases of the gully walls. *Cardaria* sp. is present; 2 plants noted high on gully side near downstream end of segment.



**Segment S2.** Near Minnie's Gap. From confluence of two branches upstream along northern branch ca. 0.25 mile to boundary with private land. NE1/4 Section 24, T 12N, R 107W. Elevation ca. 6400 feet. Surveyed August 19, 2001.

*Spiranthes diluvialis*? No

Physical environment: Stream flows in gully 2 - 3 m deep and 7 m wide at bottom. Soil on bottom is wet and water stands on surface in places. Salt stains are uncommon on gully sides.

Vegetation: Gully bottom is dense (100% canopy cover) wet meadow of *Agrostis stolonifera*, *Juncus balticus*, *Carex aquatilis*, *Eleocharis* sp., *Equisetum* spp., *Ranunculus cymbalaria*, *Triglochin* sp., with patches of *Scirpus* spp. and *Typha* sp. Gully sides are *Chrysothamnus linifolius*, *Artemisia tridentata* ssp. *tridentata*, *Sonchus* sp., *Melilotus officinalis*.

Weeds:

*Sonchus* sp. common throughout, at bases of gully sides and in drier spots on gully bottom.

*Cirsium arvense* was noted in two patches, each < 10 plants.

*Tamarix chinensis*: two shrubs 2.5 m tall were noted on gully sides.

*Elymus repens*: two patches were noted, each ca. 5 square m

**Segment S3.** Near Minnie's Gap. From confluence of two branches downstream ca. 0.25 mile to highway. W1/2 of NE1/4 and NW1/4 Section 24, T 12N, R 107W. Elevation ca. 6380 feet. Surveyed August 19, 2001

*Spiranthes diluvialis*? No

Physical environment: Channel  $\leq$  1 meter wide, in gully 2.5 m deep and 10 m wide. Terraces are present in gully, to 1 meter above channel. Salt stains are common on gully sides and drier spots in gully bottom.

Vegetation: Wettest area along channel supports wet meadow of *Carex aquatilis*, *Eleocharis* sp., *Juncus balticus*, and *Scirpus* sp. (probably *S. pungens*), with patches of taller *Scirpus* sp. Slightly drier areas (but still wet) have *Juncus balticus* with *Carex aquatilis*, *Triglochin* sp., and *Potentilla anserina*. Low terraces and dry parts of gully bottom support *Juncus balticus*, *Hordeum brachyantherum*, *Elymus trachycaulus*, and *Potentilla anserina*, often with *Glycyrrhiza lepidota* and *Sonchus* sp.

Weeds:

*Sonchus* sp. is common on gully sides (often co-dominant with *Chrysothamnus* spp.) and on drier places in gully bottom. Plants were in flower and fruit.

*Elymus repens* was noted in two patches, each ca. 100 square m, mixed with other species in the gully bottom.

**Segment S4.** From a point in NE1/4 of NW1/4 Section 9, downstream ca. 1 mile to the boundary with private land in SW1/4 SE1/4 Section 8, T12N, R106W. Elevation 6830 - 6650 feet. Surveyed August 20, 2001.

*Spiranthes diluvialis?* No

Physical environment: Channel 25 - 50 cm wide, in gully 2 m deep and 2 - 5 m wide at upstream end, ca. 9 m deep and > 5 m wide at downstream end. For ca. half of segment, the channel is on the bottom of the gully floor and water covers most of the gully floor. For the other half, the channel is incised  $\leq$  40 cm into gully floor and much of floor is dry. Salt stains are uncommon on lower gully sides.

Vegetation: Ca. half of gully bottom supports herbaceous vegetation of *Agrostis stolonifera*, *Eleocharis* sp., *Ranunculus cymbalaria*, *Carex aquatilis*, *Hordeum jubatum*, *Poa pratensis*, *Equisetum arvense*, and *Juncus balticus*. Algae grow in this type where water flows slowly. Higher surfaces and gully sides are *Artemisia tridentata* ssp. *tridentata*, *Chrysothamnus nauseosus*, *Sarcobatus vermiculatus*, *Poa pratensis*, and *Bromus tectorum*.

The vegetation had been grazed to ca. 6" high and thoroughly trampled at the time of survey.

