

LAKE ROESIGER INTEGRATED AQUATIC VEGETATION MANAGEMENT PLAN

EXECUTIVE SUMMARY

DECEMBER 2021

THE PROBLEM

Lake Roesiger is a 348-acre lake located 7 miles east of Lake Stevens. The lake is a significant regional resource for fishing, swimming, boating, water skiing and aesthetic enjoyment. Unfortunately, multiple invasive plants have infested the lake, threatening its health, recreational suitability and it puts other nearby lakes at a higher risk for a future infestation.

Unlike beneficial native plants, invasive plants have no natural controls. They decrease lake oxygen levels when they decompose and increase nutrient recycling leading to more harmful algal blooms. Overly dense plant stands pose hazards for swimmers and diminish enjoyment for paddling, boating, and waterskiing. Invasive plants also speed up lake sedimentation, especially threatening navigation in the already shallow middle basin of Lake Roesiger. Collectively, these factors have the potential to harm lake resident property values

MAKING A PLAN

In 2021, Snohomish County Surface Water Management (SWM) obtained grant funding from the Department of Ecology to develop the Lake Roesiger Integrated Aquatic Vegetation Management Plan (IAVMP). The plan provides a roadmap for the community to reduce the impact of invasive aquatic plants. The plan includes the most effective control options that are economically viable for each target invasive plant as well as a timeline for implementation. It is intended to be adaptable over time.

The project was initiated by and completed in partnership with the Lake Roesiger Community and Boat Club. The Club created a steering committee of 12 volunteers, with representatives from each basin to develop the draft plan. Snohomish County contracted with professional lake scientists at Tetra Tech, Inc. and ESA to facilitate the plan development and provide technical expertise. Finally, extensive outreach including mailers, emails and social media posts were used to advertise the draft plan and include community members in a plan survey and vote.

PROBLEM PLANTS & CURRENT EXTENT

A plant survey was completed in July 2021. Six priority invasive plants were mapped that are designated as noxious weeds by the state's Noxious Weed Control Board (Table 1). Each plant is designated by the control board as a class A, B or C noxious weed with class A being the highest priority for control. There were no class A noxious weeds discovered at Lake Roesiger. More details and maps can be found in Section 6 of the plan and online.

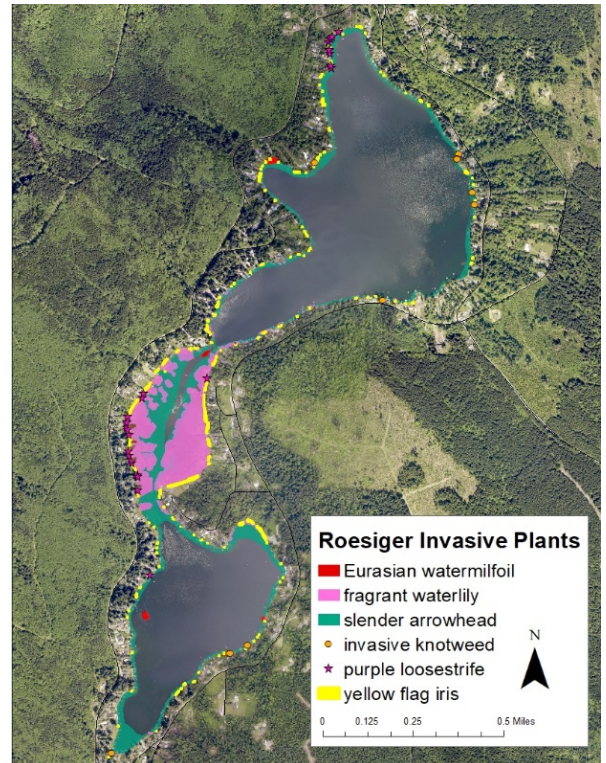


TABLE -1 NOXIOUS WEED DESIGNATIONS

In-Lake Plants	Class	Distribution	Shoreline Plants	Class	Distribution
Eurasian watermilfoil	B	Scattered patches	Invasive Knotweed	B	11 properties
Slender arrowhead	B	39.8 acres ¹	Purple Loosestrife	B	24 properties
Fragrant waterlily	C	30.1 acres	Yellow-flag iris	C	Widespread

