2005 SURVEY AND CONTROL REPORT

Walsh Lake and Cedar River Aquatic Plant Survey and Milfoil Control Project

Prepared for

Seattle Public Utilities

December 2005

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Walsh Lake and Cedar River Aquatic Plant Survey and Milfoil Control Project

Prepared for

Seattle Public Utilities
Watershed Management Division
19901 Cedar Falls Road SE
North Bend, Washington 98045

Prepared by

Herrera Environmental Consultants, Inc.
2200 Sixth Avenue, Suite 1100
Seattle, Washington 98121
Telephone: 206/441-9080

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Introduction

This report presents the results of an aquatic plant survey conducted by Herrera Environmental Consultants (Herrera) of Walsh Lake and a portion of the Cedar River, located in King County, Washington (Figure 1). The focus of the survey was to map and characterize the condition of Eurasian watermilfoil (milfoil) (*Myriophyllum spicatum*) and other aquatic plants in Walsh Lake and in the slack water of the Cedar River above Landsburg Dam. In addition, the bathymetry of Walsh Lake was mapped. The final sections of this report describe the milfoil control effort in Walsh Lake that followed the aquatic plant survey conducted in August 2005.

The impetus for the Walsh Lake aquatic plant survey is to explore the feasibility of reconnecting the Walsh Lake outlet stream to Rock Creek, an analysis that is currently being conducted by Seattle Public Utilities (SPU). Historically, the lake drained to Rock Creek, which discharges into the Cedar River upstream of Landsburg Dam, and where water is withdrawn for the City of Seattle's municipal water system (Figure 1). When the water supply system and dam were constructed, the small town of Taylor, a brickworks, and other industries were located in the Walsh Lake watershed. To prevent contamination of the municipal water supply from these activities, the Walsh Lake outlet stream was diverted into a constructed ditch (Walsh Lake diversion ditch), which discharges to the Cedar River downstream of the Landsburg Dam (see Figure 1). The town and other facilities have since been abandoned for several decades.

The City is now considering reestablishing the original confluence of the Walsh Lake outlet stream into Rock Creek, thereby adding the lake watershed to the municipal water supply. The primary potential benefit of the stream reconnection project is the enhancement of fish habitat in the lower reaches of Rock Creek by the additional drainage from Walsh Lake. This habitat is of particular interest with the recent completion of the Landsburg Dam fish passage project and the return of Chinook salmon to Rock Creek. In addition, diversion of lake drainage out of the Walsh Lake diversion ditch could prevent failures of the ditch embankment, which presently occur during extreme flow conditions and result in impacts to water quality in Rock Creek.

Milfoil was detected in Walsh Lake in 2001 by a collection team from the University of Washington Herbarium, as part of a botanical inventory of the Cedar River watershed (University of Washington 2005). Milfoil is a non-native, noxious weed that has become established in many low-elevation lakes in Washington. Once established, milfoil typically spreads throughout a lake, impairing aquatic habitat and wildlife uses of the lake. Its growth characteristics, which are to root in a variety of water depths and to rapidly grow shoots that reach the surface and form dense mats, allow it to smother most native plant species. It reproduces primarily by fragmentation, when mature plants break apart into small pieces in response to waves, currents, or animal disturbance. Each piece can then drift and root to form a new plant. This aggressive reproduction method allows it to spread rapidly and to easily infest new water bodies.

The presence of milfoil in Walsh Lake presents a potential negative impact arising from the implementation of the stream reconnection project. If the Walsh Lake outlet stream is diverted

back into Rock Creek, milfoil fragments could potentially colonize available habitat in the Cedar River and Lake Youngs. The Seattle municipal water supply is withdrawn from the Cedar River at Landsburg Dam and conveyed to Lake Youngs through a 2-mile-long tunnel. Although the water is chlorinated at the withdrawal point, chlorination levels are being reduced and it is possible that milfoil fragments (or seeds) could survive the 2-hour-long contact time in the tunnel. SPU has spent considerable efforts eradicating a milfoil infestation in Lake Youngs and preventing additional infestations (Herrera 1997).

The primary objectives of the 2005 Walsh Lake aquatic plant survey are to survey the extent of milfoil coverage in Walsh Lake, identify appropriate milfoil control measures to prevent infestation of downstream waters following stream reconnection, and to implement those measures before milfoil coverage increases in the lake during the next growing season. Secondary objectives include surveying Walsh Lake for other invasive aquatic plants, providing a baseline aquatic plant, and developing a bathymetric map of Walsh Lake. Initially, the study objectives included surveying the Walsh Lake drainage ditch for the presence of milfoil, but this task was eliminated when milfoil was not observed near the lake outlet.

In addition, SPU staff had noticed dense stands of aquatic plants growing in the slack water on the Cedar River above Landsburg Dam. Herrera surveyed this area for the presence of milfoil and other aquatic plants.

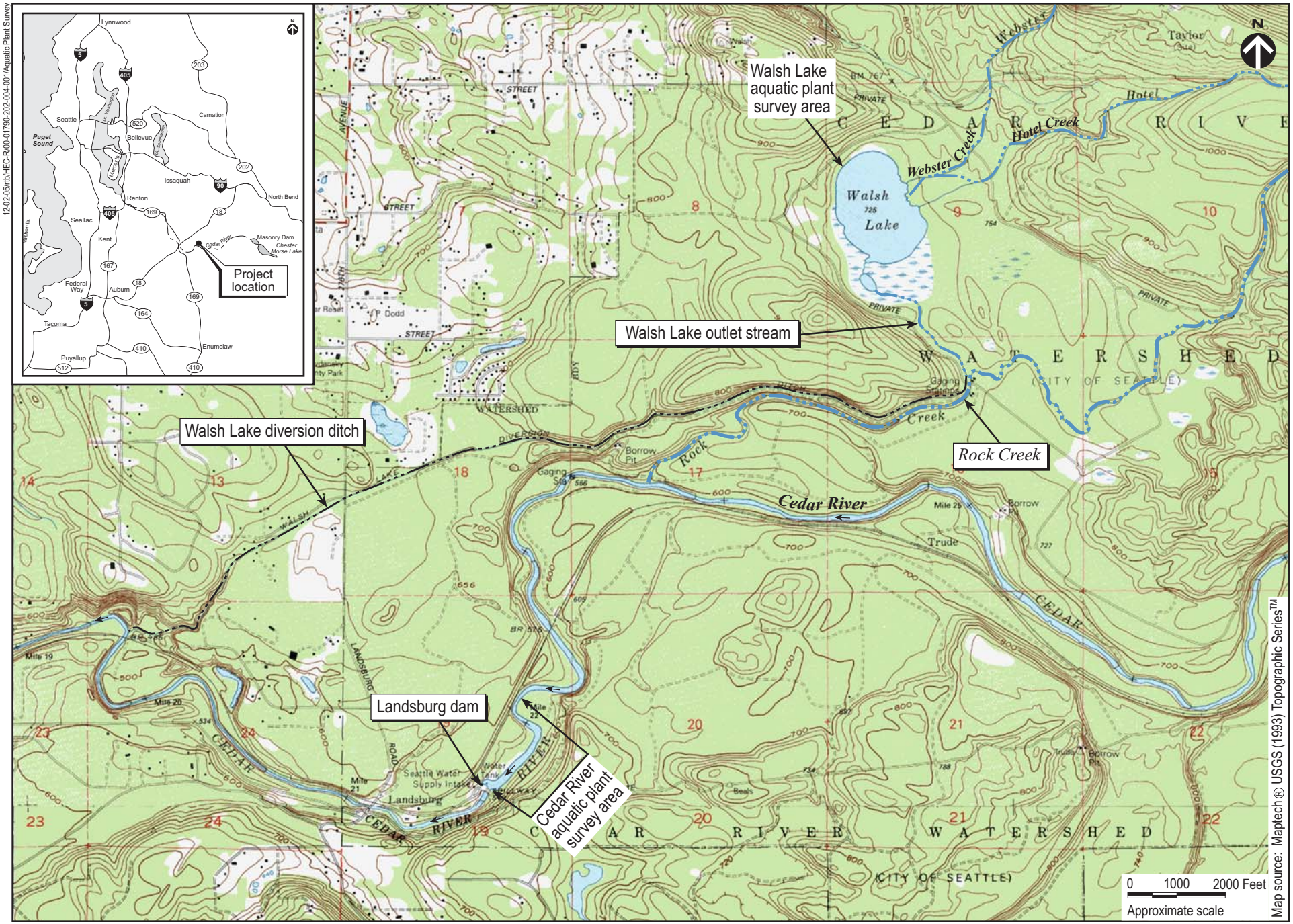

Figure 1. Vicinity map of the Walsh Lake and Cedar River aquatic plant survey areas in King County, Washington.

Survey Methods

The Walsh Lake aquatic plant survey was conducted on August 9, 10, and 11, 2005 by Herrera scientists Josh Wozniak (botanist) and Rob Zisette (limnologist). Assistance was provided by Brent Lackey (SPU Cedar River watershed planner), Moya Joubert (SPU limnologist), and Katherine Sauter-Messick (noxious weed specialist from King County) during one or more of the three survey dates. The survey was conducted using a motorized inflatable boat, and traversing the lake by following predetermined transect routes. Survey transects extended from shore at approximately 150-foot intervals along the shoreline from fixed locations and distinct shoreline features (Figure 2). A total of 29 transects were surveyed, with 21 transects extending east to west across the lake, four transects extending into the lake from the north shore, and four transects extending from the south shore. One additional (unnumbered) transect extended from the north shore to the south shore for the collection of the bathymetric data only. In addition, the entire shoreline area was surveyed for milfoil or other invasive aquatic plant species. A global positioning system (GPS) unit was used to map actual transect routes and aquatic plant features.

Aquatic plants were detected using visual observations and a recording fathometer mounted to the boat. Water clarity limited the visual surveys to areas less than 8 feet deep. The fathometer was used to detect plants in all depths of water. A rake sampler, consisting of a weighted bow rake covered with one-half inch wire mesh for entangling plants, was used to confirm the presence and to identify those plant species detected visually and using the fathometer.

Aquatic plants species observed along each transect were identified and their relative density was determined using the following three categories of lake or river bottom coverage: high = greater then 75 percent cover, medium = 25 to 75 percent cover, and low = less than 25 percent cover (King County 1996). The boundary of aquatic plant growth was mapped using GPS.

The recording fathometer was also used to map the bathymetry of Walsh Lake. The transects were surveyed at constant boat speed, with start and end points recorded using the GPS unit. Using this method, the distance of each 5-foot depth interval from the shoreline was directly extrapolated from the fathometer chart record to the map of the lake.

The Cedar River aquatic plant survey was conducted using similar techniques. Thirteen transects were established across the river, perpendicular to the river bank from the dam to the upper limit of the backwater, approximately 1,200 feet upstream (Figure 3). In addition to the transects, the entire area was surveyed for the presence of aquatic plants, including areas 1,200 feet upstream of the backwater.

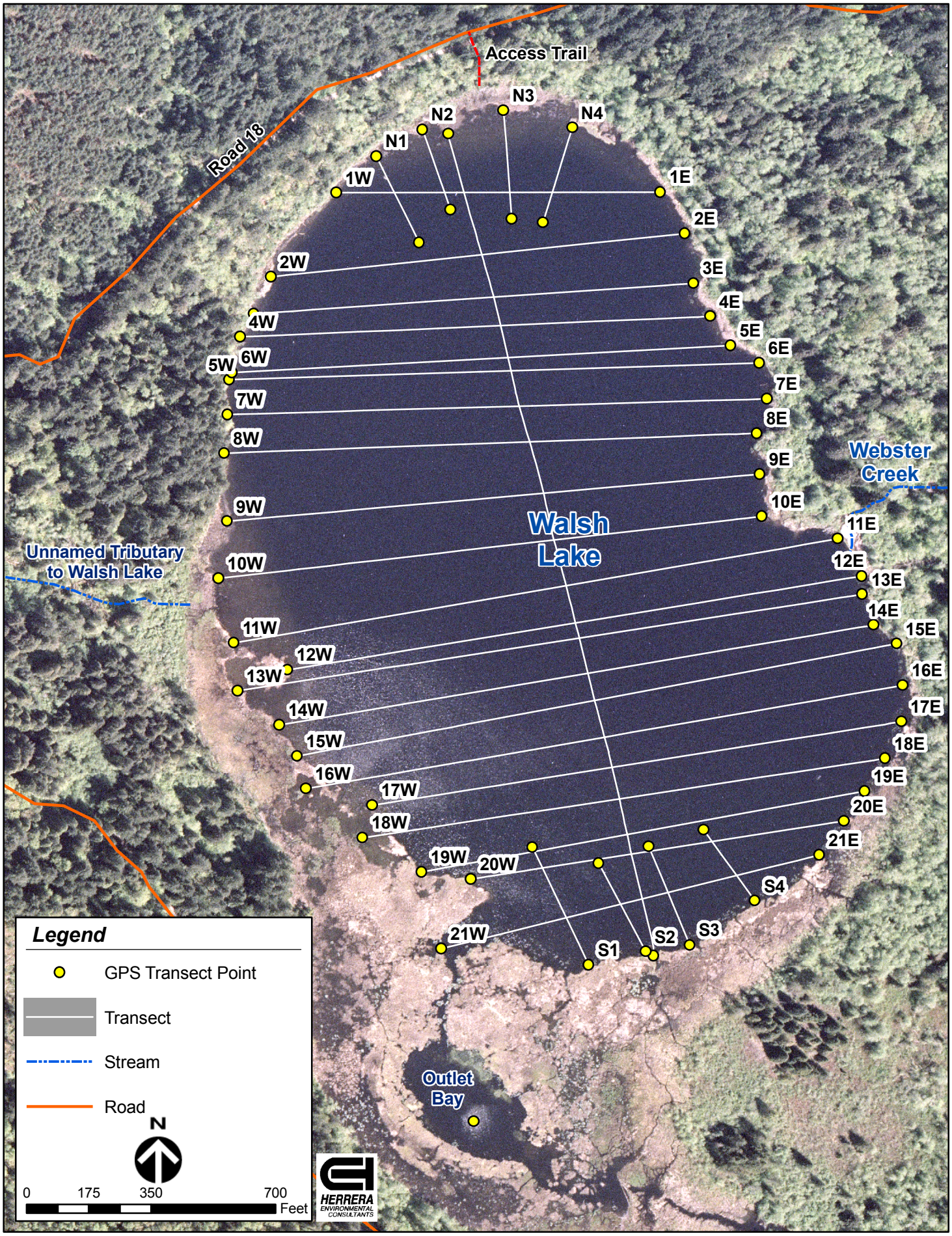

Figure 2. Walsh Lake aquatic plant survey sampling transects.