Weeds:

*Cirsium arvense* is present throughout in groups of < 100 stems each covering  $\leq$  200 sq m, mainly on gully sides.

*Carduus nutans* is uncommon, with < 20 plants growing in groups of 5 - 6 or as single plants. Flowering at time of survey.

*Tamarix chinensis* is present, with 50 - 60 plants in groups of 10 - 15, mainly in the downstream half of the segment. The shrubs are 50 cm - 2.5 m tall, and grow mainly on higher surfaces on the insides of bends in the gully.

*Sonchus* sp.: 1 patch of rosettes, ca. 5 sq m, was observed.

**Segment S5.** From a point in NE1/4 of NW1/4 Section 9, upstream ca. 0.75 mile to the boundary of the private land in NW1/4 NE1/4 Section 9, T12N, R106W. Elevation 6830 - 6960 feet. Surveyed August 20, 2001.

*Spiranthes diluvialis?* No

Physical environment: Channel 25 - 50 cm wide, flowing in gully 3 - 7 m deep and 5 - 10 m wide at bottom. Approximately 25% of the segment has water across bottom of gully.

Vegetation: Much of gully bottom supports herbaceous vegetation of *Agrostis stolonifera*, *Juncus balticus*, *Carex aquatilis*, and *Ranunculus cymbalaria*. In areas with water on surface, *Eleocharis* sp. is common as well. In the drier areas, the common species are *Agrostis stolonifera* and *Poa pratensis*.

Weeds:

*Sonchus* sp. is common in patches along the foot of the gully walls. A few plants were blooming at time of survey.

*Cirsium arvense* occur in patches covering up to 50 sq m in the drier parts of the gully bottom.

*Tamarix* sp.: 1 plant, 2 m tall, was observed.

**Segment S6.** SW1/4 Section 3, T12N, R106W, between the private land (downstream) and the state section (upstream). Elevation ca. 7000 - 7090 feet. Surveyed August 20, 2001.

*Spiranthes diluvialis?* No

Physical environment: Channel 25 - 50 cm wide flowing in gully 2 - 5 m deep and 5 - 10 m wide at bottom. In most of segment, the gully bottom 2 - 4 m wide on each side of the channel is moist but not wet. Water flows across the gully bottom in a few places. Salt stains are common along the foot of the gully sides.

Vegetation: Ca. half of gully bottom is dominated by *Agrostis stolonifera* and *Juncus balticus* with *Poa pratensis* and *Ranunculus cymbalaria*. Areas with standing water are dominated by *Carex aquatilis*, *Agrostis stolonifera*, *Eleocharis* sp., and *Ranunculus cymbalaria*. The vegetation was grazed to ca. 15 cm tall at time of survey and the bottom was thoroughly trampled.

Weeds:

*Sonchus* sp. is present throughout in patches from 2 to 20 sq m, on drier parts of gully bottom (especially along the foot of the gully sides).

*Cirsium arvense* is present in patches, most < 20 sq m, along the margins of the gully bottom and on drier microsites across the bottom.

**Segment S7.** Near head of Spring Creek, in N1/2 SE1/4 and S1/2 NE1/4 Section 35, T13N, R106W; southern channel from state land upstream ca. 0.75 mile. Elevation ca. 7520 - 7720 feet. Surveyed August 20, 2001.

*Spiranthes diluvialis?* No

Physical environment: Channel 15 - 30 cm wide, flowing in V-shaped gully  $\leq$  1 m wide at bottom. Trickle of water flows in channel for most of segment but disappears near lower end.

Vegetation: Herbaceous vegetation of *Carex aquatilis*, *Equisetum arvense*, and *Juncus* sp. fills most of the gully bottom, with *Poa pratensis* common along the margins. Gully is overhung with *Amelanchier* sp., *Prunus virginiana*, *Juniperus* sp., and *Artemisia tridentata* ssp. *tridentata* for much of the length of the segment. The herbaceous vegetation had been grazed and few plants were taller than 15 cm. The bottom was

thoroughly trampled and cattle hoofprints were present on at least 50% of the ground for most of the segment's length.

The downstream end of the segment is *Artemisia tridentata* ssp. *tridentata* ca. 2.5 m tall, with a heavily grazed undergrowth of (probably) *Poa pratensis* and scattered *Elymus cinereus*.

