MONITORING OF *HOWELLIA AQUATILIS* (WATER HOWELLIA) AND ITS HABITAT AT THE HARVARD–PALOUSE RIVER FLOOD PLAIN SITE, IDAHO: FOURTH-YEAR RESULTS

by

Juanita Lichthardt
and
Karen Gray
Conservation Data Center

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Idaho Department of Fish and Game
Natural Resources Policy Bureau
600 South Walnut, P.O. Box 25
Boise, Idaho 83707
Steve Huffaker Director

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ABSTRACT

Howellia aquatilis (water howellia) is an aquatic macrophyte that is listed as threatened by the U.S. Fish and Wildlife Service (USFWS). It occurs in internally drained ponds that dry out each year. The single known Idaho location of the species occurs on the flood plain of the Palouse River in northern Idaho, in three small ponds formed by fluvial processes. The ponds are the low points of abandoned channels or channel migration scars. Threats to the population include invasion by two aggressive, rhizomatous species– *Phalaris arundinacea* (reed canarygrass) and *Acorus calamus* (sweet flag). Water howellia populations and pond water depths at the site have been monitored since 1999. Photopoints were established in 2000. This is the fourth annual report documenting monitoring results. In 2002, flowering took place in late June when the water was 1-3 dm deep. Although absent from pond 1, water howellia was more abundant in ponds 2 and 3 than in any previous monitoring year. Photos were taken from established photopoints on July 1. Weed suppression measures (excavation and covering) for reed canarygrass and sweet flag were continued at ponds 2 and 3. Monitoring results, along with results of weed suppression measures, will provide a basis for possible future management of the site.

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INTRODUCTION

Water howellia (*Howellia aquatilis*) is an annual aquatic plant representing a monotypic genus in the family Campanulaceae. It has very specific habitat requirements and has been rare throughout the period of botanical record. It is currently known from 14 sites in western Montana, northern Idaho, eastern and western Washington, and California (Shelly and Moseley 1988). It is rare throughout its range, occurring in ephemeral ponds and at the margins of permanent ponds, which in most cases are glacial potholes (Shapley and Lesica 1997). The ponds are shallow, the bottoms vegetated with aquatic, emergent, and wetland plants, and are surrounded by deciduous shrubs and trees. A detailed description of the plant, its biology, and habitat can be found in Shelly and Moseley (1988). *Howellia* is listed as threatened by the U.S. Fish and Wildlife Service. A habitat and population monitoring program is one of the recovery actions specified in the draft Recovery Plan (Shelly and Gamon 1996).

The life cycle of water howellia is tied to the hydrology of the ephemeral ponds that comprise its habitat. Ponds must dry out each year in order for germination to occur. As an annual plant, viability in the short term depends on hydrologic conditions necessary for seed production and germination. Habitat management for water howellia requires an understanding of pond hydrology and geometry (Shapley and Lesica 1997) and the effects of colonization by exotics (Lesica 1997).

In Idaho, the only known water howellia site is on the flood plain of the Palouse River, in ponds formed by the gradual migration of the river channel (Lichthardt and Moseley 2000). Three ponds, each less than 0.1 hectare (0.25 ac) in area occur on a parcel of private land occasionally used for pasture. The site is tracked by the Idaho Conservation Data Center (IDCDC) as the Harvard-Palouse River Flood Plain Conservation Site.

In 1999, the fluvial processes of the flood plain were examined by looking at historical photos, mapping vegetation at the site, and surveying a cross-section of the flood plain (Lichthardt and Moseley 2000). Water depth gages were installed in each pond. (reed canarygrass (*Phalaris arundinacea*) and sweet flag (*Acorus* sp.), aggressive rhizomatous spreaders found within the ponds, were identified as a major conservation concerns. Populations (in terms of aerial extent) and water levels have been monitored annually since 1999. In 2001, accurate diagrams of the ponds were made for the purpose of monitoring pond vegetation (Lichthardt and Gray 2002). Also, we began experimental trials of excavation and covering to control the spread of the primary weed species. The land owner is kept appraised of the status of the water howellia populations and our activities at the site. This reports contains data on population and water levels recorded from 1999 to 2002 and describes ongoing weed control activities at the site.

