Fawn Lake

Management Plan

February 3, 2020

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1.0 Executive Summary

This Lake Environment Management Plan was prepared by the Lake Environment Committee (LEC) as a key planning and management document for the Fawn Lake Community Association (FLCA). It provides a comprehensive summary of potential action plans that the LEC is considering to maintain and improve the health, vitality and overall recreational benefits of the FLCA managed lake (the Lake), ponds, and inter-connecting waterways for all Fawn Lake user communities. These action plans are organized into major categories that cover:

- 5.0 - Vegetative Control Measures
- 6.0 - Water Quality Control Measures
- 7.0 - Maintain a Healthy Fishery
- 8.0 - Minimize Siltation and Muck in Lake
- 9.0 - Monitor and Control Waterfowl Population

Each action plan contains the goals and description of the potential activity, as well as information on strategy, schedule, costs, benefits, monitoring and funding. Upon approval of this Plan, the scope of this report addresses recommended 2020 activities. The LEC will monitor the effectiveness of the approved implementation plans/categories and will make future recommendations based on this data. This plan addresses all categories that the committee could identify at this time and recommends implementation of a subset of these categories based on criticality and available resources.

The control of excessive vegetation in Fawn Lake is the highest priority activity for 2020. The LEC's approved budget for 2020 provides $95,150 for vegetation control out of a total budget of $115,850 (82% of budget). We obtained additional information from Estate Management Services [24][25] and Fish & Wildlife Solutions [7] which has been used in the preparation of this report. Some of the budget estimates have been changed based on this additional information. Appendix A provides the LEC's recommendation to revise the approved budget for 2020 based on this report's findings.

Appendix B provides the LEC's master schedule for 2020. It shows the approximate timing for each of the activities the LEC would like to perform in 2020. Note that some of the action plans discussed in this report will not be performed in 2020.

2.0 Introduction

The Fawn Lake community spans over 2,300 acres that is nestled in Spotsylvania county. In 1988 NTS Development Company purchased Fawn Lake and in 1990 the first home was built. Within the Fawn Lake community is a 288-acre lake "*The Lake"* with a dam that was constructed in 1975. There is over seven miles of shoreline. Fawn Lake offers an abundance of recreational activities and lakeside serenity. While the majority of the shore on Fawn Lake is private property; shore fishing is available to the resident and guests. These areas include the marina/dam, kayak launch, and around the Fawn Lake Clubhouse shoreline. In addition, there are several Fawn Lake Community Association (FLCA) managed ponds within the community that are available for fishing. Whether you prefer boating, fishing, waterskiing, tubing, kayaking or sailing, Fawn Lake is available to you to engage in water recreation of your choosing.

The map below (Figure 2.1) outlines Fawn Lake and identifies the eight coves off of the main lake and includes the beach area. All cove areas on Fawn Lake are strictly no wake areas for water craft.

Fawn Lake Overall Map

Figure 2.1

3.0 State of Fawn Lake

This section details the status of water and sediment quality, aquatic vegetation, fisheries, invasive vegetation, and use. Restoration efforts to date include fish stocking, exotic vegetation removal, and proposed supplemental planting with native vegetation species. *The Lake* has responded positively to

the activities; however, continued restoration efforts are necessary for an ecological balance and improved water quality.

4.0 Action Plans

Action plans are detailed guides that describe specific actions that can be taken to achieve various goals for Fawn Lake. This Management Plan contains action plans organized into six categories: Vegetation Control Measures, Water Quality Control Measures, Maintain a Healthy Fishery, Minimize Siltation and Muck in Lake, Monitor and Control Waterfowl Population, Other LEC Issues. The action plans within each category are listed below. The action plan categories are described in further detail ahead of the action plans.

5.0 Vegetation Control Measures

Healthy aquatic vegetative communities are important to the ecological viability and water quality of *The Lake*. They provide habitat cover for aquatic fauna and fish nurseries, uptake nutrients, mitigate wave action and turbidity, and provide food for various species of fauna.

Invasive vegetation are those species that tend to outcompete other species in terms of coverage and also form dense monocultures. They can be native or exotic and are often indicative of an imbalance in the system. The control of submerged and floating exotic aquatic vegetation promotes the re-establishment of a diversity of native aquatic vegetation in *The Lake*, which is critical to lake restoration objectives.

Maintaining a balance of certain aquatic plants is necessary to maintain a diverse, healthy aquatic ecosystem and fisheries habitat in Fawn Lake. Maintaining this balance requires eradicating or managing the growth of hydrilla, elodea, and other nuisance rooted aquatic plants; and, sometimes, excessive growth of useful plants such as Chara. Over the years, this has been accomplished primarily through the use of herbicides (“chemicals”) and, initially, grass carp. Seeing the reemergence of hydrilla and elodea over the past couple seasons and, combined with the objective to reduce the dependency of herbicides in *The Lake*, it is proposed to utilize primarily natural ways to control the excessive vegetation. Chemical treatments will be utilized occasionally, but we will try to minimize them.

5.1 Chemical Treatments for Invasive or Harmful Vegetation

ACTION:
Perform chemical treatments to control invasive or harmful vegetation such as algae and submerged aquatic vegetation to maintain a healthy ecosystem and safe conditions for aquatic recreational activities such as swimming, boating, paddle boarding, etc.

BACKGROUND:
The Lake is typically treated 2 to 4 times per year with chemicals to address nuisance vegetation in specific areas. Different types of chemicals are used to treat the specific vegetation. *The Lake* was treated for hydrilla from 2009 through 2015. Hydrilla reemerged as a problem in mid-August 2018, but it was too late in the year to effectively treat it. One hydrilla treatment was performed in July 2019. Restrictions on swimming

and/or irrigation may be necessary for several days after the treatment, depending on the chemicals used. We are investigating the use of newer more eco-friendly treatments.

STRATEGY:
Minimize the use of chemicals in *The Lake*, to the maximum extent possible. This will require other natural measures to help control the amount of vegetation in *The Lake*. *See action plans 5.2 - 5.5 in this section.*

SCHEDULE:
Most treatments will be performed when the nuisance is identified, and non-chemical options are not practical. For example, the beach was treated in 2018 after residents reported getting swimmers itch. Copper sulfate was applied to kill the vegetation and snails in the beach area, and that was effective in eliminating the swimmers itch problem. In addition, a severe algae bloom may require an immediate chemical treatment, when it arises. *See action plan 6.2.*

A chemical treatment for Hydrilla will be planned for the Spring, as the plants are starting to emerge. Coverage will be targeted to the areas with Hydrilla growth and tubers based on visual observations and the results of the bathymetry survey. [8] *See action plan 5.4.*

COST:
The cost for each non-hydrilla treatment is typically $1500 - $2000 based on the number of acres treated with a standard selection of chemicals. Hydrilla treatment is more expensive. Estate Management Services estimated the cost to treat 117 acres with Sonar SRP at $37,376. In addition, spot treatments can be performed using ProcellaCor at $10,650 for 10 acres.[24]

EXPECTED BENEFITS:
Maintain a healthy lake ecosystem with a beneficial amount of vegetation, while avoiding excessive vegetation that interferes with recreational activities and/or health and safety of people and pets.

MONITORING ENVIRONMENTAL RESPONSES:
Perform routine visual monitoring of *The Lake* to look for nuisance vegetation, algae blooms, etc. Periodic bathymetry surveys are recommended to quantitatively measure the amount of vegetation in *The Lake*. *See action plan 5.4.*

REGULATORY NEEDS:
Permits are not required to implement this plan. Chemical treatments are performed under contracts with licensed companies.

FUNDING:
2020 budget provides $87,150 for hydrilla treatments and $4,000 for other chemical treatments.[1] See COST above.

5.2 Grass Carp for Natural Vegetation Control

ACTION:
Control problematic vegetation with natural controls including the addition of triploid grass carp.

BACKGROUND:
Increased aquatic plant populations make boating and swimming problematic, dramatically reducing the quality of *The Lake* for recreation.

One solution is to chemically treat the affected areas. This approach, while effective, can be expensive and only provides temporary relief.

Many of these nuisance plants can lie dormant for years, so require a persistent effort for effective control. Recent resident concerns over chemical treatment has initiated research into alternative control methods in an effort to provide a comprehensive aquatic plan control program.

Grass carp are being considered as a possible solution to this problem providing a natural long-term solution as part of a comprehensive lake action plan.

Benefits and Risks: Grass carp will reduce the need for costly and sometimes controversial chemical controls. They will stay and feed near their food source (aquatic plants) so only the areas affected by plants (typically shallow water coves) will require coverage. These fish primarily feed on hydrilla and other nuisance aquatic plants and will not reproduce to prevent an overabundance of the grass carp population.