Weeds:

*Cirsium arvense* is common throughout, in a nearly continuous, sparse growth.

*Sonchus* sp.: 1 plant was noted, in flower

**Segment S8.** Near head of Spring Creek in W/2 NE1/4 Section 35 and S1/2 SE1/4 Section 26, T13N, R106W; northern channel from state land upstream ca. 1 mile. Elevation 7520 - 7920 feet. Surveyed August 20, 2001.

*Spiranthes diluvialis*? No

Physical environment: Channel < 1 m wide, flowing through V-shaped gully 12 - 15 m deep and < 1 m wide at bottom.

Vegetation: Sparse vegetation of *Elymus cinereus*, *Ranunculus cymbalaria*, and *Cirsium arvense* growing on sides of gully.

Weeds:

*Cirsium arvense* is present throughout, in scattered patches of 10 - 30 plants.

**Location S9.** NW1/4 NE1/4 Section 35, T13N, R106W. Channel between segments S7 and S8. Elevation 7640 feet. Surveyed August 20, 2001. Only ca. 10 m of this stream was searched because survey on segments S7 and S8 strongly suggested that no mesic meadows are present on the branches of Spring Creek this close to the headwaters.

*Spiranthes diluvialis*? No

Physical environment: Channel 30 cm wide on bottom of valley.

Vegetation: Riparian vegetation present in fringe < 50 cm wide on each side of channel; species not listed.

## WEST SPRING CREEK

**Segment WS1a.** North of Minnie's Gap and across highway from (east of) Wildhorse Basin Road. From confluence with Spring Creek, upstream ca. 0.1 mile. NE1/4 of NW1/4 Section 24, T 12N, R 107W. Elevation 6360 feet. Surveyed August 19, 2001.

*Spiranthes diluvialis*? No

Physical environment: Gully 2.5 - 3 m deep and 5 m wide at bottom. Soil was saturated, and water was flowing slowly, across most of bottom and around seeps to ca. 1 meter up gully sides.

Vegetation: Wet soil in gully bottom and around seeps on gully sides supports thick herbaceous vegetation (canopy cover 100%) to 1 meter tall, of *Eleocharis* sp., *Juncus balticus*, *Scirpus pungens*, *Carex aquatilis*, and *Agrostis stolonifera*. Higher gully sides are *Sarcobatus vermiculatus*, *Artemisia tridentata* ssp. *tridentata*, and *Chrysothamnus* spp.

Weeds:

*Cardaria* sp.: 2 patches, each < 20 square m, were noted.

**Segment WS1b.** North of Minnie's Gap and across highway from (east of) Wildhorse Basin Road. Ca. 0.25 mile of stream, downstream from road. SW1/4 Section 13, T12N, R107W. Elevation 6400 feet. Surveyed August 19, 2001.

*Spiranthes diluvialis?* No

Physical environment: Channel ca. 0.25 meter wide in V-shaped gully 2 - 2.5 m deep and 1 meter - 2 m wide at bottom. Water flowing in downstream half, gully bottom wet but without flowing water in upstream half.

Vegetation: Along channel is a fringe (ca. 20 cm wide ) of *Ranunculus cymbalaria*, *Agrostis stolonifera*, *Elymus trachycaulus*, *Puccinellia* sp., *Epilobium* sp., *Poa pratensis*, and *Rumex* sp. Gully side has tall *Artemisia tridentata* ssp. *tridentata* and *Sarcobatus vermiculatus*.

Weeds:

*Elymus repens* grows in patch ca. 50 sq m mixed with other species at upstream end.

**Segment WS2.** Northern side of basin north of Minnie's Gap. Ca. 0.75 mile of stream in SW1/4 of SE1/4 Section 12, and NW1/4 of NE1/4 and SE1/4 of NW1/4 Section 13, T12N, R107W. Elevation 6440 - 6560 feet. Surveyed August 19, 2001.

*Spiranthes diluvialis?* No

Physical environment: Channel ca. 25 cm wide, in bottom of V-shaped gully 2 - 3 m deep and 1 - 1.5 m wide at bottom. Water flowing in channel.