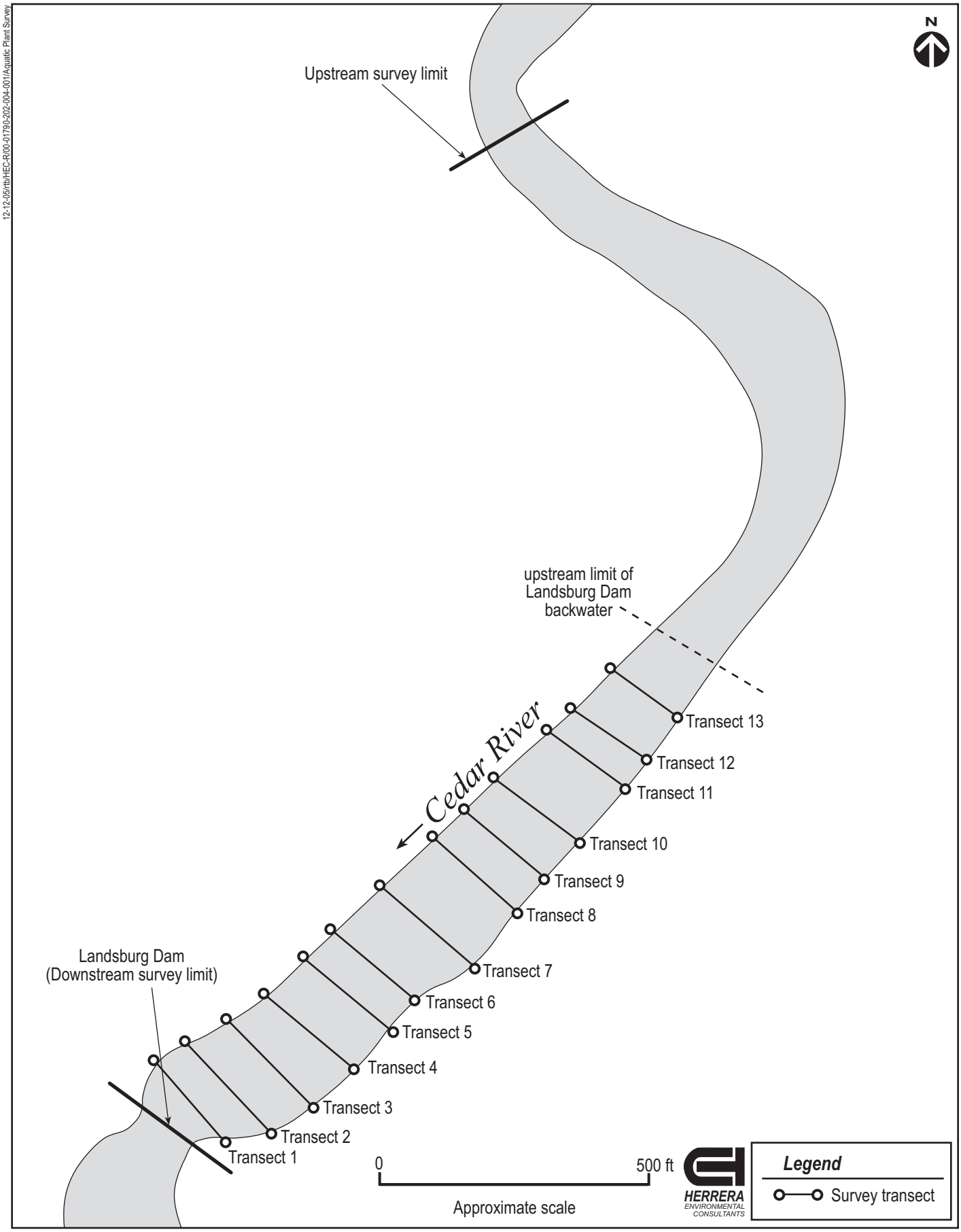

Figure 3. Aquatic plant survey area in the Cedar River above Landsburg Dam in King County, Washington.

Walsh Lake Survey Results

Lake Bathymetry

Recordings from the fathometer were cross-referenced to GPS positions to develop the bathymetry of Walsh Lake, as mapped in Figure 4. In general, the lake is located in a broad basin with a lakebed that gradually slopes to a maximum depth of 41 feet. The lakebed slope to 30 feet is steepest (16 percent) in the vicinity of Webster Creek on the east shore, and is more gradual (down to 6 percent) in other areas of the lake.

The area of the lake within the shoreline (i.e., inner boundary of the emergent wetland community) totals 74 acres (30 hectares). The volume of water in the lake totals 1,412 acre-feet (1,741,587 cubic meters), and the mean depth of the lake is 19.1 feet (5.8 meters) (i.e., volume divided by area).

Vegetation

The plant community in and around Walsh Lake is robust, diverse, and is comprised primarily of native species. The distribution of vegetation communities is illustrated in Figure 4. The lake is surrounded by wetlands. Aquatic bed wetlands (floating and submerged plants) occur from the shoreline to a lake depth of up to 15 feet. Emergent wetlands occur inland from the lake shoreline. Scrub/shrub and forested wetlands occur on the upland edge of the emergent wetlands and extend for some distance to the east and to the south. These wetlands are surrounded by forested uplands, dominated by second-growth conifers. An extensive floating bog mat occurs at the south end of the lake (see Figure 4) which supports emergent, scrub/shrub, and forested wetland vegetation and a variety of emergent species that prefer or require bog conditions.

Native Species

A total of 121 native plant species are known to occur in the lake and its immediate vicinity (see Table of Plant Species in Appendix A). Of these, 104 native species were identified during this (2005) aquatic plant survey, with the remaining 17 native species identified during University of Washington Herbarium collections in 2001 and 2002 (University of Washington 2005). A total of 26 native floating and submerged plant species were identified during this survey. The distribution of the 12 most abundant aquatic plant species identified during this survey is illustrated in Figure 5. An alphabetical list of plant species, including scientific name and vegetation code, is presented in Appendix A.

Non-native Species

Nine non-native species were identified in the 2005 survey: milfoil, white water lily (*Nymphaea odorata*), field mint (*Mentha arvense*), reed canarygrass (*Phalaris arundinacea*), narrow-leaved

cattail (*Typha angustifolia*), Himalayan blackberry (*Rubus armeniacus*), evergreen blackberry (*Rubus laciniatus*), bittersweet nightshade (*Solanum dulcamara*), and Canada thistle (*Cirsium arvense*). (Populations of giant knotweed (*Polygonum sachalinense*) have been recently controlled by SPU along road 18. This species was not observed along the shoreline of the lake, but may occur in adjoining wetlands and riparian corridors.)

The identification of the extent of the milfoil population was a major emphasis of this survey because of its ability to quickly dominate lake environments once these plants become established. At risk is the robust native plant community within Walsh Lake, as well as the potential for milfoil to spread to downstream water bodies, should the Walsh Lake drainage basin be reconnected to Rock Creek and added to the Seattle municipal water supply. Milfoil was observed only along the southeast shoreline of the lake. In most of this area, it occurred only as small, isolated plants. The milfoil population covered a total area of 25,000 ft^2 (0.6 acre). The epicenter of the population was a dense patch covering approximately 500 square feet (0.01 acre) of the lake surface (see Figure 4). Once identified, the milfoil population was isolated and removed, as part of a multi-year eradication effort. (Details on the milfoil control are discussed later in this report.)

White water lily was identified only in one isolated patch near the south end of the lake (see Figure 4). This species was also removed during the milfoil control effort.

Thin-leaved cattail grows interspersed with the native cattail (*Typha latifolia*) in extensive patches that dominate the emergent wetland vegetation zones associated with the lake. Hybrids between these species have been described at other sites in the Puget lowlands (Jacobsen 2001), and may occur in the vicinity of Walsh Lake as well. Control of this species is not practical given its interspersion with native species and the amount of ecological disturbance required to remove the species. The robust growth of the two cattail species appears to be limiting the population of reed canarygrass by dominating the available habitat.

Himalayan blackberry and evergreen blackberry occur infrequently near the lakeshore. They are more common along roadways and riparian corridors. A dense colony occurs along the Webster Creek riparian corridor.

Bittersweet nightshade occurs commonly at low density in emergent and scrub/shrub wetlands. Canada thistle and field mint were observed only as single plants in isolated areas around the lake.

Vegetation Communities

Five vegetation habitat communities were identified in Walsh Lake and in the nearby vicinity (see Figure 4): deep water habitat (no vascular plants), aquatic bed wetlands (submerged and floating-leaved vegetation), emergent wetlands, forested and scrub/shrub wetlands, and forested uplands. The wetland habitats are based on criteria developed by the U.S. Fish and Wildlife Service (Cowardin et al. 1979). Forested uplands were outside the survey area, but are included in this report to provide additional information about the ecological context of the Walsh Lake basin.

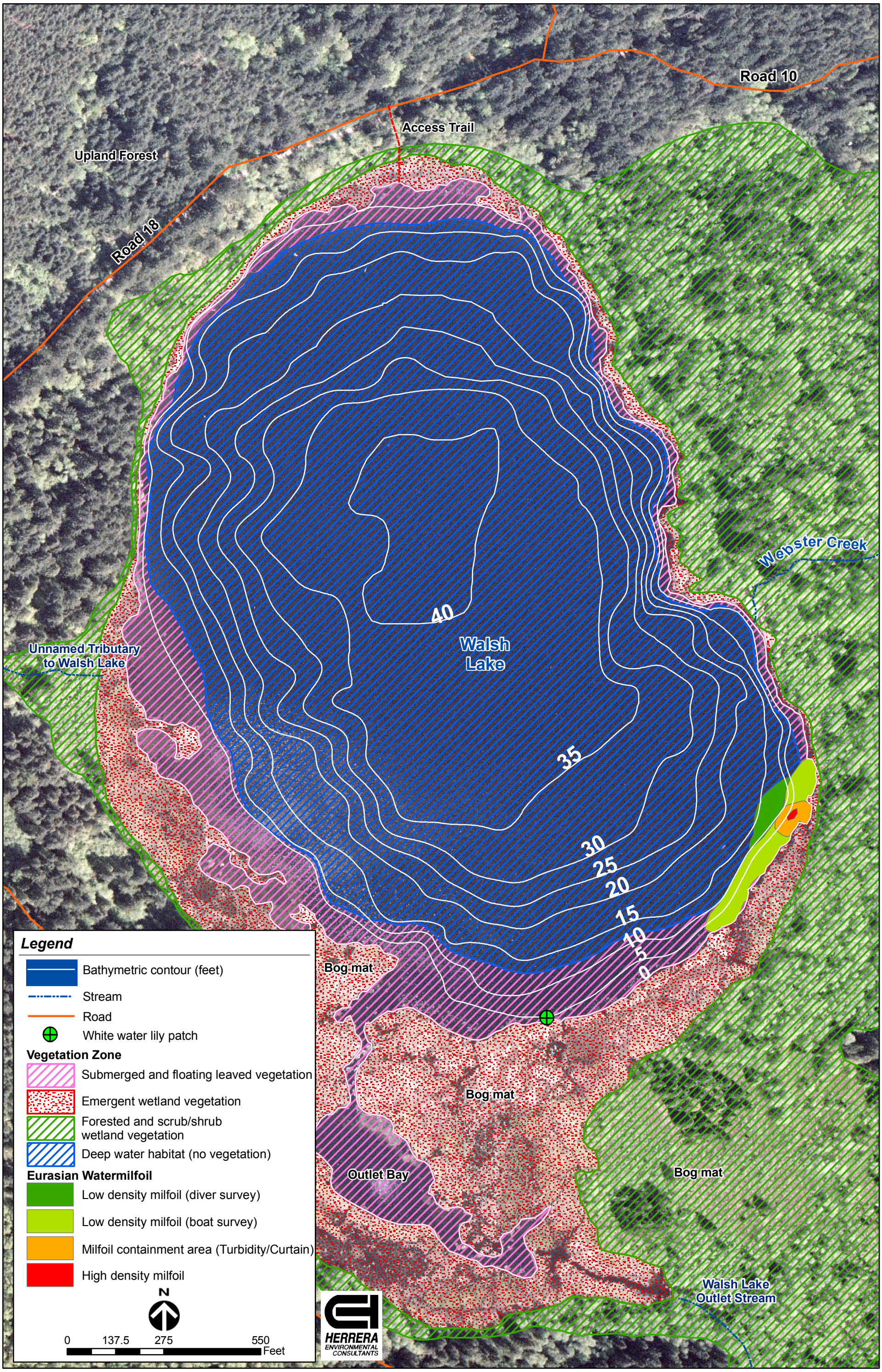

Figure 4. Walsh Lake bathymetry showing aquatic plant survey vegetation zones, and locations of milfoil and white water lily.

