



# **Waterweeds: A Report on Volunteer Survey Results for Fifteen King County Lakes**



FINAL REPORT  
for the Washington State Department of Ecology

February 2000



KING COUNTY  
Department of Natural Resources

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Prepared by:  
Sharon Walton  
Senior Limnologist  
King County Water and Land Resource Division  
201 South Jackson Street, Suite 600  
Seattle, WA 98104  
(206) 296-6519

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- Acar Bill and Ray Petit (Beaver);
- Ed and Min Merrill (Desire);
- M. Tiffany (Easter);
- Sue and Tom Jones (Geneva);
- David Mangles and Rick Sampson (Leota);
- Henry Hatem and Chuck Willis (Marcel);
- Douglas Johnston (Margaret);
- Richard Balash and Robert Wagner (Morton);
- Kay Doolittle (Paradise);
- Kate Bradley, Holly Delaney, and Ilene Stahl (Pine);
- Todd and Janice Hammerstrom (Retreat)
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# Table of Contents

|   |     |
|---|-----|
| Acknowledgments .....                       | i   |
| Table of Contents .....                     | ii  |
| Figures .....                               | iii |
| Tables .....                                | iv  |
| Summary .....                               | vi  |
| Project Description .....                   | 1   |
| Project Purpose .....                       | 1   |
| Weed Classification .....                   | 1   |
| Volunteer Recruitment .....                 | 2   |
| Training Materials and Methods .....        | 4   |
| <i>Training Materials</i> .....             | 4   |
| <i>Workshops and Onsite Training</i> .....  | 4   |
| <i>Equipment and Maps</i> .....             | 5   |
| <i>Methods</i> .....                        | 5   |
| Survey Results .....                        | 7   |
| <i>Angle Lake</i> .....                     | 8   |
| <i>Beaver Lake</i> .....                    | 10  |
| <i>Lake Desire</i> .....                    | 12  |
| <i>Easter Lake</i> .....                    | 14  |
| <i>Lake Geneva</i> .....                    | 16  |
| <i>Lake Leota</i> .....                     | 18  |
| <i>Lake Marcel</i> .....                    | 20  |
| <i>Lake Margaret</i> .....                  | 22  |
| <i>Lake Morton</i> .....                    | 24  |
| <i>Paradise Lake</i> .....                  | 26  |
| <i>Pine Lake</i> .....                      | 28  |
| <i>Lake Retreat</i> .....                   | 30  |
| <i>Shady Lake</i> .....                     | 32  |
| <i>Spring Lake</i> .....                    | 34  |
| <i>Lake Wilderness</i> .....                | 38  |
| Key Findings .....                          | 42  |
| Recommendations .....                       | 43  |
| References .....                            | 43  |
| Appendix A: Weed Identification Cards ..... | A-1 |
| Appendix B: Instructions Sheet .....        | B-1 |
| Appendix C: Workshop Agendas .....          | C-1 |
| Appendix D: Field Sheet .....               | D-1 |

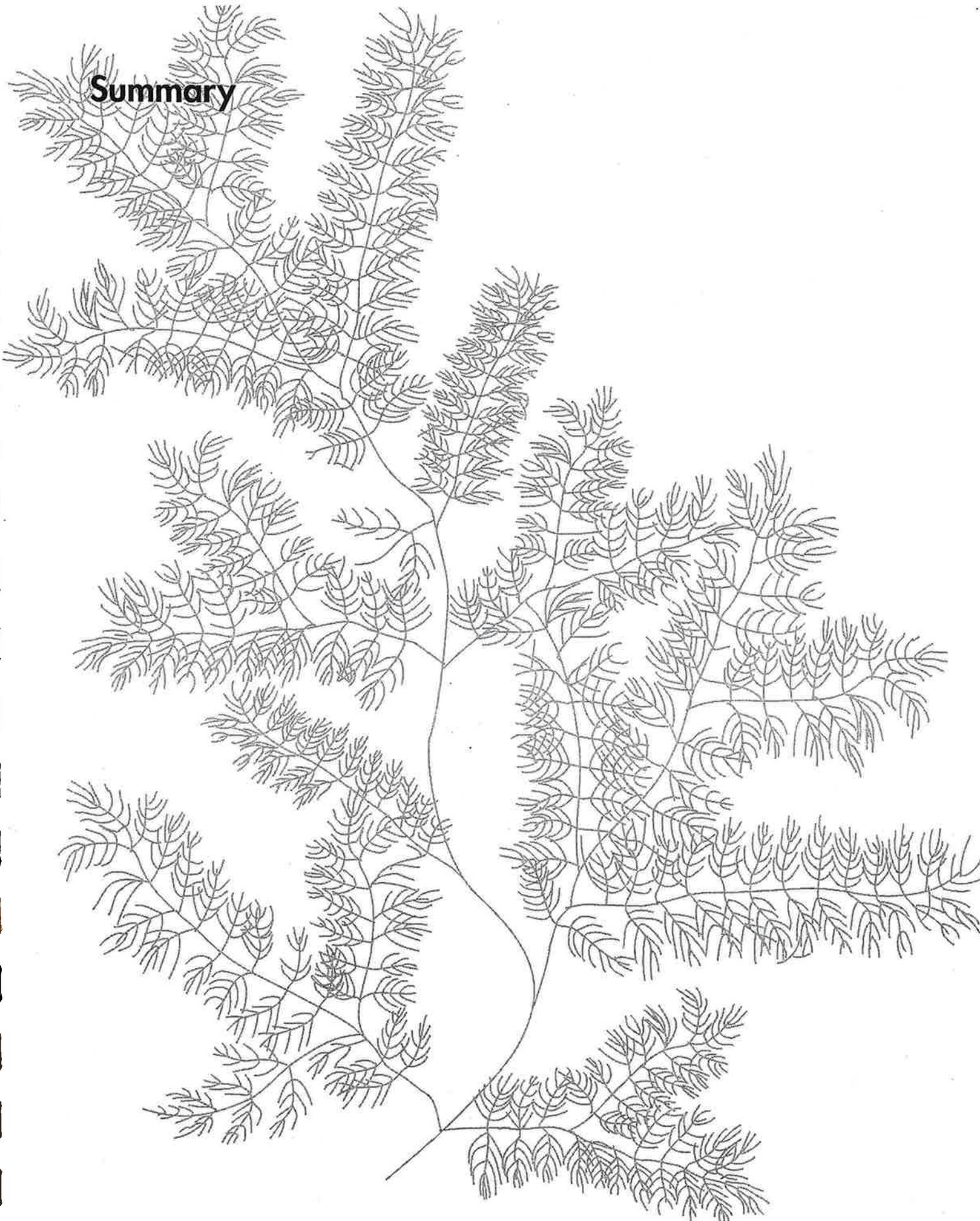
## Figures

- Figure 1: Waterweeds Participating Lakes
- Figure 2: Percent Cover Categories
- Figure 3: Angle Lake Waterweed Volunteer Survey Map 1999
- Figure 4: Beaver Lake Waterweed Volunteer Survey Map 1999
- Figure 5: Lake Desire Waterweed Volunteer Survey Map 1999
- Figure 6: Easter Lake Waterweed Volunteer Survey Map 1999
- Figure 7: Lake Geneva Waterweed Volunteer Survey Map 1999
- Figure 8: Lake Leota Waterweed Volunteer Survey Map 1999
- Figure 9: Lake Marcel Waterweed Volunteer Survey Map 1999
- Figure 10: Lake Margaret Waterweed Volunteer Survey Map 1999
- Figure 11: Lake Morton Waterweed Volunteer Survey Map 1999
- Figure 12: Paradise Lake Waterweed Volunteer Survey Map 1999
- Figure 13: Pine Lake Waterweed Volunteer Survey Map 1999
- Figure 14: Lake Retreat Waterweed Volunteer Survey Map 1999
- Figure 15: Shady Lake Waterweed Volunteer Survey Map 1999
- Figure 16: Spring Lake Waterweed Volunteer Survey Map 1999
- Figure 17: Lake Wildernes Waterweed Volunteer Survey Map 1998
- Figure 18: Lake Wildernes Waterweed Volunteer Survey Map 1999

## Tables

- Table 1: 1998 and 1999 Waterweed Survey Participants.
- Table 2: Waterweed species by Plant Group.
- Table 3: 1998 and 1999 Waterweeds Survey Results
- Table 4: Angle Lake 1998 and 1999 Waterweeds Survey Results
- Table 5: Beaver Lake 1998 and 1999 Waterweeds Survey Results
- Table 6: Lake Desire 1998 and 1999 Waterweeds Survey Results
- Table 7: Easter Lake 1999 Waterweeds Survey Results
- Table 8: Lake Geneva 1999 Waterweeds Survey Results
- Table 9: Lake Leota 1998 and 1999 Waterweeds Survey Results
- Table 10: Lake Marcel 1998 and 1999 Waterweeds Survey Results
- Table 11: Lake Morton 1998 and 1999 Waterweeds Survey Results
- Table 12: Lake Margaret 1998 and 1999 Waterweeds Survey Results
- Table 13: Paradise Lake 1998 and 1999 Waterweeds Survey Results
- Table 14: Pine Lake 1998 and 1999 Waterweeds Survey Results
- Table 15: Lake Retreat 1998 and 1999 Waterweeds Survey Results
- Table 16: Shady Lake 1998 and 1999 Waterweeds Survey Results
- Table 17: Spring Lake 1998 and 1999 Waterweeds Survey Results
- Table 18: Lake Wilderness 1998 and 1999 Waterweeds Survey Results

# Summary



## Summary

This report presents the results of the 1998-1999 waterweeds volunteer survey program. Through the waterweeds project, a pilot aquatic weed volunteer monitoring and education program was developed.

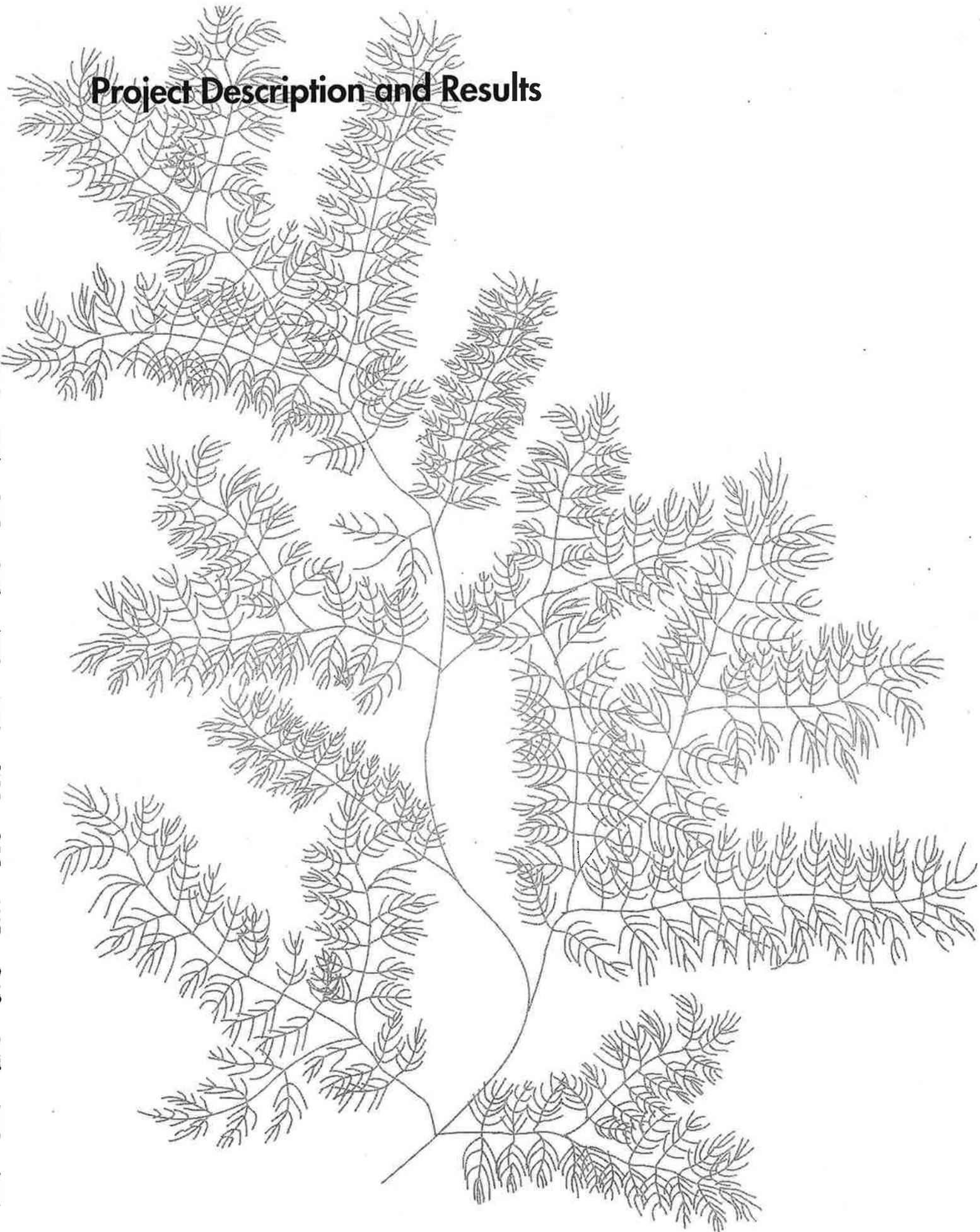
Through this program, volunteers were successfully trained to identify and survey their lakes for eight target weed species. These weeds included *Cabomba caroliniana* (fanwort), *Egeria densa* (Brazilian elodea), *Eichhornia crassipes* (water hyacinth), *Hydrilla verticillata* (hydrilla), *Lythrum salicaria* (purple loosestrife), *Myriophyllum aquaticum* (parrotfeather milfoil), *Myriophyllum spicatum* (Eurasian watermilfoil), and *Phalaris arundinacea* (reed canary grass).

During 1998 and 1999, fifteen King County lakes participated in the survey project. Using weed identification cards, lake maps, and other tools, volunteers successfully mapped the weeds in their lakes, recording this information on field sheets and accompanying lake maps.

At each lake, volunteers typically found only two or three weed species. These species were limited to *L. salicaria*, *M. spicatum*, and *P. arundinacea*. Based on previous surveys, all three of these weeds can be commonly found in King County lakes. No new infestations were reported of less frequently occurring species like *E. densa*, *H. verticillata*, or *M. aquaticum*.

By focusing on a few species of concerns, volunteers can recognize target weed species and map their location. In turn, this location information can be used to prioritize weed control efforts by lake groups, local agencies, and weed boards.

# Project Description and Results



## **Project Description**

Through the waterweeds project, a pilot aquatic weed volunteer monitoring and education program was developed. Volunteer lake monitors were trained to identify eight aquatic weeds of concern in Washington. As part of the project, identification materials for the eight target weeds were created. These materials included laminated cards with color photographs of the plant on the front side and background and identification information on the back side. These materials were used in the training program to develop plant identification and surveying skills among volunteer monitors.

During summer workshops, volunteer monitors were trained in plant survey and identification techniques. Staff followed up with on-site training, which ensured volunteers were properly identifying plants in the field and correctly implementing survey techniques.

After training, volunteers completed weed surveys at their respective lakes in 1998 and 1999. Through these surveys, volunteers were able to document the extent of weed coverage at their lakes as well as survey for new infestations of the target weeds.

## **Project Purpose**

Using volunteers to regularly survey and map aquatic plants provides an opportunity to track waterweeds in lakes which may not otherwise be monitored. Volunteers' surveys can record the types and amounts of plants in our lakes over time. Regular monitoring, in turn, can help with early the detection of waterweeds, saving time and money when weed control efforts are warranted. Additionally, survey information collected by volunteers can be used to develop integrated vegetation management plans for long-term plant eradication or control.

## **Weed Classification**

In Washington State, the management of noxious weeds is governed by RCW 17.10. This law defines a noxious weed as "any plant which when established is highly destructive, competitive, or difficult to control by cultural or chemical practices." Each year, the Washington Noxious Weed Control Board adopts a weed list for control (Washington State Department of Agriculture, 1999). Similarly, local boards like King County's Noxious Weed Board, adopt county weed lists that target statewide and regional species of concern (King County, 1999).

Both state and local weed lists categorize species into three major classes: A, B, and C. Class A weeds are non-native species with limited distribution in Washington. For Class A weeds, preventing new infestations and eradicating existing infestations is the highest priority. Moreover, the weed law requires affected property owners to eradicate Class A species.

Class B weeds are non-native species which are limited in distribution to portions of Washington state. These species are designated for control in regions where they have

areas remains a high priority. In regions where a Class B species are already established, control is decided on a local level, with containment as the main goal.

Class C weeds are non-native species that have become widespread in the state. Control of these species is designated at the local level with control programs typically established to emphasize containment, partial control, and education.

For this project, eight aquatic weed species were targeted. These species included *Cabomba caroliniana* (Class B statewide and locally), *Egeria densa* (Class B statewide, weed of concern locally), *Eichhornia crassipes* (not listed), *Hydrilla verticillata* (Class A statewide and locally), *Lythrum salicaria* (Class B statewide and locally), *Myriophyllum aquaticum* (Class B statewide and locally), *Myriophyllum spicatum* (Class B statewide, weed of concern locally), and *Phalaris arundinacea* (Class C statewide, weed of concern locally).

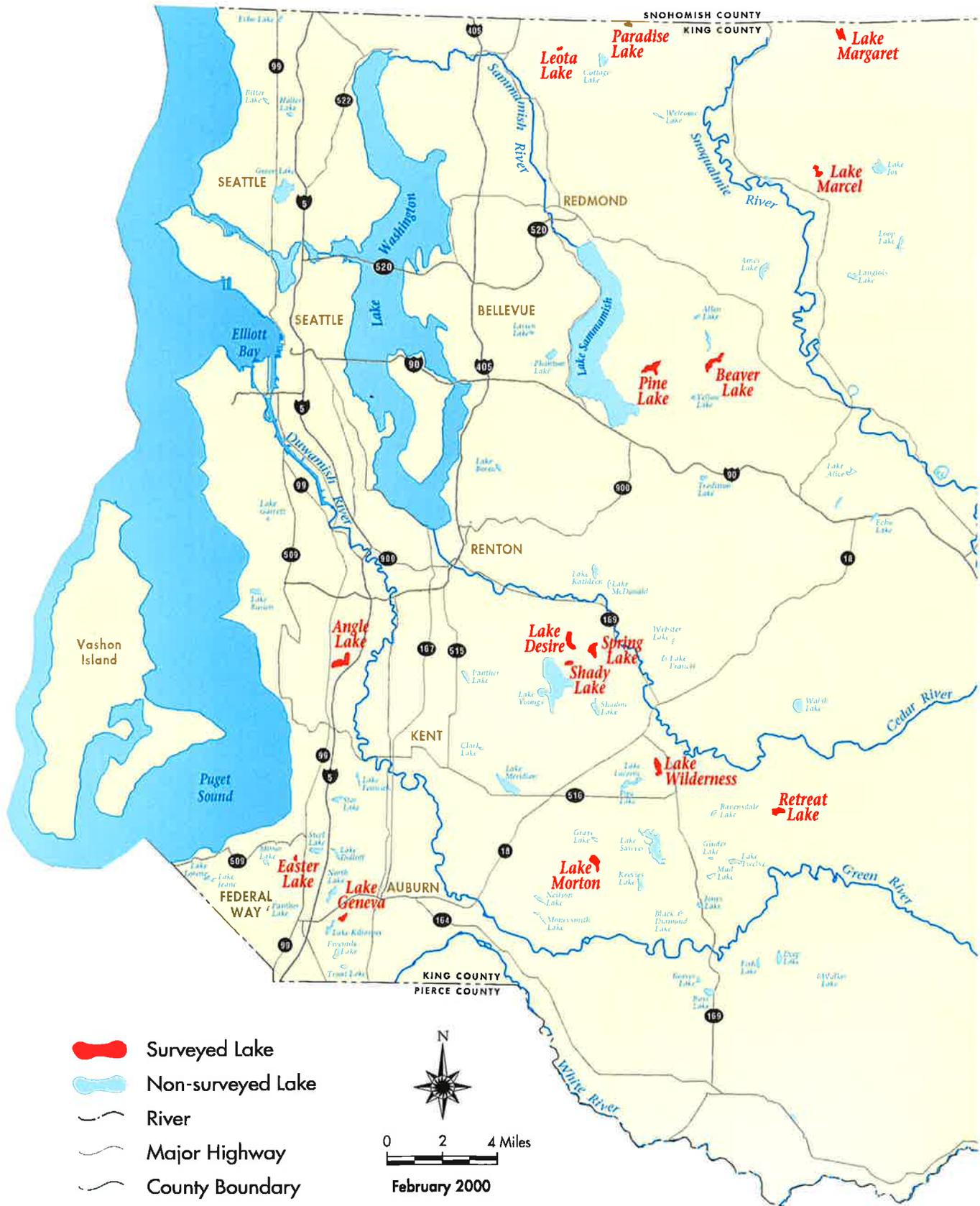
## Volunteer Recruitment

Volunteers were enlisted through the King County Lake Stewardship Program by direct contact and by advertisement in the Program's quarterly newsletter, the Lake Steward. Fifteen lakes (Figure 1) and thirty-two volunteers participated in the waterweeds project during 1998 and 1999. Surveyed lakes and participating volunteers are highlighted in Table 1.

