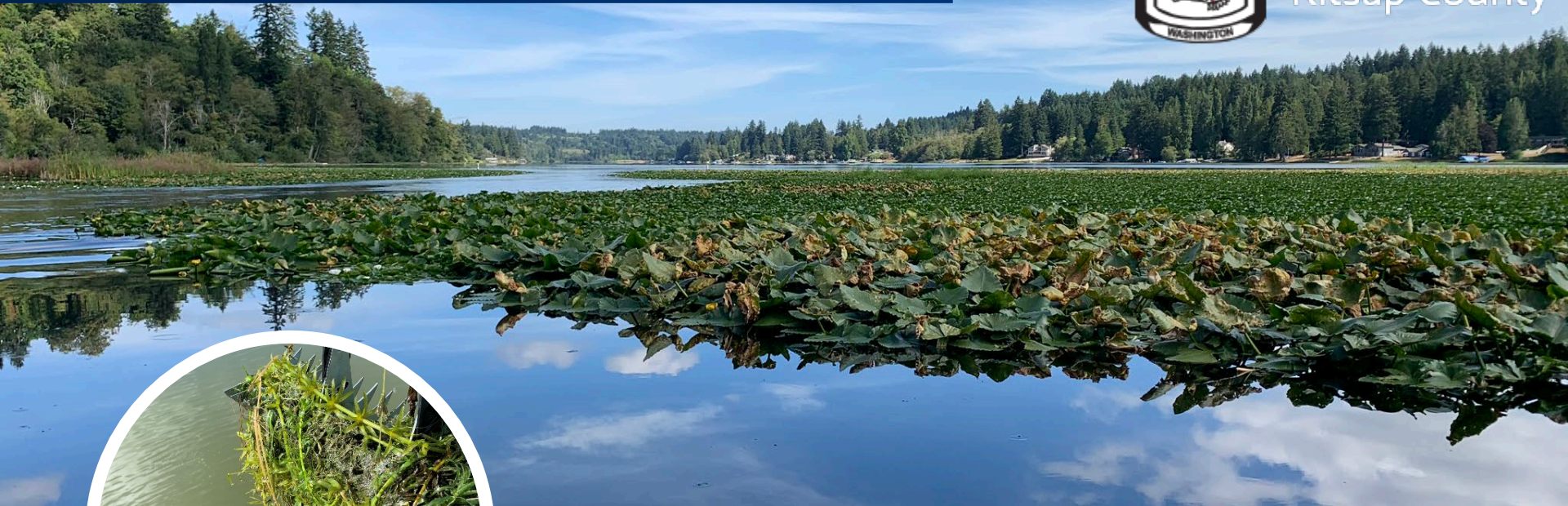




Long Lake Integrated Aquatic Vegetation Management Plan



Kitsap County



October 2022

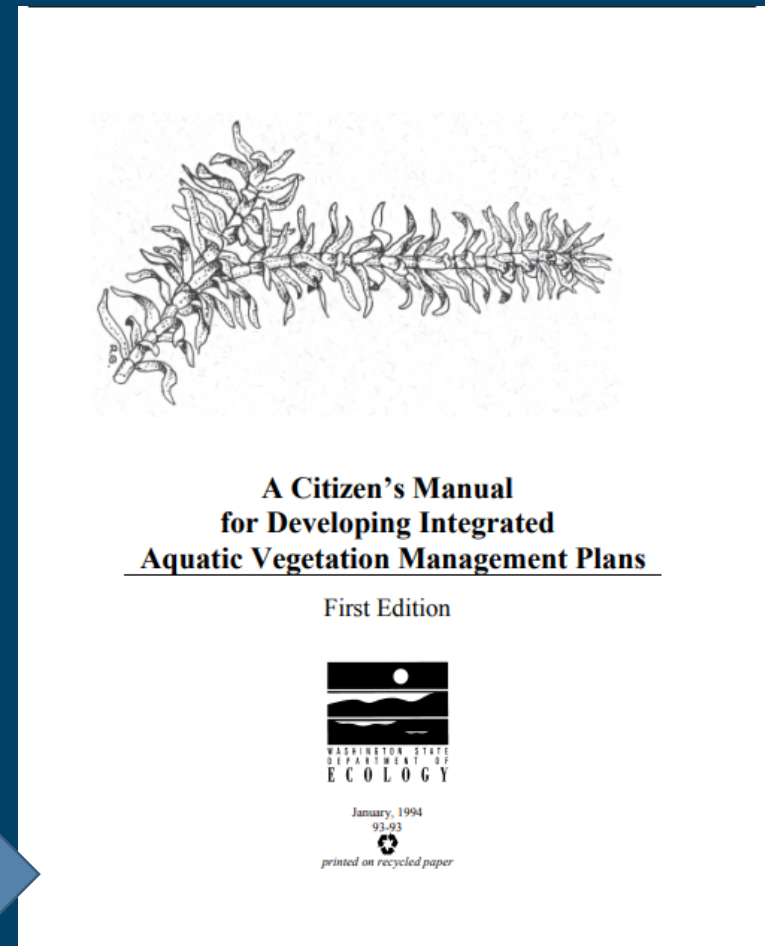
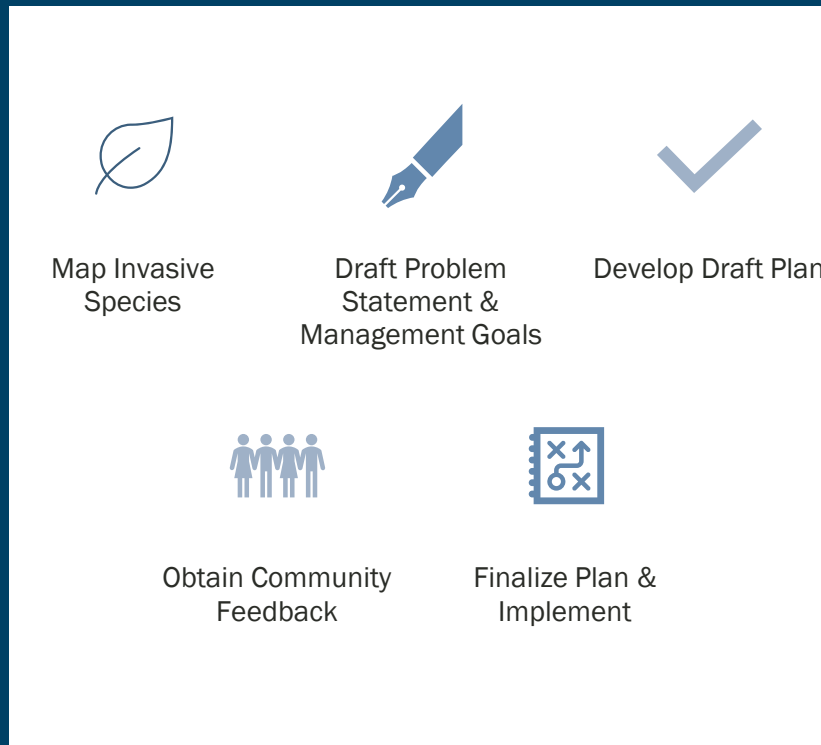
Long Lake IAVMP