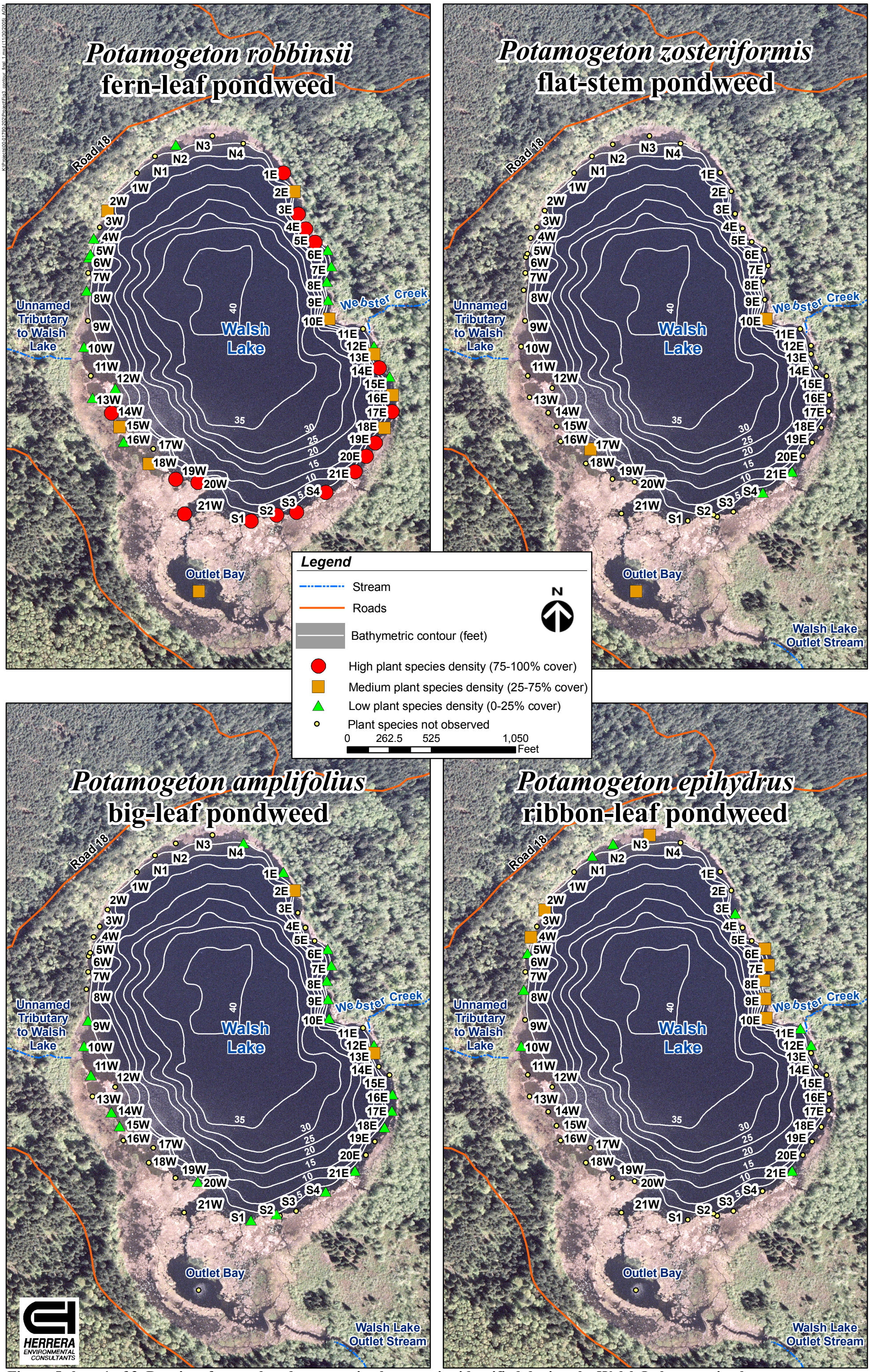

Figure 5 sheet 1 of 3. Density of most abundant aquatic plant species identified during the Walsh Lake aquatic plant survey.

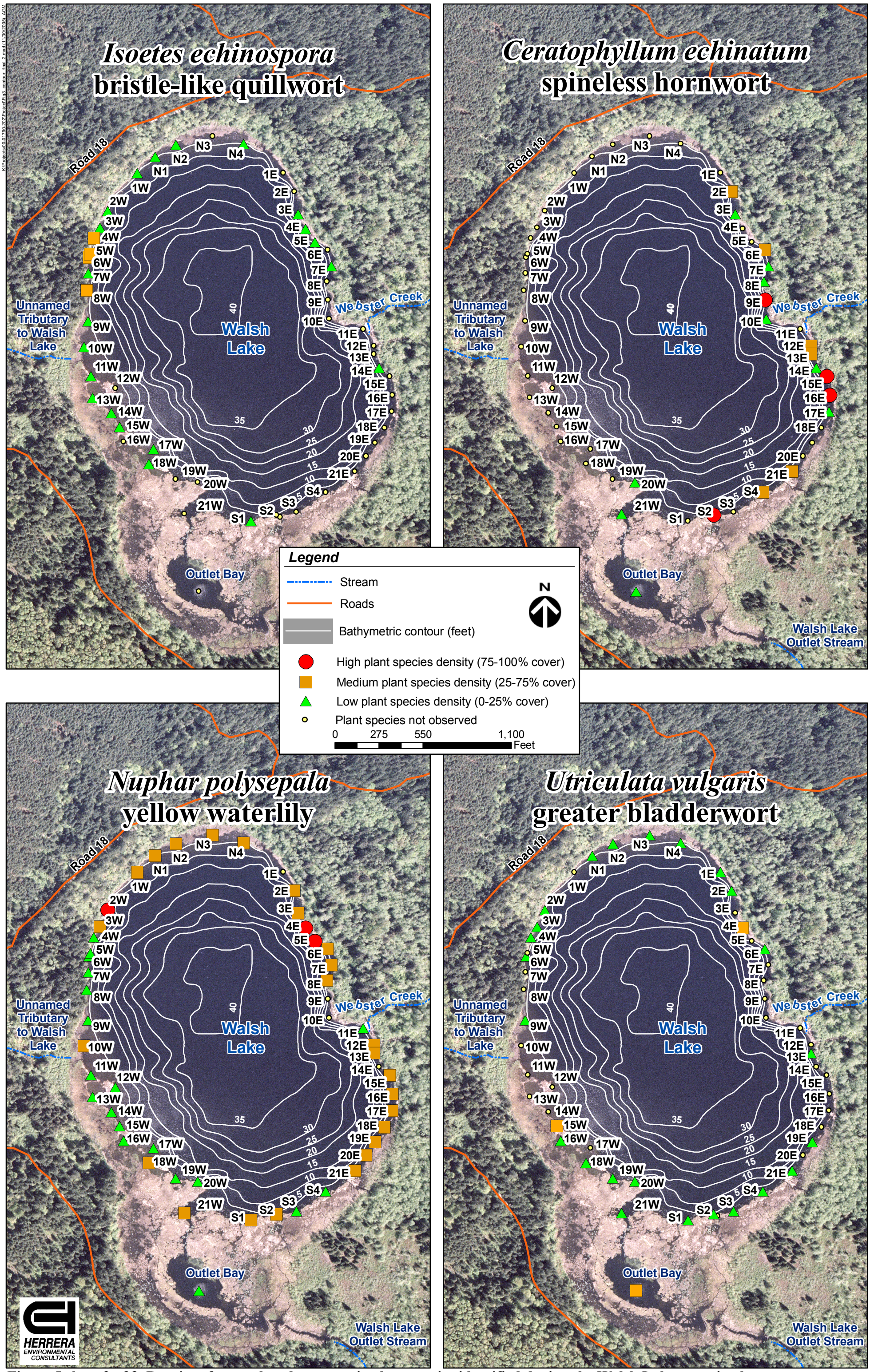

Figure 5 sheet 2 of 3. Density of most abundant aquatic plant species identified during the Walsh Lake aquatic plant survey.

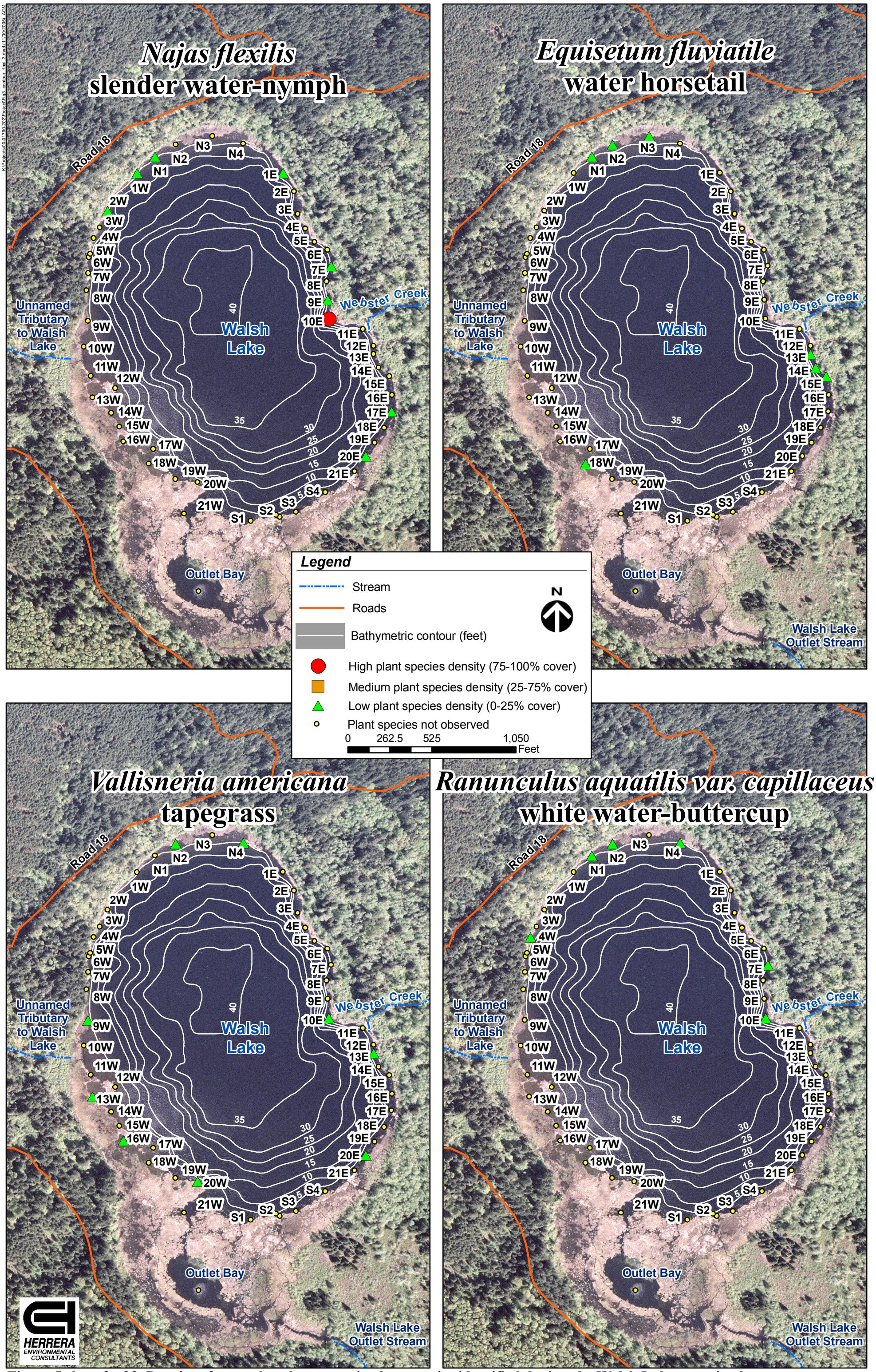

Figure 5 sheet 3 of 3. Density of most abundant aquatic plant species identified during the Walsh Lake aquatic plant survey.

An alphabetical list of plant species, including scientific name and vegetation code, is presented for each vegetation community in Appendix A. The code is based on the scientific name of the plant species. The relative density of submerged and floating-leaved plants observed at each sampling location is presented in a table and on a map in Appendix B (Table B-1 and Figure B-1). The relative density of all plant species observed at each sampling location is presented in a table and on a map in Appendix B (Table B-2 and Figure B-2). (The relative density of the 12 most abundant submerged and floating-leaved plants is presented separately in Figure 5.)

Deep Water Habitat

In those portions of the lake too deep to support vascular plant growth, a variety of algae grow as both thin mats and pillowy masses on the sediment surface. Periphyton was observed during diver surveys to depths of at least 20 feet, but may occur to the maximum depth of the lake (i.e., 41 feet).

