Marcellus Lakes 2013 Annual Progress Report

An Annual Assessment of Aquatic Vegetation & Water Quality in Big Fish, Saddlebag, and Finch Lakes Cass County, Michigan

December, 2013

Prepared for: Chris Brooks
Big Fish Lake Association
Marcellus, MI 49067

Prepared by: Jennifer Jermalowicz-Jones, PhD Candidate
Water Resources Director
Restorative Lake Sciences
18406 West Spring Lake Road
Spring Lake, MI 49456

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1.0 EXECUTIVE SUMMARY

This report describes the current distribution of the exotic aquatic plant, Eurasian Watermilfoil (*Myriophyllum spicatum*), additional nuisance aquatic plant species such as Starry Stonewort (*Nitellopsis obtusa*), and other native aquatic vegetation within Big Fish Lake, Saddlebag Lake, and Finch Lake, located in Cass County, Michigan.

Aquatic vegetation surveys were conducted on May 8, 2013, July 2, 2013, July 24, 2013, and again on August 30, 2013. Aquatic herbicide treatments were conducted on June 4-5, 2013 and again on July 2, 2013 and August 13, 2013. The initial aquatic herbicide treatment conducted on June 5, 2013 consisted of approximately 29 acres of contact herbicides for Finch Lake, 35 acres of contact herbicides for Big Fish Lake, and 31 acres of contact herbicides for Saddlebag Lake. The mixture of contact herbicides consisted of diquat (Reward®), chelated copper (Cutrine®), and hydrothol (Aquathol-K®). On July 2, 2013, approximately 5 acres of nuisance re-growth of milfoil and assorted pondweeds were treated on the northeast shore of Big Fish Lake. A whole lake littoral zone sonar scan of each lake on July 24, 2013 indicated the need for a mid-August treatment. On August 13, 2013, approximately 7 acres of nuisance re-growth was treated in Saddlebag Lake with the triple mixture of contact herbicides. In addition, 31 acres of nuisance growth was treated in Big Fish Lake with the triple mixture of contact herbicides along with 2 acres of nuisance Wild Celery with Harpoon® at a dose of 180 pounds per acre. In Finch Lake, 3 acres were treated with a blend of copper sulfate and triple contacts for Starry Stonewort and an additional 12 acres of nuisance growth were treated with the triple contact herbicide mixture as well as 12 acres of nuisance Wild Celery with Harpoon® at a dose of 180 pounds per acre.

The final survey on August 30, 2013 determined that the milfoil and Starry Stonewort had responded favorably to the treatment and the nuisance native aquatic vegetation growth was controlled in many areas. The nuisance native aquatic plant, Wild Celery, also appeared damaged n Finch and Big Fish Lakes where it was treatment and a spring, 2014 survey will confirm the 2013 treatment efficacy.

Selective management of each of the lakes is necessary to protect the remarkably diverse aquatic ecosystem with 18 native submersed, 3 floating-leaved, and 6 emergent aquatic plant species for a total of 27 native species.

Overall management recommendations for the control of milfoil include spot-treating milfoil with EPA-registered chemical contact and systemic aquatic herbicides during mid to late spring in calm conditions with oversight. In addition, Wild Celery is proposed to be treated in mid-July with the use of granular Harpoon® herbicide. Post-treatment surveys will then proceed around three weeks post-treatment to evaluate the efficacy of the treatments.

2.0 AQUATIC PLANT SURVEY METHODS

The aquatic plant sampling methods used for lake surveys of macrophyte communities consisted of shoreline surveys, visual abundance surveys, transect surveys, AVAS surveys, and GPS Point-Intercept Grid surveys. The Michigan Department of Environmental Quality (MDEQ) prefers that an Aquatic Vegetation Assessment Site (AVAS) Survey, or a GPS Point-Intercept Grid survey (or both) be conducted on most inland lakes following large-scale aquatic herbicide treatments to assess the changes in aquatic vegetation structure and to record the relative abundance and locations of native aquatic plant species.

