



SHAWNIGAN BAIN SOCIETY COLDWATER EURASIAN MILFOIL REMOVAL PROGRAM - CEMRP

Project goals / objectives

As with many lakes in BC, Eurasian watermilfoil (milfoil) has been introduced into Shawnigan Lake. Each year there is more extensive growth of Eurasian watermilfoil. This growth is fed by nutrients entering the lake, boating and other activities leading to fragmentation with each fragment capable of giving rise to a new plant. In the fall the watermilfoil dies back, consuming oxygen creating anoxic conditions and releasing nutrients back into the lake. Eurasian watermilfoil is becoming a larger and larger problem not only for recreational activities on the lake but also for aquatic life in the lake. The goal of this project is to remove unwanted nutrients accumulated in the invasive Eurasian watermilfoil to maintain the good water quality and oligotrophic status of Shawnigan Lake with the secondary benefits of restoring the natural vegetation and reducing the impact of the invasive milfoil on the fish spawning and foraging areas and food and oxygen availability. The objective is to remove only the invasive milfoil with the accumulated nutrients - including the roots - at a time approved by FLNRO (BC Forest, Lands, Natural Resource Operations, and Rural Development). Removal will be by divers putting the removed plants in a hopper connected to the input of a trash pump with the output to bulk bags. The bulk bags will be used to transport the plant material to be composted in a safe location away from the lake. The number of bags will be used as a measure of the volume of invasive Eurasian watermilfoil removed from each designated section of the littoral area of the lake. Each bulk bag holds approximately 1.1 cubic yard (0.84 cubic meter) of plant material. In summer, the lake will be surveyed using a drone to assess the status of the Eurasian water milfoil and the presence of new native plants.

Project description

Shawnigan Lake is a major source of drinking water for more than eight thousand winter residents and approximately twelve thousand summer residents. It is a popular aquatic recreation area which supports several species of fish - including Coho salmon whose stocks on the west coast are decreasing - with associated spawning and foraging areas. Unfortunately, in recent years it also has inputs from soil dumping along an input creek, forestry and agricultural activity, and increased development, all of which are adding nutrients to the lake and enhancing the growth of the invasive Eurasian watermilfoil.

Further addition of nutrients in the lake is the death and decay of the Eurasian watermilfoil. One method of decreasing the nutrient content of the lake is to remove the Eurasian watermilfoil. This proposal is to remove the invasive milfoil to reduce the nutrients available in the lake. This will also allow regrowth of the native species and improved conditions for the fish, their spawning areas and their food.

Project team experience

The directors of the Shawnigan Basin Society have a variety of backgrounds, but all have been involved in environmental issues in the Shawnigan area and in past professions. More details are available at <https://www.shawniganbasinsociety.org/shawnigan-basin-society.html>

Particularly relevant to this project are Dave Munday and Linda Gregory. Dave (B.Sc., MBA.), the president, is a Senior Environmental Specialist with over 30 years of experience, he has participated as Project Director, Project Manager and Environmental Coordinator for a diverse range of domestic and international projects. He is a registered professional biologist (RPBio.) in British Columbia, and specializes in marine biology, environmental impact assessment, and permitting for aquatic and terrestrial developments. Linda (BA., MSc., PhD) worked with the BC Ministry of Environment, largely collecting, analyzing, and summarizing water quality data. She also taught a variety of courses - primarily in the Biology Department - at the University of Victoria, and prepared contract reports for the BC and Federal Ministries of Environment. These reports focused on different aspects of water quality: analyses and summaries of existing data, developing groundwater quality objectives (Osoyoos), and preparing sampling training programs. In addition, she prepared several species summaries for COSEWIC (Committee on the Status of Endangered Wildlife in Canada). She is now retired, but is a director with the Shawnigan Basin Society

Current Treasurer and President have extensive project and financial management experience in the corporate realm.

Project management capacity

The Directors of Shawnigan Basin Society have years of management experience as indicated in the SBS website - see project team experience. Dave Munday, who will lead this initiative, has over 35 years' experience as an Environmental Consultant managing and directing large Impact assessments. These projects ranged in value from \$20,000 to over \$6,000,000 with teams of specialists that, in the case of larger projects, exceeded 200 specialists.