Table 1: 1998 and 1999 Waterweed Survey Participants.

| Lake       | 1998 Volunteers   | 1999 Volunteers                          |
|------------|---|--|
| Angle      | Ed and Jeannie Montry   | Ed and Jeannie Montry                    |
| Beaver     | Acar Bill, Ray Petit  | Acar Bill, Ray Petit                     |
| Desire     | Ed and Min Merrill  | Ed and Min Merrill                       |
| Easter     | No survey   | M. Tiffany                               |
| Geneva     | No survey   | Sue and Tom Jones                        |
| Leota      | David Mangles   | David Mangles, Rick Sampson              |
| Marcel     | Henry Hatem, Chuck Willis   | Henry Hatem, Chuck Willis                |
| Margaret   | Douglas Johnston  | Douglas Johnston                         |
| Morton     | Richard Balash, Robert Wagner   | Richard Balash, Robert Wagner            |
| Paradise   | Kay Doolittle   | Kay Doolittle                            |
| Pine       | Kate Bradley, Holly Delaney   | Kate Bradley, Holly Delaney, Ilene Stahl |
| Retreat    | Todd and Janice Hammerstrom   | Todd and Janice Hammerstrom              |
| Shady      | Roberta Dewitt, Beverly Giberson  | Nancy and Terry Golden                   |
| Spring     | Caren Adams, Ted Barnes, Elaine Cruikshank, Ellon Jarvis, Linda O'Brien | Caren Adams, Ted Barnes, Kathy Walker    |
| Wilderness | Roger King, John Vasboe   | Roger King, John Vasboe                  |

Figure 1  
**Locations of 1999 Surveyed Lakes**



## Training Materials and Methods

This section details the training materials developed for the waterweed program, training workshop content, and methods used by volunteers to survey their lakes for waterweeds. Training material developed specifically for volunteers included weed cards and survey instructions. Other materials used by the volunteers included lake maps, herbarium specimens, historical weed information, and aquatic plant reference materials.

After training, volunteers proceeded to map the weeds at their lake, marking their locations on a map. Volunteer's maps were collected at the end of the mapping season and the data compiled as part of this report.

### *Training Materials*

Weed identification cards were developed for eight weed species (Appendix A). These weeds included *Cabomba caroliniana* (fanwort), *Egeria densa* (Brazilian elodea), *Eichhornia crassipes* (water hyacinth), *Hydrilla verticillata* (hydrilla), *Lythrum salicaria* (purple loosestrife), *Myriophyllum aquaticum* (parrotfeather milfoil), *Myriophyllum spicatum* (Eurasian watermilfoil), and *Phalaris arundinacea* (reed canary grass).

In addition to the weed identification cards, a laminated instruction sheet was also developed (Appendix B). The instruction sheet provided background information, survey objectives, recommended survey timing, equipment, and abbreviated survey procedures. Additionally, a weed coverage guide and mapping key were provided on the backside of the instruction sheet.

### *Workshops and Onsite Training*

Two training workshops were held to teach volunteers how to identify and survey their lake for waterweeds (Appendix C). In 1998, 25 volunteers participated in the first workshop, representing 13 lakes. At this workshop, volunteers were introduced to the problems associated with noxious weeds. Volunteers also learned the key identification features associated with each target weed species.

To teach weed identification, several mediums were used. These media include slides, identification cards, live material, and herbarium specimens. The volunteers viewed slides of the target weeds and then participated in a hands-on demonstration of key plant features using live material.

After becoming familiar with the weed species targeted, survey methods were reviewed with the volunteers. Following the workshop, staff made onsite visits and worked with volunteers to ensure they were comfortable with weed identification and survey techniques.

In July 1999, 20 volunteers participated in a second training workshop. This workshop was designed as a refresher course for 1998 participants and training opportunity for new volunteers. At this workshop, two additional lakes and seven new volunteers were added to the waterweeds program.

## Equipment and Maps

To participate in the weed survey, volunteers were required to own or have access to a boat, safety equipment, anchor, clipboard, garden rake, rope, homemade viewing scope, pencils, and a large plastic bag or cooler. Staff provided a lake map, permanent markers, field sheets, and identification cards to all volunteers.

Lake maps were developed from digital aerial photographs, which were overlain with parcel and stream features. Lake maps were laminated to waterproof them, which allowed volunteers to write directly on their surface with permanent markers.

## Methods

Using a boat, volunteers conducted shoreline weed surveys by circumnavigating their lake. On the lake map, volunteers broke the lake shoreline into distinct areas or sections. Sections were distinguished based on plant community, level of development, and the shape of the lake. Each shoreline section was defined as the area between two chosen fixed shoreline points. These fixed shoreline points typically included public launch sites, parks, and distinct shoreline features such as homes, docks, and geologic elements.

As volunteers circumnavigated the lake shoreline, they mapped weed locations onto the lake map. Volunteers marked weed location onto the laminated field maps using permanent markers. Different symbols were used to represent each weed species.

Volunteers also qualitatively characterized each shoreline section by weed species present and relative percent coverage of weed type. This weed coverage was recorded on the field sheet (Appendix D). Three categories of percent cover were used to describe the aquatic plant coverage (Figure 2). These categories included light (0-25% coverage), medium (25-75% coverage), and heavy (75-100% coverage).

To aid volunteers in locating the target weeds, three plant groupings were also used. These groupings included emergent (shoreline plants), floating (freely or rooted) and submergent (underwater). The eight waterweed species by plant group are listed in Table 2.

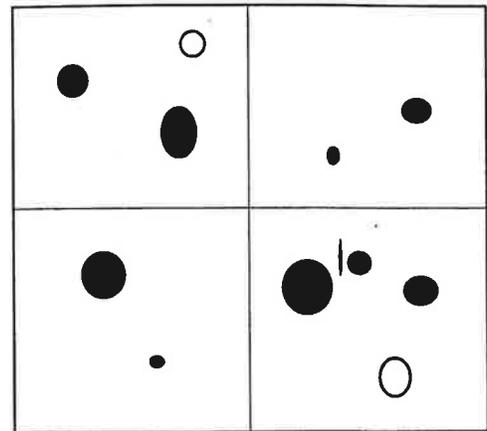
Table 2: Waterweed species by Plant Group

| Plant Group | Latin Name                    | Common Name           |
|-------------|-------------------------------|-----------------------|
| Emergent    | <i>Lythrum salicaria</i>      | purple loosestrife    |
| Emergent    | <i>Phalaris arundinacea</i>   | reed canary grass     |
| Floating    | <i>Eichhornia crassipes</i>   | water hyacinth        |
| Submergent  | <i>Cabomba caroliniana</i>    | fanwort               |
| Submergent  | <i>Egeria densa</i>           | Brazilian elodea      |
| Submergent  | <i>Hydrilla verticillata</i>  | hydrilla              |
| Submergent  | <i>Myriophyllum aquaticum</i> | parrotfeather milfoil |
| Submergent  | <i>Myriophyllum spicatum</i>  | Eurasian watermilfoil |

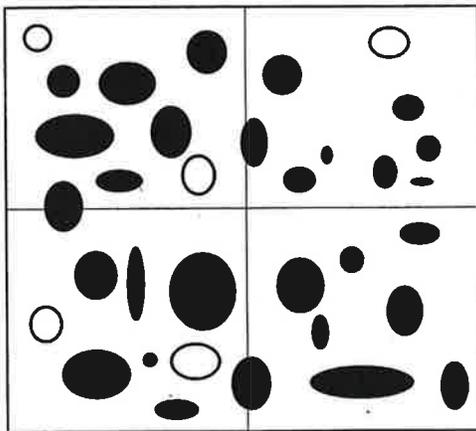
Figure 2

## Percent Cover Categories

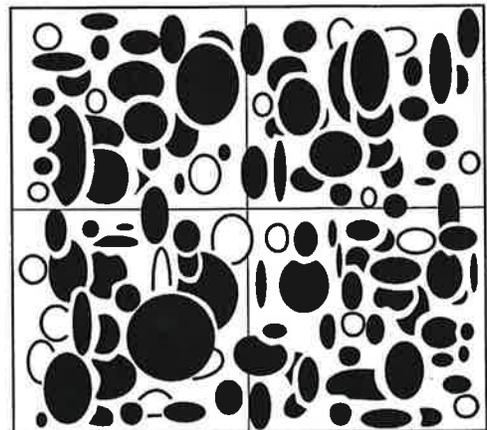
- Species A: 30%
- Species B: 50%
- ◐ Species C: 20%



Light (L): <25%



Medium (M): 25-75%



Heavy (H): >75%

Volunteers easily characterized the emergent and floating weeds by visual observation of the lake shoreline and adjacent water surface. Submergent weeds were identified through visual observation aided by using a viewing scope or by dragging a garden rake along the lake bottom. The latter technique allowed plant specimens to be brought to the surface for closer viewing.

Volunteers repeated this qualitative survey procedure for each shoreline section as they circumnavigated the lake. For plant samples that could not be identified in the field, additional samples were obtained and marked for later identification. These samples were numbered and recorded on the field sheets by designated number. Staff assisted volunteers with the identification of unknown plant specimens. Volunteers' field notes were updated with the proper identification information after samples were properly identified.

Volunteers were asked to complete their weed surveys in August when total plant numbers are near or at their peak. Most volunteers were able to complete their surveys during this month or early in September.

## Survey Results

Fifteen lakes participated in the waterweeds survey project during 1998 and 1999. Table 3 lists the survey results for participating lakes. Only three of the eight weeds species were found at participating lakes. These species included *Lythrum salicaria*, *Myriophyllum spicatum*, and *Phalaris arundinacea*. The most frequently occurring weed species was *P. arundinacea* which was found on 12 of the 15 surveyed lakes. *L. salicaria* was reported on five lakes while *M. spicatum* was found on four lakes.

Table 3: 1998 and 1999 Waterweeds Survey Results

| Lake        | 1998 Weeds** | 1999 Weeds**       |
|-------------|--------------|--------------------|
| Angle       | Pd           | Pd                 |
| Beaver      | Pd, Ls       | Pd, Ls             |
| Desire      | Ls, Ms       | Ls, Ms             |
| Easter      | No survey    | None               |
| Geneva      | No survey    | Pd                 |
| Leota       | Pd           | Pd                 |
| Marcel      | Pd           | Pd                 |
| Margaret    | Pd           | Pd                 |
| Morton      | Pd           | Pd                 |
| Paradise    | Ls           | Ls, Pd             |
| Pine        | Pd, Ls       | Pd, Ls             |
| Retreat     | None         | Pd                 |
| Shady       | Ls, Ms       | Ms, Pd, Ls removed |
| Spring      | Ls, Ms, Pd   | Ls, Ms, Pd         |
| Wilderness* | Ms           | Ms removed         |

\*Wilderness was treated with fluridone to eradicate Ms during 1998.

\*\*Key to weed species: Ls-*Lythrum salicaria*; Ms-*Myriophyllum spicatum*, and Pd-*Phalaris arundinacea*.

## Angle Lake

Angle Lake was surveyed by Ed and Jeannie Montry on August 29, 1998 and August 19 and 20, 1999. In 1998, sky conditions were overcast while in 1999, conditions were sunny on the first day and overcast on the second day.

At Angle Lake, the only weed species present was *Phalaris arundinacea* (reed canary grass). Weed locations are shown in Figure 3. For the five lake sections surveyed, coverage of this weed species was identified as light (Table 4).

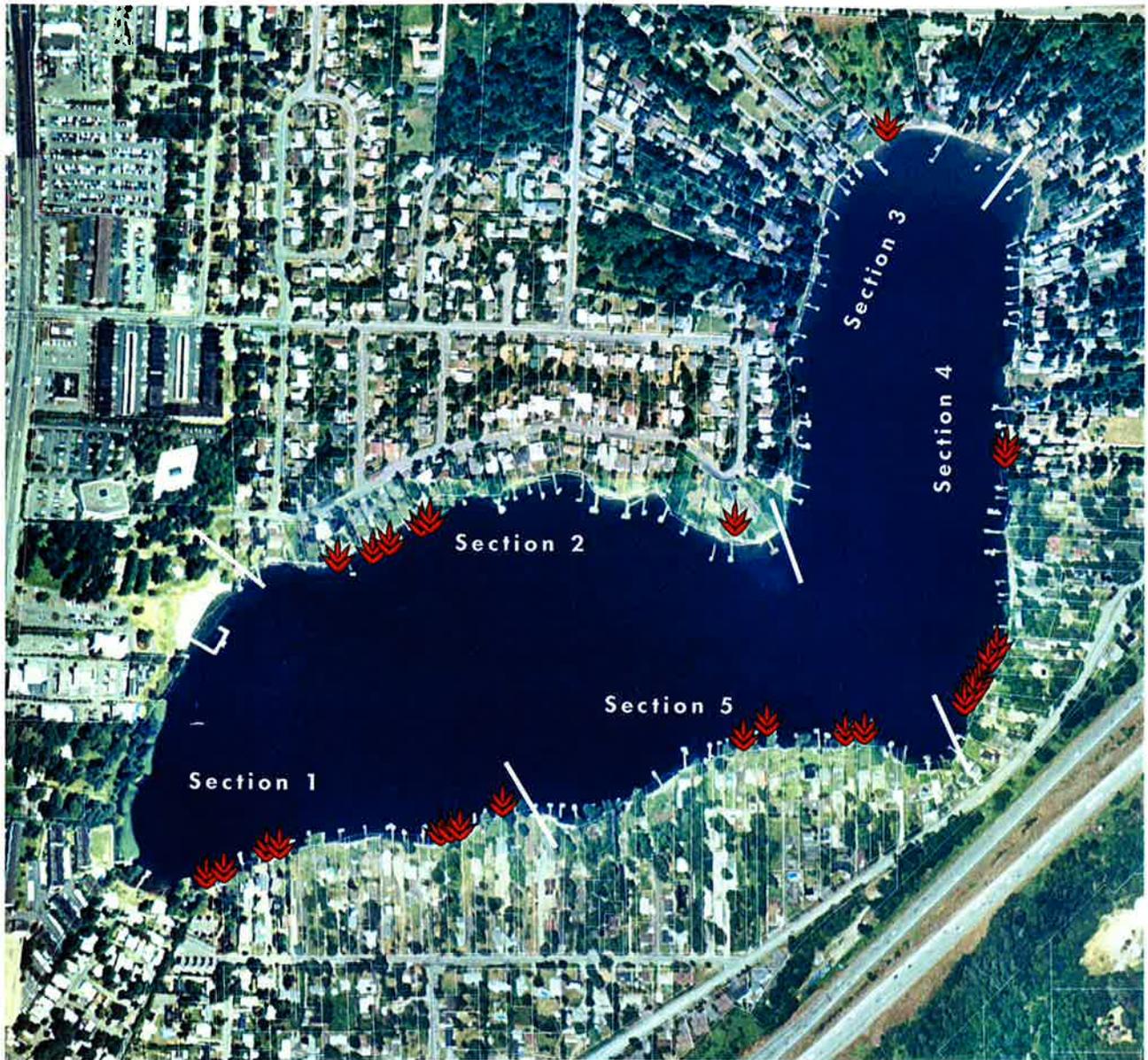
During the 1998 survey, the Montry's found *P. arundinacea* in clumps along shoreline areas that were neatly landscaped. As the Montry's completed their survey, lakeside residents also noted that the weeds were thicker and higher in 1997.

In 1999, the Montry's noted the continued absence of milfoil species in the lake and observed an increase in the pondweed and waterlily plant populations from 1998. The Montry's also noted that *P. arundinacea* was absent in the 1999 survey only in areas where shoreline disturbance (because of bulkheading, gravel addition, or homebuilding) had occurred.

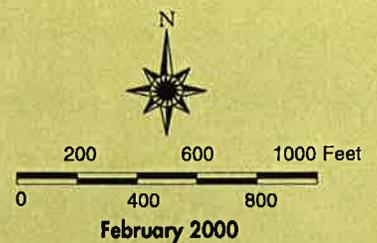
Table 4: Angle Lake 1998 and 1999 Waterweeds Survey Results

| Section | 1998 Species | 1998 Coverage | 1999 Species | 1999 Coverage |
|---------|--------------|---------------|--------------|---------------|
| 1       | Pd           | light         | Pd           | light         |
| 2       | Pd           | light         | Pd           | light         |
| 3       | Pd           | light         | Pd           | light         |
| 4       | Pd           | light         | Pd           | light         |
| 5       | Pd           | light         | Pd           | light         |

Figure 3  
**Angle Lake**  
 Waterweed Volunteer Survey Map 1999



-  *Phalaris arundinacea*  
(Reed Canary Grass)
-  Section boundary
-  Parcel boundary



## Beaver Lake

Beaver Lake was surveyed by Acar Bill and Ray Petit on August 24 and 26, 1998 and August 18 and 19, 1999. Sky conditions were cloudy for all four survey dates.

At Beaver Lake, two weed species were found: *Lythrum salicaria* (Ls, Purple loosestrife) and *Phalaris arundinacea* (Pd, reed canary grass). The 1999 location of these weeds is illustrated in Figure 4 . In the eight lake sections surveyed, coverage of these weed species ranged from light to medium (Table 5). In 1999, Roy Petit removed the loosestrife found in Section 1.