Background

- Dense aquatic plant growth impacting beneficial uses of lake
- Kitsap County applied for and were successfully awarded a grant from WA Department of Ecology to develop an Integrated Aquatic Vegetation Management Plan (IAVMP) for Long Lake
- IAVMP addresses aquatic vegetation management planning only
- Previous IAVMP for Long Lake was completed in 1997

The IAVMP Process

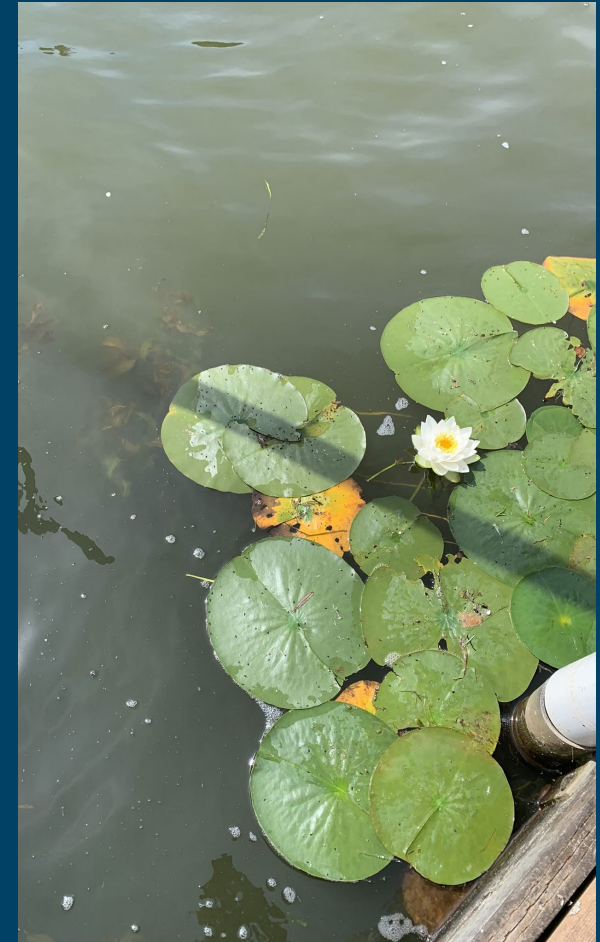


Follows guidance set by Ecology



Introduction to IAVMP Team

- Kitsap County Team
 - Charlotte Garrido, County Commissioner
 - Eric Baker, Deputy County Administrator
 - Jennifer Haro, Policy Analyst
- Tetra Tech Team
 - Harry Gibbons, PhD
 - Shannon Brattebo, PE
 - Toni Pennington, PhD – Aquatic Invasive Plant Expert with ESA – QA/QC
- Long Lake Steering Committee Members





Project Actions & Timeline

Sep 2021

- Fall Plant Survey

Apr/May 2022

- Problem statement and management goals shared with community

Aug 2022

- Draft plan complete & reviewed by County
- Committee review of plan

Nov 2022

- Public Meeting to discuss plan
- Finalize Plan
- Plan sent to Ecology for review

Feb 2022

- Steering Committee Kickoff Mtg – Draft problem statement and goal setting
- Consultant begins plans