Aquatic Bed Wetlands

Floating-leaved and submerged (aquatic bed) plants occur from the shoreline edge of emergent wetlands and extend offshore to depths of up to 15 feet (Figure 4). The area of aquatic bed wetlands totals 13.8 acres, representing 18.6 percent of the lake area. The percent cover of aquatic bed plants in Walsh Lake is lower then the average cover (36 percent) observed in 36 other lakes in King County (King County 1996). A wide variety of native species occur in this habitat. Coverage of these plants is typically very dense and layered in many areas, with different species capitalizing on resources throughout the water column. A total of 26 native floating-leaved and submerged plant species were identified during the 2005 survey. The distribution and relative density of the 12 most abundant species is illustrated in Figure 5.

Pondweeds (*Potamogeton* spp.) are ubiquitous in the lake. The most common species are big-leaf, ribbon-leaf, and fern-leaf pondweeds (*P. amplifolius*, *P. epihydrus*, and *P. robbinsii*, respectively). Yellow water lily (*Nuphar polysepala*) forms extensive patches in shallow water in many areas along the lakeshore. The north end of the lake contains patches of white water buttercup (*Ranunculus aquatilis* var. *capillaceus*). Other common species include coontail (*Ceratophyllum echinatum*), greater bladderwort (*Utriculata vulgaris*), flat-stem pondweed (*Potamageton zosteriformis*), western quillwort (*Isoetes occidentalis*), nitella (*Nitella* sp.), and slender water nymph (*Najas flexilis*). As described above in the non-native species section, milfoil and white water lily occur in this habitat. Their distribution is shown in Figure 4.

Emergent Wetlands

A continuous ring of emergent wetlands occur along the shoreline of the lake (see Figure 4). A high species richness (see Table A-1 in Appendix A) and several plant assemblages occur within this emergent wetland zone. The area of emergent wetlands totals 28.1 acres, which is much greater than average emergent cover of 1.0 acre for 36 lakes surveyed by King County (1996). The most common plant assemblage in these wetlands is a mixture of native cattail and narrow-leaved cattails, with occasional patches of reed canarygrass and a variety of native emergent

species. Some areas are dominated by aquatic horsetail (*Equisetum fluvatile*), while other areas contain a variety of sedges (*Carex* spp.) and bulrushes (*Scirpus* spp.).

The bog area at the south end of the lake supports a unique assemblage of emergent species, many of which require the peaty substrate and buffered hydrology of a bog mat in order to persist. Emergent wetland plant species unique to this area include tickle-grass (*Agrostis scabra*), prickly sedge (*Carex echinata*), sundew (*Drosera rotundifolia*), three-way sedge (*Dulichium arundinaceum*), bog St. John's wort (*Hypericum anagalloides*), and rice cutgrass (*Leersia oryzoides*).

Forested and Scrub/Shrub Wetlands

Large forested and scrub/shrub wetland complexes extend to the east and south of Walsh Lake (see Figure 4). They occur as a narrow band landward of the emergent wetlands on the north and west side of the lake. Common species include red alder (*Alnus rubra*), Sitka spruce (*Picea sitchensis*), western red-cedar (*Thuja plicata*), Pacific willow (*Salix lucida*), Sitka willow (*Salix sitchensis*), and hardhack (*Spiraea douglasii*). The emergent wetland species listed above occur in this area as understory or as emergent patches within a matrix of scrub/shrub and forested wetland.

The bog mat that occurs at the south end of the lake also includes an area that supports scrub/shrub and stunted forested wetland vegetation.

Forested Uplands

Second-growth forests, dominated by conifers, cover most of the Walsh Lake watershed. Common species include Douglas-fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), western red-cedar, red alder, big-leaf maple (*Acer macrophyllum*), and a wide variety of native shrubs and herbs. Disturbed roadsides provide niches for some common invasive species, including Canada thistle, and non-native blackberries, although populations of these species are small and isolated.

Cedar River Survey Results

No Eurasian watermilfoil or other invasive aquatic plant species were observed during surveys in 2005. The aquatic plants that occur in the backwater of Landsburg Dam are limited to white water buttercup (the dominant plant species) and isolated, low-density occurrences of nitella, tapegrass (*Vallisneria americana*), and bladderwort. The locations of white water buttercup populations are illustrated in Figure 6.

Overall, this portion of the Cedar River represents a healthy, forested riparian habitat, with minimal invasive species. The shorelines are forested with second-growth and old growth conifers, with a largely native understory. The aquatic plant community is densely vegetated and comprised entirely of native plant species. These populations of aquatic plants provide food sources, rearing habitat, and high-flow protection for fish in the Cedar River.

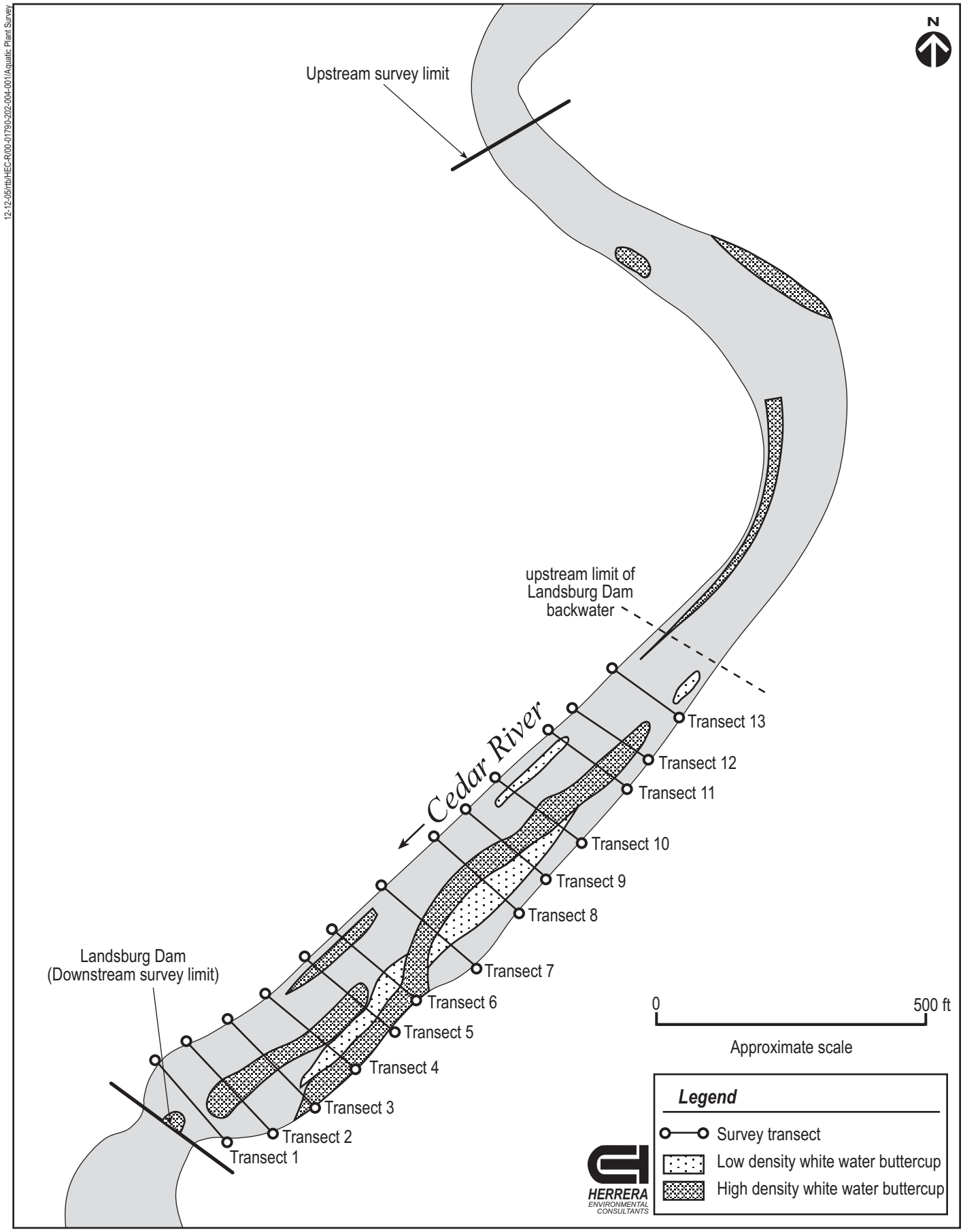

Figure 6. Aquatic plant survey results in the Cedar River above Landsburg Dam in King County, Washington.

Walsh Lake Milfoil Control Methods and Results

The discovery of a relatively small, isolated infestation of Eurasian watermilfoil in Walsh Lake during the 2005 survey prompted the City to initiate an immediate removal action. A diver hand-pulling technique was used to remove watermilfoil and white water lily from the lake because the populations were restricted to a relatively small area of the lake, and existing watershed policies prohibit the use of herbicides. As part of the removal action, a turbidity curtain was installed around dense growth near the center of the milfoil infestation area to reduce the spread of plant fragments generated during removal. Methods and results of the 2005 control effort are described below. Diver surveys and hand-pulling will be continued in 2006 in an effort to completely eradicate Eurasian watermilfoil and white water lily from Walsh Lake.

Two Herrera divers and scientists, Josh Wozniak and Rob Zisette, with a support boat captained by Rob Harrison, project engineer and safety officer, conducted the diver hand-pulling effort on September 1 and 2, 2005. The divers first hand-pulled isolated milfoil plants in the immediate vicinity of the high-density milfoil patch. When milfoil plants were encountered by a diver, all plant parts (i.e., roots, stems, and leaves) were placed in a nylon mesh bag. To reduce the loss of plant fragments, the opening of the mesh bag was lowered over the plants before they were uprooted. The roots were gently pulled out of the sediment and placed in the mesh bag. The mesh bag was carefully emptied into a large plastic container on the boat by the boat captain.

Once the immediate vicinity was cleared of isolated plants, a turbidity curtain was deployed around the high-density patch of milfoil (see Figure 4). The curtain was anchored to the shoreline at two points, north and south of the high-density milfoil patch. The curtain was manufactured with foam floats along the upper edge and the bottom edge was anchored to the lakebed using cinder blocks. These blocks were then connected to an anchor chain running along the lower edge of the curtain. This configuration was designed to isolate the plants such that any milfoil fragmentation that occurred during removal would be contained within the isolation area and not released to other areas of the lake.

Once the turbidity curtain was deployed and anchored, the divers hand-pulled the entire high-density patch inside the isolation area. All milfoil was transferred to the support boat, using extreme caution to ensure that no fragments were released from either the boat or isolation area. Fragments floating within the isolation area were collected with skim nets and transferred to the support boat. The isolation area was hand-pulled twice. Between these two hand-pulling events, divers hand-pulled milfoil plants identified outside the isolation area during boat surveys and diver surveys that extended out to depths of approximately 15 feet. The entire southeast shoreline of the lake was surveyed by divers on two occasions. White water lily plants were also removed during this hand-pulling session.

Several small, isolated milfoil plants were identified during diver surveys that were not discovered during the initial boat survey. These small milfoil plants were present between, and offshore of, larger plants observed during the boat survey (see Figure 4). They were not detected during the boat survey because they were short (less than 1 meter), unbunched, and typically

covered in periphyton (attached algae). In addition, small rooted fragments were discovered (and removed) in open water patches located within the adjacent emergent (cattail) vegetation. These plants were growing in very shallow water, outside of their preferred habitat, and appeared to be of poor vigor. These observations do indicate the potential for small populations to persist, even after the population within the lake is removed. Careful surveys and future eradication of these areas will be necessary to further reduce the potential for milfoil to establish itself in Walsh Lake.

All hand-pulled milfoil was transported by boat to a support vehicle and disposed of at the City of Seattle "Clean Green" vegetation waste composting station. In total, 580 pounds of milfoil and 8 pounds of white water lily (drained wet-weight) were removed during the 2005 control effort.

Plant Management Recommendations

The robust native aquatic plant population in Walsh Lake and the relatively small and isolated populations of milfoil and white water lily serve to enhance efforts to eradicate these noxious aquatic plants. No other species of noxious aquatic plants occur in the lake. It is recommended that diver surveys and hand-pulling be continued in Walsh Lake in 2006 in an effort to completely eradicate Eurasian watermilfoil and white water lily from the lake. Diver surveys of the 2005 infestation area should be conducted on at least three occasions in 2006 (e.g., in early June, mid-July, and late August). If plants are observed in the lake, they should be removed by hand-pulling and the immediate vicinity should be surveyed again until no noxious plants remain. Each survey should include the inspection of shallow, open water areas within the emergent vegetation and adjacent to the infestation area. In addition, the entire aquatic bed habitat in the lake should be surveyed on one occasion (i.e., in mid-July) by divers to a depth of 15 feet to ensure that no milfoil plants have become established outside the 2005 infestation area.

Several common noxious weeds that occur in wetlands and riparian areas (reed canarygrass, narrow-leaved cattail, non-native blackberries, and bittersweet nightshade) are present in wetlands that surround the lake. Even if eradicated, any of these species can be re-introduced to the lake through wildlife or human activities. Long-term monitoring and control will reduce the opportunity for invasive species to alter the wetland system surrounding the lake.