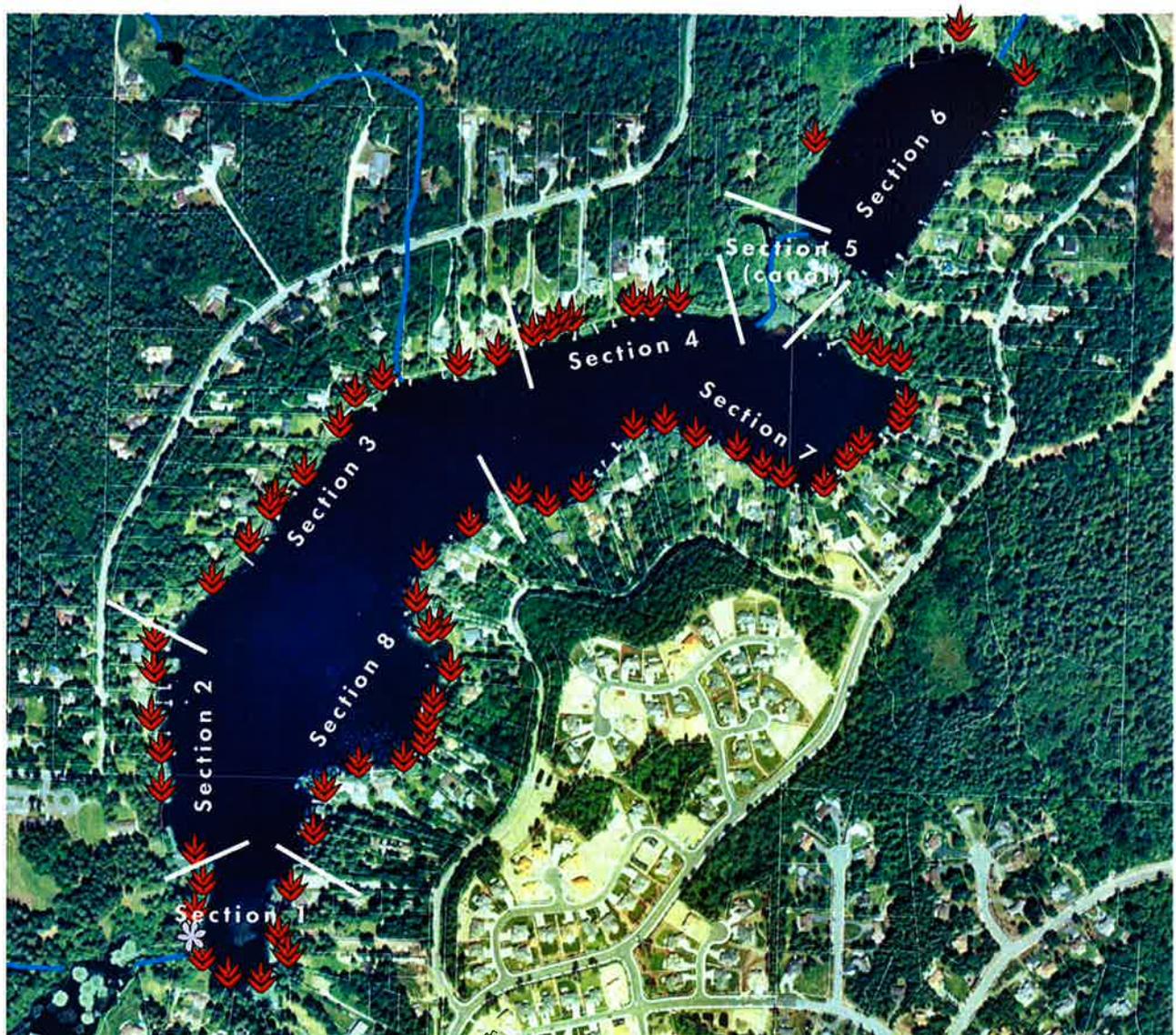
Table 5: Beaver Lake 1998 and 1999 Waterweeds Survey Results

| Section | 1998 Species | 1998 Coverage | 1999 Species | 1999 Coverage |
|---------|--------------|---------------|--------------|---------------|
| 1       | Ls, Pd       | light         | Ls, Pd       | light         |
| 2       | Pd           | light         | Pd           | medium        |
| 3       | Pd           | light         | Pd           | medium        |
| 4       | Pd           | light         | Pd           | light         |
| 5       | no weeds     |               | no weeds     |               |
| 6       | Pd           | light         | Pd           | light         |
| 7       | Pd           | medium        | Pd           | medium        |
| 8       | Pd           | medium        | Pd           | medium        |

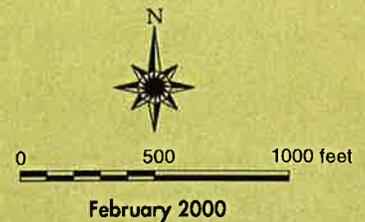
Figure 4

# Beaver Lake

Waterweed Volunteer Survey Map 1999



-  *Lythrum salicaria*  
(Purple Loosestrife)
-  *Phalaris arundinacea*  
(Reed Canary Grass)
-  Stream
-  Section boundary
-  Parcel boundary



February 2000

## Lake Desire

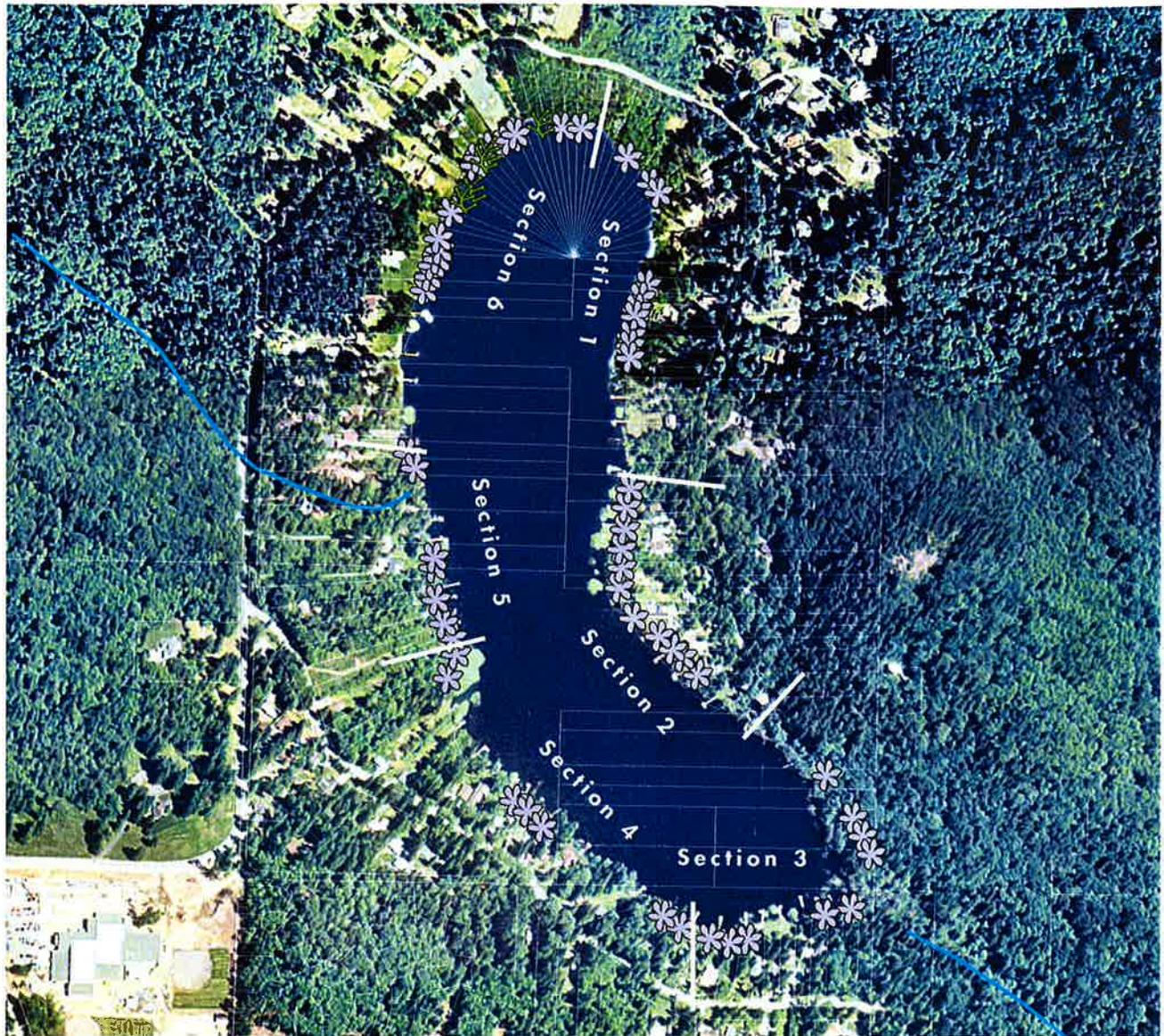
Lake Desire was surveyed by Ed and Min Merrill on August 13, 1998 and August 22 through 26, 1999. Sky conditions were sunny all survey dates.

At Lake Desire, two weed species were found: *Lythrum salicaria* (Ls, Purple loosestrife) and *Myriophyllum spicatum* (Ms, Eurasian watermilfoil). The 1999 location of these weeds is illustrated in Figure 5. In the six lake sections surveyed, coverage of these weed species ranged from light to heavy (Table 6). During the 1999 survey, *M. spicatum* coverage was limited to section 6 only.

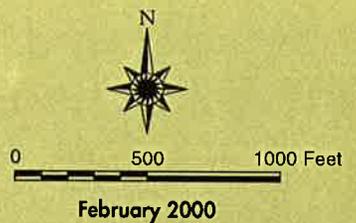
Table 6: Lake Desire 1998 and 1999 Waterweeds Survey Results Section

| Section | 1998 Species | 1998 Coverage                | 1999 Species | 1999 Coverage  |
|---------|--------------|------------------------------|--------------|----------------|
| 1       | Ls<br>Ms     | medium<br>light              | Ls           | medium         |
| 2       | Ls           | medium-heavy                 | Ls           | heavy          |
| 3       | Ls<br>Ms     | light<br>light               | Ls           | medium         |
| 4       | Ls           | light                        | Ls           | medium         |
| 5       | Ls<br>Ms     | light-medium<br>light-medium | Ls           | light          |
| 6       | Ls<br>Ms     | heavy<br>light-medium        | Ls<br>Ms     | heavy<br>light |

Figure 5  
**Lake Desire**  
 Waterweed Volunteer Survey Map 1999



-  *Lythrum salicaria*  
(Purple Loosestrife)
-  *Myriophyllum spicatum*  
(Eurasian milfoil)
-  Stream
-  Section boundary
-  Parcel boundary



### *Easter Lake*

Easter Lake was surveyed by M. Tiffany on August 18, 1999. Sky conditions were cloudy. At Easter Lake, no weed species were present (Figure 6 and Table 7).

*Table 7: Easter Lake 1998 and 1999 Waterweeds Survey Results*

| Section | 1998 Species | 1998 Coverage | 1999 Species | 1999 Coverage |
|---------|--------------|---------------|--------------|---------------|
| 1       | no survey    |               | no weeds     |               |
| 2       | no survey    |               | no weeds     |               |
| 3       | no survey    |               | no weeds     |               |
| 4       | no survey    |               | no weeds     |               |

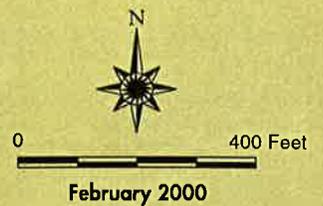
Figure 6

# Easter Lake

Waterweed Volunteer Survey Map 1999



-  Stream
-  Section boundary
-  Parcel boundary



## Lake Geneva

Lake Geneva was surveyed by Sue and Tom Jones on September 18, 1999. Sky conditions were sunny.

At Lake Geneva, two weed species were found: *Lythrum salicaria* (Ls, Purple loosestrife) and *Phalaris arundinacea* (Pd, reed canary grass). The 1999 location of these weeds is illustrated in Figure 7. In the five lake sections surveyed, coverage of these weed species was identified as light (Table 8).

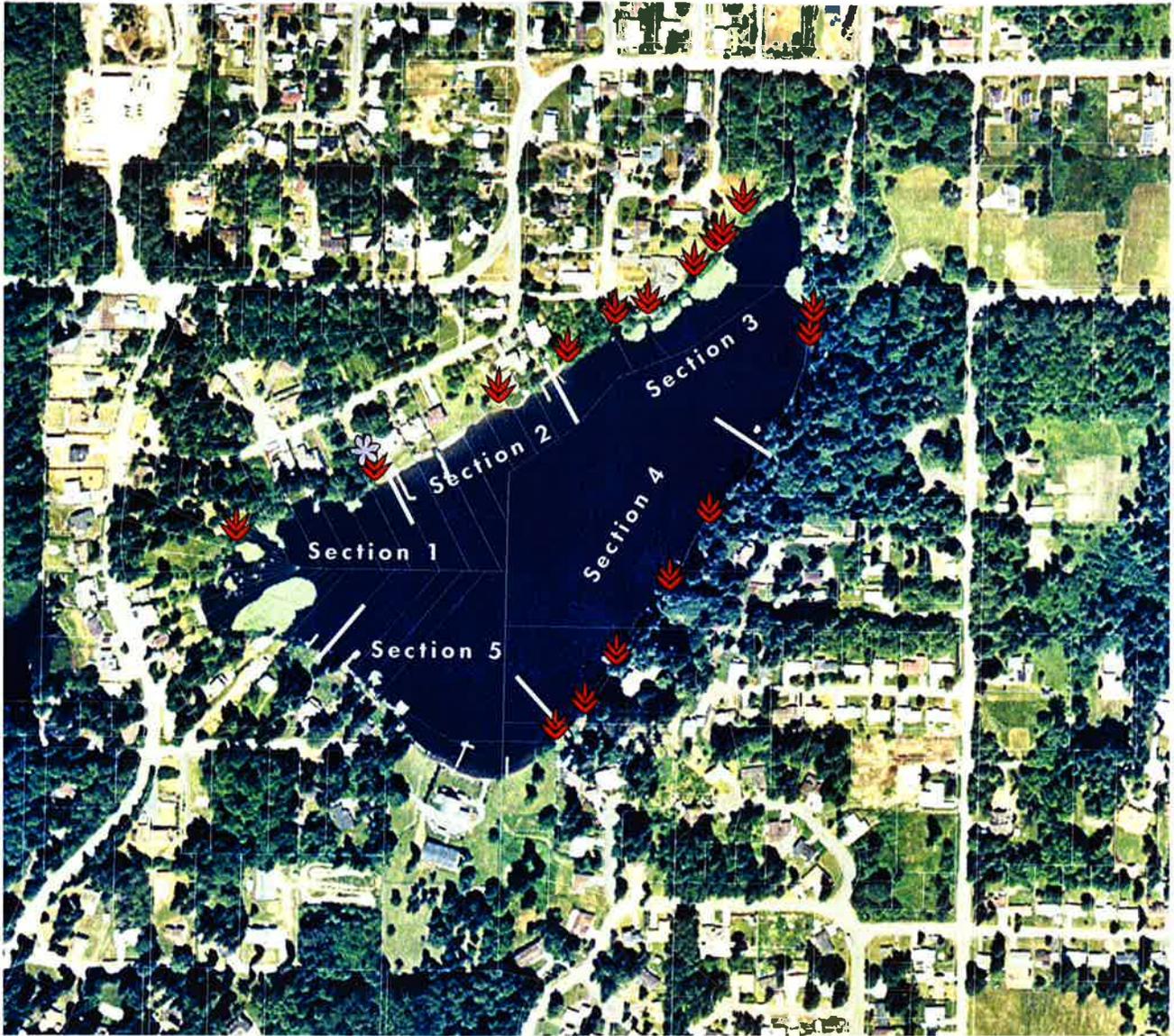
Table 8: Lake Geneva 1999 Waterweeds Survey Results

| Section | 1998 Species | 1998 Coverage | 1999 Species | 1999 Coverage  |
|---------|--------------|---------------|--------------|----------------|
| 1       | no survey    |               | Ls<br>Pd     | light<br>light |
| 2       | no survey    |               | Pd           | light          |
| 3       | no survey    |               | Pd           | light          |
| 4       | no survey    |               | Pd           | light          |
| 5       | no survey    |               | Pd           | light          |

Figure 7

# Lake Geneva

Waterweed Volunteer Survey Map 1999



 *Lythrum salicaria*  
(Purple Loosestrife)

 *Phalaris arundinacea*  
(Reed Canary Grass)

 Stream

 Section boundary

 Parcel boundary



0 100 200 300 feet

February 2000

### Lake Leota

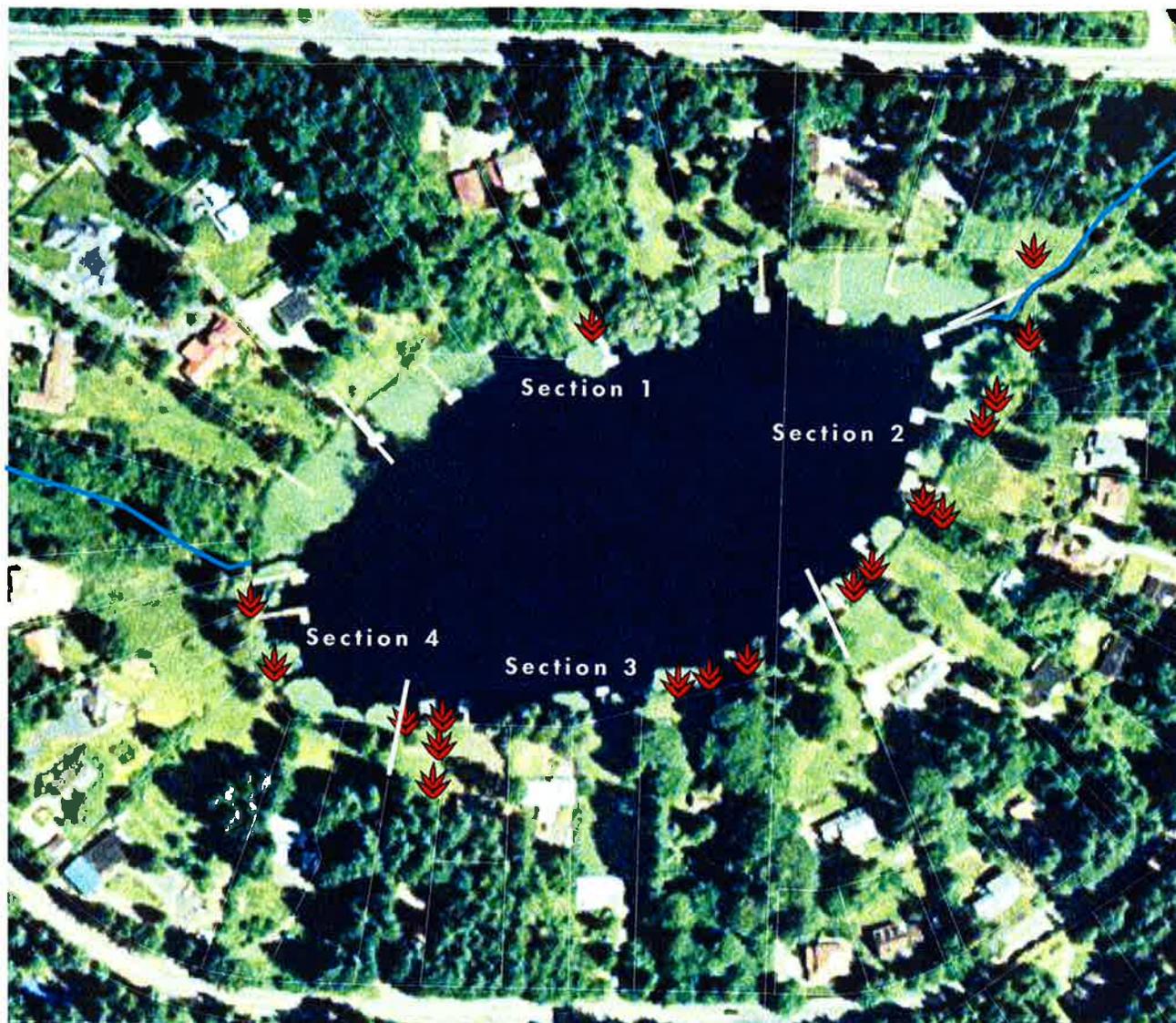
Lake Leota was surveyed by David Mangles on August 18, 1998 and by David Mangles and Rick Sampson on August 24, 1999. In 1998, sky conditions were cloudy while in 1999, sky conditions were not recorded.