¹The 39.8 acres are areas of dense coverage with an additional 5.5 acres of sparse coverage

PLAN GOALS

The first step in creating the plan was for the steering committee to establish management goals which were agreed upon as follows:

1. Reduce the distribution and density of invasive plants in Lake Roesiger to improve:
 - recreational safety, usability, and navigability of the lake
 - water quality and overall lake health
 - habitat for fish and other aquatic species
2. Prevent the spread of invasive species to and from Lake Roesiger
3. Develop a comprehensive education and outreach plan on prevention and effective control methods

After identifying the overarching plan goals, the steering committee also identified plant-specific control goals and prioritized them, with eradication of milfoil as the highest priority. These goals are described in the context of the recommended control options in the following section.

PLANT MANAGEMENT GOALS & CONTROL METHODS

The next step was to review all available invasive plant control strategies to identify their efficacy for various plant species, environmental impacts, and potential costs. Examples of strategies are listed below, and a full list with explanations and pros/cons of each control method can be found in Section 8.0 of the plan. Due to community concerns over chemical control, additional research regarding herbicides and adjuvants was completed and summarized in Tables 8-2 and 8-3 of the plan.

- Manual/bottom barriers – hand pulling, cutting, bottom barriers, diver assisted suction harvesting (DASH)
- Mechanical/Dredging– harvesters, rotoation, weed cutters, hydraulic dredging, hydorakes
- Chemical – aquatic herbicides
- Biological – grass carp, insects

Based on a review of all available control options, the steering committee was provided recommendations to consider for each plant species as appropriate to Lake Roesiger and the plant specific management goals. The committee then provided feedback to further refine the recommended control methods for each plant

The final recommendations were shared with the community in a draft plan and summary with an online survey. Using the survey results, the control options were further reduced to a final set of control options. In the final vote the plan was approved by 64% of all respondents (includes lake users), 70% among lake area residents and 74% of among Lake Roesiger Community and Boat Club members. The approved plan’s control methods and expected outcomes of the plan for each invasive plant are described in the following section.

PRIORITY 1 - EURASIAN WATERMILFOIL (CLASS B NOXIOUS WEED)

Eurasian watermilfoil (milfoil) presents a high risk to the lake as it can significantly alter aquatic ecosystems and impair recreation. It creates large stands in up to 15 feet of water with vegetation creating a tangled mat up to the lake surface. The current low levels of this plant in Lake Roesiger are a result of many years of diver hand-pulling by the County and Community Club. With limited funding, the current diving effort is minimal with 2-3 days of diving every other year which covers about half the lake. The lake is at high risk for rapid spread of milfoil.



MILFOIL FORMS DENSE MATS THAT LIMITS SWIMMING, BOATING AND FISHING

Management Goal: Eradicate small infestations and monitor to ensure early detection of new infestations

Control Method: To achieve the desired goal of eradication, the control method is to continue with diver hand-pulling and/or Diver Assisted Suction Harvesting (DASH) but increase the frequency to include a whole-lake annual survey until plants are not detected, followed by annual monitoring. If the milfoil infestation dramatically increased, a chemical option, ProcellaCOR, would be used. ProcellaCOR has been highly effective in selectively treating milfoil at area lakes, is cost effective, and has a highly favorable human health and environmental toxicity profile, meaning the impacts to human and environmental health are very low (See Section 8.3.1 for full details).

PRIORITY 2 - FRAGRANT WATER LILY (CLASS C NOXIOUS WEED)

The lake's most visible infestation includes 30 acres of this invasive ornamental lily introduced to the lake decades ago. Concentrated in the middle basin, dense pads have made navigation to and from homes nearly impossible and has caused rapid lake sedimentation, increased nutrient cycling, and caused the formation of mud islands. Left unchecked, the middle basin will continue to evolve into a shallow wetland cutting off navigation between the north and south basins.