Populations of invasive plants are difficult to control in this setting, due to the limited vehicular access to wetlands and the existing presence of high-quality native plant populations. Furthermore, a more thorough survey of the extent and condition of the existing bog ecology, a very rare and fragile habitat, is warranted prior to the implementation of limited hand-pulling or other low impact control methods to control reed canarygrass, narrow-leaved cattail, or other invasive species in the bog. It is recommended that the bog mat area be carefully surveyed on at least two occasions during the 2006 growing season to determine the extent of invasive plant populations. If left unchecked, plants such as reed canarygrass, narrow-leaved cattail, or giant knotweed could potentially overrun the bog mat and displace bog species which currently inhabit the bog mat. Once the type and extent of invasive species are known, a control plan can be developed and implemented to preserve the unique bog habitat and the plants and animals which are dependent on the niches the bog provides.

Non-native blackberries are well-established in some of the nearby riparian areas. Prompt, aggressive control of these populations will protect the highly-functioning riparian systems that feed and drain Walsh Lake. Control of non-native blackberries in these adjacent systems will also protect the lake and wetlands from invasion by these species. It is recommended that the riparian corridor of Webster Creek and the Walsh Lake outlet stream be thoroughly surveyed for the presence and extent of Himalayan blackberry, cut-leaf blackberry, giant knotweed, and other invasive species. These species occur in the vicinity of Walsh Lake and are aggressive enough to displace existing native plant populations, particularly in riparian areas where the combination of regular soil disturbance from stream action and easy distribution of plant propagules (seeds, roots, or plant fragments) facilitates the colonization of these invasive species. Once established,

these species can alter the ecology of the riparian and wetland areas by reducing plant diversity, reducing native food sources, and altering forest succession by suppressing the establishment and maturation of tree seedlings. Ongoing monitoring and control of giant knotweed and non-native blackberries should prevent the species from gaining a foothold in the watershed.

Careful habitat monitoring in the future will ensure that this high-quality lake and wetland system will continue to provide rich habitat for the wide variety of species that now occur in the vicinity, as well as provide a water source compatible with stream habitat improvements in Rock Creek and with the City's municipal water supply system.

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APPENDIX A

Plant Species List and Distribution for Walsh Lake and Cedar River Aquatic Plant Survey

Table A-1. Plant species observed in the 2005 Walsh Lake and Cedar River aquatic plant survey.

Plant Type	Scientific Name [a]	Common Name [a]	Vegetation Code	Habitat (survey transect)
Trees	*Abies grandis*	grand fir	ABGR	upland forest
	Acer macrophyllum	big-leaf maple	ACMA	upland forest
	Alnus rubra	red alder	ALRU	upland forest, wetland margins, wetlands
	Malus fusca	Pacific crab apple	MAFU	upland forest, wetland margins, wetlands
	Picea sitchensis	Sitka spruce	PISI	upland forest, wetland margins, wetlands
	Populus balsamifera spp. *trichocarpa*	black cottonwood	POBA	upland forest, wetland margins, wetlands
	Pseudotsuga menziesii var. *menziesii*	coastal Douglas-fir	PSME	upland forest
	Taxus brevifolia	western yew	TABR	upland forest
	Thuja plicata	western red-cedar	THPL	upland forest, wetland margins, wetlands
	Tsuga heterophylla	western hemlock	TSHE	upland forest
Shrubs	*Acer circinatum*	vine maple	ACCI	upland forest, wetland margins
	Cornus sericea spp. *sericea*	red-osier dogwood, red-twig	COSE	wetlands
	Corylus cornuta	beaked hazelnut	COCO	upland forest
	Gaultheria shallon	salal	GASH	upland forest
	Holodiscus discolor	oceanspray	HODI	upland forest
	Lonicera involucrata	black twinberry	LOIN	wetland margins, wetlands
	Mahonia nervosa	dull Oregon-grape	MANE	upland forest
	Physocarpus capitatus	Pacific ninebark	PHCA	wetland margins, wetlands
	Rhamnus purshiana	cascara	RHPU	wetland margins
	Ribes bracteosum	stink currant	RIBR	wetland margins, wetlands
	Rubus armeniacus	Himalayan blackberry	RUAR	road margins, Webster Creek riparian area
	Rubus laciniatus	evergreen blackberry	RULA	road margins
	Rubus parviflorus	thimbleberry	RUPA	upland forest
	Rubus spectabilis	salmonberry	RUSP	wetland margins, wetlands
	Rubus ursinus	trailing blackberry	RUUR	upland forest
	Salix lucida spp. *lasiandra*	Pacific willow	SALU	wetland margins, wetlands
	Salix sitchensis	Sitka willow	SASI	wetland margins, wetlands
	Sambucus racemosa ssp. *pubens* var. *arborescens*	coastal red elderberry	SARA	upland forest
	Solanum dulcamara	bittersweet nightshade	SODU	wetland margins, wetlands
	Spiraea douglasii spp. *douglasii*	hardhack	SPDO	wetland margins, wetlands
	Vaccinium parvifolium	red huckleberry	VAPA	upland forest

Table A-1 (continued). Plant species observed in the 2005 Walsh Lake and Cedar River aquatic plant survey.

Plant Type	Scientific Name [a]	Common Name [a]	Vegetation Code	Habitat (survey transect)
Upland [c] Emergent Plants	*Blechnum spicant*	deer fern	BLSP	upland forest
	Carex mertensii	Merten's sedge	CAME	wetland margins
	Circaea alpina	enchanter's nightshade	CIAR	upland forest and wetland margins
	Cirsium arvense	Canada thistle	CIAR	roadside margins
	Elymus glaucus	blue wildrye	ELGL	upland forest
	Epilobium angustifolium	fireweed	EPAN	wetland margins
	Geum macrophyllum	large-leaved avens	GEMA	upland forest and wetland margins
	Luzula parviflora	small-flowered wood-rush	LUPA2	upland forest and wetland margins
	Maianthemum dilatatum	wild lily-of-the-valley	MADI	upland forest and wetland margins
	Polystichum munitum	sword fern	POMU	upland forest
	Pteridium aquilinum	bracken fern	PTAQ	upland forest, road margins
	Rumex crispa	curled dock	RUCR	road margins
	Trillium ovatum	western trillium	TROV	upland forest
Wetland [d] Emergent Plants	*Agrostis hyemalis* [b]	winter bentgrass	AGHE	lakeshore wetlands
	Agrostis scabra [b]	tickle-grass	AGSC	bog mat
	Athyrium filix-femina	lady fern	ATFI	wetlands
	Bidens cernua [b]	nodding beggar-ticks	BICE	lakeshore wetlands
	Boykinia elata	coast boykinia	BOEL	stream banks, wetlands
	Callitriche heterophylla	water starwort	CAHE	lakeshore wetlands (10E, S3)
	Cardamine oligosperma	few-seeded bittercress	CAOL	lakeshore wetlands
	Carex aquatilis var. *dives*	water sedge	CAAQ	lakeshore wetlands, bog mat (5E, 5W, 9W, 16W, 17W, 18W, 19W, 20W, S2, S3)
	Carex canescens	gray sedge	CACA	lakeshore wetlands (6W)
	Carex deweyana	Dewey's sedge	CADE	wetland margins, stream banks
	Carex echinata [b]	prickly sedge	CAEC	bog mat
	Carex lenticularis var. *lipocarpa* [b]	Kellogg's sedge	CALE	north lake margin and outlet of Webster Creek
	Carex obnupta	slough sedge	CAOB	wetlands (7W, 8W, 10W, 13W)
	Carex viridula	little green sedge	CAVI	lakeshore wetlands (S1, S3, S4)
	Drosera rotundifolia	sundew	DRRO	bog mat
	Dulichium arundinaceum	three-way sedge	DUAR	lakeshore wetlands, bog mat (N4, 14W, 18W, 19W, 20W, 21W, S3)
	Eleocharis ovata	ovoid spikerush	ELOV	lakeshore wetlands (3W, 10W)
	Eleocharis palustris	creeping spikerush	ELPA	lakeshore wetlands (20W)
	Epilobium watsonii	Watson's willow-herb	EPWA	wetlands and wetland margins

Table A-1 (continued). Plant species observed in the 2005 Walsh Lake and Cedar River aquatic plant survey.

Plant Type	Scientific Name [a]	Common Name [a]	Vegetation Code	Habitat (survey transect)
Wetland [d] Emergent Plants (continued)	*Equisetum fluviatile*	water horsetail	EQFL	lakeshore wetlands (N1, N2, N3, 1W, 2W, 7E, 9E, 11W, 13E, 14E, 15E, 18W)
	Equisetum telmateia	giant horsetail	EQTE	wetlands and wetland margins (6E)
	Galium trifidum [b]	small bedstraw	GATR	lakeshore wetlands, bog mat
	Glyceria borealis	northern mannagrass	GLBO	lakeshore wetlands (2W, 3E, 9W, 11W, 13W, 14W, 15E, S2, S3)
	Hydrocotyle ranunculoides	water pennywort	HYRA	lakeshore wetlands (12W, 18E)
	Hypericum anagalloides [b]	bog St. John's wort	HYAN	bog mat
	Juncus acuminatus	tapered rush	JUAC	wetlands and wetland margins
	Juncus balticus	Baltic rush	JUBA	lakeshore wetlands (13W, 14W, 15W, 16W, 17W)
	Juncus bufonius	toad rush	JUBU	wetlands and wetland margins
	Juncus gerardii (*Juncus bulbosus* var. *gerardii*) [b]	mud rush	JUGE	lakeshore wetlands
	Juncus effusus	soft rush	JUEF	lakeshore wetlands (5W, 10E, 10W, 11E)
	Juncus ensifolius	dagger-leaf rush	JUEN	wetlands and wetland margins
	Juncus supinus (*Juncus bulbosus* var. *supinus*) [b]	bulbous rush	JUSU	lakeshore wetlands
	Juncus tenuis	slender rush	JUTE	lakeshore wetlands
	Leersia oryzoides [b]	rice cutgrass	LEOR	lakeshore wetlands, bog mat
	Lycopus uniflorus	bugleweed	LYUN	lakeshore wetlands (14W, S2, S3, S4)
	Lysichiton americanum	skunk cabbage	LYAM	wetlands
	Mentha arvensis	field mint	MEAR	lakeshore wetlands (N4)
	Mimulus guttatus	monkey flower	MIGU	lakeshore wetlands, stream banks (S4)
	Myosotis laxa	small-flowered forget-me-not	MYLA	bog mat, lakeshore wetlands (S3)
	Myosotis scorpioides	common forget-me-not	MYSC	lakeshore wetlands (N4, 14W)
	Oenanthe sarmentosa	Pacific water-parsley	OESA	wetlands
	Phalaris arundinacea	reed canarygrass	PHAR	lakeshore wetlands (occurs at low density at most sampling points)
	Poa annua [b]	annual bluegrass	POAN	lakeshore wetlands
	Poa trivalis [b]	roughstalk bluegrass	POTR	lakeshore wetlands
	Potentilla palustris	marsh cinquefoil	POPA	bog mat, lakeshore wetlands (N3, N4, 2W, 3E, 4W, 7E, 9E, 11E, 12E, 14W, 18W, 20W, 21W, S1, S2, S3, S4)

Table A-1 (continued). Plant species observed in the 2005 Walsh Lake and Cedar River aquatic plant survey.

Plant Type	Scientific Name [a]	Common Name [a]	Vegetation Code	Habitat (survey transect)
Wetland [d] Emergent Plants (continued)	*Ranunculus repens*	creeping buttercup	RARE	wetlands, wetland margins, stream banks
	Rorippa nasturtium-aquaticum	water cress	RONA	lakeshore wetlands
	Sagina procumbens [b]	bird's-eye pearlwort	SAPR	lakeshore wetlands, Webster Creek outlet
	Scirpus acutus	hardstem bulrush	SCAC	lakeshore wetlands (N2, 10W, 11W, 12W, 15W, 16W)
	Scirpus cyperinus var. *brachypodus*	wool grass	SCCY	lakeshore wetlands (N2, N3, N4, 10W, 11W, 12W, 13W, S1)
	Scirpus microcarpus	small-fruited bulrush	SCMI	lakeshore wetlands
	Sparganium emersum [b]	narrow-leaved bur-reed	SPEM	lake (eastern shoreline)
	Stachys cooleyae	Cooley's hedgenettle	STCO	stream banks, lakeshore wetlands
	Stachys rigida [b]	rigid hedgenettle	STRI	stream banks, lakeshore wetlands
	Stellaria calycantha	northern starwort	STCA	lakeshore wetlands
	Trisetum cernuum	nodding trisetum	TRCE	stream banks
	Typha angustifolia	narrow-leaved cattail	TYAN	lakeshore wetlands (common along entire shoreline)
	Typha latifolia	cattail	TYLA	lakeshore wetlands (common along entire shoreline)
	Veronica americana	American brooklime	VEAM	lakeshore wetlands
	Veronica officinalis	common speedwell	VEOF	upland forest
	Veronica serpyllifolia [b]	thyme-leaved speedwell	VESE	lakeshore wetlands, stream banks
	Viola palustris [b]	marsh violet	VIPA	lakeshore wetlands
Floating-leaved Plants	*Brasenia schreberi*	water-shield	BRSC	lake (13W, 14W, 15W, 16W, 17W)
	Lemna minor	duckweed	LEMI	lakeshore wetlands
	Ludwigia palustris	water purslane	LUPA	lakeshore wetlands (5E, 10E, 17E, S3)
	Nuphar polysepala	yellow waterlily	NUPO	lake (common at most sampling points)
	Nymphaea odorata	white waterlily	NYOR	lake (S2) – see also Figure 4
	Polygonum amphibium	water swartweed	POLAM	lake (outlet bay)
	Potamogeton amplifolius	big-leaf pondweed	POAM	lake (N4, 1E, 2E, 6E, 7E, 8E, 9E, 9W, 10E, 10W, 11W, 12E, 13E, 14W, 15W, 16E, 17E, 18E, 20W, 21E, S1, S2, S4)
	Potamogeton epihydrus	ribbon-leaf pondweed	POEP	lake (N1, N2, N3, 2W, 3E, 4W, 6E, 6W, 7E,8E, 8W, 9E, 10E, 10W, 11E,12E, 21E, S1, S2, S4)

Table A-1 (continued). Plant species observed in the 2005 Walsh Lake and Cedar River aquatic plant survey.