2.1 MDEQ AVAS Survey Method

The Aquatic Vegetation Assessment Site (AVAS) Survey method was developed by the MDEQ to quickly assess the presence and relative abundance of submersed, floating-leaved, and emergent aquatic vegetation within and around the littoral zones of Michigan lakes. With this survey method, the littoral zone areas of the lake are divided into lakeshore sections approximately 100-300 feet in length. The species of aquatic macrophytes present and relative abundance of each macrophyte are recorded onto an MDEQ AVAS data sheet. Each macrophyte species corresponds to an assigned number designated by the MDEQ. In addition to the particular species observed (via assigned numbers), a relative abundance scale is used to estimate the percent coverage of each species within the AVAS site (Table 1). If shallow areas are present in the open waters of the lake, then individual AVAS segments can be sampled at those locations to assess the macrophyte communities in offshore locations. This is particularly important since EWM and other exotics often expand in shallow island areas located offshore in some lakes.

MDEQ Species Abundance Code	***Abundance Meaning Interpretation***	***% Coverage of AVAS Surface Area***
a	**Found**	**< 2**
b	**Sparse**	**2 - 20**
c	**Common**	**21 – 60**
d	**Dense**	**> 60**

Table 1. MDEQ AVAS species relative abundance codes used in AVAS surveys.

2.2 The GPS Point-Intercept Grid Survey Method

While the MDEQ AVAS protocol considers sampling vegetation using visual observations in areas around the littoral zone, the Point Intercept Grid Survey method is meant to assess vegetation throughout the entire surface area of a lake (Madsen et *al*. 1994; 1996). At each GPS Point location, the aquatic vegetation species presence and abundance are estimated. In between the GPS points, any additional species and their relative abundance are also recorded using visual techniques. This is especially important to add to the GPS Point Intercept method, since EWM and other invasive plants may be present between GPS points but not necessarily at the GPS points. Once the aquatic vegetation communities throughout the lake have been recorded using the GPS points, the data can be placed into a Geographic Information System (GIS) software package to create maps showing the distribution and relative abundance of particular species. The GPS Point- Intercept method is particularly useful for monitoring aquatic vegetation communities through time and for identification of nuisance species that could potentially spread to other previously uninhabited areas of the lake.

Precise GPS Point-Intercept Grid Surveys of the lakes were conducted on May 8, 2013 and August 30, 2013 and consisted of 162 sampling points as was developed in 2010-2011.

3.0 BIG FISH, SADDLEBAG, AND FINCH LAKES AQUATIC VEGETATION COMMUNITIES

Aquatic Vegetation survey results collected on May 8, 2013 and August 30, 2013, showed the presence of 18 native submersed, 3 floating-leaved, and 6 emergent aquatic plant species, which is a total of 27 native species. In addition, there were 5 exotic, invasive aquatic plant species found which are discussed below. This aquatic ecosystem contains one of the most diverse aquatic vegetation communities in the state since it contains most of the aquatic plant species listed on the state aquatic ecosystem vegetation list.

3.1 Big Fish, Saddlebag, and Finch Lakes Exotic Aquatic Plant Species

Eurasian Watermilfoil (EWM; Figure 1) is a non-native (i.e. exotic), invasive, submersed, perennial aquatic plant which was introduced into the United States in the 1880's (Reed 1997), although other reports (Couch and Nelson 1985) suggest it was discovered in the 1940's. Exotic aquatic plants are not native to a particular site, but are introduced by some biotic (living) or abiotic (non-living) vector. Such vectors include the transfer of aquatic plant seeds and fragments by boats and trailers (especially if the lake has public access sites), waterfowl, or by wind dispersal. In addition, exotic species may be introduced into aquatic systems through the release of aquarium or water garden plants into a water body. An aquatic exotic species may have profound impacts on the aquatic ecosystem. EWM has since spread to thousands of inland lakes in various states through the use of boats and trailers, waterfowl, seed dispersal, and intentional introduction for fish habitat. EWM is a major threat to the ecological balance of aquatic ecosystems through causation of significant declines in favorable native vegetation within lakes (Madsen et *al*. 1991), and may limit light from reaching native aquatic plant species (Newroth 1985; Aiken et *al*. 1979). The aquatic plant frequently forms dense surface canopies on inland lakes (Figure 2).

Additionally, EWM can alter the macroinvertebrate populations associated with particular native plants of certain structural architecture (Newroth 1985). The biodiversity of native aquatic plant species is strongly threatened in areas where the EWM is common to dense, and since the plant propagates by fragmentation, many areas that are currently sparse in density may become more infested, especially in areas not well-vegetated with native aquatic plant species.

