
Spiranthes diluvialis Survey, 2004

Final

**ROCKY REACH HYDROELECTRIC PROJECT
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SECTION 1: INTRODUCTION

Three populations of *Spiranthes diluvialis* (Ute ladies'-tresses) were discovered on the upper end of the Rocky Reach Reservoir in August 2000. Rocky Reach Dam is owned and operated by the Chelan County PUD. *S. diluvialis* is an orchid species listed as Threatened under the Endangered Species Act (ESA) currently known from Colorado, Idaho, Montana, Nebraska, Utah, Washington, and Wyoming. It was listed by the U.S. Fish and Wildlife Service in 1992 because of a variety of factors, including habitat loss and modification, and hydrological modifications of existing and potential habitat areas (USFWS 1992). Its status in Washington is Endangered (WNHP website 2003). Besides the three closely situated Rocky Reach Reservoir populations, there is only one other known population of *S. diluvialis* in Washington.

Spiranthes diluvialis is endemic to mesic or wet meadows and riparian/wetland habitats near springs, seeps, lakes or perennial streams. Soils may be inundated early in the growing season, which normally become drier but retain subsurface moisture through the season. *S. diluvialis* occurs primarily in areas where the (overstory) vegetation is relatively open and not dense or overgrown (USFWS 1995). *S. diluvialis* is a late-blooming species and is only recognizable while it is blooming. Despite their distinctive spikes of white flowers, blooming plants can be extremely difficult to see in the dense herbaceous understory vegetation with which they are associated. Plants not yet blooming, plants past bloom, and vegetative plants are virtually impossible to distinguish from background vegetation. Because plants come into bloom at different times within a single population, a population must be visited several times during the growing season for an accurate count. Within the Rocky Reach project area, the plants are typically in bloom from mid-July to late-August. Because of its status as a Threatened species, several survey visits were planned to fully map and census the three *Spiranthes diluvialis* populations on Rocky Reach. The three populations have been surveyed yearly since 2000.

In 2004, individual plants were permanently marked for long-term monitoring. The permanent marking of plants will not only assist with the yearly challenge of locating plants, but may eventually provide information about the life history of individual plants of this species about which little is known. In particular long-term monitoring may provide information about the longevity of individual plants, and how long plants can remain dormant underground.

SECTION 2: METHODS

In 2004, the three Rocky Reach *Spiranthes diluvialis* populations were censused on July 12, August 5, and August 6. They were accessed by boat during times the orchid species is known to flower. Surveys consisted of careful visual searching for, and counting of, individual plants in known locations and in appropriate nearby habitat. Population counts are comprised primarily of blooming plants, as vegetative or non-flowering plants are typically very difficult to see. When observed, vegetative plants are included in counts.

In 2004, all plants located were permanently marked and numbered for long-term monitoring of individual plants. A pink pin flag with a uniquely numbered aluminum tag attached at the base was placed three to four inches north of each plant. Where rocks impeded normal flag placement, the alternate flag location was noted on the data sheet. The following information was collected for each plant: plant height, inflorescence length, number of flowering stems, and phenology. If there was more than one stem, the tallest stem of the cluster, and the longest inflorescence length were measured. GPS coordinates were collected for each plant at the Howard Flats and Gallagher Flats populations. Plant locations of the Chelan Falls population were indicated generally on an aerial photograph. Mary Moser, Northwest Fisheries Science Center, Seattle, WA

SECTION 3: RESULTS AND DISCUSSION

In general, 2004 was a typical year for winter snowpack, rain and river levels. Temperatures were hot and dry later than usual during the summer causing plants to bloom somewhat later than usual. While very few plants were evident on July 12, the majority of plants were visible on August 5. Past weather trends compared to survey dates and total plant numbers may have some value in predicting future survey dates

Table 1: General comparison of weather trends, survey dates and total number of plants for the three Rocky Reach *Spiranthes diluvialis* populations (SPDI), 2000 – 2004.