Plant Type	Scientific Name [a]	Common Name [a]	Vegetation Code	Habitat (survey transect)
Submerged Plants	*Ceratophyllum echinatum*	spineless hornwort	CEEC	outlet bay and lake (2E, 3E, 6E, 7E, 8E, 9E, 10E, 12E, 13E, 14E, 15E, 16E, 17E, 20W, 21E, 21W, S2, S4)
	Chara oregana	Oregon muskgrass	CHOR	lake (18W, 19E)
	Isoetes echinospora	bristle-like quillwort	ISEC	lake (18W, S1)
	Isoetes occidentalis	western quillwort	ISOC	lake (N1, N2, N4, 1W, 2W, 3E, 3W, 4E, 4W, 5E, 5W, 6W, 7E, 7W, 8W, 9W, 10W, 11W, 13W, 14E, 14W, 15W, 17W, 18W)
	Myriophyllum spicatum	Eurasian water-milfoil	MYSP	lake (16E, 17E, 18E, 20E, 21E) – see also Figure 4
	Najas flexilis	slender water-nymph	NAFL	lake (N1, 1E, 1W, 2W, 7E, 9E, 10E, 17E, 20E)
	Nitella sp.	nitella	NISP	outlet bay, lake (12') (1E, 14E, 15W, 16E, 21E, S1, S2, S4)
	Potamogeton friesii	flat-shelled pondweed	POFR	lake (17E)
	Potamogeton gramineus	grass-leaved pondweed	POGR	lake (18W)
	Potamogeton pectinatus	Sago pondweed	POPE	lake (14E, 15E)
	Potamogeton robbinsii	fern-leaf pondweed	PORO	lake (common at most sampling points)
	Potamogeton zosteriformis	flat-stem pondweed	POZO	outlet bay, lake (10E, 17W, 21E, S4)
	Ranunculus aquatilis var. *capillaceus*	white water-buttercup	RAAQ	Cedar River survey area (see Figure 3) and lake (N1, N2, N4, 4W, 7E, 10E)
	Utriculata vulgaris	greater bladderwort	UTVU	lake (common at most sampling points) and Cedar River survey area
	Vallisneria americana	tapegrass	VAAM	lake (N2, N4, 9W, 10E, 13E, 13W, 16W, 19W, 20E, 20W) and Cedar River survey area

[a] Plant names are based on Hitchcock and Cronquist (1973), Jacobsen (2001), Pojar and MacKinnon (1994), and University of Washington Herbarium records (2005).
[b] These species were collected and identified by Fred Weinmann as part of the 2001 Herbarium collection forays. They were not observed during the 2005 aquatic plant survey conducted by Herrera.
[c] These species tend to occur in uplands, but may occasionally be found in wetlands.
[d] These species tend to occur in wetlands, but may occasionally be found in uplands.
Shading indicates a non-native plant species.

APPENDIX B

Survey Data Tables for Walsh Lake

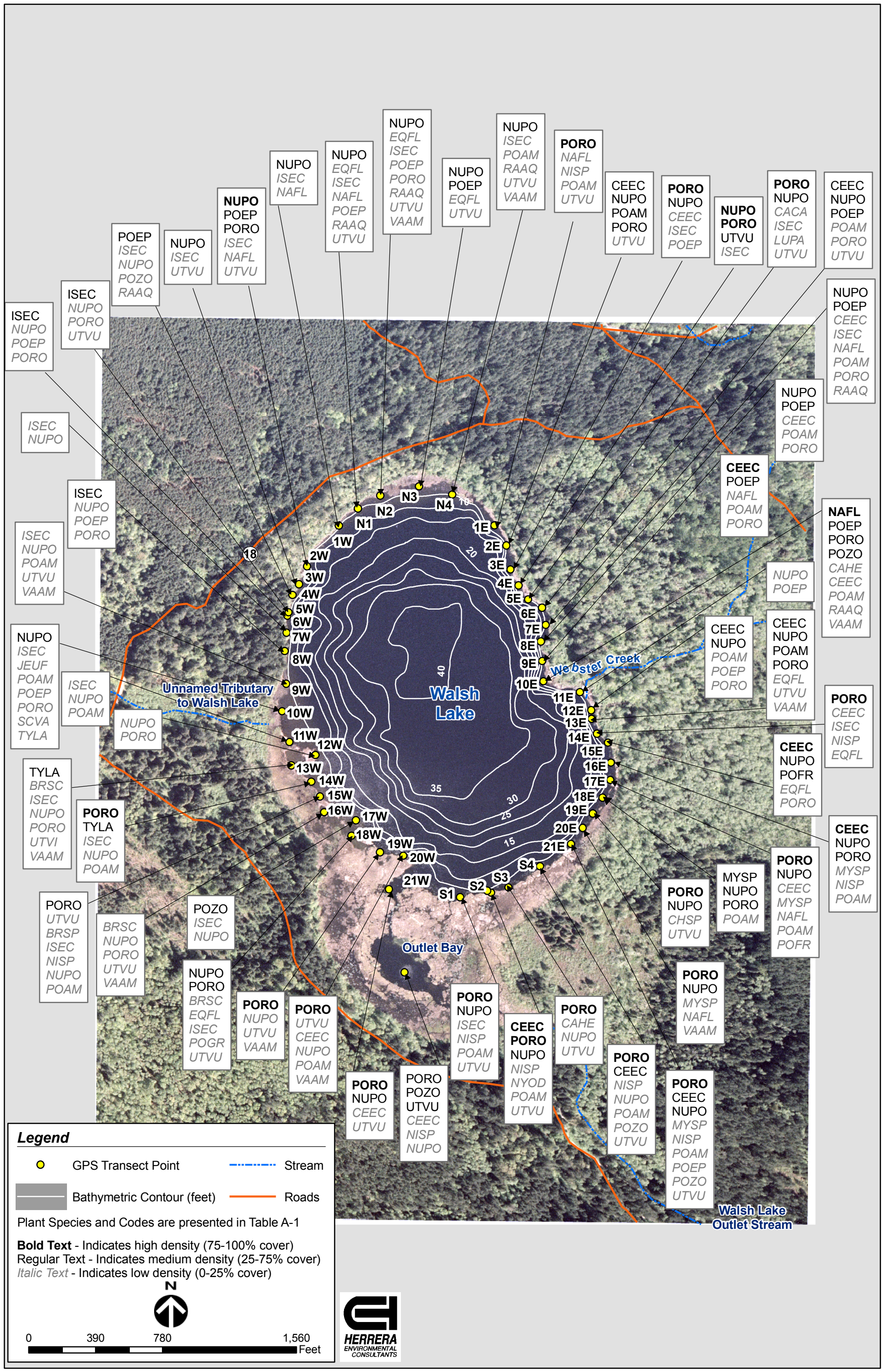

Figure B-1. Relative density of submerged and floating-leaved aquatic bed plant species identified during the 2005 Walsh Lake aquatic plant survey.

Table B-1. Walsh Lake 2005 Aquatic Plant Survey (aquatic bed habitat only).

Transect	Plant Code [a]	Frequency
1 E	PORO	H
1 E	NAFL	L
1 E	NISP	L
1 E	POAM	L
1 E	UTVU	L
1 W	NUPO	M
1 W	ISEC	L
1 W	NAFL	L
2 E	CEEC	M
2 E	NUPO	M
2 E	POAM	M
2 E	PORO	M
2 E	UTVU	L
2 W	NUPO	H
2 W	POEP	M
2 W	PORO	M
2 W	ISEC	L
2 W	NAFL	L
2 W	UTVU	L
3 E	PORO	H
3 E	NUPO	M
3 E	CEEC	L
3 E	ISEC	L
3 E	POEP	L
3 W	NUPO	M
3 W	ISEC	L
3 W	UTVU	L
4 E	NUPO	H
4 E	PORO	H
4 E	UTVU	M
4 E	ISEC	L
4 W	ISEC	M
4 W	POEP	M
4 W	NUPO	L
4 W	PORO	L
4 W	RAAQ	L
5 E	PORO	H
5 E	NUPO	H
5 E	ISEC	L
5 E	LUPA	L
5 E	UTVU	L

Table B-1 (continued). Walsh Lake 2005 Aquatic Plant Survey (aquatic bed habitat only).

Transect	Plant Code [a]	Frequency
5 W	ISEC	M
5 W	NUPO	L
5 W	PORO	L
5 W	UTVU	L
6 E	CEEC	M
6 E	NUPO	M
6 E	POEP	M
6 E	POAM	L
6 E	PORO	L
6 E	UTVU	L
6 W	ISEC	M
6 W	NUPO	L
6 W	POEP	L
6 W	PORO	L
7 E	NUPO	M
7 E	POEP	M
7 E	CEEC	L
7 E	ISEC	L
7 E	NAFL	L
7 E	POAM	L
7 E	PORO	L
7 E	RAAQ	L
7 W	ISEC	L
7 W	NUPO	L
8 E	NUPO	M
8 E	POEP	M
8 E	CEEC	L
8 E	POAM	L
8 E	PORO	L
8 W	ISEC	M
8 W	NUPO	L
8 W	POEP	L
8 W	PORO	L
9 E	CEEC	H
9 E	POEP	M
9 E	NAFL	L
9 E	POAM	L
9 E	PORO	L
9 W	ISEC	L
9 W	NUPO	L
9 W	POAM	L

Table B-1 (continued). Walsh Lake 2005 Aquatic Plant Survey (aquatic bed habitat only).

Transect	Plant Code [a]	Frequency
9 W	UTVU	L
9 W	VAAM	L
10 E	NAFL	H
10 E	POEP	M
10 E	PORO	M
10 E	POZO	M
10 E	CAHE	L
10 E	CEEC	L
10 E	POAM	L
10 E	RAAQ	L
10 E	VAAM	L
10 W	NUPO	M
10 W	ISEC	L
10 W	POAM	L
10 W	POEP	L
10 W	PORO	L
10 W	SCVA	L
10 W	TYLA	L
11 E	NUPO	L
11 E	POEP	L
11 W	ISEC	L
11 W	NUPO	L
11 W	POAM	L
12 E	CEEC	M
12 E	NUPO	M
12 E	POAM	L
12 E	POEP	L
12 E	PORO	L
12 W	NUPO	L
12 W	PORO	L
13 E	CEEC	M
13 E	NUPO	M
13 E	POAM	M
13 E	PORO	M
13 E	EQFL	L
13 E	UTVU	L
13 E	VAAM	L
13 W	TYLA	M
13 W	BRSC	L
13 W	ISEC	L
13 W	NUPO	L

Table B-1 (continued). Walsh Lake 2005 Aquatic Plant Survey (aquatic bed habitat only).

Transect	Plant Code [a]	Frequency
13 W	PORO	L
13 W	UTVI	L
13 W	VAAM	L
14 E	PORO	H
14 E	CEEC	L
14 E	ISEC	L
14 E	NISP	L
14 E	EQFL	L
14 W	PORO	H
14 W	TYLA	M
14 W	ISEC	L
14 W	NUPO	L
14 W	POAM	L
15 E	CEEC	H
15 E	NUPO	M
15 E	POFR	M
15 E	EQFL	L
15 E	PORO	L
15 W	PORO	M
15 W	UTVU	M
15 W	BRSC	L
15 W	ISEC	L
15 W	NISP	L
15 W	NUPO	L
15 W	POAM	L
16 E	CEEC	H
16 E	NUPO	M
16 E	PORO	M
16 E	MYSP	L
16 E	NISP	L
16 E	POAM	L
16 W	BRSC	L
16 W	NUPO	L
16 W	PORO	L
16 W	UTVU	L
16 W	VAAM	L
17 E	PORO	H
17 E	NUPO	M
17 E	CEEC	L
17 E	MYSP	L
17 E	NAFL	L

Table B-1 (continued). Walsh Lake 2005 Aquatic Plant Survey (aquatic bed habitat only).

Transect	Plant Code [a]	Frequency
17 E	POAM	L
17 E	POFR	L
17 W	POZO	M
17 W	ISEC	L
17 W	NUPO	L
18 E	MYSP	M
18 E	NUPO	M
18 E	PORO	M
18 E	POAM	L
18 W	NUPO	M
18 W	PORO	M
18 W	BRSC	L
18 W	EQFL	L
18 W	ISEC	L
18 W	POGR	L
18 W	UTVU	L
19 E	PORO	H
19 E	NUPO	M
19 E	CHSP	L
19 E	UTVU	L
19 W	PORO	H
19 W	NUPO	L
19 W	UTVU	L
19 W	VAAM	L
20 E	PORO	H
20 E	NUPO	M
20 E	MYSP	L
20 E	NAFL	L
20 E	VAAM	L
20 W	PORO	H
20 W	UTVU	L
20 W	CEEC	L
20 W	NUPO	L
20 W	POAM	L
20 W	VAAM	L
21 E	PORO	H
21 E	CEEC	M
21 E	NUPO	M
21 E	MYSP	L
21 E	NISP	L
21 E	POAM	L

Table B-1 (continued). Walsh Lake 2005 Aquatic Plant Survey (aquatic bed habitat only).