In addition to EWM, three other exotic species were found in the lakes, including the three emergent exotics Purple Loosestrife (*Lythrum salicaria*; Figure 3), Yellow Iris (*Iris pseudacorus*; Figure 4), and the Giant Common Reed (*Phragmites australis*; Figure 5). Lastly, the invasive Starry Stonewort (*Nitellopsis obtusa;* Figure 6) was found in dense abundance near wetland areas close to the access site of Big Fish Lake. It is estimated that the acreage of these 3 exotic emergent species is relatively low (approximately 5 acres total) in comparison to the EWM growth with estimates less than 20 acres.

Figure 1. Eurasian Watermilfoil with seed head and lateral branches.
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Figure 2. Eurasian Watermilfoil forming a dense canopy which once covered over 70% of the surface of Round Lake, Mason County, Michigan.

Figure 3. Purple Loosestrife along a shoreline.

Figure 4. Yellow Iris around a lake shoreline.

Figure 5. Phragmites australis

Figure 6. Starry Stonewort

3.2 Big Fish, Saddlebag, and Finch Lakes Native Aquatic Plant Species

During the 2013 surveys, a total of 18 native submersed, 3 floating-leaved, and 6 emergent aquatic plant species were found in the lakes on May 8, 2013 and on August 30, 2013 (Table 2). The most dominant native aquatic plant species within the lakes included the native submersed aquatic plant, Wild Celery (*Vallisneria americana*; Figure 7) and the macro alga, Chara (*Chara vulgaris*), which grows close to the bottom and offers excellent fish spawning habitat. Other dominant vegetation included pondweeds which serve as excellent fish habitat are also an important substrate for macroinvertebrates. Care should be taken to preserve the low-growing pondweeds and Chara that helps stabilize bottom sediments and offers good fish habitat, which is why selective aquatic herbicide treatments are proposed and only during during specific times of the season. In addition, many of the floating-leaved species such as the lily pads should also be preserved since they do not pose a recreational threat and are also a critical component of the ecosystem.

Emergent macrophytes are plentiful and create a natural “soft” shoreline that should be maintained as a buffer to absorb wave activity from boats and currents. This also applies to the high abundance of Sagittaria plants (Figure 8) that surround the shoreline.

The initial survey in May of 2013, resulted in a treatment map shown in Figure 9. In addition, a late season sonar benthic scan of the littoral zone areas of all lakes shows the locations of dense aquatic vegetation on the lakes denoted by red and orange colors. The density of native vegetation was quite high on Big Fish and Finch Lakes by late July; however, the density on Saddlebag was considerably lower than previous surveys found. The reason for this is that Saddlebag contained a high amount of milfoil that was reduced where the other lakes have abundant native pondweeds and Chara that are delineated as dense aquatic vegetation around the shoreline areas by late July.

Figure 7. Wild Celery

Figure 8. Sagittaria on the Marcellus Lakes

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Aquatic Plant Species	Common Name	Growth Form	Frequency (%)
Chara vulgaris	Muskgrass	Submersed	79
Potamogeton pectinatus	Thin-leaf Pondweed	Submersed	43
Potamogeton zosteriformis	Flat-stem Pondweed	Submersed	52
Potamogeton robbinsii	Fern-leaf Pondweed	Submersed	19
Potamogeton richardsonii	Richardson's Pondweed	Submersed	9
Potamogeton illinoensis	Illinois Pondweed	Submersed	28
Potamogeton amplifolius	Large-leaf Pondweed	Submersed	50
Potamogeton nodosus	American Pondweed	Submersed	9
Potamogeton natans	Floating-leaf Pondweed	Submersed	33
Heteranthera dubia	Water Stargrass	Submersed	44
Vallisneria americana	Wild Celery	Submersed	56
Myriophyllum verticillatum	Whorled Watermilfoil	Submersed	11
Ceratophyllum demersum	Coontail	Submersed	28
Elodea canadensis	Common Waterweed	Submersed	44
Utricularia vulgaris	Bladderwort	Submersed	14
Najas guadalupensis	Southern Naiad	Submersed	51
Scirpus subterminalis	Watergrass	Submersed	9
Nymphaea odorata	White Water lily	Floating-Leaved	58
Nuphar sp.	Yellow Water lily	Floating-Leaved	54
Brasenia schreberi	Water shield	Floating-Leaved	15
Polygonum amphibium	Smartweed	Emergent	9
Sagittaria sp.	Arrowhead	Emergent	57
Pontedaria cordata	Pickerelweed	Emergent	25
Typha latifolia	Cattails	Emergent	68
Scirpus sp.	Bulrushes	Emergent	23
Decodon verticillata	Swamp Loosestrife	Emergent	44

Table 2. Native aquatic plants found in Big Fish, Saddlebag, and Finch Lakes (May & August, 2013).