POND DESCRIPTIONS

All three ponds are depressions set within elongate, arcing meander scars. The entire scar holds water in the winter months. Each pond consists of an irregularly oval portion and a narrower, channel-like portion–the pond "tail"–which is partly to mostly shaded (Appendix 1). The pond bottoms have an herbaceous emergent community dominated by inflated sedge (*Carex vesicaria*), water parsnip (*Sium suave*), short-awn foxtail (*Alopecurus aequalis*), American water-plantain (*Alisma plantago-aquatica*), simple-stem bur-reed (*Sparganium emersum*), and, at pond 3, common spikesedge (*Eleocharis palustris*). Ponds are surrounded by tall shrubs–Pacific ninebark (*Physocarpus capitatus*), Bebb's willow (*Salix bebbiana*), Drummond's willow (*Salix drummondiana*), black hawthorn (*Crataegus douglasii*), and thinleaf alder (*Alnus incana*); and a few large conifers including grand fir (*Abies grandis*), Engelmann spruce (*Picea engelmannii*), Douglas-fir (*Pseudotsuga menziesii*), and lodgepole pine *(Pinus contorta*). A complete species list can be found in Lichthardt and Moseley (2000).

Pond 1: The central area of the pond is occupied by large clumps of inflated sedge, along with water parsnip and scattered clumps of reed canarygrass (Appendix 1). Prior to 2001, only a small amount of water howellia has occurred along the southeast edge. North, east, and south edges of the pond are relatively abrupt and bordered by shrubs. On the west side the edge tapers gradually, and supports sparse growth of reed canarygrass and willow. Areas of partially submerged reed canarygrass surround the pond. Reed canarygrass may increase within the pond after it dries.

Pond 2: This is the largest pond, the main portion being approximately 650 sq. m in area, with a very long, gradually narrowing tail to the west (approx. 190 sq. m; Appendix 1). About 80 percent of the main pond is occupied by sweet flag and reed canarygrass. Most of the area occupied by reed canarygrass is above the late-spring water level and therefore not part of the pond proper, although it may have been at one time. Sweet flag is a clonal emergent up to 2 m tall, that forms a dense sward very similar to cattails (*Typha* spp.) and is displacing most other pond vegetation. This year it was observed flowering for the first time (mid-August) and specimens were collected. It has tentatively been identified as *Acorus calamus*, an exotic. The sweet flag provides a high level of shade and in fall its residue covers the bottom. In spite of this, water howellia was found growing throughout the sweet flag sward in 2001 and 2002.

Pond 3: The main pond is about 100 sq. m in size with a short, narrow tail approximately 6 m long that is partly shaded (Appendix 1). The main pond is occupied by a dense sward of common spikesedge which is not found in the other two ponds. A solid growth of reed canarygrass adjoins the pond in two separate places that may once have been part of the pond, and from these places the grass is continuing its colonization of the pond, especially where it can take hold in rotting wood.

In early to mid-summer, pond 3 is covered by a surface bloom of algae. This is probably caused by runoff from a feedlot across the road to the east. When the water is high in

spring, the pond is likely connected to water coming off the feedlot through a culvert just to the south.

MONITORING

Populations

Populations were surveyed on July 1, 2002. Water was 1-4 dm deep in the center of the ponds at this time and water howellia was in flower and early fruit. We moved carefully through each pond, flagging locations of water howellia with wire flags and estimating the areas occupied. Data were used to update the element occurrence record for water howellia (Appendix 2). The aerial extent of water howellia in each of the past four years is shown in Table 1.

Table 1. Approximate area occupied by water howellia over four years.

	Pond 1	Pond 2	Pond 3
	square meters		
1999	0.5	50	0.5
2000	No data	110-130	0.5
2001	3.0[1]	345	1.0[2]
2002	0	440	4.4

[1] Four plants estimated.
[2] Eight to twelve plants estimated.

Pond 1: No water howellia was found in pond 1. Other aspects of the pond appeared normal.

Pond 2: The entire area of pond 2 was occupied by water howellia, in varying densities. As in previous years, it was most abundant in the pond tail. It occurred with lower density within the sweet flag sward and under cover of shrubs at the pond margins.

Pond 3: Water howellia occurred near the eastern edge of the pond and in the pond tail. This was the largest extent of plants observed since the beginning of monitoring.

Water levels

Water levels in the three ponds are recorded at each visit (Table 2). Water level is read directly from a vertical section of PVC pipe located in the deepest part of the pond. The pipe extends 1 m above ground and marked off in 1 cm increments. The gage can generally be read from a distance using binoculars, but the marks fade and need to be redone annually.