If introduced in too great a density, they can remove too much plant growth having an adverse effect on fisheries and overall lake health, so a gradual implementation of this solution is recommended. Grass carp can grow to up to 60 pounds and live 15-20 years. Although harmless to humans and pets, Grass carp can startle people due to their size, so education of the residents is recommended.

STRATEGY:
Introduce Virginia Department of Game and Inland Fisheries (VDGIF) approved grass carp (sterile triploids) in controlled quantities. [10] We recommend starting with an initial stocking rate of 4 grass carp per vegetated acre which is in the moderate range according to VDGIF recommendations. Our grass carp stocking proposal is provided in reference [9].

SCHEDULE:
In Virginia, grass carp should ideally be stocked from March through May or September through October when water temperatures are between 50 and 70° F.

COSTS:
According to the bathymetry survey, Hydrilla is growing in about 117 acres of *The Lake*. We will stock at 10 carp per acre at a cost of approximately $13 per triploid grass carp. Initial stocking for 500 carp will be $6,800. Based on our observations we will

tentatively plan for stocking an additional 20% (100 carp) in 2 years to sustain the population. This cost will be $1,360 in 2022. As grass carp age they consume less vegetation and therefore lose effectiveness. When stocking grass carp for hydrilla, maintenance stockings for 10 years are often needed to control new plant growth from tubers and seeds that may lay dormant for years in the pond substrate.

EXPECTED BENEFITS:
Stated in Goal section of this document

MONITORING ENVIRONMENTAL RESPONSES:
Grass carp results sometimes takes more than a year when introduced at the proposed moderate quantity levels.

REGULATORY NEEDS:
Permits are required by VGDIF to introduce triploids grass carp to any body of water.

FUNDING:
See projected costs as stated above.

Initial stocking 2020 - $6,800 (*Note that the LEC budget request for 2020 included $3,000 for grass carp).* [1]

Periodic replenishment stocking is required as there typically is some expected morbidity in this grass carp population. We will plan to stock 20% (100 grass carp) in 2022.

Third Year 2022 $1,360

5.3 Raking, Pulling, Mechanical Harvesting of Vegetation

ACTION:
Remove nuisance vegetation from significantly impacted areas of *The Lake* by manually raking or pulling it, or using mechanical machines that will either cut it or pull it with the roots.

BACKGROUND:
Manually or mechanically removing excessive vegetation from significantly impacted areas of *The Lake* is an effective way to eliminate the nuisance, but the vegetation will grow back in a few weeks unless the roots are also removed. Some plants such as hydrilla can grow from small fragments, so cutting and raking can actually spread the nuisance vegetation to other areas of *The Lake*. Some of *The Lake* front lot owners have been raking excessive vegetation from around their docks and shorelines when it becomes a nuisance.

Mechanical cutters can rapidly cut the vegetation about 4-5 ft below the surface, but it will be important to collect and remove all of that debris from *The Lake* to ensure it does not spread. Dying vegetation can cause a severe loss oxygen in our waters. The removal of tons of vegetation will be required with any mechanical harvester. Handling and disposing of this large amount of vegetation is a critical consideration.

A benefit of harvesting the vegetation and removing it from *The Lake* is that it is rich in nutrients, and the nutrients are permanently removed from *The Lake*. Other chemical and natural controls are not very effective in removing nutrients from *The Lake*.

STRATEGY:
Manual raking to remove excessive vegetation is effective in removing both the vegetation and many of the roots. Rakes that are designed for removal of aquatic vegetation can be purchased for less than $200. A couple of examples are sold by Weeders Digest (weedersdigest.com):

- Rake Zilla - Heavy Duty Aquatic Weed Rake with Long Tines for Lake & Pond, $159.99 – 3 ft wide with 9” plastic teeth, 11 ft handle and 25 ft of rope.
- T-Weeder - Aquatic Weed Removal Tool, $169.00 – solid aluminum, 3 ft wide with 1” teeth, 5 ft long handle and 25 ft of rope.

The LEC recommends that the FLCA Board adopt a policy that states that lakefront lot owners are responsible for removing any vegetation that they consider to be a nuisance along their property line. The LEC will try to control the vegetation in *The Lake*, but there will be areas that will need additional vegetation removal. Refer to Action Plan 10.3 for the LEC’s proposed action. Under this policy, raking can be done when needed at *The Lake* front lot owner’s expense.

A variety of mechanical cutters can be purchased and used. One example is sold by Weeders Digest that attaches to the transom of a small boat. It is basically a 4 ft wide hedge trimmer that can be submerged to cut as deep as 5 ft. It operates by a 12-volt marine battery. One of the concerns with individuals operating a mechanical cutter is that it will generate a lot of debris that must be collected and removed from *The Lake*. Aquatic vegetation is very heavy, so a single mechanical cutter can cut several tons of vegetation per day. Coordination with FLCA Maintenance to use the work boat will be needed if this technique is used in the future.

Mechanical harvesters can both cut (or pull) the vegetation and collect it using a conveyor belt. These machines are typically operated by one person. The vegetation can be transported to shore and unloaded. Weeders Digest sells a variety of these machines. For example:

- Eco-Harvester -- Aquatic Weed Harvester, $84,498 – “both pulls aquatic vegetation by the root system and skims floating, weed fragments, weed mattes and algae blooms”.

There are contractors that own these types of machines, but they are expensive.

Raking or harvesting specific areas may be feasible and cost effective. For example, the beach area could be manually raked by a crew in 1 day, with an estimated cost of $3000. Mechanically harvesting all of the coves would likely take weeks.

SCHEDULE:
As needed to remove excessive vegetation that is interfering with lake usage in specific

areas.

COST:

Purchase rakes that can be used by FLCA maintenance and borrowed by residents that want to rake their own shorelines.

The cost for manual or mechanical removal of excessive vegetation is estimated to be $1000 to $3000 per acre.

EXPECTED BENEFITS:
Removal of excessive vegetation from specific areas where it is interfering with the recreational usage of *The Lake*. This will also permanently remove the nutrients that are in the vegetation. Other types of chemical and natural treatments do not significantly reduce the nutrients in *The Lake*.

MONITORING ENVIRONMENTAL RESPONSES:
Monitor excessive vegetation growth, and the cost effectiveness of different techniques to remove that vegetation.

REGULATORY NEEDS:
None

FUNDING:
$1,000 is included in the 2020 Lake Health Management Budget to cover equipment such as rakes and supplies for homemade fish habitats. [1]

No funding is provided for manual or mechanical harvesting.

5.4 Bathymetry Survey to Assess Vegetation and Contour of Lake Bottom

ACTION:
Establish a baseline for *The Lake* bottom parameters, sediment buildup, aquatic plant growth. Utilize this information as part of a comprehensive lake treatment plan

BACKGROUND:
The Lake experiences changes to the shoreline and water levels around *The Lake* edges due to wave action, sediment and biomass buildup (grass, leaves and dead aquatic life, etc.) over the years. We need an accurate bathymetry survey to incorporate in the FL action plan

STRATEGY:
Perform a bathymetry survey with a qualified contractor. A bathymetry survey was performed by Estate Management Services in October 2019. [11] [12] [24] [25]

SCHEDULE:

Every year until Hydrilla is under control.

COSTS:
$3,000 for a wide band survey.

EXPECTED BENEFITS:
Updated bathymetric survey of Fawn Lake. Monitor how effective the proposed lake treatments are, and target future treatment areas.

MONITORING ENVIRONMENTAL RESPONSES:
N/A

REGULATORY NEEDS:
N/A

FUNDING:
$3,000 *Note that funding for a bathymetry survey was not included in the LEC budget request submitted in September 2019.* [1]

5.5 Drawdown Lake Level to Kill Vegetation in Shallow Areas

ACTION:
If deemed necessary, drawing down *The Lake* level on a planned basis (e.g. every 2-3 years) during the winter may kill submerged vegetation in the shallow areas that will be exposed to freezing temperatures.

BACKGROUND:
Nuisance vegetation can cause problems for recreational activities such as boating and swimming. Shallow areas are most susceptible since submerged vegetation can grow up to the surface. Drawing down *The Lake* level several feet over the winter will expose *The Lake* bed in shallow areas, and freezing temperatures will kill off much of the vegetation. Typical rainfall amounts in the Spring will refill *The Lake* in time for boating and swimming season.

This technique is being used to control vegetation in numerous lakes and ponds. [13] [14]

STRATEGY:
This is one of the options that will minimize the use of chemicals in *The Lake* by using natural measures to help control the amount of vegetation in *The Lake*. It is a no cost option that simply requires opening a valve at the dam to drawdown *The Lake* level by several feet.

SCHEDULE:
If deemed necessary in the future a planned drawdown of *The Lake* can be scheduled for every 2-3 years, or be done in response to a lot of nuisance vegetation that needs to be reduced before the next Summer.

