

STAFF REPORT: Recreation



REPORT TO: Recreation Committee
MEETING DATE: August 28, 2008
REPORT NO.: DOR 08 40
SUBJECT: Tomahawk Pond Improvements
PREPARED BY: Shawn Everitt,
Director of Recreation

A. Recommendations

THAT Council approve Staff Report DOR 08 40 "Tomahawk Pond Improvements" and authorize staff to take steps outlined by C & M Aquatics Limited to provide sustainable pond conditions and fish stocking practices.

B. Background

Staff has been approached by C & M Aquatics Limited to offer their services to help provide optimum pond and stream conditions at the Tomahawk Recreation Complex. The property has two significant ponds that are connected through a cold water stream making these conditions favourable for providing stocked ponds.

As detailed in Attachment 1, a report from C & M Aquatics Limited outlines the overall pond description and what aquatic life is contained in these two ponds. The report also highlights current issues with the overabundance of nutrients and the problems associated with the over abundance of these nutrients.

A nutrient management program outlining 3 essential elements including Circulation, Oxygenation, and Stimulation of Beneficial Bacteria. It is suggested that the following program be followed;

First phase

Implementation of (1) electric aeration pump for the front pond, and (1) solar powered aeration pump. These pumps would be operational 12 months per year to ensure adequate oxygen is available in the pond.

Second Phase

Stocking of pumpkinseed and Bluegill species into ponds in early fall pending installation of aeration pumps by mid September.

Third Phase

Bioaugmentation, adding concentrated numbers of beneficial bacteria into the pond to augment the natural population and speed up the rate of nutrient assimilation by the bacteria.

Fourth Phase

Stocking of Large Mouth Bass into the lower pond and Small Mouth Bass into the upper pond. It is expected that within 3 years the ponds will have numerous bass in excess of two pounds and thousands of adult bluegill and pumpkinseed.

These species are very easy to catch using simple tackle, as well, Bass are a very visible species often roaming the shoreline rather than a trout species that often stay in deeper water and not be as visible.

Fifth Phase

Ongoing maintenance and monitoring of ponds conditions and nutrient and fish levels.

The community benefit of this process has exciting potential and would allow for potential fishing derbies for the community in particular the youth, and special needs individuals and groups. The use of barbless hooks makes catching less harmful to the fish and promotes a catch and release program and possible tagging of some fish. Interpretive signage would also explain species, cold water stream significance, plant life and identification of plant life and the overall food chain of the pond's habitats.

C. The Blue Mountains' Strategic Plan

Preserving and enhancing natural and environmental features, and cultural heritage of the community

Supporting the development of social and recreational programs to meet the broad range of needs in the community.

D. Budget Impact

2008 upset costs of \$5,000.00

- supply and installation cost of (1) 1/3 horsepower Electric Pump 2 aeration pump and (1) solar aeration system at upset cost of \$4300.00
- Supply and stocking costs of (30) Pumpkinseed at \$3.00 per fish and (30) Bluegill at \$5.00 per fish along with MNR permit and permit facilitation upset cost of \$700.00

2009 upset costs of

- Budget would reflect energy consumption costs of approximately \$240.00 per year for electric aeration pump
- Nutrient management costs of either
 1. Biweekly application upset costs of \$3700.00 for season
 2. Weekly application upset costs of \$6100.00 for season
- Stocking of Small and Large Mouth Bass prices to be determined upon availability

- Ongoing costs would reflect energy consumption costs of electric aeration pump and nutrient management costs

2010 and on costs

- Yearly costs of Nutrient Management Costs as noted in 2009 costs

E. Environmental Impacts

To ensure sustainable use of Town lands, and cold water stream systems as well as providing an educational component of environmental significance and sustainability.

F. Attached

1. C & M Aquatics Pond Report
2. C & M August 19, 2008 Quotation

Respectfully submitted,

Shawn Everitt, Director of Recreation



August 5, 2008

Mr. Shawn Eycritt
Director of Recreation
Town of the Blue Mountains
Thornbury, Ontario

Dear Mr. Eycritt:

Re: Nutrient Management and Fish Stocking Strategy for the Ponds at Tomahawk Recreational Complex in Thornbury, Ontario.