Jun 2022

- Steering Committee Mtg to review & refine alternatives

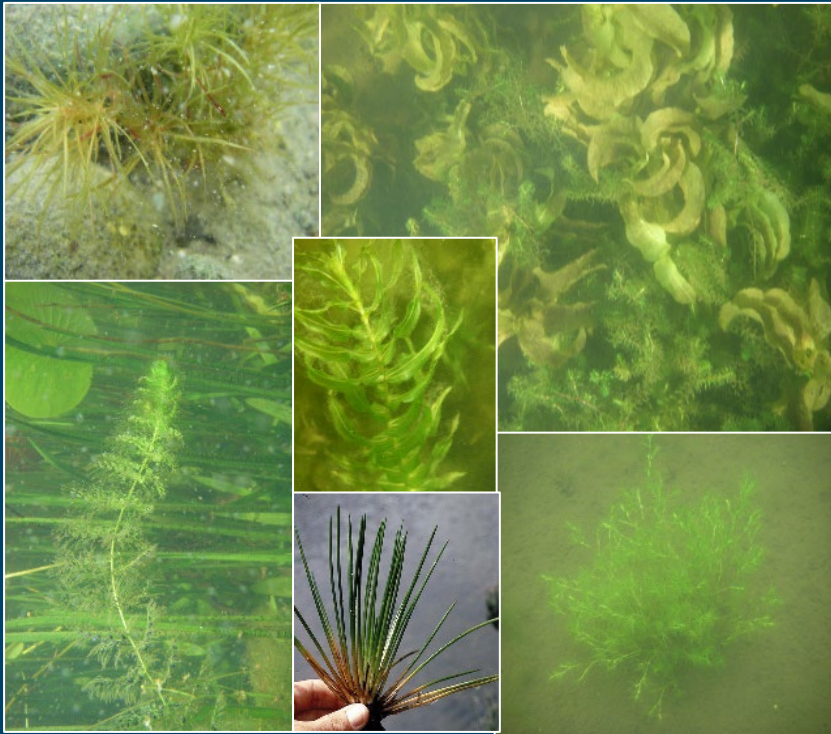
Oct/Nov 2022

- Draft plan reviewed by public
- Public comment period

Nov/Dec 2022

- Apply for Implementation Grant from Ecology

Benefits of Aquatic Plants



Fit well into lake ecosystem



Good for fish - act as nursery



Filter out pollution & protect water quality



Habitat for other aquatic life – birds, turtles etc.