COST:
None

EXPECTED BENEFITS:
Drawdowns can kill off excessive vegetation in shallow areas of *The Lake*. It also provides an opportunity to perform shoreline maintenance and to remove exposed vegetation. In addition, rainfall can wash nutrients and sediment down into deeper sections of *The Lake*. Potential negative consequences include a risk of algae blooms due to nutrients released from dying plants, a fish kill due to oxygen depletion from decaying vegetation, and negative aesthetics while the water level is abnormally low.

MONITORING ENVIRONMENTAL RESPONSES:
Monitor for excessive vegetation in shallow areas (e.g. 5 to 8 ft) over the summer, and determine whether a lake level drawdown over the winter will be beneficial.

REGULATORY NEEDS:
Permits are not required to implement this plan.

FUNDING:
None needed.

6.0 Water Quality Control Measures

6.1 Monitor Water Chemistry

Water quality is essential to the restoration of Fawn Lake. Residents will be encouraged to implement nutrient reduction best management practices to keep nutrients from entering *The Lake*.

ACTION:
Monitor water chemistry.

BACKGROUND:
The LEC monitors various parameters of *The Lake* water chemistry to ensure that relative chemical content is with acceptable limits as well as any harmful pathogens. The LEC has an annual monitoring plan [15] and maintains a database of test results. [16]

STRATEGY:
Monitor water quality and take action as appropriate.

LEC will monitor water chemistry as follows.

- Continue E. coli, phosphorous, nitrogen testing. Typically, we will utilize laboratory services from ESS Lab in Culpeper.
- Continue pH, conductivity, dissolved oxygen and temperature surveys.
- Add alkalinity testing to water chemistry monitoring protocol
- Opacity measurements to monitor phytoplankton and other suspended particles

SCHEDULE:
Spring, Summer and Fall testing. [15] [3]

COST:
$4,335 for Lake testing – included in the LEC budget request for 2019. [3]

$870 for pond testing

EXPECTED BENEFITS:
Ensure lake health

MONITORING ENVIRONMENTAL RESPONSES:
If abnormal results are returned from the lab, remedial steps will be initiated based on the problem.

REGULATORY NEEDS:
Permits are not required to implement this plan.

FUNDING:
Funding included in the LEC Water Quality Monitoring program. [8]
2020 - $4,335

6.2 Monitor for Harmful Algae Blooms (HABs)

ACTION:
Monitor for Harmful Algae Blooms such as blue-green algae.

BACKGROUND:
The LEC monitors various parameters of *The Lake* water chemistry to ensure that relative chemical content is within acceptable limits as well as any harmful pathogens.

Our lake treatment contractor reported seeing a few small clumps of blue-green algae in August 2019. Since we had not tested for HABs in the past, we needed to find a specialized lab to perform this testing. Several samples were analyzed in August and September. The results indicated the toxicity levels remained well below the safe levels established by the Virginia Department of Health. [17] [18]

STRATEGY:
Monitor water quality and take action as appropriate.

LEC will monitor water chemistry as follows.

- Visually monitor for blue-green algae blooms during normal lake monitoring activities and weekly during potential high algae bloom growth periods, typically, July, August, September.
- Suspected large algae blooms will warrant laboratory testing for safety purposes.

- In the event that hazardous concentration levels are detected, the appropriate warning will promptly be provided to HOA for dissemination to the community.

SCHEDULE:
Late Summer and as needed.

COSTS:
Lab testing costs. [3]

EXPECTED BENEFITS:
Ensure lake health and safety for people and pets.

MONITORING ENVIRONMENTAL RESPONSES:
If abnormal results are returned from the lab, applicable remedial steps will be initiated based on the problem.

REGULATORY NEEDS:
Permits are not required to implement this plan.

FUNDING:
$1,165 - funding included in the LEC Water Quality Monitoring program. [8] (see 6.1).

6.3 Increase Alkalinity from 20-22 ppm to 50 ppm or Higher

ACTION:
Investigate the benefits and value for a liming program to promote lake health

BACKGROUND:
The LEC monitors various parameters of *The Lake* water chemistry to ensure that relative chemical content is within acceptable limits. Alkalinity is a measure of a chemical that acts as a buffer preventing large swings in pH that can negatively affect aquatic life. Maintaining a healthy level of alkalinity will be beneficial to the overall lake ecology. Liming potentially increases nutritional foundation for the aquatic food chain, and can decrease water clarity by increasing phytoplankton, reducing the growth of submerged nuisance vegetation.

Fish and Wildlife Solutions, LLC, recommends adding lime to *The Lake* to increase the alkalinity of *The Lake*. [7]

STRATEGY:
Monitor water quality and take action as appropriate.

LEC will monitor water chemistry as follows.

- Perform appropriate testing to determine if any action needs to be taken,
- Add calcium carbonate (CaCO3) lime with a recommended dosage of 1-2 tons/acre if required.

SCHEDULE:
Winter

COSTS:
$250/ton x 1 ton/acre x 280 acres = $70,000 (The application will require the use of the FL work barge and personnel. It will take approximately 2 to 3-man weeks of labor.)

EXPECTED BENEFITS:
Ensure lake health by maintaining proper pH and phytoplankton to reduce aquatic growth.

MONITORING ENVIRONMENTAL RESPONSES:
testing as needed to monitor levels during normal routine testing.

REGULATORY NEEDS:
Permits are not required to implement this plan.

FUNDING:
2020 - not planned.
2021 - $70,000

6.4 Minimize Nutrients in Lake Especially Phosphorous

ACTION:
Minimize nutrients in lake, especially phosphates.

BACKGROUND:
The LEC monitors various parameters of *The Lake* water chemistry to ensure that relative chemical content is with acceptable limits. Testing is routinely performed on nutrients such as orthophosphate, nitrite and nitrate, ammonia as N along with biological content. *See action plan 6.1.*

STRATEGY:
Monitor water quality and take action as appropriate.

LEC will monitor water chemistry as follows.

- Perform appropriate testing to determine if any action needs to be taken.
- If any reading is higher than acceptable limits, the FLCA board is notified.
- Continue writing reminders and articles about proper fertilizer usage and lawn maintenance practices to avoid introduction of grass clippings and leaves into *The Lake* environment.

Additionally, LEC will perform the following actions:
- Recommend that entire community adopt a no/low phosphate fertilizer policy. *See action plan 10.4.* [21]

- Require that all lawn service providers certify that use of no/low phosphate fertilizers prior to granting access to Fawn Lake Properties

SCHEDULE:
Spring, Summer and Fall

COSTS:
Covered in routine testing funding.

EXPECTED BENEFITS:
Reduction of biomass and nutrients that contribute to algae blooms

MONITORING ENVIRONMENTAL RESPONSES:
See section 6.1

REGULATORY NEEDS:
Permits are not required to implement this plan.

FUNDING:
None.

7.0 Maintain a Healthy Fishery

The Fawn Lake community has a strong interest in ecosystem restoration, sustainability, and sport fishing. Healthy lakes and fisheries add value to real estate and provide more ways for residents to enjoy our lake. Our goal is to protect and enhance our fishery and increase the recreational value of sport fishery. Even when *The Lake* is properly stocked or maintained, an assessment made, and necessary corrective actions taken, we will need to continue to monitor fish populations. Accurate information provides a good assessment for future management decisions. Proper management of fish in our lake is as much an art as a science. Knowing what is going on with our fishery is the first step towards improving it. Management of our fishery will always be a necessity.

7.1 Electroshocking Fish Survey

ACTION:
Develop a timeline to perform routine electroshocking fish surveys about every 3-4 years.

BACKGROUND:
An electroshocking survey acts as the reference point for a long-term lake management plan and provides clues for corrective stocking and harvest recommendations. It is also used to determine the necessary steps required to manage our lake and the fish populations. While it may sound unusual or even cruel, an electrofishing survey is a standard scientific survey method that causes no long-term negative effect to the fish population. The fish are stunned briefly; examined to determine abundance, species, size, growth rates, and other characteristics. The stunned fish are then weighed, measured and released unharmed.

An electroshocking survey was performed by the Virginia Department of Game and Inland Fisheries (VDGIF) in May 2016. VDGIF Biologist John Odenkirk has been providing his expertise to help us manage the Fawn Lake fishery. [19]

STRATEGY:
Periodically review the Fawn Lake / VDGIF goals for angler catch rates, electrofishing catches per effort, and presence of young of the year.

SCHEDULE:
Coordinate with the VDGIF to conduct another electroshocking survey in the Spring of 2020.

COSTS:
Coordination and monitoring of projects.

EXPECTED BENEFITS:
Electrofishing surveys are used on established lakes to determine and diagnose problems and out-of-balance lake fish populations. They're also used as a routine management tool to identify issues before they become large and expensive problems.