Thank you for the opportunity to provide some background information for the initiation of a nutrient management strategy and fish stocking program for the ponds at the Tomahawk Recreation Complex near Thornbury Ontario.

Pond Description

The ponds at Tomahawk were initially visited by Josh Clark on June 10, 2008 and subsequently on August 01, 2008 by both Josh Clark and Fred Manning. The purpose of the first visit was to get a feel for site, the nature of the ponds and to gauge the goals and objectives of the town with respect to the ponds. The goal of the second visit was to assess the current nutrient status of the ponds and document the aquatic vegetation community and existing fish habitat conditions.

The two ponds at Tomahawk are both fed by a cold water stream that originates west of the property and flows in an easterly direction through the golf course before exiting the second pond into a drain or subterranean culvert. Both ponds would be described as "online" with a permanent inflow and outflow. The online nature of the ponds has specific regulatory implications which will be discussed in a subsequent section of this letter.

Both ponds had extensive communities of aquatic plants present at the time of the second visit in August. The aquatic plants observed included:

- Sago Pondweed (*Potamogeton pectinatus*)
- Stonewort (*Chara spp.*)
- Slender Naiad, Water Nymph (*Najas flexilis*)
- Spike Rush (*Eleocharis spp.*)
- Cattail (*Typha latifolia*)



- Softstem bulrush (*Scirpus validus*)
- White Water Lily (*Nymphaea odorata*)⁴
- Unidentified Sedges
- Jewel Weed (*Impatiens capensis*)
- Horsetail (*Equisetum* spp.)
- Purple Loosestrife (*Lythrum salicaria*)

⁴White Water Lily should be closely monitored to prevent significant spreading and subsequent overcrowding

In addition to the plant community we also observed numerous minnows in both ponds which were identified as Northern Redbelly Dace (*Parachanna eos*). Redbelly Dace are a very common inhabitant of streams and lakes throughout Ontario.

Both of the two ponds show evidence of eutrophication (overabundance of nutrients). This condition was evidenced in the lower pond by the overabundance of submerged aquatic vegetation. The upper pond show signs of an algae bloom (reduced water clarity) as well as overabundance of submerged aquatic plants.

Problems Associated With Eutrophication

All ponds (natural and manmade) gradually accumulate nutrients over the course of their lifetime. These nutrients come in many forms including organic debris from both decaying aquatic vegetation and adjacent trees that shed leaves into the pond in the fall and dissolved nutrients such as nitrogen and phosphorus from agricultural and/or residential land use practices which get washed in with precipitation or get transported in with the stream. The input of nutrients to the pond is generally more than the ponds natural ability to break down and assimilate these nutrients. As a result this material builds up on the bottom of the pond as ooze or muck, gradually robbing the pond of depth.

During the winter months when the pond is frozen over, and much of the aquatic plant life has died off, organic material is being decomposed by various species of bacteria on the pond bottom. This process uses up oxygen and, since the pond is frozen and no longer able to exchange oxygen with the atmosphere, oxygen levels in the pond can deteriorate to a point at which fish can no longer survive (termed winter kill). In addition, as soon as the pond bottom becomes anoxic (without oxygen) phosphorus, which was bound in the sediment on the bottom of the pond is released into solution. Phosphorus is a key nutrient for the success and proliferation of both algae and submerged aquatic plants. In the spring when the ice melts, the phosphorus is mixed throughout the water column, making perfect conditions for algae blooms and the overabundance



of aquatic vegetation. The pond once again becomes choked with vegetation until the next winter when the cycle plays itself out once again.

Nutrient Management

Based on our understanding and experience managing aquatic ecosystems, we are able to offer a number of innovative yet simple solutions to problems associated with the overabundance of nutrients. First and foremost is the installation of an aeration system. An aeration system consists of a compressor (electric or windpowered) which sends air through a diffusion station (airstone) on the bottom of the pond. We strongly recommend this to virtually all of our pond clients as it accomplishes several important things:

1. **Circulation** – The stream of bubbles rising up from the air diffusion station creates a current of water which prevents stratification and stagnation and prevents complete freeze up in the winter;
2. **Oxygenation** – The compressor forces thousands of tiny bubbles through the diffusion station causing oxygen to dissolve in the water and reducing anoxia and the subsequent release of phosphorus into the water;
3. **Stimulation of Beneficial Bacteria** – There are many different species of bacteria that are naturally present in ponds that can break down excess nutrients. However the desirable ones (termed aerobic bacteria) require oxygen to do so. The aeration creates conditions that are suitable for the proliferation of these beneficial bacteria.