Have natural controls



Invasive Aquatic Plants



Often create nuisance conditions in lakes



Displace native plants & harm local ecology



Adaptable; prolific; Few natural enemies

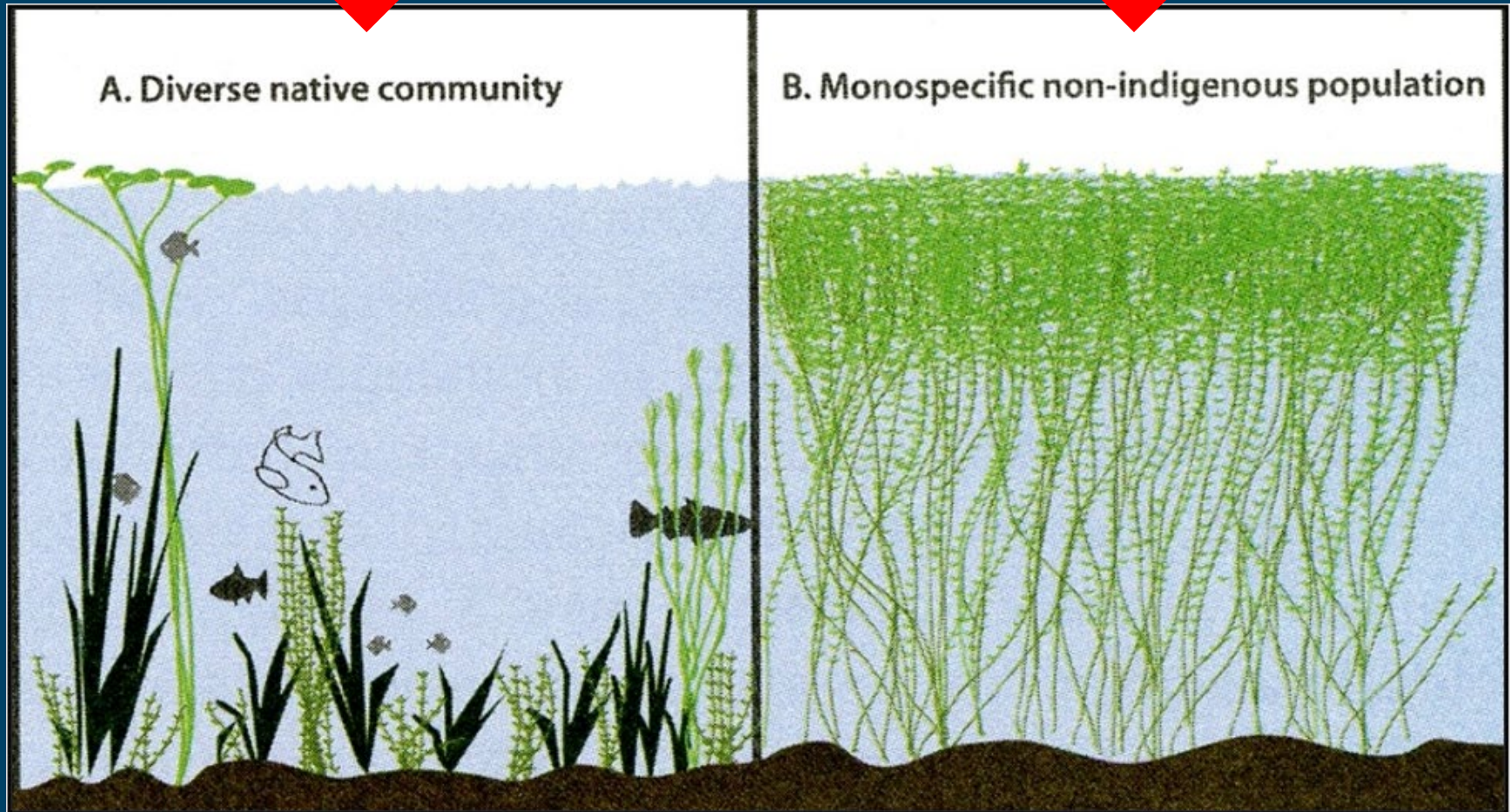


High cost to control

A Healthy Plant Community

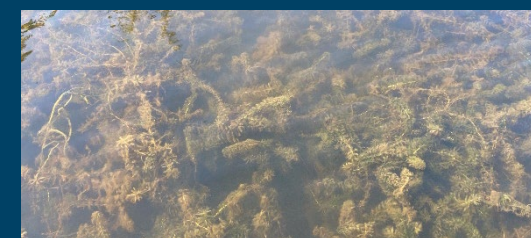


An Unhealthy Plant Community



Long Lake Vegetation Survey Results - 2021

- Currently have increased diversity with more native species
- But...Dense plant growth in majority of littoral area
- Spring 2021 aquatic plant growth accelerated relative to normal seasonal patterns
 - Approximately 6 to 12 weeks ahead
- 3 of the 4 non-native, invasive plant species have been reduced in both density and coverage
 - Eurasian watermilfoil – not observed
 - Curlyleaf pondweed – scattered patches
 - Brazillian elodea – coverage/density greatly reduced

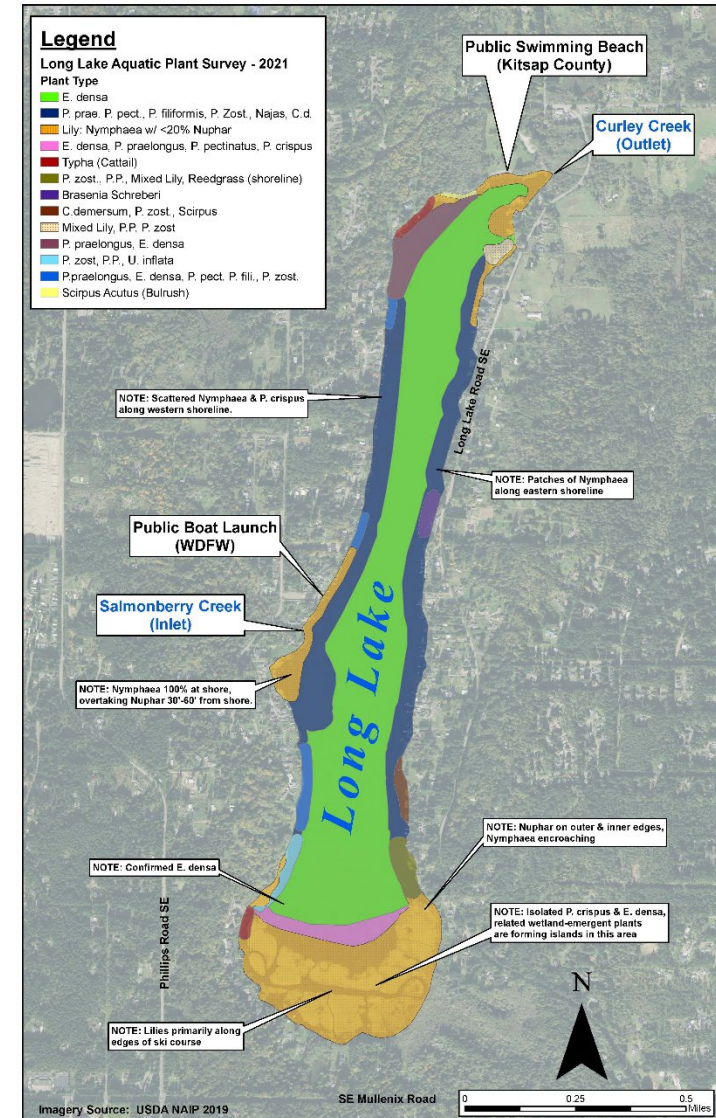


Photos: Dean Miller, CILL

Long Lake Vegetation Survey - 2021

Plant species

- *Nymphaea* (Fragrant Water Lily)
 - Non-Native, Significant Expansion, Dense Coverage
- *Egeria densa* (Brazilian elodea)
 - Non-Native, Dominant submersed plant
- *Potamogeton Crispus* (curlyleaf pondweed)
 - Non-Native, Coverage Minimal
- *Potamogeton Praelongus* (white-stemmed pondweed)
 - Native, Dense Coverage Littoral Shorelines



Long Lake Vegetation Survey - 2021

- *Nymphaea* (Fragrant Water Lily)
 - Significant expansion in density and coverage
 - Accelerated lake aging (eutrophication)
 - Sediment accumulation
 - Reducing the lake's open water area
 - Excessive growth has resulted in floating masses of plant material – islands
- Will require significant management actions



Problem Statement:

Dense invasive aquatic plants, and excessive growth of native plants, have negatively impacted lake beneficial uses

- Dense growth of invasive plants has negatively impacted navigation, recreational activities, water quality, and aquatic habitat for several decades
- Recently excessive non-native plant growth and increase in plant coverage had caused dangerous recreation and safety conditions
- Lake residents and users report they are no longer able to enjoy activities such as boating, kayaking, canoeing, swimming, and fishing due to excess expansion of aquatic plants
- Excessive growth of fragrant water lily has led to sediment accretion, decreases in lake depth, and accelerated the overall production within the lake contributing to eutrophication and lake aging

Key Plant Species in Long Lake for Management



- **Brazilian Elodea**

- Noxious Weed of Concern – Kitsap County
- Class B Weed – WA State Noxious Weed Board
- Approximate coverage = 225 acres