MONITORING ENVIRONMENTAL RESPONSES:
Monitoring will be implemented by a source chosen either by the FLCA board or by a bid process if the funding source dictates.

REGULATORY NEEDS:
No permitting is necessary for this action plan.

FUNDING:
No funding is required since VDGIF agreed to perform the survey in Spring 2020.

7.2 Stock Selected Fish to Restore Healthy Balance

ACTION:
Based upon the results of our electroshocking fish survey and fishing observations, identify the type of fish that need to be added to *The Lake*. Included in a recommendation is to identify a food source/habitat for the fish to survive and feed on.

BACKGROUND:
To properly balance a lake, it should be stocked with prey fish, like perch or bluegill, for every predator fish, such as bass. This fish stocking strategy will ensure that our predator fish will have a bountiful selection of prey, while still giving the prey fish a sporting chance to mature and reproduce.

Based on the May 2016 electroshocking survey, Golden Shiners were added to *The Lake* in 2017 and 2018 to increase the number of bait fish.

When *The Lake* is properly stocked, the fish population tends to keep itself in check.

However, it is recommended to add some golden shiners or fathead minnows to feed the predator fish while the prey fish get established. In proper conditions and with fish structures in place (rocks, trees, bushes, docks, artificial habits, etc.), minnows will be a food source for the fish to assist in replenishing themselves.

STRATEGY:
Focus on the species of fish that will need our help in survival. By taking measures in both habitat and food sources the fish should start to make a noticeable improvement and a substantial come-back in *The Lake*.

SCHEDULE:
Spring or fall is the ideal time for stocking fish in *The Lake*. Temperatures are mild and oxygen levels are high, so the stress factors affecting our fish will be at their lowest. Once acclimated to *The Lake*, they will be primed to flourish. Fish can be added in the summer, but they will need a little more time to adjust.

COST:
Cost to stock minnows on an annual basis is approximately $5,000. Once adequate structure is in place, any additional stocking will not be necessary for a 2-3-year period.

EXPECTED BENEFITS:
Stocking *The Lake* will not only bring everyone lots of fishing fun, but algae, weeds, insects, leeches and worms will be kept under control.

MONITORING ENVIRONMENTAL RESPONSES:
Periodic fish electroshocking will help us identify any short comings. This will be scheduled and closely monitored on a 3-year basis. Data will be collected and maintained for analysis.

REGULATORY NEEDS:
No regulatory needs are necessary.

FUNDING:
No funding for 2020. [4]

7.3 Establish Fishing Recommendation to Restore Healthy Balance

ACTION:
Based upon the results of our electroshocking fish survey, steps will be taken to help an affected species to recover and replenish themselves. Measures would include safe catch and release practices, recommended amounts and sizes to harvest, and stocking initiatives.

BACKGROUND:

Over the past several years there has been a noticeable decline in some of the fish species in our lake, especially the crappie population. Besides the number of fish that have declined there is a considerable size/weight deterioration. In an effort to help balance *The Lake*, it has been stocked with golden shiners to help the bass, crappie, and walleye survive and replenish themselves. Additional measures may be necessary such as adding fish habitats, minimizing the use of chemicals in *The Lake* to control vegetation, restrictions on species, etc.

STRATEGY:
Based upon the results of our electroshocking fish survey and fishing observations, fishing restrictions may be imposed to help the endangered fish population to recover and replenish.

SCHEDULE:
On an annual basis, data will be gathered from the Fawn Lake Sport Fishing Club, the Fawn Lake Kids' Fishing Derby, and the results of the electroshocking survey to determine and recommend fish harvest restrictions or encouragement.

COST:
None – publish recommendations on catch and release and/or catch and kill for specific fish and sizes.

EXPECTED BENEFITS:
Monitoring *The Lake*'s fish population will help promote fish recovery and will bring everyone lots of fishing enjoyment.

MONITORING ENVIRONMENTAL RESPONSES:
Periodic fish electroshocking will help us identify any short comings. Data will be collected and maintained for analysis.

REGULATORY NEEDS:
No regulatory needs are necessary.

FUNDING:
None

7.4 Maintain Structures to Support Fish Populations

ACTION:
Identify possible shallow water areas that can be used as fish sanctuaries. Propose the types of artificial shelters that can reside under docks and at end of coves in non-navigable waters. Revisit previously placed fish structures for functionality and remove or repair if needed.

BACKGROUND:
Habitat structures can act as miniature sanctuaries for all types of fish species, providing them with food sources and protective structure where there once was none. These structures can be docks, logs, stumps, brush and rocks that provide shelter and shade for fish. An artificial structure can be made from recycled Christmas trees, gravel beds, PVC piping, spider blocks, store bought structures, etc. Location and water depth are critical to maximize the effectiveness of the structure. Both shallow and deep structures are needed to promote both the small fish, bait fish, and the larger species. Fawn Lake currently has Christmas trees placed near cove marker buoys and artificial structures under agreed to home owner docks and also in deeper water. Marker buoys will need to be installed for shallow areas that contain fish sanctuaries.

STRATEGY:
Revisit previously placed fish structures for functionality both Christmas tree and under docks placement. Remove or repair under dock placements if needed. Periodically review the Fawn Lake's bathymetric survey to aid in identifying possible locations. On a pilot basis choose two locations to install the miniature sanctuaries followed by monitoring each.

SCHEDULE:
In the first year select locations for implementation. Purchase miniature structures and place structure in designated areas.

COSTS:
Artificial fish habitat structure varies in cost due to the type, the dimensions, the materials used. An average cost of a typical, volunteer built, shallow water porcupine style artificial habitat structure is about $35.00 - $50.00 each plus anchoring (brick, cinder block, etc.). These artificial habitat structures should have a lifespan of 10 years. Overall it is a great value.

EXPECTED BENEFITS:
Fish habitats offer more than just a cozy home for schools of bass in our lake. They also create an ideal spawning habitat, a spot of refuge and shade for young fry, a safe haven from swooping predators, and a breeding ground for algae and plankton to attract bait fish and lure larger fish to favorite fishing spots.

MONITORING ENVIRONMENTAL RESPONSES:
Monitoring will be implemented by a source chosen either by the FLCA board or by a bid process if the funding source dictates.

REGULATORY NEEDS:
No regulatory needs are necessary.

FUNDING:
TBD – LEC budget request for 2020 provides $1,000 for equipment and supplies. [1]

7.5 Confirm Fish are Safe for Eating

ACTION:
Identify a source to test fish for parasites or possible containments such as: mercury, PCBs (polychlorinated biphenyls). Other contaminants such as cadmium, chlordane, DDT, dieldrin, dioxin, mirex, and polyfluoroalkyl substances, previously known as perfluorinated chemicals are also concerns.

BACKGROUND:
Fish consumption advisories help anglers make educated choices about eating the fish they catch. While *most* Virginia waters do not have dangerous levels of contaminants, *some* fish in certain waters are found to contain contaminants at levels of concern. Mercury is one of those concerns. Mercury is a naturally-occurring metal, which is widespread and persistent in the environment. It exists in three forms: elemental or metallic mercury, inorganic mercury, and organic mercury. Most of the mercury in the atmosphere is elemental mercury vapor; most of the mercury found in water, soil, plants, and animals is either inorganic or organic (methylmercury). The majority of mercury found in fish is methylmercury, which tightly binds to protein in all fish tissue. Methylmercury is a particular concern because it can build up to levels in fish tissue that can be toxic to people.

Mercury isn't the only dangerous toxin in fish flesh—people who eat fish also ingest PCBs. As big fish eat little fish, PCBs become more concentrated in their flesh. Fish-eaters who ingest these dangerous chemicals suffer from increased cancer risk.

STRATEGY:
Fish tissue should be routinely sampled in Fawn Lake for a contaminant analysis. Fish tissue sampling will be used for advisories as needed, when the contaminants in fish exceed levels of concerns.

SCHEDULE:
After the initial first year, fish tissue should be tested every third year for contaminant analysis unless fish kills take place, then they should be tested shortly after the event.

COSTS:
Cost will include collecting, mailings, the number of fish to be tested, and the appropriate lab work to evaluate the tissue. Dollar amounts - TBD

EXPECTED BENEFITS:
Fishing is fun, and fish are an important part of a healthy diet, however, some fish contain chemicals at levels that may be harmful to health. To help people make healthier choices about which fish to eat Fawn Lake will post and monitor any precautionary concerns on consuming fish from our lake.

MONITORING ENVIRONMENTAL RESPONSES:
Data will be collected from the fish testing facility and tracked on a continual basis. As appropriate the information will be disseminated.

REGULATORY NEEDS:
Permits are not required.