At Lake Leota, the only weed species present was *Phalaris arundinacea* (Pd, reed canary grass). The 1999 weed locations are shown in Figure 8. For the four lake sections surveyed, coverage of this weed species ranged from light to medium (Table 9).

Table 9: Lake Leota 1998 and 1999 Waterweeds Survey Results

| Section | 1998 Species | 1998 Coverage | 1999 Species | 1999 Coverage |
|---------|--------------|---------------|--------------|---------------|
| 1       | Pd           | light         | Pd           | light         |
| 2       | Pd           | light         | Pd           | light         |
| 3       | Pd           | medium        | Pd           | light         |
| 4       | Pd           | light         | Pd           | light         |

Figure 8  
**Lake Leota**  
 Waterweed Volunteer Survey Map 1999



 *Phalaris arundinacea*  
 (Reed Canary Grass)

 Stream

 Section boundary

 Parcel boundary



0 400 feet

February 2000

### *Lake Marcel*

Lake Marcel was surveyed by Henry Hatem and Chuck Willis on August 20, 1998 and August 3, 1999. In 1998, sky conditions were sunny. In 1999, sky conditions started out sunny but turned stormy by the end of the survey.

At Lake Marcel, the only weed species present was *Phalaris arundinacea* (Pd, reed canary grass). The 1999 weed locations are shown in Figure 9. For the nine lake sections surveyed, coverage of this weed species ranged from light to medium (Table 10).

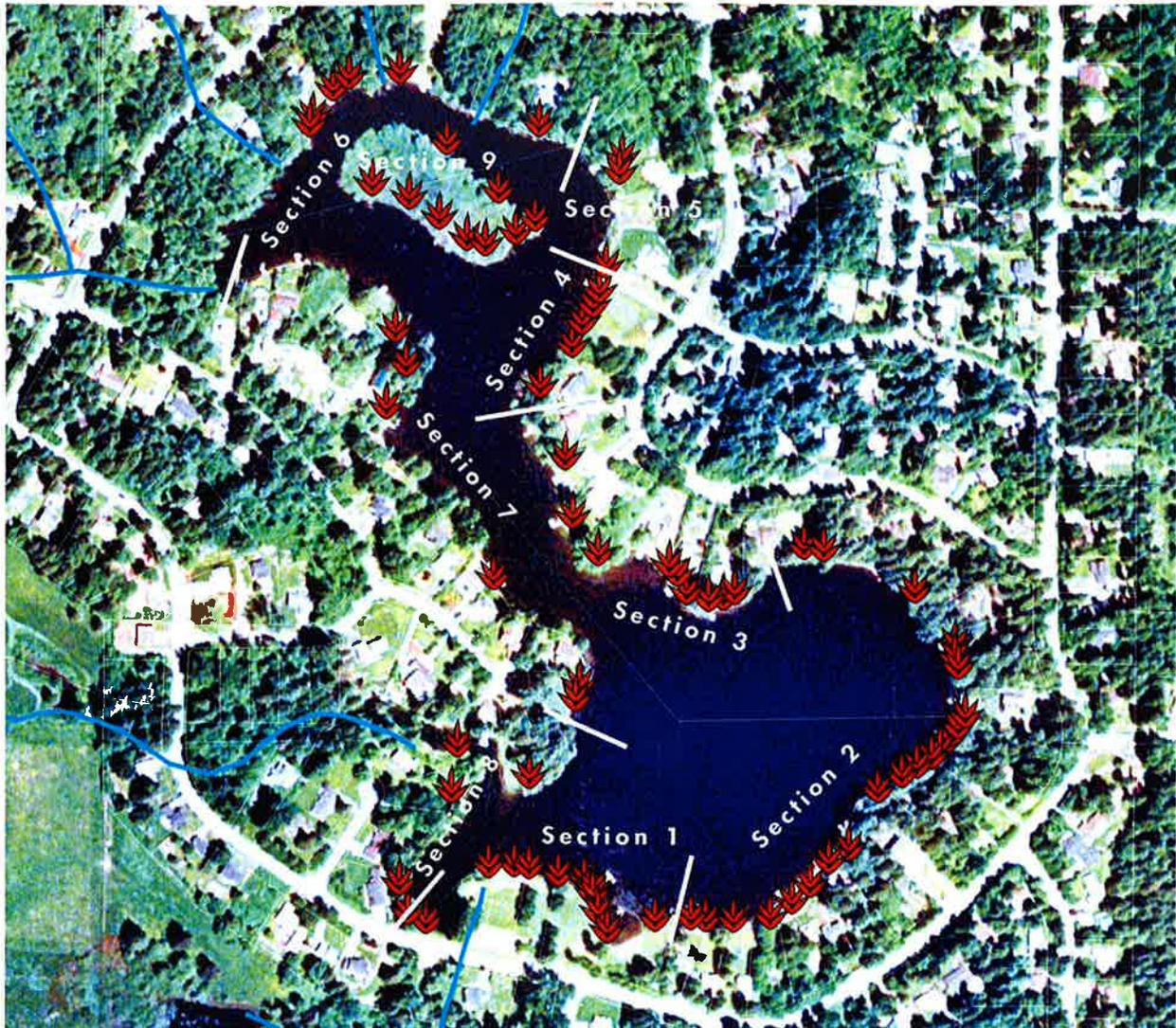
*Table 10: Lake Marcel 1998 and 1999 Waterweeds Survey Results*

| Section | 1998 Species | 1998 Coverage | 1999 Species | 1999 Coverage |
|---------|--------------|---------------|--------------|---------------|
| 1       | Pd           | medium        | Pd           | medium        |
| 2       | Pd           | medium        | Pd           | medium        |
| 3       | Pd           | light         | Pd           | light         |
| 4       | Pd           | heavy         | Pd           | medium        |
| 5       | Pd           | light         | Pd           | light         |
| 6       | Pd           | light         | Pd           | light         |
| 7       | Pd           | light         | Pd           | light         |
| 8       | Pd           | light         | Pd           | light         |
| 9       | Pd           | medium        | Pd           | medium        |

Figure 9

# Lake Marcel

Waterweed Volunteer Survey Map 1999



-  *Polygonum cuspidatum*  
(Japanese Knotweed)
-  Stream
-  Section boundary
-  Parcel boundary

N



0                      500 Feet

February 2000

### *Lake Margaret*

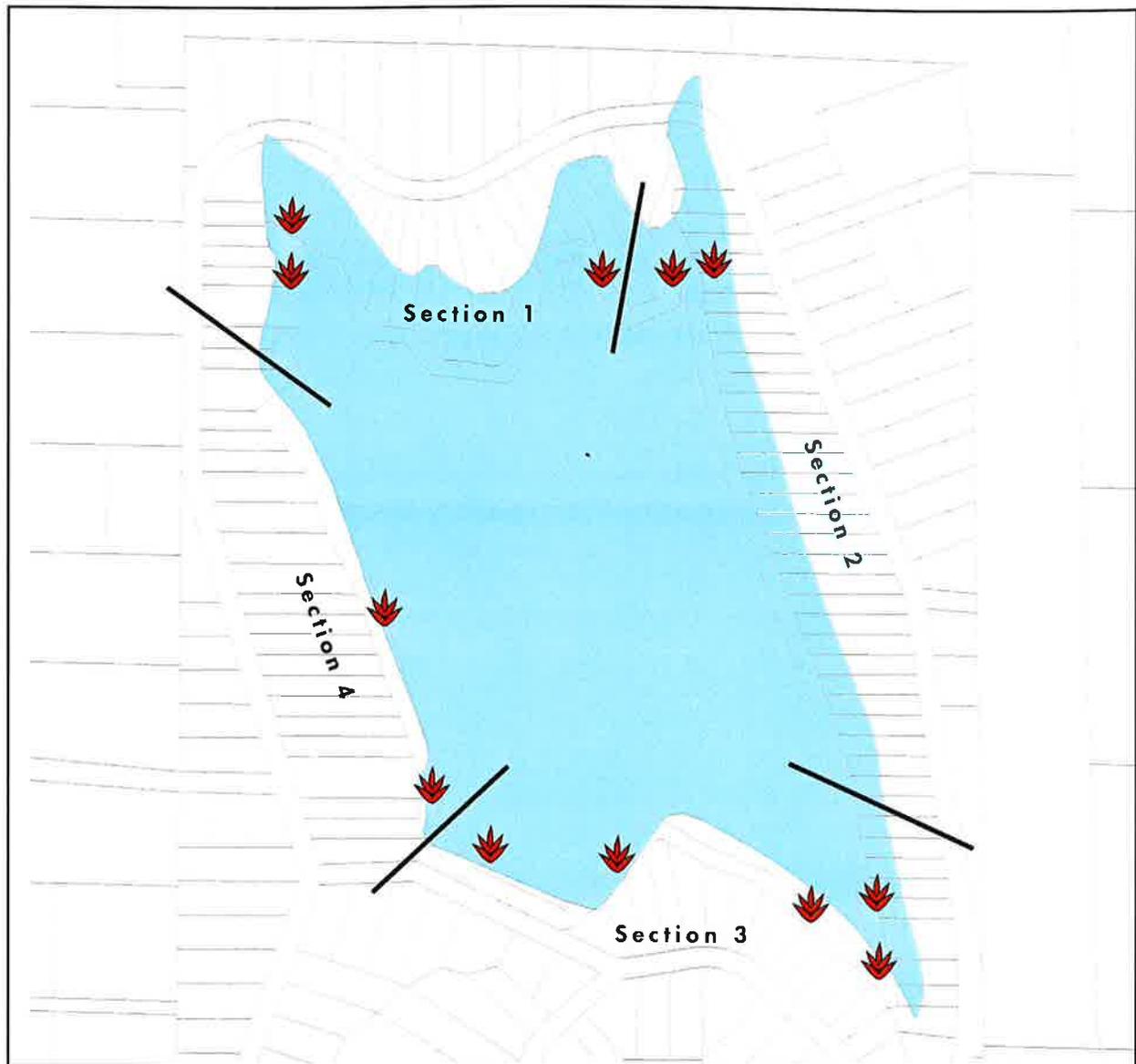
Lake Margaret was surveyed by Douglas Johnston on August 29, 1998 and August 28 and 29, 1999. In both 1998 and 1999, sky conditions were sunny for the surveys

At Lake Margaret, the only weed species present was *Phalaris arundinacea* (Pd, reed canary grass). Weed locations are shown in Figure 10. For the four lake sections surveyed, coverage of this weed species was identified as light (Table 11).

*Table 11: Lake Margaret 1998 and 1999 Waterweeds Survey Results*

| Section | 1998 Species | 1998 Coverage | 1999 Species | 1999 Coverage |
|---------|--------------|---------------|--------------|---------------|
| 1       | Pd           | light         | Pd           | light         |
| 2       | Pd           | light         | Pd           | light         |
| 3       | Pd           | light         | Pd           | light         |
| 4       | Pd           | light         | Pd           | light         |

Figure 10  
**Lake Margaret**  
 Waterweed Volunteer Survey Map 1999



 *Phalaris arundinacea*  
 (Reed Canary Grass)

 Section boundary

 Parcel boundary

Note: Aerial photo not available.



0 500 Feet

February 2000

### Lake Morton

Lake Morton was surveyed by Richard Balash and Robert Wagner on August 28 and September 5, 1998 and September 23, 1999. In both 1998 and 1999, sky conditions were sunny and clear for the surveys.

At Lake Morton, the only weed species present was *Phalaris arundinacea* (Pd, reed canary grass). Weed locations are shown in Figure 11. For the five lake sections surveyed, coverage of this weed species was light (Table 12).

During the 1998 survey, the volunteers noted the absence of submergent and floating plants in the lake. This observation is consistent with previous survey results in 1994 (King County, 1996).

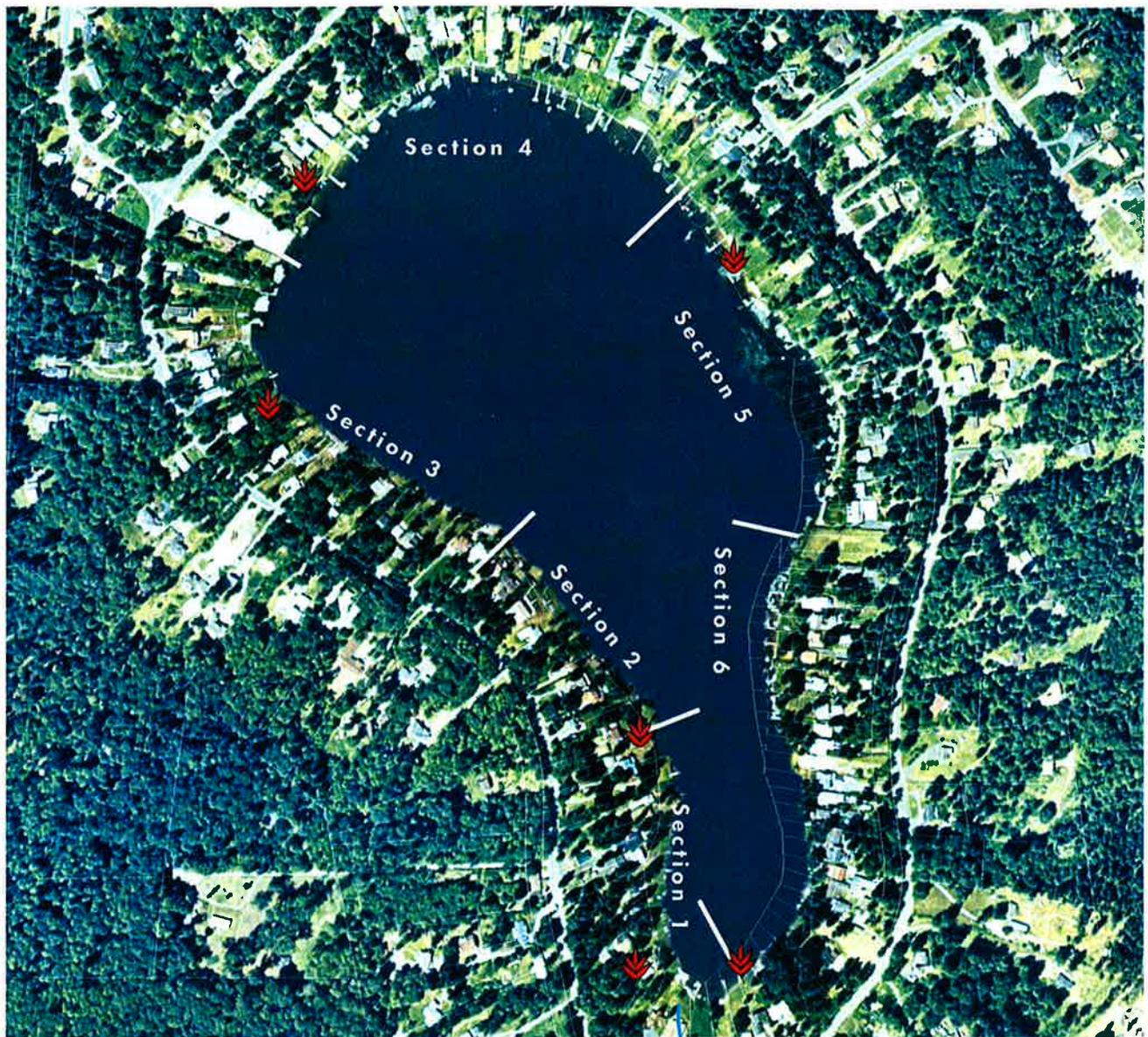
Table 12: Lake Morton 1998 and 1999 Waterweeds Survey Results

| Section | 1998 Species | 1998 Coverage | 1999 Species | 1999 Coverage |
|---------|--------------|---------------|--------------|---------------|
| 1       | Pd           | light         | Pd           | light         |
| 2       | Pd           | light         | Pd           | light         |
| 3       | Pd           | light         | Pd           | light         |
| 4       | Pd           | light         | Pd           | light         |
| 5       | Pd           | light         | Pd           | light         |
| 6       | Pd           | light         | Pd           | light         |

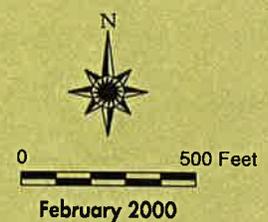
Figure 11

# Lake Morton

Waterweed Volunteer Survey Map 1999



-  *Phalaris arundinacea*  
(Reed Canary Grass)
-  Stream
-  Section boundary
-  Parcel boundary



## Paradise Lake

Paradise Lake was surveyed by Kay Doolittle on September 5, 1998 and October 3, 1999. Sky conditions were sunny for both surveys.

At Paradise Lake, two weed species were found: *Lythrum salicaria* (Ls, Purple loosestrife) and *Phalaris arundinacea* (Pd, reed canary grass). The 1999 location of these weeds is illustrated in Figure 12. In the eight lake sections surveyed, coverage of these weed species ranged was identified as light (Table 13).