- **Curlyleaf Pondweed**

- Noxious Weed of Concern – Kitsap County
- Class C Weed – WA State Noxious Weed Board
- Scattered locations throughout 15 acres



- **Fragrant Waterlily**

- Class C Weed – WA State Noxious Weed Board
- Approximate coverage = 80 acres





Past Management Efforts

- Long history of aquatic plant management
 - Brazilian elodea has existed in the lake for over 40 years
 - Harvesting in the 1990s had no effect on dominance
- 20-year study by University of Washington (1970s – 1990s)
- EWM was not present during UW study but was observed during 1997 IAVMP study – not observed in recent years
- Curlyleaf pondweed most recent invader – 2006
- Management with herbicides during 2006 – 2010 resulted in more diverse community
- Gap between 2010 and 2018 with no plant management
- Targeted native pondweeds (nuisance growth) – 2020
- Management during 2018 – 2022 – treatments for pondweeds and fragrant white lily expansion, limited by budget

IAVMP

Project Goal:

Reduce the distribution and density of invasive aquatic plants in Long Lake to support beneficial uses

- Improve recreation usability, safety, and navigability of lake
- Improve water quality and overall lake health/restore a balanced ecosystem
- Keep swimming areas & boat launches clear of plants
- Improve habitat for fish and other aquatic species
- Slow lake aging and the eutrophication process
- Eradicate small infestations of non-native invasive plant species, specifically curlyleaf pondweed
- Educate residents and lake users on the spread and prevention of invasive plant species and establishment in the lake
- Educate landowners on available, effective control options for fragrant waterlily that they can implement to support overall community plan
- Prevent the spread of invasive species to and from Long Lake
- Develop long-term, on-going funding sources for integrated adaptive plant management

Plant Specific Management Goals

- **Curlyleaf Pondweed**

- Management Goal – Eradication
- Eradicate small infestations and continue monitoring efforts to identify any new infestations within the lake



- **Brazilian Elodea**

- Management Goal - Control
- Reduce coverage and density to promote native plant growth



- **Fragrant Waterlily**

- Management Goal – Control
- Significantly reduce coverage and slow lake aging
- Educate landowners on available, effective control options that they can implement near their shorelines to complement and support the overall community plan



- **Nuisance Native Pondweeds**

- Management Goals – Control
- Maintain and enhance a balanced aquatic habitat and recreational benefits

Overview of Management Options for Aquatic Plants

Type of Control	Method	Target Plant		
		Curlyleaf Pondweed (CLP)	Brazilian Elodea	Lilies
None	No action	X	X	X
Manual	Diver hand-pulling/cutting, Diver assisted suction harvesting (DASH), Landowner/resident hand-pulling cutting (Lilies)	X	X	X
Dredging	Mechanical dredging, diver dredging, hydraulic dredging	X	X	X
Mechanical	Harvesters, rotovation, weed cutters			X
Bottom Barrier	Burlap, geotextiles/plastic	X	X	X
Chemical	Aquatic herbicides	X	X	X
Biological	Insects, herbivorous fish (grass carp)	Not applicable to Long Lake		

Methods in **Red Text** were considered by Steering Committee

Permitting – Manual, Mechanical & Dredging

- **WDFW: Aquatic Plants and Fish, Rules for Aquatic Plant Removal and Control (AKA the pamphlet)**
 - Following WDFW pamphlet including its limitations, serves as the Hydraulic Project Approval (HPA) for some types of aquatic weed control and removal
 - Addresses physical and mechanical methods
 - Does NOT address grass carp, herbicides, or water column dye
- **Hydraulic Project Approval (HPA)**
 - Required for aquatic plant removal and control projects (outside of methods covered under the pamphlet)
 - Includes dredging, log placement, repositioning, or removal
- **Application includes:**
 - General plans and specs
 - Complete plans and specs for work under the ordinary high-water line
 - Complete plans and specs for fish protection
 - State Environmental Policy Act (SEPA) checklist
 - Typically takes WDFW 45 days to issue or deny HPA

Manual: Hand-pulling/Cutting



- Plant Species: Curlyleaf Pondweed, Brazilian Elodea, Fragrant waterlily
- Applications & Advantages:
 - Small, easy to pull stands
 - All reproductive plant parts can be removed
 - Highly selective
 - For fragrant waterlily – repeated cutting over multiple years to reduce seed bank and stress rhizomes CUT FLOWERS & SEEDS
 - Minimal equipment costs (market labor costs for contractor)
- Disadvantages:
 - Time consuming
 - Must remove all plant parts
 - Market labor costs for contractor

Manual:

D.A.S.H. (Diver Assisted Suction Harvesting)



- Plant Species: Curlyleaf Pondweed, Brazilian Elodea, Fragrant waterlily
- Applications & Advantages:
 - Entire plant can be removed
 - Can be species specific in good visibility
 - Plants can be removed around obstacles (e.g., logs and docks)