FUNDING:
TBD – No specific funding is provided for 2020, but cost is expected to be fairly nominal approximately $1,500.

8.0 Minimize Siltation and Muck in Lake

8.1 Minimize Shoreline Erosion

ACTION:
Protect the shoreline of *The Lake* using a variety of measures.

BACKGROUND:
Erosion of the shoreline harms *The Lake* ecology by increasing turbidity and siltation. Silt reduces the water depth, which becomes a major problem in the shallower portions of *The Lake* such as coves. Expensive dredging may be required if excessive silt accumulates. In addition, the silt can disturb fish beds during spawning season.

A variety of shoreline protection measures are currently being used in Fawn Lake, including wooden bulkheads, stone rip rap, stone or block walls, and natural vegetative buffers. There are several areas of the shoreline that are not currently protected, and are being severely eroded due to wave actions from boats and natural erosion.

STRATEGY:
Evaluate the various shoreline protection measures for effectiveness, initial cost, and long-term maintenance costs. Develop a recommended “best practice” that should be used to protect the shoreline from continued erosion. The best practice should be utilized by the community association when the existing wooden bulkheads in the common areas need maintenance or replacement, since that will demonstrate the preferred practice to the residents.

SCHEDULE:
A working group is being formed with members of *The Lake* Environment Committee, Lake Usage Committee, Commons Committee, Finance Committee, and Architectural Review Committee. The working group will evaluate the options and make recommendations to the FLCA Board.

COST:
None

EXPECTED BENEFITS:
Improved shoreline protection will reduce erosion of the shoreline and siltation of *The Lake*.

MONITORING ENVIRONMENTAL RESPONSES:
Monitor shoreline erosion and effectiveness of shoreline protection techniques.

REGULATORY NEEDS:
Permits are not required to implement this plan.

FUNDING:
None to conduct study and develop recommendations.

8.2 Reduce the Amount of Muck in Shallow Areas (e.g. beach, end of coves)

ACTION:
Reduce the amount of decaying biomass (i.e., muck) at Fawn Lake

BACKGROUND:
It is aesthetically undesirable to contact (i.e., walk through) this muck in the various affected areas of *The Lake*. This biomass supports the growth of aquatic vegetation and traps nutrients that support algae blooms. It is extremely noticeable in the swimming area where swimming is difficult due to the plant growth and walking in the muck is just unpleasant. Additionally, it can harbor other hazardous aquatic life such as leaches and trap E. coli in areas of little natural current flow (i.e., the beach area). The abundance of aquatic vegetation also attracts waterfowl that feed on it and consequently add to the E. coli problem.

STRATEGY:
Utilize treatments to reduce this buildup to include dredging, aeration, adding CaCO3 to the water and utilization of bio digesting products. Initial treatment will be with a pro biotic, bio digesting product.

SCHEDULE:
The LEC has prepared a Lake Muck Reduction Additive Treatment Program for 2020. [20] The program proposes a series of applications of the ShoreTech Muck Pellets - Lake & Pond Sludge Remover Bacteria to affected areas (see weedersdigest.com).

COSTS:
$800 per year to treat beach during pilot phase. May be augmented with other treatments.

EXPECTED BENEFITS:
Reduction of bio mass (muck) from shallow areas of *The Lake*.

MONITORING ENVIRONMENTAL RESPONSES:
Take periodic measurements of the muck levels at various locations to determine effectiveness

REGULATORY NEEDS:
N/A

FUNDING:
2020 = $800 - LEC Lake Health Management Program [1]
Proposing to reduce cost to $800 to test effectiveness at beach only.

8.3 Dredge Shallow Areas of Lake

ACTION:
Dredge shallow areas of *The Lake* to remove sediment, organic debris (muck), and submerged vegetation including its roots.

BACKGROUND:
Fawn Lake was dredged in 2004 to increase the depths of several coves. Since then, sediment and organic debris has accumulated in shallow areas decreasing water depth and providing fertile soil for submerged vegetation to grow.

STRATEGY:
This is one of the options that will minimize the use of chemicals in *The Lake* by using other measures to help control the amount of vegetation in *The Lake*. However, dredging does not remove all of the sediment, and therefore all of the roots of the nuisance vegetation such as Hydrilla will not be completely removed. Dredging will be helpful to *The Lake*'s ecosystem by removing nutrients that have accumulated over the life of *The Lake*. Tons of organic material such as leaves, grass clippings, pine needles, etc., finds its way into *The Lake* each year. In addition, aquatic vegetation grows in *The Lake* each year and decays after the growing season. Furthermore, nutrients from fertilizers are swept into *The Lake* from stormwater runoff.

SCHEDULE:
Dredging is not currently scheduled, but is being discussed due to difficulties in accessing the shallow areas of coves by boat.

COST:
Very expensive

EXPECTED BENEFITS:
Removal of vegetation (including its roots), organic muck and nutrients will have a beneficial impact on *The Lake* ecosystem by reducing the excessive amounts of vegetation currently growing in *The Lake*. The combination of deeper water and less nutrients will help reduce the amount of vegetation in *The Lake*. However, dredging will cause high levels of turbidity which will be detrimental to aquatic wildlife and the recreational use of *The Lake*. Due to the high cost of dredging, we anticipate that dredging will only be performed to increase water depths, where needed, but it will not

be done specifically to remove vegetation. Removal of vegetation, Hydrilla tubers, organic debris, and nutrients will be a beneficial consequence of dredging, but not the primary driver.

MONITORING ENVIRONMENTAL RESPONSES:
Monitoring for turbidity and for fish kills should be done during dredging operations. Limiting dredging operations to specific sections at a time will allow aquatic wildlife to move out of that area.

REGULATORY NEEDS:
The need for permits must be evaluated.

FUNDING:
No dredging is planned for 2020.

8.4 Minimize the Amount of Grass Clippings, Leaves, and Other Debris Getting into The Lake

Cooperation of all Fawn Lake residents is needed to ensure our Lake and ponds stay free of yard and home-use fertilizers containing phosphorous, herbicides, insecticides, fungicides, bleach-containing products, pet wastes, fuel and oil, and other contaminants; as well as solid debris such as grass clippings, pine needles, tree and plant leaves, and trash.

ACTION:
The LEC will post periodic reminders in the "Fawn Lake Communicator" to the effect that no matter where they live at Fawn Lake, whether lakefront or inland, products they use outdoors for any purpose, unless completely absorbed, will eventually wash into *The Lake* or ponds. Instructions at a minimum will continue such as follows:

Fertilizers: All residents near *The Lake*, ponds and drainage streams and paths are asked to use low phosphorous fertilizers (under 3% or none) and slow-release nitrogen fertilizers such as can be purchased through the Fawn Lake Country Club. Nutrients (e.g. fertilizers) promote algae blooms. Professional landscapers and lawn service providers must be advised of this requirement.

Grass Clippings and Leaves: Lakefront and pond front residents are reminded to please keep grass clippings, leaves, pine needles, tree branches and other yard waste from entering the water – decomposition of vegetation in the water uses up available oxygen and causes fish to die. Only use lawnmowers with grass catchers near *The Lake* or ponds.

Boaters: Care and good engine maintenance are needed to keep oil and gasoline out of *The Lake*. As always, help keep our lake clean and do not litter!

BACKGROUND:
Control of chemicals such as phosphorous contained in most fertilizers is one of the most useful preventive measures one can do to prevent nutrients from entering *The Lake* to promote algae blooms and nuisance weeds. This and the other measures described above are critical to maintain *The Lake* to they stay healthy and enjoyable for

swimming, boating, fishing, and other activities. All Fawn Lake homeowners must be continually advised they are responsible to do their part to protect *The Lake* and ponds from pollution, and allowing debris to enter water.

STRATEGY:
An article is placed in the Fawn Lake Communicator each year as a reminder to the community. [21]

SCHEDULE:
Throughout Spring and Summer months.

COSTS:
None.

EXPECTED BENEFITS:
Minimal cost for Lake nuisance plant maintenance, and maintaining water quality.

MONITORING ENVIRONMENTAL RESPONSES:
None

REGULATORY NEEDS:
None

FUNDING:
None

8.5 Add Aeration and/or Water Circulation in Stagnant Areas

ACTION:
Create or improve the movement (flow) of water in stagnant areas of *The Lake* to circulate oxygen down to levels where its presence will slow or prohibit the growth of nuisance vegetation that thrive in a low O2 environment.

BACKGROUND:
Visual observations and reporting over the past several years has shown a trending high rate of growth of both subsurface a surface nuisance aquatic vegetation in areas of *The Lake* that receive little or no circulatory action either from inflow or surface activity. Typically, these areas are sheltered from boating action and wind disturbance. This stagnation slows the recombination of O2 from the surface to lower levels. As well, these areas are the shallowest and thus hardest to reach on *The Lake* by watercraft to effectively treat by any modality.