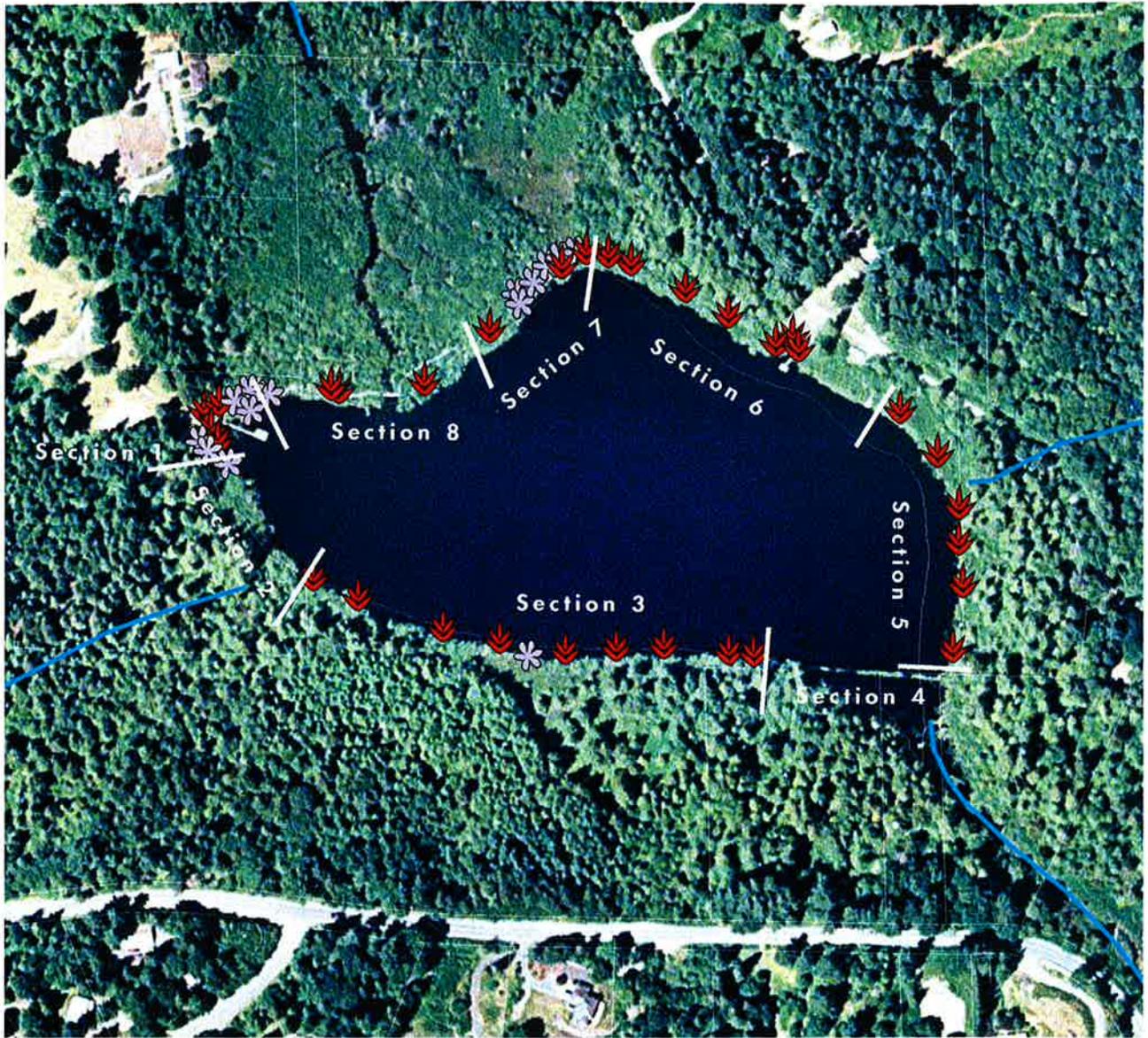
Table 13: Paradise Lake 1998 and 1999 Waterweeds Survey Results

| Section | 1998 Species | 1998 Coverage | 1999 Species | 1999 Coverage  |
|---------|--------------|---------------|--------------|----------------|
| 1       | Ls           | light         | Ls<br>Pd     | light<br>light |
| 2       | Ls           | light         | Ls<br>Pd     | light<br>light |
| 3       | no weeds     |               | Ls<br>Pd     | light<br>light |
| 4       | no weeds     |               | no weeds     |                |
| 5       | no weeds     |               | Pd           | light          |
| 6       | Ls           | light         | Ls<br>Pd     | light<br>light |
| 7       | Ls           | light         | Ls<br>Pd     | light<br>light |
| 8       | Ls           | light         | Ls<br>Pd     | light<br>light |

Figure 12

# Paradise Lake

Waterweed Volunteer Survey Map 1999



-  *Lythrum salicaria*  
(Purple Loosestrife)
-  *Phalaris arundinacea*  
(Reed Canary Grass)
-  Stream
-  Section boundary
-  Parcel boundary



0 400 Feet  
February 2000

## *Pine Lake*

Pine Lake was surveyed by Kate Bradley and Holly Delaney on August 19, 1998. In 1999, the lake was surveyed on August 27 by Kate Bradley, Holly Delaney, and Ilene Stahl. Sky conditions were sunny for both surveys.

At Pine Lake, two weed species were found: *Lythrum salicaria* (Ls, Purple loosestrife) and *Phalaris arundinacea* (Pd, reed canary grass). The 1999 location of these weeds are illustrated in Figure 13. In the seven lake sections surveyed, coverage of these weed species was identified as light (Table 14).

The volunteers reported that *P. arundinacea* was more pervasive in 1999 than in the previous year's survey. The volunteers also had the opportunity to talk with lake residents about their work as they surveyed the lake.

*Table 14: Pine Lake 1998 and 1999 Waterweeds Survey Results*

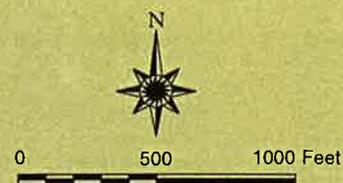
| Section | 1998 Species | 1998 Coverage  | 1999 Species | 1999 Coverage  |
|---------|--------------|----------------|--------------|----------------|
| 1       | Pd           | light          | Pd           | light          |
| 2       | Ls           | light          | Pd           | light          |
| 3       | Ls<br>Pd     | light<br>light | Ls<br>Pd     | light<br>light |
| 4       | Pd           | light          | Pd           | light          |
| 5       | no weeds     |                | Pd           | light          |
| 6       | Pd           | light          | Pd           | light          |
| 7       | Ls<br>Pd     | light<br>light | Ls<br>Pd     | light<br>light |

Figure 13  
**Pine Lake**

Waterweed Volunteer Survey Map 1999



-  *Lythrum salicaria*  
(Purple Loosestrife)
-  *Phalaris arundinacea*  
(Reed Canary Grass)
-  Stream
-  Section boundary
-  Parcel boundary



February 2000

### *Lake Retreat*

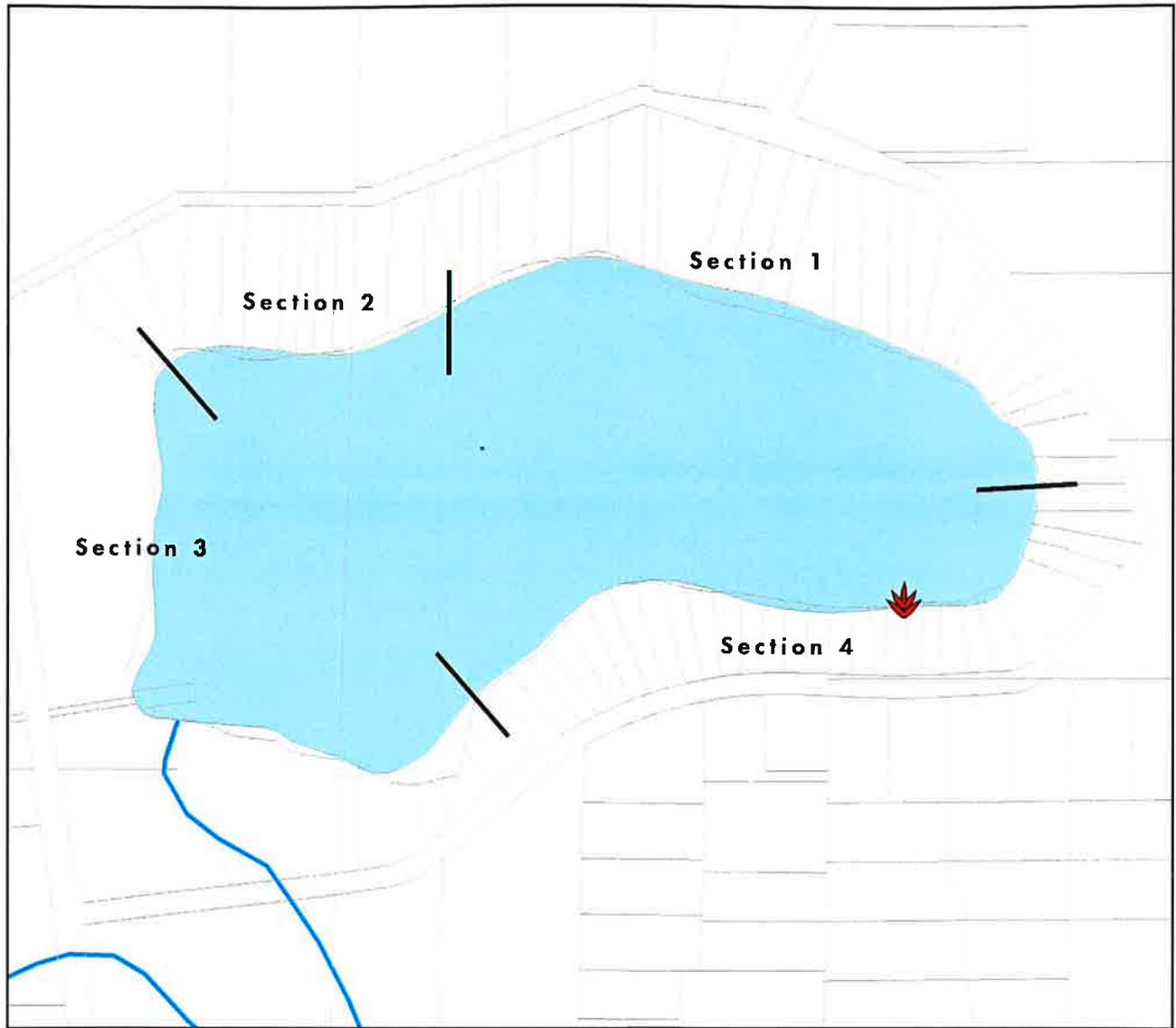
Lake Retreat was surveyed by Todd and Janice Hammerstrom in September 1998 and on September 6, 1999. In 1998, sky conditions were sunny while in 1999, sky conditions were partly cloudy.

At Lake Retreat, the only weed species present was *Phalaris arundinacea* (Pd, reed canary grass). The 1999 weed locations are shown in Figure 14. Coverage of this weed species was identified as light in the only section where it was found (Table 15).

*Table 15: Lake Retreat 1998 and 1999 Waterweeds Survey Results*

| Section | 1998 Species | 1998 Coverage | 1999 Species | 1999 Coverage |
|---------|--------------|---------------|--------------|---------------|
| 1       | no weeds     |               | no weeds     |               |
| 2       | no weeds     |               | no weeds     |               |
| 3       | no weeds     |               | no weeds     |               |
| 4       | no weeds     |               | Pd           | light         |

Figure 14  
**Lake Retreat**  
 Waterweed Volunteer Survey Map 1999



 *Phalaris arundinacea*  
 (Reed Canary Grass)

 Stream

 Section boundary

 Parcel boundary



0 500 feet

February 2000

Note: Aerial photo not available.

## Shady Lake

Shady Lake was surveyed by Roberta DeWitt and Beverly Giberson on August 28, 1998. In 1999, the lake was surveyed on September 6th by Nancy and Terry Golden. Sky conditions were sunny for both surveys.

At Shady Lake, three weed species were found: *Lythrum salicaria* (Ls, purple loosestrife), *Myriophyllum spicatum* (Ms, Eurasian watermilfoil), and *Phalaris arundinacea* (Pd, reed canary grass). The 1999 location of these weeds is illustrated in Figure 15. In the seven lake sections surveyed, coverage of these weed species ranged from light to medium (Table 16).

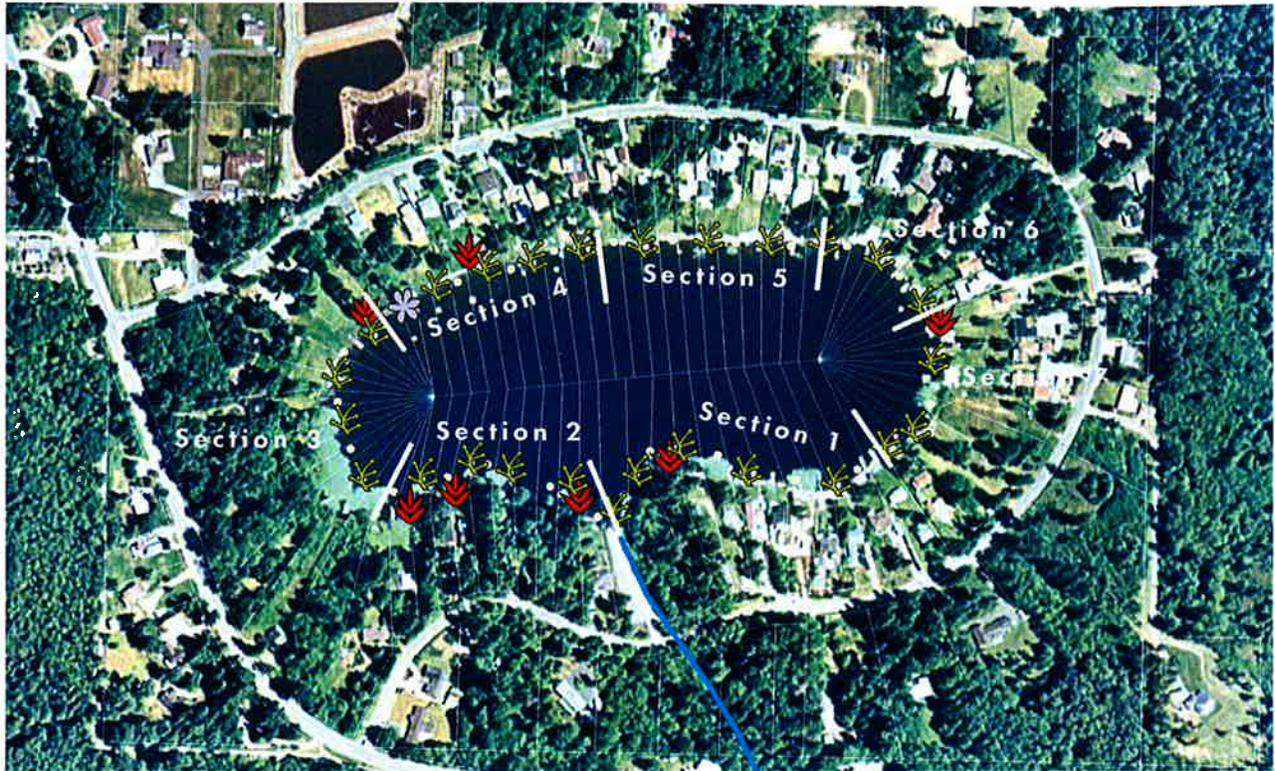
In 1998, the volunteers received permission to dig up the only patch of *L. salicaria*. The 1999 survey results suggest that the volunteers were successful in removing the loosestrife from Section 3.

In 1999, the volunteers observed that the pondweeds appeared to be crowding out the milfoil.

Table 16: Shady Lake 1998 and 1999 Waterweeds Survey Results

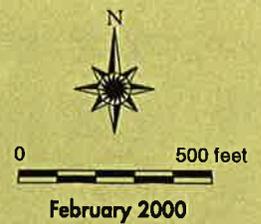
| Section | 1998 Species | 1998 Coverage   | 1999 Species | 1999 Coverage         |
|---------|--------------|-----------------|--------------|-----------------------|
| 1       | Ms           | medium          | Ms<br>Pd     | light-medium<br>light |
| 2       | Ms           | medium          | Ms<br>Pd     | light<br>light        |
| 3       | Ms<br>Ls     | medium<br>light | Ms<br>Pd     | light<br>light        |
| 4       | Ms           | light           | Ms<br>Pd     | light<br>light        |
| 5       | Ms           | medium          | Ms           | light                 |
| 6       | Ms           | light           | Ms           | light                 |
| 7       | Ms           | medium          | Ms<br>Pd     | light<br>light        |

Figure 15  
**Shady Lake**  
 Waterweed Volunteer Survey Map 1999



-  *Lythrum salicaria* (removed in 1998)  
(Purple Loosestrife)
-  *Phalaris arundinacea*  
(Reed Canary Grass)
-  *Myriophyllum spicatum*  
(Eurasian milfoil)

-  Stream
-  Section boundary
-  Parcel boundary



## Spring Lake

In 1998, Spring Lake was divided into seven main sections which were surveyed by different volunteers. Sections 1, 2, and 5 were surveyed by Caren Adams and Linda O'Brien on August 30, 1998. Sections 3 and 7 were surveyed by Ted Barnes on September 8, 1998. Section 4 was surveyed by Ellon Jarvis while Section 6 was surveyed by Elaine Cruickshank on September 7, 1998.

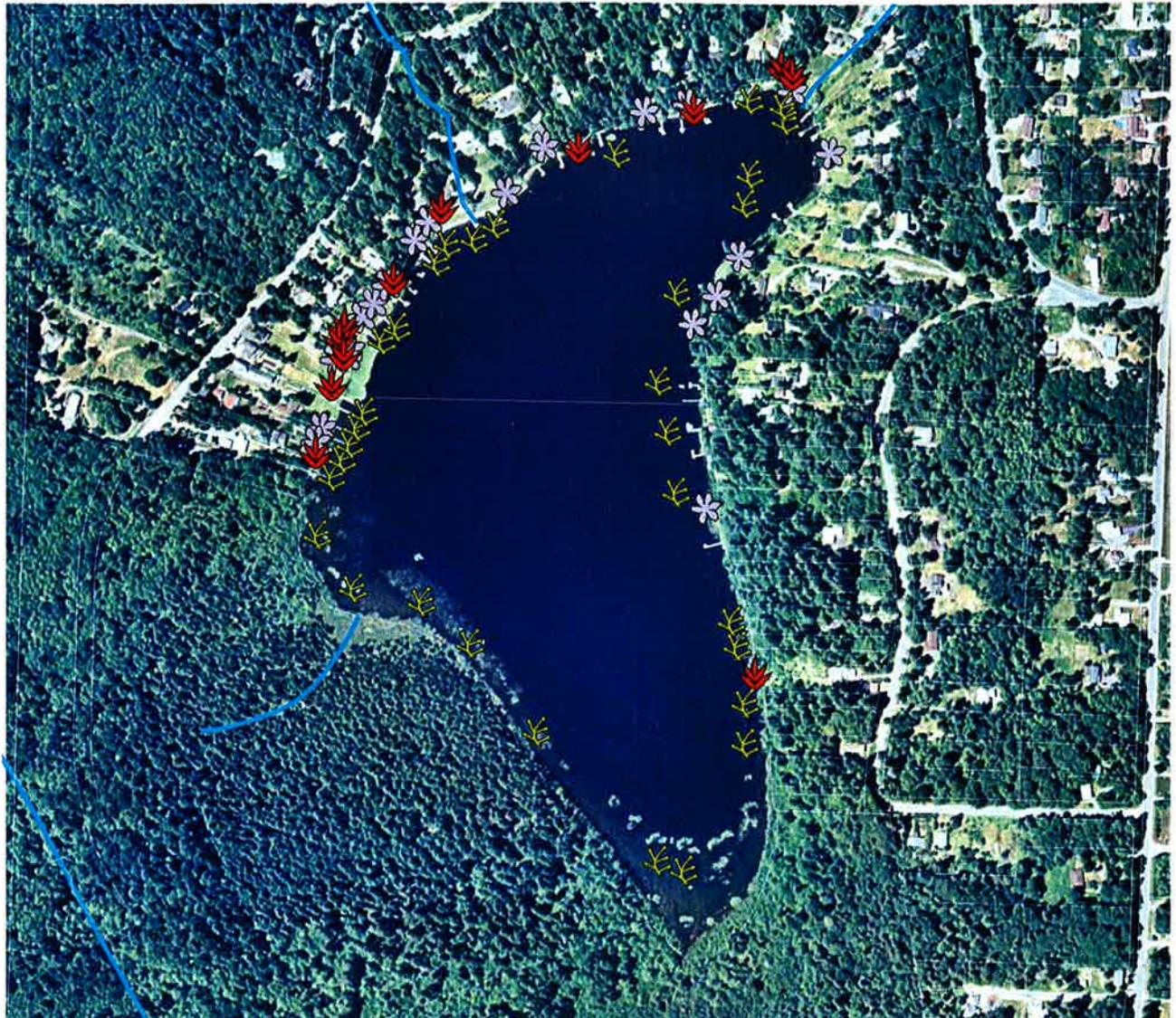
In 1999, Spring Lake was again divided into seven sections and surveyed by select volunteers. On September 4th, Caren Adams surveyed Sections 1, 2, 4, 5, and 6, while Ted Barnes and Kathy Walker surveyed Sections 3 and 7 on September 11th.

Because volunteers varied their level of survey detail, survey results were more difficult to compare and contrast for the two years. Thus, for illustration purposes, survey results were summarized in Table 17 for both years and included 1998 sub-section level detail. However, when developing the location map (Figure 16), 1998 sub-section level detail was omitted.