Table 2. Depth of water howellia ponds with concurrent river discharge rate and stage[1], 1999 to 2002.

Date	Water depth (m)			Discharge[1]	Stage[1]
	Pond			(cfs)	(m)
1999:	1	2	3		
July 1[2]	.20	no data	no data	50	1.68
July 13[3]	0	.24	0	28	1.62
July 16	0	.21	0	25	1.58
Aug. 3	0	0	0	14	1.55
2000:					
March 27	.53	.54	.67	918	2.68
April 24	.50	.48	.55	500	2.32
May 23	.42	.46	.44	122	1.83
June 13	.37	.44	.42	338	2.13
June 23	.27	.42	.34	76	1.74
July 15	0	.22	.02	24	1.58
Aug. 3	0	0	0	12	1.52
Sept. 12	0	.10	0	44	1.65
Oct. 6	0	0	0	17	1.55
2001:					
April 9	.48	.48	.43	302	2.08
May 3	.48	.49	.48	550	2.30
June 1	.33	.44	.32	40[4]	1.66
June 28	.17	.34	.19	53[5]	1.68
July 24	0	0	0		
2002:					
May 1	.48	.55	.55	760	2.50[6]
May 17	.45	no data	.48	438	2.24
June 4	.36	.50	.40	210	1.95
July 1	.18	.38	.20	49	1.71
July 12	.13	.23	no data		
Aug. 13	0	0	0		

[1] Discharge rate and stage measured at the USGS gage, 24 km downstream.
[2] All three ponds contained water on July 1, prior to installation of gages. Pond 1 depth is an estimate.
[3] Gages installed.
[4] Steadily dropping since May 29.
[5] Had been 23 cfs before rain started on the 27th, still increasing through the 28th.
[6] Had been increasing for 2 days.

Pond drying is shown graphically in Figure 1. The earliest date at which the ponds have been visited is March 27, so the time scale is represented as “days from March 26.” Drying occurs at a fairly steady rate until late June, the time at which water howellia begins flowering, then drying is rapid. Ponds 1 and 3 are dry or nearly so by mid-July, pond 2 by the end of July.

Photopoints

Photos were taken on July 1 and a set of slides is stored at the IDCDC. Photopoint locations are described in Appendix 3.

WEED CONTROL EFFORTS

Reed canarygrass is invading all three water howellia ponds and may already have filled in portions of ponds 2 and 3. Reed canarygrass is usually present under the shrubs at the pond edge, but in the open it has developed dense swards raised well above the pond bottoms. Most of the areas mapped as reed canarygrass in the pond diagrams (Appendix 1) are dense monocultures and are free of standing water by May. Water howellia appears to coexist with sweet flag, but sweet flag is displacing other vegetation in pond 2 where it occupies about 100 sq. m.

There are many limitations on the control measures that can reasonably be used at the water howellia ponds. We are probably limited to small equipment or hand tools. Burning would require landowner's approval and is likely too large a liability risk. To do any significant excavating of either or both of the target weeds would require a small crew of volunteers or other labor. In 2001 we began experimenting with several measures on a very limited scale to assess their feasibility. Weed control work has been done in late July and early August, when water howellia had gone to seed and there was no standing water in the ponds.

In 2002, weed control efforts were again focused on ponds 2 and 3.

Pond 2: In addition to the raised area of nearly solid reed canarygrass on the north edge of the pond, reed canarygrass also occurs as satellite islands raised well above the pond bottom. In 2002 we removed four such islands, 0.5-0.75 m in diameter, from the west edge of the main body of the pond, by excavation (Appendix 1). This work was done on August 13 when the pond was dry. Unfortunately, it appears that sweet flag will rapidly fill any space freed of reed canarygrass. We also observed that several satellite islands of sweet flag that had been excavated in 2001 had not resprouted.