As the growth of vegetation increases in these low O2 environs they further the slow water circulation and O2 recombination.

STRATEGY:
A proven successful strategy to inhibit the propagation of nuisance growth is the use of mechanical aeration / circulation with electric pumps: either dry pumps pushing air or

submersibles pushing water to create a vigorous circulation. Many applications exist today for this purpose. Further, one or more waterfront home owners in Fawn Lake have already seen positive results out to twenty plus feet from their docks with such a system.

SCHEDULE:
It may well be recommended to design and start with one or more different applicable systems as a beta trial initiated and funded by HOA through one or more committees prior to proffering a program to homeowners. This could be first accomplished in one or more lake access points to affected areas they have a commons area easement and suitable utility for electrical supply. It would be prudent to immediately follow a dredging program if one is anticipated.

COSTS:
TBD - A program may then be designed to offer a "buying" assistance for homeowners at a reduced cost through economies of scale.

EXPECTED BENEFITS:
Benefits to be achieved included renewal of human activity in the areas (rafting, fishing, swimming), removal of the heightened noxious odors, relief from any perceived reduction in property value of affected homes. These applications will also further support other methods of vegetation control in hard to reach locations.

MONITORING ENVIRONMENTAL RESPONSES:
Encourage homeowners to actively participate in polling/reporting to a designate of a committee such observations as necessary.

REGULATORY NEEDS:
Unknown.

FUNDING:
Site surveys to determine specific site cost to establish a beta system(s) functionality and further estimate scaled out plans.

9.0 Monitor and Control Waterfowl Population

9.1 Prohibit Feeding of All Waterfowl (signs and articles)

ACTION:
Avoid attracting and retaining waterfowl to Fawn Lake ponds and lake due to residents feeding them.

BACKGROUND:

Excessive numbers of Canada Geese and Mute Swans have caused several problems in Fawn Lake, including high E. coli levels from their feces, and aggressive behavior from swans that are accustomed to being fed.

STRATEGY:
Inform the residents and guests that the waterfowl should not be fed at any time. Periodic notices are included in the weekly emails, annual articles in the Fawn Lake Communicator, and signs have been posted around the FLCA managed ponds and public access points to *The Lake*. [21] [22]

SCHEDULE:
Continue periodic reminders.

COST:
None

EXPECTED BENEFITS:
Reduce the number of resident swans and geese. Avoid aggressive actions by swans that are looking for food because they are used to being fed rather than foraging for their food.

MONITORING ENVIRONMENTAL RESPONSES:
Continue monitoring for high E. coli levels (see 6.1) and minimize the number of resident swans and geese (see 9.2 and 9.3).

REGULATORY NEEDS:
None

FUNDING:
None

9.2 Control Resident/Migratory Canada Geese Population

ACTION:
Perform actions that will avoid having an excessive Canada Goose population in Fawn Lake, typically gathering around *The Lake* and ponds.

BACKGROUND:
Excessive numbers of Canada Geese and Mute Swans have caused several problems in Fawn Lake due to their feces and aggressive behavior. An annual program to addle (oil the eggs) of Canada Geese has been conducted every Spring for many years in order to avoid goslings from being born here and becoming long term residents. In addition, programs to disperse excessive numbers of geese using hazing dogs, goose "roundups" to remove excessive geese, and repellent sprays have been conducted at various times. In August 2019, high levels of E. coli were detected at the Fawn Lake beach, and the beach was closed for about 2 weeks until the E. coli level returned to a safe level. High E. coli counts are usually caused by excessive number of waterfowl

gathering in one area. The beach seems to be a popular area for both geese and swans to gather.

STRATEGY:
Continue the annual addling of all Canada Goose nests found in Fawn Lake. Consider extending the egg addling program to include all Mute Swan nests to limit their population also (see 9.3). Monitor the number of geese and swans during the year, and take actions when needed. Note that a goose "roundup" is conducted with the assistance of USDA, and the community must demonstrate that other actions, such as an annual egg addling program, have been performed in order to qualify for USDA assistance.

SCHEDULE:
Annual Canada Goose egg addling program is conducted in the Spring by both *The Lake* Environment Committee and the Fawn Lake Country Club personnel. Other actions to disperse excessive goose populations are conducted when necessary.

COST:
Egg addling program – no cost.
Repellent spray (FlightContol) is budgeted at $1170 per year. [2]
Goose "roundup" cost is budgeted at $2500 per year. [5]

EXPECTED BENEFITS:
Control/reduce the number of resident swans and geese.

MONITORING ENVIRONMENTAL RESPONSES:
Continue monitoring for high E. coli levels (see 6.1) and minimize the number of resident swans and geese (see 9.1 – 9.3).

REGULATORY NEEDS:
A permit from the U.S. Fish and Wildlife Service is required for the annual Canada Goose nest addling program, and the results of the program must be reported back to them in order to close the permit. [23]

FUNDING:
Repellent spray (FlightContol) is budgeted at $1170 per year. [2]
Goose "roundup" cost is budgeted at $2500 per year. [5]

9.3 Manage Mute Swan Population

ACTION:
Mute swans are a non-native invasive species, so their numbers should be controlled to the extent practical. Aggressive swans can pose a safety risk to people and pets, and should be removed from the community.

BACKGROUND:

Mute Swans are present in Fawn Lake and around several ponds in the community. Around 10 to 12 swans are often present. They are very territorial, and will aggressively push other swans, geese, ducks, etc., out of their territory to protect their food supply. They can also be aggressive towards people if there are cygnets' nearby or they are hungry and looking to be fed. There have been reports of swans being aggressive to swimmers, children, and dogs.

STRATEGY:
Inform the residents and guests that the waterfowl should not be fed at any time. See action E1. Aggressive swans should be removed. Virginia Department of Game and Inland Fisheries (DGIF) will remove the aggressive swan upon request.

In addition, we recommend instituting a policy of addling (oiling) the swan eggs to prevent the hatching of signets in the Spring. This can be done at the same time that the Canada Goose nests are addled.

SCHEDULE:
Egg addling is performed in the Spring, before the eggs hatch. Aggressive swans can be removed whenever they become aggressive and pose a safety risk to residents.

COST:
None

EXPECTED BENEFITS:
Avoid overpopulation of Mute Swans. Remove aggressive swans that pose a safety risk to people and pets.

MONITORING ENVIRONMENTAL RESPONSES:
Continue monitoring for high E. coli levels (see 6.1).

REGULATORY NEEDS:
None – a permit is not needed to addle Mute Swan nests since they are not a protected species.

FUNDING:
None

9.4 Beavers, muskrats, river otters, etc.

ACTION:
Remove beavers, muskrats, river otters, etc., from *The Lake* when they become a destructive nuisance.

BACKGROUND:
Beavers, muskrats, and river otters are native to this area, and are occasionally found in Fawn Lake. They can become a destructive nuisance when they forage for small trees to build their homes and dams. Residents have reported beavers taking away small

trees along *The Lake*. Their lodges can become obstructions in *The Lake*, and their burrows can become destructive to the shoreline.

STRATEGY:
Bring in a wildlife trapper to remove nuisance animals, when necessary.

SCHEDULE:
As needed.

COST:
Minor

EXPECTED BENEFITS:
Avoid destructive actions by removing nuisance animals.

MONITORING ENVIRONMENTAL RESPONSES:
Visually monitor *The Lake* for signs of lodges and burrows, and look for tree stumps where the tree has been chewed off.

REGULATORY NEEDS:
None

FUNDING:
Minor expense, when needed.

10. Other LEC Issues

There are some issues that the Fawn Lake Community Association (FLCA) Board of Directors need to address for the community. The following provides *The Lake* Environment Committee's (LEC) recommendations on personnel issues and policies that should be addressed by the Board.

10.1 Use of FLCA Personnel for Lake Management and Labor

ACTION:
The Lake Environment Committee (LEC) requests that the Fawn Lake Community Association (FLCA) hire personnel that will take over responsibility for managing *The Lake* and the FLCA managed ponds. In addition, FLCA maintenance personnel manhours should be designated to provide labor for lake and pond maintenance and improvement projects, as needed.

BACKGROUND:
The LEC responsibilities have been increasing significantly in recent years as issues have arisen in both *The Lake* and FLCA managed ponds. The volunteer committees are intended to provide advice to the FLCA Board, however, the LEC has taken over several active roles in the management of *The Lake* and ponds. The Board recently approved a revised LEC Mission and Responsibilities statement, which describes many

of the responsibilities [F1-1]. In addition, this Lake Management Plan describes several new actions that must be performed in the future to improve the health of *The Lake*.