As Directors of SBS, projects include organizing and conducting water and sediment quality studies in Shawnigan Lake and tributaries, working as committee members with the Cowichan Valley Regional District to develop Liquid Waste Management Plans and Drinking Water and Watershed Protection Services,

Environmental Issue

Mryiophyllum spicatum (Eurasian watermilfoil) is an invasive species that lives in freshwater - primarily lakes - to a depth of approximately 4 m, although it can occur at depths up to 10 m and propagates both sexually by flowers and asexually by fragmentation and subsequent stolon formation. Typical of an invasive species it can grow in high densities in appropriate habitats. Its growth in Shawnigan Lake is enhanced by nutrient inputs in runoff from soil deposits along an input stream, forestry and

agricultural activities and increased development. When the plant dies and decays, additional nutrients from the plants are added to the lake waters and sediment. Not only are additional nutrients added, but the decay process contributes to decreased dissolved oxygen concentrations in the lake water. The dissolved oxygen concentrations in water samples collected at different depths from four sites in September 2020 had low concentrations in the waters towards the bottom of the lake at two sites.

Dense mats are present in the lake and the actual extent of these mats will be formalized in the August/September survey (see Start and End Dates, preamble). Removal of the Eurasian watermilfoil will remove nutrients from the lake, thus help maintain the oligotrophic status of the lake and ensure continued use of high-quality drinking water. In addition, removal of the invasive milfoil will allow native plants to recolonize the littoral areas and reduce the probable impacts on the fish. Shawnigan Lake is resident to several species of fish, both native (kokanee, landlocked sockeye, *Oncorhynchus nerka*) and introduced (smallmouth bass, *Micropterus dolomieu*; yellow perch, *Perea flavascens*; and pumpkinseed, *Lepomis gibbosus*) species. Rainbow trout (*O. mykiss*) and cutthroat trout (*O. clarki*) were stocked yearly until 2014 and 2004, respectively. In addition, Coho salmon (*O. kisutch*) that migrate into Shawnigan Creek are transported across a waterfall each fall from where they move to the lake and the incoming streams where they spawn. Kokanee, rainbow trout and cutthroat trout also spawn in fall in the incoming streams to the lake. The Coho spend at least one winter in fresh water and then migrate back to salt water. The presence of the invasive milfoil will not affect their spawning as the salmonids are in the creeks. However, the dense mats of the milfoil in the littoral area of the lake can limit foraging ability. The introduced species all spawn in the littoral area in spring.

The smallmouth bass and pumpkinseed build nests on the substrate, and the yellow perch females lay a string of eggs that attach to vegetation. Spawning sites will be limited by limited by the dense mats of Eurasian watermilfoil. Although introduced, the smallmouth bass is a popular catch for anglers.

Project Need

Eurasian watermilfoil hinders or prevents water recreation - swimming, boating, fishing, water skiing and deterioration of beaches due to decaying plants washed ashore making it a nuisance organism for lake side owners and other residents of the community. Previous work to remove the invasive Eurasian watermilfoil are based largely on the plant as a nuisance organism. However, eliminating as much as possible of the Eurasian watermilfoil is also necessary now because the nutrients in the plants will be removed rather than re-released into the lake.

In the spring of 2019, the Shawnigan Residents Association (SRA) decided to follow the recommendations for mechanical removal presented by a consultant's report and addressed the residents with successful news releases - primarily posters and social media. But many fragments were released to the lake and these fragments sink to the

bottom and produce stolons and more plants, and the invasive milfoil mass appeared to increase. SRA requested that the residents hire a scuba diver in 2020, but the pandemic resulted in most residents doing the work themselves. There are still dense mats of the

invasive milfoil in the lake.

Without control of the Eurasian watermilfoil in Shawnigan Lake, the ecology of the lake, the drinking water quality, and the community use of the lake will be even more seriously impacted than it is at present. The procedures used over the past few years have not been effective. Using divers to carefully remove Eurasian watermilfoil from the littoral area has been successfully completed in Christina Lake, BC, although the exact procedure for getting the removed plants out of the water is not known. The procedure presented here has two important advantages: the roots are removed; and the plants are added directly to a hopper with little chance of fragmentation. The timing - November - further limits the extent stolon formation from any fragments.

Included in the Shawnigan Lake community are two private schools on the lake, and one - Shawnigan Lake School - has an active International Rowing Program.

Rowing training and races on the lake can be impacted by the dense mats of the invasive milfoil. Students from this school are active in helping with projects in the lake.

Eurasian watermilfoil is present in many lakes in British Columbia and in the Cowichan Valley Regional District (CVRD) that includes Shawnigan Lake. The SBS has a strategic partnership with CVRD and the CVRD will work with the SBS on the control of the invasive milfoil.