At Spring Lake, volunteers identified three weed species: *Lythrum salicaria* (Ls, Purple loosestrife); *Myriophyllum spicatum* (Ms, Eurasian watermilfoil) and *Phalaris arundinacea* (Pd, reed canary grass). The lake is an obvious candidate for both *L. salicaria* and *M. spicatum* control especially to protect the high quality wetland located on the south end of the lake.

In Figure 16, the 1999 location information for these weeds is illustrated. In the seven lake sections surveyed, coverage of the three weed species ranged from light to medium for the 1999 survey (Table 17).

Figure 16  
**Spring Lake**  
 Waterweed Volunteer Survey Map 1999



-  *Lythrum salicaria*  
(Purple Loosestrife)
-  *Phalaris arundinacea*  
(Reed Canary Grass)
-  *Myriophyllum spicatum*  
(Eurasian milfoil)

-  Stream
-  Section boundary
-  Parcel boundary

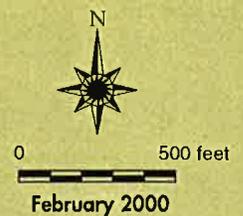


Table 17: Spring Lake 1998 and 1999 Waterweeds Survey Results

| Section | 1998 Species   | 1998 Coverage             | Section | 1999 Species   | 1999 Coverage                   |
|---------|----------------|---------------------------|---------|----------------|---------------------------------|
| 1A      | Ls<br>Ms       | light<br>medium-heavy     | 1       | Ms             | light-medium                    |
| 1B      | Ls<br>Ms       | light<br>light-heavy      |         |                |                                 |
| 1C      | Ms             | light-medium              |         |                |                                 |
| 1D      | Ms             | light                     |         |                |                                 |
| 2A      | Ms             | light                     | 2       | Ms             | medium                          |
| 2B      | Ms             | light-medium              |         |                |                                 |
| 3       | Ms             | light                     | 3       | Ms             | light                           |
|         | Pd             | one site only             |         | Pd             | light                           |
| 4       | Ls             | heavy                     | 4       | Ls             | light                           |
|         | Ms             | medium                    |         | Ms             | light-medium                    |
|         | Pd             | light                     |         |                |                                 |
| 5A      | Ls<br>Ms       | heavy<br>light-medium     | 5       | Ls<br>Ms<br>Pd | medium<br>medium<br>light       |
| 5B      | Ls<br>Ms       | light<br>medium-heavy     |         |                |                                 |
| 6A      | Ls<br>Ms<br>Pd | medium<br>medium<br>light | 6       | Ls<br>Ms<br>Pd | medium<br>light-medium<br>light |
| 6B      | Ms             | light                     |         |                |                                 |
| 6C      | Ls<br>Ms       | light<br>light            |         |                |                                 |
| 6D      | Ls<br>Ms<br>Pd | medium<br>light<br>light  |         |                |                                 |
| 6E      | Ls<br>Ms       | medium<br>medium          |         |                |                                 |
| 7       | Ls             | medium                    | 7       | Ls             | light                           |
|         | Ms             | light                     |         | Ms             | medium                          |
|         | Pd             | light                     |         | Pd             | light                           |



### *Lake Wilderness*

Lake Wilderness was surveyed by Roger King and John Vasboe on August 24, 1998 and again on August 4, 1999. In 1998 and 1999, sky conditions were sunny.

At Lake Wilderness, *Myriophyllum spicatum* (Ms, Eurasian watermilfoil) was present in the lake throughout 1998 (Figure 17). However, during the summer of 1998, the lake was treated with the aquatic herbicide, fluridone. Herbicide treatment resulted in the eradication of the milfoil from the lake. Prior to eradication in 1998, milfoil coverage was heavy in three of the four sections (Table 18). In Figure 18, the 1999 weed-free lake is illustrated.

Table 18: Lake Wilderness 1998 and 1999 Waterweeds Survey Results

| Section | 1998 Species | 1998 Coverage | 1999 Species | 1999 Coverage |
|---------|--------------|---------------|--------------|---------------|
| 1       | Ms           | heavy         | no weeds     |               |
| 2       | Ms           | heavy         | no weeds     |               |
| 3       | Ms           | light         | no weeds     |               |
| 4       | Ms           | heavy         | no weeds     |               |

Figure 17

# Lake Wilderness

Waterweed Volunteer Survey Map 1998



*Myriophyllum spicatum*  
(Eurasian milfoil)



Stream



Section boundary



Parcel boundary



0 500 feet

February 2000

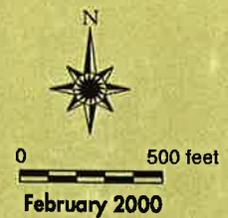
Figure 18

# Lake Wilderness

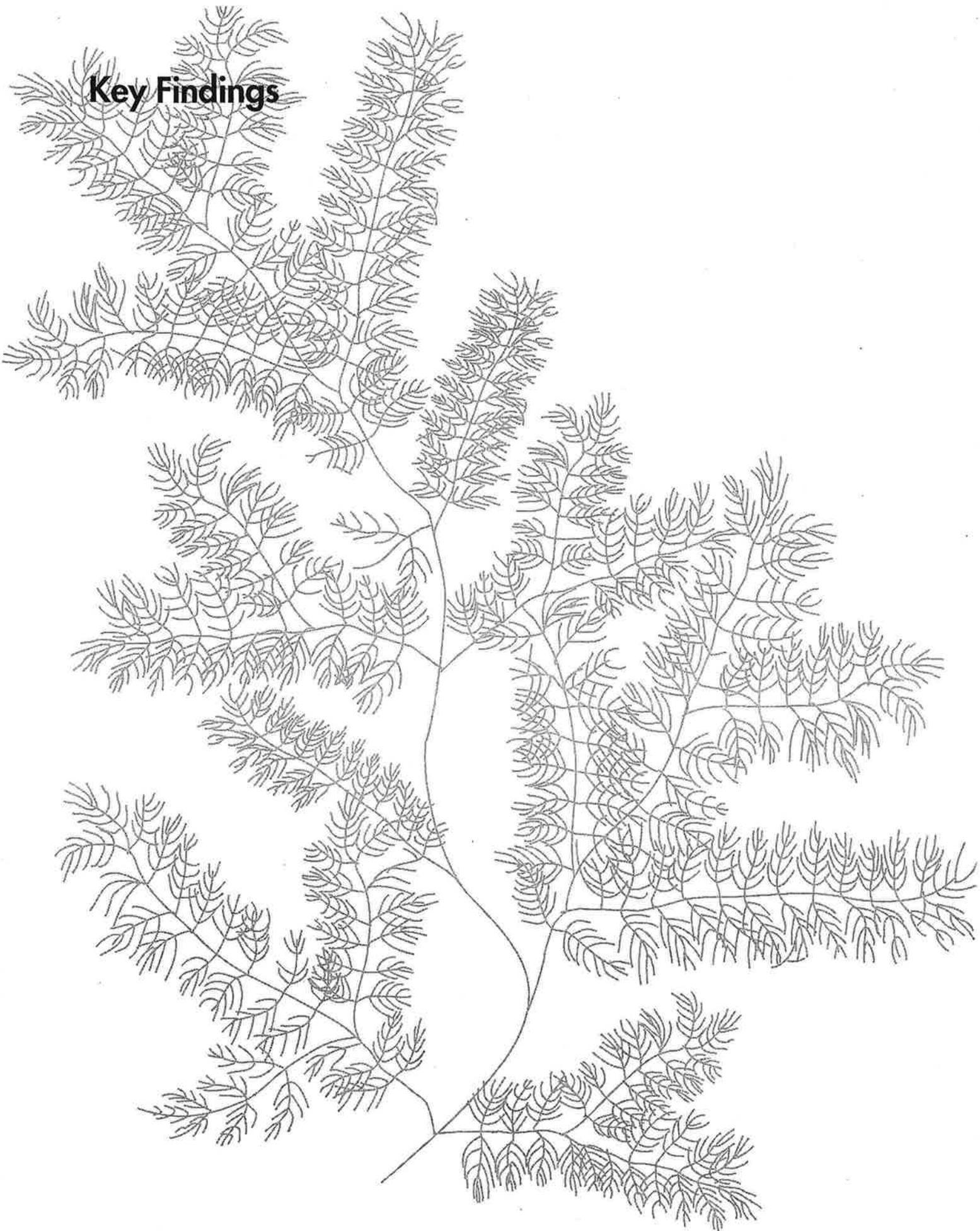
Waterweed Volunteer Survey Map 1999



-  Stream
-  Section boundary
-  Parcel boundary



# Key Findings



## Key Findings

Local lake residents are most likely to be familiar with the status of water quality or the composition of flora and fauna found at their lake. This familiarity lends residents the ability to observe changes at their lakes more readily than would be expected by a casual visitor, making lake residents very valuable observers of change.

Through the waterweeds program, volunteers were successfully trained to identify and survey their lakes for target weed species. By focusing on a few species of concerns, volunteers recognized these species and mapped their location. In turn, this location information can then be used to prioritize weed control efforts by lake groups, local agencies, and weed boards.

With the 1998 and 1999 surveys, volunteers confirmed the presence of weed species identified in previous surveys (King County, 1996), mapped weeds in lakes which had no previous survey information (Easter, Leota, Marcel, and Paradise), and identified the presence of new weeds which were not recorded in past surveys.

At lakes Angle, Geneva, Margaret, Morton Pine, Retreat, and Spring, *Phalaris arundinacea* was newly identified. While *Lythrum salicaria* was identified for the first time at lakes Beaver, Paradise, and Shady. Because of the volunteer surveys, small infestations of *L. salicaria* were identified and removed at Beaver and Shady lakes, preventing further spread.

Timely detection of new weeds has played an important role in early infestation grant awards from the Washington State Department of Ecology's (Ecology) Aquatic Weed Management Fund. Specifically, several *Myriophyllum spicatum* early infestation projects were initiated across the state after citizen monitors sent plant samples to Ecology for identification. Similarly, the waterweeds program provides opportunity for early detection and subsequent early infestation funding to address new weed infestations.

Overall, volunteers are important participants in the detection of potentially invasive weed species. Trained volunteers can detect new weeds and alert their local lakes program or weed board. New introductions as well as small infestations can usually be controlled quickly before becoming problematic. Additionally, control costs can be kept to the minimum and limited weed funding stretched further.

## Recommendations

The waterweeds program provides a valuable assessment of weed problems at King County lakes. Through the pilot project, training materials have been developed and tested at fifteen lakes. As staff funding allows, these materials can be used to continue the support of the waterweeds survey program in King County lakes.

In 2000, the waterweeds program should support the removal of noxious weeds identified at participating lakes with particular emphasis on *Lythrum salicaria* removal. At lakes Beaver, Paradise, Pine, and Spring, *L. salicaria* can likely be eradicated with moderate effort while at Lake Desire more extensive efforts are needed to ensure control and eventual eradication occurs. To accomplish *L. salicaria* removal, the WLR Lake Stewardship Program should partner with King County Noxious Weed Board (KCNWB) to ensure that volunteers and their lake communities are supported in their weed removal efforts.

In the future, the weed identification cards should be expanded to include other aquatic or emergent species of concerns including *Lysimachia vulgaris* and *Ludwigia hexapetala*. Over time, the weed cards can be updated and other new species added as appropriate.

Finally, volunteers and their lake neighbors should develop or enhance existing native shoreline buffers. These buffers will discourage *L. salicaria* and *Phalaris arundinacea* from becoming established or returning once removed from affected shoreline areas.

## References

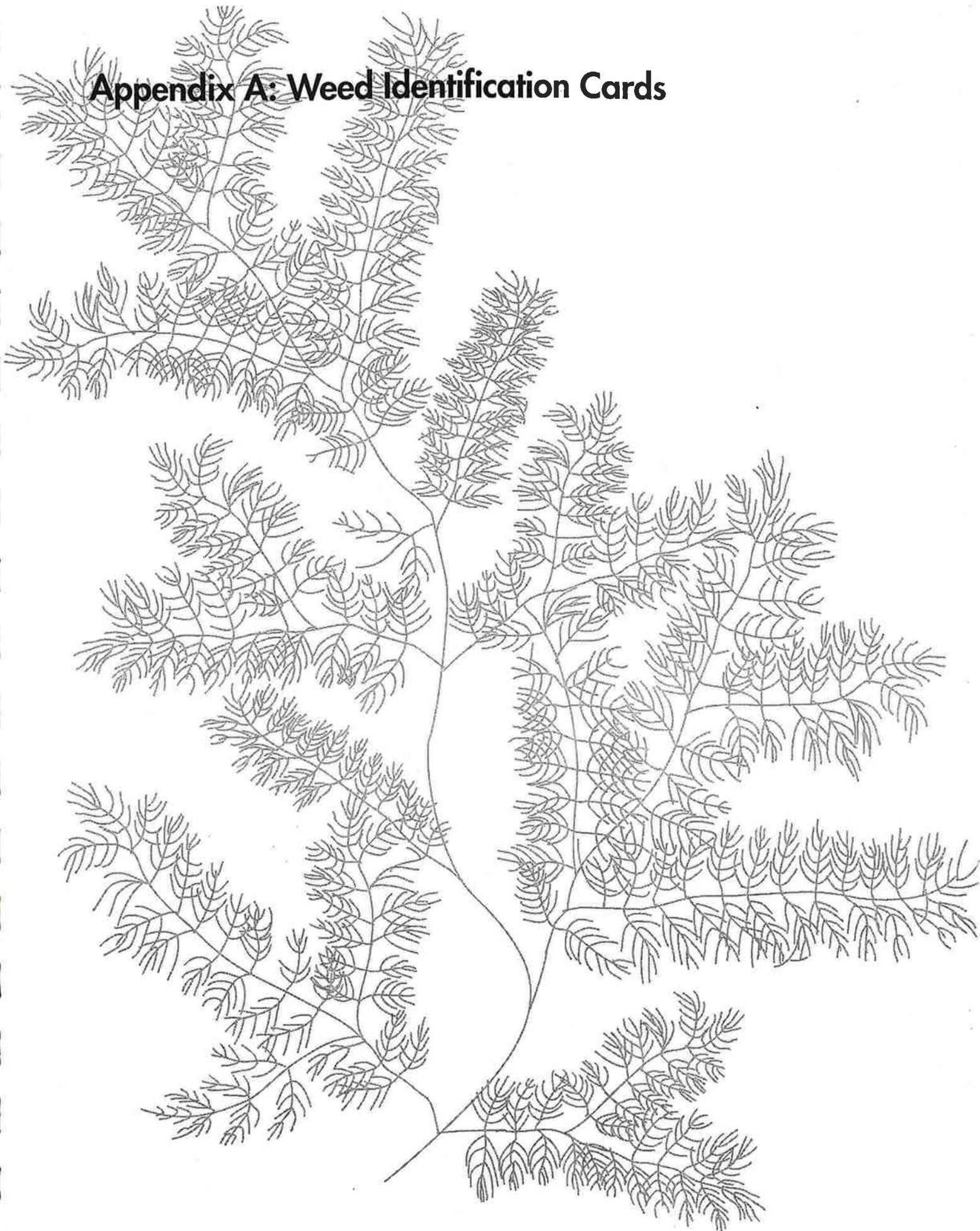
King County, 1996. Aquatic Plant Mapping for 36 King County Lakes. Department of Public Works, Surface Water Management Division.

King County, 1999. 1999 King County Noxious Weed List. Department of Natural Resources, Water and Lake Resource Division.

Washington State Department of Agriculture, 1999. 1999 Washington State Noxious Weed List. Department of Natural Resources, Water and Lake Resource Division.



# Appendix A: Weed Identification Cards



# Fanwort (*Cabomba caroliniana*)

## Class B Noxious Weed

### History

Native to the southeastern United States, fanwort is a noxious weed in the Northwest. Fanwort has traditionally been used in aquariums for its beautiful fan-shaped underwater leaves.

### Method Of Spread

Like many problem aquatic plants, fanwort can reproduce from small fragments. Fanwort stems become brittle in late summer, allowing the plant to break apart easily - facilitating its spread to new waterbodies. Once introduced, dense strands quickly form. Although fanwort is a noxious weed, it is still (as of 1997) legally sold as an aquarium plant in Washington.

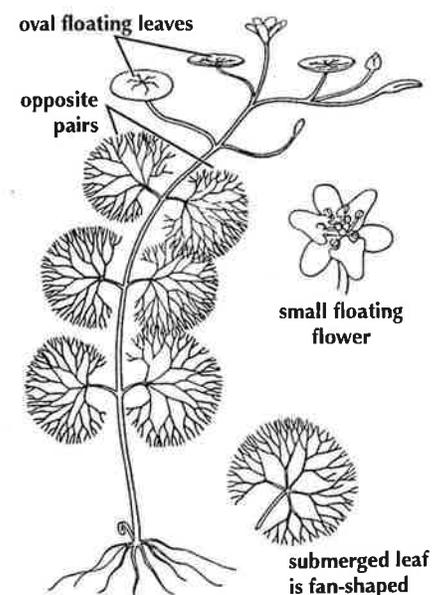
The fanwort infestation in Washington is in a pioneering stage. It has been found in southwestern Washington and some coastal lakes in Oregon. Close monitoring of our lakes and prompt action may prevent further spread and minimize future management costs.

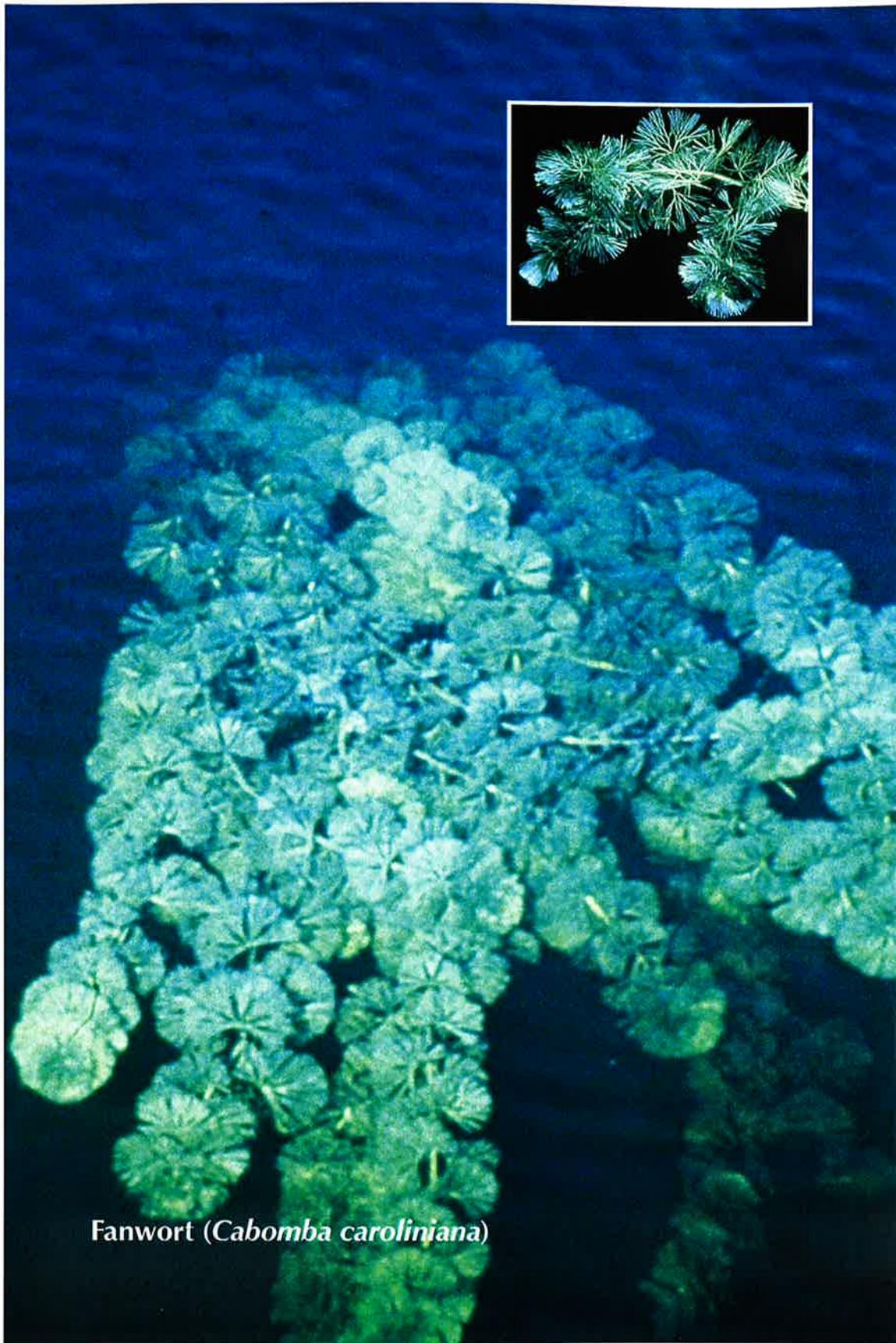
### Methods Of Control

There has been little research on fanwort biology or management, although grass carp are known to eat it. Unlike most other rooted aquatic plants, fanwort may get most of its important nutrients from the water rather than the sediment, potentially making it sensitive to the reduction of waterborne nutrients.