The second suggestion for mitigation of nutrient issues involves a process called **bioaugmentation**. Quite simply, this process involves adding concentrated numbers of beneficial bacteria to the pond (generally weekly from April to October) to augment the natural population and speed up the rate of nutrient assimilation by the bacteria. Once again, the species that we use are termed aerobic (requiring oxygen) meaning that the process of bioaugmentation works much better when applied in concert with aeration. The added bacteria help to break down excess nutrients and cycle them back through the system. This simply means that the bacteria use the excess nutrients for growth and reproduction and are then consumed by organisms higher up the food chain such as zooplankton and eventually fish. Thus, nutrients that would have ended up trapped in the ooze on the bottom of the pond are now plugged back into the food chain for fish growth.

Once an effective nutrient management protocol is implemented, the rate of nutrient accumulation is reduced and the beneficial bacteria are able to actively compete with both algae and aquatic vegetation for available nutrients resulting in a more balanced aquatic ecosystem.



This process is not instantaneous and can require a number of months before the desired results are achieved.

In addition to the weekly applications of beneficial bacteria, we monitor water quality data on most of the ponds we manage. At the end of each year (October) we summarize the water quality data to look for trends with respect to nutrients and other measured parameters. This information is provided to our clients in the form of an annual report brief and forms the basis for all future management decisions.

Recommended Fish Stocking

Because both ponds have well established aquatic plant communities, they are prime locations to support a balanced warm-coolwater fish community. Based on our site visits, we would recommend a combination of Bluegill (*Lepomis macrochirus*) and Pumpkinseed (*Lepomis gibbosus*) as the primary prey base and Largemouth Bass (*Micropterus salmoides*) and Smallmouth Bass (*Micropterus dolomieu*) as the top predators. All four of these species are in the Centrarchid or Sunfish family. Bluegill and Pumpkinseed are insectivorous, consuming the various aquatic insects that inhabit the pond. They are very well suited to pond habitats and reproduce rapidly.

Largemouth and Smallmouth Bass feed primarily on other fish but will also consume frogs, crayfish and almost anything else that will fit in their mouths. Smallmouth bass would be stocked in the upper pond because they prefer slightly cooler temperatures than do the Largemouth. All four species are nest builders and the males will build and guard a nest in the shallows of the pond during the early to mid summer. Females then come and lay their eggs in the nest (often many females per nest) with the male carefully guarding the nest until the eggs have hatched out and the young have dissipated into the surrounding vegetation for cover. This particular life history characteristic makes these fishes particularly engaging to visitors.

We also feel strongly that stocking this fish community represents a significant educational opportunity for visitors to the complex. We quite commonly collaborate with municipal and golf course clients to develop a series of attractive interpretive signs which detail each of the fish species in the pond. We have found that this provides an enhanced experience for all visitors to the ponds.

In addition to providing enjoyment for those wanting simply to observe nature, this fish community is also well suited to provide recreational angling opportunities for visitors to the complex. Even with no subsequent management, you can expect within 3 years of stocking to have numerous bass in excess of two pounds and thousands of adult bluegill and pumpkinseed.

August 19, 2008

Mr. Shawn Everitt
Director of Recreation
Town of the Blue Mountains
Thornbury, Ontario

Dear Mr. Everitt:

Re: Aeration Systems, Fish Stocking and Nutrient Management for the Ponds at Tomahawk Recreational Complex in Thornbury, Ontario.

Thank you for the opportunity to provide a cost estimate for the purchase and installation of two aeration systems the stocking of a native warmwater fish community and the implementation of a nutrient management protocol for the upper and lower ponds at the Tomahawk Recreation Complex near Thornbury Ontario.