Vegetation: Gully bottom thick herbaceous vegetation (100% canopy cover), 50 cm tall, of *Agrostis stolonifera*, *Eleocharis* sp., *Hordeum jubatum*, *Ranunculus cymbalaria*, *Carex aquatilis* with *Epilobium* sp., *Rumex* sp., *Plantago* sp. Gully sides *Artemisia tridentata* ssp. *tridentata* and *Sarcobatus vermiculatus* with undergrowth of *Bromus tectorum* and *Poa pratensis*.

Weeds:

*Cirsium arvense* grows throughout segment, in groups of < 100 stems each covering  $\leq 25$  sq m. Also scattered single stems.

*Carduus nutans* grows in several groups of  $\leq 20$  stems each; less common than *Cirsium arvense* and *C. vulgare*.

*Sonchus* sp. grows throughout segment in patches extending up to 10 m along edges of gully bottom. 5 - 6 such patches observed.

*Lepidium latifolium* in 2 patches of < 10 plants each.



## APPENDIX 2: ABUNDANCE OF THE DESIGNATED WEEDS IN EACH STREAM SEGMENT.

The species are listed alphabetically by scientific name. This information was extracted from the descriptions of stream segments in Appendix 1.

### **Hoary cress, Whitetop (*Cardaria sp.*)**

#### LITTLE DRY CREEK

Segment LD1: present

#### SPRING CREEK

Segment S1: rare on gully side

#### WEST SPRING CREEK

Segment WS1a: 2 patches ea. < 20 sq m

### **Musk Thistle (*Carduus nutans*)**

#### SPRING CREEK

Segment S4: uncommon, < 20 plants in scattered small patches and single plants

#### WEST SPRING CREEK

Segment WS2: several groups of  $\leq 20$  plants each; less common than other thistles

### **Canada thistle (*Cirsium arvense*)**

#### LANE MEADOW CREEK

Segment LM2: 5 or 6 stems, grazed to < 10 cm tall.

#### SPRING CREEK

Segment S2: 2 patches, each < 10 plants

Segment S4: present throughout in patches each < 100 stems, mainly on gully sides

Segment S5: scattered patches each covering  $\leq 50$  sq m on drier parts of gully bottom

Segment S6: patches mostly < 20 sq m each, along margins of gully bottom and on drier microsites

Segment S7: common throughout, in nearly continuous sparse growth

Segment S8: present throughout in scattered patches of 10 - 30 plants each

#### WEST SPRING CREEK

Segment WS2: present throughout in patches each < 100 stems and covering  $\leq 25$  sq m

**Quackgrass (*Elymus repens*)**

SPRING CREEK

Segment S2: 2 patches, each 5 sq m

Segment S3: 2 patches, each ca. 100 sq m, mixed with other species on gully bottom

WEST SPRING CREEK

Segment WS1b: one patch of ca. 50 sq m, at upstream end of segment

**Perennial Pepperweed, Giant Whitetop (*Lepidium latifolium*)**

WEST SPRING CREEK

segment WS2: 2 patches of < 10 plants each.

**Perennial Sowthistle (*Sonchus* sp.)**

SPRING CREEK

Segment S1: nearly continuous fringe at base of gully sides

Segment S2: common throughout, bases of gully sides and drier spots on bottom

Segment S3: common on gully sides (often co-dominant with *Chrysothamnus* spp.) and drier places on gully bottom

Segment S4: 1 patch of rosettes, ca. 5 sq m

Segment S5: common in patches along foot of gully sides. A few plants were blooming

Segment S6: present throughout in patches of 2 - 20 sq m, on drier parts of gully bottom, especially foot of walls

Segment S7: 1 plant noted, in flower

WEST SPRING CREEK

Segment WS2: grows throughout in patches up to 10 m long on edges of gully bottom. 5  
- 6 such patches noted

**Tamarisk (*Tamarix* spp.)**

LITTLE DRY CREEK

Segment LD2: 1 mature shrub and 1 patch of seedlings or sprouts.

SPRING CREEK

Segment S2: two mature shrubs

Segment S4: 50- 60 plants 0.5 m - 2.5 m tall, in groups of 10 - 15, mainly on higher terraces on insides of meanders

Segment S5: 1 plant