### Identification

- sometimes confused with aquatic buttercup and aquatic marigold
- plant sometimes looks reddish, sometimes green
- fan-shaped leaves on short stalks are submerged and arranged in opposite pairs
- small (less than one inch long), oval floating leaves with the stem attached in the center are sometimes present
- underwater stems have a "tubular" appearance
- flowers have white to light yellow petals and float on the surface





Fanwort (*Cabomba caroliniana*)

# Brazilian elodea (*Egeria densa*)

## Class B Noxious Weed

### History

As its name indicates, Brazilian elodea is from South America and was originally introduced to North America for aquarium use. Up until 1996 it was commonly sold in Washington pet stores and plant nurseries.

### Method of Spread

Brazilian elodea reproduces by the spread of plant fragments. Branches sprout from "double nodes" located at intervals along the stems. The plant is probably spread most often when aquariums are dumped in our lakes or when boaters carry it from an infested lake into an uninfested waterbody.

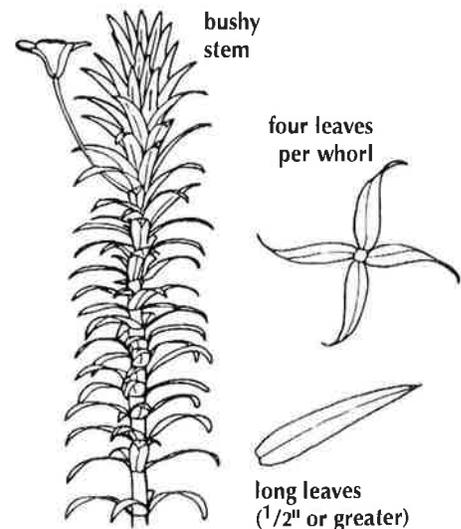
Brazilian elodea grows very well in Washington lakes once introduced and soon forms dense mats that choke out our native aquatic plants. These mats are unsightly, interfere with swimming, boating and fishing, and provide poor habitat for fish.

### Methods of Control

Brazilian elodea is difficult to control because it has few natural predators. Some aquatic herbicides are effective in controlling its growth. Grass carp have shown promise as a control technique, but are not an option in lakes with anadromous fish runs (salmon). Harvesting allows small plant fragments to spread to new areas, limiting its success as a control method.

### Identification

- commonly confused with hydrilla and American waterweed (*Elodea canadensis*)
- leaves arranged in whorls of four
- stems are dense with bright green leaves
- flowers are small, white, and have three petals
- leaf structure looks similar to hydrilla but Brazilian elodea does not produce tubers





Brazilian elodea (*Egeria densa*)

# Water hyacinth (*Eichhornia crassipes*) Unlisted Noxious Weed (1998)

## History

Water hyacinth is native to South America, and was introduced to the United States in the 1880s. Its beautiful, large purple and violet flowers have made it a popular ornamental, and the plant is now naturalized in most of the southern United States.

## Method of Spread

Water hyacinth has not yet (1998) been found in the wild in Washington State, but has been sold as an ornamental in plant nurseries. Its use as an ornamental means that it could be introduced to our lakes and rivers, and this is expected to be its primary method of spread.

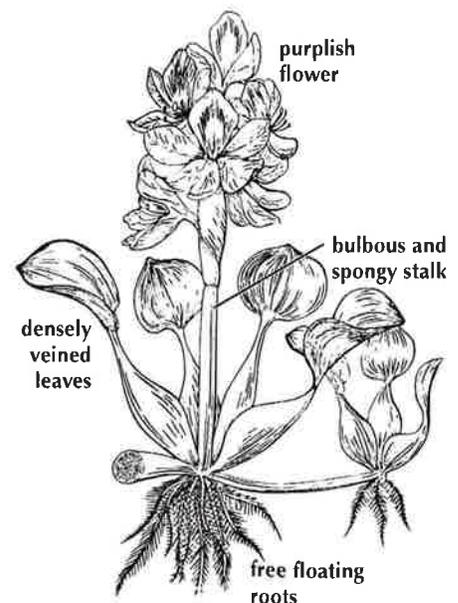
Water hyacinth has been called the worst aquatic plant in the world! Its growth rate is among the highest of any plant known: hyacinth populations can double in as little as 12 days. Incredibly dense mats of free-floating vegetation block boat traffic and prevent swimming and fishing, and keep sunlight from reaching the water column and submerged plants.

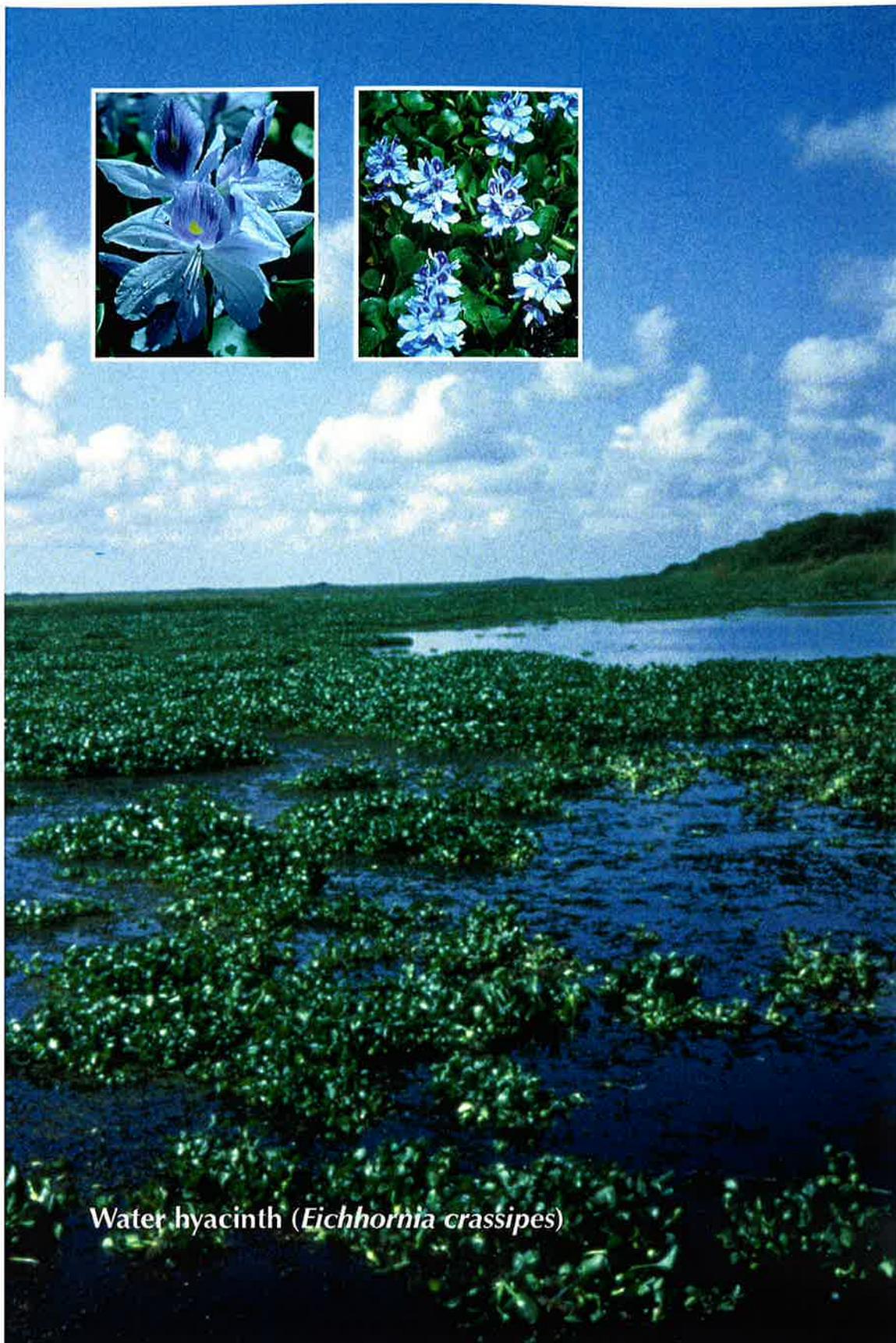
## Methods of Control

Water hyacinth can be controlled by harvesting, aquatic herbicides, and biological control agents. Locally, the best way to manage water hyacinth is to prevent it from becoming established. Plants purchased at local nurseries should be disposed of away from waterbodies.

## Identification

- free-floating, robust plant grows up to three feet off the water's surface
- shiny green leaves are round to oval, four to eight inches in diameter, with gently incurved sides
- leaf veins are dense and numerous so leaves stand erect
- stalks are bulbous and spongy, and help keep the plant buoyant
- flowers have six petals, purplish blue or lavender with yellow
- several flowers grow at the top of a single stalk
- a mass of fine purplish black and feathery roots hangs in the water underneath the plant





Water hyacinth (*Eichhornia crassipes*)

# Hydrilla (*Hydrilla verticillata*)

## Class A Noxious Weed

### History

This plant is native to Africa, Australia, and parts of Asia but was introduced to Florida in 1960 via the aquarium trade.

### Method of Spread

Hydrilla (*Hydrilla verticillata*) is considered the most problematic aquatic plant in the United States. It can grow an inch a day, forming dense mats that interfere with recreational uses and destroy fish and wildlife habitat. It will grow with less light and is more efficient using nutrients than other plants. Hydrilla reproduces easily - it can sprout new plants from root fragments or extremely small stem fragments, as well as from seeds, tubers and turions.

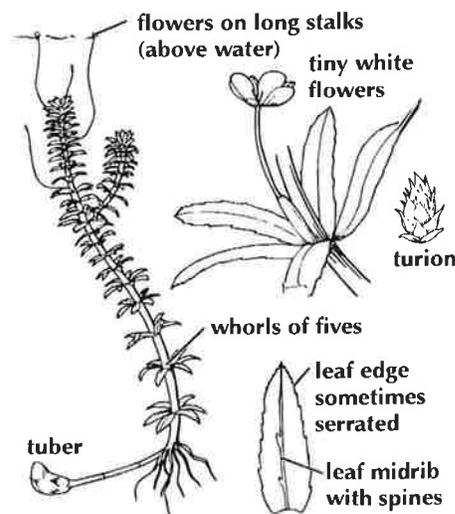
The only known occurrence of hydrilla was discovered in King County in 1995. Eradication efforts are underway. The infestation most likely came from contaminated water lily rhizomes or through a aquarium.

### Methods of Control

Different methods or combined methods can be used to control hydrilla depending on the management goal. In recreational waters the challenge is to control hydrilla selectively amid native vegetation. Management methods include herbicide, grass carp, and mechanical removal.

### Identification

- commonly confused with Brazilian elodea (*Egeria densa*) and native American waterweed (*Elodea canadensis*)
- long, sinewy, underwater plant
- leaves are small and pointed, oppositely arranged, and generally grow in whorls of five
- leaves are sometimes serrated along the edges; midrib of leaf is often reddish and has one or more sharp spines
- flowers are tiny, white, and grow on long stalks
- distinct tubers are 1/4 to 1/2 inches long, off-white to yellowish, potato-like structures that attach to the roots





**Hydrilla (*Hydrilla verticillata*)**

# Purple loosestrife (*Lythrum salicaria*)

## Class B Noxious Weed

### History

Purple loosestrife is native to Europe and was introduced to the United States as an ornamental garden flower. With no natural enemies here, loosestrife is very prolific and invades wetland and shoreline areas, crowding out native plants and reducing habitat diversity. No wildlife species are known to use this plant, and the dense thickets of dead stems deter waterfowl and other wildlife access. It is now illegal to buy or sell purple loosestrife in Washington State.

### Method of Spread

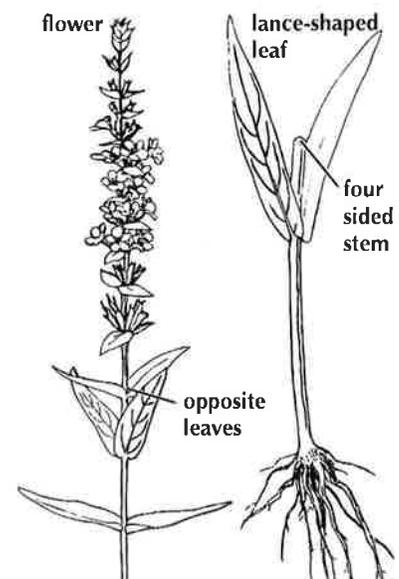
Purple loosestrife grows in all counties in our area. It is highly invasive and spreads by seed, runners, and stem cuttings. Its seed production (up to 3,000,000 seeds per plant stalk), and an extensive root system make it quite competitive.

### Methods of Control

Purple loosestrife is controlled using herbicide and mechanical methods. Flower tops can be clipped and the stalks dabbed with herbicide. Hand removal methods which include digging up the plant can be effective for small areas. Biological control agents have also been used with some success.

### Identification

- commonly confused with fireweed and spirea
- frequently occurs in very dense and colorful populations
- leaves are two to four inches long, the upper ones smaller, and are lance-like with heart-shaped bases
- leaves are typically opposite (in pairs along the stem), although they are sometimes alternate or whorled (in threes or spiraled)
- stems are up to six feet tall, and unbranched stems are woody and distinctly four-sided
- very showy flowers appear in dense, elongate spikes with the magenta petals
- blooms July to September





Purple loosestrife (*Lythrum salicaria*)

# Parrotfeather milfoil (*Myriophyllum aquaticum*)

## Class B Noxious Weed

### History

Parrotfeather milfoil, a native of South America, was sold in the United States as an ornamental for aquatic gardens and aquariums. Because of its attractiveness, some lake residents have deliberately planted this species unaware of its invasive and aggressive growth pattern. Since 1996 parrotfeather has not been offered for sale in Washington State.

### Method of Spread

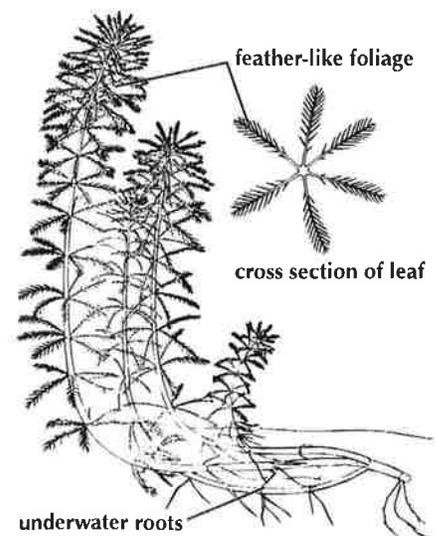
Parrotfeather forms dense mats of vegetation that can entirely cover the surface of shallow lakes. The tough stems make it difficult to boat, swim, fish, or water ski. Unfortunately, parrotfeather grows well in the Northwest and is widespread throughout Washington and Oregon. The plant spreads readily through fragmentation of the stems and underground rhizomes.

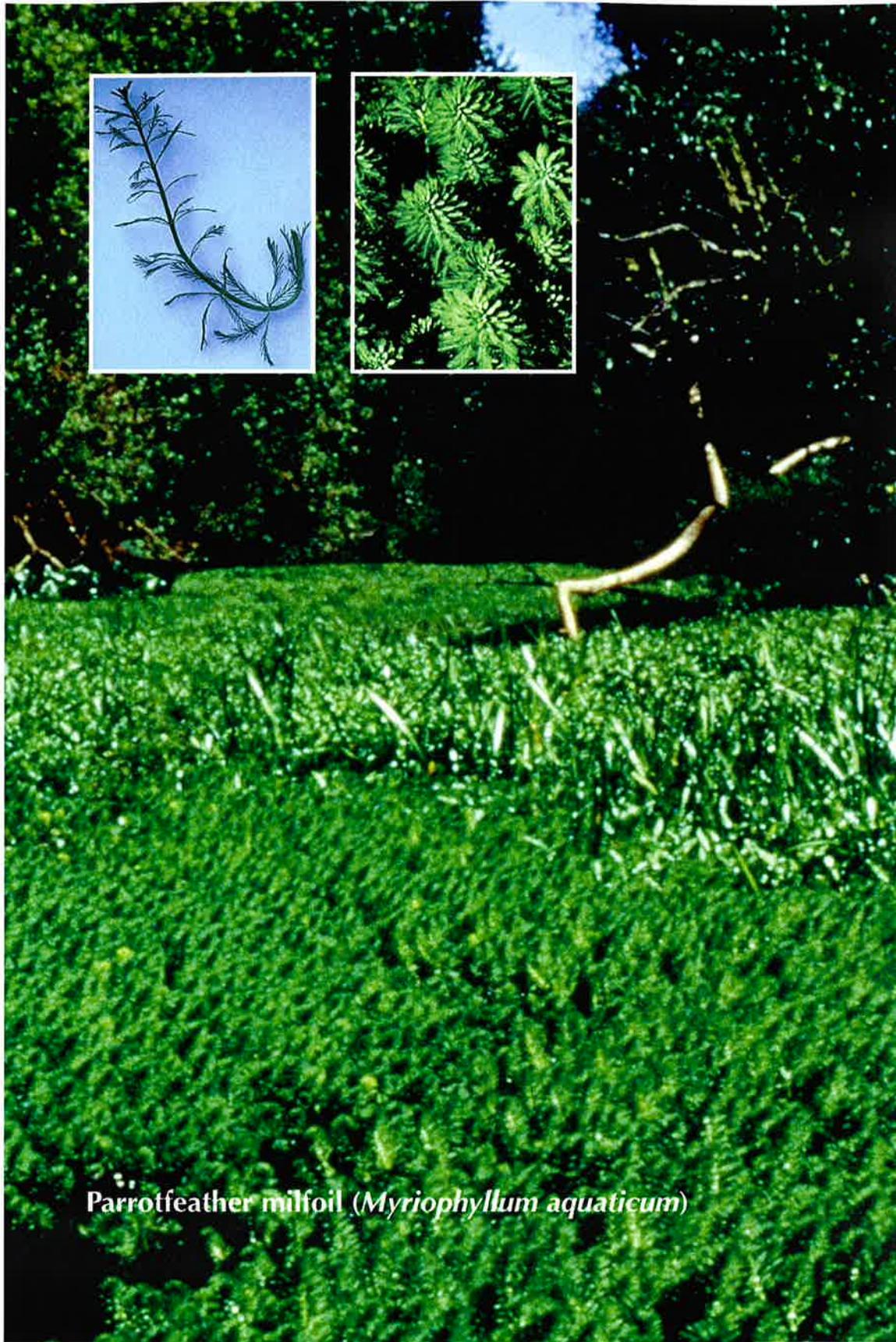
### Methods of Control

Parrotfeather is difficult to control. Grass carp used for plant control find it unpalatable. Harvesting and other mechanical controls produce fragments that help spread the plant. Its foliage makes herbicides difficult to deliver effectively, and the waxy leaves and stems inhibit herbicide uptake. Mechanical harvest has been used in Washington with limited results.