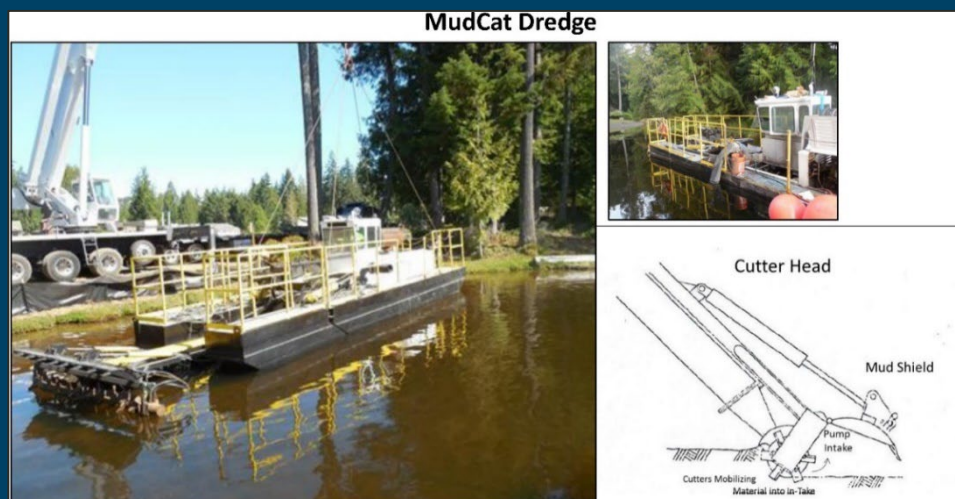


Disadvantages:

- Relatively high cost compared to herbicides
- Relatively small area can be covered in a season – Time consuming
- Contractor availability
- For lily control – rhizomes must be cut make it very labor intensive

Hydraulic Dredging

- Plant Species: All plants
- Aggressive control option
- Applications & Advantages:
 - Removes sediment and plants
 - Increases channel and lake depth
- Disadvantages:
 - **EXPENSIVE**
 - Permitting
 - Approximately 2 acres of upland area needed per acre of removed sediment to 3 ft
 - Submersed objects



Mechanical: Harvester, Weed Cutters

- Plant Species: Fragrant waterlily
- Variety of types of equipment
- Applications & Advantages:
 - Clears channels
 - Cover large areas quickly
- Disadvantages:
 - Make sure no EWM present to avoid spreading fragments
 - Equipment may not be locally available
 - Obstacles such as logs, shallow water, docks
 - Requires frequent operation, similar to mowing your yard
 - Does not enhance WQ and may accelerate eutrophication



Mechanical: Handheld Weed Cutters

- Plant Species: Fragrant waterlily
- Variety of types of equipment
- Applications & Advantages:
 - Can be operated by landowners from shoreline or dock
 - Inexpensive
- Disadvantages:
 - Covers only a small area
 - Requires frequent operation, similar to mowing your yard



Bottom Barriers – All Plants

- Advantages

- Can eradicate small areas of nuisance vegetation
- Applicable to docks and swimming areas
- Can be installed by landowners in shallow areas



- Disadvantages

- Potential boat prop damage
- Only small areas
- Maintenance requirements can be high
- Cover no more than 50% of the length of the applicant's shoreline or no more than 10 linear feet for boating and swimming areas



Permitting & Licensing - Chemical

- **Aquatic Herbicide Licensing**
 - Only aquatic formulations of herbicides can be used in or near water
 - All aquatic formulations are “Restricted Use” in WA state
 - Can only be purchased and applied by a licensed herbicide applicator with an aquatic endorsement
- **Aquatic Plant and Algae Management General Permit (APAM Permit)**
 - In-water and shoreline (roadsides, dikes/levees, and ditch banks) noxious weeds, native nuisance plants, and algae
 - Must have this permit for treatment of plants in water or on shoreline
 - Permitting process will include public comment
 - Permit requires notification to lake residents

Overview of Potential Aquatic Herbicides

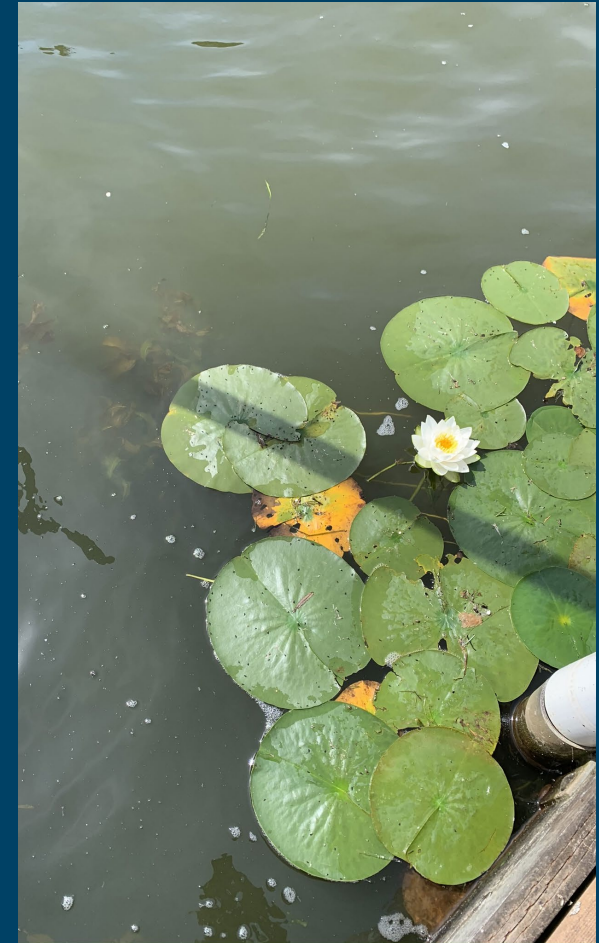


Aquatic Herbicide	Target Plant		
	Curlyleaf Pondweed	Brazilian Elodea	Lilies
2,4-D	Good	Good	Good to Excellent
Diquat (Contact only burns plants does not kill)	Moderate	Moderate	Poor
Endothall (Contact only burns plants does not kill)	Moderate	Moderate	Poor
Florpyrauzifen-benzyl (ProcellaCOR)	Excellent	Poor	Not targeted - potential
Fluridone	Excellent	Excellent	Fair
Glyphosate (no longer recommended)	Poor	Poor	Good
Imazamox	Good	n/a	Good
Imazapyr	Good	n/a	n/a
Penoxsulam	Good	Good	Good
Triclopyr	n/a	n/a	Good