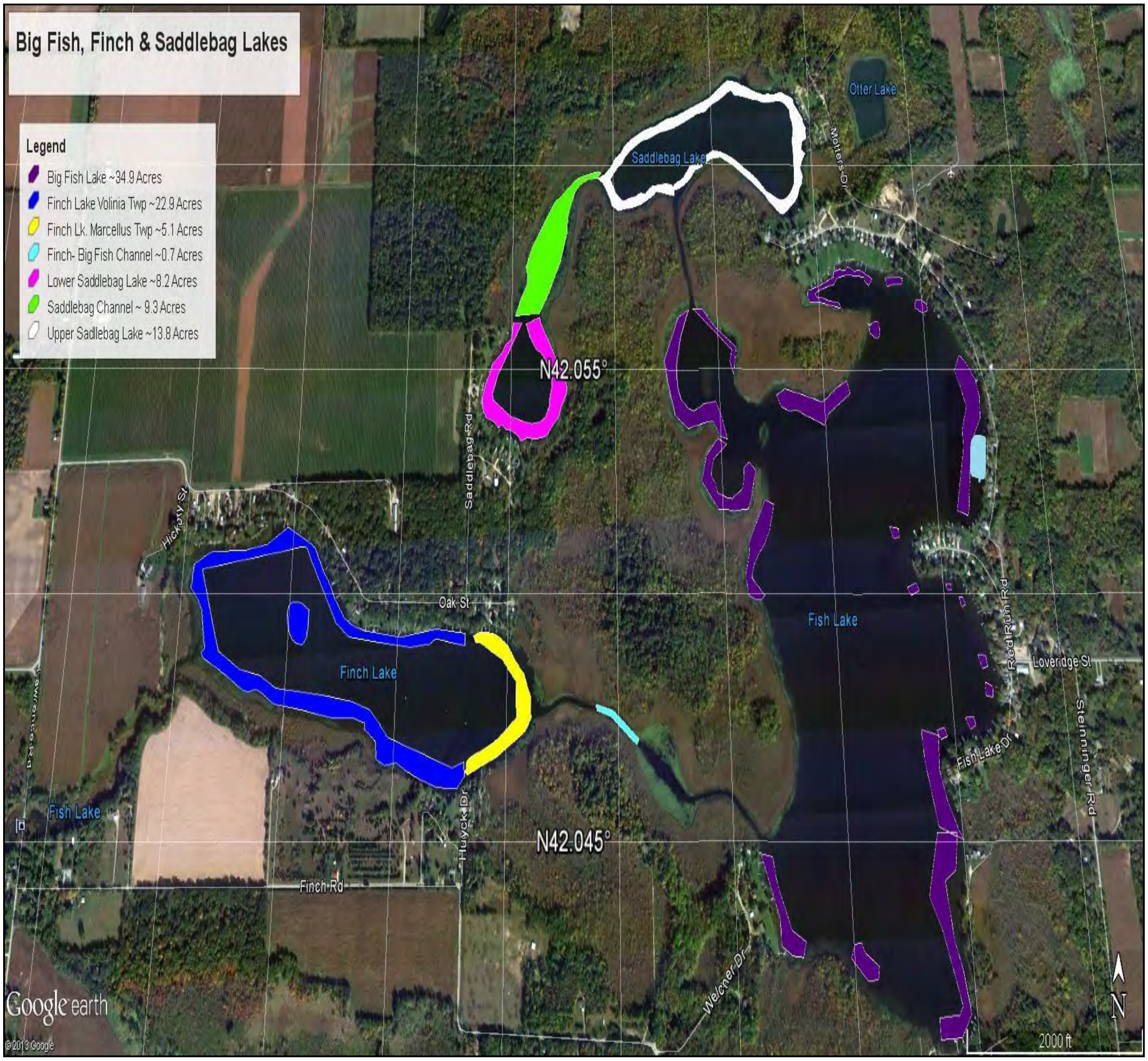

Figure 9. Initial aquatic herbicide treatment map for June, 2013.