The Lake of the Woods has a full time Environmental Resources Manager (Bobby Jones) that is responsible for caring for their lakes and ponds. He performs the routine monitoring and leads the maintenance and improvement activities. For example, he conducts his own vegetation survey each year using the community's work boat, electronic equipment, underwater camera, computer and software equipment versus hiring a company to perform a bathymetry survey. Another example is that he is responsible for maintaining the buoys on *The Lake*, so he performs both LEC and Lake Usage Committee (LUC) activities.

STRATEGY:
Hire a full time Environmental Resources Manager who will be capable of executing the responsibilities of both the LEC and LUC, including this entire Lake Management Plan. The LEC and LUC committees will resume their roles as advisory groups for the FLCA Board, including advising the new Environmental Resources Manager. In addition, FLCA Maintenance personnel manhours should be designated for lake and pond maintenance activities and improvement projects.

SCHEDULE:
2020

COST:
TBD – primarily the cost for a new salaried position with the skills needed to execute *The Lake* Management Plan and other responsibilities.

EXPECTED BENEFITS:
Full time, in house expertise and management of *The Lake* and FLCA managed ponds will ensure consistent and effective implementation of maintenance, sustainability, and improvement measures into the future. *The Lake* is a critical amenity for the Fawn Lake community, and providing professional resources to manage it is recommended by the LEC.

MONITORING ENVIRONMENTAL RESPONSES:
None

REGULATORY NEEDS:
None for the personnel requirements, however, specific activities such as chemical treatments, dredging, etc., may require permits and certifications.

FUNDING:
TBD – not currently budgeted for 2020.

10.2 Use of FLCA Work Boat for Committee Activities

ACTION:
Allow designated members of *The Lake* Environment Committee (LEC) and Lake Usage Committee (LUC) to use the Fawn Lake Community Association (FLCA) work boat for LEC and LUC activities.

BACKGROUND:
The FLCA owns a pontoon boat that is occasionally used by maintenance and safety employees. The boat is normally kept on a trailer in the maintenance yard, and is put into *The Lake* when needed. Only designated FLCA employees are authorized to operate the boat due to liability insurance considerations.

STRATEGY:
Designate members of the LEC and LUC that will be allowed to operate the FLCA work boat to conduct LEC and LUC activities, when needed. This may require those designated people to be included in the FLCA liability insurance policy in order to operate the boat.

SCHEDULE:
As needed, starting in 2020.

COST:
TBD – cost to add several additional boat operators to the FLCA liability insurance policy.

EXPECTED BENEFITS:
LEC and LUC members are currently using their own boats to conduct committee activities such as monitoring *The Lake*, collecting water samples, taking water measurements in *The Lake*, checking the buoys and emptying water from them, etc. The FLCA work boat will allow these volunteer activities to continue without requiring the use of personal boats.

MONITORING ENVIRONMENTAL RESPONSES:
None

REGULATORY NEEDS:
Boating licenses from the Coast Guard and FLCA are required to operate a boat in Fawn Lake.

FUNDING:
TBD – cost to add several additional boat operators to the FLCA liability insurance policy.

10.3 Additional Maintenance Along Private Shorelines

ACTION:
Revise the Fawn Lake Community Association (FLCA) policy about lakefront lot owner's responsibility for any additional maintenance along their shorelines, including around their docks. The FLCA will remain responsible for the general maintenance of *The Lake*, but if *The Lake*front lot owner decides that additional work is required along their shoreline, then they will be responsible for performing it.

BACKGROUND:
The entire lake is community property. Lakefront lot owners are allowed to build private docks that protrude into *The Lake*, but they do not own that portion of *The Lake*. The current FLCA policy is that all maintenance of *The Lake* is the responsibility of the FLCA. If a lot owner complains about excessive vegetation growing around their dock, then they can call the HOA Manager and ask for it to be removed. In the past, we have made special requests to our lake maintenance contractor to make sure chemical treatments are performed around specific docks. However, the physical removal of excessive vegetation has not been performed, to our knowledge. Instead of adding the removal of vegetation to FLCA Maintenance's list of responsibilities, we recommend that the FLCA Board adopt a policy that any additional maintenance that The Lakefront lot owner wants completed may be done at their own expense.

Some lakefront lot owners have raked excessive vegetation from around their docks and shorelines. In addition, one lot owner is preparing to dredge to improve boat access to their dock. Clarifying the FLCA policy about these additional maintenance activities will help avoid unreasonable expectations for FLCA maintenance responsibilities.

STRATEGY:
FLCA Board should adopt a resolution that clarifies its policy about the responsibilities of lakefront lot owners for any additional maintenance that they want performed along their shorelines.

SCHEDULE:
Draft and adopt a new policy in early 2020.

COST:
None – but perhaps a legal review is needed to address potential liability issues.

EXPECTED BENEFITS:
Clarify expectations and responsibilities

MONITORING ENVIRONMENTAL RESPONSES:
Some activities, such as dredging, should require FLCA review and approval.

REGULATORY NEEDS:
Some activities may require permits.

FUNDING:
Minor – not currently budgeted for 2020.

10.4 Minimize Use of Fertilizers that Contain Phosphorous

ACTION:
Adopt a new Fawn Lake Community Association (FLCA) policy that will minimize the use of fertilizers that contain phosphorus.

BACKGROUND:
The use of fertilizers in the community results in increased nutrient loads *The Lake* and the numerous ponds, which increases the growth of vegetation. The stormwater runoff from essentially all areas of Fawn Lake ends up in either *The Lake* or one of the numerous ponds. Routine chemical treatments of lake and ponds has been performed to control the growth of vegetation. See action plans 5.1 and 6.4 for further details.

STRATEGY:
FLCA Board should adopt a resolution that prohibits the use of high phosphorous fertilizers in the community. This should apply to all lot owners, the FLCA and FLCC. Annual notifications of this policy should be sent to all lot owners and all landscaping companies that do business in Fawn Lake. Exceptions for the use of starter fertilizers could be allowed, but should require FLCA approval.

SCHEDULE:
Draft and adopt a new policy in early 2020.

COST:
Some time and expense will be incurred by FLCA staff to send out notifications and to enforce the policy.

EXPECTED BENEFITS:
Minimizing the use of fertilizers that contain phosphorous will reduce the nutrient loads to *The Lake* and ponds in the community, thereby reducing the need for expensive treatments to control excessive vegetation.

MONITORING ENVIRONMENTAL RESPONSES:
Continue monitoring nutrient loads in *The Lake* and FLCA managed ponds on an annual basis. See action plan 6.1.

REGULATORY NEEDS:

None

FUNDING:
Minor – not currently budgeted for 2020.

REFERENCES

LEC Budget Items for 2020:

[1] Budget Request LEC1 - Lake Health Management Control 2020 16Sept2019
HTTPS://DRIVE.GOOGLE.COM/OPEN?ID=1CEEW0YD7LNOCXXVFWL1TCQWG3XMTTKA1

[2] Budget Request LEC2 - Pond Algae Control 2020 16Sept2019
HTTPS://DRIVE.GOOGLE.COM/OPEN?ID=1XMXJSAY90DUM26L5GP-A666PJVBV-NZX

[3] Budget Request LEC3 - Water Quality Monitoring 2020 16Sept2019
HTTPS://DRIVE.GOOGLE.COM/OPEN?ID=16ARGCGJRGWBLE4BC5ENIFTGO8TYHG1EL

[4] Budget Request LEC4 - Golden Shiner Bait Fish 2020 16Sept2019
HTTPS://DRIVE.GOOGLE.COM/OPEN?ID=15YQWSBFAUIF0R6LTRHH2YW4TNMFXFU8K

[5] Budget Request LEC5 - Canada Goose Control Program 2020 16Sept2019
HTTPS://DRIVE.GOOGLE.COM/OPEN?ID=1PJ5RKEHFDPL8QRNEWNVXPY2TZ6ON07XT

Other Reference Documents:

[6] FLCA Lake Environment Committee Mission and Responsibilities - June2019 Final
HTTPS://DRIVE.GOOGLE.COM/OPEN?ID=193VFG0JAUYXKQKIHNSRYFQ3TQ-MQUE6S

[7] Fawn Lake Evaluation and Management Recommendations - Fish & Wildlife Solutions - Oct2019
HTTPS://DRIVE.GOOGLE.COM/OPEN?ID=1GIKP_OSNKVVUYSK_TG2XIKTDVAF8TSNE

[8] Fawn Lake - Proposed Treatment Areas for Hydrilla Spring 2020
HTTPS://DRIVE.GOOGLE.COM/OPEN?ID=1UZSKYF4OO6OC7N-ST0STP1RBYUKWLMY6