FRAGRANT WATERLILY DECAY IS CAUSING THE LAKE TO FILL-IN MORE QUICKLY

Management Goal: Full eradication is the desired goal of many in the community yet may be difficult to achieve given the size and longevity of the infestation. Incremental goals towards eradication include:

- Prevent further spread of invasive lilies within the lake
- Improve navigation between basins and keep main navigation channels open
- Open navigation paths to lake residences
- Significantly reduce the coverage of fragrant waterlilies and slow new sediment buildup
- Reduce historic sediment buildup

Control Options: Control of fragrant waterlily is challenging both because of the scale of the problem and the dense network of underground rhizomes that are difficult to remove. The issue is further complicated by the diversity of opinions on the appropriate management goal for Lake Roesiger. In response, the draft plan included four different scenarios with different control methods and management goals for Fragrant waterlily (Section 9). The community survey on the draft plan showed that of the 149 respondents 63% supported chemical control, 50% mechanical harvesting, 23% hydraulic dredging and 19% status quo or no action. When asked which Scenario

is the best option, Chemical control was the most popular with 55% support followed by Mechanical Harvesting (17%) Hydraulic Dredging (14%) and Status Quo (16%).

The survey results led to the inclusion of chemical control as the primary option that was approved by the community. Imazapyr and Imazamox are the specific proposed chemicals as they have a highly favorable toxicological profile with little to no known human health and environmental risks, have a small impact to lake use (some irrigation restrictions) and have been effective locally in several King County lakes (Section 8.2 in the plan). Because of the favorable support, mechanical harvesting is included as an additional future tool, especially if it becomes less costly. Harvester use is limited to those lake areas deeper than 2-3 feet that are free of woody debris. Finally, individual landowners can supplement these strategies by continuing repeated hand-cutting or bottom barriers.

In the first five years, there will be an estimated 40 to 50% lily reduction (12-15 acres) in the middle basin and eradication in the north and south basins. Efforts would maintain navigation between the basins, slow the rate of sediment accumulation and clear some navigation channels in the middle basin.

PRIORITY 3 – INVASIVE SPECIES PREVENTION

In addition to invasive plant control, the steering committee recognized that outreach and education to lake users is important to prevent new invasive species from entering Lake Roesiger. The following strategies were identified to educate lake users:

- Volunteer outreach - Community members visit the boat launch on heavy use days and provide education about cleaning, draining, drying boats.
- Lake resident outreach - Develop and implement an outreach campaign for residents to prevent introduction from their boats. Outreach materials would be distributed via mailers, email, and social media.

PRIORITY 4 – INVASIVE SHORELINE PLANTS

The Lake Roesiger shoreline has three shoreline plants classified as noxious weeds and include: invasive knotweed, purple loosestrife and yellow flag iris. These invasive plants are highly aggressive and can quickly crowd out native vegetation and reduce habitat for wildlife.



INVASIVE KNOTWEED



PURPLE LOOSTRIFE



YELLOW FLAG IRIS

Management Goal: Prevent further spread, reduce current coverage and, if possible, eradicate small areas of invasive knotweed and purple loosestrife. Educate landowners on ways to manage or remove shoreline species on their property.

Control Method: The control method is to have individual landowners control plants on their properties which would be supported by education on plant identification and control methods. Education would include landowner workshops and outreach materials distributed via mailers, email, and social media.

PRIORITY 5– SLENDER ARROWHEAD

This spikey-leaved plant dominates over 40 acres of the lake’s shallow areas. It creates large monocultures where no other native plants can survive, harming important habitat and accelerating lake aging. While it has changed the lake ecosystem, the long-term impacts are largely unknown as Roesiger is one of only five lakes in WA with this largely unresearched plant. Because it is lower growing and does not normally reach the lake surface, it does not have as great of an impact on lake recreation.