Bold already being used or has been used at Long Lake

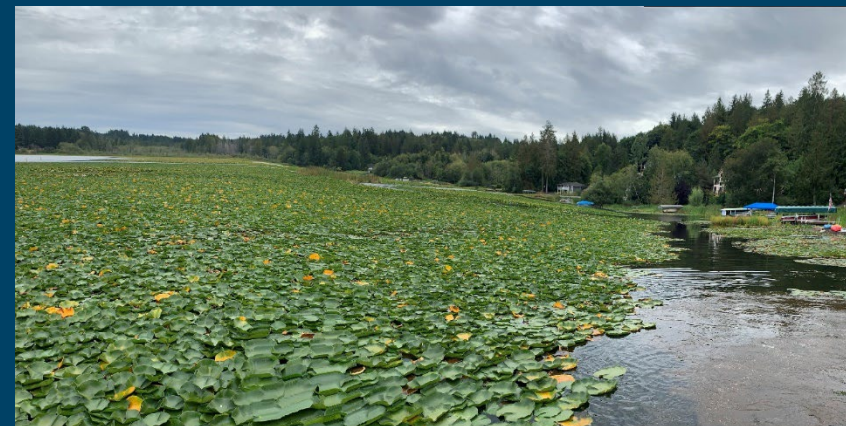
Plant Management Alternatives: Long Lake

- Discussed by plant species
- Management options dependent on level of control/management goal decided by Steering Committee
- IAVMP presents all potential options to community but includes options or suite of options the committee has recommended that the community move forward with



Plant Management Alternatives: Long Lake

- Please refer to Section 8.0 in the IAVMP for detailed information regarding all plant management alternatives considered for Long Lake
- Tables 8-4 through 8-6 provide details on management options considered for each plant species
- Table 8-7 provides details on potential Education Plan components





Proposed Plant Management Strategy for Long Lake

Plant Species	Management Goal	Control Strategy	Preliminary Costs and Assumptions	Estimated 5-Year Cost ¹
Curlyleaf Pondweed	Eradicate remaining small infestations within the lake	Manual, includes annual surveying (diver hand-pulling)	<ul style="list-style-type: none"> \$12-20K for 3-5 days for entire lake survey and hand-pulling Currently scattered throughout roughly 15 acres – majority within south end of lake and along eastern shoreline Annual surveys should be conducted for at least 5 years post eradication 	\$60K - \$80K
Brazilian Elodea	Control to reduce coverage and density to promote native plant growth	Chemical, fluridone with PAK 27	<ul style="list-style-type: none"> \$800 - \$1,500 per acre Treat 25 acres each year, equivalent to 55% of current coverage over 5 years PAK 27 used to control filamentous algae growth while reducing DO demand from organic decay PAK 27 oxidizes sediment “goo” 	\$100K - \$187.5K
Fragrant Waterlily	Moderate Control: Target 40 to 50% reduction of lilies. Focus on south end of lake, high-use recreational areas, and where lily has significantly expanded in density and coverage.	Chemical, Imazamox	<ul style="list-style-type: none"> 40% reduction would include treatment to approximately 30 acres 15-acre treatment annually; whole area cannot be treated at once -likely be 2 times per year over 5 years \$25 - \$40K per year, decreasing as infestation decreases 	\$125K - \$200K
		Manual – hand-pulling or cutting (non-diver)	<ul style="list-style-type: none"> Channel and shoreline maintenance Hand cutting of flowers and seeds and removal from lake Market labor cost for contractor; or volunteer/landowner 	Unknown – costs incurred by landowner
		Bottom Barriers (Individual Landowner)	<ul style="list-style-type: none"> Dock and swimming area maintenance per landowner discretion Follow WDFW pamphlet County could potentially supply materials - \$10K per year Installation cost incurred by landowner 	\$50K for materials

¹Costs are estimated for first five years of control. Continued control work is necessary beyond five years.

Proposed Education Plan Strategy for Long Lake



Management Goal	Control Strategy	Description	Preliminary Costs and Assumptions	Estimated 5-Year Cost ¹
Prevent spread of invasive species to and from Long Lake	Boat Launch Education through Use of Volunteers	Community members visit the boat launch on heavy use days and provide education about cleaning, draining and drying boat	<ul style="list-style-type: none"> Outreach materials Time for volunteer training - assumes volunteer labor Printing of education materials \$1.5K 	\$1.5K - \$3K
	Outreach campaign to lake residents	Develop and implement outreach campaign for landowners to prevent introduction from their boats	<ul style="list-style-type: none"> Multi-year outreach campaign \$5K - \$10K 	\$5K - \$10K
	Boat Launch Signage	Additional signage at boat launch and park – all public access points	<ul style="list-style-type: none"> Additional sign for Clean/Drain/Dry Sign costs plus installation Assume \$2K 	\$2K
Landowner/Resident Invasive Plant Control	Landowner Workshops	Host workshops with expert presenting control methods that individual landowners can use on property	<ul style="list-style-type: none"> \$5K per workshop Assume 1 workshop annually 	\$25K
	Outreach campaign to lake residents	Develop and implement outreach campaign for residents to identify invasive species and control methods they can use on their property	<ul style="list-style-type: none"> In conjunction with outreach campaign for prevention County staff time or volunteer time 	Unknown, would be in addition to prevention outreach campaign

¹Costs are estimated for first five years of control. Continued control work is necessary beyond five years.