[9] LEC Grass Carp Stocking Proposal 2019 - 27Oct2019 DRAFT
HTTPS://DRIVE.GOOGLE.COM/OPEN?ID=1LPN9BGF-N9BY7CP03K2YZ7ICPFMMXPTF

[10] Virginia DGIF Guidance – "Triploid Grass carp Stocking For Aquatic Vegetation Control"
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[11] Bathymetry Survey Proposal - Estate Management Services 28Aug2019
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[12] FL Bathymetry Survey 22Oct2019 – video of crew collecting the data
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[13] Lake Drawdown for Aquatic Plant Control, New Hampshire Department of Environmental Services, 2010
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[14] SCE&G Schedules Drawdown for Lake Murray, Dominion Energy, CAYCE, S.C. (Aug. 21, 2018)
HTTPS://WWW.SCEG.COM/ABOUT-US/NEWSROOM/2018/08/21/SCE-G-SCHEDULES-DRAWDOWN-FOR-LAKE-MURRAY

[15] Fawn Lake LEC Lab Testing Program Plan 4Aug2017
HTTPS://DRIVE.GOOGLE.COM/OPEN?ID=1WPRUFLF4URUNTFPMAR6ZCSAHHXR3FCEK

[16] Fawn Lake Water Quality Summary and Evaluation Memo - 17Jul2017
HTTPS://DRIVE.GOOGLE.COM/OPEN?ID=1O6VLAITZD41L8RW_LQSG9BMVDYFZDZD2

[17] Harmful Algae Bloom Response Protocol - Sherman 28Sept2019 Draft
HTTPS://DRIVE.GOOGLE.COM/OPEN?ID=1GJFJCFVIMG-LRXMJAJXIC0SQ0O-FXXDA

[18] Harmful Algae Bloom Testing Results Aug-Sept2019
HTTPS://DRIVE.GOOGLE.COM/OPEN?ID=1SBPMCWAHLBCSZGGLZTTXERYVLUCE1E98

[19] LEC Special Meeting Minutes - John Odenkirk DGIF 15May2018 – includes summary of electroshocking fish survey performed in May 2016
HTTPS://DRIVE.GOOGLE.COM/OPEN?ID=1CEOUXLIEJQYSYKRSPQJMG8IPA_FUWMPQ

[20] LEC Lake Muck Reduction Additive Treatment Program 14Sept2019
HTTPS://DRIVE.GOOGLE.COM/OPEN?ID=1OE3V0QZJK7V1HZ9DGJWB-QFL0NTXNIF_

[21] HELP KEEP OUR LAKE AND PONDS HEALTHY IN 2019 – FL Communicator Article
HTTPS://DRIVE.GOOGLE.COM/OPEN?ID=1MTSRVGOEOFPMWW7DWADRLPQ7VFKVEPW-

[22] New Signs for Lake and HOA Ponds 15Nov2018
HTTPS://DRIVE.GOOGLE.COM/OPEN?ID=11LPUPYLS-5BVOVWWC31XWESPZASZBYIZ

[23] Canada Goose Egg Addling Registration for Fawn Lake 11March2019
HTTPS://DRIVE.GOOGLE.COM/OPEN?ID=1A8E6QEW-RQA0016GNTRCIVJBN8DELICA

[24] Estate Management Services - Bathymetry Lake Management Letter 18Nov2019
HTTPS://DRIVE.GOOGLE.COM/OPEN?ID=1BPCIG5P1Q4TSGBTUZ4ACAAWJ-VV5YRRR

[25] Estate Management Services - Fawn Lake Bathymetry Survey Maps 22Oct2019
HTTPS://DRIVE.GOOGLE.COM/OPEN?ID=1MAXXROJ7FBNTBS2E_FF-KCWBESR_8DAS

Appendix A
Fawn Lake Environment Committee -- Revised Approved Budget CY 2020

Tasks	Approved Budget	Proposed Budget	
5.0 Lake Vegetation Control			
5.1 Chemical Treatment - Hydrilla (Sonar SRP)	**$87,150**	**$38,124**	Estate Management Services (ESM) contract
Chemical Treatment - Hydrilla (Procellacor)		**$30,750**	ESM contract basis - allowance for 40 acres treatment
Chemical Treatment - Algae, etc. (as needed)	**$4,000**	$4,000	Budget allowance
5.2 Grass Carp for Natural Vegetation Control	**$3,000**	**$5,885**	ESM contract for 500 grass carp (about 4 per vegetated acr
5.3 Raking, Pulling, Mechanical Harvesting	**$1,000**	$1,000	$1000 budgeted for equipment (see below)
5.4 Bathymetry Survey to Assess Vegetation		**$3,000**	ESM contract - Recommended to track Hydrilla growth
~~5.5 Drawdown Lake Level to Kill Vegetation~~		$0	Not planned in 2020
6.0 Lake Water Quality Controls			
6.1 Monitor Lake Water Chemistry	**$3,465**	$3,465	ESS lab costs
6.2 Monitor Harmful Algae Blooms	**$1,165**	$1,165	SePRO lab and shipping costs
~~6.3 Increase Alkalinity – Lime~~		$0	Not planned in 2020
6.4 Minimize Nutrients in Lake		$0	Articles and FLCA policy
7.0 Maintain Healthy Fishery			
7.1 Electroshocking Fish Survey		$0	By DGIF in Spring 2020
7.2 Stock Fish to Restore Healthy Balance		[1]	Restock in Fall based on electroshocking survey results
7.3 Fishing Recommendations		$0	
7.4 Maintain Structures to Support Fish Population		[1]	Budget includes $1000 for equipment and supplies total
7.5 Confirm Fish are Safe for Eating		**$1,000**	Need to find lab to perform analyses
8.0 Minimize Lake Silt and Muck			
8.1 Minimize Shoreline Erosion		$0	Participate in best practices study
8.2 Reduce Muck in Shallow Areas	**$4,200**	**$800**	Reduce treatments to beach only - pilot
8.3 ~~Dredge Shallow Areas of Lake~~		$0	Not planned for 2020
8.4 Minimize Debris into Lake		$0	Publish reminders in Communicator and email
8.5 Aeration and/or Circulation		[1]	Purchase & install, or subsidize equipment
9.0 Waterfowl Population Control			
9.1 Prohibit Feeding of Waterfowl		$0	Publish reminders in Communicator and email
9.2 Canada Goose Controls	**$2,500**	$2,500	Budgeted $2500 for goose round-up
9.3 Mute Swan Controls		TBD	Egg addling - if approved by FLCA BoD
9.4 Beavers, Muskrats, River Otters Control		$0	Use contingency, if needed
FLCA Managed Ponds Maintenance			
Pond Maintenance Annual Contract	**$7,330**	$7,330	Aquatix LLC annual contract extension
Monitor Water Chemistry - Pond Nutrients	**$870**	$870	Budgeted for once per year
FlightControl Goose Repellant Spray	**$1,170**	$1,170	
Proposed Programs Total		**$101,059**	
Unallocated Funds		$14,791	[1] item to be considered if funding available after hydrilla treatments are completed
2020 LEC Funding Total	**$115,850**	**$115,850**	

Appendix B

Fawn Lake Environment Committee -- Master Schedule CY 2020

Tasks	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5.0 Lake Vegetation Control												
5.1 Chemical Treatment - Hydrilla												
Chemical Treatment - Algae, etc. (as needed)												
5.2 Grass Carp for Natural Vegetation Control												
5.3 Raking, Pulling, Mechanical Harvesting												
5.4 Bathymetry Survey to Assess Vegetation												
5.5 ~~Drawdown Lake Level to Kill Vegetation~~												
6.0 Lake Water Quality Controls												
6.1 Monitor Lake Water Chemistry												
6.2 Monitor Harmful Algae Blooms												
6.3 ~~Increase Alkalinity -- Lime~~												
6.4 Minimize Nutrients in Lake												
7.0 Maintain Healthy Fishery												
7.1 Electroshocking Fish Survey												
7.2 Stock Fish to Restore Healthy Balance												
7.3 Fishing Recommendations												
7.4 Maintain Structures to Support Fish Population												
7.5 Confirm Fish are Safe for Eating												
8.0 Minimize Lake Silt and Muck												
8.1 Minimize Shoreline Erosion												
8.2 Reduce Muck in Shallow Areas												
8.3 ~~Dredge Shallow Areas of Lake~~												
8.4 Minimize Debris into Lake												
8.5 Aeration and/or Circulation												
9.0 Waterfowl Population Control												
9.1 Prohibit Feeding of Waterfowl												
9.2 Canada Goose Controls												
9.3 Mute Swan Controls												
9.4 Beavers, Muskrats, River Otters Control												

FLCA Managed Ponds Maintenance												
Pond Maintenance Annual Contract												
Monitor Water Chemistry - Pond Nutrients												
FlightControl Goose Repellant Spray												