### Identification

- bright green, stiff, feather-like foliage that can extend up to one foot above the water's surface
- bright green leaves, oblong, deeply cut and feathery looking, are arranged in whorls (four - six) around the stem and remain submerged until the plant flowers
- stems can be five feet long, trailing along the ground or water surface, turning erect and leafy at the ends, they appear somewhat "fir-tree-like"
- female flowers lack petals, male flowers have four small petals
- dense mat of intertwined brownish stems (rhizomes) in the water
- blooms May to July





Parrotfeather milfoil (*Myriophyllum aquaticum*)

# Eurasian watermilfoil (*Myriophyllum spicatum*)

## Class B Noxious Weed

### History

Milfoil originates from Europe and Asia, but was introduced to North America through the aquarium industry. Milfoil may have arrived as early as the late 1800s, but was first documented in the Eastern United States in the 1940s.

### Method of Spread

Milfoil forms very dense mats of vegetation on the water's surface, impairing water recreation. It spreads rapidly, mostly by fragmentation of plant parts. In the late summer and fall, the plants become brittle and naturally break apart. Each fragment is capable of growing roots and developing into a new plant. It is competitive with native species and may completely dominate a plant community within a few years.

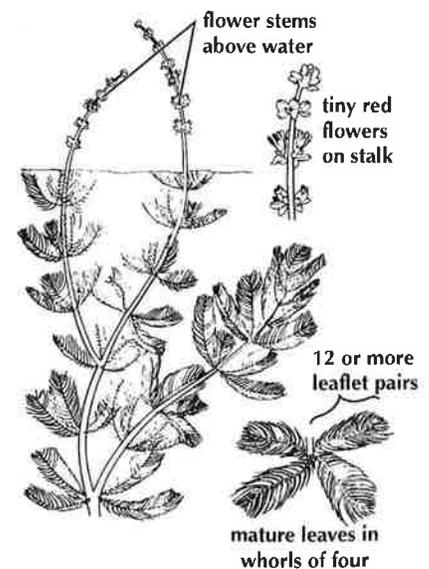
Milfoil is widespread throughout western Washington and Oregon. Found in Lake Meridian near Seattle in 1965 and Lake Washington by the mid-1970s. The distribution of milfoil now closely follows Interstate 5. Milfoil has probably been spread from lake to lake on boat trailers.

### Methods of Control

Once milfoil is well-established, it is difficult to eradicate. In smaller lakes, aquatic herbicides have been partially successful. Other control methods include: underwater rototilling, bottom barriers, hand pulling or dredging, and in limited situations, sterile grass carp. Removing fragments from boat trailers and along shorelines is advised to prevent milfoil's spread into new areas.

### Identification

- submersed aquatic milfoil grows in dense mats, with stalks of tiny reddish flowers held above the water
- usually has twelve or more leaflet pairs on each leaf
- mature leaves are usually arranged in whorls of four and are about three cm long
- leaves rarely extend above the water and collapse when removed from the water
- stems may reach lengths of three m or more, are usually two - four mm thick, and are reddish to olive green
- blooms June to August





Eurasian watermilfoil (*Myriophyllum spicatum*)

# Reed canary grass (*Phalaris arundinacea*)

## Class C Noxious Weed

### History

Reed canary grass is likely to have been introduced from Eurasia, as were most of our weedy grasses. Considered a good forage plant in Sweden as early as 1749, it has been used for pasture, silage, and hay as well as filtration for water pollution control. The seed is used for birdseed.

### Method of Spread

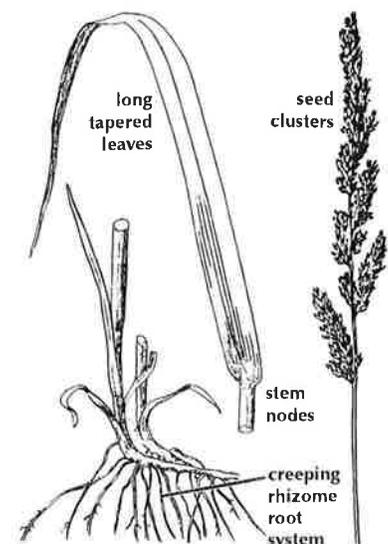
This grass is an aggressive invader of moist areas, meadows and lake shores. Reed canary grass is a generally competitive, persistent and vigorous perennial grass that grows in poorly drained areas and along stream and canal banks. Its creeping rhizomes force out other grasses and thus reduce biodiversity. Although reed canary grass has been valuable for forage, it has become a threat to some of our native wetland plant communities. The grass is widely distributed in Idaho, Oregon, Nevada, Utah and Washington.

### Methods of Control

Reed canary grass can be handpulled, but because it does not tolerate shade the best control method is selective planting of favorable species. Once shaded, reed canary grass can be replaced by sedges, rushes, willow, red osier dogwood and chokecherry.

### Identification

- a coarse but attractive perennial, reed canary grass grows as tall as six feet
- long leaves are flat, green with a sooty-gray hue, about 1/2 inch wide, and spread out from the stem at tight right angles
- light green to straw colored stems have swollen stem nodes
- flowers and grains grow in dense but branched clusters, which commonly turn purplish as the plant matures in spring and fade to straw color in late summer
- roots spread extensively by creeping rhizomes and runners

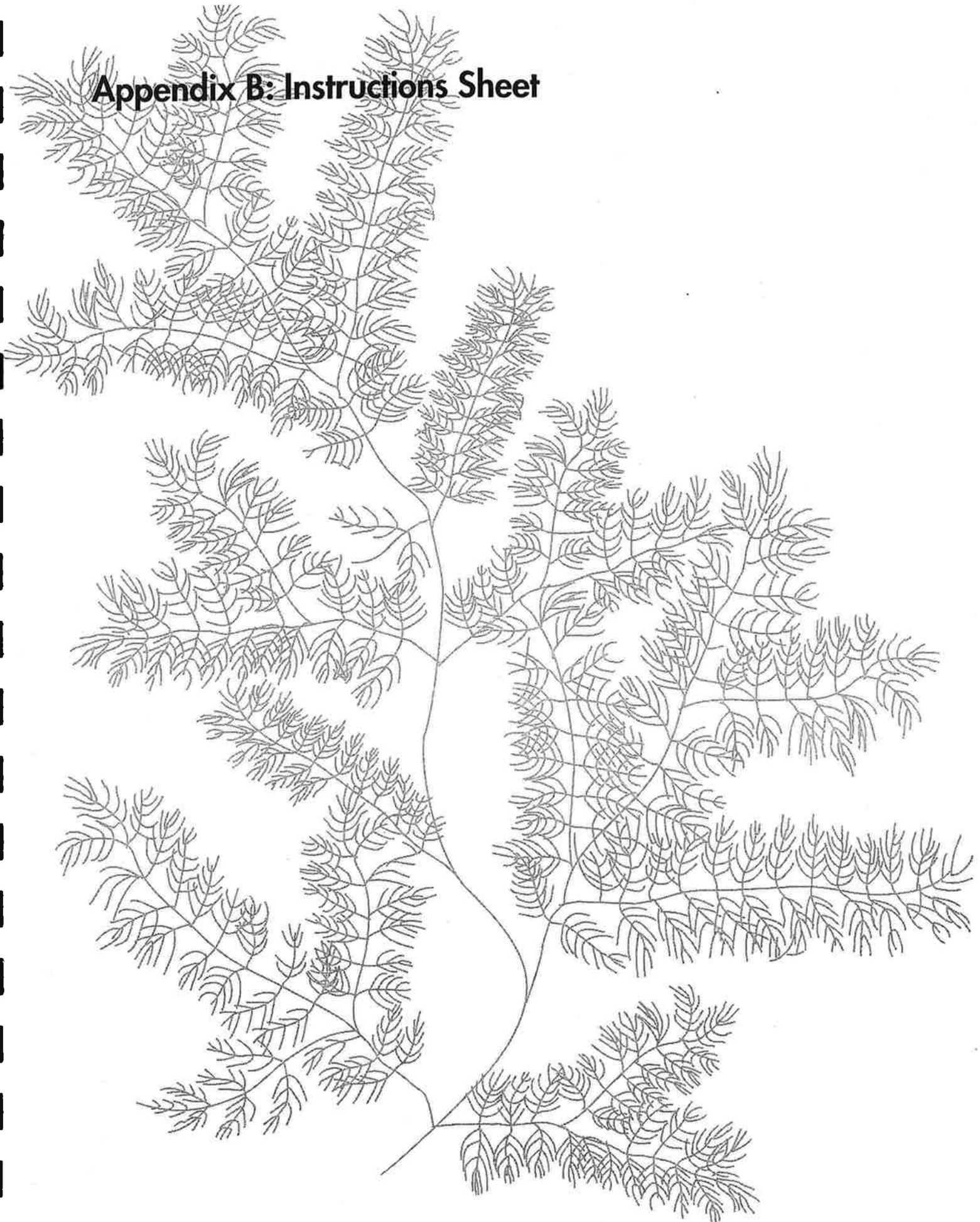




Reed canary grass (*Phalaris arundinacea*)



# Appendix B: Instructions Sheet





## King County Department of Natural Resources Lake Stewardship Program

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### Instructions for 1999 WATERWEEDS SURVEYS

#### Background

Surveying and mapping aquatic plants provides a record of types and amounts of plants in a lake over time. Regular monitoring can also help with early detection of noxious weed species and save time and money in clean-up efforts. In lakes where aquatic weeds are present at nuisance levels, survey information is used to develop integrated vegetation management plans for long-term plant eradication or control.

#### 1999 Waterweeds Survey Objectives

- Survey for the absence or presence of weeds
- Map location of weeds
- Identify level of infestation (low, medium, high)

#### Timing

A preliminary survey should be conducted in June to identify the presence of any new weed species. Early detection of new weed infestations facilitates early implementation of management activities. The comprehensive survey should be done at the same time every year, ideally in August when total plant numbers are near or at their peak. The comprehensive survey information can then be used to track changes in infestation levels over time.

#### Equipment

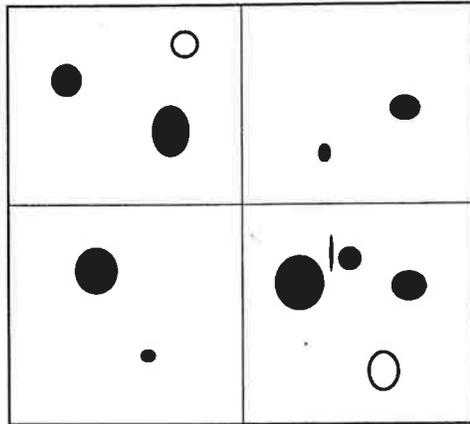
You will need a boat, safety equipment, anchor, clipboard, plastic bags, cooler, lake map, field sheet, permanent markers, pencils, identification cards, garden rake, rope, and viewing scope (optional).

#### Survey Procedure

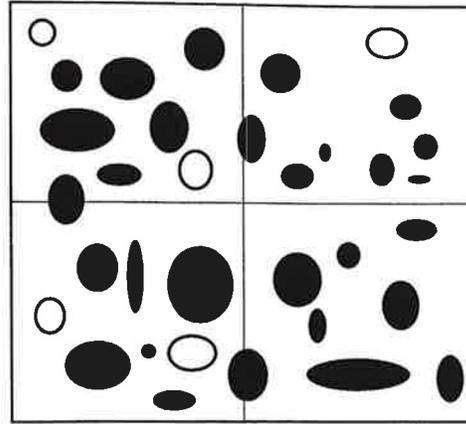
1. Using the map provided by King County WLRD, get yourself orientated in relation to the lake shoreline using key map features (e.g. homes, docks, parks, and geological features).
2. Establish regular "shoreline sections" on the map and number. Numbered sections should correspond to all information recorded on the field sheet.
3. For each shoreline section, survey by plant community type (emergent, floating, and submergent) for each target weed species. Mark location information on the map for all weed species using the weed key.
4. For each community type (emergent, floating, and submergent), estimate the degree of weed coverage using the following scale: 0-25% light (L), 25-75% medium (M), and >75% heavy (H). Record this information on your field sheet.
5. Continue to survey each section of the lake until the entire shoreline has been mapped.
6. Collect representative samples of all weed species to confirm identification with existing pressed specimens (or to press to start your own plant library).
7. For all plants where field identification cannot be made, place samples in a plastic bag and return to King County for identification.
8. Questions can be directed to Sharon Walton (206) 296-8382.

## Weed Coverage Estimate

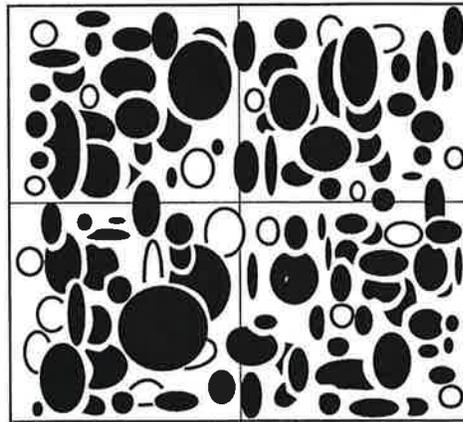
Light (L): <25%



Medium (M): 25–75%



Heavy (H): >75%



## Waterweeds '99 Mapping Key

Symbol

Ls

Pd

Ec

Ms

Ma

Cc

Hv

Eg

Species

*Lythrum salicaria* (purple loosestrife)

*Phalaris arundinacea* (reed canary grass)

*Eichhornia crassipes* (water hyacinth)

*Myriophyllum spicatum* (Eurasian watermilfoil)

*Myriophyllum aquaticum* (parrotfeather milfoil).

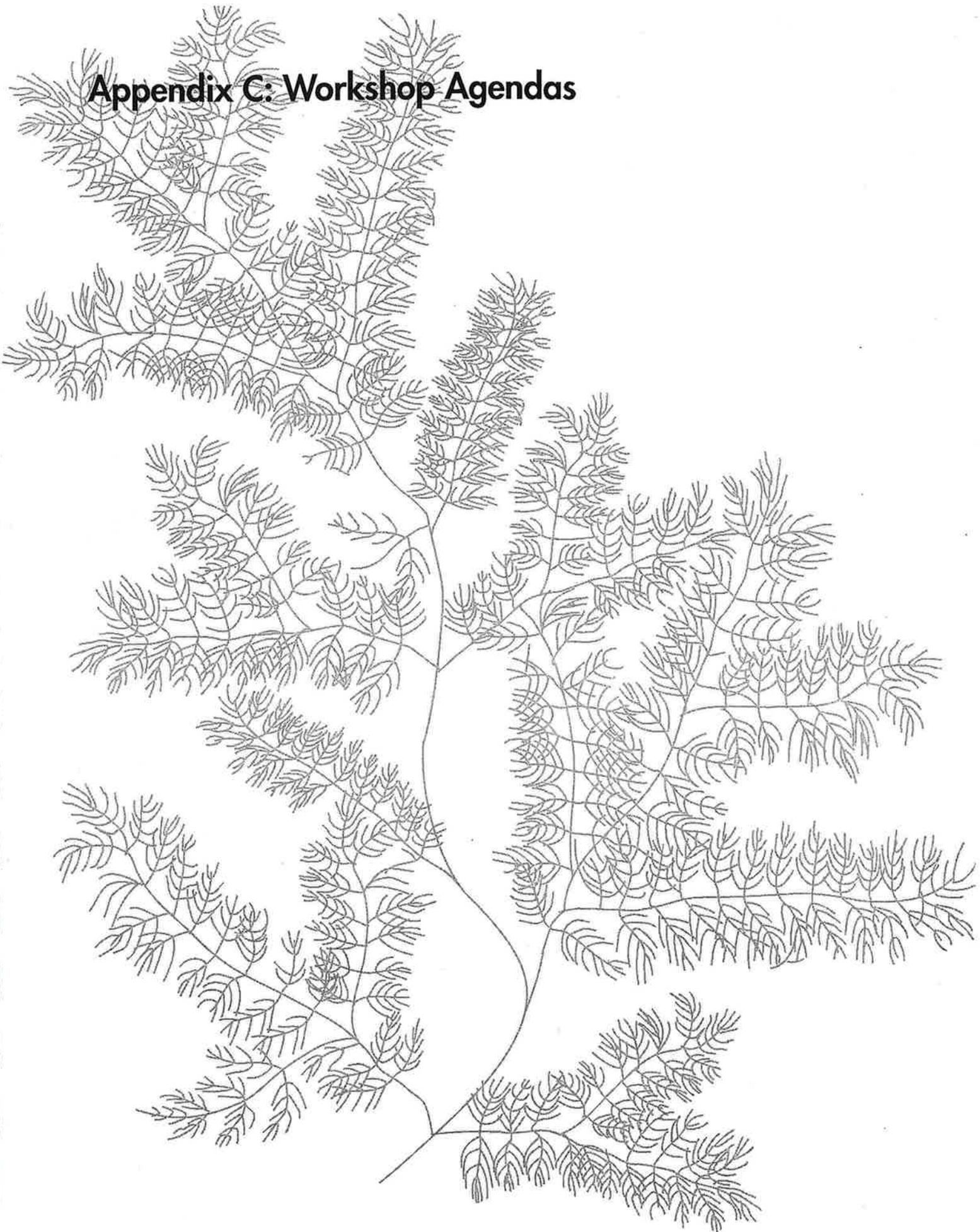
*Cabomba caroliniana* (fanwort)

*Hydrilla verticillata* (hydrilla)

*Egeria densa* (Brazilian elodea)



## Appendix C: Workshop Agendas





## AGENDA

### LOOKING FOR WATERWEEDS

Saturday, July 25, 1998

9:30-11:30 AM

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| Time  | Item   |
|-------|--|
| 9:30  | Introductions                                  |
| 9:35  | Background                                     |
| 9:45  | The Problem with Noxious Weeds                 |
| 10:00 | Identification of the Top Eight Peskiest Weeds |
| 10:45 | Survey Techniques and Follow-up Training       |
| 11:00 | Question and Answers                           |

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## AGENDA

### LOOKING FOR WATERWEEDS

Saturday, July 17, 1999

9:00-12:00 AM

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| Time  | Item                                       | Who            |
|-------|--|----------------|
| 9:00  | Complete Registration                      | All            |
| 9:15  | Introductions/Purpose                      | Sharon Walton  |
| 9:30  | The Problem with Noxious Weeds             | Jane Wentworth |
| 9:50  | Identification of the Eight Peskiest Weeds | Sharon Walton  |
| 10:45 | Break                                      | All            |
| 11:00 | Survey Techniques/Follow-up Training       | Wendy Cooke    |
| 11:15 | Weed Control Options                       | Sharon Walton  |
| 11:30 | Question and Answers                       | All            |

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# Appendix D: Field Sheet