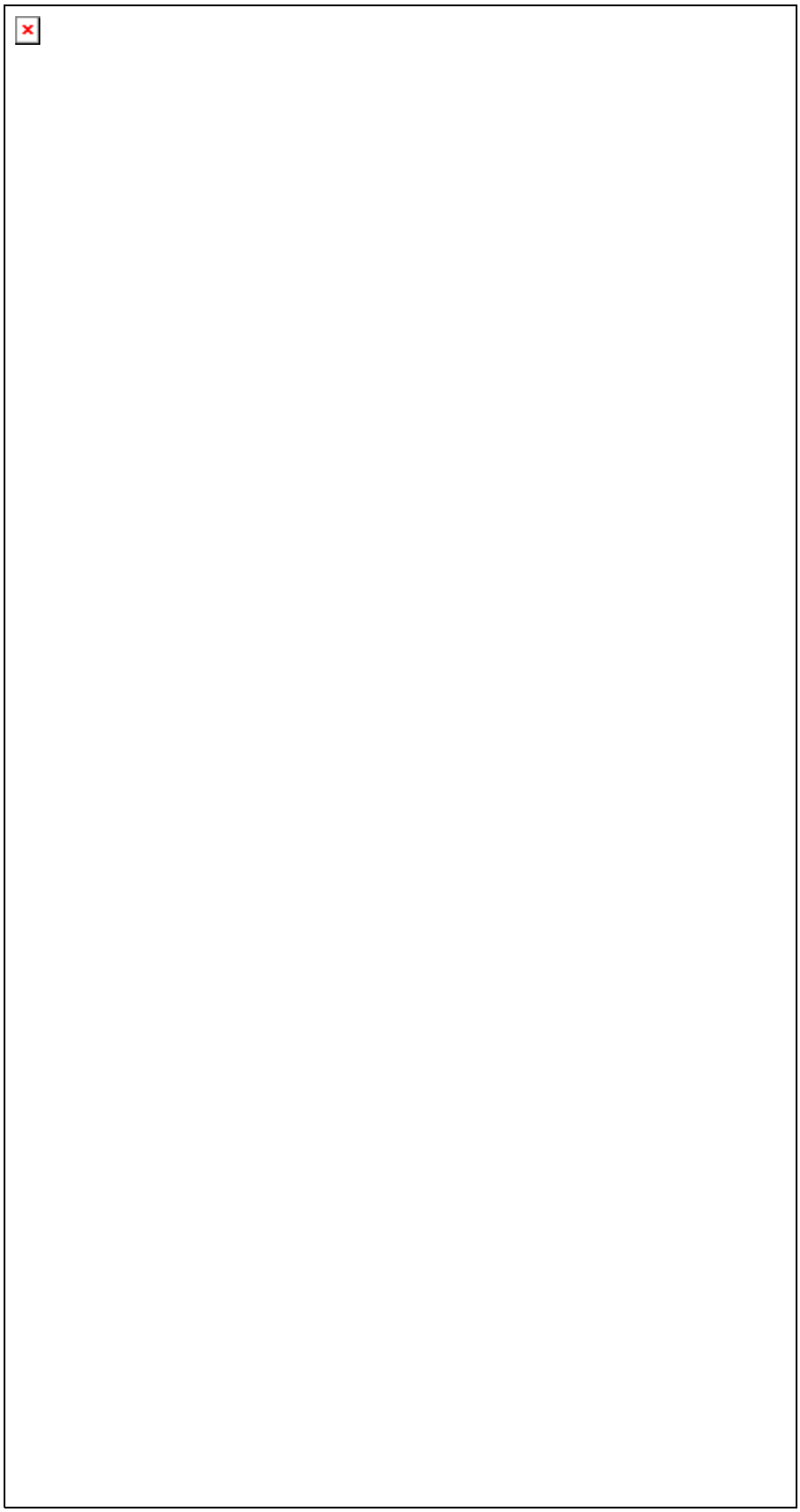

Figure 1. Depth of water in ponds (dm), March 27 to August 3.

Pond 3: Reed canarygrass occupies high ground at the east edge of the pond and from this source is colonizing the shallow tail portion of the pond via rhizomes. Along this invading front we used shovels to create an abrupt edge, then covered the edge and about a 2-m width of reed canarygrass with plastic tarp anchored by woody debris. We also maintained the similar measures installed in 2001 at the western pond edge (Appendix 1), and removed any reed canarygrass that had been missed previously.

RECOMMENDATIONS

We recommend that monitoring be continued on an annual basis and that weed control measures be maintained. At a minimum, reed canarygrass at pond 3 can be held in check by removing new plants and curtailing its advance through the use of weed blocking materials. At pond 2, removal of satellite islands of sweet flag and reed canarygrass should continue.

Seed should be collected from the major sedge species, inflated sedge, and grown out for reclaiming portions of the pond bottom where reed canarygrass has been removed.

Monitoring will continue in 2003, contingent on funding, and we will begin experimental "mowing" of sweet flag, in a trial area, in an attempt to starve the rhizomes.

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