Year	General weather trends and population observations.	Spiranthes survey dates	Total # plants
2000	Normal year for snowpack, rain and river levels. Populations located this year. Moderate summer temps.	7/21, 8/3, 8/15, 8/21	252
2001	Low winter rain and snowpack leads to low river levels. SPDI habitat dry and exposed. Depressed plant numbers. No plants observed at two of the populations, low numbers at the third.	7/25, 8/16	71
2002	High winter snowpack and rainfall creates late season highwater and flooding. SPDI habitat inundated late in season. Lower plant numbers at all populations.	8/27	175
2003	Normal winter rain and snowpack followed by hot, dry summer. Population numbers average.	7/18, 8/25	255
2004	Normal year for winter snowpack, rain and river levels. Became hot and dry later in spring with plants blooming somewhat later than usual. Plants permanently marked.	8/5	380

Overall, 2004 seemed to be a favorable year for numbers at each of the three *Spiranthes diluvialis* populations on the Rocky Reach Reservoir (Table 2). The total number of plants for the three combined populations was significantly higher than any previous year. The Howard Flats population accounted for most of the increase with almost three times the total number of plants

counted than in previous years. A number of factors may explain the apparent increase in population numbers: favorable weather patterns and river flows, or more likely, the extremely close and careful searching of plants that occurred while we were permanently marking individuals.

In 2004, one of the most striking developments at the three *Spiranthes* populations was the dramatic increase in the size, density and coverage of the invasive annual weed white sweet-clover (*Melilotus alba*). The increase was first noticeable in 2003 at the Howard Flats population. A large percentage of the *Spiranthes* habitat at all three of the populations is physically covered by dense stands of white sweet clover, which are sometimes over six feet tall. *Spiranthes* plants growing under white sweet-clover canopies were often shorter, less vigorous, bloomed later, and had shorter and less dense inflorescences. The long-term persistence of white sweet-clover at these sites is unknown. It is also unknown whether *Spiranthes* plants can persist under white sweet-clover canopy. We made an attempt to cut down white sweet-clover plants in the vicinity of many *Spiranthes* plants while we were installing permanent markers.

Each of the three Rocky Reach *Spiranthes diluvialis* populations is discussed individually below.

Table 2: *Spiranthes diluvialis* numbers for three populations on the Rocky Reach of the Columbia River, 2000 – 2004.

# Population Name	2000	2001	2002	2003	2004
1 Chelan Falls	185	71	128	178	193
2 Howard Flats	60	0	46	58	172
3 Gallagher Flats	7	0	1	19	15
Total # of plants	252	71	175	255	380

3.1 Chelan Falls Population

Although the 2004 *Spiranthes diluvialis* population total for the Chelan Falls population is similar to the 2000 and 2003 totals, field observations of numbers of plants for specific areas within the population have varied from year to year. Because these intra-population fluctuations are not reflected by population totals, the Chelan Falls population was divided into four areas (Table 3). The “Pond Habitat” that is located away from the edge of the Columbia River is divided into the “North Pond,” which is characterized as moist meadow, and the “South Pond,” where many plants grow directly along the edges of the pond. Adjacent to the Columbia River is a line of dense, tall shrubs. *Spiranthes* plants in the “River Habitat” grow on both sides of this line of shrubs in somewhat different habitats, divided into the “Riverside” and “Shrubside” sections. The “Riverside” plants grow in an often silty, rocky substrate on the river side of the dense shrub line, while the “Shrubside” plants grow in a moist, grassy area away from the river above the dense shrub line.

Plant numbers at the Chelan Falls Pond habitat have increased while plant numbers at the River habitat have decreased since monitoring began. In 2000 and 2002, 75 and 77 plants were located in the River Habitat, respectively, while only 24 and 22 plants were located there during the 2003 and 2004 surveys. Possible explanations for the decrease include a number of plants in dormancy or

plant mortality. Population numbers for the South Pond Habitat have generally risen since 2000 because plants were located in peripheral areas that may not initially have been surveyed as closely.

In 2004, a substantial increase in the number and density of the annual weed species white sweet-clover was seen in all areas of the Chelan Falls Population, especially in the Pond Habitat area. Rhizomatous stands of Russian thistle (*Acroptilon repens*), a Washington Class B noxious weed, are steadily encroaching on portions of the Chelan Falls population near the North Pond area. The number and size of yellow iris (*Iris pseudacorus*) patches, a Washington Class C noxious weed, are increasing around and near the pond. Some yellow iris plants were dug up in the North Pond area in 2003. Poplars and willows are continuing to colonize mesic areas adjacent to the pond where *Spiranthes diluvialis* stems have been observed during past surveys. Purple loosestrife (*Lythrum salicaria*), a Washington Class B noxious weed, has been increasing along the River habitat of the population.

Table 3: The Chelan Falls *Spiranthes diluvialis* population numbers broken down by area, 2000 – 2004.

	2000	2001	2002	2003	2004
North Pond habitat	100	40	20	99	125
South Pond habitat	10	29	31	55	46
Pond habitat Subtotal	110	69	51	154	171
Shrubside - River habitat	*	0	73	13	20
Riverside - River habitat	*	2	4	11	2
River habitat Subtotal	75	2	77	24	22
Grand Total	185	71	128	178	193

* areas not differentiated during the 2000 census.