Transect	Plant Code [a]	Frequency
21 E	POEP	L
21 E	POZO	L
21 E	UTVU	L
21 W	PORO	H
21 W	NUPO	M
21 W	CEEC	L
21 W	UTVU	L
N1	NUPO	M
N1	EQFL	L
N1	ISEC	L
N1	NAFL	L
N1	POEP	L
N1	RAAQ	L
N1	UTVU	L
N2	NUPO	M
N2	EQFL	L
N2	ISEC	L
N2	POEP	L
N2	PORO	L
N2	RAAQ	L
N2	UTVU	L
N2	VAAM	L
N3	NUPO	M
N3	POEP	M
N3	EQFL	L
N3	UTVU	L
N4	NUPO	M
N4	ISEC	L
N4	POAM	L
N4	RAAQ	L
N4	UTVU	L
N4	VAAM	L
OUTLET BAY	PORO	M
OUTLET BAY	POZO	M
OUTLET BAY	UTVU	M
OUTLET BAY	CEEC	L
OUTLET BAY	NISP	L
OUTLET BAY	NUPO	L
S1	PORO	H
S1	NUPO	M
S1	ISEC	L

Table B-1 (continued). Walsh Lake 2005 Aquatic Plant Survey (aquatic bed habitat only).

Transect	Plant Code [a]	Frequency
S1	NISP	L
S1	POAM	L
S1	UTVU	L
S2	CEEC	H
S2	PORO	H
S2	NUPO	M
S2	NISP	L
S2	NYOD	L
S2	POAM	L
S2	UTVU	L
S3	PORO	H
S3	CAHE	L
S3	NUPO	L
S3	UTVU	L
S4	PORO	H
S4	CEEC	M
S4	NISP	L
S4	NUPO	L
S4	POAM	L
S4	POZO	L
S4	UTVU	L

[a] Plant Codes are abbreviations of the scientific name. A list of plant species, including scientific name and Plant Code, is included in Table A-1, Appendix A.

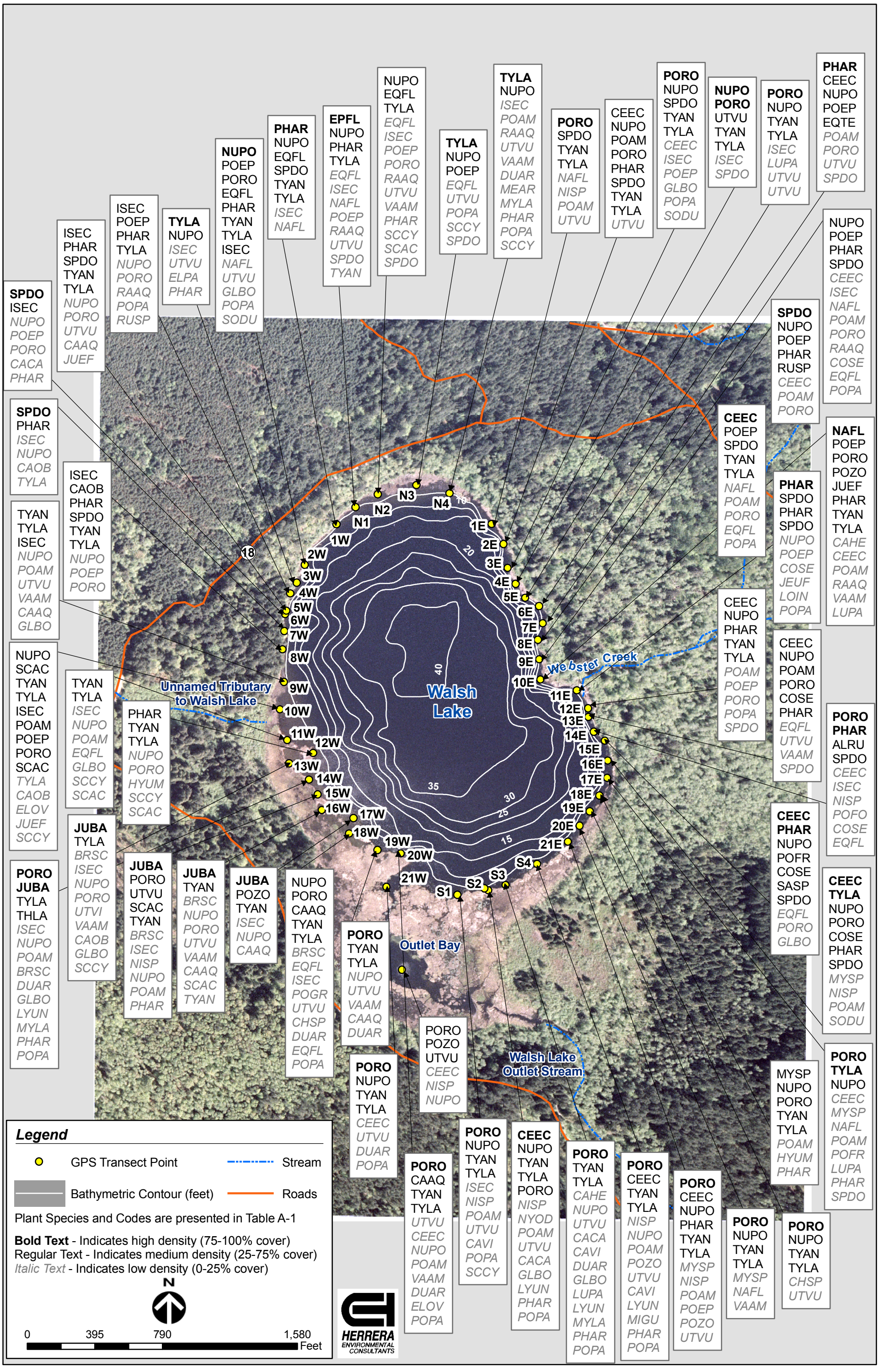

Figure B-2. Relative density of all plant species identified during the 2005 Walsh Lake aquatic plant survey.

Table B-2. Walsh Lake 2005 Aquatic Plant Survey (all habitats).

Transect	Habitat Type [a]	Plant [b]	Frequency
1 E	PAB	PORO	H
1 E	PEM	TYAN	M
1 E	PEM	TYLA	M
1 E	PAB	NAFL	L
1 E	PAB	NISP	L
1 E	PAB	POAM	L
1 E	PAB	UTVU	L
1 W	PEM	PHAR	H
1 W	PAB	NUPO	M
1 W	PEM	EQFL	M
1 W	PEM	SPDO	M
1 W	PEM	TYAN	M
1 W	PEM	TYLA	M
1 W	PAB	ISEC	L
1 W	PAB	NAFL	L
2 E	PAB	CEEC	M
2 E	PAB	NUPO	M
2 E	PAB	POAM	M
2 E	PAB	PORO	M
2 E	PEM	PHAR	M
2 E	PEM	SPDO	M
2 E	PEM	TYAN	M
2 E	PEM	TYLA	M
2 E	PAB	UTVU	L
2 W	PAB	NUPO	H
2 W	PAB	POEP	M
2 W	PAB	PORO	M
2 W	PEM	EQFL	M
2 W	PEM	PHAR	M
2 W	PEM	TYAN	M
2 W	PEM	TYLA	M
2 W	PAB	ISEC	L
2 W	PAB	NAFL	L
2 W	PAB	UTVU	L
2 W	PEM	GLBO	L
2 W	PEM	POPA	L
2 W	PEM	SODU	L
3 E	PAB	PORO	H
3 E	PAB	NUPO	M
3 E	PEM	SPDO	M
3 E	PEM	TYAN	M

Table B-2 (continued). Walsh Lake 2005 Aquatic Plant Survey (all habitats).

Transect	Habitat Type [a]	Plant [b]	Frequency
3 E	PEM	TYLA	M
3 E	PAB	CEEC	L
3 E	PAB	ISEC	L
3 E	PAB	POEP	L
3 E	PEM	GLBO	L
3 E	PEM	POPA	L
3 E	PEM	SODU	L
3 W	PEM	TYLA	H
3 W	PAB	NUPO	M
3 W	PAB	ISEC	L
3 W	PAB	UTVU	L
3 W	PEM	ELPA	L
3 W	PEM	PHAR	L
4 E	PAB	NUPO	H
4 E	PAB	PORO	H
4 E	PAB	UTVU	M
4 E	PEM	TYAN	M
4 E	PEM	TYLA	M
4 E	PAB	ISEC	L
4 E	PEM	SPDO	L
4 W	PAB	ISEC	M
4 W	PAB	POEP	M
4 W	PEM	PHAR	M
4 W	PEM	TYLA	M
4 W	PAB	NUPO	L
4 W	PAB	PORO	L
4 W	PAB	RAAQ	L
4 W	PEM	POPA	L
4 W	PEM	RUSP	L
5 E	PAB	PORO	H
5 E	PAB	NUPO	M
5 E	PEM	TYAN	M
5 E	PEM	TYLA	M
5 E	PAB	ISEC	L
5 E	PAB	LUPA	L
5 E	PAB	UTVU	L
5 E	PEM	UTVU	L
5 W	PAB	ISEC	M
5 W	PEM	PHAR	M
5 W	PEM	SPDO	M
5 W	PEM	TYAN	M

Table B-2 (continued). Walsh Lake 2005 Aquatic Plant Survey (all habitats).

Transect	Habitat Type [a]	Plant [b]	Frequency
5 W	PEM	TYLA	M
5 W	PAB	NUPO	L
5 W	PAB	PORO	L
5 W	PAB	UTVU	L
5 W	PEM	CAAQ	L
5 W	PEM	JUEF	L
6 E	PEM	PHAR	H
6 E	PAB	CEEC	M
6 E	PAB	NUPO	M
6 E	PAB	POEP	M
6 E	PEM	EQTE	M
6 E	PAB	POAM	L
6 E	PAB	PORO	L
6 E	PAB	UTVU	L
6 E	PEM	SPDO	L
6 W	PSS	SPDO	H
6 W	PAB	ISEC	M
6 W	PAB	NUPO	L
6 W	PAB	POEP	L
6 W	PAB	PORO	L
6 W	PSS	CACA	L
6 W	PSS	PHAR	L
7 E	PAB	NUPO	M
7 E	PAB	POEP	M
7 E	PSS/PEM	PHAR	M
7 E	PSS/PEM	SPDO	M
7 E	PAB	CEEC	L
7 E	PAB	ISEC	L
7 E	PAB	NAFL	L
7 E	PAB	POAM	L
7 E	PAB	PORO	L
7 E	PAB	RAAQ	L
7 E	PSS/PEM	COSE	L
7 E	PSS/PEM	EQFL	L
7 E	PSS/PEM	POPA	L
7 W	PSS	SPDO	H
7 W	PSS	PHAR	M
7 W	PAB	ISEC	L
7 W	PAB	NUPO	L
7 W	PSS	CAOB	L
7 W	PSS	TYLA	L

Table B-2 (continued). Walsh Lake 2005 Aquatic Plant Survey (all habitats).

Transect	Habitat Type [a]	Plant [b]	Frequency
8 E	PEM/PSS	SPDO	H
8 E	PAB	NUPO	M
8 E	PAB	POEP	M
8 E	PEM/PSS	PHAR	M
8 E	PEM/PSS	RUSP	M
8 E	PAB	CEEC	L
8 E	PAB	POAM	L
8 E	PAB	PORO	L
8 W	PAB	ISEC	M
8 W	PEM	CAOB	M
8 W	PEM	PHAR	M
8 W	PEM	SPDO	M
8 W	PEM	TYAN	M
8 W	PEM	TYLA	M
8 W	PAB	NUPO	L
8 W	PAB	POEP	L
8 W	PAB	PORO	L
9 E	PAB	CEEC	H
9 E	PAB	POEP	M
9 E	PEM	SPDO	M
9 E	PEM	TYAN	M
9 E	PEM	TYLA	M
9 E	PAB	NAFL	L
9 E	PAB	POAM	L
9 E	PAB	PORO	L
9 E	PEM	EQFL	L
9 E	PEM	POPA	L
9 W	PEM	TYAN	M
9 W	PEM	TYLA	M
9 W	PAB	ISEC	L
9 W	PAB	NUPO	L
9 W	PAB	POAM	L
9 W	PAB	UTVU	L
9 W	PAB	VAAM	L
9 W	PEM	CAAQ	L
9 W	PEM	GLBO	L
10 E	PAB	NAFL	H
10 E	PAB	POEP	M
10 E	PAB	PORO	M
10 E	PAB	POZO	M
10 E	PEM	JUEF	M

Table B-2 (continued). Walsh Lake 2005 Aquatic Plant Survey (all habitats).