SLENDER ARROWHEAD CROWDS OUT BENEFICIAL NATIVE PLANTS

Management Goal: Prevent spread to other waterbodies and reduce current coverage; educate landowners on ways they can control to allow for native plant growth, if desired.

Control Method: Diver Assisted Suction Harvesting (DASH) was identified as the most effective control strategy for this shallow-rooted plant. Private landowners could also hand-pull this plant in shallow areas if plant material is disposed of or composted away from the lake. An initial target of 20% per year was put forward, but as a lower priority plant, this effort could be scaled up or down based on available funding. A Lake Roesiger resident has also developed a personal DASH system which may increase viability of this strategy.

CONTROL METHOD SUMMARY AND COSTS

The control methods are summarized in the table below with detailed preliminary cost estimates for the first five years. The following assumptions were made when estimating costs:

- Cost estimates were calculated in 2021 dollars and do not include inflation.
- Costs were estimated for the first five years, but continued investment will be needed beyond five years.
- Per parcel totals were calculated based on 463 lake shoreline parcels. The per parcel cost is for illustration purposes only.
- Per parcel with grant totals assume a full Aquatic Invasive Plant Implementation Grant award of \$75,000 from the Department of Ecology is received and split evenly over the first two years of implementation (earliest potential funding in July 2022).

FUNDING OPTIONS

Implementation of the plan will require a long-term financial investment by the Lake Roesiger community. Grant funding could help to alleviate the initial financial burden. The Washington State Department of Ecology Aquatic Invasive Plants Management Implementation Grant provides a two-year grant award of up to \$100,000 of which 25% is the required local match. For longer term funding, the community can choose to continue voluntary local fund collection through the Lake Roesiger Community Club. Another option is to establishing a more formal funding structure by forming a Lake Management District ([RCW 36.61](#)) or creating a Surface Water Management Service Charge (See [Snohomish County Code 25.20.050](#) for example).

Both formal funding mechanisms require a legislative process through the Snohomish County Council and would require broad community support. View Section 11 and the online presentation for more information regarding funding options and the process by which they are established.

Approved Invasive Plant Control Methods

Target Plant	Action	Expected Outcomes	Estimated Cost for First 5 Years of Control					
			Year 1	Year 2	Year 3	Year 4	Year 5	Total
Eurasian watermilfoil	Diver hand-pulling; chemical control only if needed	Eradication within 5 years followed by annual monitoring	\$22K	\$22K	\$22K	\$22K	\$22K	\$110K
Fragrant waterlily - Middle Basin ¹	Chemical treatment (imazapyr/imazamox)	40-50% reduction in lily coverage (12-15 acres)	\$34K	\$34K	\$34K	\$17K	\$17K	\$136K
Fragrant waterlily -North & South Basin ¹	Chemical treatment (imazapyr/imazamox)	Eradication of existing patches	\$3.3K	\$3.3K	\$1.1K	\$1.1K	\$1.1K	\$9.9K
Invasive Shoreline Plants ²	Workshops & outreach on plant ID and control methods	Prevention of new areas; reduce existing areas	\$15K	\$15K	-	-	-	\$30K
Slender Arrowhead ³	Incremental removal by DASH	20% removal per year ⁴	\$22K	\$22K	\$22K	\$22K	\$22K	\$110K
Invasive Species Prevention	Outreach to lake users & residents	Lower risk of spread & intro of new invasive species	\$3.5K	\$3.5K	-	-	-	\$7K
Total			\$99.8K	\$99.8K	\$79.1K	\$62.1K	\$62.1K	\$402.9K
Cost Per Parcel			\$216	\$216	\$171	\$134	\$134	\$870
Cost per Parcel with Grant			\$135	\$135	\$171	\$134	\$134	\$708

¹Costs do not include supplemental efforts by landowner for control in private dock and swimming areas through pulling, repeated hand cutting and/or bottom barriers.

²Costs are for education and outreach only; control work and associated costs will be the responsibility of individual landowners.

³ Slender arrowhead efforts could be scaled up or down based on available funding