Pond Aeration

The aeration system recommended for the lower pond is an 1/3 hp Gast electric diaphragm compressor connected by approximately 100 feet of 3/8 inch sinking airline to one 7 inch aluminum dioxide air stone. The air stone would be placed in the deepest portion of the pond while the compressor would be placed in the pump house immediately adjacent to the pond. The cost of purchase for the system is **\$700.00** plus tax. The unit would run 24-7 from April to January.

The aeration system recommended for the upper pond is a Kelln 120 solar aeration system. The system consists of two 80-watt Solar panels complete with stands, Pur Water Compressor (0.5 cfm to 3cfm), bleeder valves, compressor enclosure with vents, two 6-volt deep-cycle batteries with battery enclosure, 50 feet of weighted hose and a 12 inch rubber membrane diffuser. The cost for purchase of the system is **\$2750.00** plus tax.

The cost for installation of both systems would be **\$650.00** plus tax. The grand total for the purchase and installation of the two aeration systems would be **\$4100.00** plus tax.

Native Warmwater Fish Stocking

The fish community recommended for the upper pond is smallmouth bass and pumpkinseed. The pumpkinseed could be stocked this fall at a density of 30 fish at a cost of \$3 per fish for a total of **\$90.00**. The smallmouth bass could be stocked in the fall of 2009 at a density of 20 fish (cost to be determined based on availability).

The fish community recommended for the bottom pond is bluegill and largemouth bass. The bluegill should be stocked this fall at a density of 30 adult fish at a cost of \$5.00 per fish for a

total of **\$150.00**. The largemouth bass could be stocked in the fall of 2009 at a cost to be determined later subject to availability. The cost to transport the fish for both ponds to your location would be **\$150.00**. Because the ponds are online, we will be required to obtain a permit to stock fish on your behalf from the Ministry of Natural Resources. This process consists of an onsite meeting with MNR and submission of an application form. The cost for C&M to facilitate this permit on your behalf would be **\$200.00** plus tax. The grand total for obtaining the necessary permit and stocking 30 bluegill and 30 pumpkinseed would be **\$590.00** plus tax.

Nutrient Management

Nutrient management should be initiated immediately following aeration system installation and consists of weekly or biweekly applications of beneficial bacteria by C&M pond management technicians. The bacteria act to break down and assimilate excess nutrients in the pond thus outcompeting algae and increasing water clarity. The bacteria also help to reduce the accumulation of organic wastes on the pond bottom.

In addition to the application of bacteria, our staff would measure water quality parameters in each of the two ponds twice monthly in order to track patterns in water quality and make any necessary changes to the nutrient management protocol. We would also provide an annual summary report of water quality parameters with recommendations for the nutrient management protocol for the following year. The monthly cost for nutrient management at a frequency of once per week is **\$750.00**. This fee includes four applications of beneficial bacteria (30 Trillion live bacteria per application) and biweekly water quality testing with a year-end summary report. The nutrient management could also be done at a reduced frequency (biweekly) at a cost of **\$450.00** per month. This price also includes water quality testing twice monthly and a year end summary report. The chances of experiencing water quality issues such as algae blooms are greater with the biweekly bacteria application than the weekly application frequency.

Nutrient management should begin in April and end in October each year. This means the annual cost for this service is **\$5250.00** plus tax for the weekly application rate or **\$3150.00** plus tax at the biweekly application rate.

Golf Ball Retrieval

Golf ball retrieval services will be provided based on the guidelines laid out by the Ontario Ministry of Labour. Our divers are fully licensed and we are fully insured to provide this type of service. This service will require a 4 man crew for approximately 7.5 hours. The crew consists of two divers (one to retrieve balls, one to be a standby safety diver on the surface) and two people to process balls. The cost to clean out the two ponds

would be **\$1462.50** plus tax per time. This should be carried out at least twice per year for an annual cost of **\$2925.00** plus tax. All recovered golf balls will be turned over the Town of the Blue Mountains.

If you are interested in pursuing any of the items outlined in this letter, please feel free to contact us at the number below. We look forward to working with you to

promote a healthy and balanced aquatic ecosystem that the users of the Tomahawk Recreation Complex will enjoy for years to come.

Yours very truly,
C&M AQUATICS LTD.

A handwritten signature in black ink, appearing to read "Josh Clark".

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