Transect	Habitat Type [a]	Plant [b]	Frequency
10 E	PEM	PHAR	M
10 E	PEM	TYAN	M
10 E	PEM	TYLA	M
10 E	PAB	CAHE	L
10 E	PAB	CEEC	L
10 E	PAB	POAM	L
10 E	PAB	RAAQ	L
10 E	PAB	VAAM	L
10 E	PEM	LUPA	L
10 W	PAB	NUPO	M
10 W	PEM	SCAC	M
10 W	PEM	TYAN	M
10 W	PEM	TYLA	M
10 W	PAB	ISEC	L
10 W	PAB	POAM	L
10 W	PAB	POEP	L
10 W	PAB	PORO	L
10 W	PAB	SCAC	L
10 W	PAB	TYLA	L
10 W	PEM	CAOB	L
10 W	PEM	ELOV	L
10 W	PEM	JUEF	L
10 W	PEM	SCCY	L
11 E	PEM	PHAR	H
11 E	PEM	SPDO	M
11 E	PAB	NUPO	L
11 E	PAB	POEP	L
11 E	PEM	COSE	L
11 E	PEM	JEUF	L
11 E	PEM	LOIN	L
11 E	PEM	POPA	L
11 W	PEM	TYAN	M
11 W	PEM	TYLA	M
11 W	PAB	ISEC	L
11 W	PAB	NUPO	L
11 W	PAB	POAM	L
11 W	PEM	EQFL	L
11 W	PEM	GLBO	L
11 W	PEM	SCCY	L
11 W	PEM	SCAC	L
12 E	PAB	CEEC	M

Table B-2 (continued). Walsh Lake 2005 Aquatic Plant Survey (all habitats).

Transect	Habitat Type [a]	Plant [b]	Frequency
12 E	PAB	NUPO	M
12 E	PEM	PHAR	M
12 E	PEM	TYAN	M
12 E	PEM	TYLA	M
12 E	PAB	POAM	L
12 E	PAB	POEP	L
12 E	PAB	PORO	L
12 E	PEM	POPA	L
12 E	PEM	SPDO	L
12 W	PEM	PHAR	M
12 W	PEM	TYAN	M
12 W	PEM	TYLA	M
12 W	PAB	NUPO	L
12 W	PAB	PORO	L
12 W	PEM	HYUM	L
12 W	PEM	SCCY	L
12 W	PEM	SCAC	L
13 E	PAB	CEEC	M
13 E	PAB	NUPO	M
13 E	PAB	POAM	M
13 E	PAB	PORO	M
13 E	PEM	COSE	M
13 E	PEM	PHAR	M
13 E	PAB	EQFL	L
13 E	PAB	UTVU	L
13 E	PAB	VAAM	L
13 E	PEM	SPDO	L
13 W	PEM	JUBA	H
13 W	PAB	TYLA	M
13 W	PAB	BRSC	L
13 W	PAB	ISEC	L
13 W	PAB	NUPO	L
13 W	PAB	PORO	L
13 W	PAB	UTVI	L
13 W	PAB	VAAM	L
13 W	PEM	CAOB	L
13 W	PEM	GLBO	L
13 W	PEM	SCCY	L
14 E	PAB	PORO	H
14 E	PEM	PHAR	H
14 E	PEM	ALRU	M

Table B-2 (continued). Walsh Lake 2005 Aquatic Plant Survey (all habitats).

Transect	Habitat Type [a]	Plant [b]	Frequency
14 E	PEM	SPDO	M
14 E	PAB	CEEC	L
14 E	PAB	ISEC	L
14 E	PAB	NISP	L
14 E	PAB	POFO	L
14 E	PEM	COSE	L
14 E	PEM	EQFL	L
14 W	PAB	PORO	H
14 W	PEM	JUBA	H
14 W	PAB	TYLA	M
14 W	PEM	THLA	M
14 W	PAB	ISEC	L
14 W	PAB	NUPO	L
14 W	PAB	POAM	L
14 W	PEM	BRSC	L
14 W	PEM	DUAR	L
14 W	PEM	GLBO	L
14 W	PEM	LYUN	L
14 W	PEM	MYLA	L
14 W	PEM	PHAR	L
14 W	PEM	POPA	L
15 E	PAB	CEEC	H
15 E	PEM	PHAR	H
15 E	PAB	NUPO	M
15 E	PAB	POFR	M
15 E	PEM	COSE	M
15 E	PEM	SASP	M
15 E	PEM	SPDO	M
15 E	PAB	EQFL	L
15 E	PAB	PORO	L
15 E	PEM	GLBO	L
15 W	PEM	JUBA	H
15 W	PAB	PORO	M
15 W	PAB	UTVU	M
15 W	PEM	SCAC	M
15 W	PEM	TYAN	M
15 W	PAB	BRSC	L
15 W	PAB	ISEC	L
15 W	PAB	NISP	L
15 W	PAB	NUPO	L
15 W	PAB	POAM	L

Table B-2 (continued). Walsh Lake 2005 Aquatic Plant Survey (all habitats).

Transect	Habitat Type [a]	Plant [b]	Frequency
15 W	PEM	PHAR	L
16 E	PAB	CEEC	H
16 E	PEM	TYLA	H
16 E	PAB	NUPO	M
16 E	PAB	PORO	M
16 E	PEM	COSE	M
16 E	PEM	PHAR	M
16 E	PEM	SPDO	M
16 E	PAB	MYSP	L
16 E	PAB	NISP	L
16 E	PAB	POAM	L
16 E	PEM	SODU	L
16 W	PEM	JUBA	H
16 W	PEM	TYAN	M
16 W	PAB	BRSC	L
16 W	PAB	NUPO	L
16 W	PAB	PORO	L
16 W	PAB	UTVU	L
16 W	PAB	VAAM	L
16 W	PEM	CAAQ	L
16 W	PEM	SCAC	L
16 W	PEM	TYAN	L
17 E	PAB	PORO	H
17 E	PEM	TYLA	H
17 E	PAB	NUPO	M
17 E	PAB	CEEC	L
17 E	PAB	MYSP	L
17 E	PAB	NAFL	L
17 E	PAB	POAM	L
17 E	PAB	POFR	L
17 E	PEM	LUPA	L
17 E	PEM	PHAR	L
17 E	PEM	SPDO	L
17 W	PEM	JUBA	H
17 W	PAB	POZO	M
17 W	PEM	TYAN	M
17 W	PAB	ISEC	L
17 W	PAB	NUPO	L
17 W	PEM	CAAQ	L
18 E	PAB	MYSP	M
18 E	PAB	NUPO	M

Table B-2 (continued). Walsh Lake 2005 Aquatic Plant Survey (all habitats).

Transect	Habitat Type [a]	Plant [b]	Frequency
18 E	PAB	PORO	M
18 E	PEM	TYAN	M
18 E	PEM	TYLA	M
18 E	PAB	POAM	L
18 E	PEM	HYUM	L
18 E	PEM	PHAR	L
18 W	PAB	NUPO	M
18 W	PAB	PORO	M
18 W	PEM	CAAQ	M
18 W	PEM	TYAN	M
18 W	PEM	TYLA	M
18 W	PAB	BRSC	L
18 W	PAB	EQFL	L
18 W	PAB	ISEC	L
18 W	PAB	POGR	L
18 W	PAB	UTVU	L
18 W	PEM	CHSP	L
18 W	PEM	DUAR	L
18 W	PEM	EQFL	L
18 W	PEM	POPA	L
19 E	PAB	PORO	H
19 E	PAB	NUPO	M
19 E	PEM	TYAN	M
19 E	PEM	TYLA	M
19 E	PAB	CHSP	L
19 E	PAB	UTVU	L
19 W	PAB	PORO	H
19 W	PEM	TYAN	M
19 W	PEM	TYLA	M
19 W	PAB	NUPO	L
19 W	PAB	UTVU	L
19 W	PAB	VAAM	L
19 W	PEM	CAAQ	L
19 W	PEM	DUAR	L
20 E	PAB	PORO	H
20 E	PAB	NUPO	M
20 E	PEM	TYAN	M
20 E	PEM	TYLA	M
20 E	PAB	MYSP	L
20 E	PAB	NAFL	L
20 E	PAB	VAAM	L

Table B-2 (continued). Walsh Lake 2005 Aquatic Plant Survey (all habitats).

Transect	Habitat Type [a]	Plant [b]	Frequency
20 W	PAB	PORO	H
20 W	PEM	CAAQ	M
20 W	PEM	TYAN	M
20 W	PEM	TYLA	M
20 W	PAB	UTVU	L
20 W	PAB	CEEC	L
20 W	PAB	NUPO	L
20 W	PAB	POAM	L
20 W	PAB	VAAM	L
20 W	PEM	DUAR	L
20 W	PEM	ELOV	L
20 W	PEM	POPA	L
21 E	PAB	PORO	H
21 E	PAB	CEEC	M
21 E	PAB	NUPO	M
21 E	PEM	PHAR	M
21 E	PEM	TYAN	M
21 E	PEM	TYLA	M
21 E	PAB	MYSP	L
21 E	PAB	NISP	L
21 E	PAB	POAM	L
21 E	PAB	POEP	L
21 E	PAB	POZO	L
21 E	PAB	UTVU	L
21 W	PAB	PORO	H
21 W	PAB	NUPO	M
21 W	PEM	TYAN	M
21 W	PEM	TYLA	M
21 W	PAB	CEEC	L
21 W	PAB	UTVU	L
21 W	PEM	DUAR	L
21 W	PEM	POPA	L
N1	PEM	EPFL	H
N1	PAB	NUPO	M
N1	PEM	PHAR	M
N1	PEM	TYLA	M
N1	PAB	EQFL	L
N1	PAB	ISEC	L
N1	PAB	NAFL	L
N1	PAB	POEP	L
N1	PAB	RAAQ	L

Table B-2 (continued). Walsh Lake 2005 Aquatic Plant Survey (all habitats).

Transect	Habitat Type [a]	Plant [b]	Frequency
N1	PAB	UTVU	L
N1	PEM	SPDO	L
N1	PEM	TYAN	L
N2	PAB	NUPO	M
N2	PEM	EQFL	M
N2	PEM	TYLA	M
N2	PAB	EQFL	L
N2	PAB	ISEC	L
N2	PAB	POEP	L
N2	PAB	PORO	L
N2	PAB	RAAQ	L
N2	PAB	UTVU	L
N2	PAB	VAAM	L
N2	PEM	PHAR	L
N2	PEM	SCCY	L
N2	PEM	SCAC	L
N2	PEM	SPDO	L
N3	PEM	TYLA	H
N3	PAB	NUPO	M
N3	PAB	POEP	M
N3	PEM	EQFL	M
N3	PAB	EQFL	L
N3	PAB	UTVU	L
N3	PEM	POPA	L
N3	PEM	SCCY	L
N3	PEM	SPDO	L
N4	PEM	TYLA	H
N4	PAB	NUPO	M
N4	PAB	ISEC	L
N4	PAB	POAM	L
N4	PAB	RAAQ	L
N4	PAB	UTVU	L
N4	PAB	VAAM	L
N4	PEM	DUAR	L
N4	PEM	MEAR	L
N4	PEM	MYLA	L
N4	PEM	PHAR	L
N4	PEM	POPA	L
N4	PEM	SCCY	L
OUTLET BAY	PAB	PORO	M
OUTLET BAY	PAB	POZO	M

Table B-2 (continued). Walsh Lake 2005 Aquatic Plant Survey (all habitats).

Transect	Habitat Type [a]	Plant [b]	Frequency
OUTLET BAY	PAB	UTVU	M
OUTLET BAY	PAB	CEEC	L
OUTLET BAY	PAB	NISP	L
OUTLET BAY	PAB	NUPO	L
S1	PAB	PORO	H
S1	PAB	NUPO	M
S1	PEM	TYAN	M
S1	PEM	TYLA	M
S1	PAB	ISEC	L
S1	PAB	NISP	L
S1	PAB	POAM	L
S1	PAB	UTVU	L
S1	PEM	CAVI	L
S1	PEM	POPA	L
S1	PEM	SCCY	L
S2	PAB	CEEC	H
S2	PAB	NUPO	M
S2	PEM	TYAN	M
S2	PEM	TYLA	M
S2	PAB	PORO	M/H
S2	PAB	NISP	L
S2	PAB	NYOD	L
S2	PAB	POAM	L
S2	PAB	UTVU	L
S2	PEM	CACA	L
S2	PEM	GLBO	L
S2	PEM	LYUN	L
S2	PEM	PHAR	L
S2	PEM	POPA	L
S3	PAB	PORO	H
S3	PEM	TYAN	M
S3	PEM	TYLA	M
S3	PAB	CAHE	L
S3	PAB	NUPO	L
S3	PAB	UTVU	L
S3	PEM	CACA	L
S3	PEM	CAVI	L
S3	PEM	DUAR	L
S3	PEM	GLBO	L
S3	PEM	LUPA	L
S3	PEM	LYUN	L

Table B-2 (continued). Walsh Lake 2005 Aquatic Plant Survey (all habitats).

Transect	Habitat Type [a]	Plant [b]	Frequency
S3	PEM	MYLA	L
S3	PEM	PHAR	L
S3	PEM	POPA	L
S4	PAB	PORO	H
S4	PAB	CEEC	M
S4	PEM	TYAN	M
S4	PEM	TYLA	M
S4	PAB	NISP	L
S4	PAB	NUPO	L
S4	PAB	POAM	L
S4	PAB	POZO	L
S4	PAB	UTVU	L
S4	PEM	CAVI	L
S4	PEM	LYUN	L
S4	PEM	MIGU	L
S4	PEM	PHAR	L
S4	PEM	POPA	L

[a] PAB = palustrine aquatic bed; PEM = palustrine emergent

[b] Plant Codes are abbreviations of the scientific name. A list of plants, including scientific name and Plant Code, is included in Table A-1, Appendix A.