3.2 Howard Flats Population

The Howard Flats *Spiranthes diluvialis* population was divided into a North and a South end to track intra-population fluctuations. The North end is near the Columbia River shore, while the South end of the population is several hundred feet inland in a large moist meadow. The Howard Flats population covers the largest area of the three populations. The 2004 Howard Flats *Spiranthes diluvialis* population total is nearly three times the highest number documented in previous years (Table 4). This is primarily because in 2004, plants were located in areas that had never been surveyed closely before and plants were located in areas that had been searched previously but had not been found in the past. The nearly linear plant distribution is related to hydrologic factors.

Table 4: The Howard Flats *Spiranthes diluvialis* populations broken down by area, 2000 – 2004.

	2000	2001	2002	2003	2004
North end	30	0	39	54	*
South end	30	0	7	4	*
Total	60	0	46	58	172

* need GIS coordinates to accurately divide into areas.

Since the *Spiranthes* population was first surveyed in 2000, the size and density of the annual weed species white sweet-clover has increased dramatically, particularly in the large moist meadow in the South end of the population. In places, these plants form dense, solid masses over six feet tall. Russian thistle is encroaching on portions of the Howard Flats population. In addition, there is an increase in the number of flowering patches of purple loosestrife observed in all portions of the population every year. Other weeds such as yellow flag, alfalfa (*Medicago sativa*), Canadian thistle (*Cirsium arvense*), and Russian olive (*Elaeagnus angustifolia*) have also become more prominent in and near the Howard Flats population. The long-term effect of the increased weediness of the Howard Flats area on the *Spiranthes* population should be monitored.

Hydrologic and river channel changes may contribute to changes in weed density and population numbers. The overall area seems increasingly dry since monitoring began in 2000. This apparent dryness may also be due to the increased transpiration of large fleshy plants like white sweet-clover, which was a minor element in the flora when monitoring began. Edna Stocker, the property-owner, informed us that cattle have not grazed in the Howard Flats area since 1994 and probably longer. Seasonal grazing may have helped to control weed infestations in and near the *Spiranthes* population.

3.3 Gallagher Flats Population

The Gallagher Flats *Spiranthes diluvialis* population (Table 2) had an average number of plants in 2004. The plants at this population continue to bloom and become senescent earlier in the season than the other two populations. White sweet-clover has formed a dense, tall, nearly continuous stand in and around the population since 2003. Many of the *Spiranthes* plants were growing under this white sweet-clover canopy. These plants were often shorter and had fewer flowers than plants growing in the open.

SECTION 4: CONCLUSIONS

Overall, 2004 seemed to be a favorable year for the Rocky Reach *Spiranthes diluvialis* populations. Future surveys are recommended. These surveys would continue to provide information about the effects of flooding, drought, river channel changes, bloom times, and the effects of warmer or colder than average temperatures on plant numbers and the habitat of the three *Spiranthes* populations. With permanent markers in place, the fates of individual plants can now be determined. In particular

long-term monitoring may provide information about the longevity of individual plants, and how long plants can remain dormant underground.

The dramatic increase of white sweet-clover at each of the three populations raises questions and concerns about the long-term persistence of *Spiranthes* at Rocky Reach. We observed that *Spiranthes* plants growing under white sweet-clover canopies were often shorter, less vigorous, bloomed later, and had shorter and less dense inflorescences.

It has been documented that *Spiranthes* “occurs primarily in areas where the (overstory) vegetation is relatively open and not dense or overgrown (USFWS 1995).” It has been suggested that *Spiranthes* in dense or overgrown habitats does not survive well (USFWS 1995). It is also unknown whether the present density of white sweet-clover will persist at Rocky Reach.

Because of the likelihood that noxious weeds are having, or will eventually have, a detrimental effect on each of the *Spiranthes* populations, weed control for the various invasive weed species should be considered. These weeds include: white sweet-clover, purple loosestrife, Russian thistle, Russian olive, yellow iris, Canadian thistle, and alfalfa.

SECTION 5: REFERENCES

USFWS. 1992. Final Rule to List the Plant *Spiranthes diluvialis* (Ute ladies' tresses) as a Threatened Species. Federal Register. 57, 12: 2048-2054.

USFWS. 1995. Ute ladies'-tresses (*Spiranthes diluvialis*) recovery plan. Denver, Colorado: U.S. Fish and Wildlife Service.