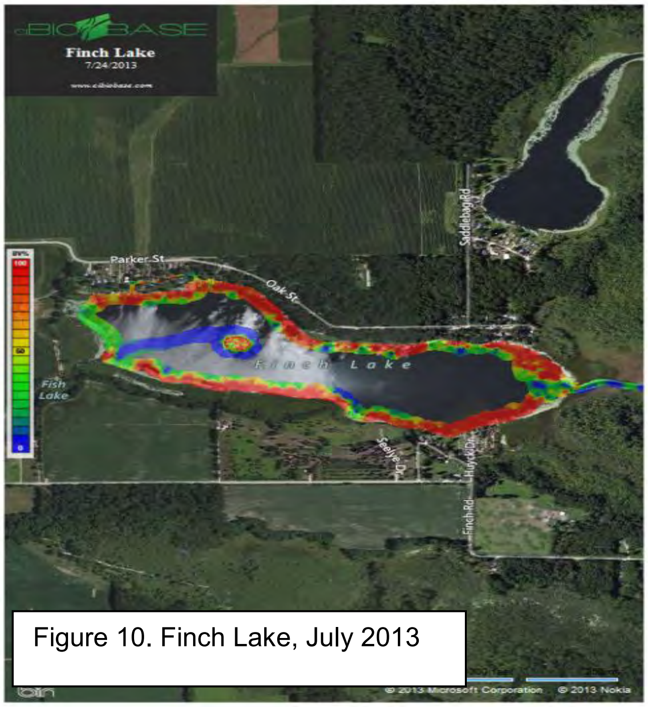

Figure 10. Finch Lake, July 2013

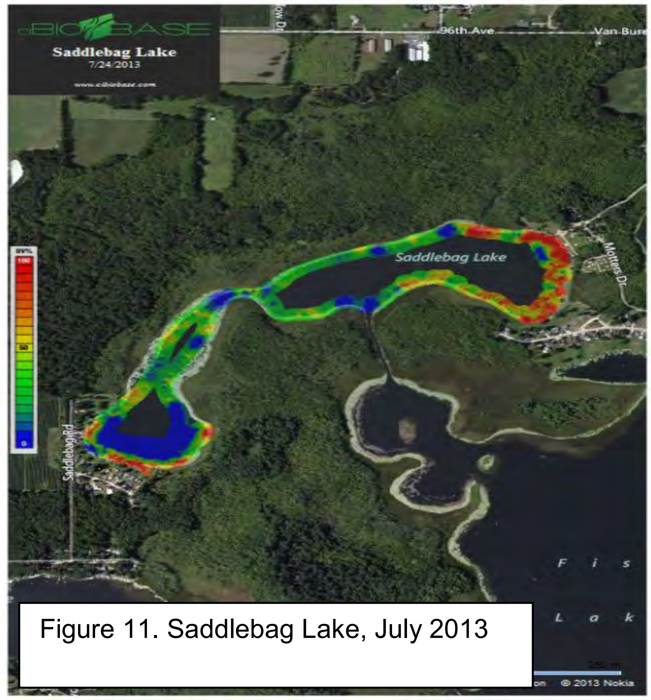

Figure 11. Saddlebag Lake, July 2013

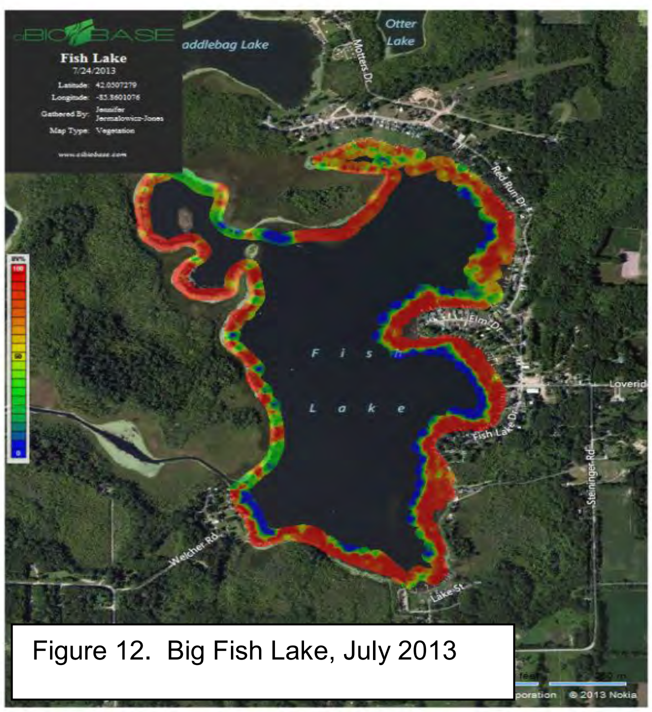

Figure 12. Big Fish Lake, July 2013

4.0 BIG FISH, SADDLE BAG, AND FINCH LAKE MILFOIL AND WILD CELERY CONTROL OPTIONS AND RECOMMENDATIONS

4.1 Spot-treatments with Systemic and Contact Aquatic Herbicides

The use of aquatic chemical herbicides is regulated by the MDEQ under Part 33 (Aquatic Nuisance) of the Natural Resources and Environmental Protection Act, P.A. 451 of 1994, and requires a permit from the Michigan Department of Environmental Quality (MDEQ). The permit contains a list of approved herbicides for a particular body of water, as well as dosage rates, treatment areas, and water use restrictions. Furthermore, residents that reside within 100 feet of the proposed treatment area must be notified at least seven days, but not more than forty-five days prior to the initial treatment date. A licensed herbicide applicator notices the residents in advance of the proposed treatment date, and during the day of treatment.

Contact and systemic aquatic herbicides are the two primary herbicide types used in aquatic systems. Contact herbicides cause damage to leaf and stem structures; whereas systemic herbicides are assimilated by the plant roots and are lethal to the entire plant. Some contact herbicides such as Diquat (Trade Name: Reward®), Endothol (Trade Name: Aquathol K®), and even chelated copper algaecides such as (Trade Name: Cutrine®), have shown substantial control over a broad spectrum of nuisance aquatic vegetation such as Coontail, Thin-leaf pondweed, Elodea, Chara, milfoil, Curly-leaf Pondweed, and nuisance algae growth. The use of this mixture is recommended in late spring on the milfoil because it will control many nuisance species and weaken the milfoil at the same time during its most rigorous period of growth.

Wherever possible, it is preferred to use a systemic herbicide for longer-lasting aquatic plant control. There are often restrictions with usage of some systemic herbicides around shoreline areas that contain shallow drinking wells. Systemic herbicides such as 2,4-D (Trade Name:

Navigate®) and Triclopyr (Trade Name: Renovate®) could be used to successfully treat localized or widely dispersed beds of milfoil. A new product called Renovate® Max G was recently developed by SePRO® Corporation and is a combination of both 2,4-D and Triclopyr. The current infestation of Big Fish, Saddlebag, and Finch Lakes could be spot-treated with granular systemic herbicides in the late spring or early summer such as 2,4-D in offshore and in areas with wells greater than 30 feet deep or Triclopyr if near shore for selective long-term control, with little negative impacts to the native aquatic vegetation communities within the lake. The use of liquid systemic herbicides is discouraged due to the flow-through nature of the impoundend lake system. In addition, all herbicides should be applied during calm weather conditions to minimize drift of the chemical from the treatment site. Areas of dense Wild Celery treated in 2013 with Harpoon were significantly damaged and should not grow as dense in 2014.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Although the genotype of the milfoil present in the lakes is not known, milfoil stem samples were collected during August 2013 and were keyed the species level using a dissection microscope and the taxonomic key provided by Crow and Hellquist (2002). The milfoil did not key out as either Eurasian Watermilfoil or any species of native milfoil. Thus, the plant is deemed to be a hybrid and will be watched closely for response to various aquatic herbicides. Due to the presence of a hybrid strain, a whole-lake SONAR® treatment is NOT RECOMMENDED for the lakes at this time or in the near future due to tolerance issues and the fact that it can exacerbate the overgrowth of Wild Celery. The best management approach is to apply different herbicides at various doses to the problem areas each year. This way, the hybrid plants do not adjust to one specific treatment and develop resistance or tolerance. We recommend a late spring treatment of Diquat, Endothal, and Cutrine to effectively treat all nuisance aquatic weed growth. The hybrid milfoil, may be treated systematically with high dose triclopyr near shore and 24-D offshore or with strong mixtures of contact herbicides. A later season Wild Celery granular herbicide treatment with Harpoon at 180 lbs. per acre is also recommended to further reduce Wild Celery in problem areas. A proposed budget for 2014-2016 is shown in Table 3 below.

Lake Improvement Item	Estimated 2014-2016 Cost
Systemic & Contact Herbicides for EWM & nuisance native plants; MDEQ permit fee	$60,000
Professional Services (limnologist surveys, oversight, processing, education, newsletter)[2]	$9,000
Contingency[3]	$6,900
Total Annual Estimated Cost	$75,900

Table 3. Proposed budget for Big Fish, Saddlebag, and Finch Lakes (2014-2016).

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