Estimated 5 – Year Cost Scenario

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
CLP Diver Hand-Pulling	\$20K	\$20K	\$12K	\$6K	\$6K	\$72,000
Brazilian Elodea Herbicide & PAK 27	\$37.5K	\$37.5K	\$37.5K	\$37.5K	\$37.5K	\$187,500
Lily Herbicide Treatment	\$40K	\$40K	\$40K	\$40K	\$40K	\$200,000
Bottom Barrier Materials	\$10K	\$10K	\$10K	\$10K	\$10K	\$50,000
Outreach & Education	\$10K	\$10K	\$8K	\$6K	\$6K	\$40,000
Project Management & Permitting	\$10K	\$10K	\$7K	\$7K	\$6K	\$40,000
TOTAL	\$127,500	\$127,500	\$114,500	\$106,500	\$105,500	\$589,500

Costs are estimated for first five years of control. Continued control work is necessary beyond five years. Costs are just for aquatic plant management strategies and control and does not cover toxic algae or nutrient management.

Nuisance Native Plant Control (Pondweeds)



- As non-native species are reduced, native plant species will increase
 - Occurred historically
 - Managed/Controlled to mitigate density and coverage
 - Help enhance water quality, promote aquatic habitat, and help prevent toxic algae blooms
- In most target areas where herbicide (Fluridone) is proposed – will impact native plants and help to control density
- Must be committed to monitoring in order to be adaptative regarding approach, timing and intensity of management



Funding Opportunities & Grants

- Department of Ecology – Aquatic Invasive Plant Management Grants Program
 - Implementation Grants (\$100,000 max – 75% grant; 25% match)
 - Can re-apply after initial 2 years but less competitive
- Lake Management District or Lake Association Fees



Aquatic Invasive Plant Funding Grant Guidelines

State Fiscal Year 2024



August 2022

Publication 22-10-022

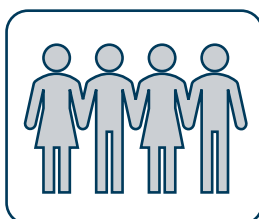
Next Steps For You



Read Draft IAVMP



Provide Comments on Draft IAVMP
(October 15 – November 5, 2022)



Attend Virtual Public Meeting
(November 2, 2022)

Next Steps for Kitsap County



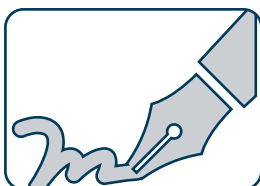
Host Virtual Public Meeting
(November 2, 2022)



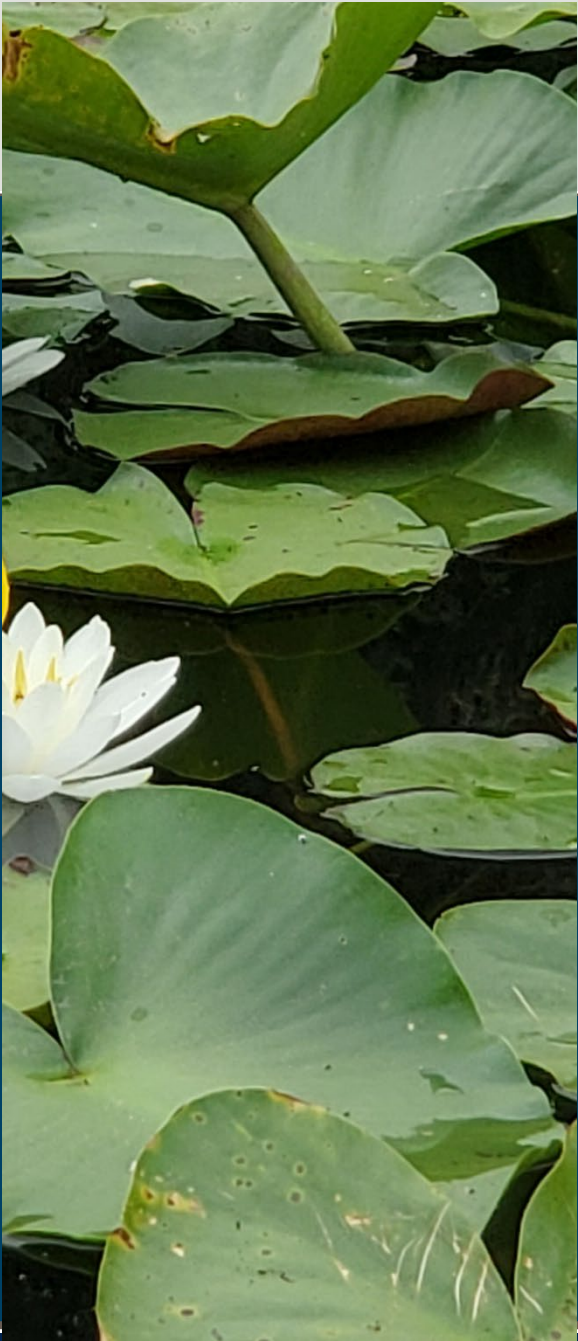
Review Public Comments and Incorporate
into Draft IAVMP



Finalize IAVMP & Submit to WA
Department of Ecology
(November 18, 2022)



Apply for Ecology Aquatic Plant
Management Implementation Grant
(December 1, 2022)



Thank you!

Steering Committee

Dana Soyat

Ken Parker

Gary Williams

Pamella Egan

Olga Shaganova

Lee Fenton

Citizens for Improving Long Lake